US 20130037013A1

(19) **United States**

(12) **Patent Application Publication**

Roy et al.

(10) **Pub. No.: US 2013/0037013 A1**

(43) **Pub. Date: Feb. 14, 2013**

(54) **BURNER FOR HEATING SYSTEM**

(75) Inventors: **Wiliam J. Roy**, Avon, IN (US); **Colin William Carey**, Brownsburg, IN (US); **Kyle Bushman**, Brownsburg, IN (US)

(73) Assignee: **CARRIER CORPORATION**, Farmington, CT (US)

(21) Appl. No.: **13/565,280**

(22) Filed: **Aug. 2, 2012**

Related U.S. Application Data

(60) Provisional application No. 61/521,143, filed on Aug. 8, 2011.

Publication Classification

(51) **Int. Cl.**

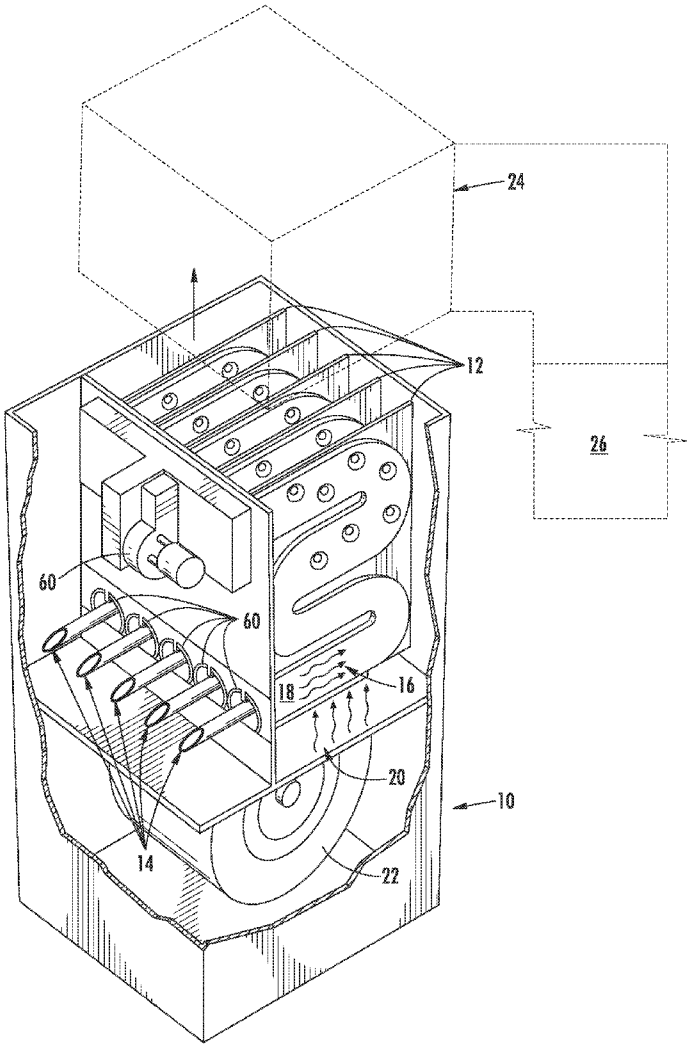
F23D 14/62 (2006.01)

F24H 3/06 (2006.01)

(52) **U.S. Cl.** ..... **126/116 R**; 431/354

(57) **ABSTRACT**

A burner for a furnace includes an inner wall defining a central burner chamber. The inner wall includes a plurality of inner wall openings to admit a fuel flow into the central burner chamber. The burner further includes an outer wall which, defines an annulus for the fuel flow to the plurality of inner wall openings. An igniter is located in the central chamber. A furnace includes a heat exchanger and one or more burners disposed at and aligned with one or more burner openings of the heat exchanger. The one or more burners include an inner wall defining a central burner chamber. The inner wall includes a plurality of inner wall openings to admit a fuel flow into the central burner chamber. The one or more burners further include an outer wall defining an annulus for the fuel flow to the plurality of inner wall openings.



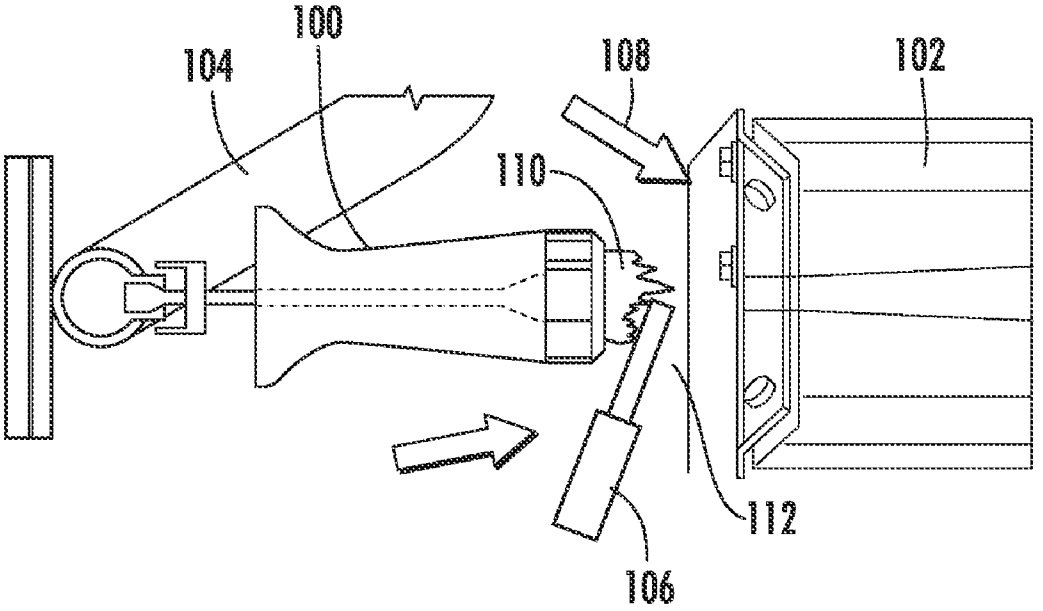


FIG. 1
PRIOR ART

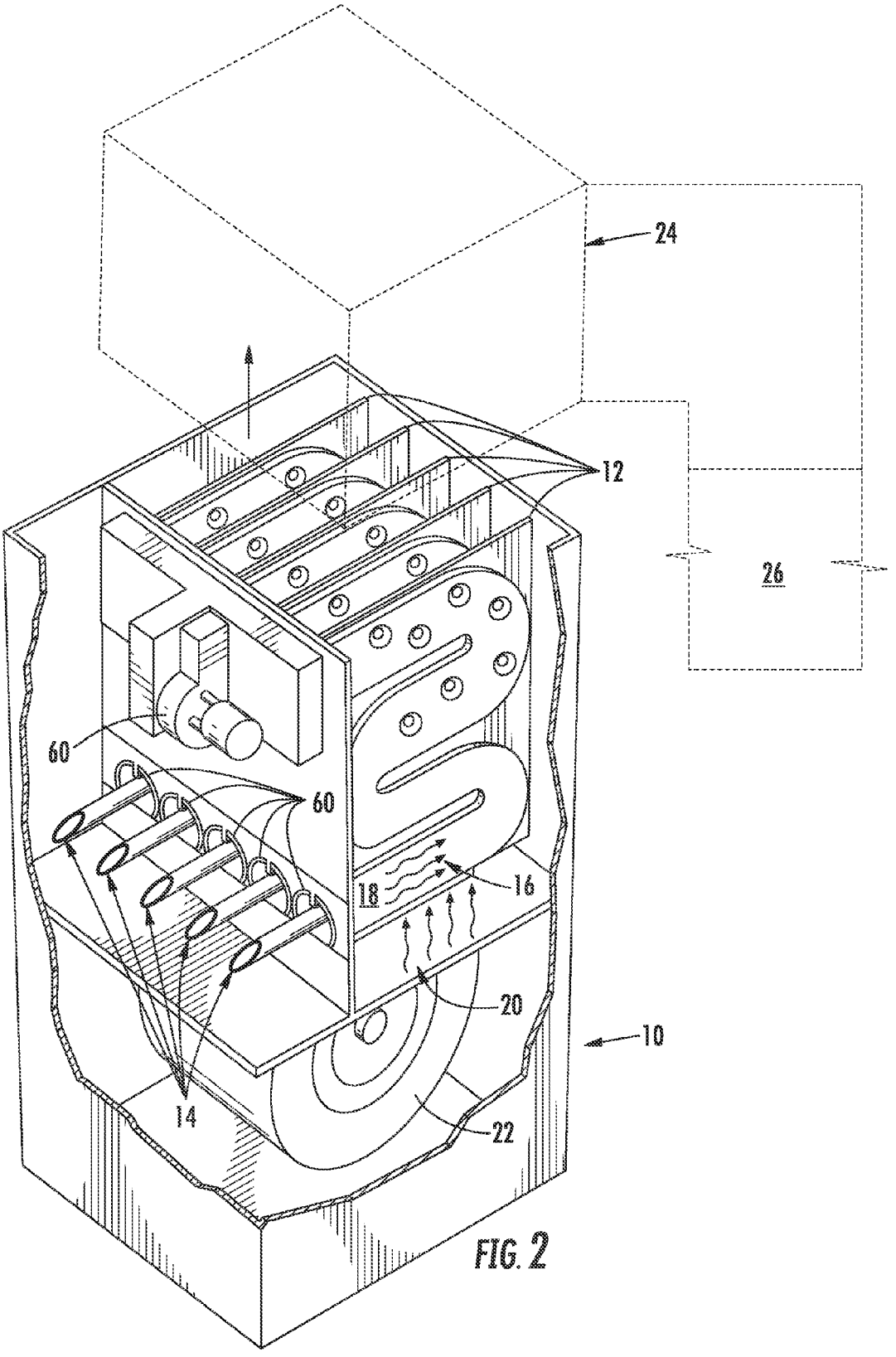


FIG. 2

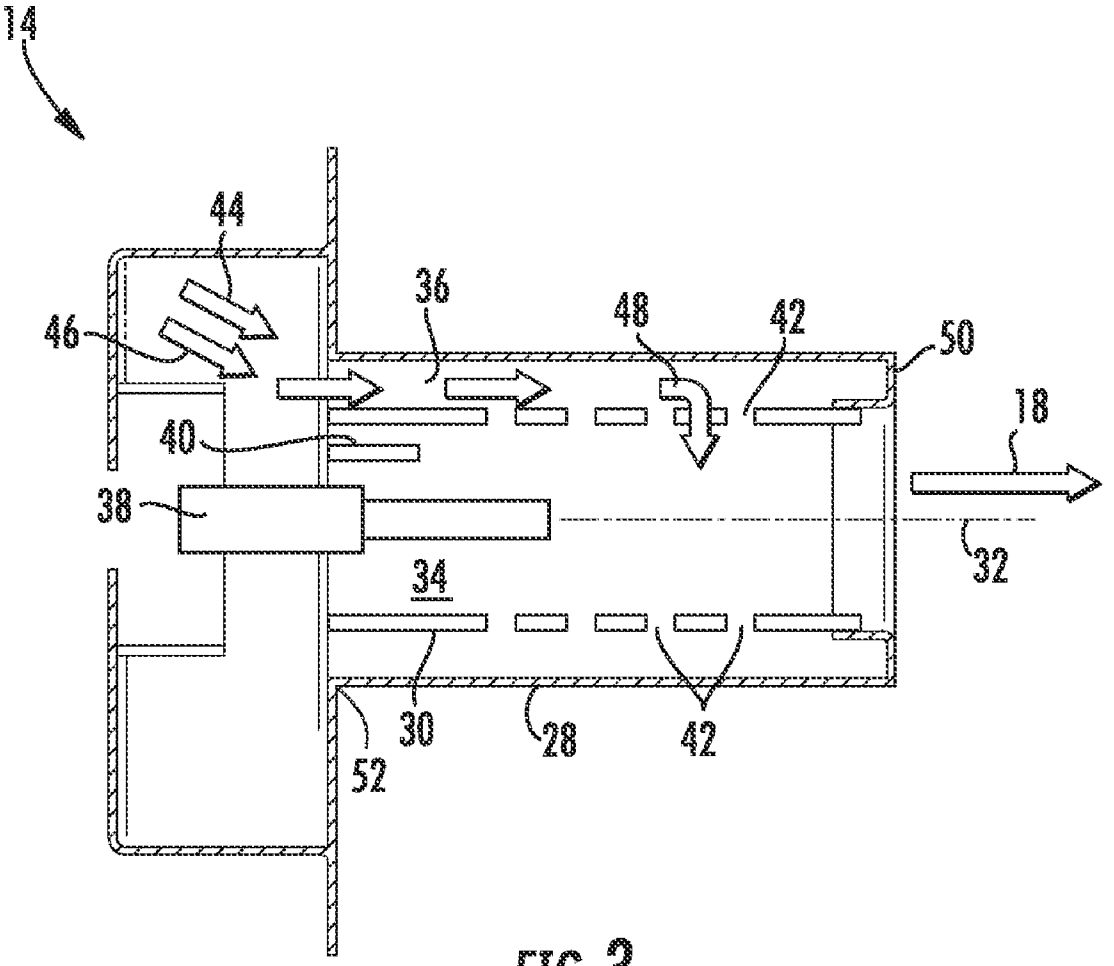


FIG. 3

BURNER FOR HEATING SYSTEM

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to U.S. provisional application Ser. No. 61/521,143, filed Aug. 8, 2011, the entire contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] The subject matter disclosed herein relates to heating systems. More specifically, the subject disclosure relates to burners for residential and commercial heating systems.

[0003] Heating systems, in particular furnaces include one or more burners for combusting a fuel such as natural gas. Hot flue gas from the combustion of the fuel proceeds from the burner and through a heat exchanger. The hot flue gas transfers thermal energy to the heat exchanger, from which the thermal energy is then dissipated by a flow of air driven across the heat exchanger by, for example, a blower.

[0004] A typical construction is shown in FIG. **1**. A burner **100** is located external to a heat exchanger **102**. The burner **100**, referred to as an inshot burner **100**, receives a flow of fuel from a fuel source **104**. An ignition source **106** combusts the flow of fuel. Even though the inshot burner **100** is in close proximity to heat exchanger **102**, surfaces of the heat exchanger **102** adjacent to the combustion flame **110** are kept relatively cool by a flow of secondary air **108** to prevent damage to the surfaces of the heat exchanger **102** via the combustion flame **110**.

[0005] Another type of burner is a premix burner in which fuel and air are mixed in the burner nozzle prior to injection into a combustion zone **112** where the ignition source **106** ignites the mixture. Premix burners, compared to inshot burners, emit much lower levels of NO_x, the emissions of which are tightly regulated and restricted. Because of this advantage of premix burners, it is appealing to introduce premix burners into furnaces. A premix burner having physical and operating characteristics similar to the burner **100** would not be suitable for use with heat exchanger **102**. The heat exchanger walls would necessarily be in close proximity to the burner and thus the concentration of heat produced in the immediate vicinity of the burner would result in excessively high temperatures in the wall of the heat exchanger **102**. Such high temperatures would increase the surface temperatures of the surrounding heat exchanger **102** and shorten the life of the heat exchanger **102**. Further, premix burners have a much quicker heat release than inshot burners and do not have the benefit of secondary airflow to protect the heat exchanger surfaces from damage. Thus, simply replacing inshot burners with premix burners in an existing furnace construction would result in excessively high temperatures at adjacent heat exchanger surfaces. Further, ignition access to a premix burner surface can be difficult and result in even more energy being dumped into the heat exchanger entry surfaces.

BRIEF DESCRIPTION OF THE INVENTION

[0006] According to one aspect of the invention, a burner for a furnace includes an inner wall defining a central burner chamber. The inner wall includes a plurality of inner wall openings to admit a fuel flow into the central burner chamber. The burner further includes an outer wall which, together with the inner wall, defines an annulus for the fuel flow to the plurality of inner wall openings. An igniter is located in the central chamber.

[0007] According to another aspect of the invention, a furnace includes a heat exchanger and one or more burners disposed at and aligned with one or more burner openings of the heat exchanger. The one or more burners include an inner wall defining a central burner chamber. The inner wall includes a plurality of inner wall openings to admit a fuel flow into the central burner chamber. The one or more burners further include an outer wall, together with the inner wall defining an annulus for the fuel flow to the plurality of inner wall openings. An igniter is located in the central chamber.

[0008] These and other advantages and features will become more apparent from the following description taken in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The subject matter, which is regarded as the invention, is particularly pointed out and distinctly claimed in the claims at the conclusion of the specification. The foregoing and other features, and advantages of the invention are apparent from the following detailed description taken in conjunction with the accompanying drawings in which:

[0010] FIG. **1** is a cross-sectional view of a typical burner arrangement;

[0011] FIG. **2** is a schematic view of an embodiment of a furnace; and

[0012] FIG. **3** is a cross-sectional view of an embodiment of a burner.

[0013] The detailed description explains embodiments of the invention, together with advantages and features, by way of example with reference to the drawings.

DETAILED DESCRIPTION OF THE INVENTION

[0014] Shown in FIG. **2** is an improved furnace **10**. The furnace **10** includes a heat exchanger **12** with one or more burners **14** aligned with respective burner openings **60** in heat exchanger **12** walls **16**. In some embodiments, the burners **14** are located substantially within the heat exchanger **12**, while in other embodiments, the burners **14** may abut the heat exchanger **12**. In still other embodiments, the burners **14** offset a distance from the heat exchanger **12**, but are aligned with the burner openings **60** such that, once ignited, the burners **14** radiate hot flue gas **18** into the heat exchanger **12**, thermal energy from which is transferred to the heat exchanger **12** structure. The thermal energy is then dissipated from the heat exchanger **12** via a flow of air **20** driven across the heat exchanger **12** by, for example, a blower **22**. The heated flow of air **20** is delivered through one or more ducts **24** to provide heating to a space **26**, such as a room or a building.

[0015] Referring now to FIG. **3**, the burner **14** is substantially cylindrical in shape, and includes an outer wall **28** and an inner wall **30**. It is to be appreciated that while a substantially cylindrical burner **14** is shown, it is merely exemplary. The burner **14** may have another cross-sectional shape, for example, elliptical, conical, parabolic, partially circular, or the like. Both the inner wall **30** and the outer wall **28** may be substantially cylindrical and in some embodiments are coaxial about a central burner axis **32**. The inner wall **30** defines a central chamber **34**, and together with the outer wall **28** defines a burner annulus **36** between the inner wall **30** and the outer wall **28**. An igniter **38** for the burner is located in the

central chamber **34** and, in some embodiments, extends along the burner axis **32**. The igniter **38** is located, for example, at a closed end **52**, or upstream end, of the burner **14**. Further, in some embodiments, a flame sensor **40** is located in the central chamber **34**, and also may be located at the closed end **52**.

[0016] The inner wall **30** includes a plurality of inner wall openings **42**, and in some embodiments, may be at least partially a mesh screen. In some embodiments, the inner wall **30** is a unitary, replaceable component. Replacing the inner wall **30** at the end of its service life extends the overall useful life of the burner **14**. A flow of fuel **44** and a flow of combustion air **46** are delivered to the burner annulus **36** where they are premixed. The air/fuel mixture **48** then flows through the inner wall openings **42** or screen and into the central chamber **34** where the mixture **48** is ignited. The flue gas **18** is emitted from the burner **14** at a distal end **50** of the central chamber **34** and into the heat exchanger **12** structure.

[0017] The structure disclosed herein allows for the utilization of a premix burner **14** which reduces NO_x emissions compared to inshot burners, while not subjecting the heat exchanger **12** surfaces to direct effects of the combustion to prevent thermal damage to the heat exchanger **12**. The cylindrical structure of the burner **14** captures the combustion thermal energy before it is emitted from the burner **14**. Further, the burner **14** is sized and configured to allow for the presence of the igniter **38** and flame sensor **40** within the burner **14** structure. This results in a space savings for the burner **14** and heat exchanger **12**, thus allowing for an increased cross-sectional sized burner **14** for a given heat exchanger **12** cross-sectional size. Further, the flow through the burner annulus **36** isolates the flame from the heat exchanger **12** and aids in cooling the heat exchanger **12** surfaces near the burner **14**.

[0018] While the invention has been described in detail in connection with only a limited number of embodiments, it should be readily understood that the invention is not limited to such disclosed embodiments. Rather, the invention can be modified to incorporate any number of variations, alterations, substitutions or equivalent arrangements not heretofore described, but which are commensurate with the spirit and scope of the invention. Additionally, while various embodiments of the invention have been described, it is to be understood that aspects of the invention may include only some of the described embodiments. Accordingly, the invention is not to be seen as limited by the foregoing description, but is only limited by the scope of the appended claims.

1. A burner for a furnace comprising:
an inner wall defining a central burner chamber, the inner wall including a plurality of inner wall openings to admit a fuel flow into the central burner chamber;
an outer wall, together with the inner wall defining an annulus for the fuel flow to the plurality of inner wall openings; and
an igniter disposed in the central chamber.

2. The burner of claim **1**, wherein the inner wall at least partially comprises a mesh screen defining the plurality of inner wall openings.

3. The burner of claim **1**, wherein one or more of the inner wall and the outer wall are substantially cylindrical.

4. The burner of claim **1**, wherein the inner wall and the outer wall are substantially concentric about a burner central axis.

5. The burner of claim **1**, wherein the igniter is disposed at a closed end of the burner.

6. The burner of claim **1**, further comprising a flame sensor disposed in the central burner chamber.

7. The burner of claim **1**, wherein the burner is alignable with a respective burner opening at a heat exchanger of a furnace.

8. The burner of claim **1**, wherein the plurality of inner wall openings are configured to convey a mixture of air and fuel into the central burner chamber.

9. The burner of claim **1**, wherein the inner wall is a replaceable element.

10. A furnace comprising:
a heat exchanger;
one or more burners disposed at and substantially aligned with one or more burner openings of the heat exchanger, the one or more burners including:
an inner wall defining a central burner chamber, the inner wall including a plurality of inner wall openings to admit a fuel flow into the central burner chamber;
an outer wall, together with the inner wall defining an annulus for the fuel flow to the plurality of inner wall openings; and
an igniter disposed in the central chamber.

11. The furnace of claim **10**, wherein the inner wall at least partially comprises a mesh screen defining the plurality of inner wall openings.

12. The furnace of claim **10**, wherein one or more of the inner wall and the outer wall are substantially cylindrical.

13. The furnace of claim **10**, wherein the inner wall and the outer wall are substantially concentric about a burner central axis.

14. The furnace of claim **10**, further comprising a flame sensor disposed in the central burner chamber.

15. The furnace of claim **10**, wherein the igniter is disposed at a closed end of the burner.

16. The furnace of claim **10**, wherein the inner wall is a replaceable element.

17. The furnace of claim **10**, wherein the plurality of inner wall openings are configured to convey a mixture of air and fuel into the central burner chamber.

18. The furnace of claim **10**, wherein thermal energy of a flue gas emitted by the one or more burners is transferred to the heat exchanger.

* * * * *