June 5, 1934. J. B. ARPIN 1,961,920

WATERPROOF MATCH

Filed Jan. 28, 1932

Fig 1

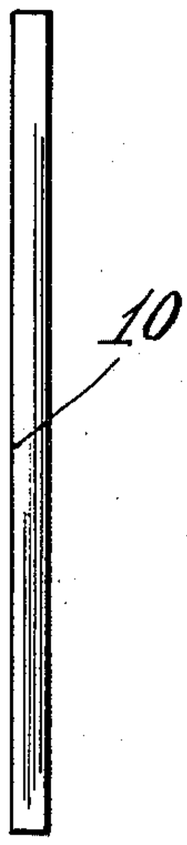



Fig 2

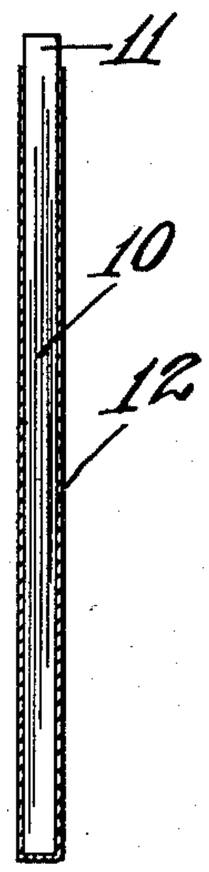



Fig 3

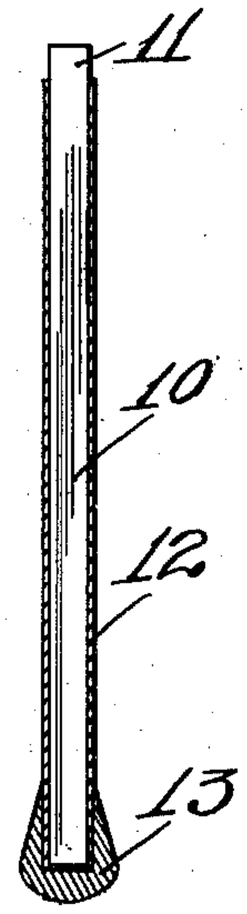



Fig 4

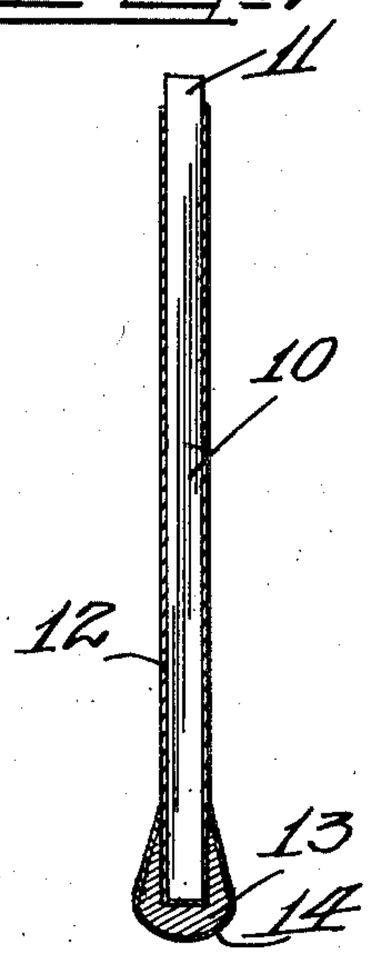
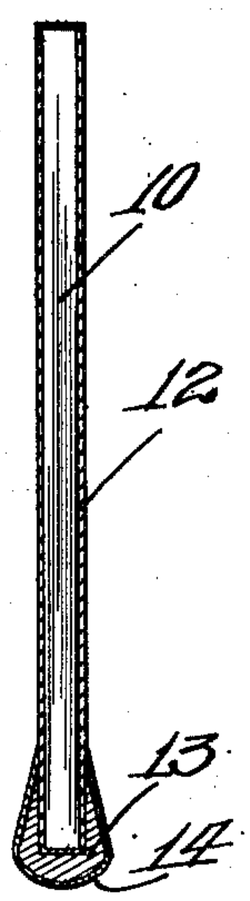



Fig 5




Inventor
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By Charles Hill Attys

Patented June 5, 1934 1,961,920

# UNITED STATES PATENT OFFICE

1,961,920

## WATERPROOF MATCH

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Application January 28, 1932, Serial No. 589,335

1 Claim. (Cl. 44—42)

This invention relates to water proof matches and includes the process of manufacturing them.

As is known in the manufacture of matches soft woods and other combinations of materials are cut by machine to form the sticks. The cut sticks are then fixed into a frame or carrier belt of the match machine so that each stick stands protruding from the belt like a bristle or a brush in the manufacture of certain wood matches. The end of each stick is dipped in melted paraffine and after drying, the paraffine dipped end of each stick is dipped into an igniting mixture to form the head of the match. The igniting mixture generally contains phosphorus together with oxidizing materials such as potassium chlorate, potassium dichromate and the like. An adhesive substance such as glue or dextrin is also generally present in the mixture to cause the igniting chemicals to adhere to the sticks.

The detrimental effects of water or moisture on matches is well known and since the chemicals in the head absorb moisture it has heretofore been proposed to protect the matches from moisture by coating the heads with a varnish or thin shellac or other solutions. It has also been proposed to use various non-absorptive compositions such as "Bakelite" (phenol-aldehyde condensation products) as agglutinants in the head preparation to protect the igniting chemicals from moisture. These proposed methods of protecting the matches from moisture have not been satisfactory due to the fact that the stick itself has not been treated to prevent absorption of moisture.

I have now found that if the sticks are completely immersed in a water proof composition which is also combustible and a coating of the waterproof combustible material allowed to substantially cover the entire match stick it is possible to produce a match which is practically totally waterproof. Since, however, the carrier belt or supporting frame of the match machine contacts a portion of the stick it will be impossible, of course, to coat this portion with the water proof composition. I have found however that if the sticks are immersed up to the belt only a very small portion of the stick remains uncoated, which portion is insufficient to have deleterious effects.

In the heretofore proposed practice of manufacturing matches the match sticks were uniformly dipped into paraffine to only an extent of one-fourth to one-half the length of the match stick. This, of course, permitted the exposure of an untreated stick to moisture. The untreated portion of the stick however absorbs the moisture and, because of the capillary properties of the cellular structure of wood, the moisture permeates throughout the entire length of the stick. As a result when the head of the match, even though treated for resisting moisture, is ignited it would be the only portion of the match to burn. The match consequently would merely sputter and go out. By treating the entire match stick however this evil is overcome and a water proof match can be produced under very economic optimum conditions.

It is therefore an object of this invention to produce a water proof match in which both the match stick and the head of the match are sealed from moisture.

It is a further object of this invention to produce a match which is unaffected by moisture even after hours of soaking in water.

It is a further object of this invention to prepare a water proof match containing a stick coated substantially over its entire surface with a combustible water proof composition and containing an igniting head portion also coated with a combustible water proof composition.

It is a further object of this invention to prepare a water proof match containing a stick treated with a penetrating filler of waterproof combustible material making any desired portion of the stick waterproof, containing an igniting head also coated with combustible waterproof composition or solutions.

Other and further objects of this invention will become apparent as the description proceeds.

On the drawing:

Figure 1 is an elevational view of an ordinary match stick.

Figure 2 is a vertical cross sectional view of a match stick coated substantially throughout its entire surface with a combustible water proof coating.

Figure 3 is a vertical cross sectional view of a water proof coated match stick after the igniting head has been added.

Figure 4 is a vertical cross sectional view of a completed water proof match containing a water proof combustible coating throughout substantially the entire surface of the match stick and having the igniting mixture on the head of the match covered by a water proof combustible composition.

Figure 5 is a vertical cross sectional view of an alternative form of a completed match in which the stick of the match is entirely coated with a water proof combustible composition.

As shown on the drawing:

In Figures 1 to 4 inclusive the reference numeral 10 indicates the match stick. A portion 11 of the match stick 10 is inserted in the carrier belt or frame of the match making machine (not shown). This portion 11 is therefore not coated with combustible water proof composition such as varnish or shellac 12 which covers the entire surface of the match stick extruding from the carrier belt. The coating 12 may be applied in any manner such as by dipping, spraying, vapor penetration or the like. The most simple manner of applying the coating consists in merely immersing the sticks on the carrier belt of the match machine into a bath of the combustible water proofing composition. The coating is then preferably allowed to set or dry.

The igniting mixture or head 13 is next applied to the sticks 10 by dipping the coated end thereof into a paste of the igniting mixture.

A water proof coating 14 is then applied to the surface of the igniting mixture 13. This coating may be of shellac or other suitable water proof composition.

Figure 5 illustrates an alternative form of water proof match in which the combustible water proof coating 12 completely covers the entire surface of the stick 10. This type of water proof match is preferable because moisture or water can in no way penetrate into the stick or head of the match. By coating the portion 11 shown in Figures 2, 3 and 4 the only unexposed or water vulnerable portion of the match is protected. It has been found, however, that for most purposes the relatively small unexposed portion 11 is not injurious since the only way moisture can affect the burning of most of the match is for the water to travel by capillary action throughout the length of the stick toward the head end. This is highly improbable since the capillary action is not ordinarily sufficient to draw moisture from such a small exposed portion to saturate the entire stick.

If, for example, only half of the stick is saturated with water, that is the portion from the end 11 to about the mid portion of the stick, it has been found that such a degree of water saturation is not harmful due to the fact that the kindling temperature of the wood or stick material is sufficiently high to dry out the rest of the wood after the flame has reached the size and proportion necessary to carry it down to the middle of the match stick. Furthermore a match is almost universally never burned for more than one-half of the length of its stick.

While any water insoluble water proofing agent that is combustible can be used as a coating material, shellac and water proof varnishes have been found to be particularly effective. However it should be understood that my invention is not limited to either of these materials.

It is furthermore found that the waterproof composition strengthens the head of the match and is an added bond which prevents chipping off and flying of portion of the head when lighted on rough surface.

The description has been confined to the preparation of wooden matches for convenience only. It should be understood however that my invention is applicable to matches of the paper variety (book matches) as well. The material used for the stick is immaterial.

I am aware that many changes may be made and numerous details of construction may be varied through a wide range without departing from the principles of this invention, and I therefore do not purpose limiting the patent granted hereon otherwise than necessitated by the prior art.

I claim as my invention:

A waterproof match consisting of a stick portion having all of its surfaces coated with a combustible waterproof composition and having an igniting head coated with a combustible waterproof composition positioned upon and around one end of the coated stick.

JOHN B. ARPIN.