

# UNITED STATES PATENT OFFICE.

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## FORMALDEHYDE PREPARATION.

No. 854,452.

Specification of Letters Patent.

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*To all whom it may concern:*

Be it known that I, HENRY SPENCER BLACKMORE, a citizen of the United States, residing at Mount Vernon, in the county of Westchester and State of New York, have invented certain new and useful Improvements in a New Composition of Matter for Disinfectant, Germicide, and Other Purposes; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a new article of manufacture or composition of matter for disinfecting, germicide, antiseptic and medicinal purposes and consists of a mixture, compound or solution of formic aldehyde or its polymerides in an oxy-acid ester, such as methyl-benzoic ester, methyl-salicylic ester, amyl-acetic ester, etc., or compositions containing oxy-acid esters, which compounds or compositions may or may not be associated with other vehicles or medicating agents, the object being to produce a solution of formic aldehyde or its polymerides which will be of permanent nature in relation to spontaneous decomposition and which, in fluid condition, may be readily utilized without producing disagreeable effects.

As a specific illustration of my new composition and the manner in which the same is made, I will take for example the production of a solution of formic aldehyde in methyl-benzoic ester (methyl benzoate). The manner in which I prefer to produce this solution of formic aldehyde or its polymerides is to place the desired ester, such as methyl-benzoic ester, in a proper container and expose it to the presence of formic aldehyde under increased pressure at the same time agitating it whereby the formic aldehyde becomes absorbed, occluded, or retained therein. When the ester has become saturated with formic aldehyde it is removed, the formic aldehyde content ascertained by test, and the composition diluted with more ester or other diluent to obtain the percentage content of the formic aldehyde desired.

The polymerides of formic aldehyde such as para-formaldehyde or trioxymethylene may be dissolved in the ester, preferably by the action of heat, producing compounds not

departing from the spirit of my invention, as, upon heating in the formation of the composition, formic aldehyde is generated in the presence of the oxy-acid ester and absorbed thereby and the composition is found to have a like disinfectant, germicide, antiseptic and medicinal property and to all intents and purposes may be considered and is herein included as an equivalent composition in accordance with my invention.

I have found it of advantage to employ compositions containing esters and formic aldehyde diluted with a vehicle such as camphor oil in which case it is found to act with satisfaction as an aerial disinfectant, inasmuch as the camphor oil and ester is volatile at ordinary atmospheric pressure and temperature and saturates the air coming in contact therewith with formic aldehyde and the ester which, having a pleasant characteristic odor, perfumes the air and obviates the disagreeable pungent effect which usually accompanies the application of formic aldehyde *per se*.

I have found that formic aldehyde and its polymerides may be readily assimilated with the oxy-acid esters and that the said oxy-acid esters act to mediate the usual disagreeable and pungent effects arising from the application of the formic aldehyde *per se* and that the said oxy-acid esters, having characteristic odors, serve to disguise the formic aldehyde when applied without deteriorating or destroying its effectiveness as a disinfectant. I have also found that the oxy-acid esters not only act as a solvent of the formic aldehyde or its polymerides but may be employed as a carrier or solvent agent to introduce formic aldehyde into other vehicles in which it is less soluble and in which event solutions of formic aldehyde in esters *per se*, which may be of expensive manufacture, may be employed with economical advantage by adding thereto a less expensive diluent without deteriorating the effectiveness of the disinfectant formic aldehyde or the odorizing or solvent ester.

Specifically my invention relates to a solution of formic aldehyde or its polymerides in oxy-acid ester of aromatic character either *per se* or with other diluents, but is not confined to esters of this character, as I may employ any practical oxy-acid ester or alkyl-substitution



product of an oxy-acid. It may be noted also that the esters, as a rule, are incompatible with water or non-miscible with or repellant thereto.

5 The term "formic aldehyde" employed throughout this specification and claims is intended to include its polymerides or equivalents, such as para-formaldehyde or trioxymethylene and intermediate polymerization  
10 products as well as formic aldehyde *per se*, and the term "oxy-acid ester" to what may be termed an alkyl salt or substitution product of an oxy-acid *i. e.*, an acid containing oxygen, which esters may be either obtained  
15 from nature or artificially or synthetically prepared.

The advantage obtained by employing oxy-acid esters as solvents for formic aldehyde, other than those already set forth, may be  
20 noted as the facility with which they appear to transform oxygen into an ozone-like character which, in combination with formic aldehyde, produces a composition of great effectiveness for disinfectant, germicide and  
25 similar purposes.

It may be noted that formic aldehyde, which is a gas, unites or combines more readily with oxy-acid esters and becomes more readily assimilated or retained or occluded  
30 therein in a more permanent manner and in a larger percentage without danger of polymerization than is the case with aqueous solutions.

The largest percentage of formic aldehyde  
35 obtained under ordinary conditions in aqueous solution does not exceed forty per cent., whereas oxy-acid esters have the property of transforming or occluding gaseous formic aldehyde into a liquid condition with such  
40 avidity and permanency that solutions even up to eighty per cent. formic aldehyde have been produced without polymerization into solid products, at the same time the valuable disinfectant and germicide properties of the  
45 formic aldehyde have not been deteriorated but in fact seem to be enhanced by its union or composition with the oxy-acid ester solvent or vehicle.

The term "containing" oxy-acid ester as  
50 employed in this specification and claims with reference to the vehicle for the formic aldehyde has reference to oxy-acid esters *per se* or inert diluent containing the same in any desired proportion.

55 The term "inert" as employed herein is intended to imply a diluent inert with reference to the formic aldehyde and oxy-acid ester content of the composition.

While my invention is particularly applicable  
60 to the employment of the esters of oxy-acids of the aromatic series such as benzoic, salicylic, cinnamic, etc., which esters are volatile, aromatic and water-repellant, still I do not desire to confine myself to this specific

class of oxy-acid esters but reserve the right  
65 to employ any oxy-acid ester be it either fluid or solid, as a solvent or vehicle, either *per se* or in composition with other diluents, for formic aldehyde or its polymerides.

Having now described my invention, what  
70 I claim as new and desire to secure by Letters Patent is:—

1. A new composition of matter consisting of an aromatic oxy-acid ester containing  
75 formic aldehyde.

2. A new composition of matter containing formic aldehyde and an anhydrous ester of the aromatic acid series.

3. A new composition of matter containing formic aldehyde and methyl-benzoic  
80 ester.

4. A new composition of matter consisting of formic aldehyde, an oxy-acid ester and camphor oil.

5. A new composition of matter consisting  
85 of formic aldehyde, methyl-benzoic ester and camphor oil.

6. The process of making the new composition of matter herein set forth which consists in generating formic aldehyde in the  
90 presence of an anhydrous oxy-acid ester and exposing the same to intimate association until the formic aldehyde has become associated therewith or occluded therein.

7. The process of making the new composition of matter herein set forth which consists in mixing an anhydrous oxy-acid ester with formic aldehyde and exposing the same  
95 to intimate association until the formic aldehyde has become associated therewith or occluded therein. 100

8. The process of making the new composition of matter herein set forth which consists in mixing an anhydrous oxy-acid ester with dry formic aldehyde and exposing the  
105 same to intimate association until the formic aldehyde has become associated therewith or occluded therein.

9. The process of making the new composition of matter herein set forth which consists in mixing an anhydrous oxy-acid ester with formic aldehyde under super-atmospheric pressure and exposing the same to intimate association until the formic aldehyde  
110 has become associated therewith or occluded therein. 115

10. The process of making the new composition of matter herein set forth, which consists in mixing a benzoic ester with formic aldehyde and exposing the same to intimate  
120 association until the formic aldehyde has become associated therewith or occluded therein.

11. The process of making the new composition of matter herein set forth, which consists in mixing methyl benzoic ester with  
125 formic aldehyde and exposing the same to intimate association until the formic aldehyde

hyde has become associated therewith or occluded therein.

12. A new composition of matter containing formic aldehyde and a benzoic ester.

5 13. A new composition of matter containing formic aldehyde, a benzoic ester, and an inert diluent.

14. A new composition of matter contain-

ing formic aldehyde, a benzoic ester, and camphor oil.

In testimony whereof I affix my signature, in presence of two witnesses.

HENRY SPENCER BLACKMORE.

Witnesses:

C. C. WRIGHT,

H. N. JENKINS.