United States Patent

[11] 3,592,150

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[54] OPEN PIT INCINERATING METHOD AND APPARATUS

6 Claims, 2 Drawing Figs.

[52] U.S. Cl. 110/7-R, 110/38
[51] Int. Cl. F23g 7/00
[50] Field of Search 110/7, 8, 38

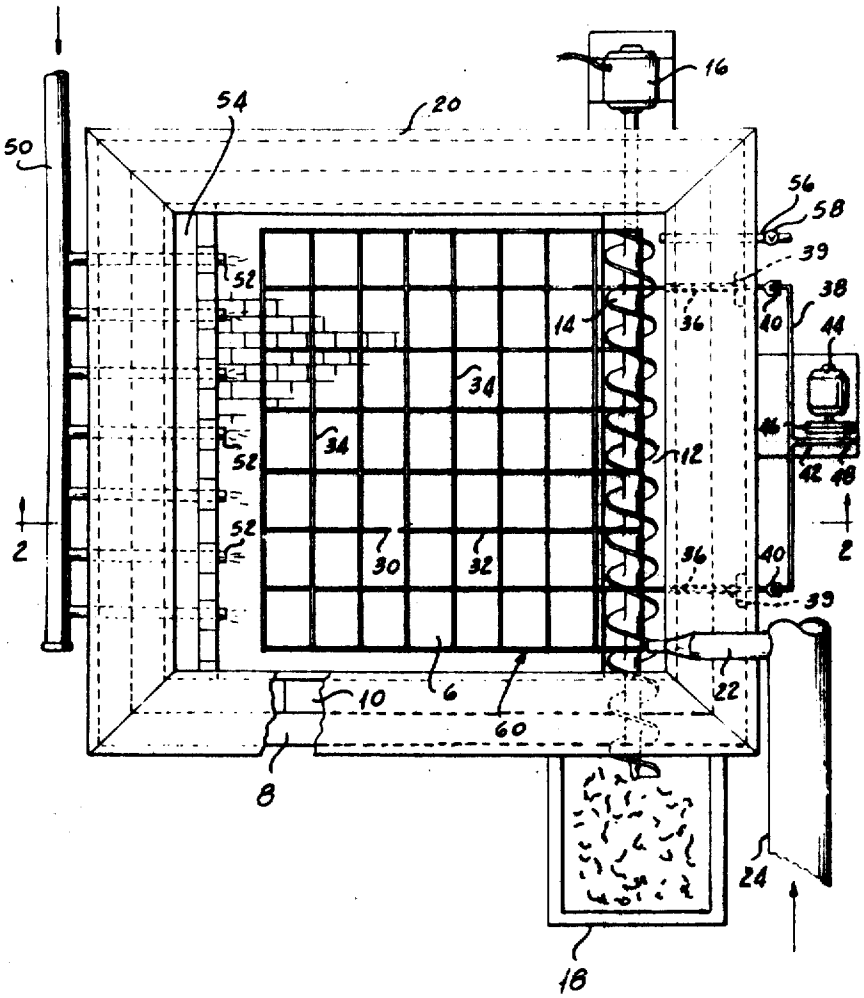
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ABSTRACT: Viscous liquid wastes having a high ash content are incinerated in an open pit incinerator having a hearth inclined upwardly from the point of introduction of the liquid wastes to the hearth. The liquid wastes are spread into a thin film by means of a reciprocating grid, and air for maintaining combustion is introduced into the open pit over one of its walls through downwardly directed jets. An ash pit is provided adjacent the highest point of the hearth. Hot ashes may be quenched therein and removed from the pit by a conveyor.



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SHEET 1 OF 2

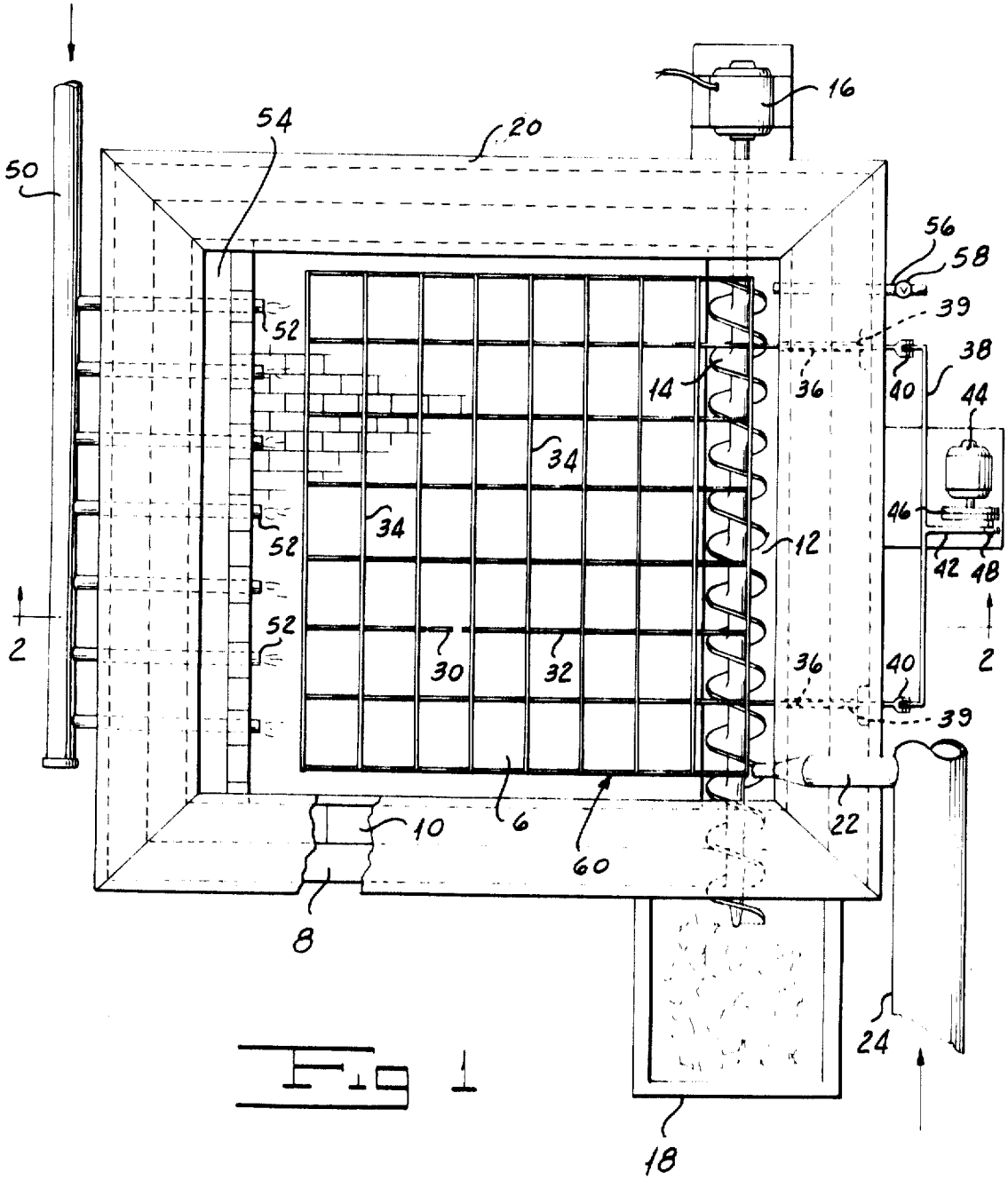


Fig 1

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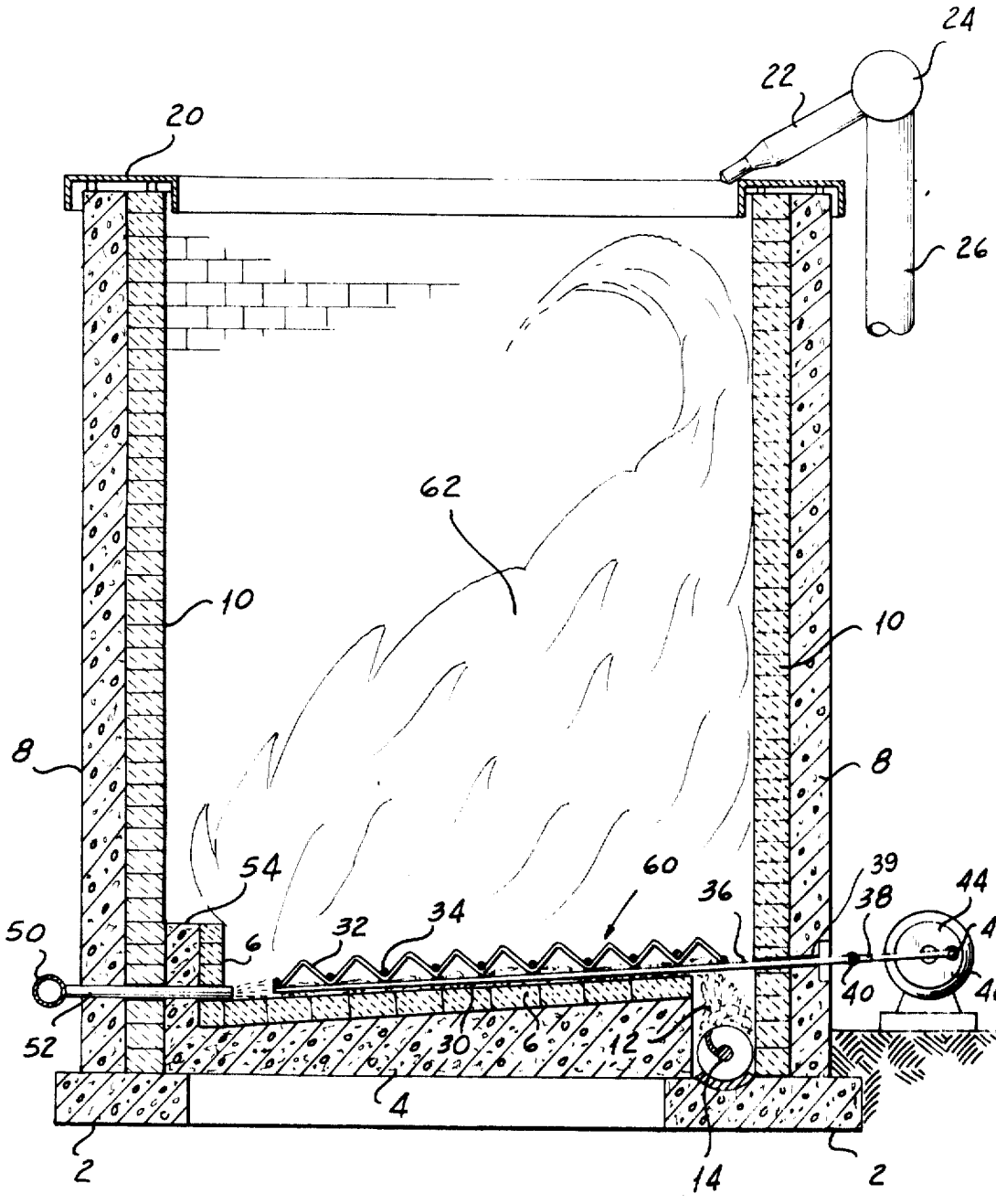


Fig 2

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OPEN PIT INCINERATING METHOD AND APPARATUS

BACKGROUND OF THE INVENTION

In our application Ser. No. 721,832, filed Apr. 16, 1968, now U.S. Pat. No. 3,483,832, we disclosed an apparatus for burning industrial wastes in which we controlled the surface area of wastes being burned by controlling the rate of feeding of the material to be burned to an inclined hearth. We have found that when viscous liquids are incinerated or liquids which form a residue having a high ash content are burned or when we burn liquids whose ash tends to clinker or crust, good results are not obtained even though the liquids of this description burn on the surface as intended. Unexpectedly, owing to the high-ash residue of the incinerated fuel, the ash floats and insulates the remaining fuel. When this occurs, the rate of combustion slows and the furnace temperature is reduced. Furthermore, puddles or lumps develop which are covered with light coatings of ash. This occurs in an erratic distribution of the fuel and in uncontrolled combustion and improper temperatures result.

As we have pointed out in our patent, in order to obtain complete, thorough and smokeless combustion, the rate of combustion must be carefully controlled. We have discovered that in the incineration of viscous liquids, liquids which will leave a high ash residue, or liquids whose ashes tend to clinker or crust, we must operate the incinerator in such a manner that there is no pool of high-ash residue fuel present. Normally, in the operation of an incinerator, the control is accomplished by controlling the rate of air, the amount of fuel which burns and the removal of the ashes. In our patent this was done by controlling the surface of the fuel exposed to burning by the fuel level in the combustion chamber. We have solved the problem which is present in the high ashing fuels by insuring that neither too much nor too little fuel is burned. The use of too much fuel introduces the problem described above, that is, the formation of a layer of ash floating on the pool of fuel. The use of too little fuel results in a drop in the temperature in the combustion chamber with the result that the gas released from the burning viscous wastes will be incompletely burned and will pollute the atmosphere.

We have invented an improved open pit incinerating method and apparatus in which high ash viscous liquids or fuels may be continuously burned in a smokeless manner so as not to pollute the atmosphere.

SUMMARY OF THE INVENTION

One object of our invention is to provide a method of incinerating industrial wastes in the form of viscous liquids or liquids having a high ash content in a continuous and smokeless manner.

Another object of our invention is to provide an improved apparatus which effectively burns industrial wastes comprising viscous liquids or liquids which produce a high ash content upon combustion.

Another object of our invention is to provide an improved open pit incinerator.

Other and further objects of our invention will appear from the following description. In general, our invention contemplates the provision of an open pit incinerator having an inclined hearth with air jets downwardly directed over the hearth. The combustion chamber may be conveniently formed with vertical sidewalls surrounding the inclined hearth. The air supply jets in our present construction are disposed over the high point of the hearth. The bottom of the hearth carries a reciprocating grid positioned over its entire surface so the entire hearth may be constantly raked. The viscous wastes are fed at the low point of the hearth to insure that no light liquids which may be present will escape. Adjacent the high point of the hearth we provide an ash pit. If desired, the ash pit can be filled with water or water may be continuously introduced to quench the ash and prevent it from flying into the atmosphere. Any suitable means for removal of the ash may be employed such as a screw or drag conveyor.

The viscous fluid may be introduced over the entire width of the hearth and the rate of feeding is such that there is no reservoir or pool of fuel. The fuel ignites as a film and will be continuously burned. The reciprocating grid breaks up clinkers of ash or mixes the ash with the fuel and insures that a fresh combustible surface is continuously being presented to the burning area. The ash and the fuel help insulate the grid from heat, except those portions of the grid which extend into the flame. The rate of reciprocation of the grid is gentle or slow enough to reduce agitation such that the ash does not become airborne as fly ash.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings which form part of the instant specification and which are to be read in conjunction therewith and in which like reference numerals are used to indicate like parts in the various views:

FIG. 1 is a top plan view of our improved open pit incinerator capable of carrying out our process.

FIG. 2 is a sectional elevation taken along the line 2–2 of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, footings 2 support base 4 which can be formed of reinforced concrete. Refractory blocks 6 line the hearth formed at the upper surface of the base 4. The vertical walls 8 of the incinerator pit are also lined with refractory bricks 10 and are carried by the footings 2. The refractory lining 10 may, if desired, be spaced from the outer walls 8, as shown in our above-mentioned patent. An ash pit 12 is formed adjacent the high end of the inclined hearth. Any appropriate conveyor, such as screw conveyor 14 driven by a motor 16 is provided to convey the ashes from the ash pit 12 to the ash bin 18. The top of the open incinerator pit is provided with a peripheral rain cap 20 which prevents rain from seeping into the spaces between the outer vertical walls 8 and refractory lining 10 and is adapted further to prevent rain from falling into the air space between the walls 8 and the refractory lining 10 when such is provided between them. The vertical wall 8 adjacent the ash pit is the "blower wall" since a plurality of nozzles 22 extend along this wall. Each of the nozzles communicate with a manifold 24 to which air from a blower (not shown) is fed through duct 26. The rake indicated generally by the reference numeral 60 covers substantially the entire hearth and is formed from a grid with a plurality of rods 30 extending across the hearth from front to back. To each rod 30 we weld a rod 32 forming a saw-toothed shape. The grid is completed by welding transverse rods 34, which run at right angles to rods 30 and hold sawtooth rods 32 in place. In FIG. 1, one of the rods 32 is broken away to show the rod 30 positioned underneath it. Two of the rods 30 are formed with extensions 36 which pass through openings 39 in the blower walls. These rods are pivotally secured to a yoke by hinges 40. A connecting rod 42 is secured to a yoke 38. A motor 44 drives a flywheel 46 to which the end of the connecting rod is pivotally and eccentrically secured at crank 48. The arrangement is such that as the motor 44 rotates, the extensions 36 will reciprocate the rake back and forth toward and away from the blower wall. The viscous wastes to be incinerated are pumped by a pump (not shown) to a manifold 50 from which a plurality of feed pipes 52 communicate. The feed pipes pass through the step 54 of the hearth and distribute the viscous wastes to be incinerated across the hearth. While we have shown a plurality of feed pipes, we have found that a pair of feed pipes or even a single feed pipe may be used, since the reciprocating grid rake quickly levels and distributes the fuel over the hearth into a film. A pipe 56 controlled by valve 58 is adapted to introduce water into the ash pit 12 to quench the hot ashes.

In operation, a small quantity of viscous fuel is introduced through the feed pipes 52 passing through the step 54 of the hearth from the manifold 50. A motor 44 is started and the grid rake which is indicated generally by the reference nu-

meral **60** is reciprocated through the crank **48** and the grid rake extension rods **36** and the yoke **38**. The air supply which is controlled by a motor (not shown) is started at low speed. The waste is spread into a film by the grid rake. The waste is then ignited by pouring a readily combustible fuel, such as gasoline or kerosene, over the surface of the wastes. As soon as the combustion of the film of viscous wastes occurs, the rate of waste feed and the rate of blower supply air are controlled until no smoke is generated and a steady state of combustion is achieved. At this time the hot ash which is formed on the surface of the fuel is knocked off and homogenized with the waste film, heating it and providing a fresh surface area of fuel to the fire. The grid rake breaks up the clinkers of ash surrounding incompletely burned fuel. The combination of the viscous waste being fed, the air from the blower and the action of the grid rake is such that the ash will move up the incline until nothing remains but ash which falls into the pit. The ash is quenched in the ash pit by the water which is fed through pipe **56** under the control of valve **58**. The motion of the grid rake is gentle enough to prevent agitation of the ash so that it does not become airborne as fly ash. Once we adjust the condition, that is, the rate of feed and the volume of air being blown, a long smokeless flame indicated by the reference numeral **62** will appear in the open pit burning in a smokeless fashion.

It will be seen that we have accomplished the objects of our invention.

We have provided a method of incinerating industrial wastes in the form of viscous liquids or liquids having a high ash content in a continuous and smokeless manner.

We have provided an improved apparatus which effectively burns industrial wastes which are viscous liquids and which produce a high ash content upon combustion and thus cannot be incinerated without polluting the atmosphere.

We have provided an improved open pit incinerator adapted to operate in a continuous manner to dispose of waste viscous liquids which are difficult to destroy.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of our claims. It is further obvious that various changes may be made in details within the scope of our claims without departing from the spirit of our invention. It is, therefore, to be understood that our invention is not to be limited to the specific details shown and described.

Having thus described our invention, what we claim is:

1. A method of incinerating viscous wastes including the steps of spreading a layer of the liquid wastes to be incinerated over an inclined hearth, igniting the film on said hearth, agitating the burning film to prevent ash from coating the same, continuously replenishing the layer of viscous wastes being incinerated, and continuously removing ash from said hearth.

2. An apparatus for incinerating wastes including in combination a combustion chamber having an open top and an inclined bottom, said chamber having a front wall disposed adjacent the uppermost portion of said inclined bottom, air distributing means extending across said front wall adjacent the top of the combustion chamber for directing air downwardly into the combustion chamber, means for feeding liquid material to be incinerated into the combustion chamber remote the front of said front wall, a rake substantially covering said inclined bottom and positioned adjacent thereto and means for reciprocating said rake.

3. An apparatus as in claim **2** in which an ash pit extends between said inclined bottom and said front wall.

4. An apparatus as in claim **2** in which said ash pit extends transversely of said combustion chamber between said front wall and said inclined bottom and means for removing ashes from said ash pit.

5. An apparatus as in claim **2** in which an ash pit extends between said front wall and said inclined bottom, means for removing said ashes from said ash pit, and means for introducing water to said ash pit to quench the hot ashes.

6. An apparatus as in claim **2** including a plurality of feed pipes distributing the viscous liquid across said inclined bottom.