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PLANOGRAPHIC REPELLENT SOLUTION AND
METHOD OF PREPARING THE SAME

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This invention relates to a so-called repellent solution for use upon planographic printing plates including parchment or like cellulose base and metal planographic printing plates, and to a method of making the said solution. The general uses and functions or purposes of such solutions are well-known in the art and are disclosed, for example, in United States Letters Patents Nos. 1,977,646, 2,003,268 and 2,393,875, to which reference may be had for a disclosure of the general nature and purposes of such solutions. In general it may be said, however, that such solutions are of the two types, namely, those which are applied directly to the plates as etching solutions at the start of a planographic printing operation to render the non-printing areas of the plate repellent to greasy or fatty acid-containing planographic printing inks and those which are employed for the same purpose as so-called fountain repellent solutions upon rotary offset planographic duplicating machines. In the latter instance the repellent fountain solution in addition to serving as a dampening or repellent solution, per se, keeps the planographic printing plate moist and prevents it from scumming up when the machine is stopped temporarily during the printing of long runs or editions. The repellent solution of the present invention is particularly adapted for use as a fountain solution in rotary offset planographic duplicating apparatus.

It is customary to include in such planographic repellent solutions a hygroscopic agent which has commonly been glycerine and it has been customary to put such solutions in concentrated form in bottles or like containers and dilute them prior to use. This, of course, necessitates the additional diluting operation and usually requires the use of distilled water since ordinary tap water is generally not suitable for the purpose of diluting such repellent solutions. A number of difficulties have been encountered heretofore in attempts to use planographic repellent solutions of low water content and among these have been the glazing of the ink rolls embodied in rotary offset planographic duplicating apparatus. While I am not entirely certain as to the physical or chemical phenomena which cause this objectionable glazing of the ink rolls I believe that it is due to the tendency of such low-

water content repellent solutions to form an emulsion of the oil-in-water type with the greasy or fatty acid inks employed in the rotary offset planographic duplicating apparatus with which such repellent solutions are used as fountain solutions and that the thus formed oil-in-water type emulsion, in some manner not clearly understood, causes the aforesaid objectionable glazing of the ink rolls. In any event, the glazed surface thus formed on the ink rolls repels the ink and thus eventually prevents proper inking of the ink rolls, the master planographic printing plate, the blanket and the copy. Moreover, such glazed surfaces are extremely hard and difficult to remove, being resistant to the action of common solvents and necessitating an abrading operation to effect their removal from the ink rolls.

I have found that the aforesaid glazing action of the repellent solution commences when the water content of the repellent fountain solution is about eighty per cent, by weight, and increases progressively with a decrease in the water content of the solution.

It is well known that when parchment and like cellulose base or other water-absorbent and water-expansive planographic printing plates are moistened with glycerine-water repellent solutions the water content of the solutions causes such plates to stretch or expand with resulting distortion of the image on the master plate and on the copies reproduced therefrom. Such stretching or expansion are directly related to and increase with the water content of a glycerine-water repellent solution. Hence it will be seen that the stretching or expansion of parchment or like water-absorbent and water-expansive planographic printing plates may be reduced by reducing the water content of such glycerine-water repellent solutions.

However, in the practice of the present invention I have found that if the water content of a glycerine-water repellent solution is reduced with a view toward, and for the purpose of, preventing stretching or expansion of water-absorbent and water-expansive planographic printing plates, such as parchment plates, with resulting proportionate increase in the glycerine content of the solution, the resulting solution tends to form the aforesaid objectionable oil-in-water

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type of emulsion with consequent glazing of the ink rolls in the rotary offset planographic printing presses with which such planographic printing plates are used, as explained hereinbefore.

It will thus be seen that for the purpose of minimizing the stretching or expansion of water-absorbent and water-expansive planographic printing plates moistened thereby it is desirable to reduce the water content of a glycerine-water repellent solution so that the same be relatively low in relation to the glycerine content, while at the same time, for the purpose of preventing the formation of the aforesaid objectionable oil-in-water type emulsion with greasy or fatty acid-containing planographic printing inks it is desirable that the water content of such glycerine-water repellent solutions be relatively high in relation to the glycerine content.

Prior glycerine-water repellent solutions have usually been somewhat acid in nature and, as pointed out hereinbefore, cause objectionable stretching or expansion of water-absorbent and water-expansive planographic printing plates moistened thereby including parchment plates and the like. However, in the practice of the present invention I have found that the water content of a glycerine-water repellent solution may be maintained relatively high in relation to the glycerine content, and the glycerine content of the solution correspondingly low, without causing objectionable stretching or expansion of the water-absorbent and water-expansive planographic printing plates moistened by the solution if the solution is rendered somewhat more acid and its pH established and controlled in a manner which will be described presently. So to do is a primary object of the present invention.

Related objects of the present invention are to provide a new and improved low water content glycerine-water repellent solution which when used as a fountain solution in conjunction with water-absorbent and water-expansive planographic printing plates, including parchment plates, prevents the objectionable spreading or stretching of such plates incidental to the use of prior glycerine-water planographic repellent fountain solutions.

Another object of the present invention is to provide a novel method of making the new repellent solution and of assuring that the same has the desired controlled pH value.

Thus I have found that if the water content of the new glycerine-water repellent solution is maintained at not substantially more than eighty per cent of the entire composition or complete solution, and if the glycerine content of the solution is maintained at not substantially less than twenty per cent nor substantially more than eighty per cent of the entire composition or complete solution, by weight, and if the pH of the solution is maintained at not substantially more than 4.0 and not substantially less than 3.0, a repellent fountain solution is afforded which materially reduces the expansion or stretching of parchment and like water-absorbent and water-expansive planographic printing plates moistened thereby while, at the same time, the new repellent fountain solution materially reduces the tendency of such glycerine-water fountain repellent solutions to form an emulsion of the oil-in-water type with fatty or greasy lithographic inks and hence correspondingly reduces the tendency of such solutions to cause glazing of the ink rolls in rotary planographic duplicating presses with which such repellent fountain solutions are used.

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Moreover, I have found that if the glycerine content of the new glycerine-water repellent fountain solution is established at about sixty per cent, by weight, of the entire composition or complete solution the rate of expansion of parchment and like water-absorbent and water-expansive planographic printing plates moistened thereby is materially less than the rate of expansion in similar plates moistened with prior low glycerine content and high water content repellent fountain solutions and that the total expansion or stretch in similar plates moistened with the prior low glycerine content high water content repellent fountain solutions.

I have found further that if the glycerine content in the new glycerine-repellent fountain solution is increased to eighty per cent or above, by weight, as may be done without causing glazing of the ink rolls, expansion or stretch of parchment and like plates moistened thereby is entirely eliminated.

Moreover, I have found that when the water content of the new glycerine-water repellent fountain solution is decreased to provide a relatively high glycerine content in the new repellent fountain solution the tendency of the repellent fountain solution to form an oil-in-water type emulsion with fatty or greasy lithographic inks and resulting glazing of the ink rolls may be materially reduced by the addition of a preselected quantity of formaldehyde or other water-soluble aldehyde to the solution. When thus incorporated in the new repellent solution the formaldehyde or other water-soluble aldehyde makes it possible to utilize a relatively high glycerine content in the new repellent fountain solution without causing glazing of the ink rolls in the presses with which the new repellent solution is used while, at the same time, the reduction of the pH of the solution to a pH of not substantially in excess of 4.0 makes it possible to employ a relatively high water content in the new repellent solution while materially reducing both the rate of expansion and the total expansion or stretch of parchment and like water-absorbent and water-expansive planographic printing plates moistened thereby.

A suitable formula which may be employed in preparing the new planographic repellent fountain solution is shown in the following example in which all parts are in terms of per cent by weight:

Example No. 1

	Per cent by weight
Formaldehyde (37 per cent solution in water) (Formalin) -----	0.5
Mono-ammonium dihydrogen phosphate (NH ₄) H ₂ (PO ₄) -----	2.0
Glycerine -----	60.0
Water -----	37.5
	100.0

Plus 10 cc. of phosphoric acid, H₃PO₄ (85 per cent) in 4000 grams of the complete solution.

It will be noted that the glycerine content of the glycerine-water repellent fountain solution set forth in the foregoing Example No. 1 is approximately sixty per cent by weight of the entire composition or complete solution.

In preparing the new repellent solution having the composition set forth in the foregoing Example No. 1, the mono-ammonium dihydrogen phosphate and the aqueous formaldehyde solution are first preferably thoroughly mixed to-

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gether, and the glycerine and water are then added to and thoroughly mixed with the solution thus formed. By thus mixing the various ingredients of the new repellent solutions the pH of the solution drops in the presence of the formaldehyde and comes to an equilibrium in a significantly shorter time than would otherwise be required to bring the pH of the solution to equilibrium if the formaldehyde were added last. The quantity of phosphoric acid indicated in the foregoing Example No. 1 may then be added to the solution so as to reduce and adjust the pH of the thus completed and resulting solution to a value of approximately 3.0.

In the new repellent solution prepared as in the foregoing Example No. 1 the mono-ammonium phosphate serves as a buffer to maintain the pH of the solution at a value of approximately 3.0, to which pH the solution is reduced by the addition of phosphoric acid.

The formaldehyde component of the new repellent solution, prepared as in the foregoing Example No. 1, serves to prevent the new repellent solution from forming an oil-in-water type of emulsion with fatty or greasy lithographic inks and consequent glazing of the ink rolls of the planographic printing presses with which the new repellent solution may be used. At the same time the formaldehyde component of the solution prevents the formation of fungus mold growth in the solution.

In the practice of the present invention I have found that the quantity of formaldehyde incorporated into the solution should be within a critical range of not substantially less than 0.1 per cent nor substantially more than 2.0 per cent of the complete composition, by weight, the formaldehyde being calculated as HCHO , or equivalent amounts of other water-soluble aldehydes. The quantity of formaldehyde, or other water-soluble aldehyde, employed in the new repellent solution may be varied somewhat between the critical limits specified depending, in part, upon the glycerine content of the solution, being greater for a higher glycerine content and less for a lower glycerine content.

In place of all or a part of the formaldehyde specified in the foregoing Example No. 1, I may employ equivalent amounts of other water-soluble aldehydes in the new repellent solution, with correspondingly good and similar results, and among such other water-soluble aldehydes which may be used are furfuraldehyde, acetaldehyde and glyoxal.

Thus, a suitable formula which may be employed in making the new repellent solution, utilizing furfuraldehyde in place of formaldehyde, is illustrated in the following example in which all parts indicated are in terms of per cent by weight:

Example No. 2

	Per cent by weight
Furfuraldehyde (Furfural)	0.5
Mono-ammonium di-hydrogen phosphate (NH_4) H_2 (PO_4)	2.0
Glycerine	55.0
Water	42.5
	100.0

Plus sufficient phosphoric acid (H_3PO_4) to reduce the pH of the solution to between 3.0 and 4.0.

A suitable formula which may be followed in

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preparing the new repellent fountain solution and which employs a percentage of glycerine which constitutes the lower limit of the critical range hereinbefore specified, namely, twenty per cent of glycerine, by weight, is shown in the following example in which all parts indicated are in terms of per cent, by weight:

Example No. 3

	Per cent by weight
Formaldehyde (37 per cent solution in water) (Formalin)	0.5
Mono-ammonium dihydrogen phosphate (NH_4) H_2 (PO_4)	2.0
Glycerine	20.0
Water	77.5
	100.0

Plus 2.8 c. c. of phosphoric acid (H_3PO_4) (85 per cent) in 4000 grams of the complete solution.

A suitable formula which may be followed in preparing the new repellent solution with a glycerine content of eighty per cent, by weight, of the entire composition or complete solution, and which is the upper limit of the aforesaid critical range of the glycerine content of the new repellent fountain solution, is shown in the following example in which all parts indicated are in terms of per cent by weight:

Example No. 4

	Per cent by weight
Formaldehyde (37 per cent solution in water) (Formalin)	0.5
Mono-ammonium dihydrogen phosphate (NH_4) H_2 (PO_4)	2.0
Glycerine	80.0
Water	17.5
	100.0

Plus 8.9 c. c. of phosphoric acid (H_3PO_4) (85 per cent) in 4000 grams of the complete solution.

In the practice of the present invention it has been found that the new repellent solution has the further desirable characteristic which resides in the fact that it makes possible the use of certain imaging materials which otherwise do not function consistently on planographic printing surfaces in that it does not penetrate the master parchment or like paper planographic printing plates with which it is used but appears to remain upon the surface thereof.

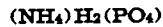
By the terms "complete solution" and "complete repellent solution," as used hereinafter in the claims, in reference to the percentages in which the several ingredients or components of the solution are employed in making the same, is meant the solution as it exists and is composed prior to the addition of the phosphoric acid (H_3PO_4) thereto.

It will thus be seen from the foregoing description that the present invention provides a new and improved low water content planographic dampening or so-called repellent fountain solution, and a novel method of preparing the same, and that the present invention thus has the desirable advantages and characteristics, and accomplishes its intended objects, including those hereinbefore pointed out and others which are inherent in the invention.

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I claim:

1. A planographic repellent composition comprising a solution of water, glycerine, mono-ammonium dihydrogen phosphate



and formaldehyde, the said water component of the said planographic repellent composition constituting not substantially more than eighty per cent of the complete repellent composition and the said glycerine component of the said repellent composition constituting not substantially less than twenty per cent nor substantially more than eighty per cent of the complete repellent composition, by weight, the said formaldehyde component of the said repellent composition constituting not substantially less than 0.1 per cent nor substantially more than 2.0 per cent of the complete repellent composition, by weight, and being calculated as 100 per cent formaldehyde, and the said repellent composition having a pH of not substantially more than 4.0 nor substantially less than 3.0.

2. A planographic repellent composition comprising a solution of water, glycerine, mono-ammonium dihydrogen phosphate



and a water-soluble aldehyde, the said water component of the said planographic repellent composition constituting not substantially more than eighty per cent of the complete repellent composition and the said glycerine component of the said repellent composition constituting not substantially less than twenty per cent nor substantially more than eighty per cent of the complete repellent composition, by weight, the said

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water-soluble aldehyde component of the said repellent composition constituting not substantially less than 0.1 per cent nor substantially more than 2.0 per cent of the complete repellent composition, by weight, and being calculated as 100 per cent water-soluble aldehyde, and the said repellent composition having a pH of not substantially more than 4.0 nor substantially less than 3.0.

3. A planographic repellent composition as defined in claim 1 which contains, in addition to the ingredients therein specified, a minor proportion of phosphoric acid (H_3PO_4).

4. A planographic repellent composition as defined in claim 2 which contains, in addition to the ingredients therein specified, a minor proportion of phosphoric acid (H_3PO_4).

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The following references are of record in the file of this patent:

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