A coconut methyl ester torch fuel is disclosed.
METHYL ESTER TORCH FUEL

FIELD OF THE INVENTION

[0001] This disclosure relates to liquid fuels in general and, more particularly, to utilization of plant derived combustibles as a liquid torch fuel.

BACKGROUND OF THE INVENTION

[0002] Liquid fueled torches may be utilized for a number of purposes such as decorative lighting and dispersing scented oils. Liquid fueled torches may also be used to disperse insect repellent oils and/or chemicals, and may be reusable and refillable. However, the refilling operation may necessitate contact with unpleasant fuels or chemicals. Transporting, using, and storing many current fuels requires a degree of care, especially with conventional hydrocarbon-derived fuels.

[0003] What is needed is a product for addressing the above, and related, issues.

SUMMARY OF THE INVENTION

[0004] The invention of the present disclosure, in one aspect thereof, comprises a torch fuel including a plant derived methyl ester biofuel having a carbon chain length distribution from 14-20 percent by weight of C8 and C10 constituents. As used herein, ‘C’ followed by an integer denotes a molecule based upon a carbon chain of a length denoted by the integer. Thus, C8 and C10 would denote molecules having an 8 carbon atom chain and a 10 carbon atom chain, respectively.

[0005] Suitable liquid torch fuels may comprise one or more methyl esters derived from coconuts that have varying carbon chain lengths. In some cases these range from 6 to 18 units in length (C6-C18). The percentage of molecules of each length dictates burn characteristics such as brightness and soot. Of course, certain compositions of these methyl esters (e.g., based on percentage of chain length) would be believed to be more suitable for use as a torch or lamp fuel than others. For example, it is commonly thought that a relatively high percentage of C8-C10 constituents is required in a fuel for adequate brightness and burn characteristics. However, in order to attain the percentages believed necessary for an adequately performing torch fuel, the base stock must be further refined to remove impurities and those carbon chain lengths that are lighter or heavier than desired. The present disclosure provides for a torch fuel composition that is attainable via esterification of plant oils (e.g., coconut oil) with minimal further processing needed.

[0006] In some embodiments, a torch fuel contains 46-52 percent by weight C12, 15-19 percent by weight C14, 7-10 percent by weight C16, and 6-9 percent by weight C18 constituents. The methyl ester may comprise from 8-11 percent by weight C8 and from 6-9 percent by weight C10 constituents. The methyl ester may include an amount of C6 constituents that is less than 2 percent by weight of the methyl ester. The methyl ester may be a coconut methyl ester.

[0007] The invention of the present disclosure, in another aspect thereof, comprises a torch having a fuel canister, a wick, and a wick holder that supports the wick for burning and to draw fuel from the canister. The torch comprises a torch fuel comprising a methyl ester that has C8 and C10 carbon chain constituents ranging from 14-20 percent of a total weight of methyl ester.

[0008] In some embodiments, the methyl ester comprises 46-52 percent by weight C12, 15-19 percent by weight C14, 7-10 percent by weight C16, 6-9 percent by weight C18, and 2 percent or less by weight C6 constituents. The methyl ester may comprise from 8-11 percent by weight C8, from 6-9 percent by weight C10. The methyl ester may be a coconut methyl ester.

[0009] The invention of the present disclosure, in another aspect thereof, comprises a method including providing a fuel canister, providing a wick, providing a wick holder that supports the wick for burning and for drawing fuel from the canister, and providing a fuel in the fuel container that is drawn into and burned on the wick. The fuel comprises a methyl ester having 14-20 percent by weight C8 and C10 carbon chains.

[0010] In some embodiments, the fuel comprises coconut methyl esters. The fuel may include 46-52 percent by weight C12, 15-19 percent by weight C14, 7-10 percent by weight C16, 6-9 percent by weight C18, and 2 percent or less by weight C6 constituents. The fuel may include from 8-11 percent by weight C8 and/or from 6-9 percent by weight C10 constituents.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 is a perspective view of a liquid fueled torch according to aspects of the present disclosure.

[0012] FIG. 2 is a perspective view of a liquid fueled torch burner cup according to aspects of the present disclosure.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0013] In one embodiment of the present disclosure, a coconut-based liquid torch fuel is utilized with a torch. The use of the fuels of the present disclosure is not meant to be hereby limited to the specific liquid fuel torches disclosed. Rather, it is understood that the fuels of the present disclosure may be useful with a variety of torches, including those strictly for decoration, those providing useful lighting, and those used to disperse scents, oils, or useful chemicals into the atmosphere.

[0014] Referring now to FIG. 1, a perspective view of a liquid fueled torch according to aspects of the present disclosure is shown. The torch 100 is merely exemplary, and should not be taken to be limiting. The torch 100 may be used as an insert with a stand or other display device to create a torch assembly. In some embodiments, the torch 100 is used as a stand-alone item. The torch 100 is a two piece design with the two major pieces including a top 1602 and canister 1604. The canister 1604 is clear or translucent in this embodiment, although solid or opaque canisters may also be used. In the present embodiment, the clear canister 1604 allows for easy viewing of the level of fuel 408 in the canister 1604.

[0015] The torch 100 provides a funnel or flame bowl 102. The funnel 102 is surrounded by a shroud 1606. The shroud 1606 and funnel 102 may be formed as an integrated piece, or may be separately constructed and attached together. Proximate the center of the funnel 102 is a flow barrier 204. The flow barrier 204 provides a baffled outer wall 402 and a solid inner wall 404. Inside the flow barrier 204 is a wick holder 406 that holds the wick 202 in a friction fit. The present torch 100 provides for touchless filling (e.g., the torch need not be opened or disassembled) as described in co-pending U.S. patent application Ser. No. 12/651,770, herein incorporated.
by reference. However, the fuels of the present disclosure have equal utility with torches that are not of the touchless fill variety and must be opened or otherwise disassembled for filling or refilling.

[0016] It will also be appreciated that the torch 100 is of the variety that produces a relatively large flame. The fuels of the present disclosure are useful with this type of torch but are also useful with those having a more traditional wick arrangement that produces a normal sized flame and/or may be protected by a globe or other structure surrounding the wick 202.

[0017] These pieces of the torch 100 may be formed integrally as applicable or may be formed separately and attached. In one embodiment, the components associated with the top 1602 may be made from rolled or stamped sheet metal that may be spot welded or glued together. In other embodiments, a more durable build may be accomplished by using cast or machined pieces. In some embodiments, some parts of the torch 100 may be plastic or another material.

[0018] Referring now to FIG. 2, a perspective view of a liquid fueled torch burner cup according to aspects of the present disclosure is shown. The fuels of the present disclosure may be used with devices such as the burner cup 200, which may itself be a standalone device or utilized as a burner-insert. The device 200 comprises a casing 302. This may be stainless steel, aluminum, or another suitably heat resistant and resilient material. In some embodiments, the casing 302 is formed from a single piece of steel or other material. It may be impermeable to the fuel utilized such that the fuel will not escape even if stored for an extended period of time. It should be noted that in some embodiments, a vessel (not shown) surrounds or contains one or more burner cups. The vessel may be decorative and can comprise a number of materials including metals, resins, ceramics, and wood, for example. Since the casing 302 is impermeable to the fuel, the vessel need not necessarily be impermeable as well.

[0019] In various embodiments, the casing 302 contains a wick 304. The wick 304 may be a polycrystalline cotton (PCC) wick, or may comprise other materials. In some embodiments, the wick comprises about 72% to about 80% Al2O3 and from about 18% to about 27% SiO2. In the present embodiment, and others, the wick 304 may be formed by wet vacuum processing. The wick 304 may also be cut after forming to achieve the desired shape and burn characteristics.

[0020] The wick 304 may be saturated or at least partially imbued or infused with a quantity of fuel sufficient to support a flame on the exposed surfaces of the wick (e.g., proximate the top of the casing 302). In some embodiments, covering the wick 304 has a screen 106. The screen 106 may be stainless steel or another heat resistant material. In various embodiments, the screen 106 serves to retain or aid in shaping the wick 304 within the casing 302 (and therefore is a type of wick holder). The screen 106 may have a generally concave or convex shape, or may have more complicated geometries.

[0021] The wick 304 may be configured in various shapes to control fuel consumption and burn time, or to create various flame effects. Such flame effects include, but are not limited to, taller or wider flames, large or smaller flames, and flames that occupy a certain area of the casing 302. The screen 106 provides a solid surface to aid in retaining the wick 304 in the chosen shape. The screen 106 also serves to promote and/or control air flow around the wick 304. The wick 304 also serves to insulate the sides of the casing 302, and can be used to control the surface temperature of the casing 302 by changing thickness of the wick 304. In some embodiments, the screen 106 provides an opening ring 107 providing additional flame modification options. For example a standard braded fiberglass wick (not shown), or a portion thereof, may be surrounded by the wick 304, and pulled up through a relatively small ring 107. A high degree of contact may be maintained between the wick 304 and screen 106 to substantially fill the casing 132 and to secure the fiberglass wick in its location.

[0022] As can be seen in FIG. 2, some embodiments have an insulating pad 110 inside the casing 302 near the bottom. The pad 110 serves to insulate the bottom of the casing 302 (and whatever is below) from excessive heat. One additional function of the pad 110 is to absorb excess fuel from the wick. This prevents excess fuel from being free to spill from the casing 302. It may also increase the burn time of the device 200 as excess fuel will eventually be wicked from the pad 110 into the wick 304 and burned. In the present embodiment, there is a single pad 110 in a short cylindrical shape to match the bottom of the casing 302. However, in other embodiments, more pads may be provided and/or the pads may have different shapes. For example, a pad may be configured to line all, or substantially all, of the casing 302.

[0023] It will be appreciated that the shape and size of any portion of the wick 304 inside the casing 302 can vary from that shown. FIG. 2 illustrates a hollowed out portion 108 that is comparatively small. However, the hollowed out portion 108 may extend all the way to the pad 110 such that the wick 304 has a chimney or tubular shape. In other embodiments the hollowed out portion 108 extended all the way to the bottom of the casing 302 (e.g., it extends through the pad 110 or no pad 110 is present).

[0024] The burner cup of FIG. 2, as well as other exemplary burner products that may utilize the fuels of the present disclosure, are additionally described in co-pending U.S. patent application Ser. No. 61/867,415, herein incorporated by reference.

[0025] The wick 202 may be a cotton wick, a fiberglass wick, a polyester wick, or another type of wick using these or other materials and/or combinations thereof. Although only a single wick 202 is shown, the present disclosure is not so limited. Multiple wicks may be provided that are capable of simultaneous or selective operation.

[0026] Suitable liquid torch fuels (for the torches 100, 200 and others) may comprise one or more methyl esters derived from coconut oils that have varying carbon chain lengths. In some cases the range is from 6 to 18 units in length (C6-C18). The percentage of molecules of each length dictates burn characteristics such as brightness and soot. Of course, certain compositions of these methyl esters (e.g., based on percentage of chain length) would be believed to be more suitable for use as a torch or lamp fuel than others. For example, it is commonly thought that a relatively high percentage of C8-C10 constituents is required in a fuel for adequate brightness and burn characteristics. However, in order to attain the percentages believed necessary for an adequately performing torch fuel, the base stock must be further refined to remove impurities and those carbon chain lengths that are lighter or heavier than desired. As explained in more detail below, the present disclosure provides for a torch fuel composition that is attainable via esterification of plant oils (e.g., coconut oil) with minimal further processing.

[0027] It will be appreciated that any fatty acid methyl ester product having the suitable chain length distributions dis-
The chain length distribution of the instant fuel formulation is important and somewhat surprising. Given what is known about suitable fuels and methyl ester carbon chain lengths, the formulation would be thought to be too low in C8-C10 constituents and also too high in heavier chains. It is known that higher chain carbons contain a higher heating value through greater intra-molecular forces than their lower carbon alternatives. When comparing a pure lower-carbon chain with a pure higher-carbon chain, the excessive heating value/heat of combustion of the higher-carbon chain dictates that more energy is required to combust the fuel, thus reducing the incandescent output of the torch below desired levels. Chains lighter than C8-C10 do not normally offset the ill effects of the longer chains owing to the volatility the lighter chains possess. Furthermore, burn properties of torch fuel constituents have shown a tendency to adopt those of the lowest flash point constituent in the mixture, despite a linear blended flash point, as governed by Le Chatelier’s Principle.

Whole-cut coconut oil includes esters of methyl alcohol and coconut fatty acids, and makes up approximately 98.5% of the fuel of the instant disclosure. Previously these chemicals were used in cosmetic products such as skin-conditioning agents, emollients, and surfactant products (which drive the supply and market). A commercial appeal of a whole-cut coconut oil as a torch fuel according to the instant disclosure is that, as the entire (unfractionated) oil of carbon chains is maintained, it is both less sensitive to shifts in surfactant and cosmetic industry trends, and it is subjected to fewer processing steps. Whole-cut coconut oil is not persistent in the environment and does not bioaccumulate. Toxico logical risk is minimal and the substance is listed as Generally Recognized as Safe (GRAS) by the FDA for uses in clothing and food packaging.
produces fewer undesirable emissions, and exhibits a similar toxicity profile with a very low likelihood of aspiration.

[0035] Fuel formulated according to the present disclosure (ME818) has a viscosity of about 7 cP at 25°C and has a melting point of about minus 8°C. Thus the fuels of the present disclosure are suitable for handling by consumers in relation to filling of torches and lamps and using as fuels.

[0036] It is understood that fuels formulated according to the present disclosure may contain ancillary constituents other than the various carbon-chain constituents (e.g., methyl esters) described above. These components may not contribute appreciably to the energy or burning characteristics of the fuel but may be necessary or desirable for other reasons. For example, stabilizers, dyes, carriers, relatively inert substances may be included in the formulation. In some embodiments, various impurities may be considered ancillary constituents. Scents, insect repellants, and other active components that are dispersed by the heat or flame from the burning fuel may be included with the fuel as ancillary constituents as well.

[0037] Thus, the present invention is well adapted to carry out the objectives and attain the ends and advantages mentioned above as well as those inherent therein. While presently preferred embodiments have been described for purposes of this disclosure, numerous changes and modifications will be apparent to those of ordinary skill in the art. Such changes and modifications are encompassed within the spirit of this invention as defined by the claims.

What is claimed is:

1. A torch fuel comprising a methyl ester having a carbon chain length distribution of less than 20 percent by weight C8 and C10 constituents, at least 74 percent by weight of constituents of carbon chain lengths in excess of C10, and an amount of ancillary constituents.

2. The torch fuel of claim 1, wherein the methyl ester comprises from 8-10 percent by weight C8 constituents and from 6-9 percent by weight C10 constituents.

3. The torch fuel of claim 2, further comprising:
   46-52 percent by weight C12 constituents;
   15-19 percent by weight C14 constituents;
   7-10 percent by weight C16 constituents; and
   6-9 percent by weight C18 constituents.

4. The torch fuel of claim 3, further comprising amount of C6 constituents that is less than 2 percent by weight of the methyl ester.

5. The torch fuel of claim 3, wherein the methyl ester is a coconut methyl ester.

6. A torch comprising:
a fuel canister;
a wick;
a wick holder that supports the wick for burning and to draw fuel from the canister; and
a torch fuel comprising a methyl ester that has C8 and C10 carbon chain constituents ranging from 14-20 percent of a total weight of methyl ester and at least 74 percent total weight longer carbon chain constituents.

7. The torch of claim 6, wherein the methyl ester further comprises:
   46-52 percent by weight C12 constituents;
   15-19 percent by weight C14 constituents;
   7-10 percent by weight C16 constituents;
   6-9 percent by weight C18 constituents; and
   2 percent or less by weight C6 constituents.

8. The torch of claim 6, wherein the methyl ester comprises from 8-11 percent by weight C8 constituents.

9. The torch of claim 6, wherein the methyl ester comprises from 6-9 percent by weight C10 constituents.

10. The torch of claim 7, wherein the methyl ester is a coconut methyl ester.

11. A method comprising:
    providing a fuel canister;
    providing a wick;
    providing a wick holder that supports the wick for burning and for drawing fuel from the canister; and
    providing a fuel in the fuel container that is drawn into and burned on the wick;

wherein the fuel comprises a methyl ester having 14-20 percent by weight C8 and C10 carbon chain constituents and at least 74 percent by weight C12 and longer carbon chain constituents.

12. The method of claim 11, wherein the fuel comprises coconut methyl esters.

13. The method of claim 12, wherein the fuel further comprises:
    46-52 percent by weight C12;
    15-19 percent by weight C14;
    7-10 percent by weight C16;
    6-9 percent by weight C18; and
    2 percent or less by weight C6.

14. The method of claim 13, wherein the fuel comprises from 8-11 percent by weight C8.

15. The method of claim 13, wherein the fuel comprises from 6-9 percent by weight C10.

16. The method of claim 13, wherein the fuel comprises from 8-11 percent by weight C8 and from 6-9 percent C10.