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WATER-REPELLENT INK TRANSFER
SURFACEFrederick H. Frost, Portland, Maine, assignor to
S. D. Warren Company, Boston, Mass., a corporation of MassachusettsNo Drawing. Application December 29, 1947,
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5 Claims. (Cl. 101-149.2)

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This invention relates to offset lithography and especially to improvements in devices and processes for offset printing.

Lithographic printing depends upon the immiscibility of water or aqueous liquids and lithographic printing-ink. In such a printing process there is placed upon a printing surface or plate by any of various known means a water-repellent, i. e., water-shedding or non-water-wettable or non-water-adsorbent image, usually greasy, waxy, or resinous in nature. Over this is applied a film of wet-out solution, usually water slightly acidified and containing glycerine or similar substance. The wet-out solution wets all portions of the plate not already covered by the imaging material, but does not wet the water-repellent image. An inking-roll coated with lithographic printing ink is next passed over the plate to apply a film of ink to the imaged areas of the plate, but no ink is left on the unimaged areas which carry the film of ink-repellent wet-out solution.

The plate bearing ink and aqueous wet-out solution respectively on its imaged and unimaged areas is then pressed against a transfer surface or offset blanket to which ink is transferred in a pattern reverse to that on the plate, and to which in its remaining areas aqueous fluid is also transferred. As a final step in the printing operation the transfer surface or offset blanket so wet with ink and aqueous fluid is pressed against a sheet of paper to which in turn ink or aqueous fluid are transferred to produce the final printed matter.

Obviously during the printing cycle previously described both ink and aqueous solution are withdrawn from the plate. Moreover additional water is lost from the plate by evaporation. Consequently as the printing cycle is repeated additional quantities of aqueous solution and ink are successively applied to the plate by means of dampening-rolls and inking-rolls which are fed respectively from a dampening-solution fountain and an ink fountain which constitute part of a conventional offset printing press assembly.

There are, however, certain disadvantages which accrue from having the paper wet by aqueous dampening solution during the usual offset printing process. One such disadvantage is that in general coated papers which have not been treated to render them fairly water-insoluble cannot be printed satisfactorily by the offset process now practiced, since a coating not rendered fairly insoluble is liable to stick to the wet blanket and thereby spoil the paper and at the same time dirty the press.

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Another but less obvious difficulty frequently resulting from contact of the printing-paper with the wet offset blanket in cases when no perceptible picking occurs is that soluble material in the paper dissolves in the water on the blanket and is carried back by the blanket to the inking-rolls where the dissolved material may act to emulsify the ink and so produce scum on the plate.

A further sometimes very serious difficulty in present offset printing technique is that the paper in absorbing the water from the wet blanket tends to expand and so change its dimensions. This frequently causes troublesome curling of the printed sheet and especially in color printing where the sheet must be printed more than once the expansion caused by water absorption may and often does cause misregister or failure of superposed printed outlines exactly to coincide.

It is therefore an object of the present invention to print paper by offset lithography and at the same time avoid wetting the paper with water or aqueous solution during the printing operation. There are at least two ways this desired object can be accomplished. One way is to use a paper which is water-repellent or non-water-wettable; such paper does not absorb or adsorb water or remove water from the system. Non-wettable paper of this nature is effective for printing both by offset lithography and by direct lithography where the paper is printed directly from the wet printing plate.

In the case of offset lithography, a preferable way to prevent wetting of the printed paper and resultant withdrawal of water from the system is to provide an offset blanket which itself is not wettable by water but which of course is readily wettable by lithographic ink. The use of such a water-repellent offset blanket not only accomplishes all the desirable effects resulting from the avoidance of wetting the paper during the printing operation but it likewise cuts down evaporation of water from the system since the blanket no longer carries an aqueous film from which water can evaporate.

While the chief value of the invention is to provide a water-shedding blanket to replace the customary water-wettable blankets hitherto used in ordinary offset lithography, it also makes possible in special cases a modification of the usual procedure of offset lithography, as will be explained. A tantalizing goal in the field of lithography for many years has been the development of a satisfactory lithographic process which would eliminate need for use of dampening rolls and water fountains on lithographic printing presses. The

omission of such moistening mechanism from a lithographic press would make the latter much more nearly comparable to a letterpress in simplicity of construction and operation. Many methods for accomplishing this end have been suggested but no method has yet achieved commercial success.

Most of the prior methods suggested for so-called dry lithography have depended upon the use of ink containing water emulsified therewith, the water being supposed to wet the clear areas of the plate while the ink wets the image. The method of the present invention does not depend on the use of emulsified inks, and in fact functions best when using an ink which is not emulsified either before or during the printing process. According to this particular aspect of the invention the imaged plate is, either before or after being placed in the press, wet with wet-out solution which may be applied by a sponge or a hand-operated roller. The so wet plate is then inked and impressed upon a water-shedding, i. e. non-water wettable, offset blanket which in turn transfers the print to a paper sheet. The printing cycle is repeated without addition of water or moistening solution after the initial wet-out. The original wet-out solution is not lost in significant amount to the non-wettable blanket. The chief losses are by evaporation from the plate and probably by entrapment of solution by the ink on the inking-roll. In any case, however, the loss is small by comparison with usual offset printing when a wettable blanket is used. Consequently a considerable number of satisfactory prints can be made before the plate begins to show evidence of "tone" or soil. From 50 to 100 good prints can be depended upon. In many if not most cases for office copying or business systems duplication 50 copies are as many as are desired. In such cases the invention makes possible the use of a printing device which is simple both to operate and to construct, consisting as it does merely of a printing plate, means for inking the plate, a water-shedding blanket, means for bringing the blanket first into contact with the inked plate and then into contact with a paper sheet and means for moving sheet paper through the system.

It should be borne in mind, however, that the concept of using a water-shedding blanket is applicable to the entire field of offset lithography. The substitution of such a blanket for the usual rubber blanket in any offset printing press yields among others two very important advantages: (1) absorption of water by and consequent distortion of the printed sheet are avoided, and (2) press operation is facilitated and quality of printing is improved by the fact that much less than customary quantities of dampening solution need be applied to the plate in each printing cycle.

The invention lies not in a blanket of specific composition but in any blanket which is water-shedding and ink-receptive and at the same time has the other qualities normally requisite in an offset blanket. Customary offset blankets have a surface of resilient rubber which is wettable by water. Such a rubber blanket may be waxed with paraffin, whereupon it becomes water-repellent i. e., non-water-wettable and will serve to illustrate the invention. A more durable surface is provided by applying a water-shedding lacquer, such as a plasticized vinyl resin lacquer, to the surface of a rubber blanket. Other usable lacquers include water-shedding lacquers customarily used to coat regenerated cellulose films to make moisture-proof films therefrom.

Blankets of longer life than those obtained by lacquering a supporting surface result from using a sheet of a water-shedding elastic resin, which may be suitably plasticized if desired. A sheet of copolymer of 85% vinylidene chloride and 15% vinyl chloride plasticized with 15% of dibutyl sebacate provides a very suitable surface for the water-shedding blanket of the invention. Other elastic resins, such as those silicone rubbers which are both ink-receptive and water-shedding, may be used. Probably rubber itself can be compounded, possibly by admixture with silicones, so that it will be sufficiently water-shedding while retaining its ink receptivity.

A sheet of elastic resinous material as described above may be cemented or heat-sealed to a backing of woven material such as cotton duck. This composite sheet when perforated at the ends to fit the clamping device on the printing press makes a very satisfactory offset blanket.

Plasticizers commonly are added to film and filament forming materials such as the synthetic resins, cellulose esters, etc. for the purpose of improving the softness, flexibility, elongation and other physical properties of the films and filaments but some of such plasticizers also have desirable or innocuous (depending upon the intended use of the film or filament) properties with respect to the water resistance of the films or filaments. A familiar instance is the provision of plastic or synthetic resin films for wrapping foods and other articles. I have found that many of such materials which are capable of forming coatings on, e. g. a rubber blanket, or of forming a thin sheet adapted to be carried on a fabric support or of forming a self-supporting blanket, as described above, have the requisite ability to be wetted by lithographic ink and to resist wetting by water for use in my invention.

The surface, whether in the form of a lacquer carried on a support, or a separately formed film carried on a support or a self-supporting blanket may depend for its water-shedding properties upon inherent properties of the resin or upon the presence of a plasticizer or both. In the case of a lacquer formed of polymerized vinyl chloride plasticized with, e. g. 15 to 20 per cent of an ester type plasticizer such as dibutyl phthalate or dioctyl phthalate it appears that the water-shedding property is inherent in the vinyl resin. On the other hand, in a lacquer of the following composition, excluding volatile solvent,

	Parts by weight
55 Nitrocellulose -----	30
Ester gum -----	50
Diamyl phthalate -----	15
Paraffin wax -----	5

the water-shedding property is attributed to the paraffin wax content.

Since such materials are well-known and are described in the literature, I consider it to be unnecessary in disclosing my invention to do more than refer to such materials and identify them clearly by a typical example. In addition to the disclosure above of a typical vinylidene resin containing 15% of dibutyl sebacate as the plasticizer I may say that other plasticizers such as dibutyl phthalate and dioctyl phthalate may be used in varying amounts, e. g. within the range from 5 to 25%. The terms "water-repellent," "water-shedding," "non-water-wettable" and "non-water adsorbent" as used herein refer to the property of a surface which causes water

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applied thereto to gather into droplets rather than to spread over the surface as a film.

I claim:

1. Lithographic printing process which comprises wetting different areas of the surface of a lithographic plate with ink and an immiscible aqueous liquid and contacting said surface with another surface which is ink-receptive and non-water-adsorbent.

2. Process as defined in claim 1 in which said ink-receptive and non-water-adsorbent surface is the surface of a transfer blanket which in turn is contacted with an ink-receptive surface.

3. An offset planographic printing press comprising a transfer blanket having an ink-receptive and non-water-adsorbent surface.

4. Process as defined in claim 1 in which the ink-receptive and non-water-adsorbent surface is the surface of a transfer blanket having a non-elastic textile base and an adherent layer of

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resilient non-water-adsorbent and ink-receptive synthetic resin composition.

5. Process as defined in claim 1 in which the ink-receptive and non-water-adsorbent surface is the surface of a transfer blanket comprising a resilient layer having an ink-receptive and non-water-adsorbent surface coating thereon.

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Certificate of Correction

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July 31, 1951

FREDERICK H. FROST

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 5, line 8, for "ink-respective" read *ink-receptive*;

and that the said Letters Patent should be read as corrected above, so that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 2nd day of October, A. D. 1951.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.