

AUTOMATED APPARATUS AND METHOD FOR COOKING**FIELD OF THE INVENTION**

The present invention relates to cooking apparatus. In particular,
5 the present invention relates to oven-type cooking apparatus and
method of using the same.

BACKGROUND OF THE INVENTION

The use of the tandoori oven for the cooking of bread and meat
10 is a well-known art in northern Indian cooking. The tandoori oven is
typically a barrel-shaped oven made from ceramic or clay and is heated
by charcoal or gas from the bottom. The meat is strung onto skewers,
and put in the circumference of the oven, while flattened piece of dough
are pressed onto the sides of the oven and cooked into naan or other
15 types of bread. The process is dangerous, requiring the operator to put
his hand into the oven for loading and unloading of the bread. It is also
labour intensive, since the operator has to remove the bread at the right
time in order to ensure quality. Furthermore, the typical tandoori oven
requires a period to heat up to the right temperature for cooking, further
20 increasing the cost of operation.

It is therefore an object of the present invention to provide an automated and simple method for cooking.

BRIEF DESCRIPTION OF THE DRAWINGS

5 Figure 1A is a perspective exploded view of the preferred embodiment of the present invention.

Figure 1B is the cross-sectional view along line A-A (see Fig.1C) of the same preferred embodiment.

10 Fig.1C is a side view of the same preferred embodiment with the oven door removed.

Figure 2A is the top perspective view of the naan and meat cooking modules with the housing and door removed.

Figure 2B is the side perspective view of the same naan and meat cooking modules with the housing removed.

15 Figure 2C is the side perspective view of the naan cooking module and the bottom support plate.

Figure 2D is the top perspective view of the same naan cooking module and the bottom support plate.

20 Figures 3A and 3B are the top and side perspective views respectively of the meat cooking module coupled to the bottom plate.

Figures 4A and 4B are the top and side views of the heating unit in the preferred embodiment of the present invention.

Figure 4C and 4D are the top and bottom perspective views of the same heating unit.

5 Fig. 4E is the elevated view of the heating unit as installed into the bottom support plate and base of the housing.

Figure 5 is the bottom perspective view of the oven with the base detached to show the motor and gears of the preferred embodiment.

Figure 6 shows another embodiment of skewer head hanging from
10 the same circular bracket as shown in Figure 3A.

Fig. 7A is the wire-frame view of the support plate of the naan cooking module.

Fig. 7B is the cross sectional view along line B-B of Fig. 7A.

Fig. 7C is the bottom perspective view of the support plate.

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SUMMARY OF THE INVENTION

Accordingly, the present invention provides, in one aspect, an apparatus with a module for cooking flat bread such as naan comprising a housing; a heating unit disposed within said housing; a
20 support plate provided above said heating unit for supporting and retaining the dough for cooking; a support plate revolving means for

rotating said support plate and a means for maintaining even temperature of both the top and bottom surfaces of the dough.

In another aspect, the present invention provides a second module for cooking meat in skewers. The skewers are supported by
5 a skewer support means that is adapted to support the skewers in a circumferential array around the heating unit. A skewer revolving means, coupled to the skewer support means, allows the skewers of meat to be cooked evenly as they revolve around the heating unit. A cam may be provided to rotate each skewer around its longitudinal
10 axis during the revolution.

In a further aspect, an automated method of cooking is provided in which a bread such as naan is cooked by pressing the dough onto a support plate within the housing of the oven; providing a heating unit below the support plate for heating said support plate; and
15 maintaining the top surface of the dough at a temperature of within 15°C of the temperature of the bottom surface of the dough.

In accordance with the present invention, the preferred embodiment is constructed with a truncated cone-shaped plate that functions as the support plate within a cylinder-like housing. A gas
20 burner is provided below the support plate for heating up the support plate. In one embodiment, convection holes are provided at the flat top of the support plate to allow the hot air generated in the gas burner to circulate to the top of the support plate. These convection

holes function as the means for maintaining an even and narrow temperature range between the top and bottom surface of the dough. A circular skewer bracket containing slots functions as the skewer support means. In the preferred embodiment, a cam mechanism is provided to rotate each skewer around its longitudinal axis.

The present invention allows the safe, low-cost and automated cooking of bread, and also provides the option of cooking meat and bread within the same machine and at the same time. Furthermore, high quality and consistency is maintained without the need for constant monitoring of the cooking process by an experienced chef. The preferred embodiment is designed as a compact apparatus suitable for both indoor and outdoor use. The use of stainless steel in the preferred embodiment also results in ease of maintenance while at the same time meeting the general requirements of the food industry.

DESCRIPTION OF THE INVENTION

The following detailed description describes the preferred embodiment for implementing the underlying principles of the present invention. One skilled in the art should understand, however, that the following description is meant to be illustrative of the present invention, and should not be construed as limiting the principles

discussed herein. In the following discussion, and in the claims the terms "including", "containing", "having" and "comprising" are used in an open-ended fashion, and thus should be interpreted to mean "including but not limited to".

5 An important aspect for producing good naan according to the present invention is temperature control, not only of the supporting plate for the dough, but also the exposed top of the dough. In the preferred embodiment, the temperature of the hot air that is in contact with the top of the dough should cook the top surface of the naan as
10 well as the bottom surface that comes into contact with the hot plate. Preferably, the cooking temperature of the top surface should come to within 15 degrees Celsius of the temperature of the support plate.

Referring first to Figures 1A and 1C, the preferred embodiment of the present invention contains both the naan cooking module 30
15 and the meat-cooking module 34 disposed thereunder within the same cooking oven. The oven is provided with a cylindrically shaped housing having side walls 20, base 22, side-opening door 24 and cover 26. The housing is preferably made from double layers of stainless steel, with insulation therebetween. Cover 26 contains
20 insulating material, which is enclosed within insulator cover 28. The naan cooking module 30 is provided above heater unit 32, while the meat cooking module 34 is provided around the periphery of heater unit 32.

Referring now to Figures 2A to 2D and Figures 7A-7C, the naan cooking module 30 is positioned like an umbrella above the heating unit (not shown for ease of illustration) and meat cooking module 34 is positioned around the periphery of the heating unit. The naan cooking module 30 contains support plate 36 of a truncated cone shape and disposed up-side down above the heating unit. The truncated portion is formed into a flat top 39 with convection holes 38 therein to allow hot air generated by the heating unit to circulate easily to the area above support plate 36. Holes 38 are designed to maintain the uniformity of the top and bottom temperature of the dough as it cooks on support plate 36. In the embodiment shown in these figures, these holes may be used to allow the temperature of the oven above the support plate 36 to be maintained within 15°C of the temperature of the support plate 36 itself. Cover plate 40 is provided to support the weight of support plate 36, and also to retain the hot air within the naan cooking section. Naan module drive shaft 42 couples to the centre of support plate 36 and bearing 44 at the top end, and couples to naan motor (not shown) at the lower end. The naan motor is adapted to rotate shaft 42 around its longitudinal axis, thereby causing support plate 36 to revolve relative to the heating unit. Bearing 44 and bearing housing 46 allow support plate 36 to revolve relative to the stationary cover plate 40. An inwardly pointing sweeping finger (not shown) may be provided proximate support plate 36 for

sweeping the cooked naan off the plate once they have made one revolution. An optional heating element may be provided above support plate 36 and adjacent the sweeping finger to brown the cooked naan just before it is swept off support plate 36.

5 Referring next of Figures 3A and 3B, below support plate 36 and constructed around the heating unit is the meat cooking module 34. In the preferred embodiment, this module contains a skewer support rack 48 fixed onto bottom plate 49. Rack 48 contains rack shaft 50, which runs through the centre of the heating unit and bottom plate 49, and is coupled to a rack motor (not shown) housed within base 22. 10 Rack 48 contains a circular bracket 48a connected to the rack shaft by radiating ribs 48b. Naan module drive shaft 42 and rack shaft 50 are positioned co-axial and concentric to each other and are connected to separate motors below the heating unit and within base 22. This 15 allows the rotation of the naan cooking module and the meat cooking module to be controlled separately. Using the embodiment shown, the naan and meat can typically be cooked in half the time used by the traditional tandoori oven.

 In the embodiment shown, a maximum number of 36 skewers 20 are placed into slots 48c (see Fig.6) provided in circular bracket 48a such that the skewers hang vertically in a circular and parallel array arranged around the periphery of the heating unit. Various cam mechanisms may be provided to cause the skewers to rotate around

their respective longitudinal axis, as the rack revolves around the heating unit. In the embodiment shown in Fig. 3A and 3B, cam 56, supported by cam support 58 is used for this purpose. Skewer 54 is provided with a skewer head 60 containing four vertical fingers 62 that
5 interact with the cam to cause the rotation. Bottom plate 49 is provided with a large opening 64 under which a drawer 66 is disposed within the motor housing 52. A cam plate (not shown) is provided above opening 64 and extend toward the skewer support rack 48 for pushing a skewer out of its slot and onto drawer 66
10 through opening 64. In this way, once a skewer have made one revolution, it will automatically drop to drawer 66 where it can be kept warm and retrieved by an operator when food is served.

Figures 4A-4E show the heating unit in detail according to the most preferred embodiment of the present invention. A gas burner is
15 used having a burner housing 68 via holder 72a and spacer 72b with a firing tube 70 and gas venturi tubes 74 below. Flange bearing 71 allows naan module drive shaft 42 and rack shaft 50 to pass through burner housing 68 and connect to the relevant motors below. Honeycomb-shaped infrared ceramic blocks 72 are attached to
20 burner housing 68 and disposed above firing tube 70. Burner housing is hexagonal in shape, with five ceramic blocks 72 disposed on each of five sides of the hexagon shape and adapted to radiate infrared rays radially outwards.

Figures 5 shows the details of the gears and motors used to rotate the naan support plate and the skewer rack. The housing is supported by L-shaped supports 76. To detect the temperature of the gas flames, a thermocoupler is provided as a safety device when the gas burner is switched on. A second thermocoupler 78 is provided to detect and control the cooking temperature. Speed controllers 80a and 80b, and motors 82a and 82b are also provided to control the speed of plate 36 and module 34 independently.

In the embodiment shown in Fig 3A and 3B, the entire skewer will drop into drawer 66. But the skewer and the skewer support rack may also be designed such that only the skewer rod drops after one revolution, and the heavier skewer head remains on the support rack.

The shape of the skewer head may be changed to contain extension of various shaped. For example, Fig. 6 shows another type of skewer 77 with fin-like extensions 78 on the skewer head 80 that may be used with cam 56 for rotating the skewers around its own longitudinal axis. Other cam mechanisms can also be used. For example, a spring-loaded finger fixed to the housing may be positioned to extend inwards to turn skewer head fingers 62 or fins 78 as the skewer rack revolves around the heating unit. A rotary finger may also be provided from the centre and extending radially outwards to interact with fingers 62 or fins 78 to turn the skewers. An alternative embodiment is the use of clips to clip disposable wooden skewers

onto the meat cooking module. This reduces the cost of fabricating numerous stainless steel skewers, and also allows the meat to be served while still attached to the wooden skewer. The skewer head of the skewer clip may contain a feature, such as the fins or the fingers
5 as suggested above, for turning by a cam mechanism.

While the present invention has been described particularly with references to Figs 1A to 7C with emphasis on a naan cooker, it should be understood that the figures are for illustration only and should not be taken as limitation on the invention. In addition it is
10 clear that the method and apparatus of the present invention has utility in many applications where automatic cooking of bread and meat under highly controlled environment is required. It is contemplated that many changes and modifications may be made by one of ordinary skill in the art without departing from the spirit and the
15 scope of the invention described.

For example, an additional support plate may be provided above or below plate 36 to provide additional area for cooking. Other types of materials may be used for fabrication of the apparatus, such as ceramic or clay. For the housing, glass may be used to allow viewing
20 of the progress of cooking. If a charcoal flavour is desired, it is envisioned that the heating unit may use charcoal as a source of fuel, either partially or completely. Heater, using other sources of fuel, such as electricity, is also within the scope of the present invention.

**CLAIMS**

- 1 1. A cooking apparatus comprising :
 - 2 a housing;
 - 3 a heating unit disposed within said housing;
 - 4 a support plate provided above said heating unit, said support
 - 5 plate having an inclined surface for supporting and retaining flat
 - 6 dough for cooking;
 - 7 support plate revolving means, coupled to said support plate, for
 - 8 rotating said support plate; and
 - 9 a means for maintaining the temperature of the top surface of
 - 10 said dough to allow equal cooking of top and bottom surfaces of
 - 11 said dough.
- 12 2. An apparatus according to claim 1 wherein said means for
- 13 maintaining temperature is adapted to maintain the top surface
- 14 of said dough to within 15⁰C of the temperature of the bottom
- 15 surface of said dough.
- 16 3. An apparatus according to claim 1 or 2 wherein said support
- 17 plate has the shape of a cone with a truncated top, said
- 18 truncated top provided with convection holes adapted to allow
- 19 convection of hot air from said heating unit to the upper surface
- 20 of said support plate.



- 21 4. An apparatus according to any one of the above claims wherein
22 said support shaft rotating means comprises a central support
23 shaft, coupled to the centre of said support plate at one end and
24 to a motor at the other end.
- 25 5. An apparatus according to any one of the preceding claims
26 wherein said heating unit is centrally located within said
27 housing, said apparatus further comprising a skewer support
28 means adapted for supporting a substantially vertical array of
29 skewers of food around the periphery of said heating unit.
- 30 6. An apparatus according to claim 5 wherein said skewer support
31 means comprises a circular bracket coupled to a skewer shaft,
32 said skewer shaft coupled to a skewer revolving means adapted
33 to rotate said bracket
- 34 7. An apparatus according to claim 5 further comprising a cam
35 means for the rotation of each of said skewer around its
36 longitudinal axis.
- 37 8. An apparatus according to claim 7 wherein said cam means
38 comprises a skewer head with extensions, connected to said
39 skewer, and a cam provided proximate said circular bracket,
40 said cam adapted to interact with said extensions to rotate said
41 skewer around its longitudinal axis as said skewer support
42 means revolves.



43 9. An apparatus according to any one of the preceding claims 4-6
44 wherein said heating unit comprises a gas burner and an
45 infrared heater adapted to radiate infrared rays radially outwards
46 towards said array of skewers.

47 10. A method of cooking dough comprising :
48 pressing said dough onto a support plate;
49 providing a heating unit below said support plate for cooking the
50 lower surface of said dough; and
51 equally cooking the top surface and the bottom surface of said
52 dough.

53 11. A method according to claim 10 wherein said step of equal
54 cooking keeps the temperature of said top surface of said dough
55 to within 15 degrees Celsius of said lower surface.

56 12. A method according to claim 10 or 11 further comprising the step
57 of browning said top surface of said dough.

58 13. A method according to claim 10 or 11 further comprising the step
59 of automatically removing said cooked dough from said heating
60 unit after cooking.

61 14. A method for cooking food on a skewer comprising the steps of :
62 providing a heating unit, said heating unit provided with a
63 thermocouple for temperature control;



64 placing a plurality of said skewers vertically in a circumferential
65 array around said heating unit;
66 revolving said skewer around said heating unit; and
67 rotating said skewer around its longitudinal axis.

68 15. A method according to claim 14 further comprising the step of
69 automatically removing said meat away from said heating unit
70 after cooking.

71 16. A cooking apparatus comprising :

72 a housing;

73 a heating unit disposed within the middle of said housing;

74 a truncated cone-shaped support plate disposed above said
75 heating unit, said support plate containing a flat top with holes
76 disposed therein for convection of air heated by said heating
77 unit;

78 a vertical drive shaft with one end connected to the centre of said
79 flat top and the other end coupled to a motor, said motor adapted
80 to cause rotation of said support plate around said shaft.

81 17. A cooking apparatus according to claim 16 wherein said heating
82 unit radiates heat radially outwards, said apparatus further
83 comprising a meat cooking module for cooking meat on a
84 skewer, said meat cooking module comprising



85 a skewer support rack having a circular bracket with slots for
86 hanging said skewers in a vertical parallel array around the
87 periphery of said heating unit;

88 a rack shaft coupled to said support rack at one end and a
89 skewer motor at the other end, said skewer motor adapted to
90 revolve said support rack around said rack shaft; and

91 a cam disposed around said support rack and adapted for
92 rotating each skewer around the longitudinal axis of said
93 skewer.

94 18. A cooking apparatus according to claim 16 wherein said heating
95 unit is a gas burning infrared heater adapted to radiate infrared
96 rays radially outwards.