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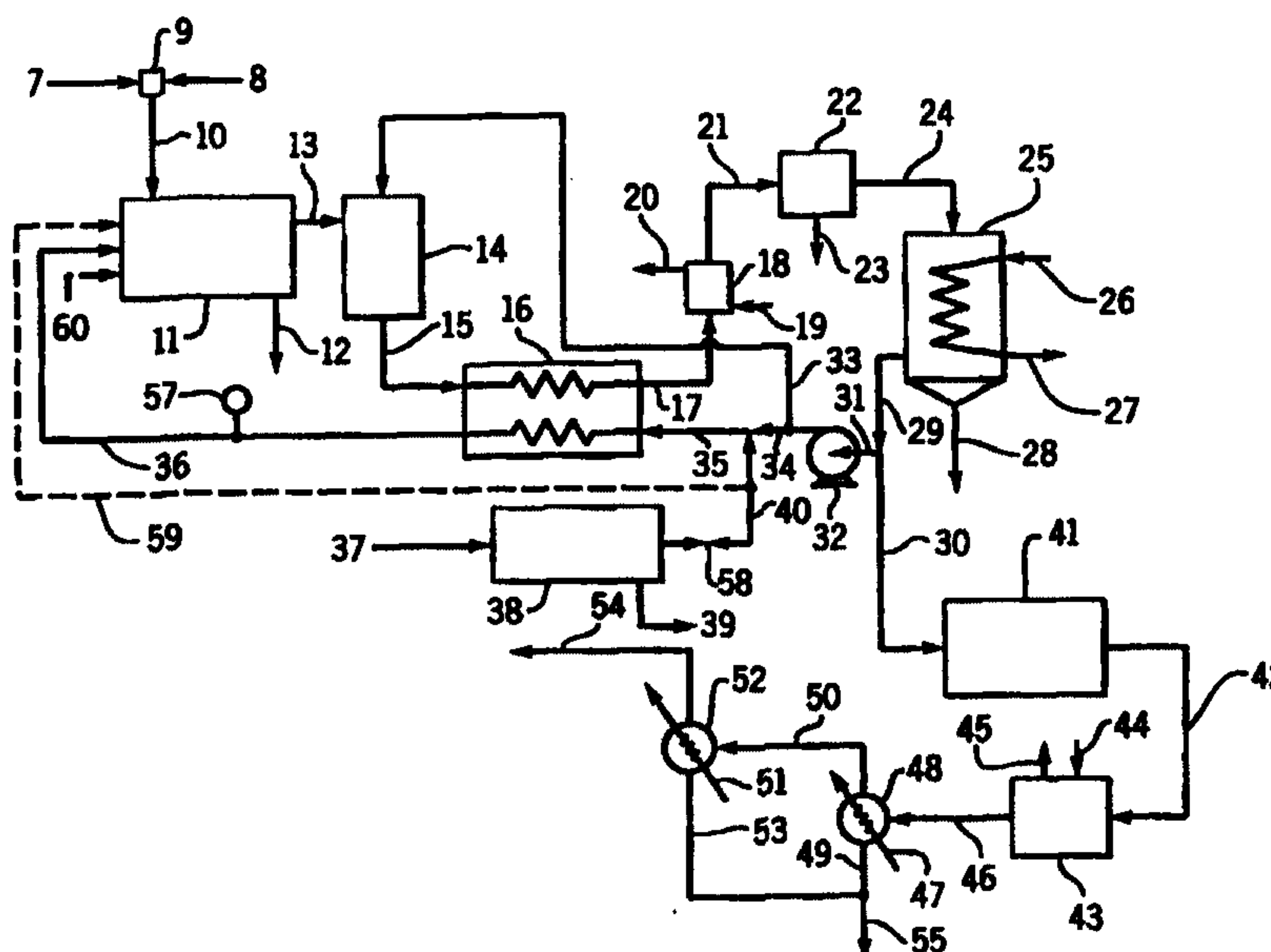
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(21) International Application Number: PCT/US99/06915 (22) International Filing Date: 30 March 1999 (30.03.99) (30) Priority Data: 09/055,502 6 April 1998 (06.04.98) US (71) Applicant: MINERGY CORP. [US/US]; N16 W23217 Stone Ridge Drive, Milwaukee, WI 53188-1155 (US). (72) Inventor: BAUDHUIN, Thomas, J.; 387 Forest View Road, Oshkosh, WI 54904 (US). (74) Agent: EHRMANN, Thomas, W.; Quarles & Brady LLP, 411 East Wisconsin Avenue, Milwaukee, WI 53202-4497 (US).		(81) Designated States: AU, CA, CN, IN, JP, RU, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i>

(54) Title: CLOSED-CYCLE WASTE COMBUSTION

CLOSED-CYCLE WASTE COMBUSTION

BACKGROUND OF THE INVENTION

This invention relates to the combustion of organic waste material, and particularly to a closed cycle combustion of waste material using concentrated oxygen.

Waste materials such as municipal solid waste, waste water treatment sludge, and paper mill sludge, are often treated by incineration. Such waste material contains organic
5 combustible matter and inorganic metal oxides. The organic combustible matter typically provides sufficient thermal energy during combustion to maintain high combustion chamber temperatures without the need for supplemental fuel. The inorganic portion of the waste material is characterized by the presence of some silica (SiO_2) and other glass forming metal oxides. If a slagging combustor such as a rotary kiln or cyclone furnace
10 is used for combustion, the inorganic portion of the waste material can reach a temperature high enough to melt. The resulting molten material is drained from the combustion chamber as slag.

Conventional incinerators designed to combust organic waste material use air as the oxidizer source. Since almost four-fifths of air is inert gases (primarily nitrogen), a
15 major portion of the air provides no benefits to the combustion process. In fact, the inert gas causes several distinct disadvantages. A first disadvantage is that the combustion flame temperature is lowered, thereby making it difficult to maintain the necessary temperatures to melt the inorganic metal oxides in the waste material. Secondly, the waste gases from the incineration will be contaminated with substantial amounts of
20 nitrogen that results in a large volume of exhaust gases which require further treatment before release into the atmosphere.

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It has been proposed to reduce the undesirable effects of nitrogen in the incineration of hazardous waste by introducing concentrated oxygen into the combustion chamber along with recycled exhaust gases. See U.S. patent 5,309,850 issued May 10, 1994, to Downs, et al.

5 The present invention also uses concentrated oxygen in a closed cycle to treat non-hazardous waste and to convert the waste material into useful end products.

SUMMARY OF THE INVENTION

10 In accordance with the invention, the non-hazardous organic waste material is introduced into a slagging combustor where it is burned. The burning produces exhaust gases and a slag of molten, inorganic ash which is removed from the combustor. The exhaust gases are treated to remove a major portion of particulate matter contained therein. A portion of the treated exhaust gases is mixed with a source of concentrated oxygen in a proportion that results in mixed gases having an oxygen concentration of at least 30% by volume. The mixed gases are introduced into the combustor to support the
15 burning of the waste material.

 Preferably, the proportion of oxygen in the mixed gases is from about 40% to 50% by volume. The exhaust gases may be cooled and dried before mixing with the concentrated oxygen.

20 Further in accordance with the invention, a second portion of the treated exhaust gases may be treated to remove the carbon dioxide therefrom. The removed carbon dioxide is preferably converted into a liquid form.

 Also in accordance with one embodiment of the invention, a portion of the heat from the exhaust gases is transferred to the mixed gases before the mixed gases are introduced into the combustor.

