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# UNITED STATES PATENT OFFICE

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## METHOD OF PREVENTING DECOMPOSITION OF HALOGENATED HYDROCARBONS

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The present invention relates to the prevention of the decomposition of halogenated aliphatic hydrocarbons by means of the addition thereto of certain substances which, when present in only relatively small amount, have the property of inhibiting such decomposition. More particularly, it is concerned with the preservation of chlorinated, or brominated, derivatives of methane, ethane, and ethylene, which have a tendency to decompose under the combined influence of air, moisture, heat or light, or a combination of such factors, with the formation of phosgene, $COCl_2$, and hydrochloric acid, or the corresponding bromide derivatives. Examples of such compounds are carbon tetrachloride, $CCl_4$, chloroform, $CHCl_3$, trichlorethylene, $C_2HCl_3$, tetrachlorethylene, $C_2Cl_4$, and the like.

It is known that the addition to chloroform of absolute alcohol in amount of about two per cent. assists in preventing decomposition. Other substances, such as paraffin oil (purified liquid petrolatum), petroleum ether, etc., have been suggested and are said to be effective for such purpose. I have found, however, that certain organic dyes, soluble in the halogenated hydrocarbons hereinbefore referred to, will substantially prevent the decomposition thereof, and are effective when present in exceedingly small amount. To the accomplishment of the foregoing and related ends the invention, then, consists of the steps and new products hereinafter fully described and particularly pointed out in the claims, the following description setting forth but several of the various ways in which the principle of the invention may be employed.

Dyes which I have found to be effective for the purpose described are comprised in the group of oil-soluble dyes which are well known and used as dye-stuffs under various trade names. Examples of such are sold under the trade name of Oil Red "O", Oil Orange "2311" and Oil Scarlet "6G". The dyes named are azo compounds, having the following described constitution:

Oil Red "O", diazotized amino-azo-benzene coupled with beta-naphthol.

Oil Orange "2311", diazotized aniline coupled with beta-naphthol.

Oil Scarlet "6G", diazotized xylidine coupled with beta-naphthol.

Other oil-soluble dyes that give good results are known as Oil Blue "MG", and Oil Green "M255", but I have not determined the constitution of these dyes. As small an amount of one of the dyes just mentioned as one part per million, dissolve in the halogenated hydrocarbon, will delay decomposition of the latter for a period of several weeks. Preferably, however, I dissolve the dye in the halogenated hydrocarbon, e. g., any one of the compounds hereinbefore specifically named, or the like, in the proportion of one part in 10,000. In this amount it has been found to prevent decomposition indefinitely.

The invention is not limited to the examples given, which are introduced merely by way of illustration, nor to the addition of such mentioned dye to halogenated aliphatic hydrocarbons in the amounts specified, as it is evident that numerous modifications from the procedure described may be introduced without departing from the principle and scope of the invention.

This method of preserving has been found to have not only the advantages of cheapness and ease of application along with attainment of preservative results, but I have found that the color imparted to the so treated halogenated hydrocar'on gives it a desirable quality for certain uses in the arts.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the method herein disclosed, provided the step or steps stated by any of the following claims or the equivalent of such stated step or steps be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. The herein described method of preventing the decomposition of halogenated aliphatic hydrocarbons which consists in adding thereto in relatively small amount an oil-soluble azo dye containing a phenolic component.

2. The herein described method of pre-

venting the decomposition of halogenated aliphatic hydrocarbons which consists in adding thereto in relatively small amount an oil-soluble azo dye containing betanaphthol as one component.

3. The herein described method of preventing the decomposition of chlorinated aliphatic hydrocarbons which consists in adding thereto a relatively small amount of an oil-soluble azo dye containing a phenolic component.

4. The herein described method of preventing the decomposition of chlorinated aliphatic hydrocarbons which consists in adding thereto in relatively small amount an oil-soluble azo dye containing betanaphthol as one component.

5. As a composition of matter a halogenated aliphatic hydrocarbon containing a relatively small amount of an oil-soluble azo dye dissolved therein, said dye including a phenolic component.

6. As a composition of matter a halogenated aliphatic hydrocarbon containing a relatively small amount of an oil-soluble azo dye dissolved therein, said dye including betanaphthol as one component.

7. As a composition of matter a chlorinated aliphatic hydrocarbon containing a relatively small amount of an oil-soluble azo dye dissolved therein, said dye including a phenolic component.

8. As a composition of matter a chlorinated aliphatic hydrocarbon containing a relatively small amount of an oil-soluble azo dye dissolved therein, said dye including betanaphthol as one component.

9. The herein described method of preventing the decomposition of halogenated aliphatic hydrocarbons which consists in adding thereto azobenzene-azo-betanaphthol in relatively small amount.

10. The herein described method of preventing the decomposition of chlorinated aliphatic hydrocarbons which consists in adding thereto azobenzene-azo-betanaphthol in relatively small amount.

11. As a composition of matter, a halogenated aliphatic hydrocarbon containing a relatively small amount of azobenzene-azo-betanaphthol dissolved therein.

12. As a composition of matter, a chlorinated aliphatic hydrocarbon containing a relatively small amount of azobenzene-azo-betanaphthol dissolved therein.

13. As a composition of matter a halogenated aliphatic hydrocarbon containing a relatively small amount of benzene-azo-beta-naphthol dissolved therein.

14. As a composition of matter a chlorinated aliphatic hydrocarbon containing a relatively small amount of benzene-azo-beta-naphthol dissolved therein.

15. As a composition of matter a halogenated aliphatic hydrocarbon containing a relatively small amount of xylene-azo-beta-naphthol dissolved therein.

16. As a composition of matter a chlorinated aliphatic hydrocarbon containing a relatively small amount of xylene-azo-beta-naphthol dissolved therein.

17. As a composition of matter chloroform containing a relatively small amount of an oil-soluble azo dye dissolved therein, said dye including a phenolic component.

18. As a composition of matter chloroform containing a relatively small amount of an oil-soluble azo dye dissolved therein, said dye including beta-naphthol as one component.

19. As a composition of matter chloroform containing a relatively small amount of azobenzene-azo-beta-naphthol dissolved therein.

20. As a composition of matter chloroform containing a relatively small amount of benzene-azo-beta-naphthol dissolved therein.

21. As a composition of matter chloroform containing a relatively small amount of xylene-azo-beta-naphthol dissolved therein.

Signed by me this 31st day of July, 1928.

EDWARD C. ZUCKERMANDEL.