A wick includes a first wick portion and a second wick portion. At least one combustion barrier is positioned between the first and second wick portions. The combustion barrier is configured to obstruct combustion from the first wick portion to the second wick portion.
SELF-EXTINGUISHING WICK AND METHOD OF PRODUCING THE SAME

TECHNICAL FIELD

[0001] The present invention relates generally to wicks, and more particularly to a self-extinguishing candle wick and a method of producing the same.

BACKGROUND

[0002] Candle wicks are generally made of a plurality of ignitable fibers that are braided or otherwise woven together. The wicks sustain combustion, thereby maintaining a flame at an end of the wick, by transporting a liquid fuel, such as melted wax, along the fibers by capillary action. The fibers may be made of cotton, spun fiberglass, synthetic fiber or similar material that is capable of absorbing the liquid fuel. The wicks may also include a core of material, such as metal, paper, cotton or the like, that adds to the wicks rigidity.

[0003] Candle combustion typically is known to depend on three components that comprise the “fire triangle.” These components include fuel, heat and oxygen (or air), and appropriate proportions of any of these components are important to support candle combustion. When an external flame is brought to the wick tip, the wick tip is ignited and produces a flame. The heat from the flame melts a solid fuel that surrounds the wick. The melted fuel travels along fibers of the wick via capillary action to the flame and supports continuous combustion at the wick tip. For typical candles, as long as a sufficient amount of the fuel is supplied through the wick via capillary action to the flame, the flame continuously burns down the wick. When one of the three components is not present in the appropriate proportion, the flame is minimized or may be extinguished altogether.

[0004] Generally, the candle is lit and burns until the candle is manually extinguished or has combusted the wick or its fuel. One major cause of household fires is attributed to candles that are left unattended for long periods of time. Thus, attention should be paid to the candle so that the wick is not permitted to burn too far down, thus ignition or shattering a candle holder or otherwise igniting materials placed too close to the candle. This constant attention can be a source of inconvenience to a candle user. Accordingly, a self-extinguishing candle wick and a method for making the same has long been needed.

SUMMARY OF THE INVENTION

[0005] While the way in which the invention addresses this long felt need will be described in greater detail below, this summary of the invention section is intended to introduce the reader to aspects of the invention and is not a complete description of the invention. Particular aspects of the invention are pointed out in other sections herein below, and the invention is set forth in the appended claims which alone demarcate its scope.

[0006] In accordance with an exemplary embodiment of the present invention, a wick includes a first wick portion, a second wick portion and at least one combustion barrier therebetween. The combustion barrier is configured to obstruct combustion from the second wick portion to the first wick portion.

[0007] In accordance with a further exemplary embodiment of the present invention, a candle comprising a source of fuel, a wick in contact with the source of fuel and a combustion barrier connected to the wick. The combustion barrier is configured to extinguish combustion of the wick.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] A more complete understanding of the present invention may be derived by referring to the detailed description and claims, considered in connection with the figures, wherein like reference numbers refer to similar elements throughout the figures, and:

[0009] FIG. 1 is a cross-sectional view of a candle having a candle wick in accordance with an exemplary embodiment of the present invention;

[0010] FIG. 2 is a cross-sectional view of the candle of FIG. 1 after a portion of solid fuel has been consumed;

[0011] FIG. 3 is a cross-sectional view of a candle having a candle wick in accordance with another exemplary embodiment of the present invention;

[0012] FIG. 4 is a cross-sectional view of a candle having a candle wick in accordance with yet another exemplary embodiment of the present invention;

[0013] FIG. 5 is a cross-sectional view of a candle having a candle wick in accordance with a further exemplary embodiment of the present invention; and

[0014] FIG. 6 is a cross-sectional view of a candle having a candle wick in accordance with another exemplary embodiment of the present invention.

DESCRIPTION OF THE INVENTION

[0015] The following description is of exemplary embodiments only and is not intended to limit the scope, applicability or configuration of the invention in any way. Rather, the following description provides a convenient illustration for implementing exemplary embodiments of the invention. Various changes to the described embodiments may be made in the function and arrangement of the elements described without departing from the scope of the invention as set forth in the appended claims.

[0016] The present invention is directed to a wick that is capable of self-extinguishing or otherwise self-obstructing combustion. In this manner, the wick is configured such that combustion along the wick changes from a first combustion rate to a second combustion rate. In a preferred embodiment, the second combustion rate becomes essentially zero such that the wick self-extinguishes. In another embodiment of the invention, the second combustion rate is slower than the first combustion rate such that the wick is permitted to burn for a longer period of time. In another embodiment of the invention, the second combustion rate is slower than the first combustion rate such that the burning of the wick is visibly dimmer. The wick may be used in a candle in which the source of fuel is wax, oil or any other suitable combustible fuel. It will be appreciated, however, that the wick is not limited to use in candles but may be used in any other device that uses a wick.

[0017] The wick generally comprises a combustion barrier positioned along the wick. As will be described more fully
hereinbelow, the combustion barrier may comprise any device formed on, in or attached to the wick and which tends to obstruct combustion from a first wick portion to a second wick portion. As used herein, the term "to obstruct" means to restrict, to substantially inhibit, to slow, to prevent, to stop or terminate, to interrupt, or to otherwise hinder combustion from the first wick portion to the second wick portion. For example, the combustion barrier may completely terminate the combustion reaction from the first wick portion to the second wick portion, thus causing the wick to extinguish altogether. Alternatively, the combustion barrier may only hinder the combustion reaction such that the combustion reaction occurs at a slower rate.

[0018] It will be appreciated that the combustion barrier may obstruct combustion using any suitable means that affects the availability of one or more of the components of the "fire triangle," that is, fuel, heat and oxygen (or air). In one embodiment, the combustion barrier may be configured to obstruct a supply of fuel along the wick. Alternatively, the combustion barrier may be configured to obstruct a supply of oxygen (or air) to the combustion reaction. In another sense, "obstruct" may refer to an actual material which reduces or prevents combustion. However, as discussed below, "obstruct" may also be realized by the lack of material which would otherwise allow combustion. In any event, it will be appreciated, that the combustion barrier may use any other suitable means for obstructing combustion from a first wick portion to a second wick portion.

[0019] One exemplary embodiment of the present invention is illustrated in FIG. 1. A candle 10 has a candle wick 14 which is disposed within a source of fuel 20, such as wax. Candle wick 14 has two wick portions 16A and 16B, which are made from a plurality of fibers formed of a suitable combustible material, such as cotton, spun fiberglass, synthetic material or the like. The plurality of fibers are braided or otherwise woven together and are configured to permit molten fuel from the source of fuel 20 to travel up the wick via capillary action. Wick portions 16A and 16B may be formed of different materials or, alternatively, may be made from the same material. Between wick portions 16A and 16B wick 14 is a combustion barrier 18. Combustion barrier 18 is configured to obstruct combustion from wick portion 16B to wick portion 16A.

[0020] When a flame 12 is brought in contact with candle wick 14, the tip of wick portion 16B ignites. The heat from the flame melts the source of fuel 20 close to the flame, forming a pool 22 of molten fuel. The pool 22 of molten fuel expands until a maximum diameter is met. The molten fuel travels up wick portion 16B and is burned off by the flame as the flame consumes wick portion 16B. As wick portion 16B continues to burn, the solid source of fuel 20 close to the flame continues to melt, forming molten fuel that is consumed by combustion at the wick. As illustrated in FIG. 2, eventually the solid source of fuel 20 is consumed down to combustion barrier 18. Combustion barrier 18 is configured to obstruct combustion from wick portion 16B to wick portion 16A. When combustion is not permitted to proceed to wick portion 16B, flame 12 is extinguished. With this embodiment, candle 10 can be configured to burn under a number of circumstances and subsequently self-extinguish. For example, the candle wick 14 may be configured so that candle 10 burns until a time before an unsafe amount of wick is left, at which time the wick will self-extinguish. Alternatively, candle wick 14 may be configured so that candle 10 burns for a limited period of time, for example, the typical number of hours of an event, such as a dinner party, wedding, bath time, or the like. In other words, wick portion 16B can be of a sufficient length that will require an approximate period of time to burn before the flame reaches the flame. In this manner, wick 14 may be permitted to burn at a slower rate or at a rate such that flame 12 may be visibly dimmer.

[0022] At such time as it is desirable to reignite wick 14, combustion barrier 18 may be removed from the wick, such as by cutting it off with a knife or scissors, if combustion barrier 18 has not already been consumed by a combustion process.

[0023] In another embodiment of the invention, the candle wick can be configured to burn at a determined combustion rate for multiple intervals of time. FIG. 3 illustrates schematically, in cross-section, a candle 30 with a wick 38 that includes a plurality of wick portions 32. Between each of two wick portions 32 is a combustion barrier 34. Combustion barriers 34 may be spaced at regular intervals so that wick 38 may be burned multiple of time periods each period being for a limited time. For example, candle wick 38 may be configured so that candle 30 can be burned for multiple periods of one hour, two hours, and the like. Alternatively, combustion barriers 34 may be placed at any other suitable intervals along wick 38.

[0024] It will be appreciated that combustion barrier 18 may be configured in any number of suitable means to obstruct combustion. For example, FIG. 4 illustrates a candle 40 having a candle wick 44 in which the combustion barrier 18 is at least one knot 42 formed in the candle wick. Knot 42 is interposed between each of two wick portions 16A and 16B of wick 44 and is contiguous therewith. In another exemplary embodiment of the invention, the combustion barrier of the candle wick comprises a portion of wick in which one or more of the individual fibers of the wick is knotted.

[0025] Referring again to FIGS. 1 and 3, in a further exemplary embodiment of the invention, combustion barrier 18 may be formed of a material that absorbs liquid fuel at a rate sufficiently below the rate at which wick portions 16A and 16B absorb the liquid fuel. Such materials include materials such as nylon, metal or other non-absorbent synthetic or non-synthetic materials. Similarly, combustion barrier 18 may comprise the same material, but be configured differently the remainder of candle wick 44. For example, in one exemplary embodiment, the number of plies of strands (e.g., cotton) which comprises wick 44 may decrease at combustion barrier 18. For example, while wick portions 16A, B may comprise 24 ply wick, combustion barrier 18 may comprise 6 ply wick, thereby providing a material that effectively does not absorb the liquid fuel. That is, the rate of absorption of the combustion barrier 18 is approximately zero.

[0026] In yet another embodiment of the invention, the combustion barrier 18 of the candle wick 14 may comprise
a flame retardant material. A flame retardant material resists combustion so that the flame of an ignited wick portion 16B of the candle wick is extinguished without combustion continuing to wick portion 16A of the candle wick. In a further exemplary embodiment of the invention, the combustion barrier 18 of the candle wick 14 may comprise material that does not readily combust at temperatures at which wick portions 16A and 16B burn. Such materials may include metals. Suitable flame retardant or combustion resistant materials include treated cotton, asbestos, metals, fiberglass, celluloses or any material with similar flame retardant properties.

[0027] In yet a further exemplary embodiment of the invention, the combustion barrier 18 of candle wick 14 may be comprised of a restricting device that is connected to candle wick 14 and physically restricts the flow of liquid fuel from wick portion 16A to ignited wick portion 16B. As used herein, the term “connected to” may mean coupled to, attached to, formed within or formed around. As an example, referring to FIG. 5, a candle 50 has a candle wick 54 that is surrounded by a restricting device 56. Restricting device 56 may be a staple, a tight collar configured from metals (e.g., foil, staples, wire or the like), fiberglass, plastics, ceramics or other similar device that forces the fibers of the candle wick tightly together, thereby restricting the flow of liquid fuel from a wick portion 52A to an adjacent ignited wick portion 52B.

[0028] In a still further exemplary embodiment of the invention and with reference now to FIG. 6, combustion barrier of candle wick 14 may comprise an interruption in the candle wick in the form of a gap 62 between a first portion 60A of wick 14 to a second portion 60B of wick 14. Gap 62 thus restricts the flow of liquid fuel from wick portion 60B to ignited wick portion 60A as the fuel cannot bridge gap 62, and candle wick 14 extinguishes.

[0029] Additionally, in accordance with various aspects of this embodiment, features for re-ignition may be provided. For example, a reignition portion 63 of wick 14 may be provided on second portion 60B. In this sense, after consumption of first portion 60A and upon extinguishment of wick 14, reignition portion 63 is exposed for reignition of second portion 60B.

[0030] Optionally, a reignition portion protector 64 which protects portion 63 prior to and after consumption of first portion 60A. For example, protector 64 may comprise a removable flame/heat resistant cylinder which encircles reignition portion. In this manner, protector 64 assists in preventing reignition of portion 60B until desired. Portion 64 may also facilitate finding reignition portion 63 after exposure.

[0031] In the foregoing specification, the invention has been described with reference to specific embodiments. However, one of ordinary skill in the art appreciates that various modifications and changes can be made without departing from the scope of the present invention as set forth in the claims below. Accordingly, the specification and figures are to be regarded in an illustrative rather than a restrictive sense, and all such modifications are intended to be included within the scope of the present invention.

[0032] Benefits, other advantages, and solutions to problems have been described above with regard to specific embodiments. However, the benefits, advantages, solutions to problems, and any element(s) that may cause any benefit, advantage, or solution to occur or become more pronounced are not to be construed as a critical, required, or essential features or elements of any or all the claims. As used herein, the terms “comprises,” “comprising,” or any other variation thereof, are intended to cover a non-exclusive inclusion, such that a process, method, article, or apparatus that comprises a list of elements does not include only those elements but may include other elements not expressly listed or inherent to such process, method, article, or apparatus.

We claim:
1. A wick, comprising:
a first wick portion;
a second wick portion;
at least one combustion barrier therebetween said first wick portion and said second wick portion, said combustion barrier configured to obstruct combustion from said second wick portion to said first wick portion.
2. The wick of claim 1, wherein said at least one combustion barrier is configured to restrict the flow of fuel from said first wick portion to said second wick portion.
3. The wick of claim 2, wherein said at least one combustion barrier comprises at least one knot formed of said wick.
4. The wick of claim 2, said wick comprising a plurality of fibers woven together, wherein said at least one combustion barrier comprises at least one knot in at least one said plurality of fibers of said wick.
5. The wick of claim 1, wherein said at least one combustion barrier comprises a flame retardant material.
6. The wick of claim 1, wherein said at least one combustion barrier comprises a gap between said first wick portion and said second wick portion.
7. The wick of claim 6, wherein said second wick portion has a reignition portion.
8. The wick of claim 7, wherein said second wick portion has a reignition portion protector.
9. The wick of claim 2, wherein said second wick portion absorbs a fuel at a first rate and said at least one combustion barrier comprises a material that absorbs said fuel at a second rate which is sufficiently less that said first rate so that flow of said fuel from said first wick portion to said second wick portion is obstructed.
10. The wick of claim 9, wherein said second rate is zero.
11. The wick of claim 1, wherein said at least one combustion barrier is formed of material that does not readily combust at a temperature at which said second wick portion combusts.
12. The wick of claim 1, wherein said wick comprises a third wick portion disposed between said first wick portion and said second wick portion, said combustion barrier comprising a restricting device that is coupled to said third wick portion and physically obstructs a flow of a fuel from said first wick portion to said second wick portion.
13. The wick of claim 11, wherein said restricting device is a staple.
14. The wick of claim 11, wherein said restricting device is a collar.
15. A method for substantially obstructing combustion along a wick, comprising:
   providing a first wick portion;
   providing a second wick portion;
   positioning at least one combustion barrier between said first wick portion and said second wick portion, said at least one combustion barrier configured to obstruct combustion from said second wick portion to said first wick portion.
16. The method of claim 15, wherein said at least one combustion barrier is configured to restrict the flow of fuel from said first wick portion to a second wick portion.
17. The method of claim 16, wherein said at least one combustion barrier comprises at least one knot formed of said wick.
18. The method of claim 16, said wick comprising a plurality of fibers woven together, wherein said at least one combustion barrier comprises at least one knot in at least one of said plurality of fibers of said wick.
19. The method of claim 15, wherein said at least one combustion barrier comprises a flame retardant material.
20. The method of claim 16, wherein said second wick portion absorbs a fuel at a first rate and said at least one combustion barrier comprises a material that absorbs said fuel at a second rate which sufficiently is less than said first rate so that flow of said fuel from said first wick portion to said second wick portion is obstructed.
21. The method of claim 20, wherein said second rate is zero.
22. The method of claim 15, wherein said at least one combustion barrier is formed of material that does not readily combust at a temperature at which said second wick portion combuts.
23. The method of claim 15, wherein said wick comprises a third wick portion disposed between said first and said second wick portions, said combustion barrier comprising a restricting device that is coupled to said third wick portion and physically restricts a flow of a fuel from said first wick portion to said second wick portion.
24. The method of claim 23, wherein said restricting device is a staple.
25. The method of claim 23, wherein said restricting device is a collar.
26. A candle comprising:
   a source of fuel;
   a wick in contact with said source of fuel; and
   a combustion barrier connected to said wick, said combustion barrier being configured to extinguish combustion of said wick.
27. The candle of claim 26, wherein said combustion barrier is configured to restrict a flow of liquid fuel along said wick.
28. The candle of claim 26, said combustion barrier being formed of flame retardant material.
29. The candle of claim 26, wherein a rate of combustion at said combustion barrier is sufficiently below the rate of combustion at said wick such that combustion is effectively extinguished at said combustion barrier.
30. The candle of claim 26, said combustion barrier comprising a restricting device that is coupled to said wick and obstructs a flow of fuel along said wick.

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