Nov. 4, 1941. H. H. HANSON 2,261,467

COMPOSITE FUEL UNIT

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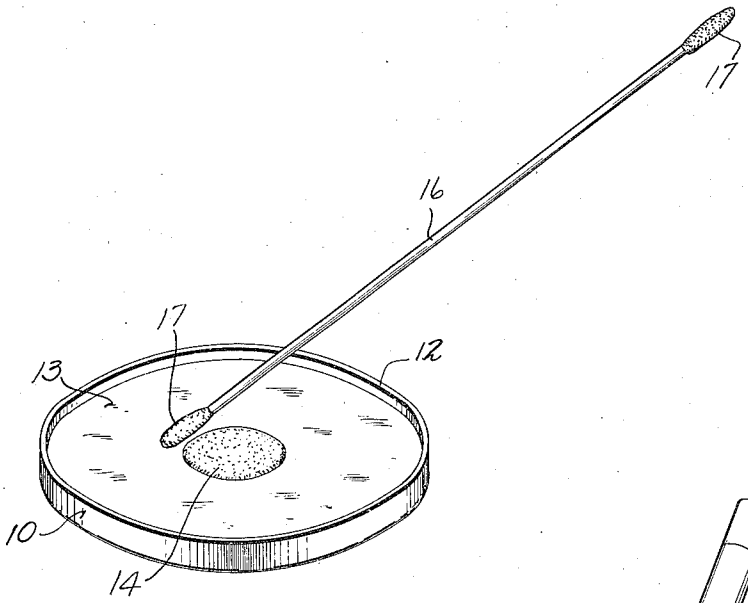


Fig. 1.

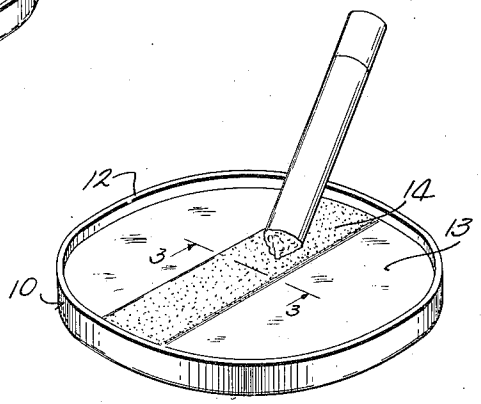


Fig. 2.

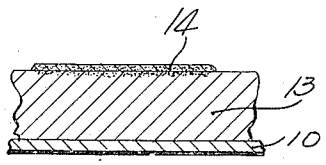


Fig. 3.

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COMPOSITE FUEL UNIT

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3 Claims. (Cl. 44—3)

This invention relates generally to fuel igniters, with particular reference to means for igniting prepared fuel such as used to provide vulcanizing temperatures for tire and tube repair vulcanizing.

In the art of repair vulcanization, it has been conventional practice for many years to include within the patch clamping platen a wafer of composition fuel substantially as described in the patent to A. B. Low, No. 1,252,909 dated January 8, 1918. Several attempts have been made to provide the fuel wafer with fuse means for igniting the fuel, but undesirable factors which are necessarily present in all previous fuel igniters have prevented them from coming into common use, or to have gained any appreciable public acceptance.

It is at present common practice for an operator, after positioning the platen and its attached patch in respect to the work and clamping it thereto, to dig into or upset a small portion of the wafer with a sharp instrument to produce an upwardly projecting portion, which he ignites with a match flame.

In some cases fuses are embedded in the fuel wafer or inserted in an opening in the wafer. It is a primary object of the present invention to avoid all such practices for the reason that they tend toward irregularity in the delivery of heat from the patch, and to provide a fuel wafer with a water repellent coating for at least a portion of its surface, composed of permanently attached fuse material, preferably incapable of being ignited by ordinary frictional contacts, and so bonded to the fuel water by impregnation as to prevent accidental dislodgement while capable of being easily ignited by friction of an igniting stick containing phosphorus combined with an abrasive.

It is my purpose to leave the fuel wafer of predetermined uniform thickness and composition with no embedded fuse to produce a high localized heat and no irregularities in the form of the fuel wafer such as might admit more air to support a higher rate of combustion at one point than another. Uniformity of heat delivered to the patch is extremely important in a device of this kind, and the present invention seeks to provide an easy and safe means of igniting the fuel unit without impairing its uniform heat delivery.

Further objects are to provide:

A fuel wafer with an improved fuse means which ignites from being struck or scratched by incombustible safety striker means.

A fuel wafer with a centrally positioned fuse of combustion initiating material, whereby combustion may spread through the mass of fuel with uniformity of direction and time.

A fuel wafer which may be ignited by being contacted with the lighted end of a cigarette or cigar.

Fuse material applied to a fuel wafer in band form.

In the drawing:

Fig. 1 is a view in perspective of a fuel unit having my ignition fuse applied centrally of the fuel wafer, with a striker head or pencil in position for contact with the fuse.

Fig. 2 is a view in perspective of an alternate embodiment of my invention showing my fuse applied in ribbon fashion diametrically of the fuel wafer with a cigarette in position to ignite the fuse.

Fig. 3 is a section taken on line 3—3 of Fig. 2.

Like parts are identified by the same reference characters throughout the several views.

The pan 10 contains a fuel wafer or disk 13 which has a portion of its exposed surface provided with a spot or ribbon of fuse material 14 adhering to the surface of said wafer. When the fuse material is applied as a spot, it is preferably centrally disposed in respect to the wafer margins and when applied in ribbon form, the ribbon is preferably disposed diametrically of the wafer. Fuse material 14 may or may not be frictionally ignitable, but if non-frictionally ignitable material is used, it is of such composition as to be readily ignitable upon contact therewith of a lighted portion of a cigar, a cigarette or a match.

For the purpose of illustration and not of limitation, I shall first describe one embodiment of the invention as shown in Fig. 1 wherein I provide a spot of frictionally ignitable fuse material which is preferably disposed centrally of the fuel wafer, after which I will describe an alternate embodiment as shown in Fig. 2, wherein a ribbon of non-frictionally ignitable material is applied diametrically of the wafer. It may readily be seen that the converse arrangement or any modification thereof may be adopted if desired without departing from the spirit and scope of my invention.

In conjunction with the frictionally ignitable fuse 14 shown in Fig. 1, I provide a rod-like striking member or pencil 16 which has at least one end coated with an abrasive safety striker material 17 which is adapted to ignite the fuse material upon forcible contact therewith. The safety

striker material may consist of any of the compositions commonly applied to the striking areas of safety match boxes which will ignite the particular fuse material applied at 14. The area of fuse material is of substantial size in respect to the total area of the fuel wafer. Hence, its combustion, which is of a nearly instantaneous nature throughout the fuse area, will rapidly spread throughout the entire wafer.

The striking surface of the abrasive pencil is relatively small in comparison to the area of the fuse material, and it is important that the fuse material area be of sufficient size so that in the event that it is partially rubbed off without igniting upon being struck with the striker pencil, there still will be left a sufficient unused portion to ignite the wafer during a subsequent striking operation. The fuse material is so applied to the wafer as to provide a substantially flat surface over which the striker material may travel at nearly uniform pressure. Fuel wafer 13 is preferably symmetrical and of uniform thickness and composition to provide uniform heat transfer to the base of the platen.

Attempts have heretofore been made to provide a combustible wafer with ignitable material, which is either socketed in the fuel or deposited upon the surface of the wafer, but so far as I am aware such attempts have never been commercially successful for the reason that the substances so deposited had the form of a match head, easily dislodged, or the ignitable surface thereof destroyed. By applying the fuse material in the form of a flat disk or area to the surface of the fuel wafer, I not only eliminate the possibility that all of this material may be removed by abrasion during the initial striking operation, thus rendering the fuse inoperative, but, further, I protect a substantial area of the fuse wafer from dampness. The composition of the fuse material which I employ is such that the material, when dry, is moisture repellent, and thus the fuel area directly under the fuse material is at all times kept dry irrespective of weather conditions. By protecting this covered portion of fuel material from dampness, uniformity of combustion is promoted, and whereas a relatively small area or drop of fuse material may fail to ignite a damp fuel wafer, my relatively large fuse consistently ignites the dry protected area. After combustion has been initiated in this dry area it rapidly spreads in all directions through the entire fuel wafer regardless of the degree of dampness which may be present in the outer portions of the wafer.

I prefer to apply the fuse material to the fuel in liquid rather than in plastic form. I have found that in so doing the wafer is partially impregnated by the liquid and that when dry the fuse cannot be dislodged from the wafer during the igniting process, due to multiple anchorage which is effected between fuse and fuel material, and to said fuse material when in liquid form impregnating the interstices of the fuel composition.

Further, because of the intimate contact with the particles of fuse and the particles of fuel material due to surface impregnation, combustion spreads very rapidly through the fuel mass as heretofore described, and particularly so if the fuel contains self oxygenating material, such as salt peter, in accordance with common practice in the composition of fuel wafers.

While I do not limit my invention to include any specific formula for use in the composition of the fuse or striker rod material, as any one of the numerous formulae employed in the match art would be satisfactory, I have found that the following formula for frictionally ignitable fuse material works very well, and I prefer it to many others because of its quick drying qualities. The fuse material may consist of:

	Parts
Potassium chlorate, $KClO_3$	60–90
Zinc oxide, XnO	20–50
Potassium dichromate, $K_2Cr_2O_7$	3– 7
Glue composed of 10 parts water and 10 parts animal glue	20

The safety striker head may consist of:

	Parts
Red phosphorus	4–10
Antimony trisulfide	4– 8
Glue (preferably animal glue)	1– 3
Abrasive material (may consist of ground glass, sand, emery, or any other suitable material)	2–10

It will be understood that the fuse material applied to the fuel wafer will have characteristics in general correspondence with the material used in the head of an ordinary safety match, whereas the striker head will be coated with material having characteristics in general correspondence with that of the material employed as a coating for the exterior surface of an ordinary match box. The action is reversed, combustion being initiated in the relatively stationary surface instead of in the head of the striker.

By coating the fuel with safety fuse material which will not become ignited except by frictional contact with' a moving surface containing phosphorus, or by the intense heat substantially equal to that of burning fuel, I avoid all danger of accidental ignition due to friction of the patch and fuel units upon each other, or of a fuel unit with metal surfaces, or any ordinary abrasive material. Danger of accidental ignition and the risk of dislodgment of ordinary ignition caps from the fuel wafer have heretofore prevented commercial adoption of this method of igniting prepared fuels employed for portable repair vulcanizers, such as are carried in the tool kits of motor driven vehicles. By applying the fuse material to the fuel in liquid form and thereby partially impregnating the fuel with the fuse material, I eliminate the danger of accidental dislodgment. And by employing a composition similar to that used in the heads of ordinary safety matches and providing a striker head coated with material similar to that with which safety match boxes are coated, I eliminate all danger of accidental ignition even under conditions of storage and vibration in the tool box of a motor driven vehicle.

It is well known that in the use of portable repair vulcanizers for the purpose of making roadside repairs of ruptured tire tubes, the use of ordinary matches,—even safety matches,—is dangerous for the reason that careless motorists will frequently throw the burning match into dry grass or other combustible material at the roadside, thereby starting fires which may smolder for a considerable time before developing into a conflagration. I believe I am the first to provide such vulcanizers with igniting means which can be relied upon and nevertheless safely used without danger of accidental ignition while the vehicle is in motion.

Various dyes may be employed to color the fuse material. For example, I employ:

½–4 parts dye (Axo Phloxine G. A. for light red color, National Croceine Scarlet for darker red color, National Brilliant Wool Blue B for a blue color, Du Pont Pontacyl Green for a green color).

When my invention is embodied in a tire tube repair kit, the striker pencil may be permanently connected with some portion of kit, such, for example, as the clamping mechanism or a container for patch and fuel units.

As heretofore mentioned, I do not limit the application of my fuse material to any specific portion of the fuel wafer and it may therefore be applied to the entire surface of the wafer if desired. I have found that the application of this material in ribbon form running diametrically in respect to the wafer as shown in the embodiment of Fig. 2, is very practical as well as being economical from a manufacturing standpoint. The fuse material may be applied in the form of parallel ribbons to stock material out of which the fuel wafers are later stamped to diametrically position the said ribbon to each wafer. Because combustion of the fuse material may be considered as practically instantaneous as heretofore mentioned, it is readily seen that combustion of the fuel wafer rapidly spreads through each divided portion of the wafer in such a manner as to provide as far as possible uniform heat transfer.

Where I apply a non-frictionally ignitable fuse material in either form herein disclosed or in any modified form, I prefer to use the following formula for the composition of said fuse material, although any other formula which will produce material of suitable characteristics may be substituted therefor:

Four parts of potassium chlorate and one part of potassium dichromate are dissolved in water at about 150 degrees Fahrenheit in sufficient quantities to produce a concentrated or saturated solution. Dye of the character of eosin J (when a red fuse material is desired) is mixed in a separate solution of water in the proportions of ½ lb. of dye to 1 gal. of water. The dye is added to the chlorate solution just prior to use. I have found this procedure gives best results as to brilliance of color in the finished fuse. Approximately 1 pt. of dye solution is required for 3 gals. of chlorate solution. I have found that most dyes are neutralized by the action of the potassium dichromate while in solution; however, after the solution has dried, the action becomes negligible and unless exposed to bright light, the color will remain brilliant. As a control for the saturation of the chlorate solution, I maintain a specific gravity of about 1.12 at a solution temperature of about 150 degrees Fahrenheit.

I claim:

1. A combustible fuel wafer for use in a vulcanizer pan wherein its lower surface will contact the pan and its upper surface will be exposed, said wafer having a flat body of highly ignitible moisture-repellant fuse material bonded to and partially impregnating the exposed surface thereof over a substantial area in moisture protective relation thereto to assure ready ignition thereof.

2. A device according to claim 1 in which the ignitible material extends in the form of a band substantially across the wafer.

3. A device according to claim 1 in which the ignitible material is of safety composition frictionally ignitible only by a safety striker.

HAROLD H. HANSON.