

UNITED STATES PATENT OFFICE

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DRY CLEANING FLUID

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11 Claims. (Cl. 87-5)

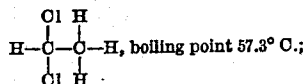
My invention has to do with a new type of flame resistant cleaning fluid comprising the aliphatic, saturated, unsymmetrical, polyhalogenated hydrocarbon derivatives and more particularly the saturated, unsymmetrical, polychlorinated derivatives of the normally gaseous hydrocarbons.

One object of my invention is to provide flame resistant cleaning fluids having low evaporation temperatures and superior dry cleaning qualities. Another object is to provide superior cleaning fluid compositions comprising novel blends of chlorinated hydrocarbons with or without the addition of petroleum naphthas or other hydrocarbon mixtures. Further objects of my invention will become apparent as the description thereof proceeds.

Carbon tetrachloride has been used as a flame resistant cleaning fluid or as a constituent of such materials. However, it has been found desirable to get away from certain properties of carbon tetrachloride such as its tendency to yield the highly poisonous phosgene on oxidation; its tendency to extract natural oils from fabrics such as wools, thereby rendering them harsh; etc. Carbon tetrachloride has also been blended with petroleum naphthas to reduce these adverse effects and to lower the cost. This, however, has not been satisfactory, since the naphtha invariably contains some relatively high boiling constituents which tend to concentrate in the residue during evaporation or fractional distillation. This makes for a considerable fire hazard, particularly during the drying of garments which have been cleaned with such a fluid. I find that the incorporation of a relatively small amount of certain of the compounds comprehended by my invention solves this problem in a new and unique fashion.

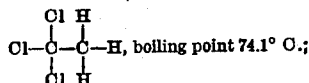
In its broadest terms, my invention comprehends the dry cleaning of fabrics by the application to them of a dry cleaning fluid comprising one or more bodies selected from the aliphatic, saturated, unsymmetrical, polyhalogenated hydrocarbon derivatives, and particularly from the aliphatic, saturated, unsymmetrical, polychlorinated derivatives of the normally gaseous hydrocarbons. Of these the most important are the unsymmetrical polychlorine substitution products of ethane which class includes:

Unsymmetrical dichlorethane (1,1 dichlorethane), structural formula



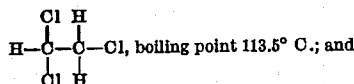
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Unsymmetrical trichlorethane (1,1,1 trichlorethane), structural formula



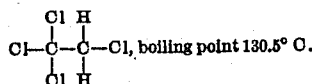
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Unsymmetrical trichlorethane (1,1,2 trichlorethane), structural formula



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Unsymmetrical tetrachlorethane (1,1,1,2 tetrachlorethane), structural formula



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These compounds can be used alone as cleaning fluids or may be incorporated as a constituent of cleaning fluids containing naphtha and/or other chlorinated bodies. In any event their outstanding advantage is a high degree of non-flammability or flame resistance coupled with a low boiling point or evaporation temperature. They can be used alone or blended with each other to give flame resistant fluids which can be used in dry cleaning by immersing textile fabrics in them, agitating fabrics and/or fluid, removing the fabrics and drying them by evaporation of the fluid. They can also be used as "spotting fluids", i. e. by applying them locally in small quantities to remove spots from garments, etc. In the claims the word "contacting" is used to cover both the application of a spotting fluid to a fabric and the immersion of a fabric in a dry cleaning fluid.

As examples of suitable cleaning fluids com-

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prising these compounds the following may be mentioned:

Example I

- 60% carbon tetrachloride
40% 1,1,1 trichlorethane

These two compounds have very similar boiling points and do not separate materially on evaporation or fractional distillation. The unsymmetrical body is found to improve the solvent properties of the carbon tetrachloride and the mixture is substantially non-flammable under all conditions. The percentages of the two components may be varied within wide limits, say from 10% 1,1,1 trichlorethane and 90% carbon tetrachloride to 95% 1,1,1 trichlorethane and 5% carbon tetrachloride.

Example II

- 40% 1,1,1 trichlorethane
40% 1,1,2 trichlorethane
20% petroleum naphtha, boiling range 73-120° C.

This blend is substantially non-flammable under all conditions. The two chlorinated solvents have fairly low boiling points and the naphtha has a range of boiling points such that it will evaporate or distill off together with the chlorinated solvents, thus insuring a high degree of flame resistance at all times.

Example III

- 60% 1,1,1 trichlorethane
25% 1,1,1,2 tetrachlorethane
15% petroleum naphtha, boiling range 70-140° C.

This blend has many of the characteristics of that of Example II, except that it has a wider range of boiling points and dries more slowly.

Example IV

- 50% carbon tetrachloride
25% 1,1,2 trichlorethane
25% petroleum naphtha, boiling range 76-105° C.

This blend has a very narrow boiling range for a naphtha-containing fluid. By using these two chlorinated solvents which are close together in boiling point, a blend can be produced which will fractionate very little on evaporation or distillation and in which a relatively high percentage of naphtha can be used without impairing the flame resistance of the blend.

In these blends containing a petroleum naphtha and two chlorinated solvents the petroleum naphtha should have a boiling range extending from approximately the boiling point of the lighter chlorinated solvent to the boiling point of the heavier chlorinated solvent although it is possible to have the initial boiling point of the naphtha as much as 10 or 15° C. below the boiling point of the lighter chlorinated solvent and the maximum boiling point of the naphtha as much as 15 or 20° C. above the boiling point of the heavier chlorinated solvent without rendering the blend unduly flammable at any stage in its evaporation from a textile fabric. The percentage of naphtha used can be varied within wide limits, say from 5% to 60% but when more than 20 to 25% naphtha is used the blend is rarely if ever absolutely non-flammable, although it has a relatively high degree of flame resistance.

When very light and rapid-drying dry cleaning fluids are desired unsymmetrical dichlorethane can be used either alone; in combination

with from 10 to 90% of a slightly heavier chlorinated solvent such as carbon tetrachloride or 1,1,1 trichlorethane; or in combination with naphtha, with or without a heavier chlorinated solvent. These unsymmetrical dichlorethane blends are not completely free from fire hazard but are markedly flame resistant.

In all of these blends I prefer to use not more than 2 of the chlorinated solvents covered by my invention and I prefer that each of these be present in quantities of at least 10% and preferably 20% by volume.

While my invention has been described particularly as applied to the saturated, unsymmetrical, polychlorinated ethane derivatives it may also be applied to the corresponding compounds of the other halogens, particularly fluorine and to the saturated, unsymmetrical, polyhalogenated derivatives of other hydrocarbons, particularly propane. All of these compounds have an outstanding and typical advantage for use in dry cleaning fluids in that for a given empirical formula they have a much higher volatility than their more symmetrical isomers. This permits the attainment of a high degree of flame resistance in a fluid of rapid drying characteristics.

I have also found that the dry cleaning fluid composition of my invention can be greatly improved by the incorporation therein of a very small amount of a substance which will improve the color of white fabrics undergoing dry cleaning. For this purpose I prefer to use an oil soluble blue dye preferably of the class commercially known as "oil blues". I may also employ the oil soluble leuco base of certain dyes which develop a blue tint subsequently. White fabrics tend to take on a slightly yellowish appearance with age and use which cannot be entirely removed by ordinary dry cleaning. I find, however, that the incorporation of from .0005% to .05% of an "oil blue" in my cleaning fluid compositions will overcome this difficulty without leaving any objectionable color on the fabric. Most of these dyes can be dissolved directly in the cleaning fluid or in one of the constituents of the fluid prior to blending. In some cases, however, the dye must be dissolved in a small amount of a solvent such as benzol before addition to the fluid. As an example of this feature of my invention I may dissolve .005% of the commercial product known as "Victoria blue B" in any of the cleaning fluid compositions discussed above.

The exact amount of dye to be used will vary with the particular dye selected, but can be readily determined by experiment. The amount used should be such as to overcome the yellow tint of a typically "white" fabric but should be insufficient to leave any blue color on fabrics being dry-cleaned. Applying the tint in solution in cleaning fluid as I do facilitates uniform distribution of color on the fabric.

Whereas I have described my invention in terms of certain specific embodiments thereof, I do not wish to be limited thereby but only by the scope of the appended claims.

I claim:

1. In a process for the dry cleaning of textile fabrics the step which comprises contacting said fabrics with a fluid comprising a substantial amount of an aliphatic, saturated, unsymmetrical, polychlorinated hydrocarbon substitution product selected from the group consisting of 1,1 dichlorethane, 1,1,1 trichlorethane, 1,1,2 trichlorethane and 1,1,1,2 tetrachlorethane.

2. In a process for the dry cleaning of textile

fabrics the step which comprises contacting said fabrics with a fluid comprising at least 10% of 1,1 dichlorethane.

3. In a process for the dry cleaning of textile fabrics the step which comprises contacting said fabrics with a fluid comprising at least 10% of 1,1,1 trichlorethane.

4. In a process for the dry cleaning of textile fabrics the step which comprises contacting said fabrics with a fluid comprising at least 10% of 1,1,1,2 tetrachlorethane.

5. A flame resistant fluid blend for use in dry cleaning, comprising from 10% to 95% of 1,1,1 trichlorethane and from 5% to 90% of carbon tetrachloride.

6. A flame resistant fluid blend for use in dry cleaning, comprising two chlorinated solvents, at least one of which is an aliphatic, saturated, unsymmetrical polyhalogenated hydrocarbon derivative, and from 5% to 60% of a petroleum naphtha having an initial boiling point not less than about 15° C. below the boiling point of the lighter chlorinated solvent and a maximum boiling point not more than about 20° C. higher than the boiling point of the heavier chlorinated solvent.

7. A flame resistant fluid blend for use in dry cleaning, comprising at least about 10% of 1,1,1 trichlorethane, at least about 10% of 1,1,2 trichlorethane and from about 5% to about 60% of a petroleum naphtha having an initial boiling point not more than about 15° C. below the boiling point

of said 1,1,1 trichlorethane and a maximum boiling point not more than about 20° C. above the boiling point of said 1,1,2 trichlorethane.

8. A flame resistant fluid blend for use in dry cleaning, comprising approximately 40% of 1,1,1 trichlorethane, approximately 40% of 1,1,2 trichlorethane and approximately 20% of a petroleum naphtha having an approximate boiling range of from 73° C. to 120° C.

9. A flame resistant fluid blend for use in dry cleaning, comprising at least about 10% of 1,1,1 trichlorethane, at least about 10% of 1,1,1,2 tetrachlorethane and from about 5% to about 60% of a petroleum naphtha having an initial boiling point not more than about 15° C. below the boiling point of said 1,1,1 trichlorethane and a maximum boiling point not more than about 20° C. above the boiling point of said 1,1,1,2 tetrachlorethane.

10. A flame resistant fluid blend for use in dry cleaning, comprising approximately 60% of 1,1,1 trichlorethane, approximately 25% of 1,1,1,2 tetrachlorethane and approximately 15% of a petroleum naphtha having an approximate boiling range of from 70° C. to 140° C.

11. A flame resistant fluid blend for use in dry cleaning, comprising approximately 50% of carbon tetrachloride, approximately 25% of 1,1,2 trichlorethane and approximately 25% of a petroleum naphtha having an approximate boiling range of from 76° C. to 105° C.

GEORGE L. PARKHURST.

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