

## UNITED STATES PATENT OFFICE

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## MEANS OF DETECTING ALTERATIONS OF DOCUMENTS

Josef Ehrlich, Vienna, Austria

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## 2 Claims. (Cl. 23—5)

This invention relates to a chemical composition of the kind applied to written documents for the detection of alterations therein.

It is well known that iodine, either in the form of a vapour or a liquid will, when applied to a written document in which alterations have been made with ink or by bleaching or erasure, reveal such alterations by a discolouration which appears in different hues and shades determined by the nature of the inks and chemicals employed and by the particular disturbance in the structure of the paper material. The characteristic indicia thus obtained, however, are not very lasting, and the outlines are blurred and indistinct and require expert opinion as regards correct interpretation.

The object of the present invention is to obtain a chemical composition of this kind which will, even to a layman, give definite results, and the invention consists essentially in mixing the halogen solution to saturation with mineral salts.

Such a solution will reveal at least most of occurring alterations in a manner which allows the result to be readily interpreted without any particular experience or skill.

Articles such as bank notes, stamps of various kinds, passports, securities, cheques, savings bank books, letters, account books, invoices and other documents, are frequently subjected to alterations, illicit or otherwise, and the invention provides the means for rapidly revealing such alterations without calling for the aid of an expert.

Experiments have shown that alterations in the paper material in the form of creases, expansion, swelling, displacement or mechanical reduction, would produce different shadings on the paper under treatment with the solution. An obliteration, whether mechanical or chemical will be revealed by the solution as well as attempts made to conceal the obliterations. Alterations in the paper material will be visible not only on the front but also at the back of the paper. Mechanical erasures in particular can be readily detected and the erased matter restored by treating the back of the paper with the solution.

The discolouration produced on affected places by treatment with the solution, will be clear and sharp and will last long enough for a proper investigation of the falsification. The treatment will not in any way interfere with other, more elaborate investigations by means of photography, quartz lamps or the like, that may subsequently be found necessary.

In order to prevent the bleaching out of easily soluble prints or other matter from cheques and the like, the solution should be highly concentrated. Apart from halogen in free or lightly combined form, preferably bromine or iodine, the solution contains mineral salts. The presence of

hygroscopic substances is advantageous but not necessary. However, the high concentration with mineral salts is of great importance. The more concentrated the solution is as regards mineral salts, the more clearly the paper alterations will be shown, the longer they will last, and the less will the treatment be affected by other influences such as finger marks or the like. The best result is obtained from a saturated solution. Moreover, the greater the salt contents of the solution the less likely it is to injure the paper, soluble prints and the like. It is therefore advantageous to use easily soluble mineral salts, i. e., salts which will dissolve in large quantities in the liquid. As suitable salts may be mentioned magnesium chloride which has a saturation degree of 365 parts by weight to 100 parts of cold water and 558 parts to 100 parts of warm water. Another suitable salt is calcium chloride which has a saturation degree of 400 parts to 100 parts of cold and 650 parts to 100 parts of warm water. For the same reason calcium iodide, calcium iodate, lithium chloride, lithium chlorate, aluminium chloride and others are suitable. As nonhygroscopic salt may be mentioned zinc sulphate. Glycerine is an example of a suitable hygroscopic, non-mineral substance for use in the solution.

The colour obtained by the treatment depends on the nature of the salt employed. Grey of different shades are obtained from blue over brown and red to yellow. This is of great importance since it is possible to determine the colour so that it will be suitable for a subsequent photographic test. The best results are obtained by the use of magnesium chloride. This may be due to the fact that many subsidiary ingredients in paper will combine with magnesium chloride to form traces of colloidal magnesium hydroxide which, as is well known, has a great affinity for free iodine.

The free halogen may be incorporated in a solution in the following manner: A solution of potassium or sodium iodide is mixed with a solution of mineral salts, and a few drops of bromine are added. As an example of an easily dissociated halogen may be mentioned the Pregl iodine solution. In 10 parts by weight of this solution 30 parts magnesium chloride are dissolved, and a little potassium iodide is added. After having been stood aside for a time, the solution assumes a yellowish brown colour.

The employment of a highly concentrated solution for the detection of alterations in the paper surface, has led to the further use of the solution for determining whether anything has been added to an original piece of writing. Thus, an iodine and potassium iodide solution highly concentrated with mineral salts and applied to a document containing matter written down at different times, will after a few minutes cause the later writing to be darker than the earlier one.

For the removal of the marks left by a test made according to the invention, the tested document is subsequently treated in known manner with a substance adapted to remove the discolourations. For this purpose a concentrated solution of sodiumthiosulphate may be employed. Not less than 20% and preferably a 60-80% solution is required. When the halogen consists of iodine and is dissolved in potassium iodide it has been found advantageous to use from 20 to 40 times as much potassium iodide as free iodine. When several salts are present in the same solution, the saturation point of different salts is reached earlier.

15 The method is carried out as follows:

The document or the like to be treated is first coated with the halogen solution and then treated with a dry brush, a piece of cotton wool or the like, for the removal therefrom of superfluous liquid. After the intactness or alteration of the document has been determined, the testing solution is, if required, removed by treatment with a sodiumthiosulphate solution whereupon the document is blotted and carefully dried. Previous to the blotting and drying the document may be washed in water. Instead of the thiosulphate, sodium sulphite or other substance which reacts on halogen, may be employed.

30 *Example*

1. Testing solution: 200 grammes of magnesium chloride are dissolved in 100 ccms. of water. To this solution 40 g. potassium iodide, dissolved in 40 cubic cms. of water containing 0.15 g. 35 iodine, are added.

2. Clearing solution: 60 g. sodiumthiosulphate are dissolved in 100 cubic cms. of water.

The invention is not restricted to the examples given, and analogous substances may be used. For instance potassium or ammonium sulphite 5 may be used instead of sodium sulphite. The same applies to the thiosulphate and to the iodide etc. If, in the case of a chemical obliteration, the obliterated writing is to be intensified and lastingly restored, the place where the obliteration occurs is dabbed, first with dilute hydrochloric acid, then with a solution of potassium ferrocyanide and subsequently again with hydrochloric acid. Ammonium hydrosulphide may be used instead of ferrocyanide without treatment 10 with hydrochloric acid.

It should be observed that it has previously been proposed to employ a composition containing zinc chloride, potassium iodide and iodine, as a discolouring medium in the microscopic test- 20 of paper fibres. As the zinc chloride has a destructive influence on paper, it is not suitable for use in a testing composition intended for prolonged contact with a document.

I claim:

1. In a chemical composition of the character described comprising a solution containing about 200 parts by weight of magnesium chloride, 40 parts alkali iodide, 0.15 part of iodine, and 140 parts water.

2. A chemical composition of the character described comprising an aqueous solution of free iodine containing iodides saturated with magnesium chloride.

JOSEF EHRLICH. 35.