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BLUE PRINT COATING

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This invention relates to blue print coatings and more particularly to blue print coatings having improved printing characteristics with respect to speed and latitude.

Blue print coatings in general consist of a light sensitive ferric salt, a ferricyanide, and other substances which may be necessary to produce the desired solution pH. In general in the past, potassium ferricyanide has been standard as the ferricyanide component of blue print coatings, and ferric ammonium oxalate has been used where fast printing coatings have been desired, other ferric salts such as the citrate being used where slower speed is unobjectionable.

According to the present invention, certain sensitizers are added to the blue print coating which increase the printing speed of the coating and do so without any sacrifice in latitude but with an actual increase in latitude so that in spite of very greatly increased printing speeds, practically pure white backgrounds can be readily obtained which is an important factor in the reproduction of line drawings, the most important single use for blue print paper. These sensitizers are compounds of strong organic bases included in the group consisting of amidines and quaternary ammonium compounds. While the invention is not broadly limited to these groups, I have found that the compounds which are rather strongly basic, such as the quaternary ammonium hydroxides and the carbonates of the amidines, give results which are superior to those obtained with compounds of the organic bases with relatively strong acids. Among the many compounds included in the invention, two have proven to be of particular effectiveness, namely, guanidine carbonate and trimethylbenzylammonium hydroxide (obtainable in the trade under the name "Tetrone B").

I have found that the effectiveness of the sensitizers of the present invention varies to a considerable extent with the relative amount of sensitizer and ferricyanide or ferri- and ferro- cyanide in the coating. The improved effect does not continue to increase with increased amounts of sensitizers but passes through a maximum, thereafter declining so that both very small amounts of sensitizer and very large amounts of sensitizer give results which are relatively poor as compared to those obtainable within the optimum range. This range is not highly critical. Good results are obtained with an amount of the sensitizer stoichiometrically corresponding to the total ferri- and ferro- cyanide present. Results are improved with the addition of larger amounts of sensitizer, and a maximum is reached in most cases when the amount of sensitizer is stoichiometrically equivalent to twice the total ferri- and ferro- cyanide present in the coating. Additional amounts of sensitizer result in a lowering of activity and therefore, while the invention in its broader aspects is not limited to a particular proportion of sensitizer, in more specific aspect a proportion of sensitizer approximately twice the stoichiometrical equivalent of ferri- and ferro- cyanide content is included as a specific preferred modification of the invention.

I have not as yet been able to determine the mechanism by which the sensitizers operate, and the present invention is not intended to be limited to any theory of action. I do believe, however, that there is some chemical relationship between the sensitizer and the iron-cyanogen complex, and this is advanced as a probable explanation of the operation of the present invention without in any way limiting it thereto. It is an advantage of the present invention that the addition of sensitizers increases both speed and latitude of blue print coatings containing either potassium ferricyanide alone, mixtures of potassium ferri- and ferro-cyanide, sodium ferricyanide alone, or mixtures of sodium ferricyanide and sodium ferrocyanide. I have found that optimum results are, however, obtained when the best of the sensitizers of the present invention, that is to say, such strongly basic sensitizers as guanidine carbonate and the quaternary ammonium hydroxides, are used with a sodium ferricyanide liquor to which additional sodium ferrocyanide has been added. The increase in latitude is particularly effective in conjunction with such combinations where otherwise the printing speed sometimes results in slightly colored background. I have not as yet been able to determine the reason for the extraordinary latitude combined with high speed which is obtained with the best of the sensitizers of the present invention. This is an unusual result since normally factors which increase printing speed decrease latitude and cause trouble with backgrounds and, while I have at present no proven explanation for this extraordinary behaviour of the sensitizers of the present invention, it constitutes one of their most important advantages since all of the desirable results of high speed printing are obtained without any compromise on background quality.

The invention will be described in greater detail in conjunction with the following specific examples which illustrate typical embodiments of the present invention which, however, is not

limited to the details therein set forth and particularly is not limited to the illustrative compounds of the strong organic bases therein described.

EXAMPLE 1

Two solutions are prepared as follows:

Solution A

	Parts
Water	50
Ferric ammonium oxalate	20
Potassium oxalate or citrate	2.5

Solution B

	Parts
Water	50
Potassium ferricyanide	2.5
Potassium ferrocyanide	3.0

Solution B is added to Solution A at a temperature of approximately 35° to 40° C., the addition being in the absence of actinic light and with sufficient agitation to ensure thorough mixture. 3.57 parts of 90% pure guanidine carbonate are then added and the entire solution cooled to 25° C., whereupon 0.5 part citric acid is introduced. The final solution has a pH of approximately 7.7 and may be used for coating paper at room temperature or slightly elevated temperatures, all steps, of course, being in the absence of actinic light. The paper was compared with a premium paper of high speed printing characteristics using conditions of machine printing corresponding to the CF Pease #20 continuous blue printing machine. The blue intensity at 6 secs. exposure (15 feet per minute) was almost of the same depth as on the premium paper at 42 secs. exposure (2 feet per minute). Normal fast running is 10 feet per minute. Pure white backgrounds were obtained, and the coating showed high quality for the reproduction of line drawings and was also suitable for contact printing from negatives giving pictures of good detail. At the highest machine speeds at which the above machine can run (about 19 feet per minute), the blues were still of satisfactory depth for good reproduction of line drawings and were notably deeper than the premium grade commercial paper at the same speed.

EXAMPLE 2

Two solutions were prepared as follows:

Solution A

	Parts
Water	50
Potassium oxalate	2.5
Ferric ammonium oxalate	20

Solution B

	Parts
Water	37
Sodium ferricyanide liquor	13
Sodium ferrocyanide	2.83

In Solution B the normal ferricyanide liquor which contains approximately 1.33% sodium ferrocyanide has been enriched with additional sodiumferrocyanide. Solution B is added to Solution A as described in Example 1, then 3.57 parts of 90% guanidine carbonate introduced, the solution cooled and 1 part of citric acid added to give a pH of approximately 6.85. The solution is then ready for coating paper at room temperature or slightly elevated temperatures. All operations are, of course, carried out in the absence of actinic light.

The paper shows an even higher speed than that of Example 1, and the latitude is slightly greater. Even at the very slowest printing speeds, a pure white background is obtained. The fidelity is also somewhat better than in Example 1, and excellent contact prints can be obtained from suitable negatives.

EXAMPLE 3

The speed of the paper coated according to Example 2 was so high that with tracings of high translucency, even at the highest useful printing speeds, the paper was faster than necessary. Therefore, a paper was made similar to Example 2 but with slightly less speed. This was effected by reducing the amount of sodium ferrocyanide in Solution B from 2.85 parts to 1.5 parts and cutting the amount of citric acid in half. The resulting pH was about 7.35, and a paper was obtained having a speed somewhat less than that of Example 1 but still better than premium paper available on the market.

EXAMPLE 4

A solution was made up as in Example 3 but 0.04 part of water-soluble nigrosine was added. The resulting solution was coated onto paper and gave a stronger blue approaching in strength that of Example 1. The nigrosine washed off the paper completely, leaving no stain in the background, but apparently exerted some effect on the depth of the blue shade.

EXAMPLE 5

A blue print coating was prepared in accordance with Example 1 except that, in the place of 3.57 parts of guanidine carbonate, 11 parts of trimethylbenzylammonium hydroxide were used, the pH solution being 7.6. The paper produced showed approximately the same characteristics as that of Example 1.

EXAMPLE 6

Two solutions are made up as follows:

Solution A

	Parts
Water	50
Ferric ammonium oxalate	17
Potassium oxalate	2.5

Solution B

	Parts
Water	50
Potassium ferricyanide	3

Solution B is added to Solution A as described in Example 1 and then 1.2 parts of guanidine nitrate were added, followed by 1 part of citric acid. Paper was coated and showed a printing speed approximating that of Example 3.

It will be noted that guanidine nitrate is not as effective a sensitizer as guanidine carbonate.

EXAMPLE 7

A coating solution is prepared according to Example 1, but instead of guanidine carbonate, 1 part of guanyl-urea sulfate is substituted. A fast printing paper is obtained, but the latitude is not as satisfactory as with guanidine carbonate, white backgrounds being unobtainable with very long printing speeds.

Doubling the amount of guanyl-urea sulfate and citric acid produced a pure white background but reduced the printing speed down to approximately that of premium commercial paper.

What I claim is:

1. A blue print coating composition comprising a light sensitive ferric salt, a soluble ferri-

cyanide and an amidine salt in an effective amount.

2. A blue print coating composition comprising a light sensitive ferric salt, a soluble ferricyanide and a strongly basic amidine salt in an effective amount.

3. A blue print coating composition comprising a light sensitive ferric salt, a soluble ferricyanide and a guanidine compound in an effective amount.

4. A plue print coating composition comprising a light sensitive ferric salt, a soluble ferricyanide and guanidine carbonate in an effective amount.

5. A blue print coating composition according to claim 1 in which the amidine salt is stoichiometrically equivalent to approximately twice the ferricyanide.

6. A blue print composition according to claim 4 in which the amount of guanidine carbonate is stoichiometrically equivalent to approximately twice the ferricyanide.

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