SOLID FUEL COOK SYSTEM

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ABSTRACT

A vertically disposed charcoal type grill or cook system with an insulated wall, includes concentric design mechanisms for completely surrounding the food material by the solid heat source. The systems provide for a removable fuel basket which carries the fuel material and a set of interchangeable and removable food basket that carry the food to be cooked internal to the fuel system. The grill is covered with a top possessing a reflective under surface.

DIAGRAMS

Side View with Cover
DIAGRAMS

Side View with Cover

Fig. 1
Fig. 1A

Schematic Cross Section along A--B
Side View Showing Kindling Process

Fig. 2
Schematic Top View without Grill Cover
Side View Showing Tiered Fuel Basket

Fig. 5
SOLID FUEL COOK SYSTEM

FIELD OF THE INVENTION

[0001] The present invention relates to cookers or grills, specifically to those cooking systems which generate cooking heat by burning combustible fuels such as charcoal, wood or biomass type derivatives.

BACKGROUND INFORMATION

[0002] Grills or cookers have become ubiquitous fixtures for preparing food in many places of the world, ranging from modern suburban metropolises to the rural hinterlands in emerging countries. Generally, grills commonly known as charcoal grills, cook food over a burning bed of fuel such as bits or briquettes of charcoal, wood or other combustible biomass material. A lid is sometimes used to cover the food and keep heat close to the food material.

[0003] Known grill types fall into three basic groups. Vertically disposed systems in which the burning combustible fuel is usually below the food; heat flow is upwards; horizontal systems in which the fire is lateral to the burning fuel compartment which then allows the hot gases to flow horizontally over the food material. Finally, indirect heating in which the heat is reflected from a heat source to the food via some reflecting medium.

[0004] Grills in general, control the cooking conditions by controlling the burning heat rate by the amount of air contacting the fuel or by changing the distance between the food material and the charcoal material.

PRIOR ART

[0005] Patent Application 20090199839, describes a typical vertical food cooker which includes all requirements for fuel, food and for controlling air into the grill burner.

[0006] U.S. Pat. No. 6,736,128 teaches a portable charcoal cooker with fuel starting materials and charcoal in separate compartments, with a grill rack above the compartment.

[0007] U.S. Pat. No. 3,769,901 illustrates a horizontal axis type cooker. The heated gases from a fuel firebox, which is located laterally at one end of the housing, rise over a baffle, flow through a cooking region, and exhaust out through a flue at the other end of the housing.

[0008] U.S. Pat. No. 4,683,866 is a rotisserie type; charcoal cooker has a cooker bowl and a lid dimensioned to cover the bowl during cooking. Food is supported within the cooker on a support grid. A primary grate is disposed within the bowl below the food support is configured to support a charcoal fire.

[0009] U.S. Pat. No. 6,363,925 illustrates a grill on wheels, which is a typical backyard charcoal grill, with table-like surfaces, and adjustable air vents in grill cover. In this grill the user can adjust the vertical distance between a fuel grate and a cooking grid by rotating a control knob located on the surface of the charcoal grill. The charcoal grill further includes a removable ash collector located at the bottom of the charcoal grill.

[0010] U.S. Pat. No. 6,557,544 relates to a typical vertical table-like charcoal cooker. The charcoal cooker comprises: a charcoal burning part, a cooking part for cooking food, an inner space receiving ash and food residue.

[0011] U.S. Pat. No. 6,598,598 teaches a charcoal grill having a cool base assembly for preventing burns and damage to a tabletop. It comprises a casing with a refractory mass, below which has an upper free air space made by insulators, and a lower free air space created by a base plate having feet or openings.

[0012] U.S. Pat. No. 4,576,140 illustrates a portable charcoal grill with a tripod leg arrangement with an ash catcher supported by the legs.

[0013] U.S. Pat. No. 3,848,577 provides for a charcoal fire starter and grill incorporating an open ended tubular body with a perforated grate into a charcoal chamber and a combustion chamber.


[0015] U.S. Pat. No. 5,722,388 describes a charcoal burning grill, with a coal duct with a vertical U cross sectional form and lateral air vents, a grease trap tray inserted into the ducts’ outer walls, with tapering guide walls rising upward from the ducts’ outer walls to form a cover.

[0016] U.S. Pat. No. 4,469,019 describes a rotisserie type barbecue grill comprising a fire bowl, legs for supporting the fire bowl, a cooking grill above the fire bowl rotating about a generally vertical axis, and a rod which is selectively mountable in a generally horizontal position above the cooking grill for use as a spit and in a generally vertical position for use in rotating the cooking grill.

[0017] U.S. Pat. No. 6,776,084 is a cylindrical type grill with an extension at its top side, a hollow-cylindrical center part attached to the base, one or several rests attached to this hollow-cylindrical center part and several coal pans inserted in the rests.

[0018] U.S. Pat. No. 6,363,925 teaches a charcoal grill includes an adjusting mechanism between a fuel grate and a cooking grid. This mechanism provides a safer and more convenient way of adjusting the distance between the burning fuel and the food being cooked.

[0019] U.S. Pat. No. 6,736,128 provides for portability. It portable charcoal cooker includes a housing having side doors for loading starting materials and charcoal in separate compartments, a grill rack above the compartment, and a pivoting cover provided with a handle for transporting the cooker. The cooker is placed on end with the top door open to lights the starting materials and ignite the charcoal. After the charcoal is lit, the cooker is placed on its base and the cover opened to present the cooker rack for cooking.

[0020] Application 20090199839 describes a complex vertical food cooker which includes: (a) an open-bottomed upper warming portion; (b) a cooker base portion including; (c) a cooker mid portion; and (d) grate brackets attached to the support frame.

[0021] U.S. Pat. No. 5,485,816 shows an oven which utilizes charcoal as the source of cooking heat is disclosed, the oven having a thermostatically controlled charcoal ignition means used only to ignite and then reignite the charcoal in response to any temperature drop below a predetermined lower limit.

[0022] U.S. Pat. No. 6,995,340 describes a portable oven includes a foldable cooker and a chassis, and the foldable cooker has two symmetric sets of heating boxes. The two heating boxes can be folded together for an easy carry after its use.

[0023] U.S. Pat. No. 3,817,164 describes a convection grill device in which an upstanding heater device which is asymmetrically implemented in a vertical cylinder jacket circulates.
air via a mechanically top driven propeller. Air passing over the grilled object is drawn through the vertical heater element via the propeller device.

[0024] There is a universal and important need to heat the food material more efficiently and more effectively. Making more productive use of the heat energy produced by the heater device can increase efficiency. Effectiveness can be improved by making a device that is more user friendly and one that minimizes deleterious emissions affecting the human users. Both areas of needed change can be addressed by either the surrounding the food with the heat source which negates the need to rotate the food, or by allowing the food to rotate or move in front of the heat source. Typical rotisseries perform the latter process. The subject invention surrounds the stationary food with the surrounding heat source.

[0025] Regardless of the mechanical design, most grills today only cook the food from one side necessitating the need to utilize a rotating type apparatus to rotate the food while cooking; or to manually flip the food over to allow cooking on both sides.

[0026] There exists a need in the art for a more capable grilling system that can allow for efficient heat transfer from the hot charcoal material to the food material; also for systems that allow for rapid grilling, as well as provide for safe and clean operation in diverse environments ranging from suburban backyards to rural village settings.

SUMMARY OF THE INVENTION

[0027] A grill according to an exemplary embodiment of the present invention provides a generally cylindrical grill body, an internally positioned removable fuel basket which contains the fuel, an internally positioned removable food basket which contains the food material and auxiliary systems to allow for efficient cooking and grilling. The grill top of a preferred embodiment utilizes a curved reflective surface on the underside.

[0028] An embodiment of the present invention further provides a removable ash collector located at the bottom of a grill.

[0029] Furthermore a grill according to an embodiment of the present invention incorporates an insulation system inside the outer metal skin which minimizes the heat loss outwardly and keeps the sensible heat preferentially directed on to the food material.

[0030] This invention provides an improvement in charcoal grilling technology whereby greater efficiency is achieved from the heat energy produced by the combusting fuel. The insulation system in the invention also minimizes the use of solid fuel since more of the heat is preferentially directed at the food to be heated by the radially situated heat sources and by the reflective nature of the top covering.

[0031] This invention further allows the user to have better control of the heating process by strategically placing the heat source at different tier levels inside the grill device, thus allowing a better distribution of heat energy.

[0032] This invention allows a grill operation with little or no flare-ups during cooking, since the drippings do not drop directly onto hot burning solid fuel.

[0033] This invention addresses the need to rapidly interchange food types by using a simple fuel basket of variable design.

[0034] An objective of this invention is to increase the food cooking rate by completely and mostly uniformly surrounding the food material by heat energy.

[0035] Another specific objective is to utilize an insulation system to limit unproductive heat loss outward away from the grill heat source.

[0036] Another specific objective is to position the hot fuel basket in close contact with the heated food mass allowing for rapid heat transfer and more efficient cooking.

[0037] Another specific objective is to utilize a reflective polished grill cover to refocus potentially lost vertical radiant energy back downward into the food basket.

[0038] Another specific objective is to allow for the adjustment of the heat rate by a simple control of the air flow through the grill using simple vents.

[0039] Another specific objective is to utilize an outer cylindrical shape which effectively focuses the heat produced towards the focal center of the grill.

[0040] Another specific objective is to utilize interchangeable food baskets thus allowing a variety of foods to be cooked.

[0041] Another specific objective is to utilize tiered food baskets which can allow a plurality of different types of food to be cooked simultaneously.

[0042] Another specific objective is to minimize and limit food sticking to the hot grill surfaces.

[0043] Another specific objective is to minimize flame flare-ups caused by drippings from the hot food onto hot fuel thus affecting the food cooking process by burning the food non-uniformly.

[0044] Another specific objective is to optimize and minimize the quantity of solid fuel needed to achieve comparable levels of heating as in a conventional oven type grill system.

[0045] Another specific objective is to allow ash to be released by gravity into an ash collector.

[0046] Another specific objective is to utilize a simple kindle process to ignite the solid fuel.

[0047] Another specific objective is to simplify grill construction with the use of simply manufactured circular grid elements.

BRIEF DESCRIPTION OF THE DRAWINGS

[0048] The present invention is explained by means of the embodiments described in FIGS. 1 to 6.

[0049] FIG. 1 shows a sectioned side view of the grill device. This figure also shows the top cover and the ash collector in place.

[0050] FIG. 1A is a detailed cross-section of the grill along the line A-B of FIG. 1.

[0051] FIG. 2 is a cross-section view of the device without the top cover removed.

[0052] FIG. 3 is a plan view of a horizontal cross-section of the embodiment.

[0053] FIG. 4 is a plan view of a horizontal cross-section showing an embodiment with an additional internal fuel basket.

[0054] FIG. 5 shows a sectioned side view of the grill device with an embodiment showing a tiered fuel basket embodiment.

[0055] FIG. 6a and FIG. 6b show sectional side view of the removable and interchangeable food basket variations.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0056] Turning now descriptively to the drawings, in which similar reference characters denote similar elements through-
out the several views, the Figures illustrate a method of disposing of nuclear waste in underground rock formations of the present invention. With regard to the reference numerals used, the following numbering is used throughout the various drawing figures.

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Owen wall element</td>
</tr>
<tr>
<td>2</td>
<td>Insulation element</td>
</tr>
<tr>
<td>3</td>
<td>Food basket or food grate</td>
</tr>
<tr>
<td>3a</td>
<td>Food basket hook</td>
</tr>
<tr>
<td>4</td>
<td>Leg support</td>
</tr>
<tr>
<td>5</td>
<td>Ash collector</td>
</tr>
<tr>
<td>5a</td>
<td>Ash</td>
</tr>
<tr>
<td>6</td>
<td>Ash release</td>
</tr>
<tr>
<td>7</td>
<td>Cover</td>
</tr>
<tr>
<td>7a</td>
<td>Curved reflective surface</td>
</tr>
<tr>
<td>8</td>
<td>Adjustable air vents</td>
</tr>
<tr>
<td>9</td>
<td>Charcoal briquettes</td>
</tr>
<tr>
<td>10</td>
<td>Fuel basket or grate</td>
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<tr>
<td>10a</td>
<td>Inner Fuel Basket</td>
</tr>
<tr>
<td>11</td>
<td>Support grate</td>
</tr>
<tr>
<td>12</td>
<td>Kindler material</td>
</tr>
<tr>
<td>13</td>
<td>Flame</td>
</tr>
<tr>
<td>14</td>
<td>Ignition chamber</td>
</tr>
<tr>
<td>15</td>
<td>Support element</td>
</tr>
<tr>
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<td>Food samples</td>
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<td>Handle</td>
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<tr>
<td>18,18a,18b</td>
<td>Food basket types</td>
</tr>
</tbody>
</table>

[0057] The present invention will be now described, noting that to one skilled in the art that the present invention may be practiced with various modifications and embodiments.

[0058] FIG. 1 illustrates a vertical cross-section side view of a grill according to an exemplary embodiment of the present invention. Referring to FIG. 1, the rigid cylindrical grill body wall 1 according to an embodiment of the present invention provides the structural member for the support of the grill. Internal to this support element 1 and afforded thereto, is high temperature insulation liner system 2 implemented to minimize heat loss and to maximize heating efficiency within the grill system. Internal to the insulation system 2 is a removable fuel basket 10, which contains the solid fuel 9. A ceramic based material would provide the insulation needed in the embodiment. The overall grill shape is cylindrical though other polygonal shapes can also implemented in the invention.

[0059] This fuel basket 10 sits on a support grate 11, which extends across the base of the grill wall 1. In a preferred embodiment, the fuel basket 10 can be implemented out of an expanded metal type cylindrical cage that holds the solid fuel or charcoal material. Internal to the fuel basket 3, also visible in the food basket 3 are shown examples of food 16, which is being grilled. The food basket has a top hook 3a which allows it to be lifted out of the grill. Interchangeable food baskets, 18a, 18b, shown later, for vegetables, corn, and meats are implemented in various embodiments. The fuel basket 9 completely surrounds the food basket 3 and allows heat energy to directly contact all surfaces of the food 16 simultaneously.

[0060] Shown below the grate 11 is an ignition space 14, which opens downwards converging to an ash collector 5 in which ash 5a can collect during grill operation. The ash 5a passes through the ash releases 6 from the base of the fuel basket 10 to drop into the ash collector 5.

[0061] Attached to and supporting the grill via the grill wall 1 are a plurality of external grill supports or feet 4 which elevate the grill above the table of other flat working surface. Handles 17 made from plastic or any other poor conductor of heat, may be used for lifting the grill.

[0062] Capping the grill is a cover 7, which fits snugly over the top of the grill wall 1. This cover 7 has a plurality of adjustable vents 8 which allow the manual monitoring and control of the hot gases by increasing or decreasing the flow of air through the grill. The underside of the cover 7 has an upwardly curved shape with a polished surface 7a to reflect back the heat energy radiated by the hot fuel pieces 9. The grill cover handle 7b is implemented on the cover and is made of poor heat conducting material like plastic or wood.

[0063] FIG. 1a illustrates a cross-sectional view along the line A-B of FIG. 1. It shows, moving from the outside, radially inwards, first the grill wall 1, then the insulation material 2, the outer wall of the fuel basket 10, then the discrete pieces of the solid fuel briquettes 9, then the inner wall of the fuel basket 10, next to this is the outer wall of the food basket 3, innermost is shown the food 16. The insulation material 2 is implemented with a thickness calculated to lower the radial heat loss. A ceramic material with thickness of between ½ inch and 1½ inch would provide sufficient heat insulation.

[0064] FIG. 2 illustrates a cross-sectional view of an uncovered grill. Shown below the grill grate 11 is the ignition space 14 in which the kindle material 12 is ignited to initially ignite the charcoal or solid fuel 9 in the fuel basket 10. The flames 13 of the kindle 12 contact the fuel 9 which then begins to burn.

[0065] Another embodiment of the invention allows for the implementation of a tiered fuel basket which allows the heat to be disseminated more uniformly across the full vertical height of the grill.

[0066] FIG. 3 illustrates a cross-section of an embodiment looking in plan view. The cylindrical grill support 1 forms the outermost support system. The inner insulation layer 2, the fuel basket 10 containing the solid fuel 9 and the innermost food basket 3 containing the food 16 are shown in this view.

[0067] FIG. 4 illustrates a cross-section of an embodiment looking in plan view. In addition to the grill description above, a central small fuel basket 10a is shown. This embodiment allows the heating of the food 16 from both the outside and the inside during the grill process. The hot charcoal 9 in the interior basket 10a aids in heating the food 16.

[0068] The ash pan 5 may be made of metal or similar heat resistant material and collects the ash 5a during the grilling process.

[0069] FIG. 5 illustrates a vertical cross-section of an embodiment illustrating a tiered fuel basket 10a with the solid charcoal briquettes 9 distributed at different vertical intervals.

[0070] FIGS. 6a, 6b illustrate a vertical cross-section of an embodiment illustrating different food baskets 18a, 18b, for different types of foods.

[0071] In a typical operation of the embodiment, the grill process is implemented in the following steps:

[0072] Remove grill cover 7; clean the cover reflective surface 7a.

[0073] Remove food basket 3 and fuel basket 10 from inside grill unit 1.

[0074] Place kindle material 13 e.g. old newspapers inside the ignition chamber 14 at bottom of grill housing unit 1.
Load the fuel grate 10 with charcoal briquettes or other solid fuel 9.

Place the fuel basket 10 inside the grill 1 on the support grate 11 above kindle material 12.

Ignite the kindle material 12.

Allow kindle material 12 to ignite the charcoal fuel 9 with the flames 13.

Put food material 16 in food basket 3.

Insert food basket 3 into grill after charcoal 9 is ready.

Replace cover 7 on the grill.

Adjust air vents 8 to regulate the charcoal 9 heating rate.

Allow food 16 to cook.

Check on food 16 as required by lifting top 7.

During cooking process, ash 5a falls under gravity and accumulates in the ash collector 5.

Clean out ash collector 5 when cool.

Because of the embodiments illustrated in this application, oil and grease drippings from the food 16 drop directly onto the ash 5a and not onto the hot charcoal 9 which can create a flash burn or flame eruption to burn the food 16. This is an advantage of the new invention.

Furthermore, food 16 does not stick to the grill fuel basket 10 in the current embodiment. In the prior art the food usually rests on a horizontal hot grill and the grilled food stuck to the surface unless some chemical spray is used to minimize the sticking. The free standing nature or the vertical food basket 3 used in the current invention reduces or eliminates the prospect of food sticking on a grill surface.

Further there is no need to rotate the food 16 since the food is surrounded completely by the heat source of charcoal as evidenced by the circular fuel basket 10.

What is claimed is:

1. A food cooker for cooking food, said cooker comprising:
   - a main housing,
   - an insulation element disposed internally adjacent to side walls of said housing,
   - a lower support element disposed in said housing,
   - a fuel grate disposed internally adjacent to the insulation element,
   - a food basket disposed internally adjacent to the fuel grate, wherein heat emanates from burning of fuel in said fuel grate and said heat is disseminated to food in said food basket.

2. The cooker according to claim 1, further comprising a central small fuel grate to heat the food from inside.

3. The cooker according to claim 1, further comprising a cover with a curved bottom surface to reflect the heat to the food.

4. The cooker according to claim 1, further comprising a cover with a bottom surface coated with a reflective material to reflect the heat to the food.

5. The cooker according to claim 1, wherein the fuel grate is a tiered fuel grate having said fuel placed at different vertical intervals.

6. The cooker according to claim 1, wherein the food being vertically placed does not stick to the fuel grate.

7. The cooker according to claim 1, further comprising at least one adjustable vent on cover of said cooker to control the flow of air and hot gases.

8. The cooker according to claim 1, further comprising at least one ash release vent disposed on bottom of said main housing.

9. The cooker according to claim 1, further comprising an ignition chamber below the main housing.

10. The cooker according to claim 9, further comprising an ash collector disposed below the ignition chamber.

11. The cooker according to claim 1, further comprising a plurality of fixed or collapsible support legs.

12. The cooker according to claim 10, wherein drippings from food drop directly onto ash collector or ignition chamber without any contact with the fuel in the fuel grate.

13. The cooker according to claim 1, wherein the main housing element is made of one or more of the following materials: cast iron, steel or an inherently rigid material.

14. The cooker according to claim 1, wherein shape of the main housing element is cylindrical or polygonal.

15. The cooker according to claim 1, wherein the main housing element, said insulation element, said fuel grate and said food basket are disposed concentrically within the cooker.

16. The cooker according to claim 1, wherein the insulation element is made of a heat resistant material.

17. The cooker according to claim 1, wherein the fuel in the fuel grate substantially completely surrounds the food material.

18. The cooker according to claim 1, wherein the food basket is implemented with interchangeable grates capable of holding a variety of foods including meats, chicken, fish, and vegetables.

19. The cooker according to claim 1, wherein the lower support element mechanically disposed adjacent to the bottom of the main housing, supports the fuel grate, the food basket and ash release vents.

20. The cooker according to claim 1, wherein the lower support element is circumferentially disposed and forms mechanical support for the fuel grate, the food basket and the insulation element.

21. The cooker according to claim 1, wherein the lower support element is a grate disposed at the bottom of the housing unit and forms mechanical support for the fuel grate, the food basket and the insulation element.

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