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C. D. GUERTIN

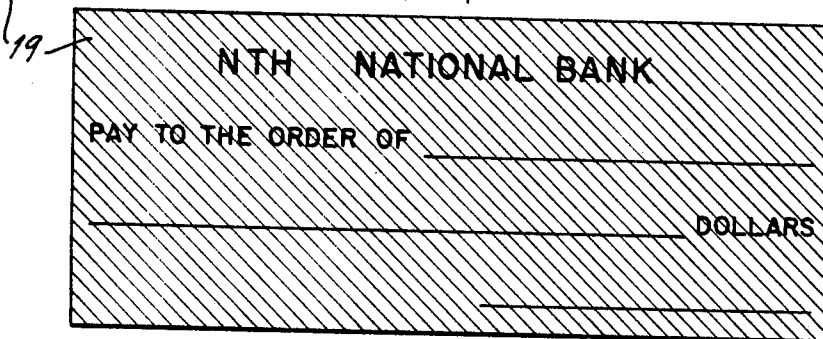
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SAFETY INKS AND DOCUMENTS

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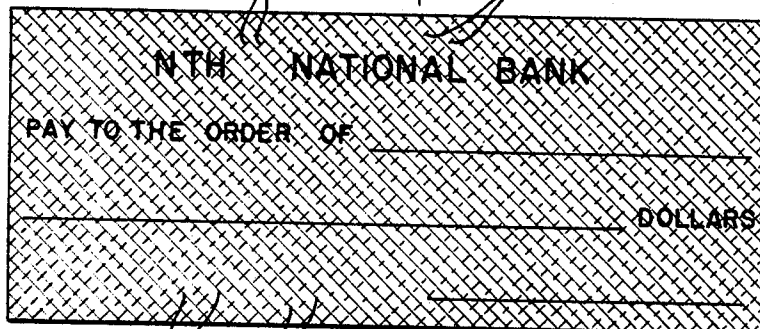
SET OF ALTERABLE
PRINTED ELEMENTS

Fig. 1.



ANOTHER SET OF
ALTERABLE PRINTED ELEMENTS

Fig. 2.



ONE SET OF ALTERABLE
PRINTED ELEMENTS

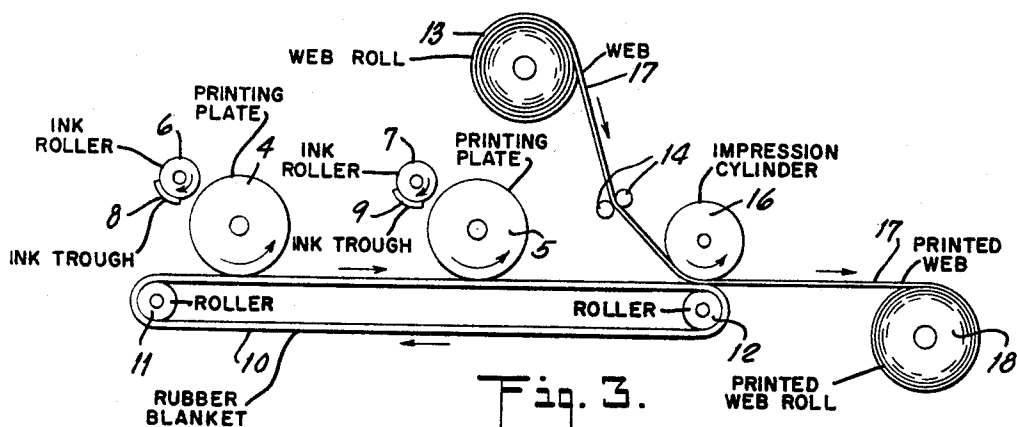


Fig. 3.

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3,400,003

SAFETY INKS AND DOCUMENTS

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Continuation-in-part of application Ser. No. 270,105, Apr. 2, 1963. This application Aug. 9, 1966, Ser. No. 571,311

5 Claims. (Cl. 117—1)

ABSTRACT OF THE DISCLOSURE

A printing ink consisting essentially of coloring matter and a vehicle soluble in water and lower alcohols and lower ketones, said vehicle consisting essentially of glycerine, sorbitol and water, the glycerine being present in an amount in the range 10–30% by weight based on said vehicle, the remaining percentages of sorbitol and water being in the weight ratio 4:1, said coloring matter including a dye soluble in lower alcohols and lower ketones wherein said lower alcohols and said lower ketones contain not more than 8 carbon atoms per molecule, has been found to be especially useful for the preparation of a printed document sensitive to attempted alteration. A printed document, such as a printed security document, printed with a background provided by the above-described printing ink would be sensitive to and would indicate an attempted alteration with respect to any indicia written thereon by means of a typical writing ink, such as a water-soluble and/or bleachable writing ink, or by means of a ball point ink. When indicia on the printed document written by means of a water-soluble ink are altered the printing ink background, since the vehicle from which it is derived is water-soluble, would be disturbed and would indicate, as a result, an attempted alteration. Similarly, when the indicia on the printed document written thereon by means of a ball point ink are subjected to an attempted alteration, such as by means of a lower alcohol or ketone, the printed background material would also be altered or changed, along with the ball point ink, with the result that the attempted alteration would be indicated on the face of the document.

This application is a continuation-in-part of my application Ser. No. 270,105, filed Apr. 2, 1963, entitled, "Safety Inks and Documents," now abandoned, and "Methods of Printing Documents," which in turn is a continuation-in-part of my application Ser. No. 12,211 filed Mar. 1, 1960, entitled, "Safety Inks and Documents," now U.S. Patent 3,088,841.

This invention relates to safety papers, i.e. printed documents, such as negotiable instruments, which are adapted for the insertion of names, amounts, etc., by hand and which are sensitive to attempts to alter these names, amounts, etc., once they have been inserted. The invention includes documents having areas printed with inks designed to give the required sensitivity and inks having the characteristics necessary for such documents. By sensitivity to attempted alteration is meant that an attempt to alter the printed document results in a noticeable change in the appearance of the document so as to alert a person receiving it to the fact that the document has been altered.

For a long time prior to 1945, most writing inks were water solutions whose coloring material was either a ferrous salt which oxidized to a ferric salt after writing, or an aniline dye, or combinations of both a salt and a dye. The techniques of eradication of such inks were established many years ago. Where the dried ink was water soluble, such techniques simply involved the use of water

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as a solvent (so-called washable ink). Where the dried ink was not water soluble, the eradication techniques employed some type of bleaching reaction. The bleaching solutions (ink eradicators) for such inks are commonly sold.

Inks consisting of coloring material of one type or another dissolved in water are still in common use, and are hereinafter referred to as "conventional inks." Ball point pens, which came into use about 1945, use a different type of ink. Typically, a ball point pen ink is relatively stiff and heavy and may consist of one of the higher glycols as a vehicle, with an aniline dye for coloring material. Many of the ball point pen inks cannot be eradicated either by the use of water as a solvent or by the bleaching method. Until recently there has been no known effective means of eradicating such inks.

Safety papers and safety printing techniques have been developed in the past which are reasonably sensitive to attempted eradication of one of the conventional inks, so as to warn a person to whom an altered document was presented that an attempt had been made to alter it. Such papers and printing techniques are not sensitive to eradication techniques directed at ball point inks. Until recently, no particular difficulty has been encountered with these safety papers and printing techniques, when used with ball point writing, because there has been no commonly known effective technique for eradicating the ball point ink.

Recently, banks and other institutions using printed documents of this type have encountered situations where ball point writing had been successfully eradicated, and it has become apparent that at least some individuals are aware of techniques for eradicating at least some of the ball point pen inks. While the details of all processes which might eradicate ball point pen inks are unknown, it has been determined that all processes so far known involve the use, at some stage of the process, of a solvent selected from the lower alcohols or lower ketones. By "lower" is meant that the number of carbon atoms in the particular alcohol or ketone is not greater than eight.

There have been recognized in the past two general techniques of eradication which may be classified as "line" eradication and "sheet" eradication. Line eradication involves the application of eradicating solution only to the particular line or lines to be eradicated. In sheet eradication, the entire sheet or document is immersed in the solvent or other agent used. The line eradication technique is the one most frequently employed in connection with conventional inks. It has been determined that the ball point pen inks require, in all the known processes, the sheet eradication technique.

It is also known that time is very important in the ball point ink eradication techniques. To be successful, the eradication must be completed within a relatively short time, of the order of thirty seconds. If the eradication has not been completed in that time, then the solvent may start to spread the ball point ink into the paper, thereby frustrating the attempted eradication.

A document printed according to the invention described in my U.S. Patent 3,088,841, mentioned above, has one area, which may be the area where the name of the payee is to be inserted, wherein background elements (fine lines, dots, etc.) are printed from two complementary plates. One of the two plates may print the fine lines in a portion of the area which defines a plurality of parallel bars. The other of the two plates may print the rest of the area, filling in the unprinted spaces between the parallel bars of the first plate. The first plate employs an ink which is eradicated by any of the conventional eradication techniques, principally bleaching and/or dissolving in water. The second plate employs an ink sensitive to any of the

new ball point ink eradication techniques. Such documents require two impressions for printing the background, and the two impressions must be in registry.

An object of the present invention is to provide a printed document having a printed background sensitive to attempted alteration by either the conventional eradication techniques which are useful with water based writing inks or by the newer eradication techniques which may be used with ball point pen inks, which background may be printed in a single impression.

Another object of the invention is to provide an improved single impression method of printing such documents.

A further object of the invention is to provide improved inks for use in the printing of such documents.

The foregoing and other objects of this invention are attained in the preferred embodiment described herein, by printing two sets of background elements on a document in two different inks, desirably by the use of a single printing impression. The inks differ as to their sensitivity to eradication techniques and particularly with respect to their sensitivity to techniques employed in the eradication of ball point pen inks. Typically, one of the two inks is not affected by attempted eradication, while the other ink is affected either by complete disappearance or by a change in color. The two inks are compatible with each other so that they may be printed over one another while still wet without causing any blurring or any repellent effect between the two inks. In the preferred printing process, the two patterns of background elements are successively printed on a rubber blanket and the combined patterns are then transferred to the paper document in a single printing impression.

Compatibility of the several inks is preferably secured by using the same vehicle for all the inks but it is a feature of this invention that by employing the special vehicle-containing ink herein a wide variety of other inks, water-base and oil base may be employed in cooperation therewith.

Other objects and advantages of the invention will become apparent from a consideration of the following specification and claims, taken together with the accompanying drawings.

In the drawings:

FIG. 1 is a plan view of a bank check printed in accordance with one embodiment of the invention;

FIG. 2 is a plan view of a bank check printed in accordance with another embodiment of the invention;

FIG. 3 is a diagrammatic view showing printing apparatus for producing the check of FIG. 2 and illustrating a printing method forming part of the invention.

Safety papers prepared in accordance with the invention have printed matter thereon, which is eradicated by the techniques presently known for eradicating ball point pen ink. Typically, the printed matter so eradicated consists of a background of closely spaced fine lines, which may appear in any suitable configuration characters, words, geometric figures, etc. The ink in which at least some of the printed patterns of the background appear should be soluble in organic solvents selected from the class having not more than eight carbon atoms and consisting of the lower alcohols and lower ketones. There are two principal reasons for so limiting the class of organic solvents. One reason is that the alcohol and ketones as defined above are the ones most available commercially, and hence most likely to be used by a person attempting to alter a document. Another reason is that the higher ketones and alcohols do not act rapidly enough as solvents, and spread the ink into the paper instead of carrying it away. Consequently, a person seeking to alter such a document is frustrated if he attempts to use any of the higher alcohols or ketones.

Where more than one ink is used, the two inks must be compatible if a single impression printing process is to be employed. Compatibility is assured by employing the special vehicle-containing ink in accordance with this

invention. At least one of the inks must include a coloring matter component soluble in the lower alcohols and lower ketones. In many cases, it is desirable to use one ink including a pigment which is insoluble in the lower ketones and lower alcohols.

Typically, it is desired that the inks and ink components which are soluble in the lower alcohols and lower ketones be also soluble in water, since water is utilized as the vehicle in conventional eradication techniques, including the bleaching techniques. However, in some cases, printed documents may be exposed for long periods of time to the air in humid climates. In those cases, it is essential that the ink employed should not be so water soluble that high humidity will make it start to run and destroy the pattern.

Vehicle

I have found only one vehicle which is suitable from the standpoint of being miscible with the various coloring matters employed in inks manufactured according to the invention and which is also soluble in water and in the lower alcohols and ketones. This vehicle consists essentially of about 20% glycerine, about 64% sorbitol and about 16% water. These percentages are by weight. The proportion of glycerine employed in this vehicle may vary from about 10% to about 30%. If the proportion of glycerine is reduced below about 10%, tendencies to crystallize are observed. If the proportion of glycerine is increased above about 30%, the consistency of the vehicle becomes too thin for proper operation on conventional printing presses. The relative proportions of sorbitol and water should remain about the same (i.e. about 80% of the material other than glycerine should be sorbitol and about 20% water).

A printing ink in accordance with this invention having the above-described vehicle therein results in an ink which is compatible not only with water-base inks but also with oil-base inks. Accordingly, a printing ink containing this vehicle can be employed in a single printing operation together with another water-base ink or another oil-base ink.

Printing inks containing this vehicle also perform satisfactorily on the printing press and are stable during printing and after being applied to the paper by the printing press. Also the resulting printed lines support writing by the conventional writing media without noticeable "bleed" and "feather" of the written line. Additionally, the resulting printed material is stable to handling during use and does not tend to change in color and effectively responds in the intended manner to fraudulent manipulation of the written material to create a noticeable change in the appearance of the document.

INK—EXAMPLE I

This ink may consist essentially of the vehicle as described above and a coloring matter including a mixture of a dye which is bleachable, soluble in water and soluble in the lower alcohols and lower ketones and a permanent pigment which is insoluble in water and the lower ketones and alcohols, and which is also unbleachable. A dye having these characteristics is disclosed in my above-identified Patent No. 3,088,841. The dye may be one of the diamino-triphenylmethane group, for example, Malachite Green. An example of a suitable permanent pigment is a copper phthalocyanine Blue.

EXAMPLE II

This ink may consist essentially of the vehicle as described above and coloring matter consisting essentially of a dye or dyes which are soluble in the lower alcohols and ketones, water soluble, and bleachable. The dye may be a hydrochloride of phenylpentamethyl-triamido-di-phenyl- α -naphthol-carbinol, for example, Victoria Blue.

EXAMPLE III

This ink may consist essentially of the vehicle as described above and coloring matter consisting essentially of

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dyes and permanent pigments. The dyes must be soluble in water and in the lower alcohols and ketones and must also be bleachable. An example of such a dye is given under Example II. The pigments must be unbleachable and insoluble in water and the lower alcohols and ketones. An example of such a pigment is given under Example I.

EXAMPLE IV

This ink consists essentially of the vehicle described above and coloring matter consisting only of pigments which are bleachable and insoluble in water and in the lower alcohols and ketones.

Printing process—FIG. 3

This figure illustrates diagrammatically apparatus for carrying out a single impression printing process utilizing inks of the type described above. This printing process produces a document such as that illustrated in FIG. 2, having a background including one set of elements such as the solid lines 1 and another set of elements such as the dotted lines 2. Typically, one of the two sets of elements will be printed in ink of the type set forth above in Example IV and the other set of elements will be printed in one of the inks described in Examples I, II and III. In the apparatus of FIG. 3, cylinders 4 and 5 carry printing plates (not shown) which respectively reproduce the patterns of the lines 1 and 2 in FIG. 2. Inking rollers 6 and 7 respectively pick up ink from the ink troughs 8 and 9 and apply the ink to the patterns on the plates carried by the cylinders 4 and 5. The patterns on those cylinders are transferred to an endless rubber blanket 10 which runs over a pair of drive rollers 11 and 12, so that its outer surface comes successively into contact with the printing plates carried by the cylinders 4 and 5. The paper or other sheet material to be printed comes from a supply roll 13 and passes through a pair of guide rollers 14 and between an impression cylinder 16 and the blanket 10 at the point where the blanket 10 passes over the roller 12. The two patterns transferred to the blanket 10 by the cylinders 4 and 5 are thus transferred to the paper web 17 at that point. The web 17 passes on to a take-up reel 18.

If the two inks in the ink troughs 8 and 9 are selected from the examples given above, then these inks are fully compatible and the deposition of the pattern on the blanket 10 by the roller 4 will not be disturbed by the deposition of a second pattern by the cylinder 5 even though the lines of the second pattern cross the lines of the first pattern.

It is not necessary that the vehicles in the two inks be exactly the same but they must be compatible, i.e. one must mix with the other when both are spread in successive layers on the rubber blanket surface. Compatibility is assured by employing an ink having the vehicle in accordance with this invention. The above-described vehicle in accordance with this invention when incorporated in a water-base ink renders the same compatible with oil-base inks.

Where one of the patterns is printed in ink according to Example IV, then that pattern is not disturbed or changed in any way by any eradication, whether it be water eradication, organic solvent eradication, or bleaching eradication. If the other ink is Example I, then its dye is removed by the use of an organic solvent eradication technique, leaving the permanent pigment portion of the ink on the paper. Consequently, the pattern printed in this ink changes color when such an eradication is attempted. The use of water eradication or bleaching eradication techniques may remove the dye or not, depending on whether the particular dye is bleachable and/or water soluble.

If the document has a background printed with one pattern in ink of Example IV and one in ink of Example II, then the use of any eradication techniques, whether it

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is water eradication, organic solvent eradication, or bleach eradication, destroys the Example II pattern completely.

Whether the document is printed with one pattern in an ink of Example IV and one ink of Example III, then the pattern in Example II ink changes color upon the application of any eradication technique, due to the removal of the dye while the pigment remains. For this purpose, it is of course essential that the dye and the pigment be of different colors.

Single pattern document—FIG. 1

It is alternatively possible to print safety paper with a single background pattern of a single set of lines, such as shown by the lines 19 of FIG. 1. Typically, the lines will be irregularly curved or made with a fanciful pattern rather than being simple straight lines as illustrated. For the purpose of making such a document, the ink may be selected from any of the Examples I, II and III above. The application of eradication techniques would affect such a paper in the same manner as explained above in connection with the ink examples.

It is also possible to use known vehicles and coloring materials common in the printing art to produce printing inks which will be both bleachable and soluble in water and in organic solvents of the class described. Another example of such an ink which has been found suitable for use in connection with the present invention consists of 50 to 70 parts by weight of sulfonated castor oil as a vehicle, 20 to 50 parts by weight of an extender which may be aluminum hydrate, or calcium silicate or magnesium silicate or mixtures thereof, and 6 to 12 parts by weight of coloring material which may be a dye of the diamino-triphenylmethane group, for example, Malachite Green.

While I have shown and described certain preferred embodiments of my invention, other modifications thereof will readily occur to those skilled in the art, and I therefore intend my invention to be limited only by the appended claims.

I claim:

1. A printed document sensitive to attempted alteration comprising an area adapted to be written upon in ink and having a background of printed elements including two superimposed patterns, one of said patterns having been printed in a first ink consisting essentially of coloring matter and a vehicle soluble in water and lower alcohols and lower ketones, said vehicle consisting essentially of glycerine, sorbitol, and water, the glycerine being present in an amount in the range 10–30% by weight based on said vehicle, the remaining percentages of sorbitol and water being in the weight ratio 4:1, said coloring matter including a dye soluble in lower alcohols and lower ketones wherein said lower alcohols and said lower ketones contain not more than eight carbon atoms per molecule, and the other said pattern being printed in a second ink compatible with said first ink and which is non-bleachable and insoluble in water and in said lower alcohols and said lower ketones.

2. A printed document sensitive to attempted alteration comprising an area adapted to be written upon in ink and having a background of printed elements including two superimposed patterns, one of said patterns having been printed in a first ink consisting essentially of coloring matter and a vehicle soluble in water and lower alcohols and lower ketones, said vehicle consisting essentially of glycerine, sorbitol, and water, the glycerine being present in an amount in the range 10–30% by weight based on said vehicle, the remaining percentages of sorbitol and water being in the weight ratio 4:1, said coloring matter including a dye soluble in lower alcohols and lower ketones wherein said lower alcohols and said lower ketones contain not more than eight carbon atoms per molecule and being bleachable and soluble in water, and a pigment which is non-bleachable, insoluble in water and insoluble in said lower alcohols and lower ketones,

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and the other pattern having been printed in a second ink compatible with said first ink but which is non-bleachable and insoluble in water and in said lower alcohols and lower ketones.

3. A printing ink consisting essentially of coloring matter and a vehicle soluble in water and lower alcohols and lower ketones, said vehicle consisting essentially of glycerine, sorbitol and water, the glycerine being present in an amount in the range 10-30% by weight based on said vehicle, the remaining percentages of sorbitol and water being in the weight ratio 4:1, said coloring matter including a dye soluble in lower alcohols and lower ketones wherein said lower alcohols and said lower ketones contain not more than 8 carbon atoms per molecule.

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4. A printing ink in accordance with claim 3 wherein said dye is water soluble and bleachable.

5. A printing ink in accordance with claim 3 wherein said coloring matter includes a pigment which is non-bleachable, insoluble in water and insoluble in said lower alcohols and lower ketones.

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MURRAY KATZ, *Primary Examiner*.

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