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FOUNTAIN SOLUTION AND PLATE ETCH CONCENTRATE OF INCREASED OPERATING LATITUDE

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No Drawing. Continuation of abandoned application Ser. No. 855,369, Sept. 4, 1969. This application Jan. 18, 1971, Ser. No. 107,522

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ABSTRACT OF THE DISCLOSURE

A fountain solution concentrate of increased operating latitude is provided which is adapted upon varying degrees of water dilution for use with a plurality of different types of planographic masters, such as electrostatic, direct image, and photographic plates, both projection speed and conventional.

The concentrate comprises an aqueous solution of a humectant, a buffered phosphate compound, and preferably a low molecular weight aldehyde. Relatively high weight ratios of the phosphate ion to the humectant are possible without sacrificing a tolerable acidic pH.

This application is a continuation of application Ser. No. 855,368, filed Sept. 4, 1969, and now abandoned.

BACKGROUND OF THE INVENTION

In the art of copy reproduction from planographic masters, it is customary continually to flow what is termed a fountain solution over a master as it is rotated on a drum to imprint repeatedly its image on a receiving sheet of paper, or the like, either directly or through an intervening blanket cylinder. The solution is designed to convert the non-image areas to hydrophilic condition, to preserve that condition in the course of the printing use, and to maintain a sharp distinction between the hydrophobic image areas and the hydrophilic background areas, such that a longer run may be achieved than might otherwise be the case.

The present invention relates to a solution concentrate which can be shipped as and then diluted at a point of use and, more particularly, to such a concentrate which, even after varying degrees of dilution, is effective for use with various types of planographic masters, either as a fountain solution or plate etch, without sacrificing a tolerable acidic pH.

In the past, fountain solutions have been composed of ingredients found useful for particular planographic masters, especially as new or more sophisticated types of masters appeared. For example, whether the backing was paper, aluminum, or zinc, coated or uncoated, the type of sensitizer employed, the manner by which an image was actually formed on the backing, etc., all could influence the ingredients chosen for a fountain solution to be used with such a master. Accordingly, it is not surprising that a number of different fountain solutions have been formulated to meet diverse requirements, causing printers to stock inventories of each. It would, therefore, advance the art if a single fountain solution could be provided which required only varying amounts of dilution to adapt it for virtually any type of master, regardless of the nature of the backing, the sensitizer used, and whether a conventional, electrostatic, direct image, or Photo-Direct master was to be prepared.

It is known that the phosphate ion, $\equiv PO_4$, is admirably suited for maintaining the non-image areas of a master in a hydrophilic condition. The effect of the phosphate ion, as well as the latitude of application of a fountain solution containing it, particularly a concentrate, are directly related to the amount of phosphate ion that can be dissolved. Not many phosphate compounds are water soluble. Those that are have such a limited solubility in glycerin-water solution that for a relatively concentrated solution, such that contemplated for the present fountain solution concentrate, not enough phosphate can be dissolved to meet the objective sought. On the other hand, phosphoric acid, H_3PO_4, is readily soluble in water. In this case, however, dissolving enough acid to produce the desired amount of phosphate ion in a concentrate renders the solution so strongly acidic that it is impractical for use.

Another important component of a fountain solution is a humectant such as glycerin. A humectant serves not only to keep the surface moist in a dry atmosphere, but to keep the solution on the surface of a master and prevent it from soaking in which can result in curling of paper-backed masters. Similarly, a humectant retains the phosphate ion on the non-image areas of the master where it can perform its useful and intended functions. Accordingly, it is desirable to have as much humectant present as possible as long as the functions of the other components are not adversely affected. Particularly desirable is a high weight ratio of the phosphate ion to a humectant, so that the best features of both components are happily combined.

U.S. Patent No. 3,398,002 to Bondurant et al. discloses a fountain solution said to be of universal application for planographic printing. The composition of this solution is relatively complex, containing at least four necessary components (in addition to water) and including, for instance, an alcohol such as ethyl alcohol, propyl alcohol, or isopropyl alcohol, and ethylene glycol monobutyl ether. The latter component in particular is said to undergo a coupling action which is relied upon to eliminate ink emulsification. Under optimum conditions, the maximum amount of the phosphate ion in the solution of Patent No. 3,398,002 is 10 percent by weight calculated as the monopotassium, monoammonium, or monosodium phosphate; and the maximum amount of humectant is 30 percent by weight.

SUMMARY OF THE INVENTION

The aqueous fountain solution of the present invention is highly concentrated as to the amount of phosphate ion and humectant present and, accordingly, has a relatively high weight ratio of phosphate ion to humectant. For example, the present solutions contain as much as 12 percent by weight of an anhydrous phosphate, such as monosodium phosphate, and as much as 75 perecnt by weight of a humectant.

These relatively concentrated amounts are accomplished, in part, by eliminating from the solution all additives such as alcohols, ethers, etc., which were thought to improve the overall performance of a fountain solution. Instead, it has been determined that such additives actually inhibit the solubility in the aqueous medium of other components and especially those whose presence in maximum amounts have been found to be advantageous. The present concentrated fountain solutions have also been achieved by the use of a buffered phosphate compound capable of relatively high solubility in the solution to produce a high weight ratio of the phosphate ion to the humectant without resulting in a highly acidic pH, even in the concentrated form.

As a result, the present concentrate can be shipped to a point of use and then diluted as needed with water. The amount of the dilution depends upon the purpose of use, either as a plate etch or fountain solution, and on the particular master material and the equipment upon which

it is run. In any case, the present solution after dilution performs well with each type of master and especially with Photo-Direct and electrostatic masters which are inherently quite critical in their operation, and especially so when running these two types intermixed, and with other types of masters.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A concentrated aqueous fountain solution of the present invention comprises at least 60 percent by weight of a humectant and a sufficient amount of a buffered phosphate compound to provide a weight ratio of the phosphate ion to the humectant in the range of about 0.085:1 to about 0.160:1 on the basis of anhydrous diH sodium orthophosphate. The phosphate compound is sufficiently buffered to provide a pH for the concentrate in the range of about 3.75 to about 4.50 for the stated weight ratios. The concentrate may also contain a low molecular weight aldehyde according to U.S. Patents 2,393,875 and 2,515,536.

In view of its hygroscopic character and its aid to viscosity, the humectant aids in keeping clean the hygrophilic non-image areas of a master. The humectant may be glycerin, ethylene glycol, or diethylene glycol. Glycerin is much preferred. Longer runs are possible with glycerin than with the other two, because glycerin increases the viscosity more effectively. However hygroscopic, the glycerin and water alone do not provide an acceptable fountain solution. The presence of a phosphate ion is essential.

To place by dissolution sufficient quantities of the phosphate ion in the solution concentrate without unduly lowering the acid pH, a buffered phosphate compound is used. Although the previously mentioned U.S. Patent 3,398,002 teaches that monoammonium phosphate can be used in that solution as well as monosodium phosphate, monoammonium phosphate is not useful in the present fountain solutions. It cannot meet the higher solubility requirements and does not produce the phosphate ion to humectant weight ratio desired. Instead, in the present solution, alkali metal phosphate salts, such as sodium and potassium phosphates, that still contain an ionizable hydrogen atom, are used. Although di-substituted phosphoric acid salts, such as disodium acid phosphate, may be used to achieve a phosphate ion to humectant weight ratio in lower portion of the range cited, it is preferred to use the mono-substituted salts because of the required pH values. The preferred buffered phosphate compound is monosodium phosphate which is also known as diH sodium orthophosphate. The hydrated form of an alkali metal acid phosphate may be used to promote the dissolving action.

The joint presence of the humectant and buffered phosphate compound tends to encourage the formation of mold. It has been found that the mold can be substantially inhibited or entirely eliminated by the presence of a low molecular weight aldehyde, such as formaldehyde and acetaldehyde. In addition, the aldehyde, especially formaldehyde, materially contributes to the efficacy of the fountain solution by aiding the cleaning of the hydrophilic, non-image areas of the master and maintaining them ink-repellent. Further, the aldehyde reduces the ratio of fountain solution to ink needed to keep the background clean. If the ratio of fountain solution to ink is high, it tends to cause the copy paper to curl and the ink to become emulsified. The use of an aldehyde guards against these deleterious effects by reducing the ratio of the fountain solution to ink needed by the master.

With respect to proportions, substantially increased amounts of the humectant and phosphate ion are jointly possible. The humectant should comprise at least 60 percent by weight of the concentrate and can comprise as much as 75 percent or higher. Preferably, as much as possible of the buffered phosphate compound should be dissolved in the concentrate. Based on solubility limits, the present concentrate can dissolve a sufficient amount to provide a phosphate ion to humectant weight ratio in the range of about 0.085:1 to about 0.160:1 on the basis of anhydrous diH sodium orthophosphate. As indicated, this results in a pH range for the concentrate of about 3.75 to about 4.50. The aldehyde can be present in an amount up to about 3 percent based on a 37 wt. percent aqueous solution. More than 3 percent tends to upset the buffering action of the phosphate.

As an example, a composition of the present concentrate containing the preferred components may have the following general composition in weight percent:

	Percent
Glycerin	60 to 75
Monosodium phosphate	8 to 12
Formaldehyde (37% aqueous solution)	0.5 to 2.5
Distilled water	Balance

To prepare the concentrate, the ingredients may be mixed together in any order. The preferred procedure is to add the aldehyde to the phosphate and mix. Then water is added and finally, the glycerin. This order causes the pH to reach a stable condition much more quickly. Any other order, it has been discovered, requires an extended period of time before the optimum pH is obtained and the solution can be used.

The following examples are intended to illustrate the invention and should not be construed as limiting the claims. Percentages are by weight.

Example 1

A concentrated fountain solution was prepared having this composition:

Percentage	Quantities, kilograms	Components
70.00	84.140	Glycerin, 95 percent.
1.00	1.202	37% aqueous formaldehyde.
11.50	13.820	Monosodium phosphate monohydrate.
17.50	21.038	Distilled water.

In preparing this concentrate, the monosodium phosphate was first wetted by the formaldehyde to the consistency of a paste. The water was next added with stirring to fully dissolve the phosphate. Then the glycerin was added and the stirring continued until the solution was homogeneous. These quantities produced approximately 25 U.S. gallons. The specific gravity of this solution was 1.275 at 25/4° centigrade. Its pH was 4.30 at 25° centigrade. The concnetrate was packaged for shipment in one gallon plastic bottles made of polyethylene.

Example 2

Another fountain solution concentrate was prepared having this composition:

Component:	Percentage
Glycerin	65.0
37% aqueous formaldehyde	0.75
Monosodium phosphate	8.5
Water	Balance

The ingredients were mixed together with continuous stirring in the manner of the preparation of the composition of Example 1. The specific gravity of this concentrate was 1.250 at 25/4° centigrade, and its pH was 4.10 at 25° centigrade.

Example 3

The concentrate of Example 1 was diluted one part of the concentrate to 7 parts of water and then used as a fountain solution in a duplicator having separate ink and water systems. An electrostatic master was used which normally produced about 500 copies before the background of the master degraded to ink receptiveness. With the present fountain solution, diluted as indicated, the same electrostatic master produced over 5000 copies. It was also noted that an increased number of electrostatic masters could be run on a duplicator having a blanket

cleaner, before a sufficient amount of sludge was deposited on the wick in the blanket cleaner to require cleaning of the wick.

Example 4

In a duplicator having an integrated ink and water system, the concentrate of Example 1 was diluted one part of the concentrate to 3 parts of water, and then used as a fountain solution for a succession of electrostatic masters. It was found that more masters could be run than usual before clean-up of the inking system was required.

Example 5

The present concentrate diluted as in Example 3 was used as a fountain solution for a Photo-Direct master on a duplicator having separate systems. This master ran easily and was compatible with all direct image masters and electrostatic masters.

Example 6

The present concentrate diluted as in Example 3 provided compatibiilty when electrostatic, Photo-Direct, photo-image, and direct image masters were interchanged. For best results when interchanging the above indicated types of masters, it is recommended that the electrostatic masters be converted in an Addressograph-Multigraph Master Converter. Photo-Direct masters should be processed in the normal manner.

The present concentrate fountain solution is a shippable commodity which can be diluted as desired at a point of application for use with a plurality of different types of masters without losing its ability to keep clean the background or hydrophilic areas of the masters. In particular, the present concentrate provides increased operating latitude; interchangeability and operating compatibility among conventional, electrostatic, Photo-Direct, and direct image masters; and especially much longer runs when used with electrostatic masters.

The present fountain solution concentrate has an improved desensitizing effect which requires less moisture to produce quality copies. Because there is less solution used, the possibility of contamination is reduced since less moisture is carried back into the ink system. The present concentrate also makes longer runs possible through its special chemical properties that provide the best combination of action for keeping non-image areas of the masters clean with a minimum of moisture pentration of the surface of the master. Ink and water balance are easy to maintain, and emulsification of the ink is also reduced. In order to achieve the appreciably increased amounts of the phosphate ion and humectant in the concentrate, the present solutions eliminate other previously used compoents like alcohol and ethers which delimit the solubility of the phosphate and the humectant.

Although the foregoing describes several embodiments of the present invention, it is understood that the invention may be practiced in still other forms within the scope of the following claims.

What is claimed is:

1. A solution concentrate of increased operating latitude adapted upon varying degrees of dilution for use with a plurality of different types of planographic masters, said concentrate consisting essentially of an aqueous solution of about 60 percent to about 75 percent by weight of a humectant selected from the group consisting of glycerin, ethylene glycol, and diethylene glycol, and a sufficient amount of a buffered, ionizable, hydrogen-containing, alkali metal phosphate to provide a weight ratio of the phosphate ion to said humectant in the range of about 0.085:1 to about 0.160:1, said phosphate being sufficiently buffered to provide a pH for said concentrate in the range of about 3.75 to about 4.50 for the stated weight ratios.

2. The solution concentrate of claim 1 wherein said buffered alkali metal phosphate is a diH sodium orthophosphate.

3. A solution concentrate of increased operating latitude adapted upon varying degrees of dilution for use with a plurality of different types of planographic masters, said concentrate consisting essentially in weight percent of:

	Percent
Glycerin	60 to 75
diH sodium orthophosphate	[1] 8 to12
Formaldehyde (37% aqueous solution)	0.5 to 2.5
Water	Balance

[1] Based on anhydrous orthophosphate.

4. A solution which is to be diluted with water for use as a plate etch and in the fountain of a planographic printing press, consisting essentially of:

60–75 wt. percent of a humectant selected from the group consisting of glycerin, ethylene glycol and diethylene glycol,

0–3 wt. percent (calculated on the basis of a 37 wt. percent aqueous solution) of an aldehyde selected from the group consisting of acetaldehyde and formaldehyde, and

as the sole source of phosphate ion, from 8–12 wt. percent (calculated on an anhydrous basis) of a buffer selected from the group consisting of mono and diH, sodium and potassium orthophosphates, and their hydrates.

References Cited

UNITED STATES PATENTS

2,515,536	7/1950	Van Dusen	106—2
3,398,002	8/1968	Bondurant et al.	106—2

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