IGNITABLE FUEL PACKAGE

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6 Claims

ABSTRACT OF THE DISCLOSURE

An ignitable fuel package comprising in combination finely divided particles comprising cellulose and finely divided carbon particles, substantially saturated with a normally liquid fuel and sealed in an impervious combustible plastic envelope, and method for preparing said fuel package.

This invention relates to fuel compositions and fuel packages useful for kindling fires, for example, barbecue fires. More particularly, the invention relates to fuel compositions and fuel packages which serve not as the main fuel for a fire, but as kindling material which burns for a sufficient length of time to cause burning of the main fuel to progress sufficiently to be self-sustaining.

PRIOR ART

Various fuel compositions and fuel packages, useful both as the main fuel or as kindling fuel, or both, for fires such as barbecue fires, are known. For example, the following prior art U.S. patents disclose the indicated fuel compositions and fuel packages:

2,011,245—Coal particles, up to ½" size, in paper bag reinforced with heat-resistant mesh, used in large packages as main fuel.

2,206,362—Bag of paper or other combustible material, containing charcoal lumps and either: (a) shredded paper; or (b) wood chips soaked in pine oil, used as a fire kindler. Alternatively, charcoal impregnated with pine oil, with no paper or wood, is used.

2,240,335—Bag of paper or other combustible material containing charcoal lumps coated with wax, used as a fire kindler or a main fuel.

2,799,563—Bag of paper or cellophane, containing a charcoal-containing briquette and a cellulose-containing material, for use as a main fuel.

2,963,352—Charcoal particles having minor dimensions of at least ⅜", impregnated with alcohol, located in a sealed metal container, for use as a main fuel.

3,232,721—Solid-form composition comprising a liquid hydrocarbon and a solid polyolefin, for use as a fire kindler.

3,351,443—Charcoal lumps or briquettes, impregnated with liquid hydrocarbon and sealed in plastic container, for use as main fuel.

3,395,002—Charcoal briquettes impregnated with polymer dissolved in alcohol, immersed in water to get the impregnant, and coated with a polymer film if desired, for use as a main fuel.

Each of the above and other similar prior art fuel compositions and fuel packages, particularly those intended for use as fire kindlers, has been developed in efforts to provide various and numerous advantages not possessed by prior compositions and fuel packages. Such advantages that have been sought include: increased burning duration, cleaner during handling, cleaner burning, easier ignition, less deterioration or loss of ingredients during storage, less formulation difficulty, less cost, less odor, less danger of explosion, economy of packaging space, and more visibility of package contents. Some of the various prior art compositions have achieved some of the improvements sought, and some have achieved others. However, there still has existed room for improvement. In particular, there has been a need for a single fuel package that would achieve the result of providing all or most of the advantages heretofore sought, together with additional advantages. The fuel package of the present invention achieves that result.

STATEMENT OF INVENTION

In accordance with a first embodiment of the present invention, there is provided an ignitable fuel package comprising in combination finely divided particles comprising cellulose, finely divided carbon particles, a normally liquid fuel and an impervious combustible plastic envelope, said particles comprising cellulose and said carbon particles being substantially saturated with said normally liquid fuel and being sealed in said envelope.

In accordance with a further embodiment of the present invention, there is provided an ignitable fuel package comprising in combination:

(a) finely divided particles comprising cellulose, in an amount of 25 to 75 weight percent, based on the total contents of said package;

(b) particles substantially comprising carbon, in an amount of 1 to 15 weight percent, based on the total contents of said package;

(c) a normally liquid fuel, in an amount of 24 to 60 weight percent, based on the contents of said package; and

(d) an impervious combustible plastic envelope; said particles comprising cellulose and said carbon particles being substantially saturated with said normally liquid fuel, relatively dry to the touch, relatively free-flowing, intimately mixed, and sealed in said envelope.

In accordance with a further embodiment of the present invention, there is provided an ignitable fuel package comprising in combination:

(a) particles comprising cellulose,

(i) in an amount of 25 to 75 weight percent, based on the weight of the total contents of said package,

(ii) at least 90 weight percent of which have a major particle dimension below "⅜",

(iii) at least 70 weight percent of which have a major particle dimension below "⅜",

(b) particles substantially comprising carbon,

(i) in an amount of 1 to 15 weight percent, based on the total contents of said package,

(ii) at least 90 weight percent of which have a major particle dimension below "⅜",

(iii) at least 70 weight percent of which have a major particle dimension below "⅜",

(c) a normally liquid fuel selected from hydrocarbons and alcohol, in an amount of 24 to 60 weight percent, based on the weight of the total contents of said package;

(d) an envelope substantially comprising plastic, said plastic being

(i) combustible,

(ii) in the form of a thin film,

(iii) substantially impervious to passage therethrough of said normally liquid fuel as such or in vapor form,

(iv) heat sealable;

said particles comprising cellulose, said particles comprising carbon and said normally liquid fuel being contained in said envelope, said envelope being heat sealed to prevent evaporation of said normally liquid fuel, said normally liquid fuel being substantially taken up, that is, absorbed and/or adsorbed, by said particles comprising cellulose and said particles comprising carbon.

In accordance with a further embodiment of the present invention, there is provided a method for preparing an ignitable fuel package, which comprises:
(a) substantially saturating particles comprising cellulose with a normally liquid fuel, 
(b) mixing said substantially saturated particles with particles substantially comprising carbon, and 
(c) sealing said particles so mixed in an impervious combustible envelope.

DETAILED DESCRIPTION

Particles Comprising Cellulose

The particles comprising cellulose may be sawdust, chips or other particles derived from natural wood or from synthetic compositions comprising cellulose. Said synthetic compositions comprising cellulose may be pressed wood or wood by-product compositions, including, blocks, boards and paper. However, thin paper particles have borderline acceptability.

A substantial preponderance of the particles preferably will have a length not exceeding two times the width, and a width not exceeding two times the thickness. Thin, elongated materials such as lengthy shreds of thin paper are unsatisfactory. Preferably a substantial preponderance of the particles will have proportions of length, width and thickness that do not vary substantially from natural wood sawdust.

At least 90 weight percent of the particles, based on the total package contents, should have a major particle dimension which is below ¼". At least 70 weight percent of the particles, based on the total package contents, should have a major particle dimension which is below ¼".

Fine particles such as sawdust derived from natural wood or synthetic wood compositions are most useful, with fine sawdust derived from natural wood being preferred. It is even more preferred to further grind or otherwise powder the fine particles such as sawdust, because in such finer form the particles absorb the liquid fuel better, and mix more intimately with the particles comprising carbon.

The particles will be present in the fuel package in an amount of 25 to 75 weight percent, preferably 35 to 60 weight percent, based on the total contents of the package.

PARTICLES COMPRISING CARBON

The carbon in the particles comprising carbon may be bone charcoal, wood charcoal, charcoal obtained by substantially carbonizing various other types of organic matter, amorphous carbon, natural carbon such as graphite, petroleum coke, or any other type of carbon amenable to easy comminution by simple mechanical operations. Carbon in a metastable state is not preferred.

The particles comprising carbon preferably are substantially pure carbon, although any particles containing substantial amounts of carbon are operable. Especially good results have been obtained with "Durco" carbon, a highly fired carbon derived from lignite, manufactured by Atlas Chemical Industries, Wilmington, Del. 19899.

At least 90 weight percent of the particles, based on the total package contents, should have a major particle dimension which is below ¼". At least 70 weight percent of the particles, based on the total package contents, should have a major particle dimension which is below ¼". The best results are obtained when a substantial proportion of the particles have a major particle dimension which is below ¼" with particles in highly pulverized fine powder form being most preferred. The optimum results are obtained when the particles are fine enough to cause the particles comprising cellulose to darken when they are mixed with the particles comprising carbon so that the resulting blended mixture has a relatively uniform dark appearance rather than a salt-and-pepper appearance.

The particles will be present in the fuel package in an amount of 1 to 15 weight percent preferably 3 to 10 weight percent based on the total contents of the package.

NORMALLY LIQUID FUEL

The normally liquid fuel is a normally liquid hydrocarbon or a normally liquid oxygenated hydrocarbon such as alcohol ketone, ester or ether. Normally liquid hydrocarbons boiling within the range 300°-650° F. preferably 350°-600° F. more preferably 370°-600° F. are preferred to the oxygenated hydrocarbons.

Normally liquid hydrocarbon fuels substantially comprising paraffins are preferred. A substantial aromatic content produces undesirable results including smoky burning and excessive odor. Preferably the cyclic content is below 15 volume percent and the aromatic content is below 10 volume percent. Of the normally liquid hydrocarbon fuels substantially comprising paraffins those substantially comprising isoparaffins are most preferred.

The normally liquid fuel is used in an amount of 24 to 60 weight percent, preferably 35 to 55 weight percent, based on the total contents of the package. Smaller amounts provide substantially less than optimum ignition characteristics. Larger amounts cause excessive flame.

Especially good results have been obtained with "Chevron ISO P 370," an odorless hydrocarbon liquid, manufactured by Standard Oil Company of California, having the following specifications:

Saybolt Color +30
Specific gravity at 60° F. (6.36 #/gal. at 60° F.) 0.7645
Flash point:
TCC 132° F.
TOC 144° F.
Aniline point 183° F.
Kauri butanol value 27
Toluene plus ethylbenzene, vol. percent 0
Xylene plus C9+ aromatics, vol. percent 0
Naphthenes, vol. percent 97
Paraffins, vol. percent 99
Boiling range, ° F.:
IBP 358
10 percent 366
50 percent 370
70 percent 376
90 percent 380
Dry Point 396
90% evaporation time at 80° F., minutes 215

IMPERVIOUS COMBUSTIBLE PLASTIC ENVELOPE

The impervious combustible plastic envelope serves to hold together the mixture of particles comprising cellulose and particles comprising carbon prior to use of the fuel package, serves to prevent evaporation of the normally liquid fuel, and while the fuel package is burning, the unburned portion of the envelope continues to hold the particle mixture together. The envelope cannot be paper, which would flare up and burn too quickly if untreated, and would permit evaporation of the normally liquid fuel. The envelope cannot be a non-combustible material such as metallic foil.

The envelope must be substantially impervious to the passage therethrough of the normally liquid fuel or vapors thereof. It must be initially so impervious, or must be coated or otherwise treated to make it so impervious.

Preferably the envelope is a substantially transparent plastic film material, desirably a medium-weight polymer film such as a polyolefin or polyester.

Preferably "breathable" plastic materials such as are used for food packaging are unacceptable because they would permit evaporation of the normally liquid fuel from the package. These materials also generally are too light to have adequate mechanical strength, and have unacceptable burning characteristics.

The envelope material desirably is readily susceptible to heat sealing, although an adhesive sealed envelope also is contemplated.

Especially good results have been obtained with "Scotch 20-A-5" polyester film, manufactured by Minnesota Mining and Manufacturing Company.
PREPARATION OF FUEL PACKAGE

It has been found that criticalities exist in the preparation of the fuel package ingredients, in the combination of those ingredients, and in the packaging of those ingredients.

The size ranges for the particles comprising cellulose and the particles comprising carbon, that are given above, should be observed. Unacceptable results are obtained with particles that are too large, because impregnation of such particles with the liquid fuel cannot be accomplished adequately, and the necessary intimate admixture of the two kinds of particles cannot be obtained. Optimum results are obtained when both kinds of particles are finely comminuted, at least to the consistency of a coarse powder, and preferably to the consistency of a medium or fine powder.

The normally liquid fuel should not be combined with the particles comprising carbon in the absence of the particles comprising cellulose, because it tends to dissolve the particles comprising carbon if those particles become too wetted with the fuel.

The particles comprising cellulose may be contacted, in the absence of the particles comprising carbon, with a sufficient amount of normally liquid fuel to substantially impregnate or saturate the particles, without any superfluous liquid or other excess of fuel being present to cause the particles to form a slurry or a wet agglomerated mass. Thereafter, without use of further amounts of liquid fuel, the impregnated or saturated particles comprising cellulose may be thoroughly blended or mixed with the particles comprising carbon. The particles comprising carbon can be taken up from the particles comprising cellulose, by absorption and/or adsorption, a portion of the liquid fuel carried by the latter. However, in this method, care must be taken to prevent the particles comprising carbon from agglomerating.

In any case, the amount of normally liquid fuel will have been so chosen that the resulting mixture of liquid fuel-impregnated particles, while containing a high percentage of normally liquid fuel, will be relatively dry to the touch, relatively free-flowing, and will not be a mass of agglomerated particles. When the mixture has these characteristics, its burning characteristics will be optimum.

Ideally, when the two kinds of particles have an adequately small size, the particles comprising cellulose become darkened by intimate contact with the particles comprising carbon, until the entire mixture assumes a relatively uniform dark color.

The particle mixture so prepared is sealed in the impermeable combustible plastic envelope, preferably by heat sealing the envelope in a known manner, although adhesive sealing may be used.

Any desired quantity of the particle mixture so prepared may be enclosed in the impermeable combustible plastic envelope; however, as a general guide, envelopes about 2-3 inches long and 2-3 inches wide, containing ½ ounce to 2 ounces of said mixture have been found to be most useful. It is desirable that said mixture completely fill the envelope to the extent possible by pouring the mixture into the envelope.

USE OF THE FUEL PACKAGE

The fuel package may be used by being laid flat on the bottom of a barbecue pit, and by being covered with kindling and/or a main fuel such as charcoal, leaving adequate air space between said kindling and/or charcoal. The fuel package then may be ignited with a match at one corner or edge thereof. The plastic film will tend to burn first from the top side of the package, and the contents of the package will continue to burn for many minutes thereafter, providing adequate flame and burning time to cause a self-sustaining combustion of the main fuel in the barbecue pit. The plastic film on the underside of the package will be covered by the package contents and the burning thereof accordingly will be delayed, enabling it to hold the package contents, as a tray, during burning of those contents.

If, during use, the flame from the burning package becomes smothered or otherwise extinguished, the package easily may be re-lighted, preferably first stirring or otherwise agitating the package contents.

If the package is used on the open grate of a fireplace, preferably the package is placed on top of conventional kindling wood used in the fireplace.

EXAMPLES

The following examples of ignitable fuel packages will serve to further aid a complete understanding of the present invention. Example 3 is an example of an ignitable fuel package according to the present invention. The other examples are provided for purposes of comparison.

In each of the examples, finely powdered cellulose-containing particles consisting of wood sawdust further comminuted into a powdery form were used. In each of the examples finely powdered "Darco" lignite-derived carbon, manufactured by Atlas Chemical Industries, Inc., Wilmington, Del., was used. In each of the examples the weight percentages given are based on the total contents of the combustible film envelope.

<table>
<thead>
<tr>
<th>Example</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cellulosic-containing particles, wt. percent</td>
<td>47.5</td>
<td>47.5</td>
<td>47.5</td>
<td>47.5</td>
<td>47.5</td>
<td>47.5</td>
<td>47.5</td>
<td>47.5</td>
<td>47.5</td>
<td>47.5</td>
</tr>
<tr>
<td>Carbon particles, wt. percent</td>
<td>52.5</td>
<td>52.5</td>
<td>52.5</td>
<td>52.5</td>
<td>52.5</td>
<td>52.5</td>
<td>52.5</td>
<td>52.5</td>
<td>52.5</td>
<td>52.5</td>
</tr>
<tr>
<td>Normally liquid, normal paraffin wax in particulate form, wt. percent</td>
<td>47.5</td>
<td>47.5</td>
<td>47.5</td>
<td>47.5</td>
<td>47.5</td>
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<td>47.5</td>
<td>47.5</td>
</tr>
<tr>
<td>Normally liquid, &quot;Chevron ISOP 370 fuel, wt. percent</td>
<td>47.5</td>
<td>47.5</td>
<td>47.5</td>
<td>47.5</td>
<td>47.5</td>
<td>47.5</td>
<td>47.5</td>
<td>47.5</td>
<td>47.5</td>
<td>47.5</td>
</tr>
<tr>
<td>Normally liquid aromatic cleaning solvent, wt. percent</td>
<td>55.5</td>
<td>55.5</td>
<td>55.5</td>
<td>55.5</td>
<td>55.5</td>
<td>55.5</td>
<td>55.5</td>
<td>55.5</td>
<td>55.5</td>
<td>55.5</td>
</tr>
<tr>
<td>Kerosene, wt. percent</td>
<td>47.5</td>
<td>47.5</td>
<td>47.5</td>
<td>47.5</td>
<td>47.5</td>
<td>47.5</td>
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<td>47.5</td>
<td>47.5</td>
<td>47.5</td>
</tr>
<tr>
<td>&quot;Stotch 20-A-6 Polyester Film&quot; envelope, used for fuel packaging</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

The following comments on the results in each of the above examples point up the unobviousness of the present invention, by indicating the unacceptable results obtained when the critical components of the fuel package of the invention are replaced by substitute materials.

<table>
<thead>
<tr>
<th>Example</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Didn't burn well.</td>
</tr>
<tr>
<td>2</td>
<td>Didn't burn well. No significant shelf life because of evaporation of normally liquid fuel through pervious envelope.</td>
</tr>
<tr>
<td>3</td>
<td>Exhibited excellent storage and burning characteristics. No evaporation of normally liquid fuel during storage. Burned steadily with essentially no visible smoke, and with no odor.</td>
</tr>
<tr>
<td>4</td>
<td>Satisfactory burning characteristics when used immediately. However, no significant shelf life because of evaporation of normally liquid fuel through pervious envelope.</td>
</tr>
<tr>
<td>5</td>
<td>Burned erratically with excessive smoke and odor.</td>
</tr>
<tr>
<td>6</td>
<td>Burned erratically with excessive smoke and odor. No significant shelf life because of evaporation of normally liquid fuel through pervious envelope.</td>
</tr>
<tr>
<td>7</td>
<td>Burned erratically with excessive smoke and some odor.</td>
</tr>
<tr>
<td>8</td>
<td>Burned erratically with excessive smoke and some odor. No significant shelf life because of evaporation of normally liquid fuel through pervious envelope.</td>
</tr>
<tr>
<td>9</td>
<td>Burned with excessive flame, with some smoke.</td>
</tr>
<tr>
<td>10</td>
<td>Burned with excessive flame, with some smoke. No significant shelf life because of evaporation of normally liquid fuel through pervious envelope.</td>
</tr>
</tbody>
</table>
When paper envelopes were used in various additional tests, unsatisfactory results were obtained, that were similar to those obtained when a pervious plastic film envelope was used.

It was found in other tests that variations within the ranges prescribed herein in the proportions of cellulose-containing particles, carbon-containing particles and normally liquid fuel, used in Example 3 above, did not significantly affect the excellent results obtained by the fuel package of the present invention. On the other hand, similar variations in the proportions of the ingredients used in the comparison examples above did not significantly affect the poor results obtained by the products of those examples.

Conclusion

From the foregoing it may be seen that the ignitable fuel package of the present invention results in a combination of advantages that long have been sought in a single product, including ease of preparation, excellent shelf life, odorless storage, cleanliness in handling, odorless burning, clean burning, long burning with adequate flame, visibility of package contents, and economy of packaging space.

What is claimed is:

1. An ignitable fuel package comprising in combination finely divided particles comprising cellulose, finely divided carbon particles, at least 90 weight percent of said carbon particles having a major particle dimension below ½ inch, a normally liquid fuel and an impervious combustible plastic envelope, said particles comprising cellulose and said carbon particles being substantially saturated with said normally liquid fuel and being sealed in said envelope, said normally liquid fuel being present in an amount of 24 to 60 weight percent based on the contents of said package and being selected from normally liquid hydrocarbons and normally liquid oxygenated hydrocarbons, said normally liquid hydrocarbons substantially comprising paraffins.

2. An ignitable fuel package comprising in combination:

(a) finely divided particles comprising cellulose, in an amount of 25 to 75 weight percent, based on the total contents of said package;

(b) particles substantially comprising carbon in an amount of 1 to 15 weight percent, based on the total contents of said package;

(c) a normally liquid fuel, in an amount of 24 to 60 weight percent, based on the contents of said package and being selected from normally liquid hydrocarbons and normally liquid oxygenated hydrocarbons, said normally liquid hydrocarbons substantially comprising paraffins; and

(d) an impervious combustible plastic envelope; said particles comprising cellulose and said carbon particles being substantially saturated with said normally liquid fuel, relatively dry to the touch, relatively free-flowing, intimately mixed, and sealed in said envelope.

3. An ignitable fuel package comprising in combination:

(a) particles comprising cellulose,

(i) in an amount of 25 to 75 weight percent, based on the weight of the total contents of said package,

(ii) at least 90 weight percent of which have a major particle dimension below ½";

(b) particles substantially comprising carbon,

(i) in an amount of 1 to 15 weight percent, based on the total contents of said package,

(ii) at least 90 weight percent of which have a major particle dimension below ½";

(iii) at least 70 weight percent of which have a major particle dimension below ¼);

(c) a normally liquid fuel, in an amount of 24 to 60 weight percent, based on the weight of the total contents of said package, selected from normally liquid hydrocarbons and normally liquid oxygenated hydrocarbons, said normally liquid hydrocarbons substantially comprising paraffins,

(d) an envelope substantially comprising plastic, said plastic being

(i) combustible,

(ii) in the form of a thin film,

(iii) substantially impervious to passage therethrough of said normally liquid fuel as such or in vapor form,

(iv) heat sealable;

said particles comprising cellulose, said particles comprising carbon and said normally liquid fuel being contained in said envelope, said envelope being heat sealed to prevent evaporation of said normally liquid fuel, said normally liquid fuel being substantially taken up, that is, absorbed and/or adsorbed, by said particles comprising cellulose and said particles comprising carbon.

4. A method for preparing an ignitable fuel package, which comprises:

(a) mixing particles comprising cellulose with particles substantially comprising carbon, said carbon particles substantially comprising carbon being present in an amount of 1–15 weight percent based on the total contents of said package,

(b) substantially saturating the particles in the resulting mixture with a normally liquid fuel, in an amount of 24 to 60 weight percent, based on the weight of the total contents of said package, selected from normally liquid hydrocarbons and normally liquid oxygenated hydrocarbons, said normally liquid hydrocarbons substantially comprising paraffins, and

(c) sealing said particles so mixed in an impervious combustible envelope.

5. A fuel package as in Claim 1, wherein said normally liquid fuel has an aromatic content below 10 volume percent.

6. A fuel package as in Claim 1, wherein said normally liquid fuel substantially comprises isoparaffins.

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