Eco-friendly Incense Paper Burner

Field of Invention

[001] The present invention relates to an eco-friendly incense paper burner. During burning of incense paper, flying smoke and ash particles are separated out as hot air exits through an exhaust. Entry of fresh air currents into the burner allows for an improved and cleaner burning process.

Background

[002] Incense paper burning has been practiced for a long time. However, burning of incense paper contributes to environmental pollution. Smoke and ash particles from burning of incense paper is unpleasant and is a health concern for some people. During burning, ashes and smoke particles fly free according to rising hot air and external air currents. Sometimes, the burning is very intense and naked flames pose a fire hazard. The effects of burning incense paper have affected the harmonious relations among some of the people living in a multi-racial and multi-religious community; the present invention minimizes air pollution caused by burning of incense paper.

[003] Inventor has obtained a Singapore patent no. 201308880-2 for an eco-friendly incense burner. Continued testing and improvement over the years have led to the present invention.

[004] Attempts have also been carried out by others to address similar air pollution caused by burning of incense paper. For eg., China utility model no. CN204427573U, issued to Fu Shou Yuan Env., describes an incense burner which suppresses extending flame during burning and guides emanating smoke to reduce pollution. Taiwan patent no. TWI346537B, issued to Shu Te University, describes an eco-friendly incense burner with a cover; extending from the cover is a post, which has a heating tube and a filtration screen. China utility model no. CN2162177Y, issued to Wu Jiande, describes an incense burner that can be assembled and disassembled, thereby addressing the problem of storage volume and handling. Yet, in another eg., China utility model no. CN202269874U, issued to Chen Pinghe, describes a double-liner joss paper burner, where an inner liner is made of a filter screen.

[005] Despite development of incense burners, it can thus be seen that there is a need to design an eco-friendly burner to address both health and pollution concerns associated with burning of incense paper.

Summary

[006] The following presents a simplified summary to provide a basic understanding of the present invention.

[007] The present invention seeks to provide an eco-friendly incense paper burner to improve on burning efficiency as a way to address air pollution created by burning of incense paper.

[008] In one embodiment, the present invention provides an eco-friendly incense paper burner comprising: a shell, which is closed by a top cover and a bottom cover, with an array of exhaust holes formed around a circumference of the shell at a location below the top cover; an exhaust pipe-cover assembly being fitted inside the shell at a location below the array of exhaust holes; a loading window formed on the shell to allow incense paper to be placed onto a burn tray, which is disposed inside the eco-friendly incense paper burner, with the loading window being operable to be opened or closed by a door; and a plurality of air-intake ports formed around the circumference of the shell at a location below a top of the burn tray, with each of the air-intake port having a vane to direct air flow into the eco-friendly incense paper burner at an angle β to the circumference. In use, during burning of the incense paper, fresh air is drawn in through the air-intake ports to create combined inward and swirling air currents below the top of the burn tray to improve on burning efficiency of the incense paper, and the air currents interact with hot air currents from the burning incense paper to generate a vortex below the exhaust pipe-cover assembly, so that ash and smoke particles are separated out from the air before the air is exhausted out through the exhaust pipe-cover assembly and the array of exhaust holes.

[009] In another embodiment, the present invention provides a method for improving burning efficiency in the above eco-friendly incense paper burner, the method comprises: directing fresh air-intake currents at an angle β to a circumference of a shell making up a body of the eco-friendly incense paper burner with inwardly directed vanes disposed at intake ports to create inwardly and swirling air currents below a top of a burn tray, on which incense paper is placed for burning.

[0010] Preferably, the air-intake vanes are directed inwardly to the circumference in one direction; the vane may be substantially vertical or inclined. The vane may be planar, arcuate or spiral. Preferably, the loading window is operable to close or open by sliding (vertically or horizontally) or pivoting the door.

[0011] The air-intake vanes are formed to extend from the shell and air is directed by natural convection; it is possible that air-delivery duct is provided on an exterior of the shell and air supply can then be assisted by a blower. In another embodiment, the air-delivery duct is provided on an interior of the shell and the intake ports and associated air-intake vanes are configured on the air-delivery duct.

[0012] Preferably, a handle bar is located on the door for a user to open or close the loading window, with the handle bar having a heat insulator. The handle bar has a projection that extends out of an inside surface of the door, and is therefore operable to engage with a cooperating hole on the shell to keep the door in a closed position.

Brief Description of the Drawings

[0013] This invention will be described by way of non-limiting embodiments of the present invention, with reference to the accompanying drawings, in which:

[0014] FIG. 1 illustrates a front view of an eco-friendly incense burner according to an embodiment of the present invention;

[0015] FIG. 2 illustrates a rear view of the above incense burner;

[0016] FIG. 3A illustrates a vane associated with an air-intake port according to an embodiment, whilst FIG. 3B illustrates air currents flowing into and inside the incense burner;

[0017] FIGs. 4A and 4B illustrate vanes associated with a plurality of air-intake ports according to other embodiments;

[0018] FIGs. 5A-5B illustrate swirling air currents of intake air and hot air inside the eco-friendly incense burner when in use; and

[0019] FIGs. 6A-6C illustrate eco-friendly incense burners according to other embodiments of the present invention; and FIG. 6D illustrates an internal structure typical of the incense burner.

Detailed Description

[0020] One or more specific and alternative embodiments of the present invention will now be described with reference to the attached drawings. It shall be apparent to one skilled in the art, however, that this invention may be practised without such specific details. Some of the details may not be described at length so as not to obscure the present invention.

[0021] FIGs. 1 and 2 show an eco-friendly incense paper burner **100** according to an embodiment of the present invention. As shown in FIGs. 1 and 2, the eco-friendly incense paper burner **100** is made up of:

- a cylindrical shell **110** with a top cover **112**. An array of exhaust holes **114**, for example a row of holes, are formed along a circumference of the cylindrical shell **110** at a location below the top cover **112**;
- an exhaust pipe-cover assembly **120** made up of an exhaust cover **122** and an exhaust pipe **124** fitted at a centre of the exhaust cover; the exhaust pipe-cover assembly **120** is fitted inside the cylindrical shell **110** at a location below the array of exhaust holes **114**;
- a loading window **114** in the cylindrical shell **110** for putting incense paper into the burner, with the loading window **114** being operable to be opened or closed by a door **116**;
- a burn tray **130** disposed in the cylindrical shell **110**;

- air-intake ports **140** formed around a circumference of the cylindrical shell **110** at a location below a top of the burn tray **130**, with the air intake vanes 142 to direct fresh air into the cylindrical shell **110** in one direction (clockwise or anti-clock wise direction); and
- an ash collection door **160** located near the bottom of the cylindrical shell **110** to provide access to remove ashes that has collected on the bottom cover **113**.

[0022] FIG. 1 shows a vertically sliding door **116** over the loading window **114** according to one embodiment. The vertically sliding door **116** is guided on two sides of the loading window **114** by two sills **117**, one along each vertical edge of the loading window **114**. At a top, centre of the sliding door **116**, a handle bar **118** is provided to allow a user to move the sliding door **116** to open or close the loading window **114**. The handle bar **118** has a projection (not shown in the drawings) that extends out of an inside surface of the sliding door **116** in order to engage with a cooperating locating hole formed on the cylindrical shell **110** to keep the sliding door **116** in a closed position, as seen in FIG. 1. Preferably, a heat insulator (also not shown in the drawings) is provided around the handle bar **118** to prevent the handle bar **118** from being heated up and too hot to touch, for eg. during or after burning of incense paper. To open the sliding door **116**, the handle bar **118** is momentarily tugged to release the handle projection from its cooperating locating hole, and the sliding door **116** is moved down to open the loading window **114**; to close, the sliding door **116** is moved up to cover the loading window **114**, is momentarily tugged to engage the handle projection into the cooperating hole. In another embodiment, the sliding door **116** can be configured to slide in a circumferential manner (instead of just vertically).

[0023] Also seen from FIG. 1, a plurality of the air-intake ports **140** are formed as rectangularly upright slots around the circumference of the cylindrical shell **110**. Each air-intake port **140** has a vane **142** being fixed to a substantially vertical edge of the air-intake port **140**; the vane **142** projects into the interior of the cylindrical shell **110** at an angle **β**. All the vanes **142** are arranged to point in one direction, either in a clockwise or anti-clockwise direction. Preferably, the vanes **142** project inwardly with **β** ranging from about 30 to about 40 degrees with the circumference. The vanes **142** can be welded to the edge of each of the air-intake port or be bent inwardly after cutting 3 edges of the air-intake port **140**, such as, by laser cutting or die cutting. FIGs. 3A and 3B show more clearly the arrangement of the vanes **142**, with FIG. 3B showing the vanes **142** are projecting

inwardly in an anti-clockwise direction, according to one embodiment. Effects of the vanes **142** contributing to improve burning efficiency will be described later.

[0024] FIGs. 4A-4B show vanes **142a**,**142b** are associated with a plurality of air intake ports 140 formed circumferentially around the cylindrical shell **110**. As shown in FIG. 4A, each vane **142** is inclined to a vertical yet is directed inwardly at angle **β** to the circumference. The vanes **142** can also be vertically orientated, as shown in FIG. 4B. Each vane **142** may be welded or riveted to an inside of the cylindrical shell **110**. It is possible that the vanes **142** may not be planar, that is, the vanes may be slightly arcuate or even slightly spiral to direct fresh air intake inwardly and in one direction.

[0025] FIG. 2 shows a rear view of the eco-friendly incense paper burner **100**. As seen from FIG. 2, the ash collection door **160** is located substantially opposite from the loading window **114** or the sliding door **116** but near to the bottom cover **113**. An opening **161** in the cylindrical shell **110** provides access to an ash collection chamber **162** located between the top of the burn tray **130** and the bottom cover **113**; in another embodiment, it is possible that the ash collection door **160** is located at the front side like the loading window **114** or at a side between the front and rear; the ash collection door **160** thus provides the user with easy opening or closing of the ash collection chamber **162**, for eg., to facilitate clearing away of the ashes. A handle **164** is provided at an upper edge of the ash collection door **160** to facilitate its opening or closing. The ash collection door **160** is normally in the closed position (by gravity) and the handle **164** allows the user to open the ash collection door for access to the ash collection chamber according to a need. In another embodiment, it is possible to configure the ash collection door **160** to slide in a circumferential manner.

[0026] In use, incense paper is placed on top of the burn tray **130** for burning. After an initial process of burning, some of the burning and un-burnt incense paper drop through the burn tray **130** and burning continues with fresh air being drawn in through the air-intake ports **140**. Ashes produced from burning of the incense paper fall into the ash collection chamber **162**.

[0027] During burning of the incense paper, hot air rises, and fresh, exterior air is drawn in through the air-intake ports **140**. Due to the inwardly projecting vanes **142**, fresh, exterior air is drawn in through the air-intake ports **140** at substantially angle **β**; as burning

continues, the fresh air-intake currents create combined inward and swirling air flow currents below the top of the burn tray **130**, as illustrated by respective arrows **A** and **B** in FIGs. 3B and 5; with the combined inward and swirling air currents, more complete burning of the incense paper is provided. Inventor has carried out continued testings and found that the burning efficiency has improved by about 20% or more by providing the vanes **142** at the air-intake ports **140**. The swirling air flow currents also rise up together with hot air currents from burning of the incense paper and these dynamic air currents create an air vortex inside an upper portion of the eco-friendly incense paper burner **100**. The air vortex swirls below the exhaust cover **122** and around the exhaust pipe **124**. Centrifugal forces throw the flying ash and smoke particles outwardly to the inside surface of the cylindrical shell **110**; these ash and smoke particles, being relatively heavier than air, then fall by gravity into the ash collection chamber **162**. The hot air swirling around the exhaust pipe **124**, now devoid of heavy ash and smoke particles, flows through the exhaust pipe **124** and exhausts out to the exterior through the array of exhaust holes **114**. With this eco-friendly incense paper burner **100**, the ash and smoke particles remain trapped inside the burner **100** and the exhaust air is seen to be visually devoid of smoke; pollution of air and health concerns associated with burning of incense paper are now addressed.

[0028] In one embodiment, the cylindrical shell **110** is made of stainless steel. Preferably, components of the eco-friendly incense paper burner **100** are made of stainless steel grades 304 or 430. Preferably, the eco-friendly incense burner **100** is supported on legs **170** connected to the cylindrical shell **110** near the bottom cover **113**, with four legs being shown for illustration.

[0029] FIGs. 6A-6C show three eco-friendly incense burners **100a-100c** according to other embodiments of the present invention. As shown in FIGs. 6A-6C, each of the incense burners **100a-100c** is made up of a shell **110a** that is cuboid in section, with four sides, a top cover **112** and a bottom cover **113**; however, the incense burners can also be of other polygonal shape, or non-regular in shape, for example, to fit to a space of installation, without detracting from the principles used in the present invention. In FIG. 6A, the air intake ports **140** and associated vanes **142** direct fresh air-intake at an angle β by natural convection and in one direction into the incense burner **100a-100c**. In FIGs. 6B-6C, the fresh air-intake is assisted by a blower **190**, where an air-delivery duct **180** is

configured on an exterior of the shell **110a** in FIG. 6B, whilst in FIG. 6C, the air-delivery duct **180** is configured on an interior of the shell **110a**.

[0030] FIG. 6D shows a typical internal structure of the above eco-friendly incense burner **100a**-**100c**. In FIG. 6D, the sliding door **116** is configured as a bi-sliding door, operable in a horizontal manner, whilst the ash collection door **160** is slidable in a vertical manner. A burner tray **130** is located above the air-intake ports **140**. Like in the above embodiments, an exhaust pipe-cover assembly **120** is located below the air-exhaust holes **114**, preferably, with the exhaust cover plate **122** being connected to the burn tray **130** at the corners of the shell **110a**-**110c** by a connect plate **135** disposed at each of the corners; the connect plate **13**5 can be curved in section or simply planar. The air-delivery duct **180** is shown to be located internally but this is not so limited; fresh air intake is supported by the air blower **190**.

[0031] While specific embodiments have been described and illustrated, it is understood that many changes, modifications, variations and combinations disclosed in the text description and drawings could be made to the present invention without departing from the scope of the present invention. For example, the ash collection door **160** can be slidable in a circumferential manner or can be pivoted to open or close; likewise, the door **116** over the loading window **114** can also be slidable in a circumferential manner or can be pivoted to open or close. Ribs can also be formed on the shell **110,110a** to help maintain the shape or rigidity of the shell **110,110a**.

CLAIMS:

1. An eco-friendly incense paper burner comprising:

a shell, which is closed by a top cover and a bottom cover, with an array of exhaust holes formed around a circumference of the shell at a location below the top cover;

an exhaust pipe-cover assembly being fitted inside the shell at a location below the array of exhaust holes;

a loading window formed on the shell to allow incense paper to be placed onto a burn tray, which burn tray is disposed inside the eco-friendly incense paper burner, with the loading window being operable to be opened or closed by a door; and

a plurality of air-intake ports formed around the circumference of the shell at a location below a top of the burn tray, with each of the air-intake port having a vane to direct air flow into the eco-friendly incense paper burner at an angle β to the circumference;

such that during burning of the incense paper, fresh air is drawn in through the air-intake ports to create combined inward and swirling air currents below the top of the burn tray to improve on burning efficiency of the incense paper, and the air currents interact with hot air currents from the burning incense paper to rise and to generate a vortex below the exhaust pipe-cover assembly, so that ash and smoke particles are separated from the air before the air is exhausted out through the exhaust pipe-cover assembly and the array of exhaust holes.

2. The eco-friendly incense paper burner according to claim 1, wherein the loading window is operable to close or open by sliding or pivoting the door.

3. The eco-friendly incense paper burner according to claim 2, further comprising a handle bar located on the door for a user to open or close the loading window, with the handle bar having a heat insulator.

4. The eco-friendly incense paper burner according to claim 3, wherein the handle bar has a projection that extends out of an inside surface of the door, and is operable to engage with a cooperating hole on the shell to keep the door in a closed position.

5. The eco-friendly incense paper burning according to any one of the preceding claims, wherein the vanes are inwardly orientated in one direction, either clockwise or anticlockwise inside the shell.

6. The eco-friendly incense paper burner according to claim 5, wherein a plane of each vane is substantially vertical, inclined, arcuate or spiral.

7. The eco-friendly incense paper burner according to any one of the preceding claims, wherein the plurality of air-intake ports is configured on an air-delivery duct so that fresh air intake is assisted by a blower.

8. The eco-friendly incense paper burner according to claim 7, wherein the air-delivery duct is configured on an exterior of the shell or an interior of the shell.

9. A method for improving burning efficiency in an eco-friendly incense paper burner according to any one of apparatus claims 1-8, the method comprises:

burning incense paper on a burn tray disposed inside the eco-friendly incense paper burner; and

directing fresh air-intake currents at an angle β to a circumference of a shell making up a body of the eco-friendly incense paper burner with inwardly directed vanes disposed at intake ports to create inwardly and swirling air currents below a top of the burn tray to improve on burning efficiency of the incense paper.

10. The method according to claim 9, wherein directing fresh air-intake is configured by a duct and assisted by a blower.