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UNIVERSAL FOUNTAIN SOLUTION FOR PLANOGRAPHIC PRINTING

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3 Claims. (Cl. 106—2)

ABSTRACT OF THE DISCLOSURE

A universal fountain solution for planographic printing which solution in general comprises a humectant, a buffer, a glycol ether and an organic solvent in prescribed proportions.

This application is a continuation-in-part of application Ser. No. 476,204, filed July 30, 1965, now abandoned.

BACKGROUND OF THE INVENTION

Planographic printing involves the preparation of a flexible printing plate having water-receptive nonprint areas and water-repellent ink-receptive areas constituting an image to be reproduced. The plate is moistened with an aqueous liquid which is repelled by the image, to render and maintain the nonprint areas of the plate ink repellent after which printing ink is applied to deposit the same on the ink-receptive image areas. The ink is then transferred from the image, usually by an offset blanket to a copy sheet, to form a reproduction of the image thereon. The moistening, inking and transfer operations are successively repeated for the production of large numbers of copies.

Offset printing presses differ widely in construction. However, a typical press contains four cylinders of uniform diameter. First of the four is the printing cylinder, which carries the flexible printing plate clamped tightly around it. Bearing on this, one on each side of the printing cylinder, are two sets of rollers: the water rollers, which moisten the face of the plate as the cylinder revolves; and the ink rollers, which supply the ink. The water rollers are supplied with an aqueous liquid from a supply reservoir referred to as the fountain. The printing cylinder does not come in contact with the paper, but rather prints the image on the surface of the second cylinder which is known as the blanket cylinder. To one side (usually) of the blanket cylinder is the third cylinder, the impression cylinder, the purpose of which is to hold the paper against the blanket cylinder as all of the cylinders revolve. The paper feeds in between the impression cylinder and the blanket cylinder, and the printing takes place at the point at which the two are in contact. Thus, the printing image is transferred to, or offset on, the paper. The fourth cylinder which is usually below the pressure cylinder and revolves against it, and is the delivery cylinder which carries the printed paper to the delivery end of the press.

The present invention relates particularly to improvements in the aqueous solution which is to be used in the fountain of presses of the above-described type. The formulation of the invention may be referred to as a universal-type fountain solution since it is applicable to virtually all types of planographic printing plates. There are in current use three basic types of planographic printing plates, each of which has, heretofore, required that a different type of solution be used in the fountain of the press. The first of these types of printing plates is the so-called "photo-direct" plate which requires processing

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with an etchant prior to printing. The second type of plates is the so-called "metal plate," and the third type is the "direct-image" type, sometimes referred to as a "stencil" plate since it is prepared by typing or drawing directly on the plate. This latter type of plate is usually made with a paper or plastic base.

A common characteristic of all of these types of plates is that the image is oleophilic in nature in that it attracts oily or greasy substances and is essentially water repellent. The image background portion of the plate is hydrophilic to the extent that it can readily be wetted by water but it can also, before being wetted, accept and hold an oily or greasy image. A hydrophilic-oleophilic balance must be maintained so that the greasy image can be applied to the surface of the plate and the background area can be wetted. The planographic surface thus prepared and imaged is subjected to treatment by an etching solution (etchant) which conditions the plate for printing. The etchant is repelled by the image portion of the plate but is attracted by the background area. The background area, therefore, is covered by a surface film of etchant leaving only the image portion ink receptive. Once in the press, the nonimage portion of the plate is maintained in a moistened condition by the fountain solution, applied by the water rollers.

Heretofore, fountain solutions have comprised either tap water, distilled water, dilute aqueous solutions of gum arabic, or relatively complex formulations of water and alcohol, and/or other organic solvents. Also it has been proposed, heretofore, to add glycerine and/or other deliquescents and/or humectants to the fountain solution. In some instances, other additives such as colloidal silicic acid and phosphoric acid have been used. However, each of the many fountain solutions of the prior art has been formulated for use with a particular type of printing plate and has not been suitable for use as a universal solution.

By the present invention, there is provided a fountain solution which is compatible with virtually all types of planographic printing plates and which, therefore, does not require that the solution in the press fountain be changed each time that it is desired to use a different type of plate. Additionally, the novel composition of the fountain solution of the present invention overcomes certain other shortcomings of prior solutions. For example, certain prior formulations tended to gum up the press or cause "piling" which necessitated frequent cleaning of the press. Also, the novel composition of the present invention obviates frequent changes and/or adjustments of the press during running. Another advantage of the composition of the present invention is that it utilizes less water, thereby permitting the water rollers of the press to be somewhat drier than is usual in normal press operation. The advantage of drier rollers is that the paper issuing from the press will also be drier. A reduction in paper drying time permits the reverse side of each sheet of paper to be printed immediately and also significantly reduces the time required for printing multiple color jobs. Still another advantage of the universal fountain solution of the present invention is that it is compatible with a very large number of types of inks. Heretofore, the type of fountain solution employed determined in part the types of ink which must be employed in the press, or conversely. Also, the use of ethyl glycol monobutyl ether in the fountain solution will virtually eliminate the problem of ink emulsification because of the coupling action of this substance which allows a greater percentage of the water to mix with grease or oil base ink.

Not only is the composition of the fountain solution of the present invention useful in the press, but also may be used as an etchant for photo-direct plates as well as direct image plates. That is, the solution of the present inven-

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tion may be used to prepare a planographic plate for printing as well as to maintain the plate in the necessary moist condition during the printing process. It has also been found that the solution of the present invention permits a significantly longer press run (more copies) than has been possible with solutions of the prior art.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a novel and improved solution for use in the fountain of planographic printing presses.

Another object of the invention is to provide a novel and improved universal fountain solution, of the type used for maintaining planographic plates in moist condition during printing.

Yet another object of the invention is to provide a novel and improved universal fountain solution which is compatible with various types of planographic printing plates, including direct-image plates, photo-direct plates, metal plates, fiber plates, and "Ektalith" plates, and which requires no special handling, special inks, special press adjustments, or other modifications of the printing process.

Still another object of the invention is to provide a novel and improved formulation for a fountain solution to be used in the fountain of planographic printing presses, which formulation is more economical and which has greater versatility than prior formulations intended to achieve generally similar purposes.

These and other objects of the invention will become more apparent to those versed in the art upon consideration of the following description.

DESCRIPTION OF THE INVENTION

The formulation of the invention is based upon an aqueous solution of a monobasic alkali metal phosphate; alcohol; a humectant selected from the group comprising glycerin, propylene glycol, and sorbitol; a substance selected from the group comprising "butyl Cellosolve," "butyl Carbitol," and "Jeffersol EB," all trade names for ethylene glycol monobutyl ether. A trace amount of phosphoric acid may be added to adjust the pH to within the preferred range of 3.5 to 4.5. A preferred formula for the stock solution which may be diluted 1:7 with water for use with any of the various types of planographic printing plates referred to hereinabove, is given in the following example in which all parts are in terms of percent by weight:

Example 1

	Percent
Monopotassium phosphate [KH_2PO_4]	2
Isopropyl alcohol [$\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$]	7
Glycerin $\text{CH}_2\text{OHCHOHCH}_2\text{OH}$	12
Ethylene glycol monobutyl ether (butyl "Cellosolve" or 2-butoxyethanol)	
[$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_2\text{OH}$]	8
Balance deionized water.	

In preparing the solution set forth in the foregoing Example 1, it is preferred that the monopotassium phosphate be added to the deionized water first and thoroughly mixed therein, after which the remaining liquid ingredients are added and thoroughly mixed therewith. The solution of Example 1 constitutes a stock solution which is further diluted in the ratio of one part of said solution to seven parts deionized water prior to use in the fountain of the press. This solution is the preferred formulation and is deemed to be the best compromise between cost and performance.

As examples of the ranges of operable concentrations of the solution components, there follows a number of examples, the first of which, Example 2, shows the low limit concentrations of the reagents. As in the foregoing example, all percentages are by weight.

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Example 2

	Percent
Monopotassium phosphate [KH_2PO_4]	0.1
Isopropyl alcohol [$\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$]	1
Glycerin [$\text{CH}_2\text{OHCHOHCH}_2\text{OH}$]	2
Ethylene glycol monobutyl ether (butyl "Cellosolve" or 2-butoxyethanol)	
[$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_2\text{OH}$]	1
Balance deionized water.	

In the following examples the maximum quantity of reagents have been used. In Example 3, the maximum amount of alcohol has been employed, while in Example 4 the maximum amount of glycerin has been used. Example 5 is illustrative of the maximum amount of ethylene glycol monobutyl ether and Example 6 shows the use of the maximum amount of the buffer.

Example 3

	Percent
Monopotassium phosphate [KH_2PO_4]	1
Isopropyl alcohol [$\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$]	25
Glycerin [$\text{CH}_2\text{OHCHOHCH}_2\text{OH}$]	5
Ethylene glycol monobutyl ether (butyl "Cellosolve" or 2-butoxyethanol)	
[$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_2\text{OH}$]	3
Balance deionized water.	

Example 4

	Percent
Monopotassium phosphate [KH_2PO_4]	1
Isopropyl alcohol [$\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$]	2
Glycerin [$\text{CH}_2\text{OHCHOHCH}_2\text{OH}$]	30
Ethylene glycol monobutyl ether (butyl "Cellosolve" or 2-butoxyethanol)	
[$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_2\text{OH}$]	1
Balance deionized water.	

Example 5

	Percent
Monopotassium phosphate [KH_2PO_4]	1
Isopropyl alcohol [$\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$]	2
Glycerin [$\text{CH}_2\text{OHCHOHCH}_2\text{OH}$]	2
Ethylene glycol monobutyl ether (butyl "Cellosolve" or 2-butoxyethanol)	
[$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_2\text{OH}$]	25
Balance deionized water.	

Example 6

	Percent
Monopotassium phosphate [KH_2PO_4]	10
Isopropyl alcohol [$\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$]	7
Glycerin [$\text{CH}_2\text{OHCHOHCH}_2\text{OH}$]	2
Ethylene glycol monobutyl ether (butyl "Cellosolve" or 2-butoxyethanol)	
[$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_2\text{OH}$]	5
Balance deionized water.	

The maximum amount of monopotassium phosphate used will be dependent upon the amount of nonaqueous materials in the solution. If the amount of nonaqueous materials is increased, obviously the amount of monopotassium phosphate that will stay in the solution will be decreased.

It should be understood that the exemplary formulations are not limited to monopotassium phosphate as the buffer since other buffers may be substituted therefor. For example, the buffer may also be monoammonium phosphate or monosodium phosphate. A 0.2 mole solution of monopotassium phosphate has a pH of 4.2 to 4.5 at 25° C., which is within the desired range. The buffer serves to maintain the desired pH of the fountain solution. As was stated previously, a trace amount of phosphoric acid may be added to adjust the pH. It has been found that the workable pH range of the fountain solution is from 2 to 7. A pH below the lower limit, namely 2, may result in damage to the printing press.

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Example 7

	Percent
Monosodium phosphate -----	2
Isopropyl alcohol -----	7
Glycerin -----	12
Ethylene glycol monobutyl ether (butyl "Cellosolve" or 2-butoxyethanol) -----	8
[CH ₃ CH ₂ CH ₂ CH ₂ OCH ₂ CH ₂ OH] -----	8
Balance deionized water plus a trace of phosphoric acid.	

Example 8

	Percent
Monoammonium phosphate -----	2
Isopropyl alcohol -----	7
Glycerin -----	12
Ethylene glycol monobutyl ether -----	8
Deionized water and trace of phosphoric acid -----	71

Examples 7 and 8 are illustrative of the substitution of monosodium phosphate and monoammonium phosphate for monopotassium phosphate as the buffer. These examples also include the use of a trace of phosphoric acid to maintain optimum pH.

Alcohol such as ethyl and n-propyl may be substituted for isopropyl alcohol as set forth in Examples 9 and 10, respectively.

Example 9

	Percent
Monopotassium phosphate -----	2
Ethyl alcohol -----	7
Glycerin -----	12
Ethylene glycol monobutyl ether -----	8
Deionized water and a trace of phosphoric acid -----	71

Example 10

	Percent
Monopotassium phosphate -----	2
n-Propyl alcohol -----	7
Glycerin -----	12
Ethylene glycol butyl ether -----	8
Deionized water and a trace of phosphoric acid -----	71

It will also be understood by those versed in the art that other polyhydric alcohols may be substituted for glycerin. For example, the glycerin may be replaced by propylene glycol (see Example 11) or ethylene glycol (see Example 12).

Example 11

	Percent
Monopotassium phosphate -----	2
Isopropyl alcohol -----	7
Propylene glycol -----	12
Ethylene glycol monobutyl ether -----	8
Deionized water and trace of phosphoric acid -----	71

Example 12

	Percent
Monopotassium phosphate -----	2
Isopropyl alcohol -----	7
Ethylene glycol -----	12
Ethylene glycol monobutyl ether -----	8
Deionized water and trace of phosphoric acid -----	71

Variations may also be made in the range of dilution of the stock solution with water. It has been found that acceptable ranges of dilution are from one part stock solution to one part water, to one part stock solution to thirty

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parts water. While all of the above formulations specify the use of deionized water, which is preferred, it should be understood that the use of deionized water is not a necessary limitation of the invention.

It will thus be seen from the foregoing description that the present invention comprises a single product which continues the condition of any one of a variety of planographic plates beyond the camera control to, and through, the printing cycle. It will also be seen that a fountain solution prepared according to the present invention accomplishes the intended objects and has the desirable advantages and characteristics, including those hereinbefore pointed out and others which are inherent in the invention.

Since certain changes may be made in the above formulations and processes, without departing from the scope of the invention herein involved, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A solution which is to be diluted with water for use in the fountain of a planographic printing press comprising:

0.1% to 10% by weight of a buffer comprising a monobasic alkali metal phosphate selected from the group consisting of monopotassium phosphate, monoammonium phosphate and monosodium phosphate;

1% to 25% by weight of an alcohol selected from the group consisting of ethyl alcohol, isopropyl alcohol and n-propyl alcohol;

2% to 30 by weight of a polyhydric alcohol humectant selected from the group consisting of ethylene glycol glycerin and propylene glycol;

1% to 25% by weight of ethylene glycol monobutyl ether; and

the balance being water; and wherein all of the monobasic alkali metal phosphate is in solution.

2. A solution which is to be diluted with water for use in the fountain of a planographic printing press comprising:

2% by weight of a buffer comprising a monobasic alkali metal phosphate selected from the group consisting of monopotassium phosphate, monoammonium phosphate and monosodium phosphate;

7% by weight of an alcohol selected from the group consisting of ethyl alcohol, isopropyl alcohol, and n-propyl alcohol;

12% by weight of a polyhydric alcohol humectant selected from the group consisting of ethylene glycol, glycerin and propylene glycol;

8% by weight of ethylene glycol monobutyl ether; and the balance being water.

3. The invention as set forth in claim 1 and wherein a trace of phosphoric acid is added to adjust the pH of the solution to within the range of approximately 2 to 7.0.

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