

## UNITED STATES PATENT OFFICE

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MOISTUREPROOF IGNITING COMPOSITION,  
ESPECIALLY FOR MATCHES, AND MATCH  
PREPARED THEREWITH

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The binders of igniting compositions heretofore used for matches contain mostly water-soluble glues of one kind or the other. As a consequence the resistance of the ignition charges against the action of water and moisture is very small so that matches which have been subjected to the action of moisture even for a few minutes do not ignite. This is caused by the glue as well as the usual constituents of the composition, such as potassium chlorate and potassium bichromate being dissolved out of the composition more or less by the influence of water. The said drawback makes itself felt especially in tropic climates. Matches are usually shipped to the tropics in soldered sheet metal packages. If the moisture content of the air is considerable it may easily happen that the entire content of such a package is rendered useless in a very short time after the package has been opened due to the dissolving action of the air moisture and heat on the ignition charges of the matches.

The object of the present invention is to obviate such inconveniences. The invention relates to moisture-proof igniting compositions, especially adapted for matches, the binding constituent of which wholly or partly consists of cellulose or cellulose derivatives, and is characterized in that the cellulose containing solution respectively the cellulose derivative containing solution which is used as a binder contains more than 8, preferably 12–15 and up to 20 per cent of cellulose or cellulose derivative. As stated above the binding constituent of the composition need not wholly consist of cellulose or cellulose derivatives, it being possible to use the said substances with an admixture of usual glues.

According to one feature of the invention the cellulose derivative used is nitro-cellulose.

A very good result is obtained by using a binder consisting of a solution of nitro-cellulose in acetone. An ignition charge which has been sized with such a binder ignites quite satisfactorily even after having been kept for 2 hours in water. In order to make the method cheaper and, in certain cases, to improve it the nitro-cellulose may with almost as good results be substituted by waste film or waste celluloid and the acetone by a mixture of alcohol and benzol. Nitro-cellulose or celluloid are preferred because they are inflammable and may therefore be used in higher concentrations without the combustion of the ignition charge being substantially retarded.

According to another feature of the invention the ignition composition or the solution of binder

for the same contains natural or artificial resins or resinous substances. As a matter of fact an addition of resin to the binder is very advantageous as it renders the heads of the matches harder and firmer and increases their resistance against moisture.

The igniting composition according to the invention is especially improved if among the oxygen carriers of the composition superoxide of lead is used in suitable quantities.

One may considerably increase the moisture-proof properties of the composition by incorporating in the same a readily soluble metal salt, the positive ion of which is the same as the positive ion of the chlorate of the composition. This may be attained either by increasing the percentage of bichromate of the composition or by adding to the latter a readily soluble salt such as a nitrate.

This measure is intended to prevent the dissolving out of the chlorate usually to be found in the ignition charge, by water or moisture penetrating into the match head. Of course, narrow channels leading from the surface to the interior of the match head may be formed by the action of water on soluble particles of the composition which are disposed in the surface of the match head. Through the said channels a diffusion of the chlorate contained in the composition takes place. If, however, the igniting composition according to the invention contains a readily soluble metal salt, the positive ion of which is similar to that of the chlorate of the igniting composition, the said readily soluble salt is first dissolved and the liquid circulating in the channels is enriched with ions of the metal in question whereby the dissociation of the chlorate is counteracted or prevented so that the dissolving out of chlorate from the match head is checked.

After the ends of the match splints have been dipped in the viscous composition mixture according to the invention one obtains a match head in which the different particles of the composition are lying homogeneously divided in the binder. Such soluble constituents are thus to be found even on the surface of the head. If these are subjected to the action of water they may be dissolved out as previously mentioned whereby a system of narrow channels is formed in the ignition charge and further dissolving out of the active constituents of the charge is made easy. In order to obviate this drawback the surface of the finished match head is coated in any suitable manner with binding material of

the same kind that has been used for the making of the match head or with another material which has one or more solvents in common with the binding material. The object of this coating is to cover particles on the surface of the match head which might otherwise be attacked by water, and to prevent that such particles which may be attacked by water are revealed by mechanical action for instance by the friction between the matches in the filling machines. For this reason it is rather important that the surface of the match head be hard. The adherence is attained in such a way that no definite surface of separation between the mass of the match head and the coating later applied is allowed to form. On dipping or in any other way introducing the finished match heads in the relatively diluted solution of the substance which is to form the protective coating, said solution containing as solvents one or more liquids which are able to dissolve also the binding substance of the match head, the cover-forming substance will not be applied as a coating which is definitely separated against the surface of the match head but melts together with the binding substance of the match head, as it were, so that no definite separating surface can be determined, the coating and the match head homogeneously passing into one another. The last-mentioned protective coating may of course consist of the same substance which forms the binding substance of the match head, but there is nothing to prevent that an igniting composition which

has been sized with nitro-cellulose be coated with a thin rubber layer or the like in the manner above described.

What I claim as new and desire to secure by Letters Patent of the United States of America is:—

1. A match comprising a wooden splint provided with a tip of igniting composition composed of ignitable material and a binder therefor, characterized in that the binder consists of water-insoluble combustion-supporting substances including a water-insoluble cellulosic material and a water-insoluble resin.

2. A match comprising a wooden splint provided with a tip of igniting composition composed of ignitable material including a chlorate and a binder for said ignitable material, characterized in that the binder consists of water-insoluble combustion-supporting substances including a water-insoluble cellulosic material and a water-insoluble resin, and in that the ignitable material of the igniting composition includes also an increment of a water-soluble metal salt the positive ion of which is the same as the positive ion of the chlorate.

3. A match comprising a wooden splint provided with a tip of igniting composition composed of ignitable material and a binder therefor, characterized in that the binder consists of water-insoluble combustion-supporting substances including nitro-cellulose and a natural resin.

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