Jan. 5, 1937. H. W. GREIDER ET AL 2,066,399

MATCH

Filed Sept. 21, 1933

Fig. 2.

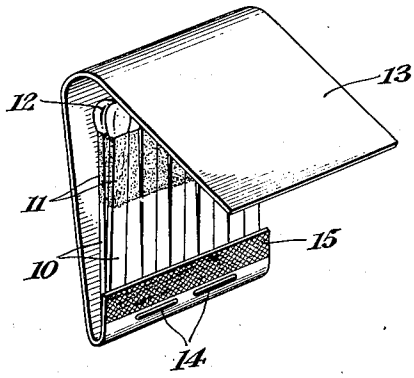
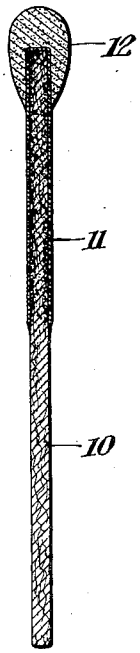


Fig. 1.



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Patented Jan. 5, 1937 2,066,399

UNITED STATES PATENT OFFICE

2,066,399

MATCH

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Application September 21, 1933, Serial No. 690,334

2 Claims. (Cl. 44—46)

This invention relates to matches and to methods of making the same.

Heretofore matches have been made using combustible splints tipped with a substance that can be ignited by striking the same against an object or, as with so-called safety matches, against a particular composition carried for example by a container for the matches.

Matches of the type heretofore manufactured have been defective in that the combustible splint body thereof is subject to continued burning after use and presents a serious fire hazard. Moreover, a user is subjected to the annoyance of carefully watching the match lest it burn too far and burn the fingers. It is a purpose of this invention to overcome the defects above mentioned. It is another object of this invention to afford such a result without resort to special chemical treatment and while using inexpensive and readily available materials.

It is one of the features of this invention that a match splint is afforded which not only has a part capable of supporting combustion and has an ignitable tip but also has another part which is not capable of supporting combustion, at least in ordinary atmosphere. Thus the match may be ignited and burned but is of such character that is goes out before the flame reaches a point adjacent the other end thereof that is normally grasped by the user.

A further feature of this invention resides in providing a splint body which is made of a material that is incapable of supporting combustion and applying to a portion only of the splint body a substance that is capable of supporting combustion as carried by said splint body. When the portion of the splint body carrying the combustible material is given a friction ignitable tip, of fulminating material and the like, the match can be ignited and the combustible material can be burned with a free flame as in the normal case of a match. However, the match becomes extinguished when the flame reaches the portion of the splint body which does not carry the combustible material and which is normally grasped by the user. Moreover, as the splint body is non-combustible, the match cannot flow or burn after it has gone out.

According to one embodiment of this invention the match splint body is made out of fibrous material which is incapable of supporting combustion. Thus according to this invention it is regarded as preferable to employ non-combustible mineral fiber in making the match splint body. For example, it is regarded as preferable to employ asbestoform mineral fiber of the asbestos and/or amphibole type such as chrysotile, anthophyllite, amosite, crocidolite and the like. Asbestoform mineral fiber which can be made up into a strong paper web is to be regarded as preferable in the practice of this invention. The ordinary chrysotile asbestos of commerce including "shingle stock", "paper and millboard stock", "cement stock" and that which is sold under $2x$ and $3x$ grades give satisfactory results.

While the use of asbestoform mineral fiber in match splint stock is regarded as one of the features of this invention, a further feature of this invention resides in employing organic cellulosic fiber together with the mineral fiber in making a paper web for the match splint stock. Thus it is regarded as preferable to employ a major proportion of asbestoform mineral fiber with a minor proportion of organic mineral fiber. It has been found that when the non-combustible mineral fiber in major proportion is made up into a paper web with combustible organic fiber, the resulting paper web will not support combustion. The cellulosic fiber is desirable in giving strength and toughness to the mineral fiber and in enabling the web to be readily saturated with silicate of soda to harden the web.

In one embodiment of this invention a fibrous web containing asbestoform mineral fiber is given rigidity and strength by impregnation with a solution of soluble silicate. For this purpose a properly diluted solution of commercial sodium silicate of about 40° to 42° Bé. may be used. It is also desirable in giving strength and rigidity to the match splint stock to use an organic binder especially when cellulosic fiber is combined with the asbestoform mineral fiber. Thus, for example, it is preferable to combine with a web containing asbestoform mineral fiber and cellulosic fiber about 3% to about 7% of a binder such as starch. In addition to starch other binders such as casein, glue, rubber latex and the like may also be employed.

Of the cellulosic fibers which may be employed in combination with asbestoform mineral fiber, it is regarded as preferable to use an alkali-treated fiber. Such fibers include not only those refined by alkaline methods but also those which have been treated with alkali. Thus, for example, sulphite fiber (refined by an acidic method) can be treated with an alkali, e. g., sodium silicate, sodium hydroxide, soda ash, ammonia, borax, sodium phosphate and the like, so as to have alkaline characteristics imparted thereto.

Moreover, a fiber such as cotton fiber may be treated with alkali. When the cellulosic fiber is treated with alkali, it has been found that the fibrous web containing the cellulosic fiber and mineral fiber is much more susceptible to impregnation with soluble silicate solution.

While mention has been made of the use of alkali treated cellulosic fiber generally, it is regarded as preferable to employ cellulosic fiber which has been refined by alkaline methods. For example, it is regarded as preferable to employ a mixture of asbestoform mineral fiber with kraft fiber. Thus, for example, a satisfactory product can be made using about 50% to about 90% of asbestos fiber and about 10% to about 50% of kraft fiber. The kraft fiber is particularly desirable as it has been found that this type of fiber affords match splint stock which is very strong and tough.

Match splints embodying this invention can be manufactured in any suitable manner. When the match splint stock is to consist of fibrous web material containing asbestoform mineral fiber and cellulosic fiber, the stock can be manufactured by first making a web of desired thickness from a water furnish containing a desired proportion of fiberized asbestoform and cellulosic fibers. The web can be made using any suitable paper making apparatus of which several types are known. The fiber furnish may contain, for example, about 50% to about 80% of asbestos fiber together with about 20% to 50% of kraft fiber. While it is not essential to employ an organic binder, about 5% of starch, for example (on the dry weight of the fiber) may be included in the furnish so as to become thoroughly incorporated in the completed web.

After the web has been manufactured, it is treated with a solution of a soluble silicate. The web as taken from the paper making machine is dried prior to treatment with the silicate solution. Preferably the web is only partially dried as it has been found that the absorption of the silicate solution is promoted when about 20% to about 41% of water on the weight of dry fiber is retained in the web. The silicate solution that is used is preferably obtained by diluting commercial strength sodium silicate of 40° to 42° Bé. so that it contains from about 3 parts of water and 10 parts of concentrated silicate solution to about 4 parts of water and 1 part of concentrated silicate solution. It has been found that the silicate diluted to the extent aforesaid is advantageous in that it is sufficiently dilute to penetrate the fibrous web adequately and is sufficiently concentrated to leave an adequate amount of silicate in the web after the same has been dried. It is advantageous to employ a sodium silicate wherein the ratio of silica to soda is relatively high.

In saturating the web with silicate solution it is regarded as preferable not to fill all of the interstices and pores of the web with dried silicate but to leave the web, after it has been saturated and dried, in a somewhat porous condition. Ordinarily it is desirable to incorporate about 20% to about 35% of dry silicate in the web. Under the conditions above described this can be readily accomplished.

While the use of soluble metallic silicates has been described above as a binder for asbestoform mineral fiber especially as mixed with cellulosic fiber, it is to be understood that other binders or hardening agents may be used such as resins and synthetic preparations of a similar character.

A method of and apparatus for making an asbestos-cellulose fiber web and impregnating the same with silicate solution is described in applicants' co-pending application Serial No. 665,378 filed April 10, 1933 (Patent No. 2,006,392).

A non-combustible web made as aforesaid may be cut into splints suitable for matches. While it is normally preferable to apply the silicate solution prior to cutting the web into splint bodies, it is not without the scope of this invention to apply the silicate solution after the web has been cut into splint bodies.

The splint bodies made as above described are tough and non-combustible in the sense that they will not support combustion in ordinary atmosphere. In order that a desired portion of the finished splints may have combustible characteristics imparted thereto, a part of the individual splint bodies has applied thereto, by dipping or otherwise, a combustible material such as paraffin, oil, wax and the like. As applied to the match splint bodies above described, these materials will burn freely when ignited. It is usually preferable to apply the combustible material to the match splint bodies after the stock has been cut into individual splint bodies, at least throughout a portion of the length thereof, so that the coating and impregnation of the splint bodies will be as complete as possible. As aforesaid, the splint stock is preferably left in a somewhat porous condition so that the combustible material may penetrate the match splint bodies and be retained not only on the surfaces thereof but also impregnated within the interior thereof.

It is one of the objects of this invention to apply the combustible material to a portion only of the length of an incombustible match splint body so that another portion thereof is substantially free of combustible material and may be freely grasped by the user.

The portion of the match splint bodies which carries the combustible material may, of course, be tipped with any suitable friction ignitable material. Such friction ignitable materials are well known in the art and further description thereof is not regarded as necessary herein.

For the purpose of illustration, this invention will be described in connection with the accompanying drawing, wherein

Fig. 1 is a longitudinal cross sectional view of a match embodying this invention, and

Fig. 2 is a perspective view of a plurality of match splints embodying this invention made up into book form.

The match comprises the match splint body 10. As hereinabove stated the match splint body is non-combustible and in one embodiment of this invention may comprise an asbestos-cellulose web impregnated with silicate solution and a suitable binder. A portion only of the length of the match splint body carries a combustible material 11, such as wax, oil and the like as above described. As shown, the combustible material 11 preferably impregnates the match splint body 10 and is likewise carried on the surface of the match splint body 10.

The end of the match carrying the combustible material has a friction ignitable tip 12 of suitable combustible material. The tip is adapted to be ignited by striking the same against an object or special fulminating composition as is well known in the art.

In Fig. 2 a plurality of match splints of the type shown in Fig. 1 are made up into a match

book comprising a paper folder 13, binder staples 14, and a fulminating material 15. The splints can be made up in strips. For example, two strips of splints may be bound in book form as shown in the drawing.

In using a match such as above, the match may be ignited by striking the tip 12 in the usual way. The burning of the tip 12 ignites the combustible material 11 which burns with a free flame. When the combustible material has been burned, the match becomes extinguished for the reason that the splint body in itself is not capable of supporting combustion. While the cellulosic fiber in the splint body 10 may become charred to a certain extent during the burning of the combustible material 11, any such charring promptly discontinues as soon as the match flame is extinguished.

While this invention has been described in connection with certain specific embodiments thereof and methods of practicing the same, it is to be understood that this has been done merely for the purpose of illustration and that this invention is not to be limited in scope thereby.

I claim:

1. As an article of manufacture, a match comprising a non-combustible fibrous match splint body containing fiber, of which fiber about 50% to about 90% is asbestoform mineral fiber and about 10% to about 50% is alkaline refined fiber, and soluble silicate permeating said fiber, said match splint body carrying throughout a portion of the length thereof an oleaginous or waxy substance which is capable of supporting combustion as carried by said match splint body and an ignitable tip adjacent to and adapted to ignite said substance.

2. As an article of manufacture, a match comprising a non-combustible fibrous match splint body containing fiber, of which fiber about 50% to about 90% is asbestoform mineral fiber and about 10% to about 50% is kraft fiber, soluble silicate to the extent of about 20% to about 35% on the weight of dry fiber permeating said fiber, and about 3% to about 7% of starch on the weight of dry fiber as a binder for said fiber, said match splint body carrying throughout a portion of the length thereof an oleaginous or waxy substance which is capable of supporting combustion as carried by said match splint body and an ignitable tip adjacent to and adapted to ignite said substance.

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