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(72) Inventor: **Lin, Jung-Lang**
Wu Feng Hsiang
Taichung Hsien (TW)

(74) Representative: **Schütte, Hartmut et al**
BSB
Beethovenstrasse 34
59302 Oelde (DE)

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(71) Applicant: **Suncue Company Ltd.**
Wu Feng Hsiang
Taichung Hsien (TW)

(54) **Combustion system**

(57) A combustion system includes: a furnace housing (11) defining a combustion chamber (111) therein and having a gas outlet (112) in fluid communication with the combustion chamber (111); a plenum housing (61) surrounding and cooperating with the furnace housing (11) to define a plenum chamber (601) therebetween, and having an air inlet (611) and an air outlet (603) which

are in fluid communication with the plenum chamber (601); and a heat exchanger housing (51) disposed outwardly of the plenum housing (61) and having an air inlet (501) in fluid communication with the air outlet (603) of the plenum housing (61), an air outlet (502), a gas inlet (503) in fluid communication with the gas outlet (112) of the furnace housing (11), and a gas outlet (504).

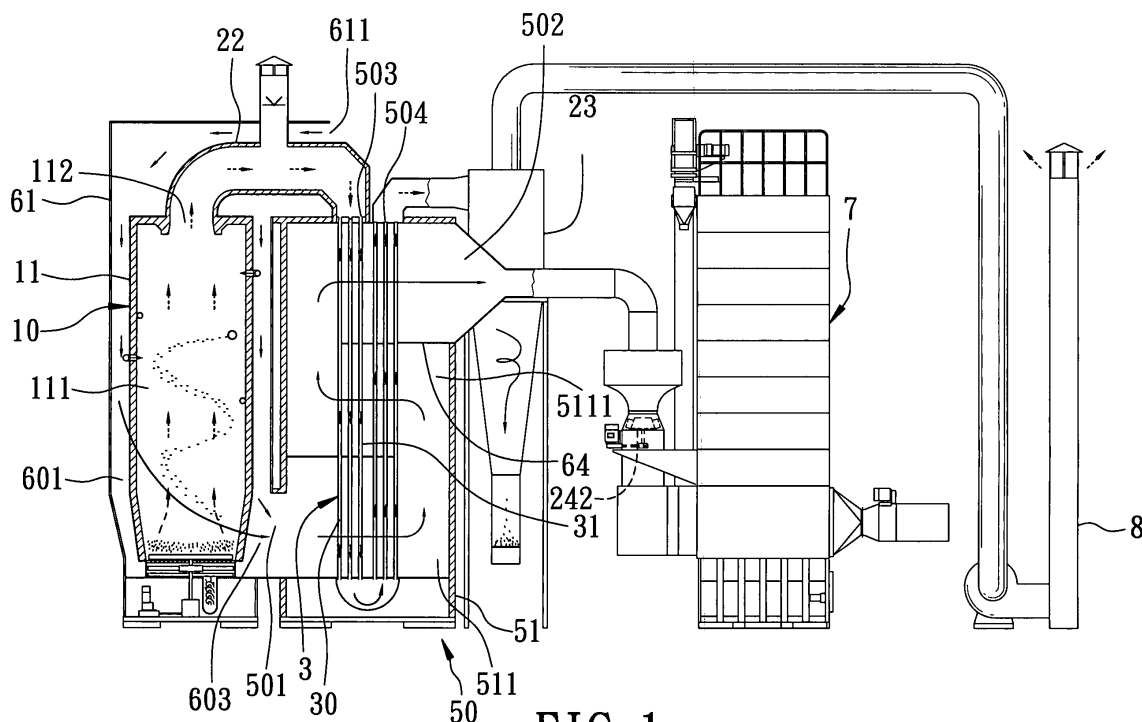


FIG. 1

Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority of Taiwanese application no. 096210759, filed on July 2, 2007.

[0002] This invention relates to a combustion system, more particularly to a combustion system including a heat exchanger separated from a furnace.

[0003] U.S. Patent No. 4,449,510 discloses a heat exchanger furnace that includes a furnace housing defining a combustion chamber therein, a plenum housing surrounding and cooperating with the furnace housing to define a plenum chamber therebetween, and a number of exhaust tubes disposed in the plenum chamber. A combustion gas from the combustion chamber of the furnace housing flows through the exhaust tubes along a serpentine path and into a stack. Meanwhile, ambient air passes into the plenum chamber, and is heated by contacting heat transfer surfaces of the combustion chamber and the exhaust tubes. However, the heat exchanger furnace thus arranged, i.e., the plenum chamber surrounds the furnace housing and the exhaust tubes are disposed within the plenum chamber, has a relatively poor heat exchanging efficiency between the exhaust gas and the heat exchanging air.

[0004] Therefore, the object of the present invention is to provide a combustion system that can overcome the aforesaid drawback associated with the prior art.

[0005] According to the present invention, a combustion system comprises: a furnace including a furnace housing defining a combustion chamber therein and having a gas outlet in fluid communication with the combustion chamber; a plenum housing surrounding and cooperating with the furnace housing to define a plenum chamber therebetween, and having an air inlet and an air outlet which are in fluid communication with the plenum chamber; and a heat exchanger having a heat exchanger housing disposed outwardly of the plenum housing, defining a heat exchanger chamber, and having an air inlet in fluid communication with the air outlet of the plenum housing, an air outlet, a gas inlet in fluid communication with the gas outlet of the furnace housing, and a gas outlet. The heat exchanger further has a tube-bundled structure disposed in the heat exchanger chamber and defining a plurality of passageways extending between and permitting fluid communication between the gas inlet and the gas outlet of the heat exchanger housing.

[0006] In a drawing which illustrate an embodiment of the invention,

Fig. 1 is a schematic view of a combustion system embodying this invention.

Fig. 1 illustrates the preferred embodiment of a combustion system according to this invention for combustion of solid waste, such as hull or shell waste of agricultural crops.

[0007] The combustion system includes: a furnace 10 including a furnace housing 11 defining a combustion chamber 111 therein and having a gas outlet 112 in fluid communication with the combustion chamber 111; a plenum housing 61 surrounding and cooperating with the furnace housing 11 to define a plenum chamber 601 therebetween, and having an air inlet 611 and an air outlet 603 which are in fluid communication with the plenum chamber 601; and a heat exchanger 50 having a heat exchanger housing 51 disposed outwardly of the plenum housing 61, defining a heat exchanger chamber 511, and having an air inlet 501 in fluid communication with the air outlet 603 of the plenum housing 61, an air outlet 502, a gas inlet 503 in fluid communication with the gas outlet 112 of the furnace housing 11, a gas outlet 504. The heat exchanger 50 further has a tube-bundled structure 3 disposed in the heat exchanger chamber 511 and having a plurality of exhaust tubes 31 which define a plurality of passageways 30 extending between and permitting fluid communication between the gas inlet 503 and the gas outlet 504 of the heat exchanger housing 51.

[0008] The heat exchanger 50 further has a plurality of baffles 64 dividing the heat exchanger chamber 511 into a plurality of sections 5111 which are connected to form a tortuous path extending between the air inlet 501 and the air outlet 502 of the heat exchanger housing 51.

[0009] A manifold 22 interconnects the gas outlet 112 of the furnace housing 11 and the gas inlet 503 of the heat exchanger housing 51, and extends through the air inlet 611 of the plenum housing 61.

[0010] During combustion of the solid waste, the combustion gas generated from the combustion chamber 111 passes through the manifold 22 and into the exhaust tubes 31 of the tube-bundled structure 3 and then into a cyclone 23 connected to the gas outlet 504 of the heat exchanger housing 51 and finally into a stack 8 connected to the cyclone 23 for emission of the combustion gas. Meanwhile, an air blower 242 is disposed downstream of the air outlet 502 of the heat exchanger housing 51 for introducing ambient fresh air via the air inlet 611 of the plenum housing 61 into the plenum chamber 601. The introduced air flows around the furnace housing 11 for conducting a preliminary heat exchange, and then flows into the heat exchanger chamber 511 in a sinuous path across the exhaust tubes 31 of the tube-bundled structure 3 for conducting a primary heat exchange. The heated air is then delivered into a crop dryer 7 for drying crops stored therein.

[0011] By disposing the heat exchanger 50 outwardly of the plenum housing 61 of the combustion system of this invention, the heat exchanging efficiency between the introduced air and the exhaust gas can be considerably improved as compared to the aforesaid conventional heat exchanger furnace.

Claims

1. A combustion system **characterized by:**

a furnace (10) including a furnace housing (11) 5
 defining a combustion chamber (111) therein
 and having a gas outlet (112) in fluid communi-
 cation with said combustion chamber (111);
 a plenum housing (61) surrounding and coop- 10
 erating with said furnace housing (11) to define
 a plenum chamber (601) therebetween, and
 having an air inlet (611) and an air outlet (603)
 which are in fluid communication with said ple-
 num chamber (601); and
 a heat exchanger (50) having a heat exchanger 15
 housing (51) disposed outwardly of said plenum
 housing (61), defining a heat exchanger cham-
 ber (511), and having an air inlet (501) in fluid
 communication with said air outlet (603) of said
 plenum housing (61), an air outlet (502), a gas 20
 inlet (503) in fluid communication with said gas
 outlet (112) of said furnace housing (11), and a
 gas outlet (504), said heat exchanger (50) fur-
 ther having a tube-bundled structure (3) dis- 25
 posed in said heat exchanger chamber (511)
 and defining a plurality of passageways (30) ex-
 tending between and permitting fluid communi-
 cation between said gas inlet (503) and said gas
 outlet (504) of said heat exchanger housing (51).

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2. The combustion system of claim 1, **characterized in that** said heat exchanger (50) further has a plu- rality of baffles (64) dividing said heat exchanger chamber (511) into a plurality of sections (5111) which are connected to form a tortuous path extend- 35 ing between said air inlet (501) and said air outlet (502) of said heat exchanger housing (51).

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3. The combustion chamber of claim 1, further **char-** **acterized by** a manifold (22) interconnecting said 40 gas outlet (112) of said furnace housing (11) and said gas inlet (503) of said heat exchanger housing (51) and extending through said air inlet (611) of said plenum housing (61).

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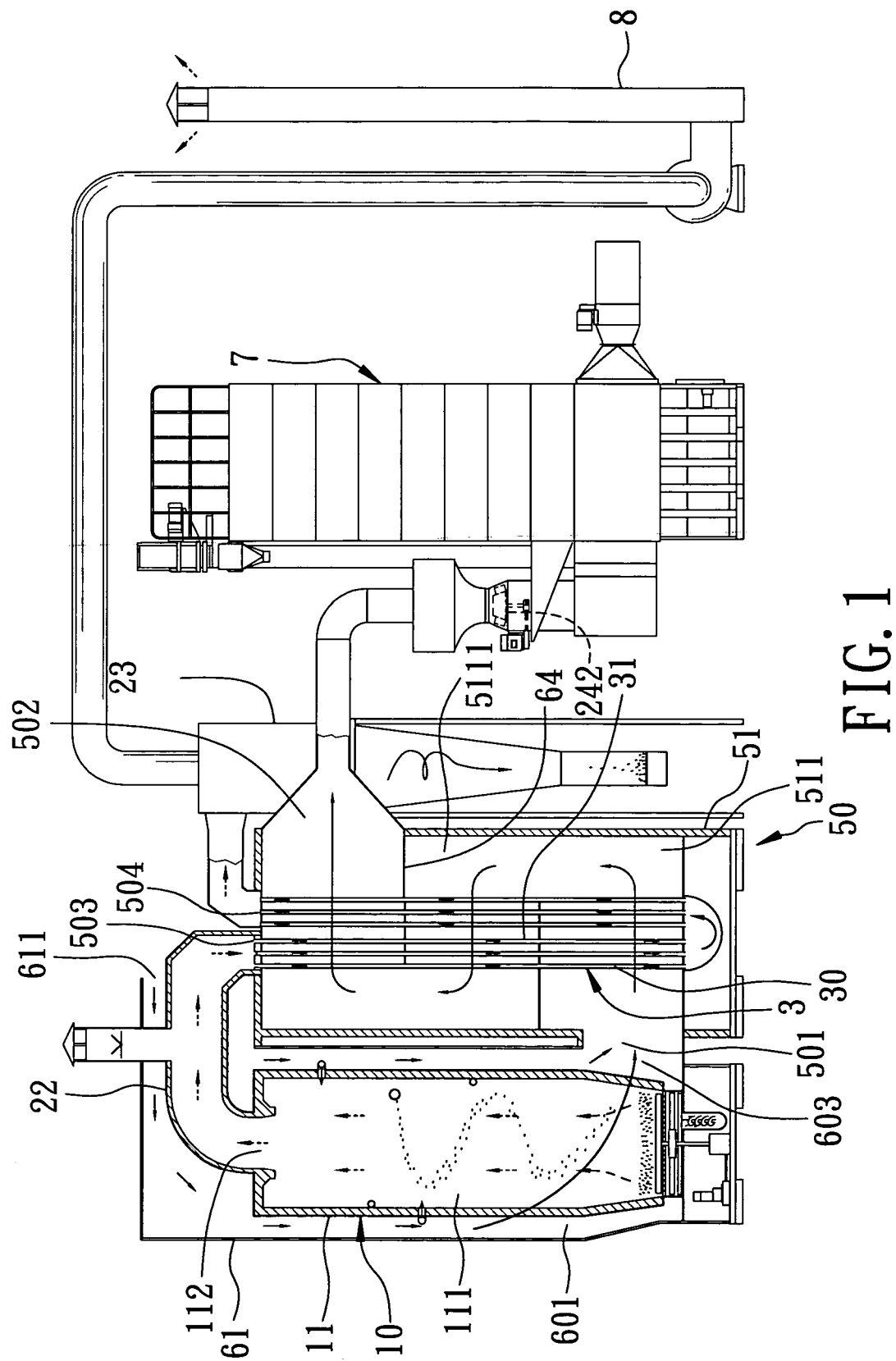


FIG. 1

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- TW 096210759 [0001]
- US 4449510 A [0003]