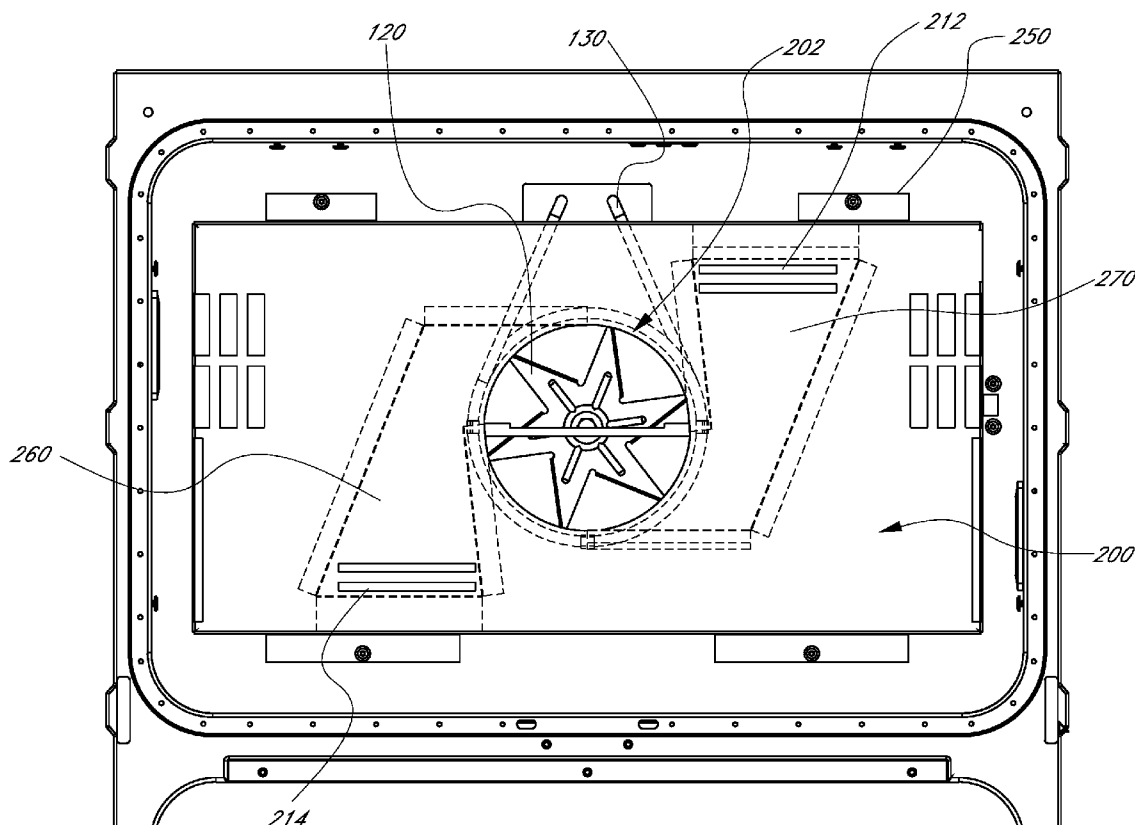


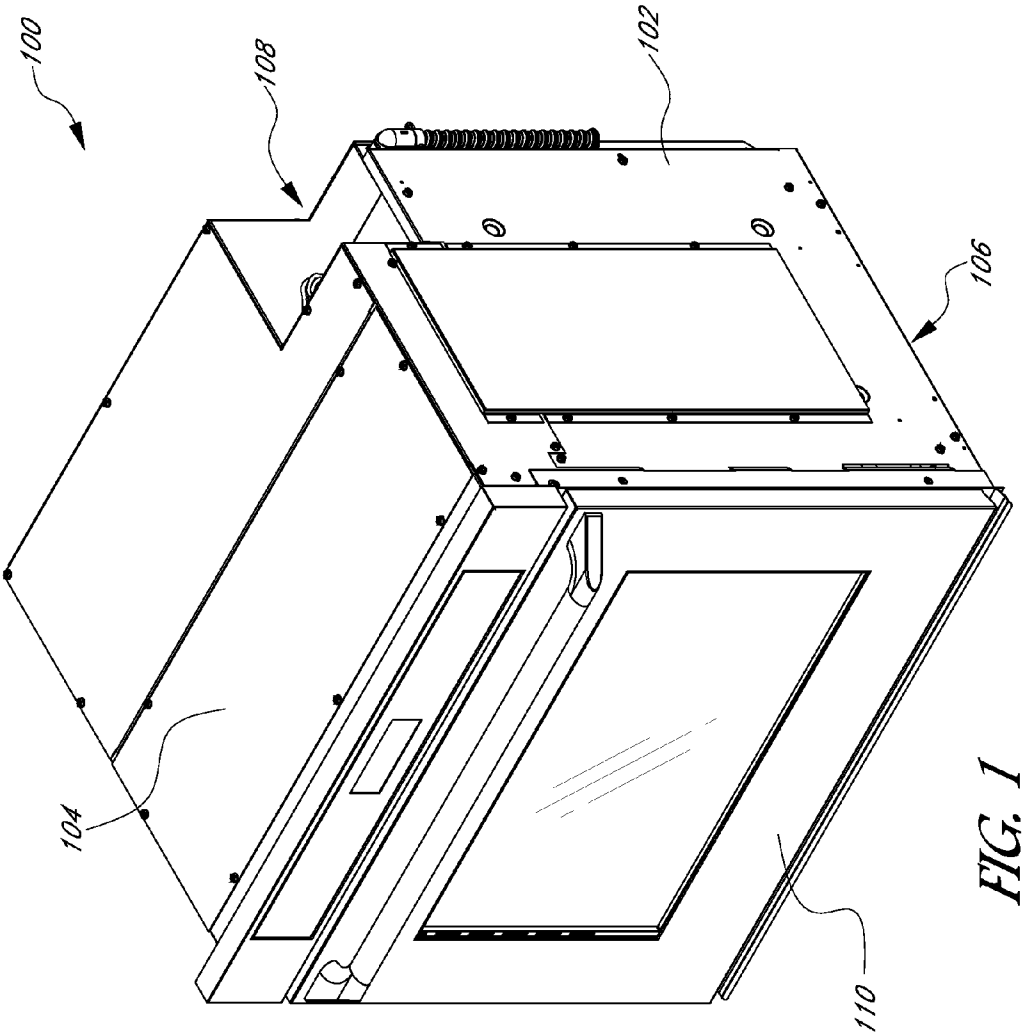


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Michael Khandros, North Hollywood,
CA (US)(52) **U.S. Cl.**
CPC **F24C 7/002** (2013.01)
USPC **219/400; 219/399**(21) Appl. No.: **13/727,411**(22) Filed: **Dec. 26, 2012****Related U.S. Application Data**(63) Continuation-in-part of application No. 13/657,694,
filed on Oct. 22, 2012.(57) **ABSTRACT**

A baffle for directing air in a convection oven is disclosed herein. The baffle includes upper vents, lower vents and side vents that draw in air from the cooking chamber, or discharge air from a fan into the cooking chamber of the convection oven. Left and right conduits are disposed around the fan that redirect air drawn in from the upper and lower vents, or pushes the air through the upper and lower vents. The left and right conduits and locations of the upper and lower vents are configured to produce airflow throughout the cooking chamber and even distribution of cooking temperatures.





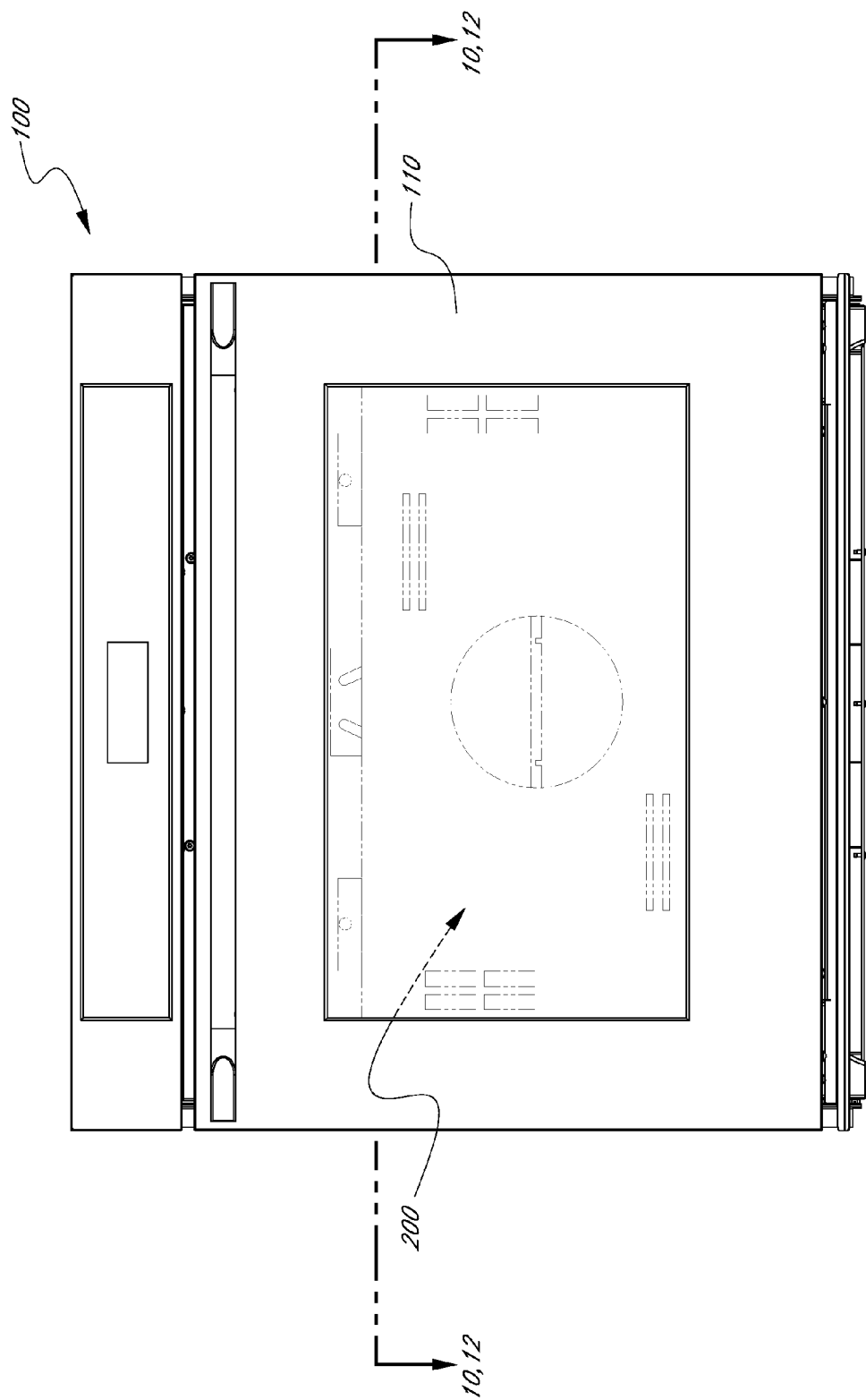


FIG. 2

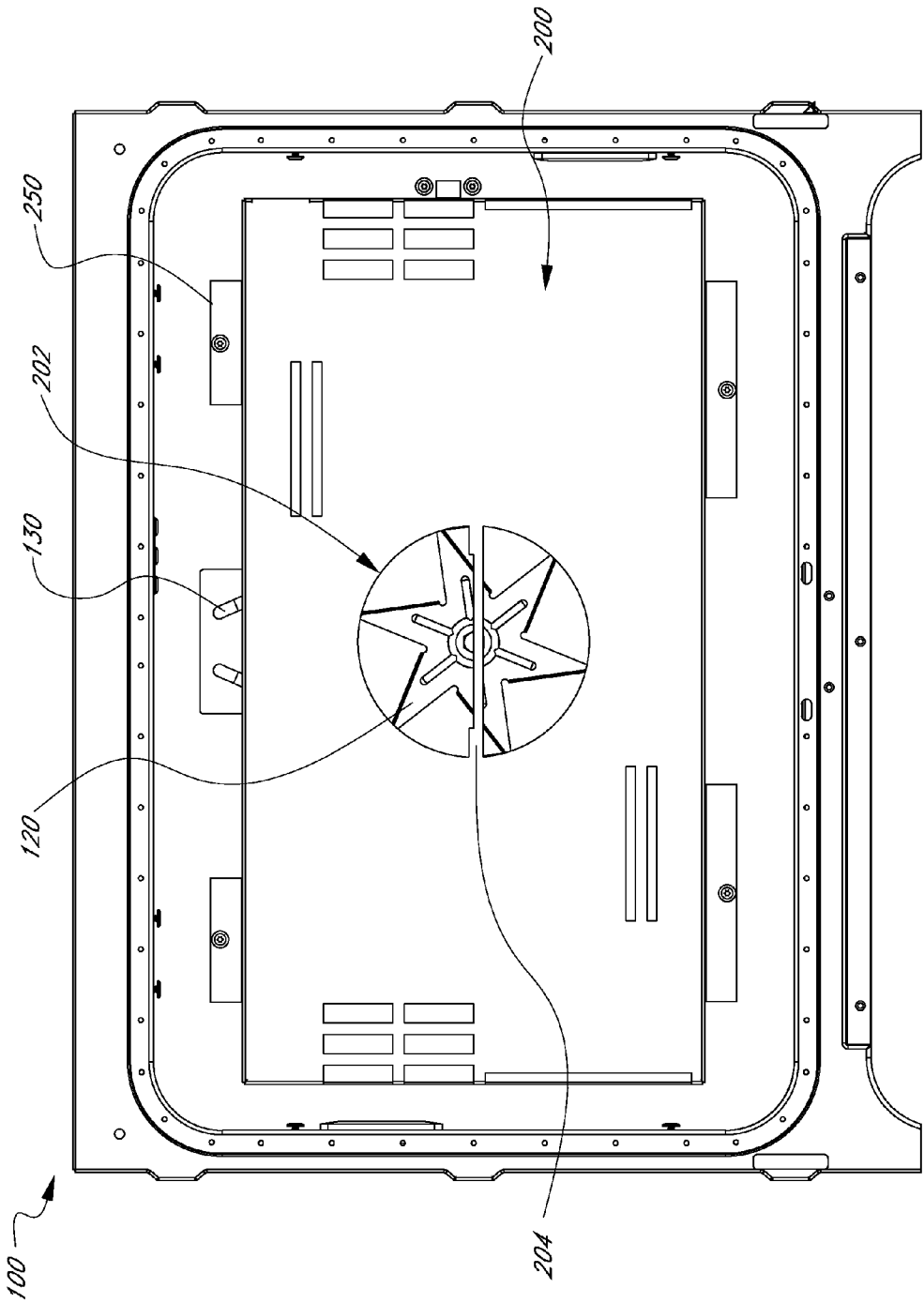


FIG. 3A

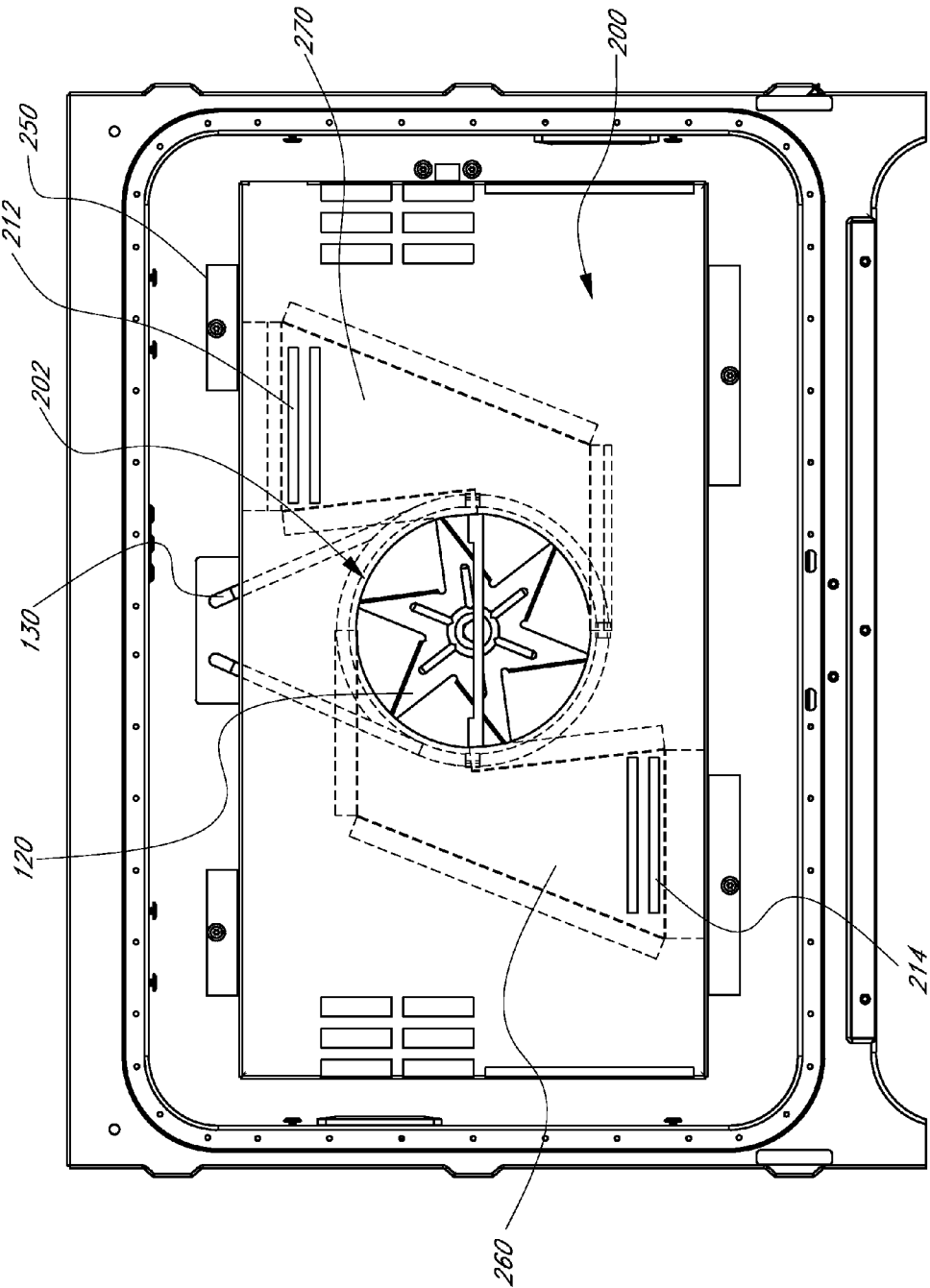


FIG. 3B

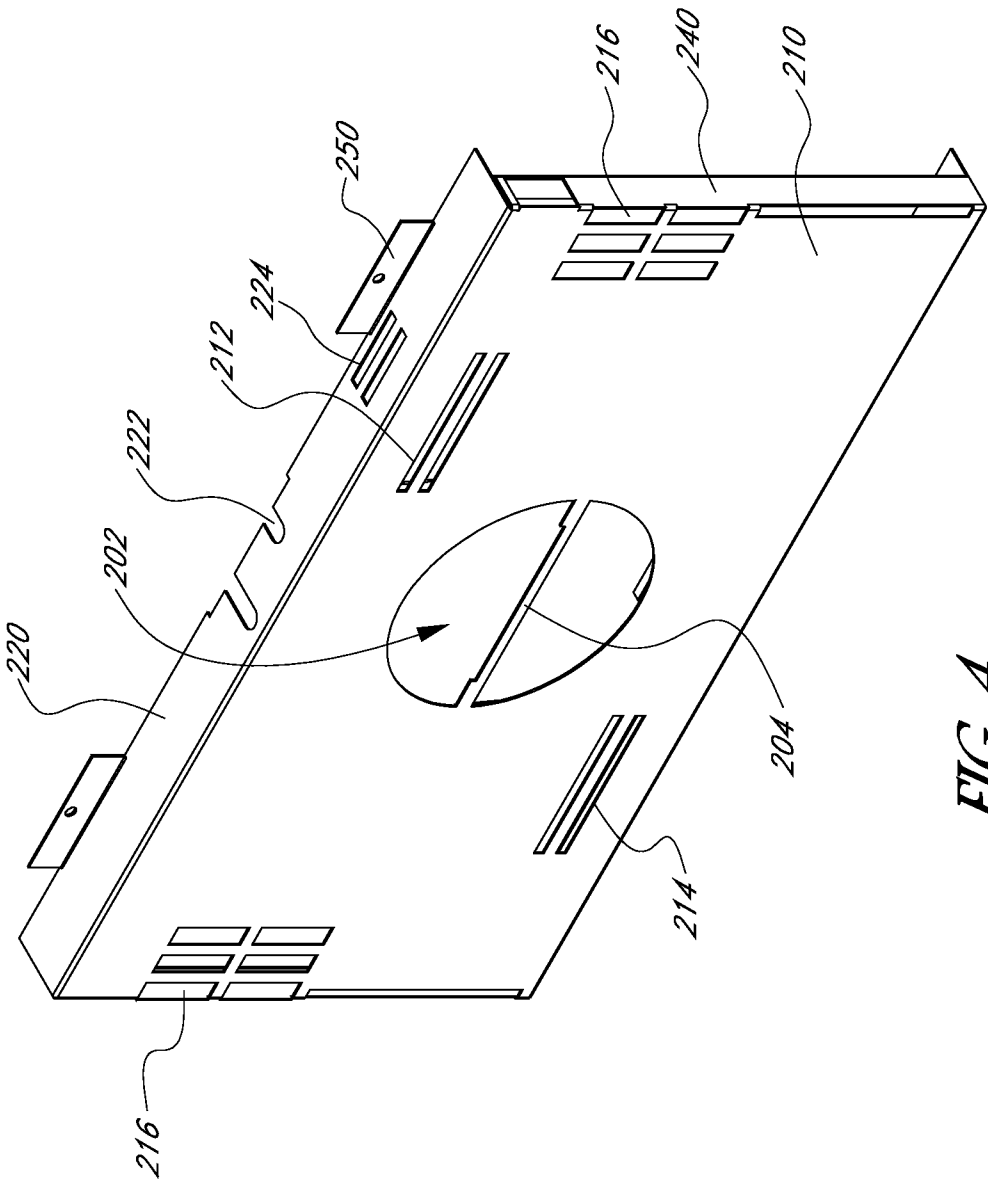
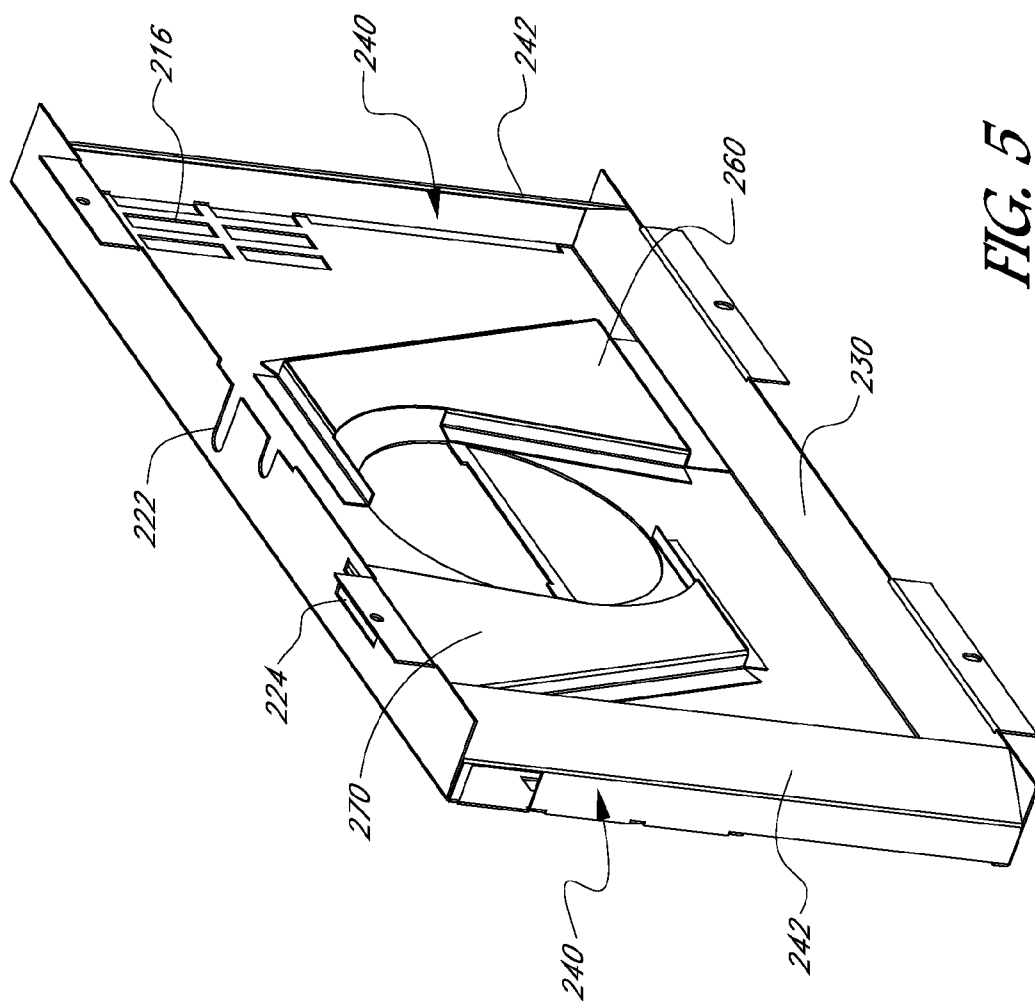


FIG. 4



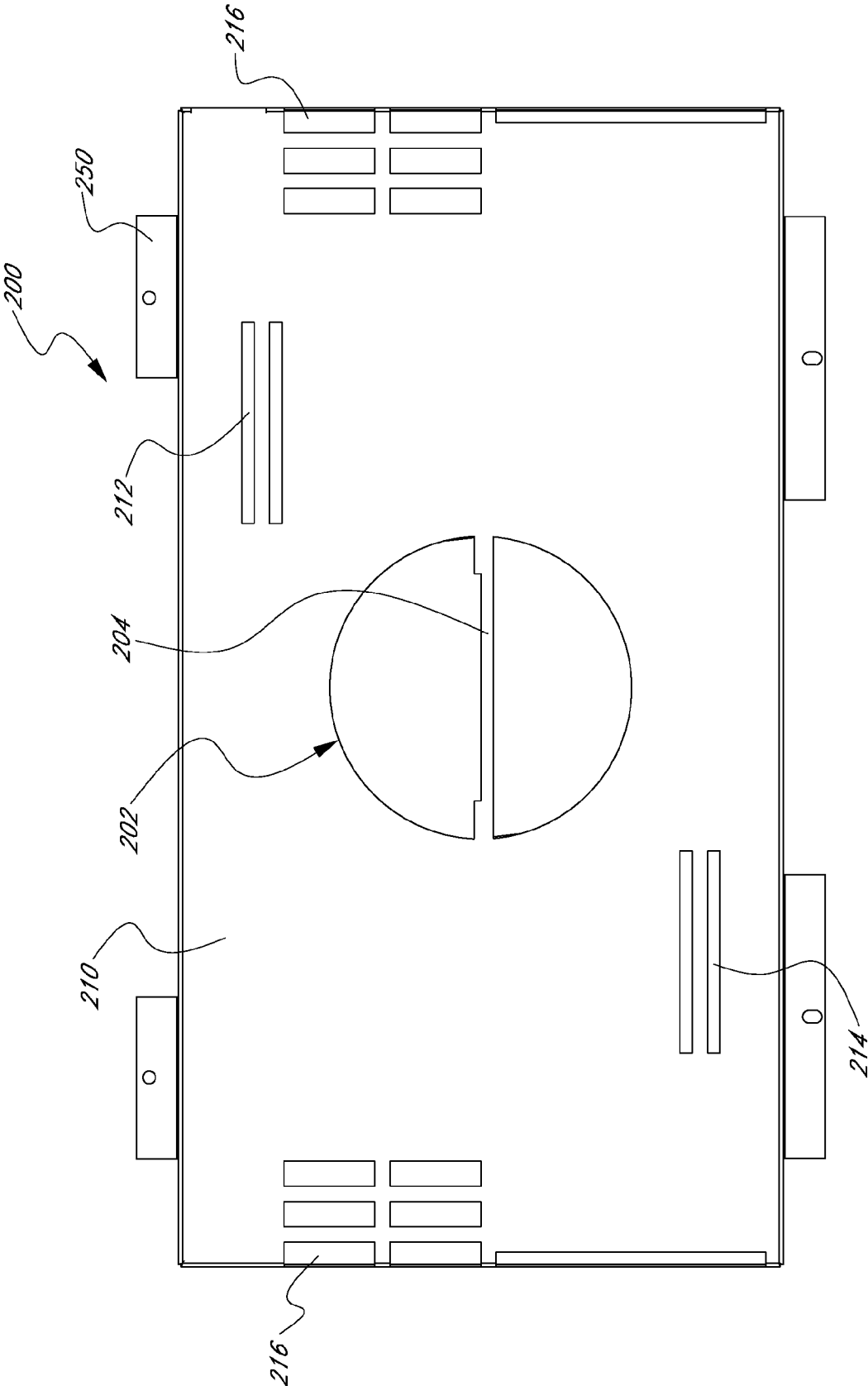


FIG. 6

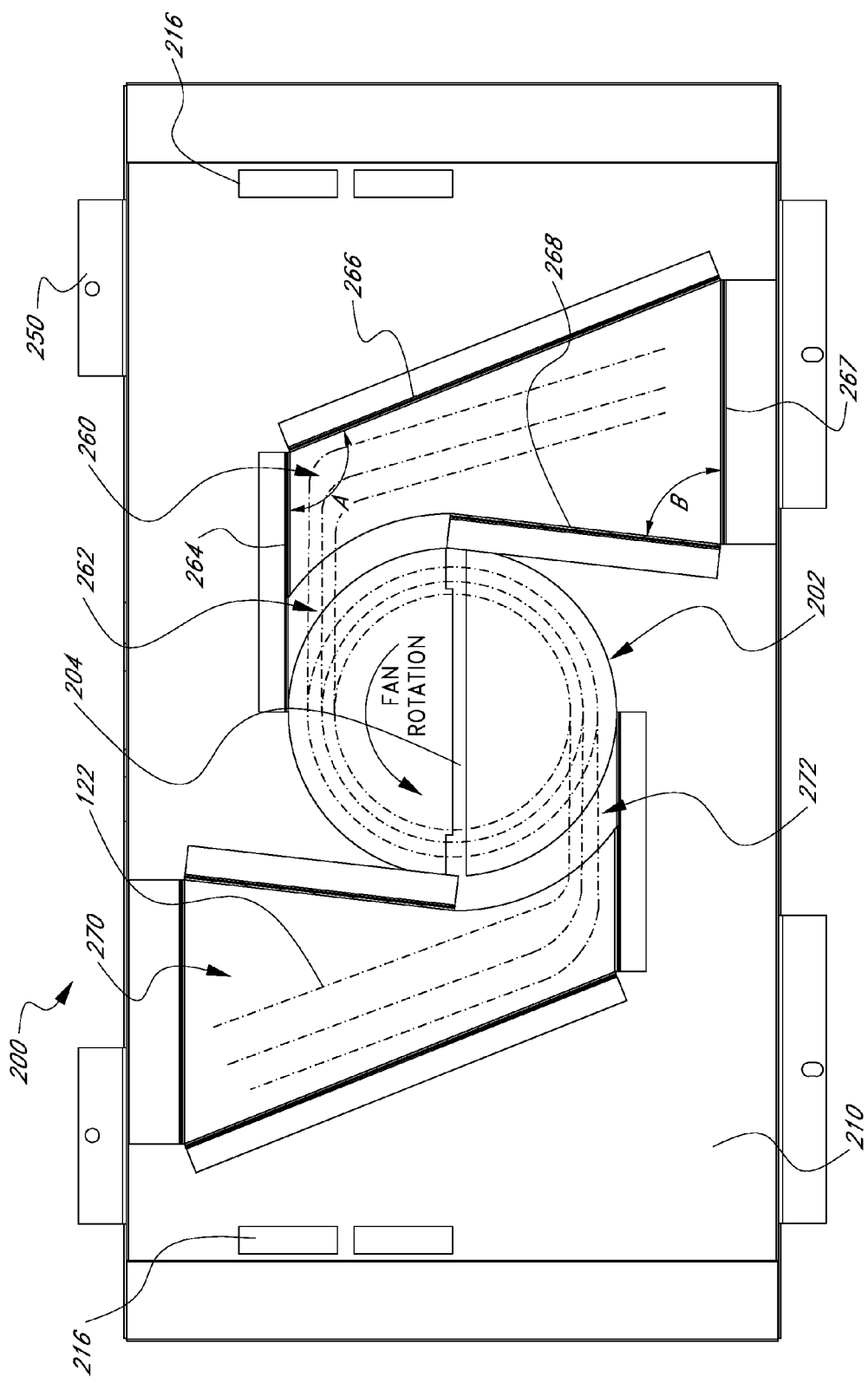


FIG. 7

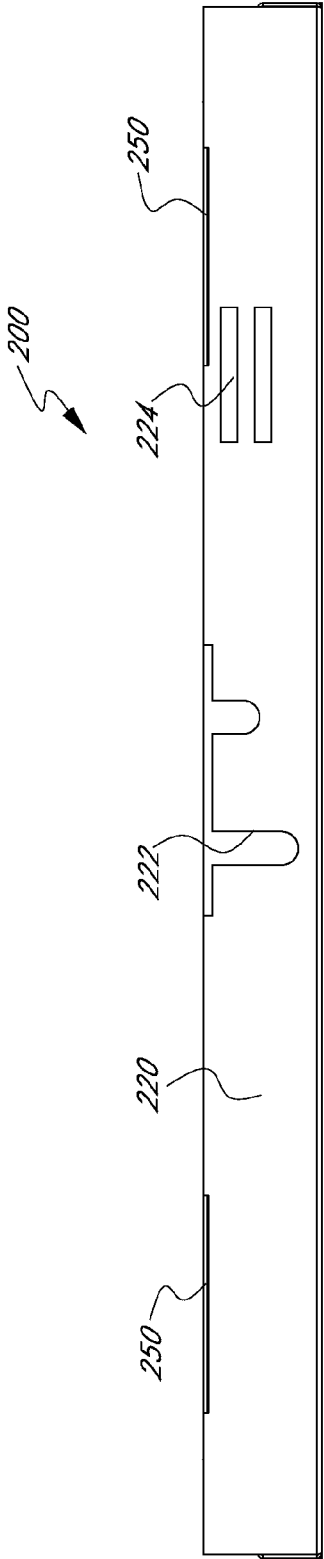


FIG. 8

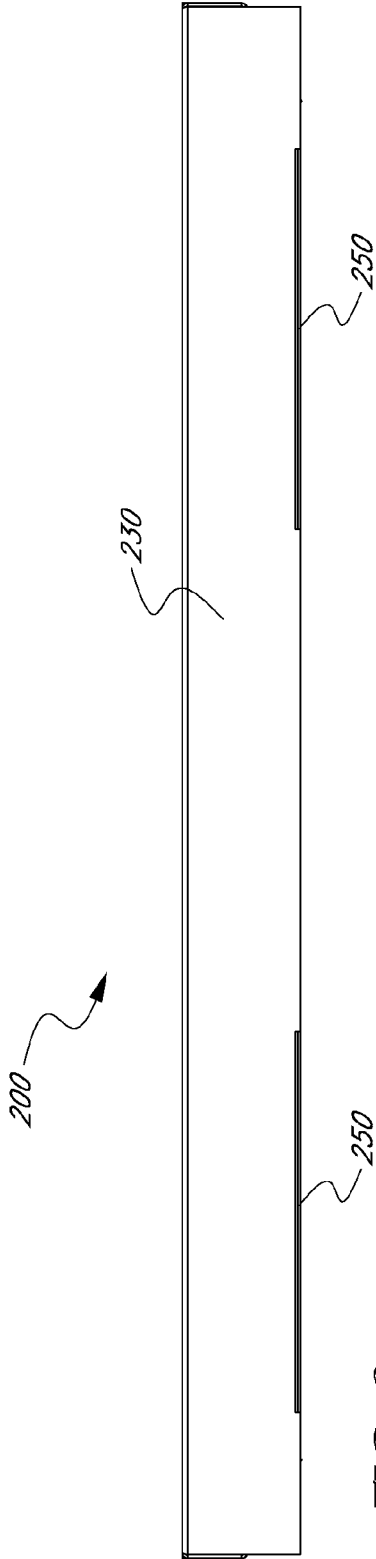
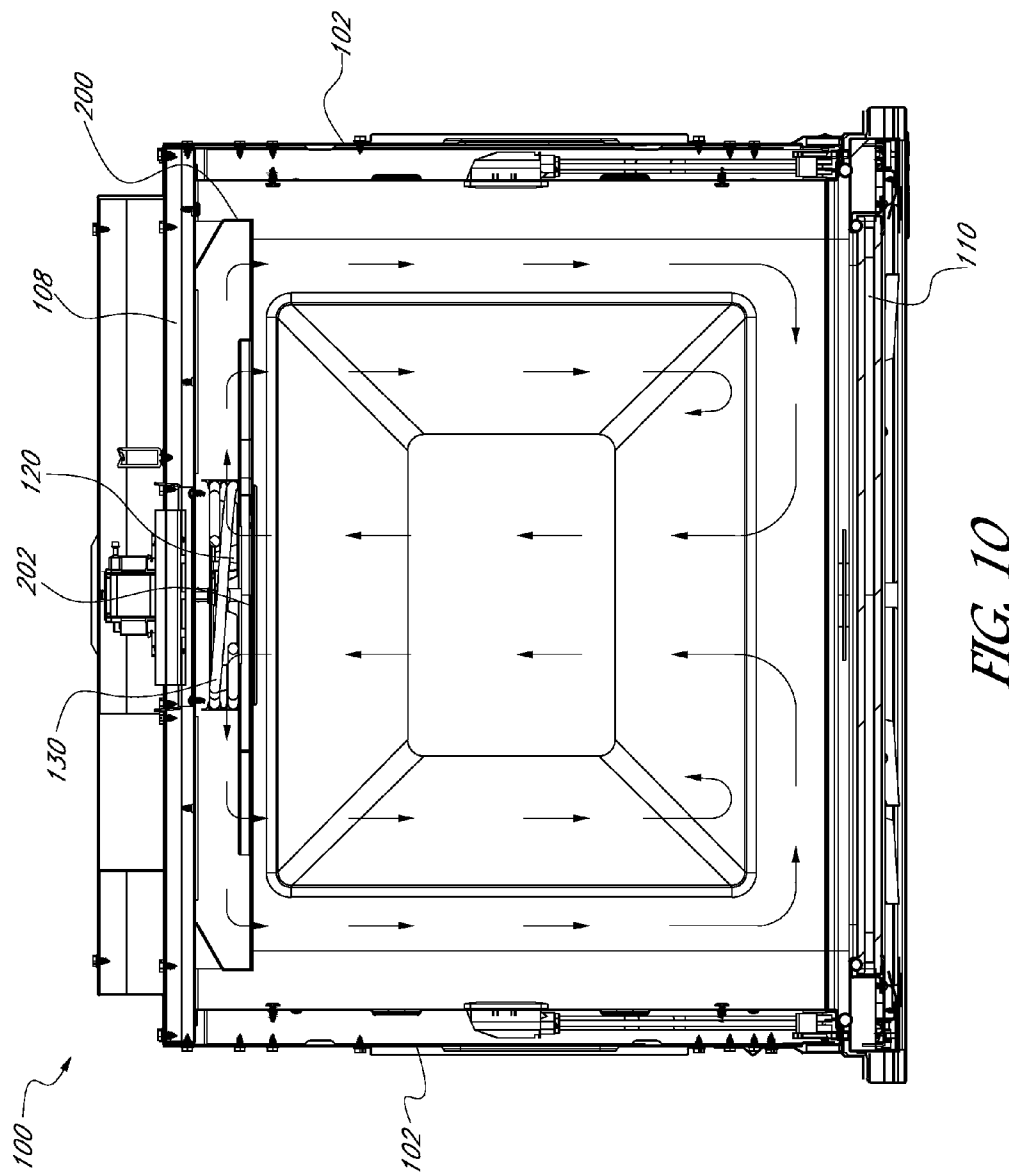
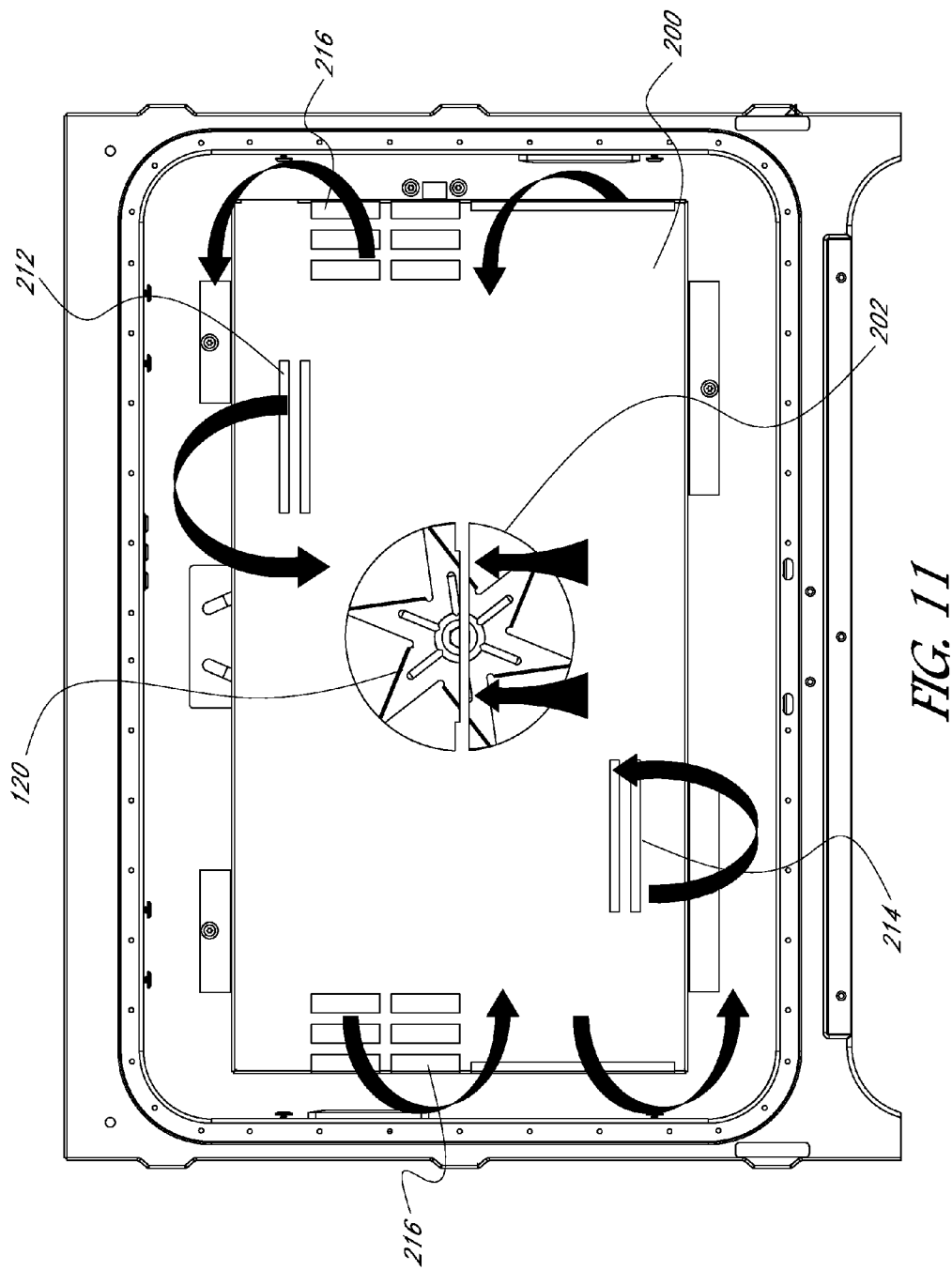


FIG. 9





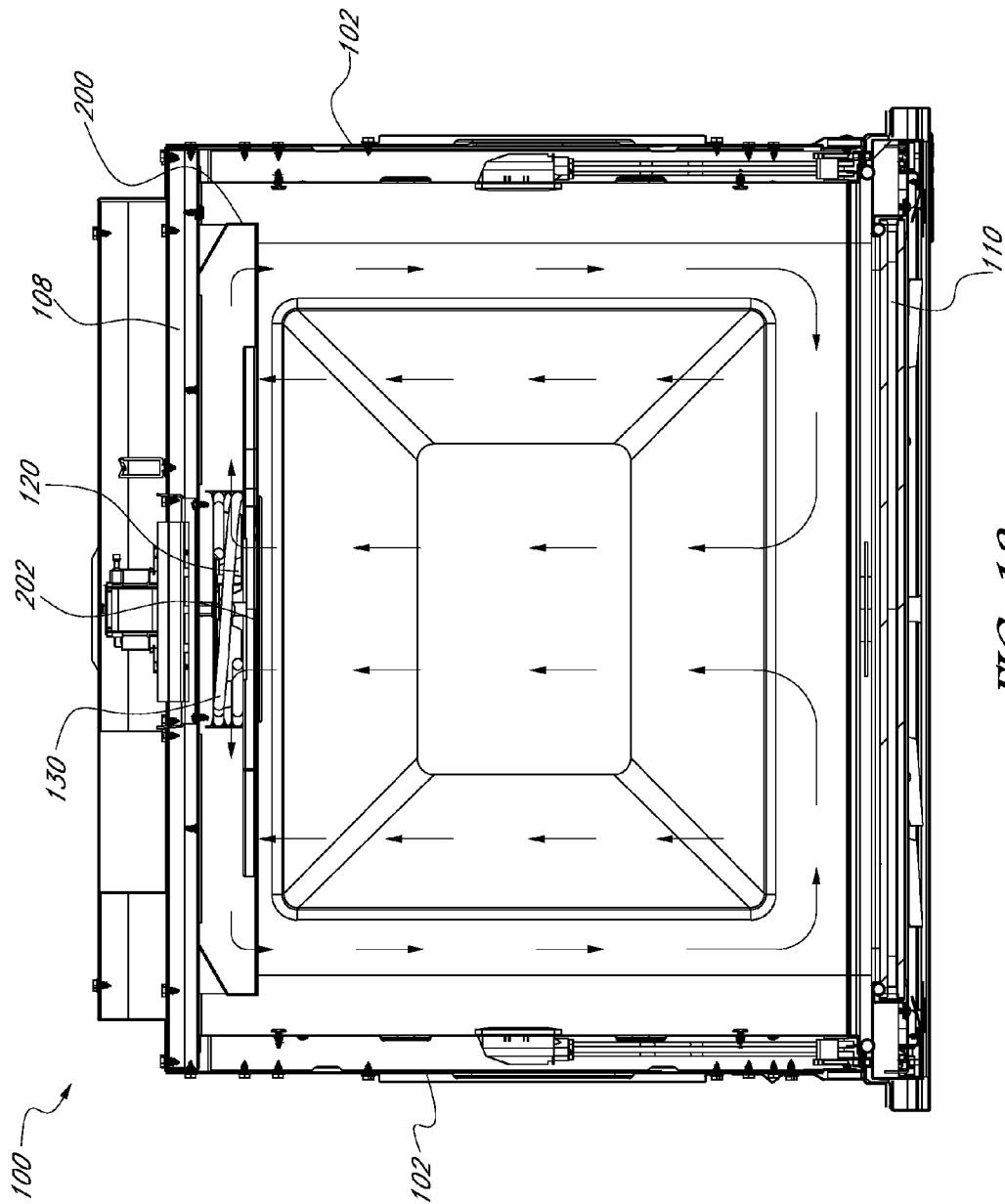
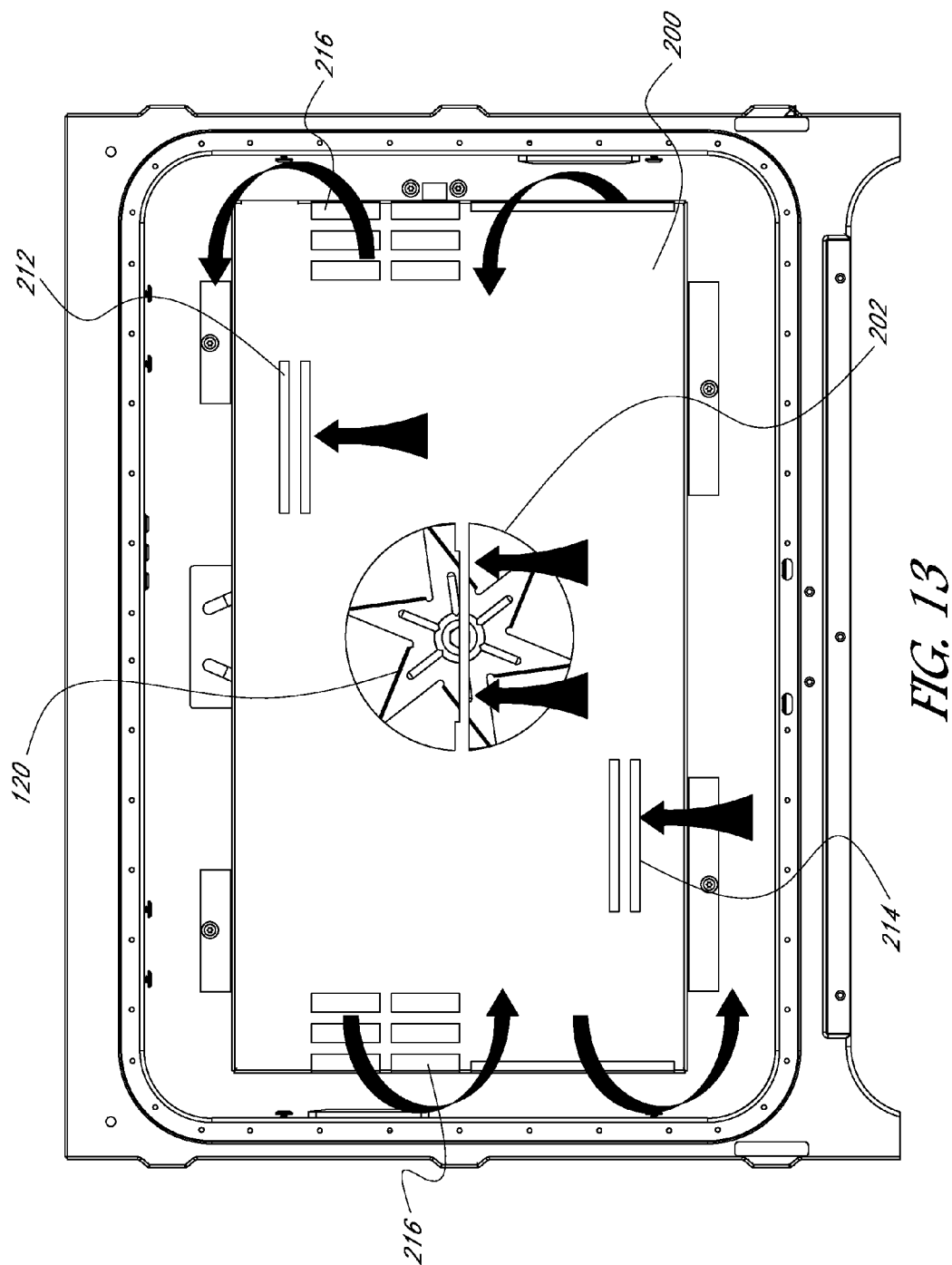


FIG. 12



OVEN BAFFLE

RELATED APPLICATION INFORMATION

[0001] This application is a continuation-in-part of application Ser. No. 13/657,694 filed Oct. 22, 2012, the entirety of which is incorporated by reference herein.

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BACKGROUND

[0003] 1. Field
 [0004] This disclosure relates to oven baffles.
 [0005] 2. Description of the Related Art
 [0006] Convection ovens provide air flow in the cooking chamber of an oven to cook food generally faster than conventional non-convection ovens. Convection ovens include one or more fans, typically in the rear of the cooking chamber, that circulate air within the chamber creating convection currents. The fans are typically located on a rear baffle that directs airflow out one or more vents on the baffle towards the front of the chamber. The fan may circulate air past a heating element that heats the air. The hot circulating air currents flow around food in the oven cavity to facilitate increased cooking efficiency.
 [0007] Sometimes, the convection ovens cook food unevenly because of uneven distribution of airflow and regions of stagnation in the oven. For example, some convection ovens heat food by circulating air in one direction around stationary food. The unidirectional path or stream of the airflow can result in unevenly cooked food. Some convection ovens use reversible fans, which can reverse the direction of the airflow to provide more even cooking. However, these reversing fan convection ovens still are not able to provide even distribution of heated air throughout the cooking chamber. Consequently, hot spots and uneven cooking still occur.

DESCRIPTION OF THE DRAWINGS

[0008] FIG. 1 is a front perspective view illustrating an example of a convection oven.
 [0009] FIG. 2 is a front elevation view illustrating an embodiment of a baffle inside the convection oven of FIG. 1.
 [0010] FIG. 3A is a close-up front elevation view of the inside of the convection oven illustrating the baffle of FIG. 2.
 [0011] FIG. 3B is a close-up front elevation view of the inside of the convection oven illustrating the baffle of FIG. 2 as transparent.
 [0012] FIG. 4 is a front perspective view of the baffle of FIG. 2.
 [0013] FIG. 5 is a rear perspective elevation view of the baffle of FIG. 2.
 [0014] FIG. 6 is a front elevation view of the baffle of FIG. 2.
 [0015] FIG. 7 is a rear elevation view of the baffle of FIG. 2.
 [0016] FIG. 8 is a top plan view of the baffle of FIG. 2.

[0017] FIG. 9 is a bottom plan view of the baffle of FIG. 2.
 [0018] FIG. 10 is a cross-sectional top view of the convection oven of FIG. 1 showing the flow of air.
 [0019] FIG. 11 is a front elevation view of the convection oven of FIG. 3 showing the flow of air.
 [0020] FIG. 12 is a cross-sectional top view of the convection oven of FIG. 1 showing another embodiment of the flow of air.
 [0021] FIG. 13 is a front elevation view of the convection oven of FIG. 3 showing the flow of air.

DETAILED DESCRIPTION

[0022] In this patent, the top, bottom, left and right directions are from the perspective facing the oven door, as in the viewpoint of FIG. 2. The front is the side visible in FIG. 2 and the rear is the side opposite the front, not visible in FIG. 2.
 [0023] A convection oven 100 having a cooking chamber that is enclosed by side walls 102, a top wall 104, a bottom wall 106, a rear wall 108 and a front door 110 is shown in FIG. 1. FIG. 2 illustrates a front view of the convection oven. Inside the cooking chamber and attached to the rear wall 108 is a baffle 200, which is a structure that helps distribute and circulate the air flow from the fan. The baffle 200 surrounds a fan, which draws air into the baffle through selected vents and forces air out through other vents on the baffle 200 into the cooking chamber. The positions of the vents on the baffle 200 are optimized to evenly distribute air in the cooking chamber, which results in improved cooking efficiency and uniform cooking of food.
 [0024] FIG. 3A is a front view of the convection oven with the front door removed for an unobstructed view of the baffle 200 attached to the interior side of the rear wall 108 of the oven 100. The baffle 200 includes an inlet opening 202 where a fan 120 can draw in air and direct the airflow back out to the cooking chamber through the vents. The fan 120 may be located behind the inlet opening 202 in the baffle 200. In the illustrated embodiment, the fan 120 spins clockwise when viewed from the front to suck in air through the inlet opening 202 and force the air towards the sides of the baffle 200. In some embodiments, a filter (not shown) may be placed over the inlet opening 202 to filter the air inside the cooking chamber and help reduce cross-contamination of flavors and scents between items placed in the cooking chamber. Some convection ovens may include a heating element 130 which at least partially surrounds the fan 120 and consequently heats the air as the air stream travels through the baffle 200.
 [0025] FIG. 3B shows the baffle as transparent to better illustrate the components behind the baffle, such as the heating element 130. Also visible through the transparent baffle are the left conduit 260 and the right conduit 270. In some embodiments, the left conduit 260 may draw in air through the lower vents 214 to the fan 120 and the right conduit 270 may draw in air from the upper vents 212 to the fan 120. The fan may then direct the air through the baffle and out the vents on the sides of the baffle. In other embodiments, the fan 120 may direct air through the left conduit 260 to exit out of the lower vents 214, and through the right conduit 270 to exit out of the upper vents 212.
 [0026] FIGS. 4 and 5 illustrate perspective views the baffle 200. The baffle 200 includes a main panel 210, a top panel 220, a bottom panel 230 and side panels 240. The main panel 210 includes the inlet opening 202 generally in the center of the main panel 210. In the illustrated embodiment, the inlet opening 202 is made up of two semicircles with a cross-

member **204** between the semicircles. The cross-member **204** helps maintain the structural rigidity of the main panel **210** and may provide a mounting structure for the filter. In other embodiments, the inlet opening may have any of a plurality of different shapes, such as square, rectangular, ovular, etc. Some embodiments of the inlet opening may not have a cross-member and may be one large opening.

[0027] The baffle **200** may be attached to the oven using mounting tabs **250**, which are extensions of the baffle **200** with through holes where fasteners are inserted to secure the baffle to the back of the cooking chamber, as illustrated in FIGS. 3A and 3B. The illustrated embodiment has four mounting tabs **250**. In other embodiments, the baffle may be attached to the oven through other methods, such as welding, clips, rivets, etc. Preferably, the baffle can be easily removed to access and service the components behind the baffle **200**.

[0028] As illustrated in FIG. 4, the baffle **200** includes vents that draw in air or discharge the air that is drawn into the baffle **200** by the fan. The vents may be positioned in a variety of places on the baffle **200**, including the main panel **210**, top panel **220**, bottom panel **230** and/or side panels **240**. The illustrated embodiment shows a combination of vent positions that may be used to provide efficient distribution of air and even cooking temperatures in the cooking chamber. The vents are described in further detail below. Other combinations of vent positions and sizes are also contemplated and can be selected depending on oven size, shape and specifications.

[0029] With reference to FIG. 5, the side panels **240** may have an angled portion **242** that is angled toward the center of the baffle **200**. Some of the air blown by the fan can flow toward the sides of the baffle **200**, where the angled portions **242** redirect the air toward the side vents **216** and into the cooking chamber. In the illustrated embodiment, the angled portion **242** is formed by bending the sheet metal side panels **240**. Preferably, the edge of the angled portion **242** is in the same plane as the rear edge of the baffle **200**, such that there is substantially no gap between the side panels **240** and the rear wall where air can escape.

[0030] As shown in FIG. 6, the main panel **210** may include side vents **216** toward the side edges of the main panel **210** where the heated air is directed out into the cooking chamber. In the illustrated embodiment, the side vents **216** include a matrix of six rectangular opening and an elongate opening on each side of the main panel **210**. However, the shape and size of the side vents can vary in other embodiments and other shapes and sizes can be used.

[0031] With continued reference to FIG. 6, the main panel **210** may have upper vents **212** toward the top edge of the main panel **210** and lower vents **214** toward the bottom edge of the main panel **210**. The upper vents **212** are preferably on the opposite side of the main panel **210** as the lower vents **214**. For example, as illustrated in FIG. 6, the upper vents **212** are in the upper right section of the main panel **210**, while the lower vents **214** are in the lower left section of the main panel **210**. The opposite positions of the upper vents **212** and lower vents **214** help produce an even distribution of temperatures in the cooking chamber from the airflows into and from the baffle **200**, which is particularly beneficial for multiple rack ovens.

[0032] The baffle **200** may be made from a piece of sheet metal that is stamped and bent into the desired shape. First, the piece of sheet metal may be stamped to cut the inlet opening **202**, vents and cutouts. Then the edges of the sheet

metal may be bent to form the top panel **220**, side panels **240** and bottom panel **230**. Other bends can be created to form the mounting tabs **250**. In some embodiments, the sheet metal may be bent in to the desired shape and then the openings, vents and cutouts can be formed using a cutting tool. In other embodiments, the baffle is made from multiple panel pieces that are attached together through welding, adhesives, fasteners, rivets, etc.

[0033] The baffle **200** may be made from other materials besides sheet metal. For example, the baffle may be machined from a block of metal, such as aluminum, steel, or alloys. In other embodiments, the baffle is made from fiberglass, high temperature plastics, composites, etc. Furthermore, the baffle **200** may be made from a variety of different methods. For example, the baffle may be formed by stamping, machining, extruding, casting, molding, vacuum forming, etc. In some embodiments, the baffle is made by machining one or more pieces into the desired shape. The baffle **200** may be coated, such as with porcelain, epoxy, or multilayered coatings. The coating may help the baffle resist deformation under high temperatures, protect the surfaces from damage, and improve aesthetics. The coating is able to withstand the high temperatures experienced inside the oven cooking chamber, such as during the self-cleaning procedure.

[0034] FIG. 7 illustrates a rear view of the baffle **200**, showing the left conduit **260** and right conduit **270**. In some embodiments, the left conduit **260** and right conduit **270** direct air drawn in by the fan from the lower vents **214** and upper vents **212**. The fan blows the air out to the cooking chamber through the side and top vents. In other embodiments, the left conduit **260** and right conduit **270** direct air from the fan out to the lower vents **214** and upper vents **212**, respectively.

[0035] The left conduit **260** has a generally triangular shape with a left conduit opening **262**. The left conduit opening **262** extends around approximately a quarter of the circumference of the inlet opening **202**. The inner channel of the left conduit **260** widens from the left conduit opening **262** to the lower vents **214**. The left conduit **260** is positioned to surround and enclose the lower vents **214**. In some embodiments, the baffle is configured so that the air is drawn in through the lower vents **214** by the fan and redirected to blow out the side and top vents of the baffle. In other embodiments, the baffle is configured so that the fan pushes the air into the left conduit opening **262**, where the air flows through the inner channel and out of the lower vents **214**. FIG. 7 illustrates the air path **122**, shown as broken lines. The direction of airflow can be in either direction along the air path **122** depending on the embodiment described above.

[0036] With continued reference to FIG. 7, the left conduit **260** in the illustrated embodiment has a top side **264**, a first side **266**, an end side **267** and a second side **268** in a generally triangular configuration. The top side **264** is adjacent to the inlet opening **202** and is generally horizontal. The first side **266** extends downward at an obtuse angle A to the top side **264**. The illustrated embodiment has an angle A of approximately 112 degrees. The angle A may range from at least approximately 90 degrees and/or less than or equal to approximately 135 degrees. At the bottom end of the first side **266** is the end side **267** that is generally horizontal. The second side **268** extends upward at an angle B from the end side **267**. Angle B is approximately 84 degrees in the illustrated embodiment. The angle B may range from at least approximately 45 degrees and/or less than or equal to

approximately 135 degrees. The second side **268** may also be adjacent to the inlet opening **202**. Although the left conduit **260** is described as having the shapes, angles and dimensions of the illustrated embodiment, in other embodiments the left conduit **260** and right conduit **270** may have a plurality of different types of shapes and dimensions that are appropriate to achieve the desired airflow and distribution in the oven cooking chamber.

[0037] The thickness of the left conduit **260** is defined as the normal distance from the main panel **210** to the inner surface of the left conduit **260** (front to rear distance). The thickness of the left conduit **260** may be at least approximately 0.25 inch and/or less than or equal to approximately 0.5 inch. In the illustrated embodiment, the thickness of the left conduit **260** is approximately 0.4 inch. The thickness affects the cross-sectional area of the left conduit **260** and the flowrate of air through the left conduit **260**. The cross-sectional area is configured to achieve a desired inlet flowrate from the lower vents **214**, or to achieve a desired exit flowrate of the air discharged from the lower vents **214**, depending on the configuration of the flow direction through the left conduit **260**. Variables such as fan speed and size of vent openings may affect the inlet flowrate or exit flowrate, and the cross-sectional area of the conduit may be adjusted to suit specific specifications and requirements.

[0038] In the illustrated embodiment, the left conduit **260** and right conduit **270** have substantially the same shape and cross-sectional area, but are attached to opposite sides of the inlet opening **202**. Accordingly, the right conduit **270** surrounds the upper vents **212** and in some embodiments air is drawn into the upper vents **212** and through the right conduit **270** to the fan. In other embodiments, air flows into the right conduit opening **272** and out through the upper vents **212**, as shown by the air path **122**. The right conduit **270** may have similar shapes, dimensions and other characteristics as described above for the left conduit **260**.

[0039] In the illustrated embodiment, the left conduit **260** and right conduit **270** are made of sheet metal that are bent into the desired shape. The left and right conduits **260**, **270** have tabs that lie flat against the rear of the main panel **210** and are welded to the back of the main panel **210**. Alternatively, the conduits **260**, **270** may be attached to the main panel **210** with fasteners, adhesives, rivets, clips, etc. Also, similar to described above, the left conduit **260** and right conduit **270** may be made from materials besides sheet metal, such as aluminum, steel, alloys, fiberglass, high temperature plastics, composites, etc. The left conduit **260** and right conduit **270** may be formed by casting, molding, vacuum forming, machining, etc. and may have a coating, such as porcelain or epoxy.

[0040] FIG. 8 illustrates a top view of the baffle **200**. The top panel **220** includes cutouts **222** that provide clearance for the wires of the heating element **130**. The top panel **220** may also have top vents **224** that allow the heated air inside the baffle **200** to discharge toward the top of the cooking chamber.

[0041] FIG. 9 shows the bottom panel **230** of the baffle **200**. The illustrated embodiment does not include vents, however, in some embodiments the bottom panel **230** may have vents to discharge air toward the bottom of the cooking chamber.

[0042] FIGS. 10 and 11 illustrate an embodiment of the air flow in the cooking chamber produced by the baffle **200**. FIG. 10 shows a cross-sectional top view with arrows showing the flow of air produced by the fan **120** in an embodiment where the air is discharged through the upper vents **212** and lower

vents **214** into the cooking chamber. The fan **120** draws air into the baffle **200** through the inlet opening **202** and pushes the air through the heating element **130**, where the air increases in temperature. The air continues toward the sides of the baffle **200** where it is discharged through the upper vents, lower vents or side vents. Once exiting the vents, the air travels toward the front door **110** and then back toward the inlet opening **202**. As observed in FIG. 10, the air flows through all areas of the cooking chamber to produce a generally even distribution of heat.

[0043] FIG. 11 shows the air flow as viewed from the front of the oven **100**. The air is drawn into the inlet opening **202** and discharged on the sides through the side vents **216**, discharged on the top through the upper vents **212**, and discharged on the bottom through the lower vents **214**. The discharged air disperses through the cooking chamber and returns back to the inlet opening **202**. The vents are positioned to minimize temperature gradients from the bottom to the top of the cooking chamber, and from the left side to the right side of the cooking chamber. For example, the lower vents are positioned in the left portion of the baffle **200** while the upper vents are positioned on the right portion of the baffle **200** to equally distribute the air to the left and right sides. In other embodiments, other combinations of vent positions can achieve a desired distribution of air. For example, the upper vents may be on the left portion of the baffle while the lower vents are on the right portion of the baffle.

[0044] FIGS. 12 and 13 illustrate an alternative embodiment of the air flow in the cooking chamber produced by the baffle **200**. FIG. 12 shows a cross-sectional top view with arrows showing the flow of air produced by the fan **120**. The fan **120** draws air into the baffle **200** through the inlet opening **202**, upper vents **212** and lower vents **214**, and draws the air through the heating element **130**, where the air increases in temperature. The air continues toward the sides of the baffle **200** where it is discharged through the side or top vents. Once exiting the vents, the air travels toward the front door **110** and then back toward the inlet opening **202**, upper vents **212** and lower vents **214**. As observed in FIG. 12, the air flows through all areas of the cooking chamber to produce a generally even distribution of heat.

[0045] FIG. 13 shows the alternative embodiment of the air flow as viewed from the front of the oven **100**. The air is drawn into the inlet opening **202**, upper vents **212** and lower vents **214**, and discharged on the sides through the side vents **216**. The discharged air disperses through the cooking chamber and returns back to the inlet opening **202**, upper vents **212** and lower vents **214**. As discussed above, the vents are positioned to minimize temperature gradients from the bottom to the top of the cooking chamber, and from the left side to the right side of the cooking chamber.

[0046] Throughout this description, the embodiments and examples shown should be considered as exemplars, rather than limitations on the apparatus and procedures disclosed or claimed. Although many of the examples presented herein involve specific combinations of method acts or system elements, it should be understood that those acts and those elements may be combined in other ways to accomplish the same objectives. Acts, elements and features discussed only in connection with one embodiment are not intended to be excluded from a similar role in other embodiments. Additionally, it will be recognized that the methods described herein may be practiced in different sequences, and/or with additional devices as desired. Such alternative embodiments and/

or uses of the methods and devices described above and obvious modifications and equivalents thereof are intended to be included within the scope of the present invention. Thus, it is intended that the scope of the present invention should not be limited by the particular embodiments described above, but should be determined only by a fair reading of the claims that follow.

What is claimed is:

1. A convection oven comprising:
a baffle comprising:
a panel with a front surface and a rear surface;
an inlet opening generally at a center of the panel;
upper vents toward a top edge of the panel;
lower vents toward a bottom edge of the panel;
side vents toward a left edge and a right edge of the panel;
a left conduit on the rear surface of the baffle, the left conduit configured to draw in air from the lower vents and direct the air toward the inlet opening;
a right conduit on the rear surface of the baffle, the right conduit configured to draw in air from the upper vents and direct the air toward the inlet opening; and
a fan adjacent the inlet opening.
2. The convection oven of claim 1, wherein the left conduit surrounds the lower vents and comprises a left conduit opening and wherein the right conduit surrounds the upper vents and comprises a right conduit opening.
3. The convection oven of claim 2, wherein each of the left conduit inlet and the right conduit inlet are disposed adjacent the inlet opening and span approximately a quarter of the circumference of the inlet opening.
4. The convection oven of claim 2, wherein a width of the left conduit increases proceeding from the left conduit opening to the lower vents.
5. The convection oven of claim 2, wherein a width of the right conduit increases proceeding from the right conduit opening to the upper vents.
6. The convection oven of claim 1, wherein the left conduit and right conduit have a generally triangular shape.
7. The convection oven of claim 1, wherein the left conduit and right conduit have a thickness between approximately 0.25 inch to approximately 0.5 inch.

8. The convection oven of claim 1, wherein the left conduit and right conduit have a thickness of approximately 0.4 inch.

9. The convection oven of claim 1, further comprising a heating element coiled around the fan.

10. The convection oven of claim 1, further comprising a filter over the inlet opening.

11. A baffle for a convection oven, the baffle comprising:
a panel with a front surface and a rear surface;
an inlet opening generally at a center of the panel;
upper vents toward a top edge of the panel;
lower vents toward a bottom edge of the panel; and
a pair of air conduits on the rear surface of the baffle, the air conduits configured to draw in air from the upper vents and lower vents and direct the air toward the inlet opening.

12. The baffle of claim 11, wherein each air conduit comprises an air conduit opening and an end surrounding the lower or upper vents.

13. The baffle of claim 12, wherein the air conduit opening are disposed adjacent the inlet opening and spans approximately a quarter of the circumference of the inlet opening.

14. The baffle of claim 12, wherein a width of the air conduits increase proceeding from the air conduit opening to the ends.

15. The baffle of claim 11, wherein the air conduits have a generally triangular shape.

16. The baffle of claim 11, wherein the air conduits comprise a generally horizontal top side and a first side extending from the top side at an angle at least approximately 90 degrees and/or less than or equal to approximately 135 degrees.

17. The baffle of claim 11, wherein the air conduits comprise a generally horizontal end side and a second side extending from the end side at an angle at least approximately 45 degrees and/or less than or equal to approximately 135 degrees.

18. The baffle of claim 11, wherein the air conduits have a thickness between approximately 0.25 inch to approximately 0.5 inch.

19. The baffle of claim 11, wherein the air conduits have a thickness of approximately 0.4 inch.

20. The baffle of claim 11, wherein the baffle is at least partially made of sheet metal.

* * * * *