United States Patent

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[15] **3,669,040**

[45] **June 13, 1972**

[54] ACCESS DOOR CONTROL APPARATUS FOR CONTROLLED EMISSION INCINERATOR

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[22] Filed: **Jan. 25, 1971**

[21] Appl. No.: **109,387**

[52] **U.S. Cl.** ..... **110/8 A,** 110/18 C, 110/173, 110/176

[51] **Int. Cl.** **F23g 5/12**

[58] **Field of Search** ..... 110/8 R, 8 C, 8 A, 18 R, 18 C, 110/173, 176

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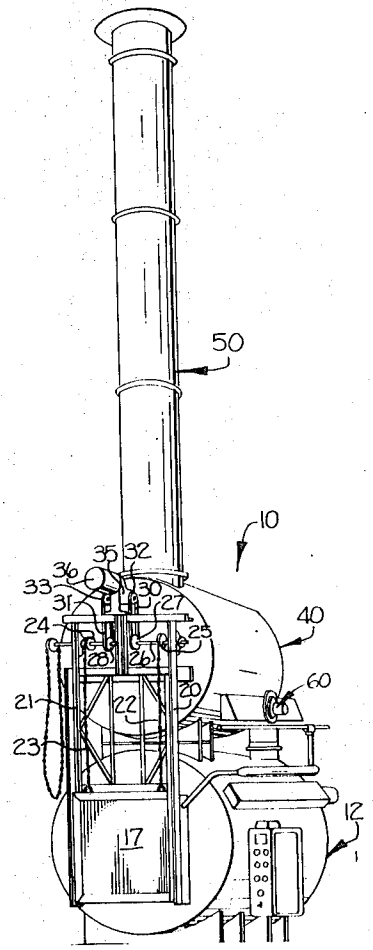
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[57] **ABSTRACT**

The improvement, in a controlled emission incinerator apparatus having a main combustion chamber including an access door mounted for movement between an open position for loading of material and a closed position for burning of the material loaded and an independent secondary combustion chamber for burning the products of incomplete combustion from the main combustion chamber, of apparatus for preventing undesirable emissions from the incinerator resulting if material for burning is loaded into the incinerator when the temperatures in both the combustion chambers are not in the desired range. The apparatus comprises devices independently responsive to temperatures within both combustion chambers for selectively allowing movement of the access door from the closed position to the open position only when desired temperature ranges are present in both the main and secondary combustion chambers.

7 Claims, 3 Drawing Figures



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SHEET 1 OF 2

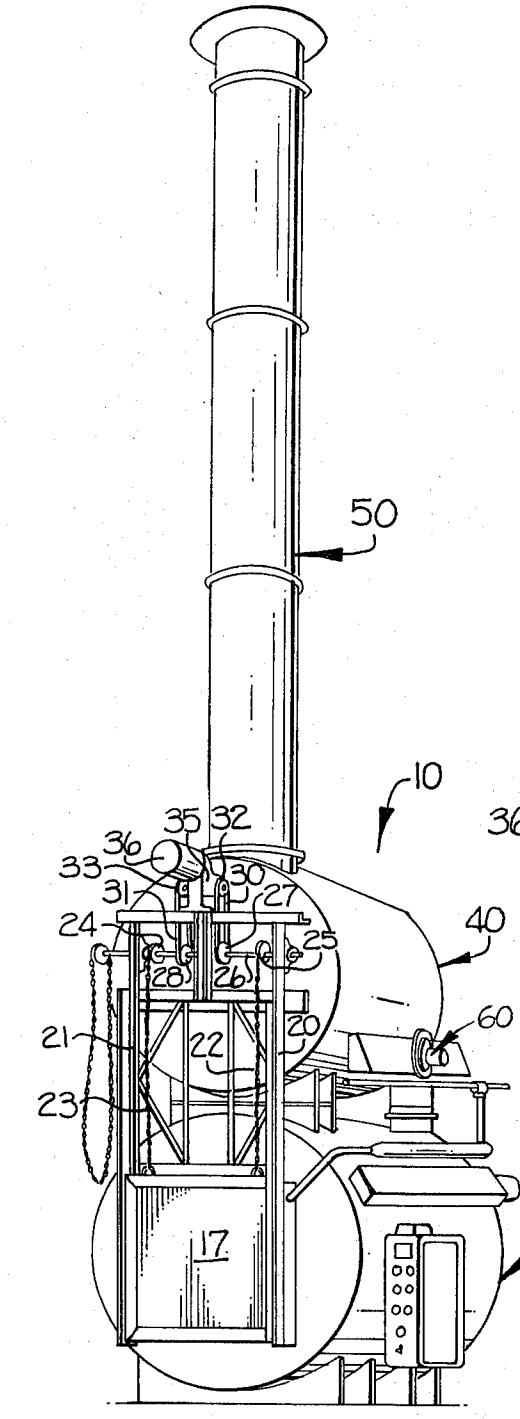


Fig-1

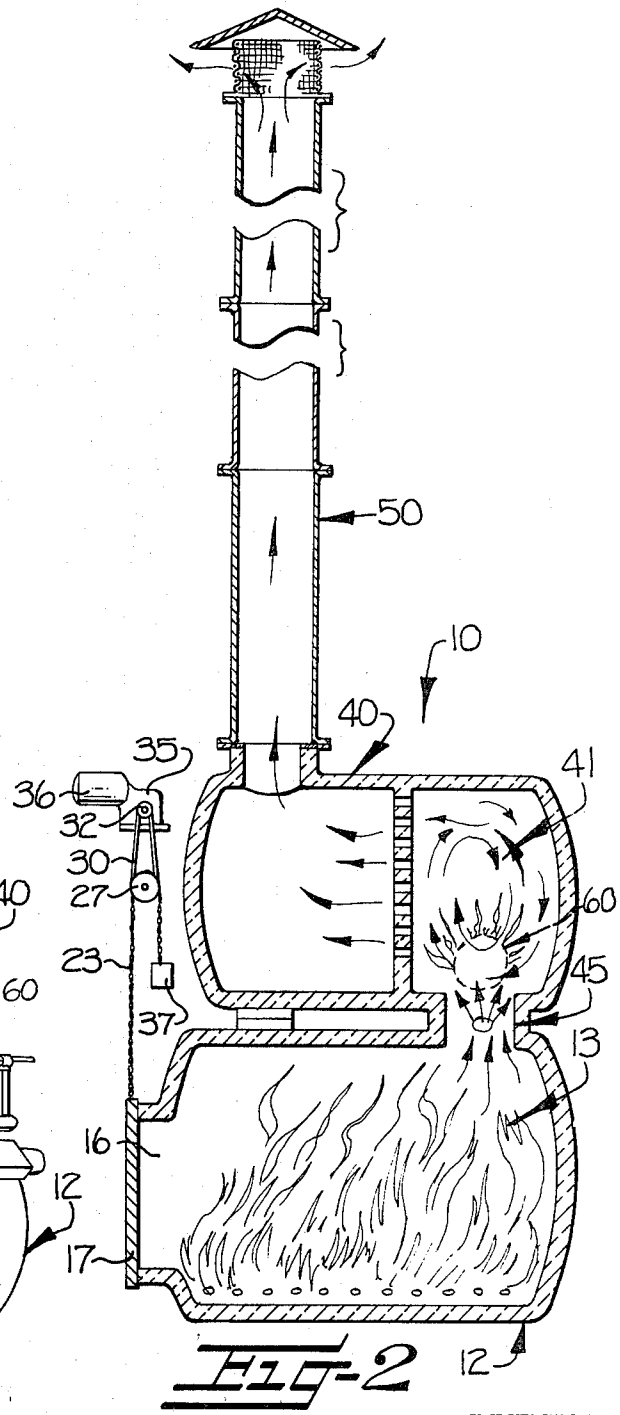


Fig-2

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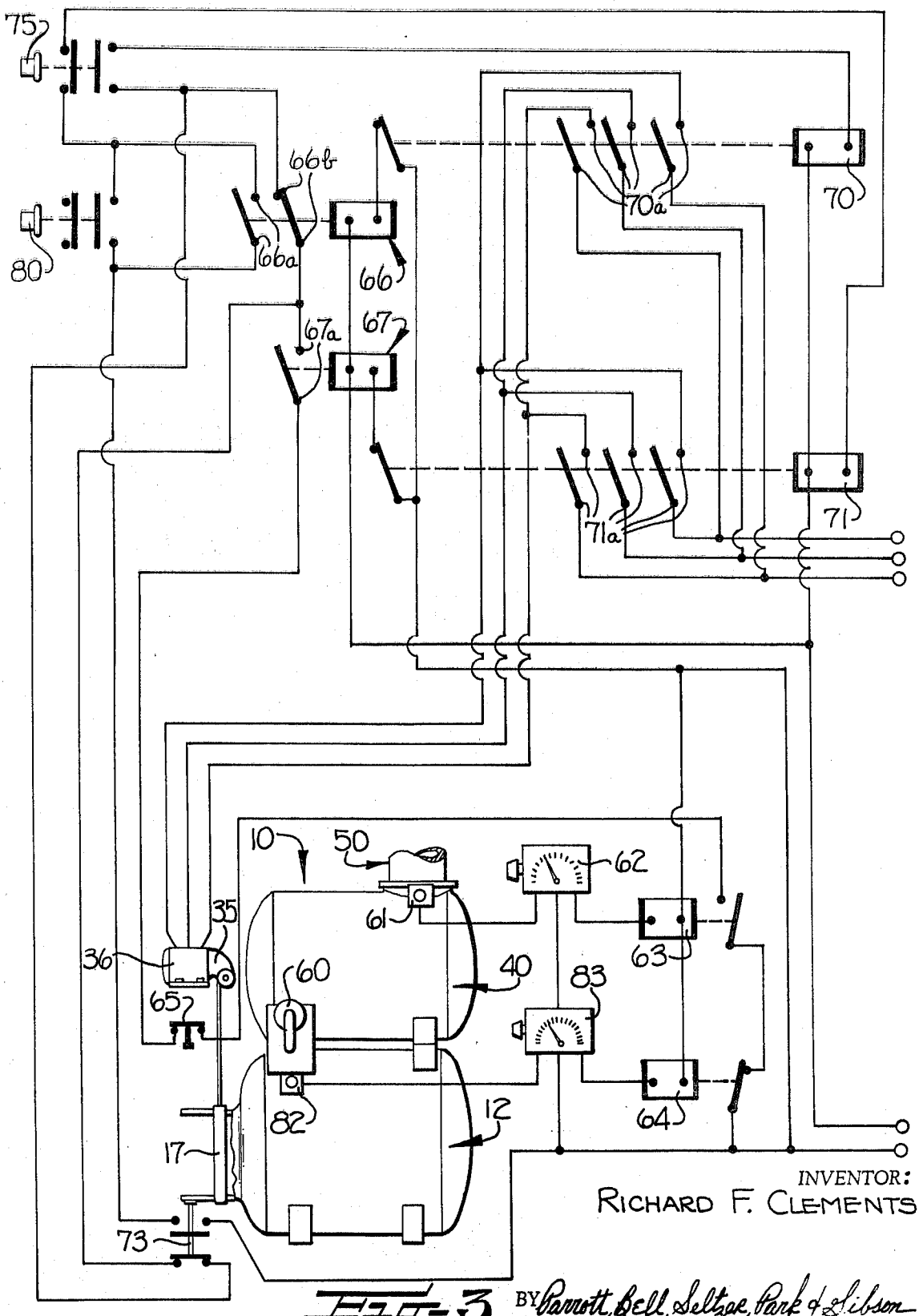


Fig. 3

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ACCESS DOOR CONTROL APPARATUS FOR CONTROLLED EMISSION INCINERATOR

This invention relates to access door control apparatus for a controlled emission incinerator for preventing undesirable emissions from the incinerator resulting if material for burning is loaded into the incinerator when the temperatures in both the combustion chambers are not in the desired ranges.

This invention is an improvement to a controlled emission incinerator apparatus of the type disclosed in U.S. Pat. No. 3,543,700, issued Dec. 1, 1970, and assigned to the present assignee. This controlled emission incinerator apparatus includes a main combustion chamber for burning of waste material including an access door for movement between an open position for loading of material to be burned and a closed position for burning of the material loaded and an independent secondary combustion chamber for burning of the products of incomplete combustion received from the main combustion chamber.

In the use of this type of controlled emission incinerator apparatus, excessive or undesirable emissions from the incinerator can result if the incinerator is operated at temperatures other than within its programmed temperature ranges, such as when the temperature in the secondary combustion chamber has not reached a range of ignition for the products of incomplete combustion or the temperature in the primary combustion chamber has exceeded a predetermined temperature range which directly indicates that combustion is occurring at a rate which will produce excessive amounts of product gases. Also, undesirable emissions occur if too much material is loaded into the incinerator for burning or if the burning cycle of the material in the incinerator is cut short.

Accordingly, it is the object of this invention to provide improved means for a controlled emission incinerator apparatus, of the type described above, which will prevent undesirable emissions from the incinerator.

It has been found by this invention that the above object may be accomplished by providing means, in a controlled emission incinerator of the type discussed above, comprising means for selectively allowing and preventing movement of the access door from the closed position to the open position for respectively allowing loading of material to be burned and preventing loading of material to be burned, and means independently responsive to temperatures within both the main combustion chamber and the secondary combustion chamber for controlling the means for selectively allowing and preventing movement of the access door so as to allow movement of the access door from the closed position to the open position only when the desired temperature ranges are present in both the main and secondary combustion chambers.

Preferably, the means for selectively allowing and preventing movement of the access door comprises motor means for moving the access door from a closed position to an open position and from the open position to the closed position. Preferably, the control means comprises an electrical circuit operatively associated with the motor means and including separate temperature sensors positioned in the main combustion chamber and the secondary combustion chamber for activating the electrical circuit control means to allow the motor means to move the access door to the open position only when the temperature in the main combustion chamber has not exceeded a predetermined range and when the temperature in the secondary combustion chamber has reached a predetermined range. Also, the preferred embodiment of this invention includes timer means for controlling the motor means so that the access door will remain in the open position for loading of material to be burned only a predetermined time period to limit the amount of material loaded and so that the access door will remain in the closed position at least a predetermined period of time for complete burning of the loaded material.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds when taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of a controlled emission incinerator apparatus incorporating the improvements of this invention;

FIG. 2 is a cross-sectional, elevational view of the controlled emission incinerator apparatus of FIG. 1; and

FIG. 3 is a schematic view illustrating the improvements of this invention.

Referring now to the drawings, FIGS. 1 and 2 illustrate a controlled emission incinerator apparatus which, as discussed above, is of the type disclosed in U.S. Pat. No. 3,543,700, issued Dec. 1, 1970, and assigned to the assignee of the present invention. This incinerator apparatus is broadly indicated in the drawings by the reference numeral **10** and includes a first, generally horizontally-extending, enclosed, hollow housing **12** defining internally a main combustion chamber **13** for the burning of waste material therein.

The housing **12** defining the main combustion chamber **13** includes an access opening **16** in the front wall thereof which is covered by a door **17** suitably shaped to completely close the opening **16** when in the closed position illustrated in FIGS. **1** and **2**. The door **17** is suitably mounted in trackways **20** and **21** for moving from the closed position, illustrated in FIGS. **1** and **2**, to an open position completely exposing the opening **16** in the housing **12** for the loading of material into the main combustion chamber **13**.

For moving the door **17** between the closed position and the open position, up and down along the trackways **20** and **21**, the door **17** is mounted on the ends of chain members **22** and **23** which extend around sprockets **24** and **25**, respectively. Sprockets **24** and **25** are mounted on a rotatable shaft **26** which is suitably mounted for rotation in bearing members secured to the trackways **20** and **21** or to suitable support frame members. The shaft **26** also includes pulleys **27** and **28** secured thereto and around which pass suitable belts **30** and **31**. The belts **30** and **31** also pass around respective pulleys **32** and **33** leading from a suitable gearing unit **35** which is operatively connected to and driven by a reversible electric motor **36**. The other ends of the chain members **22** and **23** may include suitable weights **37** attached to the ends thereof or may be anchored in any suitable manner such that when the motor **36** rotates the shaft **26**, the door **17** will be moved from either the closed to the open position or from the open to the closed position, depending upon the direction of rotation of the motor **36**.

The controlled emission incinerator apparatus **10** further comprises a second, independent, generally horizontally-extending, enclosed, hollow housing **40** defining internally a secondary combustion chamber **41** for receiving the products of incomplete combustion from the main combustion chamber **13** for burning the same therein. Also included is a generally vertically-extending, hollow, transition conduit **45** having the bottom end thereof opening into the main combustion chamber **13** and the upper end thereof opening into the secondary combustion chamber **41** for providing a flow and path of travel for the products of incomplete combustion from the main combustion chamber **13** to the secondary combustion chamber **41**. The controlled emission incinerator apparatus further includes a generally vertically-extending, open-ended, exhaust stack means **50** having one end thereof communicating with the interior of the secondary combustion chamber **41** and the other end thereof opening into the atmosphere for allowing the exhaustion of gases remaining after burning in the secondary combustion chamber **41**.

Proper control of the operation of the electric motor **36** and the door **17** are important in the overall operation of the controlled emission incinerator apparatus **10**. Excessive emissions can result if the incinerator **10** is operated at temperatures other than within its programmed temperature ranges. The undesirable conditions can occur when the temperature in the secondary combustion chamber has not reached the ignition range of the combustion product gases or the products of incomplete combustion, or when the temperature in the primary combustion chamber has exceeded a predetermined range

which directly indicates that combustion is occurring at a rate which will produce excessive amounts of product gases.

To exercise control over the loading and burning of material in the incinerator **10**, an electrical control circuit, as schematically illustrated in FIG. **3**, is provided which will permit the door **17** to be opened only when the incinerator temperatures are within the described correct operating ranges. Also, additional circuitry is incorporated for automatically limiting the time the door **17** will remain open for loading, and once closed, prevent the opening of the door **17** for an additional period of time. The first timed period limits the amount of material capable of being loaded per cycle and the second timed period spaces the loads throughout the burning schedule.

Referring now specifically to FIG. **3** of the drawings, a conventional fuel type burner **60** is ignited and the incinerator **10**, including the primary and secondary combustion chambers **13** and **41**, proceeds through its warm-up phase. When the lower limit of the temperature range for efficient incineration has been reached, e.g., 600° F., in the secondary combustion chamber **41**, a thermocouple type temperature sensor **61** and its controlling indicator **62** closes solenoid switch **63**. Current can now flow through solenoid switch **64**, which is normally closed, through solenoid switch **63**, through the door open limit switch **65**, and to the timer circuit **67**. The timer circuit **66** is a door open timer and the timer circuit **67** is a door closed timer and these timers are controlled by normally closed contacts on an open motor control relay **70** and a close motor control relay **71**, respectively. Either motor control relay **70** or **71**, when energized, opens a set of control contacts which resets its respective timer. When either motor control relay de-energizes, its set of contacts closes and thus starts the respective timer. Assuming both motor control relays **70** and **71** have been de-energized a sufficient time to permit the timers **66** and **67** to complete their timing interval, contacts **67***a* and **66***a* will have closed and contacts **66***b* will have opened.

The current available through the temperature sensing circuit previously described can now flow through the closed set of timer contacts **67***a*, and through the closed set of switch contacts on the door close position limit switch **73**. (This switch is shown actuated and held by the door being in its closed position.) Depressing the open operator push button **75** closes its set of normally open contacts and completes the circuit to the open motor control relay solenoid **70** which closes the power contacts **70***a* and thereby provides current to the electric motor **36** to turn the same in a direction to move the door **17** to its open position. As long as the open operator push button **75** is depressed, the door **17** will continue to move toward the open position until it reaches its fully open position and actuates the door open position limit switch **65** which breaks the circuit, de-energizing the open motor control relay **70**. The door may be stopped in any position be releasing the open operator push button **75** which also breaks the circuit.

When the open motor control relay **70** de-energizes, its set of control contacts starts the door open timer **66**. When the door open timer **66** times out, its contacts **66***b* will open and contacts **66***a* will close. The contacts **66***b* prevent the door opening circuit from being energized, while the contacts **66***a* complete the door closing circuit through the normally closed set of switch contacts on the door close position limit switch **73**, through the normally closed contacts of the open operator push button **75**, and energizes the close motor control relay **71** which closes the power contacts **71***a*. This will deliver current to the electric motor **36** and cause it to rotate in a direction to close the door **17**. The door will continue in its closing path of travel until it actuates the close position limit switch **73** and breaks the closing circuit. The door **17** may be temporarily stopped by depressing the open operator push button **75** which also breaks the closing circuit, but is prevented from opening by the energized open contacts **66***b*. However, when the push button is released the door will continue to close.

Once the door has closed, it cannot be opened until the door close timer **67**, started when the close motor control relay **71** de-energized closing its timer control contacts, has timed out.

If the temperature in the main combustion chamber exceeds the upper limit of the desired temperature range, e.g. 2,000° F., a thermocouple type sensor **82** and its indicator **83** will open solenoid switch **64** preventing the door from being opened until the temperature has reduced to within the operating range.

Although a preferred control circuit has been illustrated in FIG. **3** and described above, it is to be understood that other types of control circuits could be designed which perform the improved functions set forth above. By this invention it may be seen that there has been provided an access door control apparatus for a controlled emission incinerator which prevents undesirable emissions from the incinerator by controlling the operation of the door responsive to temperatures in both the primary and secondary combustion chambers.

In the drawings and specification there has been set forth a preferred embodiment of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation.

What is claimed is:

1. In a controlled emission incinerator apparatus having a main combustion chamber for burning of waste material including an access door mounted for movement between an open position for loading of material to be burned and a closed position for burning of the material loaded and an independent secondary combustion chamber for burning the products of incomplete combustion received from the main combustion chamber; the improvement of means for preventing undesirable emissions from the incinerator resulting if material for burning is loaded into the incinerator when the temperatures in both the combustion chambers are not in the desired ranges, said means comprising:

means for selectively allowing and preventing movement of the access door from the closed position to the open position for respectively allowing loading of material to be burned and preventing loading of material to be burned; and

means independently responsive to temperatures within both the main combustion chamber and the secondary combustion chamber for controlling said means for selectively allowing and preventing movement of the access door so as to allow movement of the access door from the closed position to the open position only when desired temperature ranges are present in both the main and secondary combustion chambers.

2. In a controlled emission incinerator apparatus, as set forth in claim **1**, in which said control means includes timer means for controlling said means for selectively allowing and preventing movement of the access door so that the access door will remain in the open position for loading of material to be burned only a predetermined time period to limit the amount of material loaded and so that the access door will remain in the closed position at least a predetermined period of time for complete burning of the loaded material.

3. In a controlled emission incinerator apparatus, as set forth in claim **1**, in which said control means includes separate temperature sensors positioned in the main combustion chamber and the secondary combustion chamber for activating said control means to allow the access door to move to the open position only when the temperature in the main combustion chamber has not exceeded a predetermined range and when the temperature in the secondary combustion chamber has reached a predetermined range.

4. In a controlled emission incinerator apparatus having a main combustion chamber for burning of waste material including an access door mounted for movement between an open position for loading of material to be burned and a closed position for burning of the material loaded and an independent secondary combustion chamber for burning the

products of incomplete combustion received from the main combustion chamber; the improvement of means for preventing undesirable emissions from the incinerator resulting if material for burning is loaded into the incinerator when the temperatures in both the combustion chambers are not in the desired ranges, said means comprising:

motor means for selectively moving the access door from a closed position to an open position for allowing loading of material to be burned and for moving the access door from the open position to the closed position to prevent loading of material to be burned; and

electrical circuit control means independently responsive to temperatures within both the main combustion chamber and the secondary combustion chamber for controlling said motor means for selectively allowing and preventing movement of the access door so as to allow movement of the access door from the closed position to the open position only when desired temperature ranges are present in both the main and secondary combustion chambers.

5. In a controlled emission incinerator apparatus, as set forth in claim 4, in which said electrical circuit control means includes timer means therein for controlling said motor means so that the access door will remain in the open position for loading of material to be burned only a predetermined time period to limit the amount of material loaded and so that the access door will remain in the closed position at least a predetermined period of time for complete burning of the loaded material.

6. In a controlled emission incinerator apparatus, as set forth in claim 4, in which said electric circuit control means includes separate temperature sensors positioned in the main combustion chamber and the secondary combustion chamber for activating said electrical circuit control means to allow said motor means to move the access door to the open position only when the temperature in the main combustion chamber has not exceeded a predetermined range and when the temperature in the secondary combustion chamber has reached a predetermined range.

7. In a controlled emission incinerator apparatus having a main combustion chamber for burning of waste material including an access door mounted for movement between an open position for loading of material to be burned and a closed position for burning of the material loaded and an independent secondary combustion chamber for burning the products of incomplete combustion received from the main combustion chamber; the improvement of means for preventing undesirable emissions from the incinerator resulting if material for burning is loaded into the incinerator when the temperatures in both the combustion chambers are not in the desired ranges, said means comprising:

motor means for selectively moving the access door from a closed position to an open position for allowing loading of material to be burned and for moving the access door from the open position to the closed position to prevent loading of material to be burned; and

electrical circuit control means for controlling said motor means for selectively allowing and preventing movement of the access door, said electrical circuit control means including separate temperature sensors positioned in the main combustion chamber and the secondary combustion chamber for activating said electrical circuit control means to allow said motor means to move the access door to the open position only when the temperature in the main combustion chamber has not exceeded a predetermined range and when the temperature in the secondary combustion chamber has reached a predetermined range and timer means for controlling said motor means so that the access door will remain in the open position for loading of material to be burned only a predetermined time period to limit the amount of material loaded and so that the access door will remain in the closed position at least a predetermined period of time for complete burning of the loaded material.

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