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(54) **PORTABLE FIREPLACE**

(57) A portable fireplace (150) for burning combustible fuel includes an outer wall (120) defining a lower portion and a tower portion (160), an inner wall (140) separated from the outer wall by an air gap and defining a combustion chamber (190) within the lower portion and a chimney (165) within the tower portion. The portable fireplace also includes a fireplace aperture (180) through the outer wall and inner wall, a mantel (170) below the fireplace aperture and projecting outward from the outer wall, a number of inlet ventilation holes (122) in the outer wall, and a number of outlet ventilation holes (124) in the inner wall within the combustion chamber.

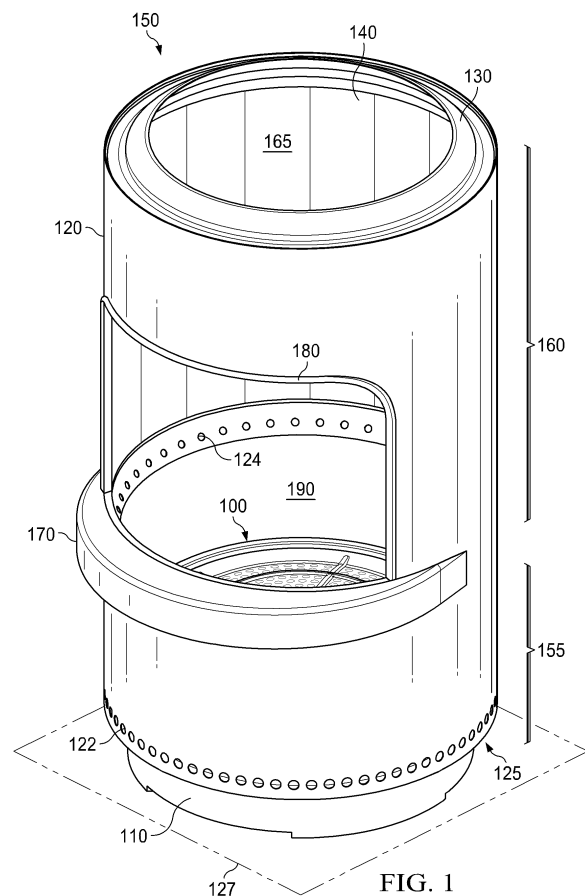


FIG. 1

EP 4 524 473 A2

Description

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Patent Application 18/815,451, filed August 26, 2024, and also claims priority to and the benefit of U.S. Provisional Patent Application No. 63/582,607 filed 14 September 2023, both applications of which are hereby incorporated by reference in their entirety as though fully set forth herein.

TECHNICAL FIELD

[0002] The subject matter described herein relates to a portable device for burning solid fuel to provide light, heat, and ambience. This portable fireplace has particular but not exclusive utility for outdoor gatherings.

BACKGROUND

[0003] Conventional chimineas, despite their raised chimneys, often emit excessive smoke that can impact user enjoyment and experience. Furthermore, they may be formed or cast in a manner that does not permit easy cleaning. It should thus be appreciated that such commonly used chimineas have numerous drawbacks that affect the user experience. Accordingly, a need exists for improved outdoor combustion-based lighting and heating products that address the forgoing and other concerns.

[0004] The information included in this Background section of the specification, including any references cited herein and any description or discussion thereof, is included for technical reference purposes only and is not to be regarded as subject matter by which the scope of the disclosure is to be bound.

SUMMARY

[0005] Disclosed is a portable fireplace that can serve as an outdoor fireplace to provide heat, light, and ambience in back yards, parks, camp sites, etc. The modular portable fireplace can burn sticks, logs, etc., and uses primary and secondary combustion to increase heat and light output while reducing the generation of smoke. The modular portable fireplace includes a base, combustion chamber, mantel, chimney, and fireplace aperture, as well as a removable fuel grate and removable ash pan. The portable fireplace also includes a double-walled design that both enables air flow for more complete combustion, and also reduces the temperature of the portable fireplace's exterior surfaces.

[0006] One general aspect includes a portable fireplace for burning combustible fuel. The portable fireplace includes an outer wall defining a lower portion and a tower portion. The portable fireplace also includes an inner wall separated from the outer wall by an air gap and defining a

combustion chamber within the lower portion and a chimney within the tower portion. The portable fireplace also includes a fireplace aperture through the outer wall and inner wall. The portable fireplace also includes a mantel disposed below the fireplace aperture and projecting outward from the outer wall. The portable fireplace also includes a plurality of inlet ventilation holes disposed in the outer wall. The portable fireplace also includes a plurality of outlet ventilation holes disposed in the inner wall within the combustion chamber.

[0007] In some implementations, the portable fireplace includes a plurality of inlet ventilation holes configured to draw air from an environment outside the portable fireplace, and also includes a plurality of outlet ventilation holes in communication with the inlet ventilation holes and the air gap. The plurality of outlet ventilation holes may be disposed in the inner wall within the combustion chamber below the aperture.

[0008] Implementations may include one or more of the following features. The portable fireplace may include a base different than the outer wall and disposed at a bottom of the outer wall. The portable fireplace may include a flow redirector disposed within the chimney above the fireplace aperture. The portable fireplace may include a removable fuel grate disposed within the combustion chamber. The portable fireplace may include a removable ash pan disposed below the removable fuel grate. The inner wall, outer wall, air gap, removable ash pan, and removable fuel grate may be configured such that air entering through the plurality of inlet ventilation holes exits through both the plurality of outlet ventilation holes and a plurality of ventilation holes in the removable fuel grate. Air exiting through the plurality of ventilation holes in the removable fuel grate may facilitate primary combustion of a fuel disposed on the removable fuel grate. Air exiting through the plurality of outlet ventilation holes may support secondary combustion of gases, smoke, and soot emitted by the fuel. The fuel may include wood, paper, or cardboard. The fuel may include sticks or logs.

[0009] One general aspect includes a method for burning combustible fuel. The method includes providing a structure that may include: an outer wall defining a lower portion and a tower portion, an inner wall separated from the outer wall by an air gap and defining a combustion chamber within the lower portion and a chimney within the tower portion, a fireplace aperture through the outer wall and inner wall, a mantel disposed below the fireplace aperture and projecting outward from the outer wall, and a plurality of inlet ventilation holes disposed in the lower portion of the outer wall. The method also includes drawing air in through the plurality of inlet ventilation holes. The method also includes expelling a first portion of the air into a lower portion of the combustion chamber to support primary combustion of a fuel. The method also includes expelling a second portion of the air into an upper portion of the combustion chamber to support secondary combustion of gases, smoke, and soot emitted by the fuel

during primary combustion.

[0010] Implementations may include one or more of the following features. The method may include providing a base different than the outer wall, and positioning a bottom of the outer wall on a top of the base. The method may include positioning a flow redirector within the chimney above the fireplace aperture. The method may include supporting the fuel on a removable fuel grate disposed within the combustion chamber. The method may include collecting ash from the primary and secondary combustion in a removable ash pan disposed within the combustion chamber below the removable fuel grate. Each of the removable fuel grate and the removable ash pan may be removable from the combustion chamber via the fireplace aperture. The fuel may include wood, paper, or cardboard. The fuel may include sticks or logs.

[0011] One general aspect includes a system for burning combustible fuel to provide light and heat. The system includes a double-walled body defining a lower portion and a tower portion. The system also includes a combustion chamber disposed within the lower portion. The system also includes a chimney disposed within the tower portion. The system also includes an air gap disposed between walls of the double-walled body. The system also includes a fireplace aperture disposed within the tower portion. The system also includes a mantel disposed below the fireplace aperture and projecting outward from the double-walled body. The system also includes a plurality of inlet ventilation holes disposed in an outer surface of the lower portion. The system also includes a plurality of outlet ventilation holes disposed in an inner surface of the combustion chamber. The system also includes a base different than the double-walled body and disposed at a bottom of the double-walled body. The system also includes a flow redirector disposed within the chimney above the fireplace aperture. The system also includes a removable fuel grate disposed within the combustion chamber. The system also includes a removable ash pan disposed below the removable fuel grate.

[0012] Implementations may include one or more of the following features. In some embodiments, the double-walled body, air gap, removable ash pan, and removable fuel grate are configured such that air entering through the plurality of inlet ventilation holes exits through both the plurality of outlet ventilation holes and a plurality of ventilation holes in the removable fuel grate, where air exiting through the plurality of ventilation holes in the removable fuel grate facilitates primary combustion of a fuel disposed on the removable fuel grate. Where air exiting through the plurality of outlet ventilation holes supports secondary combustion of gases, smoke, and soot emitted by the fuel.

[0013] One general aspect includes a portable fireplace for burning combustible fuel. The portable fireplace includes a lower portion that may include: an outer wall, and an inner wall separated from the outer wall by an air gap and defining a combustion chamber, a fuel grate

configured to support fuel and defining a portion of the combustion chamber. The portable fireplace also includes a chimney disposed above the lower portion, the chimney being arranged to draw smoke from the combustion chamber therethrough. The portable fireplace also includes a fireplace aperture in one of the lower portion and the chimney, the fireplace aperture being disposed at an elevation above the fuel grate and providing visual, lateral access to an interior of the combustion chamber. The portable fireplace also includes an inlet ventilation hole in one of the lower portion and the chimney, the inlet ventilation hole being configured to draw air from outside the portable fireplace and into the air gap between the outer wall and the inner wall. The portable fireplace also includes a first outlet ventilation hole configured to introduce drawn air at an elevation below the fuel grate to feed flames of fuel on the fuel grate and generate a primary burn of the fuel. The portable fireplace also includes a second outlet ventilation hole disposed in the inner wall to introduce air into the combustion chamber at an elevation above the fuel grate to accommodate a secondary burn of the fuel, the second outlet ventilation hole being in fluid communication with the air gap between the outer wall and the inner wall and with the inlet ventilation hole and configured to provide air for passage through the chimney.

[0014] Implementations may include one or more of the following features. In some embodiments, the first outlet ventilation hole is in fluid communication with the inlet ventilation hole. The portable fireplace may include a base forming a part of the lower portion, the inlet ventilation hole being disposed on an outer surface of at least one of the outer wall and the base. The portable fireplace may include a second inlet ventilation hole, the second inlet ventilation hole being in fluid communication with the first outlet ventilation hole. The second outlet ventilation hole may be disposed at an elevation lower than the fireplace aperture. The second outlet ventilation hole may be disposed at an elevation higher than the fireplace aperture.

[0015] In some examples, a portable fireplace for burning combustible fuel may include an outer wall and an inner wall separated from the outer wall by an air gap and defining a combustion chamber. A fuel grate may be configured to support fuel and defining a portion of the combustion chamber. A fireplace aperture may extend through both the inner wall and the outer wall, the fireplace aperture being disposed at an elevation above the fuel grate and providing visual, lateral access to an interior of the combustion chamber. An open top may be configured to pass convective heat when fuel is burned on the fuel grate. A first outlet ventilation hole may be configured to introduce air into the combustion chamber at an elevation below the fuel grate to feed flames of fuel on the fuel grate and generate a primary burn of the fuel, and a second outlet ventilation hole may be disposed at an elevation above the fuel grate to accommodate a secondary burn of the fuel, the second

outlet ventilation hole being in fluid communication with the air gap between the outer wall and the inner wall.

[0016] In some aspects, an inlet ventilation hole may be in fluid communication with at least one of the first outlet ventilation hole and the second ventilation outlet hole to draw air used for combustion of fuel on the fuel grate. In some aspects, the inner wall comprises an infrared reflective surface opposite the fireplace aperture, the infrared reflective surface configured to reflect radiative energy out of the fireplace aperture. In some aspects, a reflective redirector may face the infrared reflective surface opposite the fireplace aperture, the reflective redirector configured to reflect radiative energy toward the infrared reflective surface opposite the fireplace aperture.

[0017] This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to limit the scope of the claimed subject matter. A more extensive presentation of features, details, utilities, and advantages of the modular portable fireplace, as defined in the claims, is provided in the following written description of various embodiments of the disclosure and illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] Illustrative embodiments of the present disclosure will be described with reference to the accompanying drawings, of which:

Figure 1 is a top right perspective view of an example modular fireplace, also referenced herein as a chiminea, in accordance with at least one embodiment of the present disclosure.

Figure 2 is a front exploded view of an example modular chiminea, in accordance with at least one embodiment of the present disclosure.

Figure 3 is an exemplary representation of a fire grate or fuel grate for a chiminea in accordance with at least one embodiment of the present disclosure.

Figure 4 is a perspective view of an example ash pan and bottom portion of the bracing tray of the modular chiminea, in accordance with at least one embodiment of the present disclosure.

Figure 5 is a side view of an example modular chiminea, in accordance with at least one embodiment of the present disclosure.

Figure 6 is a side cross-sectional view of an example modular chiminea, in accordance with at least one embodiment of the present disclosure.

Figure 7 is a front cross-sectional view of an example modular chiminea, in accordance with at least one embodiment of the present disclosure.

Figure 8 is a front cross-sectional view of at least a portion of an example modular chiminea, in accor-

dance with at least one embodiment of the present disclosure.

DETAILED DESCRIPTION

[0019] In accordance with at least one embodiment of the present disclosure, a portable fireplace is provided that can be used as an outdoor fireplace to provide heat, light, and ambience in back yards, parks, camp sites, etc.

The portable fireplace can burn wood (e.g., sticks, logs, twigs, etc.), paper, cardboard, and other fuel, and uses primary and secondary combustion to increase heat and light output and reduce the generation of smoke. The portable fireplace includes a base, combustion chamber, mantel, chimney, and fireplace aperture, as well as a fuel grate and ash pan that can be removed when the portable fireplace is cool, for easy emptying of the ash that is generated during combustion. The modular portable fireplace also includes a double-walled design that both enables air flow for more complete combustion, and also reduces the temperature of the portable fireplace's exterior surfaces. The portable fireplace includes a flame ring at the top that affects the flow of hot gas and can thus improve combustion.

[0020] In some implementations, the portable fireplace may be made of stainless steel (e.g., with some components made of rolled and welded sheet steel and other components stamped from sheet metal blanks), providing a lightweight, portable design that can be moved from one location to another with minimal effort. However, other materials may be used instead or in addition, including metals, ceramics, polymers, and composites.

[0021] The modular portable fireplace provides a shallow combustion chamber that makes the flames readily visible (and heat readily accessible) through the fireplace aperture, while smoke generated during combustion will generally tend to rise vertically through the chimney so as not to be bothersome to people standing or seated around the portable fireplace. Furthermore, the dual-burn features of primary and secondary burn described herein may reduce the smoke generated by the portable fireplace.

[0022] In the example shown, the fuel grate (also known as a fire grate) and ash pan are removable through the front opening or fireplace aperture. In an example, the fireplace aperture is sized so that the ash pan can pass through the fireplace aperture in a flat, horizontal orientation. The fireplace aperture may be sized so that the grate may fit therethrough by rotating the fuel grate at a slight angle for removal. In some embodiments, the tower portion or upper portion and the combustion portion or lower portion are one unit. In other embodiments, the tower portion or upper portion may be a separate, removable component.

[0023] These descriptions are provided for exemplary purposes only, and should not be considered to limit the scope of the modular portable fireplace. Certain features may be added, removed, or modified without departing

from the spirit of the claimed subject matter.

[0024] For the purposes of promoting an understanding of the principles of the present disclosure, reference will now be made to the embodiments illustrated in the drawings, and specific language will be used to describe the same. It is nevertheless understood that no limitation to the scope of the disclosure is intended. Any alterations and further modifications to the described devices, systems, and methods, and any further application of the principles of the present disclosure are fully contemplated and included within the present disclosure as would normally occur to one skilled in the art to which the disclosure relates. In particular, it is fully contemplated that the features, components, and/or steps described with respect to one embodiment may be combined with the features, components, and/or steps described with respect to other embodiments of the present disclosure. For the sake of brevity, however, the numerous iterations of these combinations will not be described separately.

[0025] **Figure 1** is a top right perspective view of an example portable, modular fireplace 150, in accordance with at least one embodiment of the present disclosure. In this example, the fireplace 150 is also referred to herein as a chiminea 150. The modular chiminea 150 can be used as an outdoor fireplace in back yards, parks, camp sites, etc. The modular chiminea 150 includes a base or stand 110, a lower portion or combustion portion 155, and an upper portion, tower portion, or chimney portion 160. In some embodiments, the lower portion or combustion portion 155 and the upper portion, tower portion, or chimney portion 160 are a single unit. In other embodiments, the upper portion, tower portion, or chimney portion 160 is a separate unit that is removable from the lower portion or combustion portion 155.

[0026] The lower portion or combustion portion 155 rests on the base or stand 110, and in this implementation, includes a mantel 170, a fuel grate or fire grate 100 to support combustible fuel, a combustion chamber 190 within which the fuel is burned, a plurality of lower ventilation holes 122 that draw in cool air from the outside, and a plurality of upper ventilation holes 124 that emit warm air radially inward into the combustion chamber to ignite uncombusted gases and particulate matter rising up from the fuel. This secondary combustion increases the light and heat output of the modular chiminea, while reducing the emission of smoke.

[0027] The upper portion or tower portion 160 includes a front opening or fireplace aperture 180, a chimney 165, and a flame ring 130 that shaped the flow of rising air and can improve combustion of the fuel, while directing smoke away from people sitting around the modular chiminea 150.

[0028] The modular chiminea 150 includes a double-walled design that includes an outer wall or outer body 120 and an inner wall or inner body 140, separated by a gap or space. This double-walled design aids secondary combustion (as shown below in **Figure 8**) while also

allowing the outer surfaces of the modular chiminea 150 to remain cooler during combustion of the fuel. Similarly, the base or stand 110 prevents the bottom surface 125 of the outer wall 120 from coming into contact with the surface 127 (e.g., the ground, a patio or driveway, etc.) on which the modular chiminea 150 is resting, thus limiting unwanted heat transfer between the outer wall 120 and the ground surface 127. Since the chiminea is portable, the base or stand may have feet formed therein, and the base or other portion of the chiminea may have grips or handles formed thereon that enable a user to more easily pick and move the chiminea to a desired location. The chiminea may be formed to weigh between 8 and 60 lbs., making it moveable about a backyard, campsite, park, or other space.

[0029] It should be noted that the examples described herein are provided for purposes of illustration, and are not intended to be limiting. Other devices and/or device configurations may be utilized to carry out the operations described herein.

[0030] **Figure 2** is a front exploded view of an example modular chiminea 150, in accordance with at least one embodiment of the present disclosure. Visible are the flame ring 130, inner body or inner wall 140, outer body or outer wall 120, removable fuel grate or fire grate 100, mantel 170, and base 110. The outer wall 120 includes an outer fireplace aperture 180o and the plurality of inlet ventilation openings 122. The plurality of inlet ventilation openings 122 may be configured to draw air from an environment outside the portable fireplace. The inner wall 140 includes an inner fireplace aperture 180i and the plurality of outlet ventilation holes 124.

[0031] Opposite the fireplace aperture 180i, the inner wall 140 forms a reflective inner-facing rear wall surface 181. This reflective rear wall surface 181 may be formed of a sheet metal, a metal plate, or other reflective material, whether metal or non-metal. In some examples, the rear wall surface 181 may include a reflective finish or a high emissivity coating adapted to promoted reflection of radiant energy away from the inner wall, across the burn chamber, and toward the fireplace aperture 180. In one example, the reflective finish may include a matte finish ceramic coating that radiates absorbed heat. Ultimately, such reflected infrared radiation from the rear wall surface 181 passes through the fireplace aperture 180 to warm the air and users around the fireplace aperture 180.

[0032] The highly reflective coating on the rear wall surface 181 of the inner wall 140 promotes increased reflection of radiant energy from the inner wall 140, laterally outward away from the device through the fireplace aperture 180. There are many highly reflective coatings commercially available and known in the art, as are highly reflective finishings. In some embodiments, a polished reflective metal coating may also be used on the rear wall surface of the outer wall 140 to promote reflection of radiant energy.

[0033] A top ring 135 attaches to the top of the outer wall 120 and the top of the inner wall 140, joining them into

a single body. The flame ring 130 typically rests on top of the top ring 135. In some implementations, the flame ring is formed as a part of the top ring.

[0034] This implementation includes a flow redirector 210 attachable inside the inner wall 140 above the inner fireplace aperture 180i. The flow redirector 210 interrupts the symmetry of flames generated by the combusting fuel, directing them away from the fireplace aperture 180 to some degree, for safety and aesthetic reasons. A gasket 185 (e.g., made of a heat-resistant material such as silicone or rock wool) covers the top and side edges of the outer fireplace aperture 180o, to prevent accidental contact between a user's hand and the hot edge of the outer fireplace aperture 180o. The lower edge of the outer fireplace aperture 180o is covered by the mantel 170.

[0035] Also visible are a bracing tray 220, within which sits a removable ash pan 230, as shown below in Figures 6-8.

[0036] Figure 3 is an exemplary representation of a fire grate or fuel grate 100 for the chiminea in accordance with at least one embodiment of the present disclosure. In the example shown in the figure, the fire grate is a circular, convex, ventilated dome-shaped structure 325 surrounded by a stiff outer ring 315. The outer ring 315 includes an outer rim 310 with a downward-facing lip or rollover 312 that provides stiffness, that rests on the bottom edge of the inner wall 140 (e.g., by fitting into an upward-facing lip or rollover), and makes it more difficult for the outer rim 310 of the fire grate 100 to dent, warp, or otherwise deform. The outer rim 310 may define the central vertical axis 270 of the fire grate 100. In this example, the fire grate 100 further includes a central hub 320 that is raised above the outer rim 310. The ventilated dome 325 reaches from the inner edge 318 of the stiff outer ring 315 to the outer edge the central hub 320. The ventilated dome 325 includes a plurality of ventilation holes 330, and in some embodiments the stiff outer ring 315 is devoid of ventilation holes.

[0037] The fire grate 100 has an outer diameter D 1, matched to an inner diameter of the inner wall 140. The dome portion 325 has an outer diameter D2, which is less than D 1. In an example, the fire grate 100 includes 258 circular ventilation holes 330, each having a diameter of about 10 mm. Other numbers and sizes of holes could be used (e.g., 50 - 800 holes, each with a diameter of between 0.5 cm and 1.5 cm). While more holes and/or larger holes would mean better overall ventilation, it may mean less structural material and thus a weaker structure for both the ventilated dome portion 325 and the fire grate 100 overall. Because better ventilation may result in higher combustion temperatures, the structure may weaken further due to a combination of heat softening and heat expansion. A weaker structure may have a reduced ability to support the weight of firewood or other fuel piled on top of it (see FIG. 1), and may be more prone to collapse or warping. Conversely, fewer holes and/or smaller holes may result in a stronger overall structure and better support for firewood or other fuel, it may also

result in worse ventilation and thus a lower combustion temperature, less head output, and increased generation of smoke.

[0038] The fire grate 100 in the example shown in Figure 3 may further include a plurality of radial stiffening ribs 350 that reach from the outer stiffening ring 315 to, or partway to, the central hub 320. In the example shown in Figure 2, six stiffening ribs 350 reach all the way to the central hub 320. Depending on the implementation, other lengths or numbers of stiffening ribs 350 could be used, including some ribs of a first length and other ribs of a second or third length. It is noted that adding more radial stiffening ribs 350 may leave room for fewer ventilation holes, while removing radial stiffening ribs 350 may create a weaker, less stiff, structure that is more prone to crushing and/or warping.

[0039] In addition to the plurality of ventilation holes 330, the ventilated dome 325 includes a concentric stiffening ring 360 that provides additional strength, stiffness, and stability to the structure of the fire grate 100, both at ambient temperature and at operating temperatures when a fire is burning in the modular chiminea 150 that includes the fire grate (see FIG 1). In some embodiments, the stiffening ring 360 has a taller profile than the stiffening ribs 350. In other embodiments, the fire grate 100 could include more than one stiffening ring. For example, some embodiments include between 2 and 5 stiffening rings. Even greater numbers of stiffening rings are contemplated. However, increasing the number of stiffening rings may reduce the number or size of the ventilation holes 330, with effects as described above, or else decrease the spacing between the ventilation holes 330, which may weaken the structure of the fire grate 100. In still other embodiments, the fire grate 100 may include no stiffening rings, which may result in a weaker, less stiff structure with more space available for ventilation holes. In some embodiments, the central hub 320 is not present.

[0040] In an example, the hub 320, stiffening ribs 350, and stiffening ring 360 are stamped or otherwise embossed into the material of the fire grate (e.g., stainless steel), although other fabrication methods may be employed. In an example, the dome portion 325 is a spherical section with a radius of curvature larger than one-half of a width or diameter of the fire grate. In an example, the fire grate 100 is formed from a flat, circular blank by a stamping process. In an example, the holes 330 are also formed by the stamping process, although they may alternatively be produced by drilling, laser cutting, or other methods.

[0041] In some embodiments, one or more of the holes 330 may overlap with one or more of the stiffening ribs 350, or stiffening ring 360. However, in other embodiments the hole pattern, rib pattern, and ring pattern have been selected such that no holes 330 overlap with any of the ribs 350, or ring 360.

[0042] In the example shown in Figure 3, the removable fire grate 100 also includes two grip features, shown in this example as handles 380. In other implementations,

the grip features may be shaped to interface with a fire grate removal tool. As shown, the handles are formed as openings larger than the ventilation holes 330. In the implementation shown, each of the handles or openings 380 are sized and shaped to receive human fingers and thus to serve as handles for lifting the removable fire grate 100 out of the modular chiminea 150 through the cavity or burn chamber 190. The handles 380 may be sized or shaped differently than shown herein, and may be of different number. For example, the fire grate may include one handle, three handles, or a larger number of handles.

[0043] Figure 4 is a perspective view of an example ash pan 230 and bottom portion 475 of the bracing tray 220 of the modular chiminea, in accordance with at least one embodiment of the present disclosure. The ash pan 230 has a diameter D3 which is less than the diameter D1 of the fire grate, and which may be comparable to the diameter D2 of the ventilated dome portion 325 of the fire grate 100. In some implementations, the ventilated portion of the fire grate (e.g., the ventilated dome portion 325, includes a width (e.g., a diameter) that is equal to or smaller than the width of the ash pan. Thus, when fuel combusts to ash, the ash can fall through the ventilation holes 330 in the dome portion 325 of the fire grate 100 and then fall downward into the ash pan 230. The ash pan 230 has an interior volume that determines how much ash 162 it can hold before it needs to be emptied. The interior volume of the ash pan 230 is determined at least in part by the height H and diameter D3 of the ash pan 230.

[0044] The ash pan 230 includes a side wall 402 and bottom 404. The side wall 402 includes a top lip 410, which may for example be a rolled or folded lip. In the example shown in Figure 4, the ash pan bottom 404 includes an upward-embossed central hub 420, three radial stiffening arms 430, and three downward-embossed feet 440 disposed at or near the outer edge 450 of the ash pan bottom 404. Other sizes, shapes, and numbers of feet may be used instead of or in addition to the three feet shown in Figure 4. For example, some embodiments include only two feet, sized and shaped to provide stability for the removable ash pan 230, while other embodiments include four or more feet. The sizes and shapes of the central hub 420, radial stiffening arms 430, and feet 440 may differ from those shown in Figure 4, and some embodiments may have different numbers of feet 440 or stiffening arms 430, or may lack the hub 420 and/or stiffening arms 430 altogether.

[0045] When correctly placed in the example chiminea 150, the ash pan 230 rests on the bottom 475 of the bracing tray 220. The bracing tray bottom 475 includes a raised outer ring 460 and a lowered inner ring 470, separated by a centering rim 480. The bracing tray bottom 475 also includes a ventilation opening 490, through which air can flow during combustion of the fuel in the modular chiminea 150. The feet 440 of the ash pan 230 rest on the bracing tray bottom 475 such that they are nested against the centering rim 480. This permits both the self-centering of the ash pan 230 within the modular

chiminea 150, and the maintenance of an air gap between the ash pan 230 and the bracing tray 220, with minimal effort or precision required on the part of the user.

[0046] In an example, the diameter D3 of the ash pan is less than the diameter D1 of the fire grate 100 (and thus less than the inner diameter of the inner wall 140) by an amount large enough to admit a user's fingers. The lip 410 or side wall 402 may they form one or more grippable surfaces which enable the user to grasp the ash pan 230 and lift it vertically upward through the combustion chamber 190 of the modular chiminea 150, or else return it into the modular chiminea 150 by lowering it vertically through the combustion chamber 190.

[0047] In an example, because the central hub 420 and the radial stiffening arms 430 increase the strength and stiffness of the removable ash pan 230, the overall thickness (and thus, weight) of the ash pan can be reduced, without substantially increasing the risk of heat-related warping, or of denting or other damage occurring from handling of the ash pan 230. In an example, the removable ash pan 230 may be produced quickly and at low cost by stamping a metal blank.

[0048] Figure 5 is a side view of an example modular chiminea 150, in accordance with at least one embodiment of the present disclosure. Visible are the flame ring 130, outer wall or outer body 120, fireplace aperture 180, gasket 185, inlet ventilation holes 122, and base 110. The mantel 170 sits at the bottom of the fireplace aperture 180, and includes a top surface 176, a side surface 174, and a bottom surface 172. In some embodiments, it may be possible or desirable to set objects on the top surface 176 for warming by the fire. For example, a mug of coffee or hot chocolate may be kept warm, a pair of damp socks may be dried, etc.

[0049] The modular chiminea fits within a total width (in this example, a diameter Dc) and height Hc. In an example, the width Dc is between 6 inches and 42 inches, and Hc is between 8 inches and 7 feet, although smaller and larger widths and heights are contemplated. For example, some implementations have a width in a range of 6 inches and 26 inches, and a height in a range of 11 inches and 5 feet. Yet other widths and heights are contemplated.

[0050] Figure 6 is a side cross-sectional view of an example modular chiminea 150, in accordance with at least one embodiment of the present disclosure. Visible are the flame ring 130, top ring 135, outer wall or outer body 120, inner wall or inner body 140, flow redirector 210, chimney 165, fireplace aperture 180, gasket 185, outlet ventilation holes 124, mantel 170 (including upper surface 176 and lower surface 172), removable fuel grate 100, bracing tray 220, removable ash pan 230, inlet ventilation holes 122, and base 110. As visible in Figure 6, the flow redirector 210 narrows the passage of air through the chimney. This narrow region may increase the velocity of the flow past the flow redirector 210, increasing the draw of any remaining smoke away from the fireplace aperture 180 and upward toward the chim-

ney. This may also help reduce the likelihood of flames coming out of the fireplace aperture 180. In some examples, the inner holes contribute to this flow by being disposed only in the inner circumference not directly below the fireplace aperture 180.

[0051] Figure 7 is a front cross-sectional view of an example modular chiminea 150, in accordance with at least one embodiment of the present disclosure. Visible are the flame ring 130, top ring 135, outer wall or outer body 120, inner wall or inner body 140, chimney 165, outlet ventilation holes 124, removable fuel grate 100, bracing tray 220, removable ash pan 230, inlet ventilation holes 122, and base 110.

[0052] The arrows 177 in Figure 6 and Figure 7 represent the reflective infrared (IR) radiant energy (i.e., heat) being emitted from the fireplace aperture 180. The dual-wall system of the inner wall 140 and the outer wall 120 provide a level of insulative protection that may maintain the outer surface of the outer wall 120 at a relatively low temperature compared to the surface of the inner wall 140 of the chiminea, while the fireplace aperture 180 may emit reflected IR radiant energy from the rear wall surface 181 (Figure 2) of the inner wall 140. In some implementations, the fireplace aperture 180 may emit both reflected radiant heat from the rear wall surface and radiant or convective heat from the flames and/or the fuel in the burn chamber. This radiant heat may, in some implementations, include heat from the flames formed by a) the secondary burn or the secondary combustion from the outlet ventilation holes, b) the primary burn or primary combustion from the main fuel burning as a result of the primary airflow through the fuel grate, or c) both the primary and the secondary combustion together. Convective heat also may be emitted out the top of the chimney, along with any additional radiative heat from the inner walls 140.

[0053] In some implementations, the flow redirector 210 also may reflect radiative heat (shown by the arrows 179) toward the reflective rear wall 181, which in turn may reflect the radiative heat 177 toward the fireplace opening 180. In some implementations, the flow redirector 210 may be formed of the same reflective material or have the same reflective coatings discussed herein with regard to the rear wall 181, although the surface finishes or IR reflectivity could vary between the rear wall 181 and the flow redirector 210.

[0054] Figure 8 is a front cross-sectional view of at least a portion of an example modular chiminea 150, in accordance with at least one embodiment of the present disclosure. Visible are the outer wall or outer body 120, inner wall or inner body 140, chimney 165, outlet ventilation holes 124, removable fuel grate 100, bracing tray 220, removable ash pan 230, inlet ventilation holes 122, and base 110. The bracing tray 220 is attached to, and forms the bottom of, the inner wall or inner body 140.

[0055] In the example shown in Figure 8, a first air gap 810 exists between the bottom 125 of the outer body 120 and the bottom 475 of the bracing tray 220. A second air

gap 820 exists between the bracing tray 220 and the removable ash pan 230. A third air gap 830 exists between the removable ash pan 230 and the removable fuel grate 100. A fourth air gap 840 exists between the outer wall or outer body 120 and the inner wall or inner body 140. The air gaps serve both an insulating and cooling function, to keep exterior surfaces cooler, and an oxygen circulation function, to promote primary and secondary combustion.

[0056] The design of the modular chiminea 150 enables an air flow pattern favorable to both primary and secondary combustion. Cool outside air 850 enters through the lower ventilation holes or inlet ventilation holes 122 into air gap 810 between the bottom 125 of the outer body 120 and the bottom 475 of the bracing tray 220. There, the air divides into two separate flows: an upward flow 860 and a radial flow 870.

[0057] In the radial flow 870, cool air passes into the ventilation opening 490 in the bottom 475 of the bracing tray 220 (see Figure 4), then radially outward through air gap 820 between the bracing tray 220 and the removable ash pan 230, then upward to the air gap 830 between the removable ash pan 230 and the removable fuel grate 100, where it is warmed. From there, the air moves vertically through the fuel grate 100. The introduction of warm, fresh (e.g., oxygenated) air into the combustion chamber supports flames or primary combustion 890 of the fuel 880.

[0058] In the upward flow 860, cool air passes into air gap 840 between the outer wall 120 and inner wall 140, where it is warmed, then radially inward through the upper ventilation holes or outlet ventilation holes 124. The introduction of warm, fresh (e.g., oxygenated) air into the combustion chamber 190 above the fuel 880 and primary combustion flame 890, creates secondary combustion 895 of un-combusted smoke, gas, and soot emitted by the burning fuel 880. This secondary combustion 895 improves the total output of energy (e.g., heat and light) from the fuel 880, while decreasing the amount of smoke, soot, and organic gases emitted from the modular chiminea 150. In an example, a percentage of the smoke, soot, and organics are converted into ash 898, carbon dioxide, nitrogen gas, and water vapor rather than being emitted from the modular chiminea 150 in their original form.

[0059] The ash 898 falls through the openings in the removable fuel grate and is collected in the removable ash pan 898. When the chiminea is cool, the ash pan can be emptied by reaching in through the fireplace aperture and removing the fuel grate 100 (e.g., by its handles) through the fireplace aperture. Depending on the implementation, the fuel grate 100 may be removable through the fireplace aperture in a horizontal orientation. In other embodiments, the fuel grate 100 may be removable through the fireplace aperture in a diagonal orientation (e.g., aligned with the corners of the fireplace aperture). Once the fuel grate 100 is removed, the ash pan 230 can also be removed through the fireplace aperture. Once the

ash pan 230 is emptied, it can be replaced into the combustion chamber 190 through the fireplace aperture, and the fuel grate 100 can be replaced into the combustion chamber 190 and positioned on top of the ash pan 230.

[0060] Depending on the implementation, the air gaps 810, 820, 830, and 840 may be differently sized or shaped than the examples shown here, while still performing the functions described herein.

[0061] In some implementations, the lower ventilation holes 122 are disposed in the sides of the base or stand 110. Accordingly, the air flow would start lower, and would flow upward through the bracing tray as described herein. In some implementations, the upper ventilation holes 124 are disposed above the front opening or fireplace aperture 180 instead of below. In such embodiments, the air flow may include air drawn inwardly through the front opening or fireplace aperture 180 that intermingles with a portion of the air from the upper ventilation holes 124. In some implementations, the chiminea includes inner ventilation holes at multiple levels. For example, some of the inner ventilation holes 124 may be disposed as shown herein below the fireplace aperture 180, while other inner ventilation holes may be disposed at a different elevation, such as above the fireplace aperture 180. In some implementations, the number of inner ventilation holes or the combined area of the inner ventilation holes may be higher for the lower inner ventilation and lower for the inner ventilation holes at a higher elevation. Yet other configurations are contemplated.

[0062] As will be readily appreciated by those having ordinary skill in the art after becoming familiar with the teachings herein, the modular chiminea advantageously provides a unique outdoor experience, while magnifying the amount of light and heat and minimizing the amount of smoke and/or soot given off by the combusting fuel.

[0063] A number of variations are possible on the examples and embodiments described above. For example, the modular chiminea could be taller shorter, wider, or narrower than described herein. It could have more or fewer components, while still performing the functions described herein. It could be made in different shapes. For example, although the modular chiminea described herein is circular in cross section, it could instead be square, rectangular, triangular, oval, polygonal, etc. Any of the components described herein may be metallic (e.g., stamped or rolled stainless steel), or may be made of other materials including but not limited to polymers, ceramics, composites, or otherwise.

[0064] Accordingly, the pieces and/or logical operations making up the embodiments of the technology described herein are referred to variously as operations, steps, objects, elements, components, or modules. Furthermore, it should be understood that these may occur, or be performed or arranged in any order, unless explicitly claimed otherwise or a specific order is inherently necessitated by the claim language.

[0065] All directional references e.g., upper, lower, in-

ner, outer, upward, downward, left, right, lateral, front, back, top, bottom, above, below, vertical, horizontal, clockwise, counterclockwise, proximal, and distal are only used for identification purposes to aid the reader's understanding of the claimed subject matter, and do not create limitations, particularly as to the position, orientation, or use of the modular chiminea. Connection references, e.g., attached, coupled, connected, joined, or "in communication with" are to be construed broadly and may include intermediate members between a collection of elements and relative movement between elements unless otherwise indicated. As such, connection references do not necessarily imply that two elements are directly connected and in fixed relation to each other. The term "or" shall be interpreted to mean "and/or" rather than "exclusive or." The word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality. Unless otherwise noted in the claims, stated values shall be interpreted as illustrative only and shall not be taken to be limiting.

[0066] The above specification, examples and data provide a complete description of the structure and use of exemplary embodiments of the modular chiminea as defined in the claims. Although various embodiments of the claimed subject matter have been described above with a certain degree of particularity, or with reference to one or more individual embodiments, those skilled in the art could make numerous alterations to the disclosed embodiments without departing from the spirit or scope of the claimed subject matter.

[0067] Still other embodiments are contemplated. It is intended that all matter contained in the above description and shown in the accompanying drawings shall be interpreted as illustrative only of particular embodiments and not limiting. Changes in detail or structure may be made without departing from the basic elements of the subject matter as defined in the following claims.

[0068] The following numbered statements indicate additional novel and inventive combinations of features that define preferred embodiments of the invention disclosed herein:

1. A method for burning combustible fuel, the method comprising:

providing a structure comprising:

an outer wall defining a lower portion and a tower portion;
an inner wall separated from the outer wall by an air gap and defining a combustion chamber within the lower portion and a chimney within the tower portion;
a fireplace aperture through the outer wall and inner wall;
a mantel disposed below the fireplace aperture and projecting outward from the outer wall;

- a plurality of inlet ventilation holes disposed in the lower portion of the outer wall;
- drawing air in through the plurality of inlet ventilation holes; 5
- expelling a first portion of the air into a lower portion of the combustion chamber to support primary combustion of a fuel; and
- expelling a second portion of the air into an upper portion of the combustion chamber to support secondary combustion of gases, smoke, or soot emitted by the fuel during primary combustion. 10
2. The method of statement 1, further comprising providing a base different than the outer wall, and positioning a bottom of the outer wall on a top of the base. 15
3. The method of statement 1 or 2, further comprising directing radiant heat with a flow redirector within the chimney above the fireplace aperture. 20
4. The method of statement 1, 2 or 3, further comprising supporting the fuel on a removable fuel grate disposed within the combustion chamber. 25
5. The method of statement 4, further comprising collecting ash from the primary and secondary combustion in a removable ash pan disposed within the combustion chamber below the removable fuel grate. 30
6. The method of statement 5, wherein each of the removable fuel grate and the removable ash pan are removable from the combustion chamber via the fireplace aperture. 35
7. A system for burning combustible fuel to provide light and heat, the system comprising: 40
- a double-walled body defining a lower portion and a tower portion;
- a combustion chamber disposed within the lower portion; 45
- a chimney disposed within the tower portion;
- an air gap disposed between walls of the double-walled body;
- a fireplace aperture disposed within the tower portion; 50
- a mantel disposed below the fireplace aperture and projecting outward from the double-walled body;
- a plurality of inlet ventilation holes disposed in an outer surface of the lower portion; 55
- a plurality of outlet ventilation holes disposed in an inner surface of the combustion chamber;
- a base different than the double-walled body

and disposed at a bottom of the double-walled body;

a flow redirector disposed within the chimney above the fireplace aperture;

a removable fuel grate disposed within the combustion chamber; and

a removable ash pan disposed below the removable fuel grate.

8. The system of statement 7, wherein the double-walled body, air gap, removable ash pan, and removable fuel grate are configured such that air entering through the plurality of inlet ventilation holes exits through both the plurality of outlet ventilation holes and a plurality of ventilation holes in the removable fuel grate,

wherein air exiting through the plurality of ventilation holes in the removable fuel grate facilitates primary combustion of a fuel disposed on the removable fuel grate, and

wherein air exiting through the plurality of outlet ventilation holes supports secondary combustion of gases, smoke, or soot emitted by the fuel.

Claims

1. A portable fireplace for burning combustible fuel, the portable fireplace comprising:
- an outer wall defining a lower portion and a tower portion;
- an inner wall separated from the outer wall by an air gap and defining a combustion chamber within the lower portion and a chimney within the tower portion;
- a fireplace aperture through the outer wall and inner wall;
- a plurality of inlet ventilation holes configured to draw air from an environment outside the portable fireplace; and
- a plurality of outlet ventilation holes in communication with the inlet ventilation holes and the air gap, the plurality of outlet ventilation holes disposed in the inner wall within the combustion chamber below the aperture.
2. The portable fireplace of claim 1, further comprising a base different than the outer wall and disposed at a bottom of the outer wall.
3. The portable fireplace of claim 1 or 2, further comprising a flow redirector disposed within the chimney above the fireplace aperture.
4. The portable fireplace of claim 1, 2 or 3, further comprising a removable fuel grate disposed within

the combustion chamber.

5. The portable fireplace of claim 4, further comprising a removable ash pan disposed below the removable fuel grate. 5
6. The portable fireplace of claim 4 or 5, wherein the inner wall, outer wall, air gap, removable ash pan, and removable fuel grate are configured such that air entering through the plurality of inlet ventilation holes exits through both the plurality of outlet ventilation holes and a plurality of ventilation holes in the removable fuel grate. 10
7. The portable fireplace of claim 6, wherein air exiting through the plurality of ventilation holes in the removable fuel grate facilitates primary combustion of a fuel disposed on the removable fuel grate, optionally wherein air exiting through the plurality of outlet ventilation holes supports secondary combustion of gases, smoke, or soot emitted by the fuel. 15 20
8. The portable fireplace of any preceding claim, comprising a mantel disposed below the fireplace aperture and projecting outward from the outer wall. 25
9. A portable fireplace for burning combustible fuel, the portable fireplace comprising:
 - a lower portion comprising: 30
 - an outer wall; and
 - an inner wall separated from the outer wall by an air gap and defining a combustion chamber; 35
 - a fuel grate configured to support fuel and defining a portion of the combustion chamber;
 - a chimney disposed above the lower portion, the chimney being arranged to draw smoke from the combustion chamber therethrough; 40
 - a fireplace aperture in one of the lower portion and the chimney, the fireplace aperture being disposed at an elevation above the fuel grate and providing visual, lateral access to an interior of the combustion chamber; 45
 - an inlet ventilation hole in one of the lower portion and the chimney, the inlet ventilation hole being configured to draw air from outside the portable fireplace and into the air gap between the outer wall and the inner wall; 50
 - a first outlet ventilation hole configured to introduce drawn air at an elevation below the fuel grate to feed flames of fuel on the fuel grate and generate a primary burn of the fuel; and 55
 - a second outlet ventilation hole disposed in the inner wall to introduce air into the combustion

chamber at an elevation above the fuel grate to accommodate a secondary burn of the fuel, the second outlet ventilation hole being in fluid communication with the air gap between the outer wall and the inner wall and with the inlet ventilation hole and configured to provide air for passage through the chimney.

10. The portable fireplace of claim 9, wherein the first outlet ventilation hole is in fluid communication with the inlet ventilation hole; and/or the portable fireplace further comprising a base forming a part of the lower portion, the inlet ventilation hole being disposed on an outer surface of at least one of the outer wall and the base.
11. The portable fireplace of claim 9 or 10, further comprising a second inlet ventilation hole, the second inlet ventilation hole being in fluid communication with the first outlet ventilation hole; and/or wherein either the second outlet ventilation hole is disposed at an elevation lower than the fireplace aperture or the second outlet ventilation hole is disposed at an elevation higher than the fireplace aperture.
12. A portable fireplace for burning combustible fuel, the portable fireplace comprising:
 - an outer wall; and
 - an inner wall separated from the outer wall by an air gap and defining a combustion chamber;
 - a fuel grate configured to support fuel and defining a portion of the combustion chamber;
 - a fireplace aperture through both the inner wall and the outer wall, the fireplace aperture being disposed at an elevation above the fuel grate and providing visual, lateral access to an interior of the combustion chamber;
 - an open top configured to pass convective heat when fuel is burned on the fuel grate;
 - a first outlet ventilation hole configured to introduce air into the combustion chamber at an elevation below the fuel grate to feed flames of fuel on the fuel grate and generate a primary burn of the fuel; and
 - a second outlet ventilation hole disposed at an elevation above the fuel grate to accommodate a secondary burn of the fuel, the second outlet ventilation hole being in fluid communication with the air gap between the outer wall and the inner wall.
13. The portable fireplace of claim 12, comprising an inlet ventilation hole in fluid communication with at least one of the first outlet ventilation hole and the second ventilation outlet hole to draw air used for combustion of fuel on the fuel grate.

14. The portable fireplace of claim 12 or 13, wherein the inner wall comprises an infrared reflective surface opposite the fireplace aperture, the infrared reflective surface configured to reflect radiative energy out of the fireplace aperture. 5
15. The portable fireplace of claim 14, further comprising a reflective redirector facing the infrared reflective surface opposite the fireplace aperture, the reflective redirector configured to reflect radiative energy toward the infrared reflective surface opposite the fireplace aperture. 10

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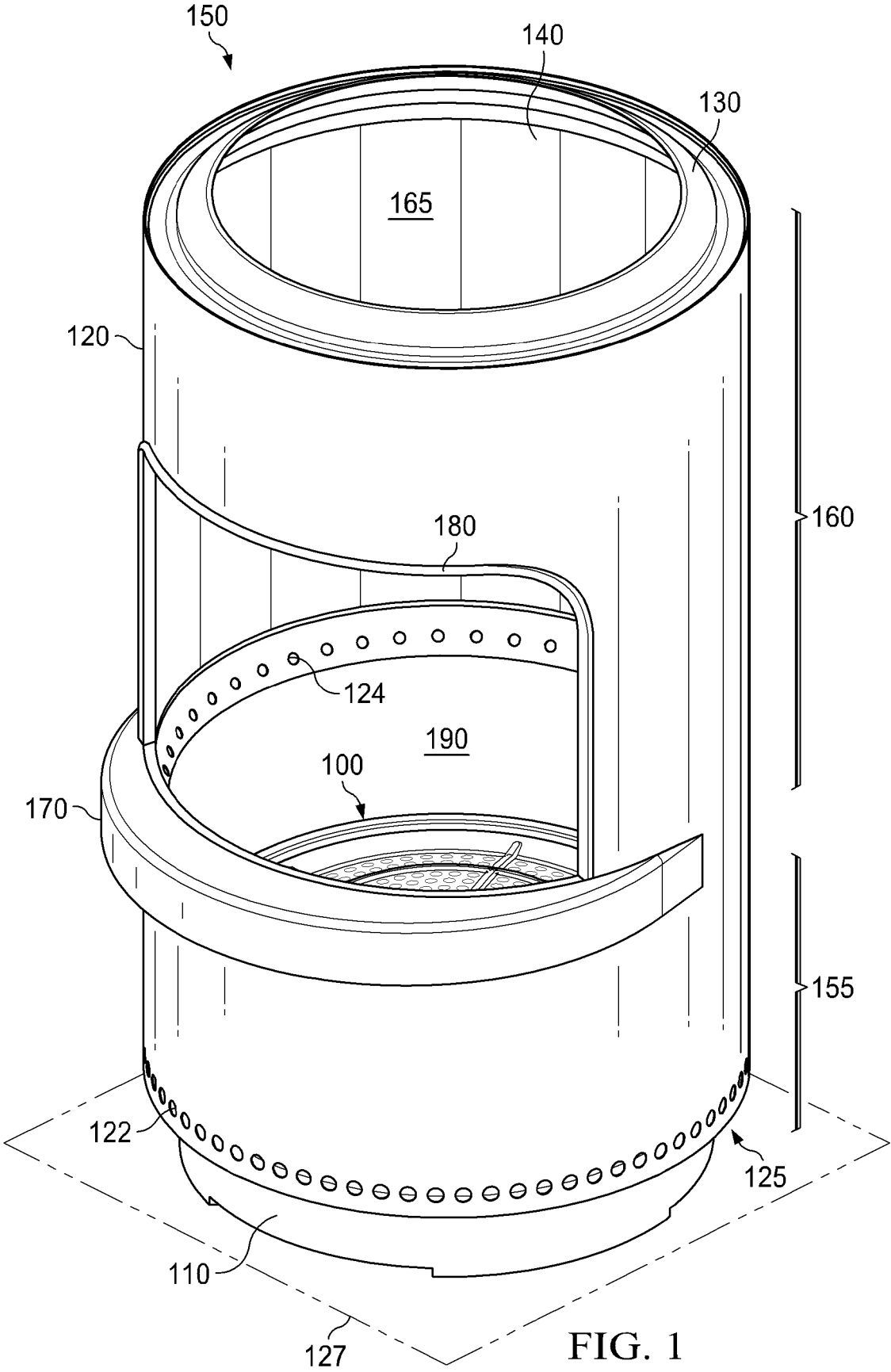
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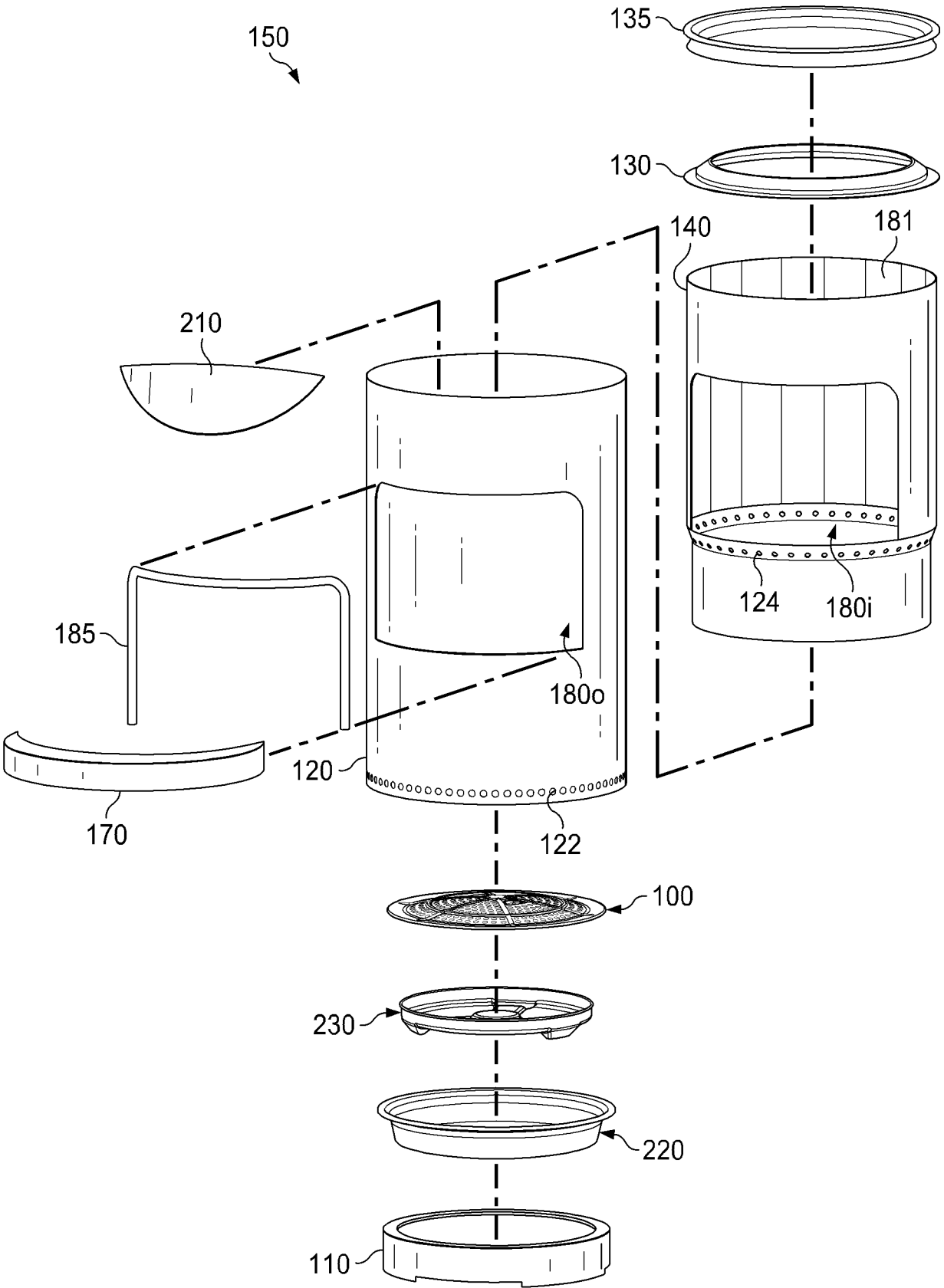


FIG. 2

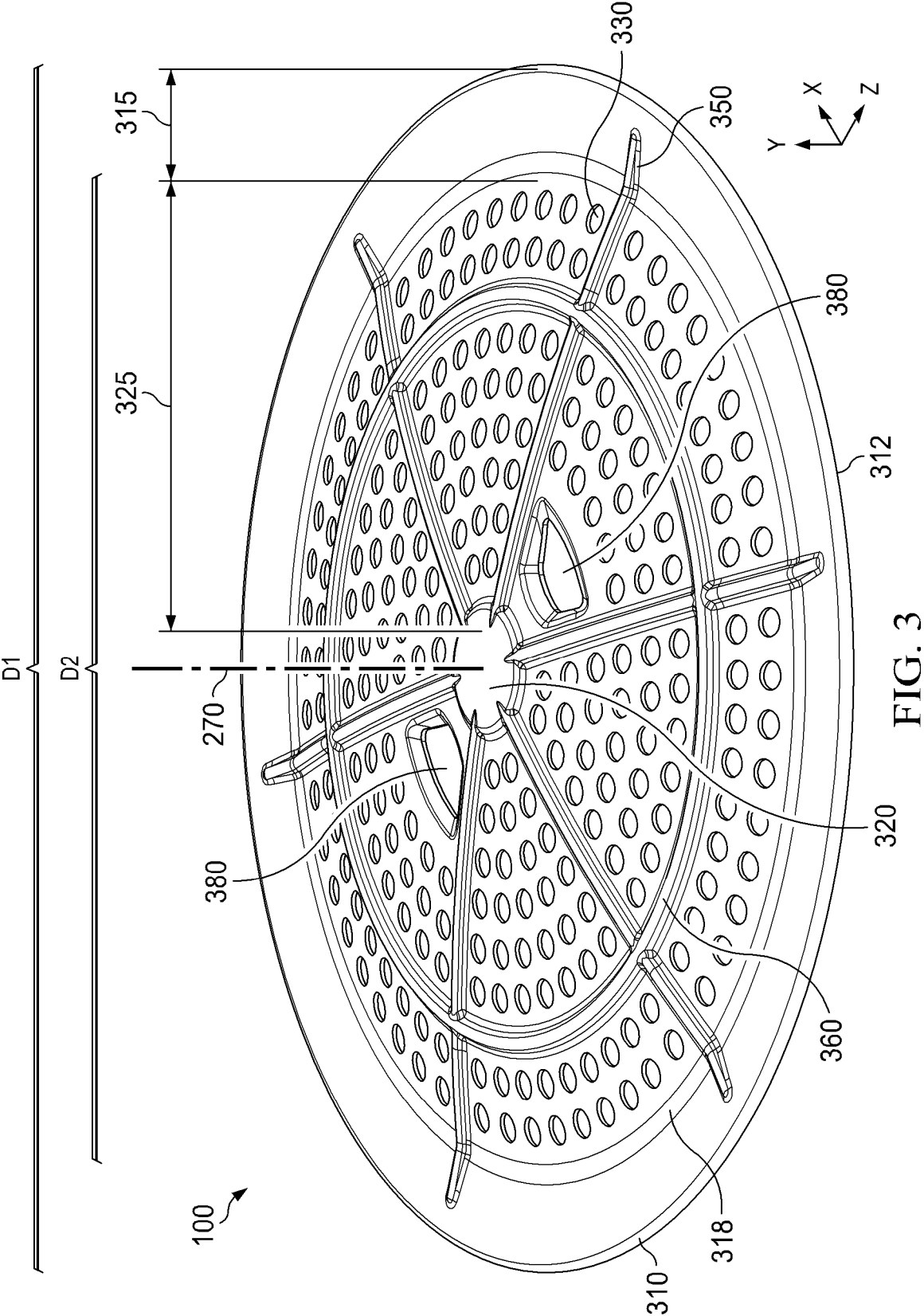


FIG. 3

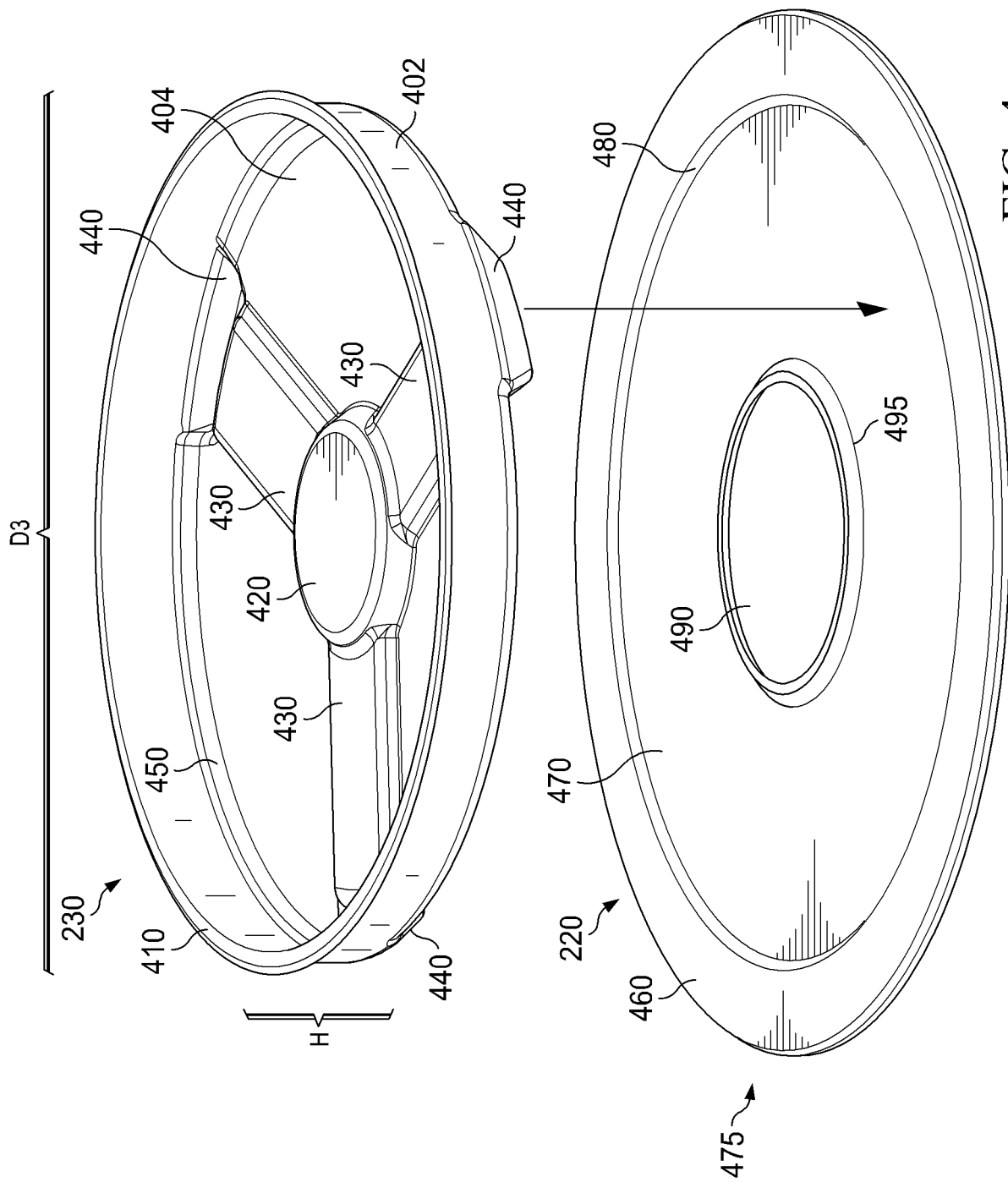


FIG. 4

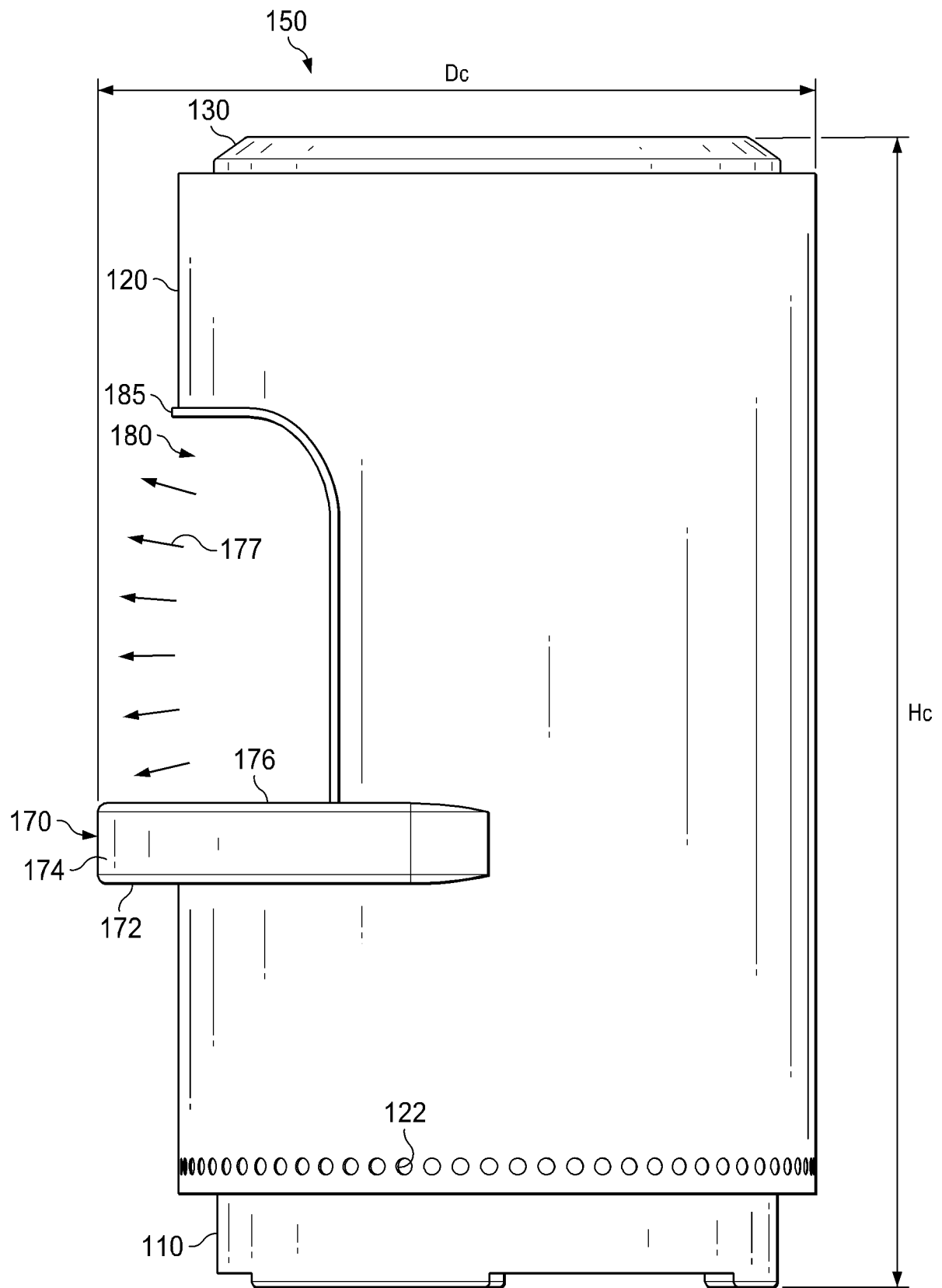


FIG. 5

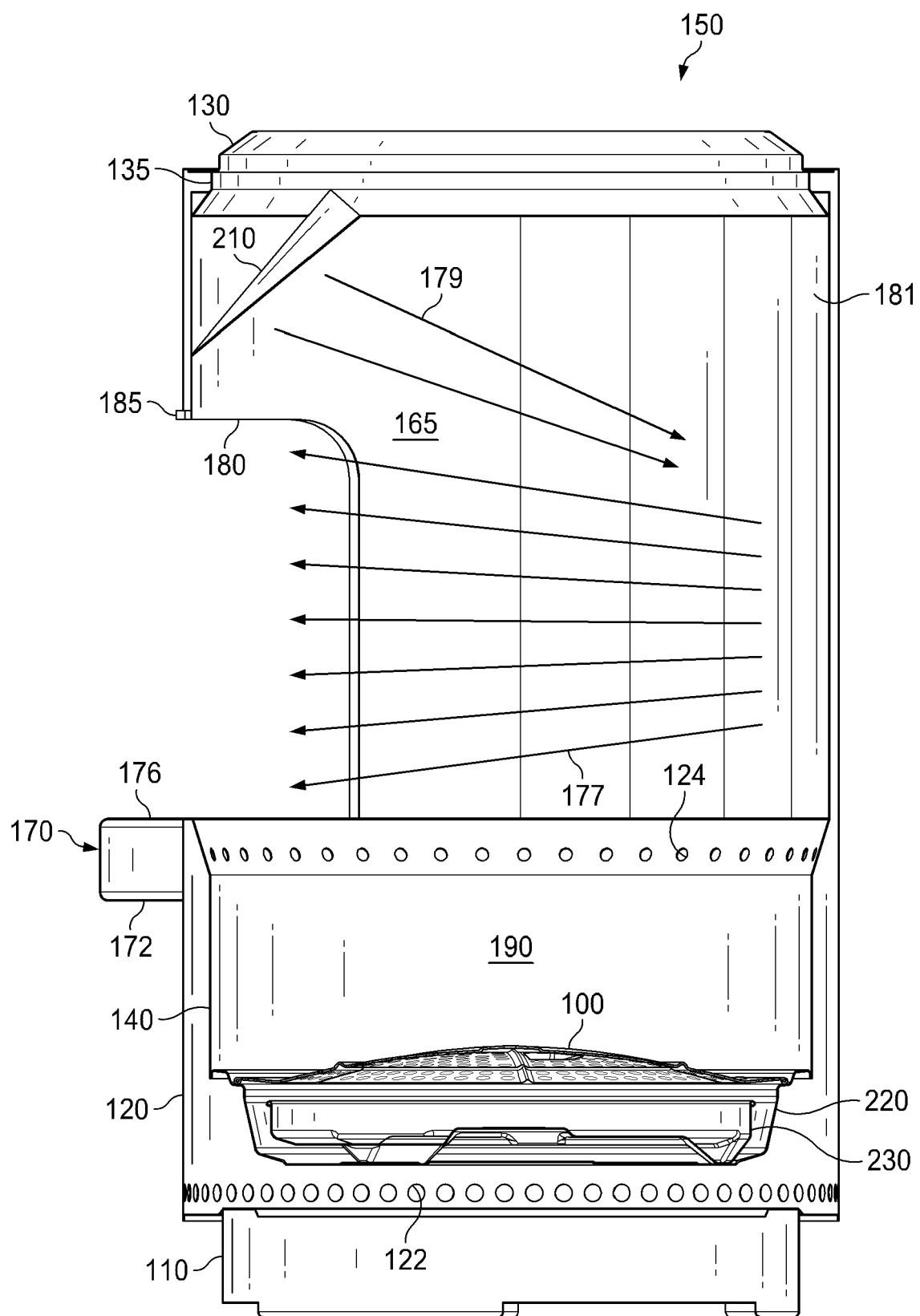


FIG. 6

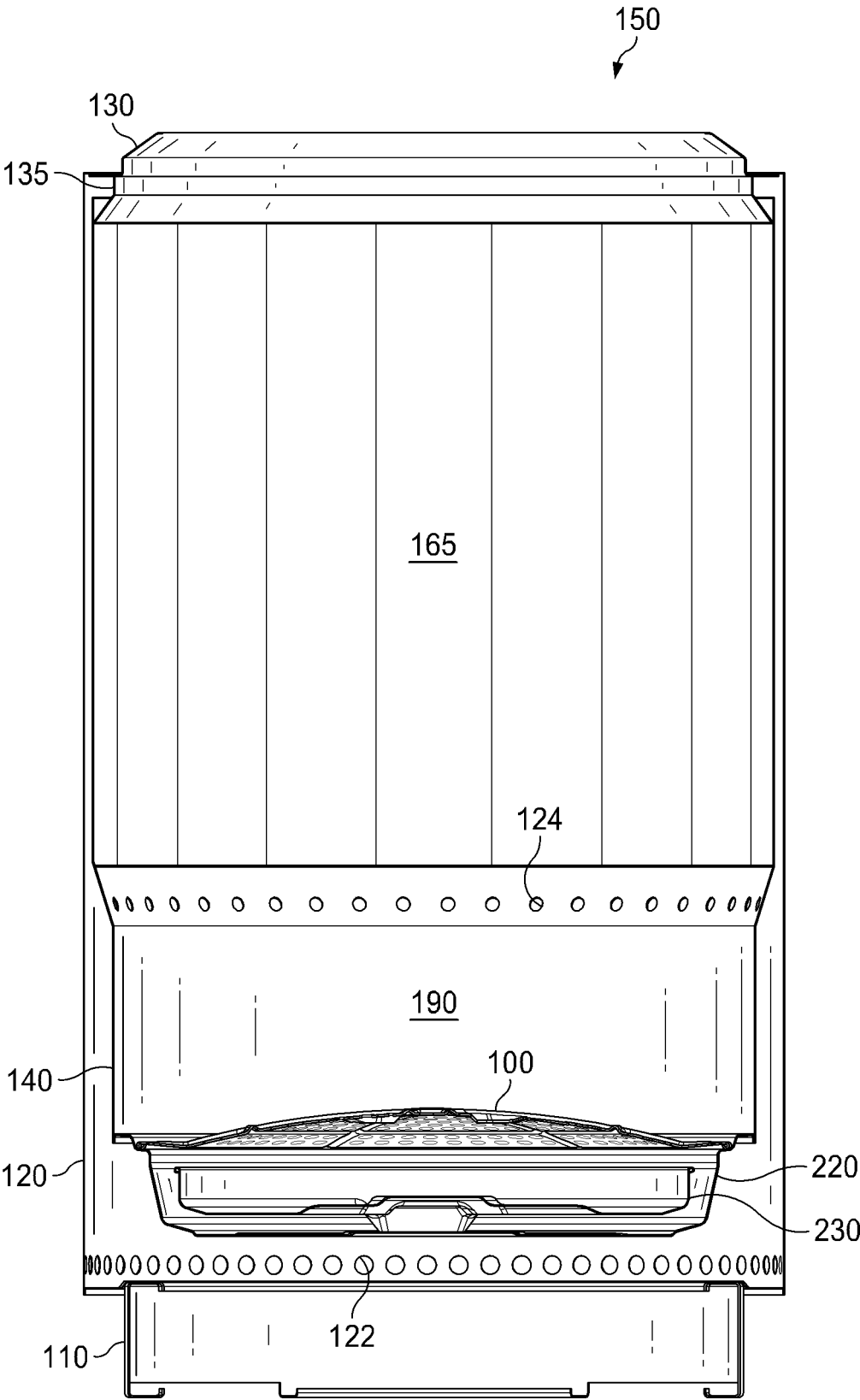


FIG. 7

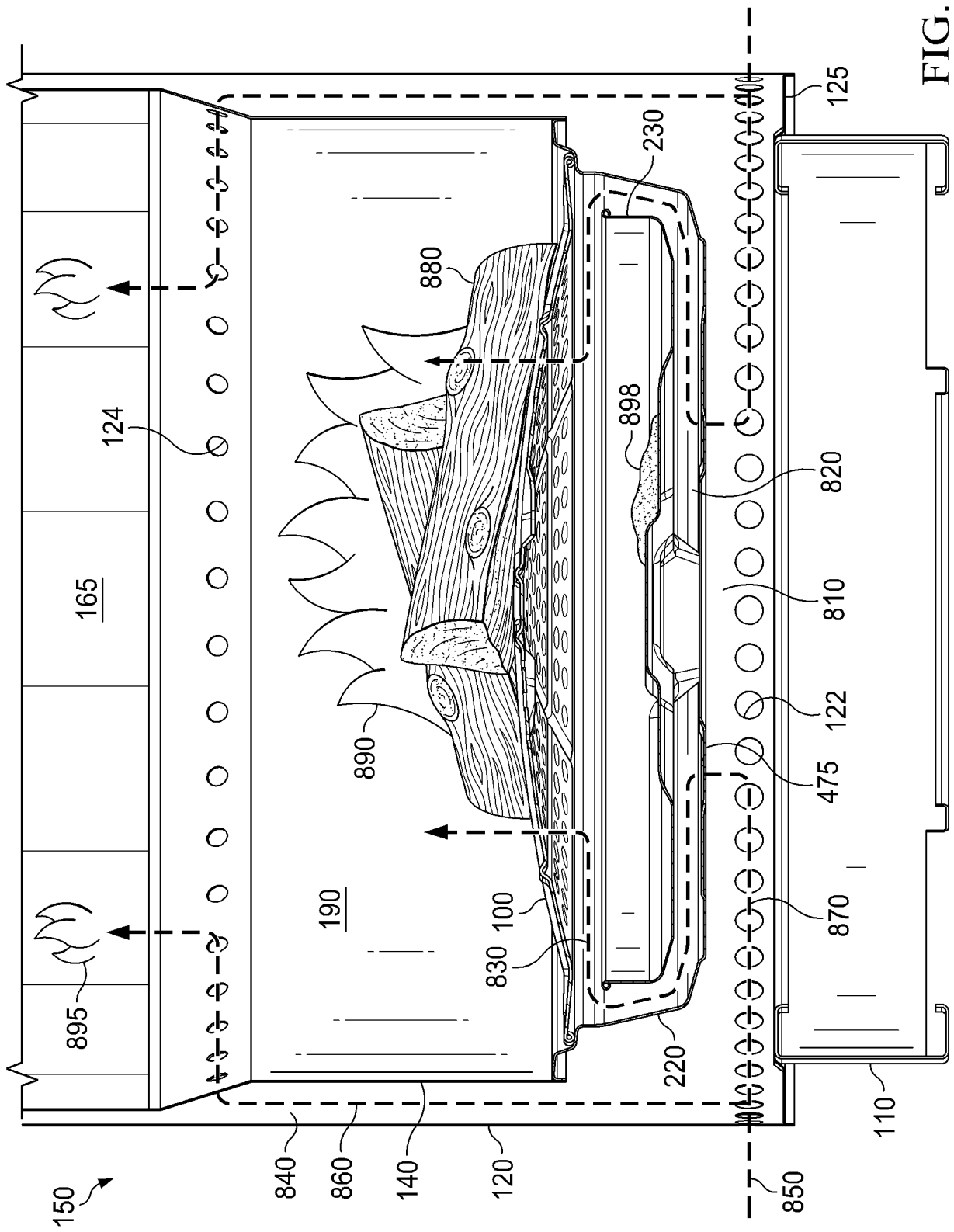


FIG. 8

REFERENCES CITED IN THE DESCRIPTION

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