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TRASH INCINERATOR ROTARY FURNACE

Filed Feb. 2, 1967

Fig. 1

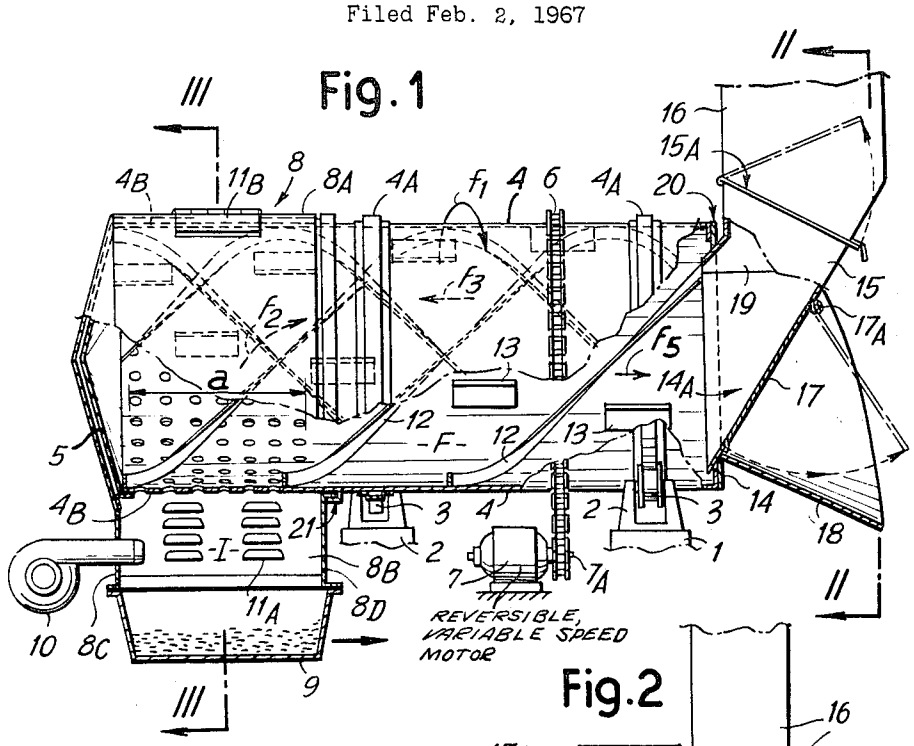


Fig. 2

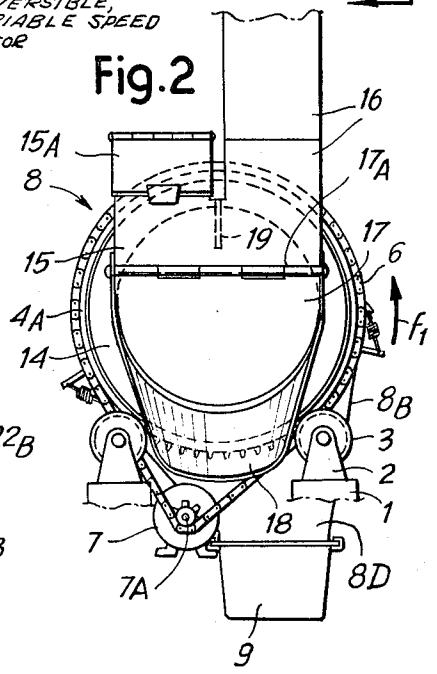
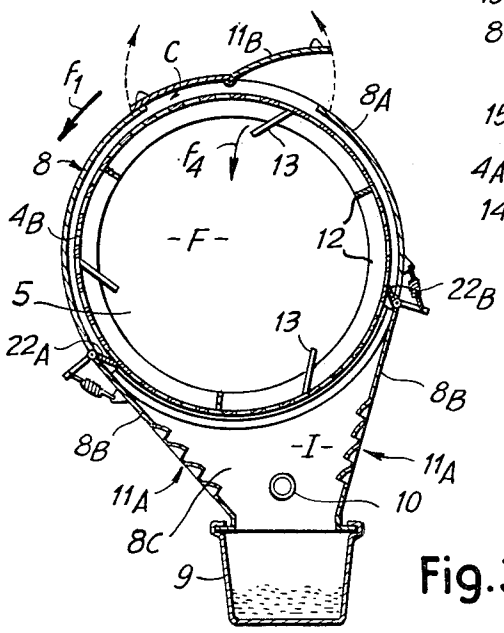


Fig. 3



INVENTOR

SILVANO MATTEINI

By McGlew and Toren

ATTORNEYS

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TRASH INCINERATOR ROTARY FURNACE

Silvano Matteini, Via Bellosguardo 2, Florence, Italy

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ABSTRACT OF THE DISCLOSURE

A trash incinerator has a tubular body rotatable about a fixed axis and disposed adjacent a stationary end member having an opening therein. A section of the tubular body remote from the end member is perforated to form a grate and is surrounded by a shell which also forms an ash collecting box therebelow. A burner for igniting the trash extends into the box. In addition the tubular body is provided with internal helical fins which distribute the trash inside the body when the body rotates.

The invention relates to a trash incinerator.

The present invention provides a rotary trash incinerator including a tubular body, for rotating in opposite directions about a substantially horizontal axis, a stationary end member having a loading hopper, an unloading door, and smoke draught means, said tubular body having internal helical projections for distribution of trash therein, an outer shell surrounding a perforated portion of the tubular body remote from the end member and forming a chamber therebelow and a burner extending into said chamber at least to initiate combustion of trash in said incinerator.

The present invention further provides apparatus for trash incineration comprising, a tubular body rotatable about a fired axis, a stationary end member having an opening therein, a section of said tubular body remote from the end member being perforated, a shell assembly enclosing the perforated section and forming a chamber vertically therebelow, combustion ignition means extending into said chamber and means projecting from the internal surface of the tubular body operable by rotation of said tubular body to distribute trash therein.

An embodiment of apparatus for trash incineration in accordance with the present invention will now be described, by way of example with reference to the accompanying diagrammatic drawings in which;

FIGURE 1 shows a partially sectioned side elevation of a trash incinerator;

FIGURE 2 shows an end view taken along the line II—II of FIGURE 1; and

FIGURE 3 shows a sectional view taken along the line III—III of FIGURE 1.

FIGURE 1 shows supports **2** mounted on a base **1** each carrying a pair of rollers **3**, the rollers **3** rotatably support a tubular body **4** having one end sealed by a conical end wall **5**. The tubular body **4** has circumferenital tracks **4A** which engage with the rollers **3**. A drive chain **6**, engages with a circumferential gear formed externally on the tubular body **4** and a geared pinion **7A** driven by a motor **7**. The motor **7** is arranged to rotate the tubular body **4** in both clockwise and counterclockwise directions and also at two or more speeds.

The section **4B** of the tubular body **4** adjacent the wall **5** is perforated to form a grate and is surrounded by a stationary shell **8**, the shell **8** has an upper section **8A** substantially coaxial to the section **4B**, and a lower section **8B** having sloping walls which in conjunction with two end walls **8C** and **8D** form a hopper chamber I. The tubular body **4** forms a combustion chamber F. The two chambers F and I intercommunicate through the grate formed by

the perforations in the section **4B**. The perforations extend across the width *a* of section **4B**. An ash collecting box **9** is mounted below the neck of the hopper chamber I so that ash can be withdrawn from the box through an opening therein or by removing the box itself. A burner **10** extends through the end wall **8C** and can be used to commence combustion in the chamber F and also to ensure complete combustion in cases of poorly burning trash. The walls of section **8B** have openings **11A** therein to provide an air inlet to the chamber I, where the burner flame is developed. A regulatable secondary air inlet is provided by the opening **11B**, formed in the upper section **8A** of the shell **8**.

The chamber F has helical fins **12** extending therein which fins are rigid with and extend radially inwardly from the inner wall of the tubular body **4** as shown in FIGURE 3. Vanes **13** also extend inwardly from inner wall of the tubular body but are directed in a non-radial direction towards the direction of motion of the inner wall when in operation for trash combustion.

The end of the tubular body **4**, remote from the end wall **5**, has a stationary wall **14** adjacent thereto and in which there is an opening **14A**. A loading hopper **15** is connected to one half of the opening while a smoke stack **16** extends upwardly from the other half. An upwardly opening door **15A** gives access to the loading hopper **15**. A lower outwardly opening door **17**, hinged at **17A** is provided for the discharge of the non-burnt residues. A discharge chute **18** enables the removal of the combustion residues. A short baffle **19** at the top of the opening separates the hopper **15** from the smoke stack **16**.

Labyrinth seals **20** and **21**, are provided between the tubular body **4** and the stationary wall **14**, and the tubular body **4** and the end wall **8D** respectivley.

The material to be incinerated is introduced by means of the hopper **15** into the tubular body **4** which is rotated during loading at a relatively high speed in the direction of the arrows f_1 so that the fins **12**, distribute the material along the length of the tubular **4** of the combustion chamber F towards the section **4B**. Dependent on the amount of material of a particular load and whether or not further loading is carried out during the first stage of incineration, relatively slower and variable rotational speeds are used.

To start combustion, the tubular body **4** is rotated slowly in the direction of the arrow and the burner **10** is ignited. Flames pass from the burner through the grate section **4B** into the chamber F and from there, in the direction of the arrow f_2 to the smoke stack **16**. The flames thus ignite all combustible material along the flame path in the combustion chamber F.

Dependent on the composition of a particular load of material, the burner **10** may be required to burn continuously to ensure complete combustion of the load, or it may be quenched after initial combustion if the material is of such composition as to sustain combustion itself.

The rate of combustion may be controlled by adjustment of the opening **11B**, either to control the supply combustion air, or to adjust the smoke temperature.

The radial dimension of the gap C between the concentric sections **4B** and **8A** is made small so that most of the gases and flames produced by the burner **10** only pass through the lower zone of the grate section **4B**. In addition, screens **22A** and **22B** are provided to bridge the gap on either side of the grate section **4B** between the grate section **4B** and the section **8** so as to define the upper limit of the chamber **1**. The screens are pivoted on the shell **8** and urged to bear in sliding relationship on the grate section **4B** only during rotation of the tubular body **4** in the direction of the arrow f_1, the screens are made to clear the grate section **4B** when the tubular body **4** rotates in the opposite direction.

During the combustion, the material is progressively fed by the helical fins **12** in the direction of the arrow f_3, under the slow rotation of the tubular body **4**. The ash which is formed eventually passes through the grate section **4B** and the chamber I into the box **9**. The flame of the burner **10** and/or the flames provided from the combustion of the material itself ensure the complete reduction to ash of any incompletely burnt particles in the ash. It should be noted that the air entering the chamber I through the openings **11A** is heated by the ash, and also enriches the falling ash with oxygen to provide more uniform combustion of the material, the vanes **13**, under the rotation of the tubular body **4**, tend to gather material from the bottom of the chamber F, raise it, and allow it to fall in the direction of the arrow f_4, so as to pass through the flame paths in the chamber F. Initially during the combustion process the slow rotation of the tubular body **4**, tends to level the material in the interior of the tubular body **4**, whereas towards the end of the combustion process the inert material residual tends to pile up towards the conical end wall **5**. When the combustion has been completed the burnt residue is unloaded by reversing the direction of rotation of the tubular body **4**, i.e. in a direction opposite that shown by the arrows f_1. The fins **12** now move the residual material in the direction of the arrow f_5, so that it can discharge itself through the door **17**, which is opened for this purpose.

The cycle can now be repeated with a further load of material.

I claim:

1. In a rotary trash incinerator the combination comprising a longitudinally extending tubular body forming a combustion chamber and having its central axis disposed substantially horizotal, said tubular body arranged to be rotated in opposite directions about its central axis, an end wall secured to one end of said tubular body and being rotatable therewith, a longitudinally extending section of said tubular body located adjacent to said end wall and spaced from the other end of said tubular body being perforated about the circumference thereof and forming a grate-like surface within the interior of the combustion chamber, a stationary end member disposed in the other end of said tubular body, a loading hopper disposed within said end member for supplying material to be incinerated into said combustion chamber, an unloading door in said end member for removing non-burnt residue from said combustion chamber, a smoke draft means secured to said end member and communicating with said combustion chamber for removing smoke therefrom, a plurality of longitudinally extending helical material distributing projections secured to the inner surface of said tubular body and extending inwardly therefrom, a plurality of axially extending projections secured to the inner surface of said tubular body and extending inwardly therefrom into the combustion chamber, said projections disposed obliquely to the surface of said tubular body, a stationary shell spaced outwardly from and at least partially enclosing said perforated section of said tubular body, walls depending downwardly from said shell below said tubular body and forming a collecting chamber for receiving ash passing through said perforated section from the combustion chamber,

2. In a rotary trash incinerator as set forth in claim **1**, wherein said stationary shell and the opposite surface of said tubular body form a narrow channel therebetween communicating with said collecting chamber, a pair of screen members disposed between said shell and said tubular body positioned on opposite sides of said combustion chamber, and means for urging said screen members

against the outer surface of said tubular member to provide a seal across the channel.

3. In a rotary trash incinerator as set forth in claim **1**, wherein drive means are disposed in contact with said tubular body for rotating said tubular body, said drive means being operable at different speeds and in opposite directions for high speed operation during the loading of materials into the incinerator, for low speed operation during combustion within the combustion chamber, and for high reverse speed operation after the completion of combustion for transporting non-burnt residue within said combustion chamber to said unloading door in said end member.

4. In apparatus for trash incineration the combination comprising a longitudinally extending tubular body, means for mounting said tubular body for rotation in opposite directions about the central axis thereof, an end wall secured to one end of said tubular body and being rotatable therewith, a longitudinally extending section of said tubular body located adjacent said end wall and spaced from the other end of said tubular body being perforated about the circumference thereof and forming a grate-like surface within the interior of the combustion chamber, wall means enclosing said perforated section of said tubular body and forming a collecting chamber in communication with the interior of said combustion chamber through the perforations in said tubular body, combustion ignition means disposed within said collecting chamber, material advancing means comprising a plurality of longitudinally extending helical projections secured to the inner surface of said tubular body and directed radially inward therefrom, a plurality of inwardly directed projections secured to and disposed obliquely to the internal surface of said tubular body for raising and dropping material through the combustion chamber, a stationary end member affixed to the other end of said tubular body and having an opening therethrough, a loading hopper, an unloading door and a smoke outlet member each in communication with the opening in said stationary end member.

5. In apparatus for trash incineration as set forth in claim **4**, wherein a portion of said walls enclosing said perforated section of said tubular body and the opposite surface of said tubular body form a passageway about the exterior of the tubular body communicating at the opposite ends thereof with the collecting chamber formed by said walls, movable flap members disposed in the passageway between said walls and said tubular body at positions spaced on opposite sides of said tubular body, and means for urging said flap members into a closed position across the passage between said walls and said tubular body.

6. An apparatus for trash incineration as set forth in claim **4** wherein said walls forming said collecting chamber are provided with openings for admitting air into the collecting chamber wherein it is heated by said combustion ignition means for passage into said combustion chamber through the perforation in said tubular body.

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JAMES W. WESTHAVER, *Primary Examiner.*