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PLASTIC BURNER

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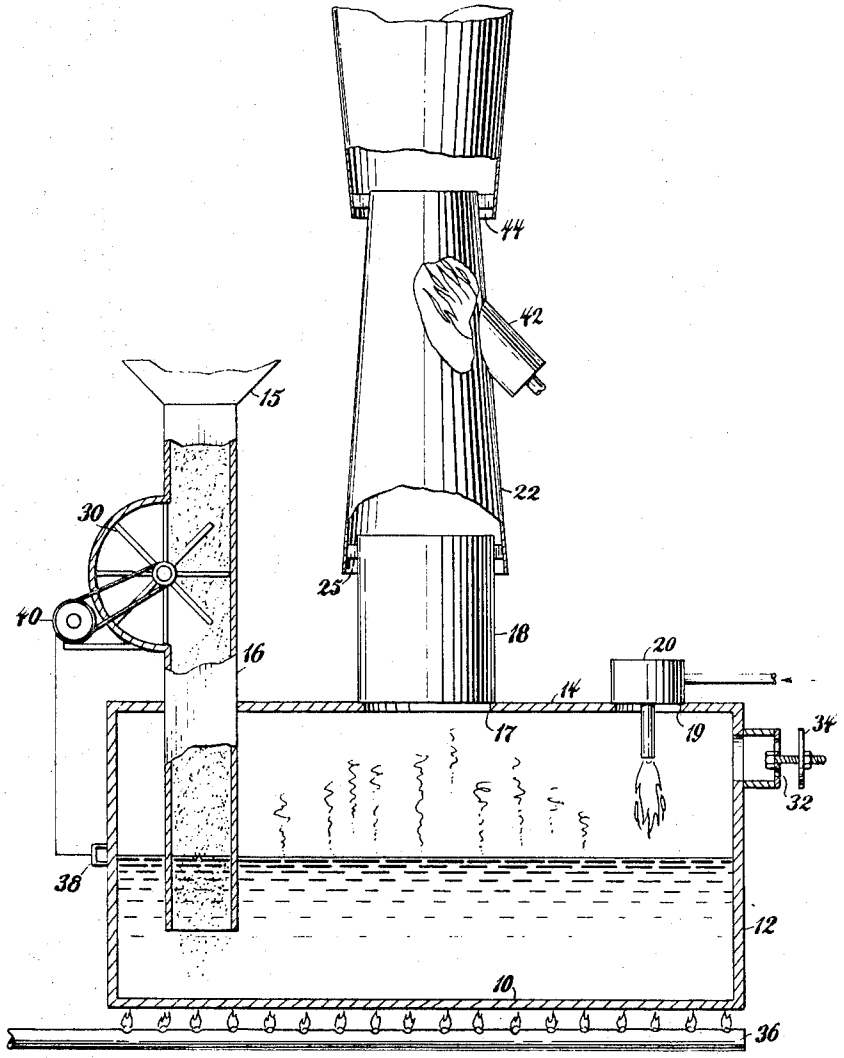

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PLASTIC BURNER

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ABSTRACT OF THE DISCLOSURE

The method of and apparatus for incinerating a meltable plastic material by means of first reducing the plastic to a liquid, heating the liquid to vaporization, and then burning the fumes that are given off from the surface of the liquid before they may be exhausted to the surrounding atmosphere.

BACKGROUND OF THE INVENTION

(1) Field of the invention

The present invention relates to the incineration of waste plastic material of a solid form that may be reduced to a liquid by the application of heat. More particularly, the present invention is directed to an incinerator which provides for the complete elimination of fumes given off by controlled vaporization of the liquid plastic. Accordingly the general objective of the present invention is to provide a new and improved method and apparatus that provides for the complete elimination of waste plastic material and the fumes given off therefrom.

(2) Description of prior art

As is well known various incinerators have been developed which subject the exhaust gases of burning solids to a series of combustion processes and are adapted to incinerate all the combustible products of combustion. For example, reference may be had to U.S. Pat. No. 3,176,634 which subjects the effluent gases to a secondary combustion process for complete elimination.

In such previous patents, incinerators were charged with various organic articles to be burned. If the charge included material comprised of plastic having a high carbon content, the plastic would first be reduced to a liquid state and then quite suddenly, as the material changed to a liquid state, its surface area would be greatly enlarged and its rate of gasification would be accordingly increased. Inasmuch as the amount of air for combustion being supplied to the combustion chamber would vary slowly or not at all, the sudden release of a great amount of fuel in the combustion chamber without adequate air for its combustion would result in excessive amounts of incompletely burned gas and smoke.

In the prior art the combustion air was regulated in accordance with the amount of combustible fuel available. For example, a sensor in the exhaust stack of the incinerator would determine from the density of the exhaust gas, from its composition or temperature that insufficient air for complete combustion was being provided. It then would accordingly actuate the necessary valves and blowers to increase the amount of combustion air being supplied thereto.

Such an arrangement is quite satisfactory for the incineration of typical solid wastes that commonly pass from a solid form directly to a gaseous form prior to combustion. When however, certain plastics or the like are incinerated they inherently pass first through a liquid state which may have a greatly increased surface area from which an excess of combustible gases or fumes are given off therefrom. Inasmuch as known air supply devices do not or cannot respond quickly to all possible variations in available fuel, there will be incomplete combustion of

the fumes and objectionable smoke will be given off from the incineration process.

It therefore follows that if an arrangement could be developed that would control the temperature and surface area of the liquified plastic, the amount of gases or fumes could be regulated, combustion would be complete and at an even rate, and there would be little or no objectionable smoke or other products of combustion.

SUMMARY OF THE INVENTION

In accordance with the present invention, the surface area of the molten plastic and therefore the surface on which vaporization of the plastic may occur is closely controlled for the entire incineration period. Therefore the amount of vapor available for burning at any given time is closely controlled so that the air required for its complete combustion will vary between relatively narrow limits.

It is therefore an objective of the present invention to provide an incinerator for plastic materials which has a constant rate of vaporization and therefore a constant rate of combustion.

It is another objective of this invention to positively control the surface area and the temperature of the plastic material that has been reduced to a liquid state.

BRIEF DESCRIPTION OF THE DRAWING

The present invention may be better understood and its numerous advantages will become apparent to those skilled in the art by reference to the accompanying drawing in which:

The single figure is a side elevation of an incinerator involving the invention.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to the single figure the reference numeral **10** refers to a housing or a container for the incineration of plastic material or the like. The housing has substantially vertical side walls **12** and an apertured top **14** with an inlet duct **16** which extends therethrough and terminates above the floor of housing **10** for adding solid plastic material into the container while an outlet port **17** at the top of the housing exhausts the fumes given off therefrom.

The port **17** is provided with an outlet duct **18** of cylindrical design which terminates a short distance above the housing **14** and is centrally positioned within the housing in a manner that permits a reasonable freedom from the congestion of fumes given off from the molten plastic.

The stack **22** exhausting from the container **10** may be of any approved construction, however I have found that one of modified venturi configuration performs best in mixing the fumes with air for combustion and then subjecting the mixture to a secondary process of combustion.

At the lower end of the stack I provide air supply ports **25** whereby the upward flow of fumes from the container **10** will induce the flow of air therethrough. As the air mixes with the fumes it is compressed slightly by passing through the converging section of the venturi shaped stack. Adjacent its point of greatest restriction a burner **42** including an independent source of gas and air is injected into the stack and ignited whereby the fumes from the plastic together with the air supplied through ports **24** are then subjected to combustion. As the gases ignite in the stack they expand and draw in still more air through the ports **44** whereby combustion is nearly complete in the remaining section of the stack before the spent gases are exhausted to the atmosphere.

The top **14** of the container includes a third opening **19** for a start up burner **20** which is inserted therethrough to initiate combustion of the plastic fumes. An air supply port **32** in the upper portion of the housing **12** includes

an adjustable valve **34** therefor that may be opened a predetermined degree to partially burn the fumes being given off from the surface of the liquified plastic and produce sufficient heat in the combustion process to insure that the mass of plastic material in the housing is maintained in a liquid state.

In operation a mass of plastic material is loaded into the hopper **15** leading to container **10** through the inlet duct **16**. The size of the individual pieces of plastic will determine the size of duct **16**, thus for a mass of particle sized plastic an inlet duct **16** of smaller diameter is adequate while for larger chunk sized pieces of solid plastic an inlet of larger diameter is required.

A feeding device such as a star wheel **30** may be required to feed the plastic evenly and to preclude the back flow of excess quantities of vapor or fumes given off from the molten plastic which lies within the inlet tube **16**.

A temporary source of heat such as a burner **36** is applied to the container **10** adequate to heat the contents thereof and thus reduce the solid plastic to a liquid state. As the plastic is heated it liquified and its rate of vaporization increases so that it increasingly gives off fumes and vapors which are in turn ignited by the burner or other ignition means in the opening **20**. Fumes given off from the incomplete combustion of fumes in the housing **10** are exhausted through the outlet **18** to the stack **22**.

The fumes from the incompletely burned plastic are then mixed with air entering through ports **25**, mixed in the throat of the venturi and subjected to the incinerating action of the secondary burner **42**. Such incineration causes the inspiration of additional air through ports **44** so that combustion is complete before the gases are exhausted to the atmosphere. The step of injecting air and combustible fuel can be located at as many points along the stack as may be required to provide for the complete elimination of combustible products in the exhaust gas.

Heat from the plastic burning in the container **10** is sufficient to melt additional plastic material being added thereto so that auxiliary or temporary source of heat such as the burner **36** is not required for continuous operation. A liquid level sensor **38** on the container **10** may be made to control operation of the motor **40** and star wheel feeder **30** so that the level of plastic supplied through tube **16** to container **10** is maintained above the lower end opening to the inlet tube **16** so that little vapor from the molten plastic is allowed to escape up the tube **16** to the atmosphere. The star wheel **30** provides an additional barrier in tube **16** preventing still further the escape of vapor from the container.

The amount of combustion air permitted to enter the container **10** through supply valve **34** is controlled carefully to provide heat for the combustion of plastic within the container **10** adequate only for the continuous reduction to a molten state of the solid plastic being added through inlet **16**, it being understood that level of the plastic within the container is continuously controlled by the liquid level controller **20** so that it remains substantially constant at a point lying between the open bottom end of tube **16** and the top of the container.

Therefore the surface area of the body of molten plastic remains substantially constant, its temperature too is almost constant, and the air for its combustion is allowed to vary little so that an almost constant rate of combustion is permitted. Inasmuch as wide fluctuations in the amount of fuel available for burning are substantially

eliminated, combustion is nearly compete and little smoke or obnoxious exhaust gas escapes to the atmosphere.

While this invention has been directed to a preferred embodiment, it will be obvious to those skilled in the art that modifications and changes may be made without departing from the spirit of the invention. It is therefore intended that the embodiment defined is illustrative only and not restrictive of the invention, the scope of which is defined only by the appended claims.

I claim:

1. A process for incinerating solid plastic material that may be reduced to a liquid state by the application of heat comprising the steps of supplying a source of heat to the plastic material sufficient to reduce the plastic to a liquid state and to produce surface vaporization of the liquid plastic, burning the vapor emanating from the surface of the liquid plastic to produce heat therefrom sufficient to maintain the plastic in a liquid state, removing the source of heat after vaporization of the liquid plastic is sufficient to support combustion, and controlling the air for combustion being supplied thereto in accordance with the rate of vaporization of the plastic material whereby heat from the burning vapor is sufficient to provide continuous reduction of the solid plastic to a liquid state.

2. A process for incinerating organic material as defined in claim **1** wherein the products of combustion produced from burning the vaporized liquid are directed through a secondary combustion zone subsequent to that adjacent the surface of the liquid plastic.

3. A process for incinerating solid plastic material or the like that may be reduced to a liquid form by the application of heat comprising the steps of supplying a temporary source of heat to the material sufficient to reduce it to a liquid state and produce substantial surface vaporization of the liquid, collecting the liquid plastic in a container, removing the temporary source of heat after vaporization of the plastic is sufficient to support combustion, igniting the vapor given off from the surface of the liquid plastic, supplying air required for burning the vapor given off from said plastic, and controlling the supply of said air for combustion in accordance with the rate of vaporization of the plastic material whereby heat from the burning vapor is sufficient to provide continuous reduction of the solid plastic to a liquid state and elimination of the vapor emanating therefrom.

4. A process for incinerating plastic material as defined in claim **3** wherein the surface area of the molten plastic is maintained substantially constant to provide a constant area for the production of vapor.

5. A process for incinerating plastic material as defined in claim **3** wherein vapor produced by the incomplete combustion of fumes is directed through a secondary combustion zone.

6. A process for incinerating plastic material as defined in claim **5** wherein the exhaust fumes of the molten plastic are compressed before they are directed through the secondary combustion zone.

References Cited

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