United States Patent

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[15] **3,703,070**

[45] **Nov. 21, 1972**

[54] INCINERATOR HOOD

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[22] Filed: **June 10, 1970**

[21] Appl. No.: **45,186**

[52] **U.S. Cl.**.....**55/526,** 110/18 R, 110/119

[51] **Int. Cl.**.....**B01d 35/12,** F23j 15/00

[58] **Field of Search** .....55/385, 525, 526; 110/119, 110/18 R; 55/526

[56] **References Cited**

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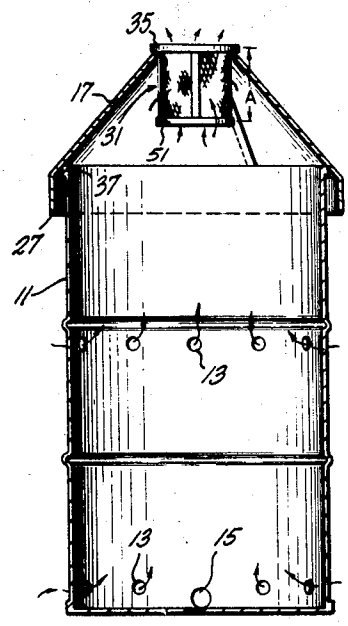
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[57] **ABSTRACT**

This invention relates to outdoor refuse burning containers and more particularly to such containers incorporating a hood for improved filtration of burned products, for ordinary outdoor refuse burning barrels. A conical hood for such a barrel is provided, the hood being disposed over the barrel in a lift-off relation; and having a combustion product discharging vent with a removable filter cartridge inserted therein. The cartridge is pervious to escape of the burn products and presents an extended cartridge length through which these incineration products must pass to escape from the chamber. The combustion products are forced to pass first through the walls of a generally cylindrical cartridge, formed of thin sheets of expanded metal, and then through the interior of the cartridge which comprises a second labyrinthine path constituted of strips of expanded metal stuffed into the interior of the cartridge.

3 Claims, 9 Drawing Figures



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SHEET 1 OF 2

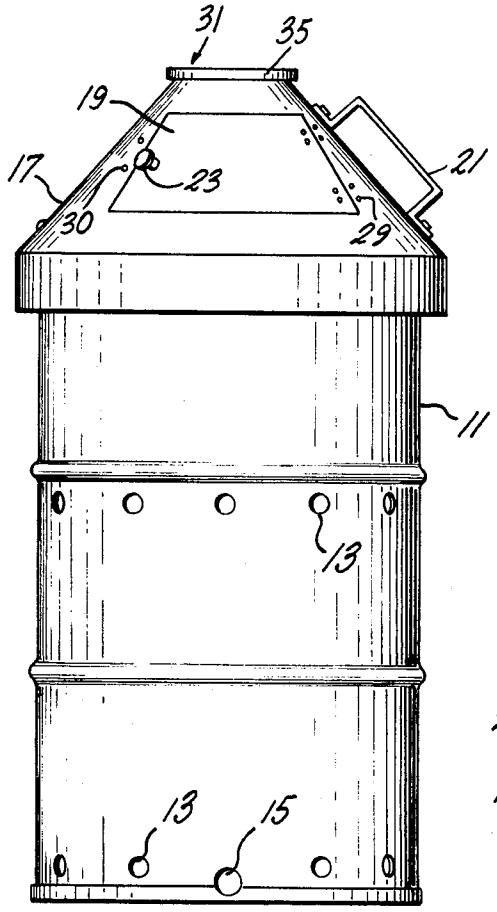


FIG. 1

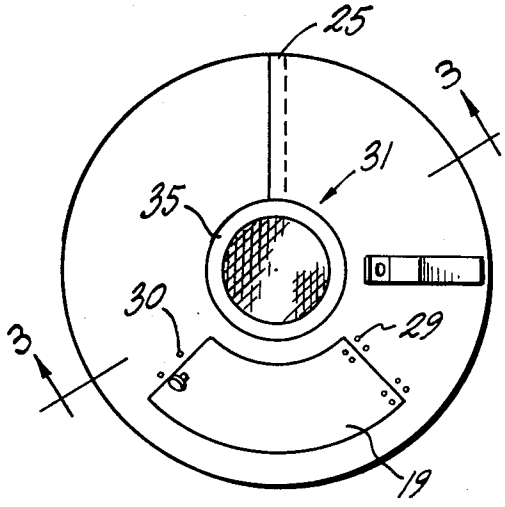
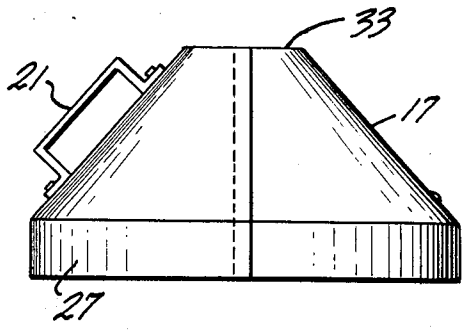


FIG. 2

FIG. 4



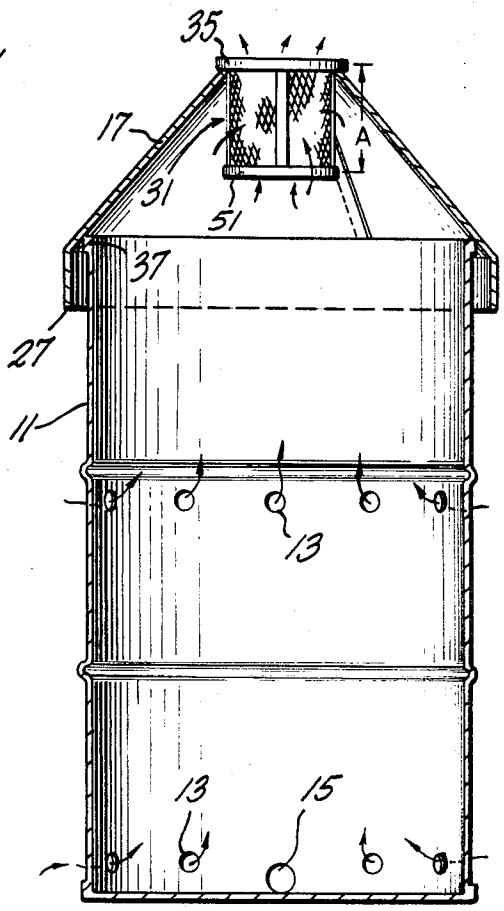


FIG. 3

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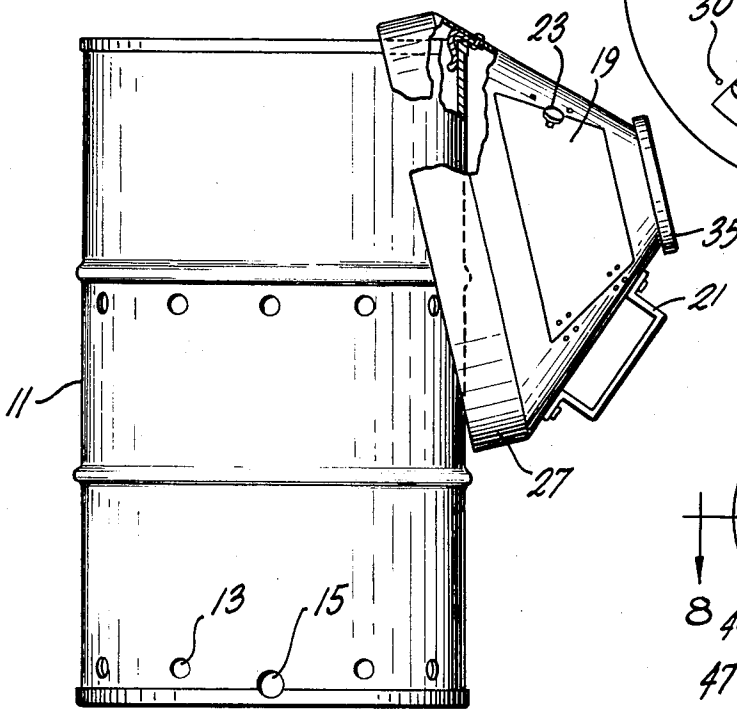


FIG. 5

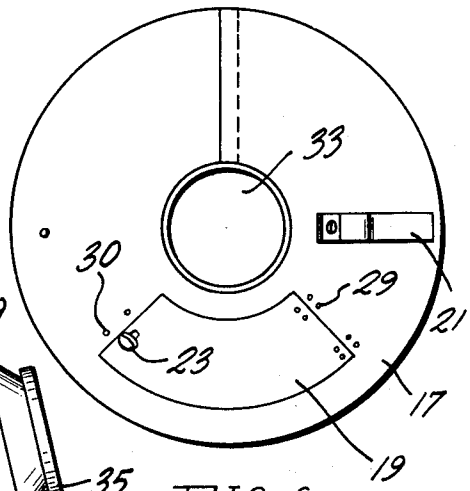


FIG. 6

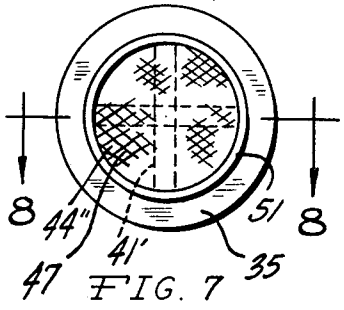


FIG. 7

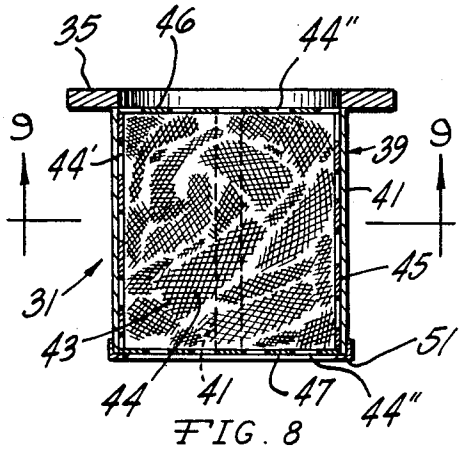


FIG. 8

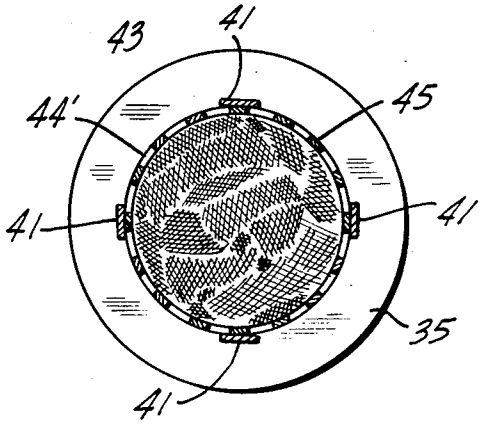


FIG. 9

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INCINERATOR HOOD

BACKGROUND OF THE INVENTION

Incinerators of various kinds utilized in domestic and industrial situations, for burning everyday collections of refuse, trash, and the like, are well known. Except in areas where outdoor burning of trash is not permitted by local law, the backyards and alleys of any residential neighborhood present to view an array of such combustion chambers which, in most cases, take the form of large steel barrels such as the 30 and 55 gallon industrial drum container. Often such barrels are used in connection with tent-shaped, conical, or otherwise configured covering structures which serve not only to keep out the elements (rain, snow and the like) but also serve to generate a modicum of positive pressure within the incineration chamber. However, there exists a potentially more important aspect of these cover structures: a constraint upon unlimited escape of burn products from the interior of the chamber, including large solid products which drift upwardly with the rising draft of stack gases, and smoke and related particulate matter. Such emissions as the latter have been established to constitute a substantial source of air pollution, and have for this reason become a cause of increasing concern to those involved in its study and regulation.

In some of the burning devices of the prior art it is the practice to burn with the barrel completely open. Others utilize gross means of constraint, such as wide mesh screens or spark arrestors overlying the combustion chamber. Still others employ combustion product discharge ducts of constricted diameter, sometimes in combination with spark arresting screens, baffles, and/or deflector plates. It would appear that the most pertinent reference to such prior art is that contained in U.S. Pat. No. 2,738,743, which discloses a combination of a burning barrel, a frusto-conical hood emplaced thereover, and an exhaust flow deflecting plate located transversely of the flow path, inside the hood, and formed of expanded metal.

The present invention introduces a burning barrel dome, or hood, which is movable and which includes a specially constructed replaceable filter for escaping incineration products, especially discharged particulate matter, thereby to diminish what has previously been a major source of undesirable air pollution.

Therefore, it is an object of this invention to provide new and useful cover structures for burning barrels, which significantly reduce the emission of air polluting agents.

Another object of the present invention is to teach an improved burning barrel cover which is portable, easily removed and replaced, and includes a replaceable filter cartridge.

Still another object of the present invention is to disclose an easily and inexpensively fabricated trash incinerator cover for substantially reduced pollution emission from ordinary outdoor burning barrels, which embodies a facilitated and economical replacement thereof.

A still further object of this invention is to provide a burning barrel cover which incorporates a novel filter cartridge structure having a durable reusable filter element.

A more particular object of the present invention is to provide variable density filter elements which may be accordingly modified for selected concentration of filtrate from escaping incineration products.

Still further objects of this invention will be apparent to those skilled in the art upon study of the specifications, drawings, and claims presented herewith.

IN THE DRAWING

FIG. 1 is a front elevation view of the burning barrel cover of the present invention, shown in its normal functioning combination with a burning barrel; and also showing an auxiliary portal and handle associated with the barrel cover.

FIG. 2 is a top plan view of the entire apparatus of this invention as depicted in FIG. 1, and particularly shows a conically configured barrel hood formed by a single interlocked seam on a wrapped around annulus of sheet metal; and further shows a foraminous filter cartridge deposited in the exhaust vent aperture of the hood.

FIG. 3 is a cross-sectional view of the entire apparatus of the invention taken at section line 3—3 of FIG. 2.

FIG. 4 is a rear elevation view of the burning barrel or other incinerator and hood cover of the present invention, with the filter cartridge removed therefrom, and showing the single seam construction thereof.

FIG. 5 is a front elevation view of the combination of the present invention with the cover displaced from its functional position on the barrel; and the cover structure partially broken away to reveal hanger means on the interior of the cover for convenient handling thereof during loading or unloading of the incinerator chamber.

FIG. 6 shows a top plan view of the barrel cover, identical to that of FIG. 2, except that the filter cartridge is removed from the vent aperture.

FIG. 7 is a bottom plan view of the filter cartridge of the present invention, shown disengaged from the barrel cover.

FIG. 8 is a cross-sectional view of the removable filter cartridge of the present invention, taken at section line 8—8 of FIG. 7.

FIG. 9 is a cross-sectional view of the removable filter cartridge of the present invention taken at section line 9—9 of FIG. 8.

FIGS. 6, 7, 8 and 9 are all drawn to different scales.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring first to FIG. 1, there is seen the overall combination of the present invention, i.e., an ordinary trash burning barrel 11 having circulation holes 13 and bottom drain hole 15. On top of the barrel is normally placed the closure cover or hood 17. The hood 17 may include an access portal normally closed by access door 19 and a lift-off carrying handle 21. The door 19 may be opened by grasping knob 23.

FIG. 2 shows the barrel hood construction as a single annular piece of sheet metal wrapped into a cone-shape and joined at seam 25. A skirt 27 may be optionally added to the conical hood member, either integrally therewith or otherwise, as seen in FIGS. 3 and 4. The access door 19 is movable on interior hinges (not shown) attached to the cover and door structure by

hinge rivets 29, as is a latch structure (not shown) connected to the hood by rivets 30.

FIG. 3 again shows the entire combination of the present invention in section, including the interior relationship of the filter cartridge 31 to the filter cover 17 and barrel 11. The filter cartridge 31 has been dropped into engagement with the discharge vent 33 formed at the truncated top of the frusto-conical hood member 17. The cartridge is supported on the vent 33 (see FIG. 4) by a circular flange portion 35 around the top of the cartridge 31. The hood 17 is seen to rest on top of the upper barrel rim 37. Refuse (not shown) would be deposited for burning into the lower portion of the barrel 11 and ignited. Combustion is supported by intake of air through the circulation holes 13 in the direction of the flow arrows in FIG. 3. A discharge of exhaust products takes place through the discharge duct 33 at the top of the vented cover 17, but not before these same discharging products are intermediately passed through the filter cartridge 31 and the filtering elements contained therein, and which are more fully described hereinafter.

Referring now to FIG. 8, there is illustrated the details of the construction of the filter cartridge 31. The main structural frame 39 is formed of depending strap members 41, spaced substantially equally from one another around the periphery of the cartridge. Also seen in FIG. 8 is the pollutant collecting filter medium 43 which, in the particular embodiment shown, is comprised of loosely stuffed strips of expanded aluminum metal 43. Flow of exhaust products and pollutants, including soot, ash, and other particular matter, is forced through the labyrinth of strips 43 in accordance with the path as illustrated by the arrows in FIG. 3. The effectiveness of the filtration is in large part related to the number of edges over which the flow is compelled to pass. Thus, an important aspect of the present invention is the multiplicity of edges encountered by any exhaust flow as it exits from the interior of the barrel or drum 11. This multiplicity is developed in two phases: firstly, the elongate several edges presented by the extended, serpentinely oriented metal strips; and secondly, from the augmented number of edges afforded by the interior diamond-shaped openings 44 through these strips. The diamond-shapes are a natural concomitant of expanded metal which is formed by implementing a multiplicity of slits in a sheet of metal, and then stretching the metal so as to open the slits, which ultimately materialize into the diamond-shaped opening 44. It is of no particular functional consequence as to how the holes are formed, but, as a matter of practicality, such expanded metal material is available from existing market sources, and need not be independently fabricated by one practicing this invention.

In order to provide a completed closure for the central filter medium 43, and also to still further augment the filtering effect of the entire cartridge apparatus, foraminous side, top and bottom walls are introduced. Further reference to FIG. 8 shows the side wall 45, as well as top wall 46 and bottom wall 47. The side wall 45 as seen in FIG. 9 comprises a cylindrical shell of expanded metal, the openings thereof being designated 44'. The The top wall and bottom wall are each formed of expanded metal discs 46 and 47 respectively; the openings of which are designated 44'' as seen in the view of FIG. 7.

A most economical and easily assembled construction is now described: the cartridge frame support member 41 is provided at its bottom end with an additional support lip 51 or an equivalent structure upon which the bottom wall disc 47 is rested (see FIG. 8). The side wall 45, basically a simple rectangular sheet of expanded metal, is wrapped around to form a cylindrical shell and then slid into the cartridge frame and rested on top of the lower wall or disc 47. Finally, the upper disc 46 is dropped in to rest on the top circular edge of the cylindrical shell wall 45, which thereby acts as a hollow supporting column. This structure is not only extremely simple and convenient to assemble, but is economical of manufacturer and, functionally, results in a greatly augmented filtration effect inasmuch as all flow must, per force, pass through one of these foraminous surfaces both before and after passage through the central filter medium 43. As a consequence the flow is passed over an increased number of filtering edges, these being the edges of the expanded apertures 44' and 44'' in the top and side walls 45, 46 and 47 of the cartridge 31. These walls also serve as a better defined enclosure for containment of the central filtering medium. However, it must be recognized that the side, top and bottom walls of the cartridge 31 could be eliminated and the central filter medium permitted to act alone as filtering agent. Its containment within the frame 39 could be effectuated by providing some alternative auxiliary structure, as for example the diametrical bottom straps 41' shown in the broken line (FIG. 7) across the bottom of the cartridge 31.

At this juncture, it is expedient to consider the filter cartridge independently of the remaining structure of the combination: the cartridge unit may be utilized independently, as for example it may be incorporated into any existing incinerator hood having a discharge opening generally conforming to the cross-sectional configuration of the filter cartridge depicted in FIGS. 7 and 9. Thus, any opening larger than the diameter of the cylindrical wall of the cartridge basket, but smaller than the diameter of the cartridge flange 35, would be compatible with the cartridge of the present invention. A wide range of such compatibility may be developed simply by according the flange 35 a rather substantial diametrical dimension, and limiting the diameter of the filter containment or basket portion of the cartridge 31. Of course, complete compatibility can be accomplished merely by the fabrication of a plurality of cartridge sizes, selected to fit particular exhaust vent openings. In any event, it is essential that the relative dimensions of the vent and cartridge are such that the latter engages into the former interferingly with the entire vent aperture and all exhaust flow therethrough.

A still further remarkable feature of the cartridge unit of this invention is its design for re-use and/or replacement. Thus when, through extended use, the filtering cartridge 31 is ascertained to have become fouled to the point of reduced effectiveness, the entire cartridge 31 may simply be discarded and replaced with a new cartridge. Alternatively, the structure of this particular cartridge permits of its being quickly removed without tools or removal of fasteners, and cleaned, as by merely washing in soapy water, or other appropriate compositions; and then replaced into the hood for re-use. Consequently, not only may a desired

level of atmospheric-polluting emission be accomplished, but it may be maintained as desired.

It should be realized that certain attributes of prior art burning barrels are preserved undiminished in the present apparatus: as previously, a major component of the present apparatus is inexpensively available commercially, namely the standard 30 or 55 gallon industrial drum **11**, which is available at junk yards, salvage sales, hardware stores, or the like. It is of the readily obtainable type used throughout industry for the storage and shipment of liquids such as oil, paint and chemicals. Moreover, as do prior instrumentalities, the filter apparatus of the present invention functions as an effective spark arrestor; in fact this particular safety aspect is greatly increased over most manufactures of the prior art, in that they normally employ filter elements which are only two-dimensional in effect, such as flat perforated plates, screens and the like; these fail to travel the combustion effluent over any appreciable distance. In the present invention, not only sparks, but also other undesirable solid residues, including soot, smoke, fly ash and other discharged particulate matter, are all travelled over extended lengths of particle-capturing elements. This feature of the invention may be more clearly appreciated by consideration of the three-dimensional aspect of the filter cartridge and its extended axial-flow dimension represented by the dimensional arrow A in FIG. **3**. It is this extended length, over which the smoke is travelled, that develops the improved filtering effect.

By contrast, a spark arrestor screen, grate, or the like, of the prior art merely provides a mesh to impede the egress to the atmosphere of very large floating fragments. Moreover, such fragments, when becoming lodged against the spark arresting screen, block the natural flow and directly interfere with the burning draft, etc. In the present invention, however, the prodigious extent of filtration distance accommodates an extremely greater accumulation of exhaust deposits without burdening the draft or other operation of the entire apparatus.

This greatly multiplied filtration effect of the invention is increased even further by the substantial factor of the intertwined serpentine disposition of the individual filter strip elements of the internal filtering medium **43**. This coiled effect greatly augments the length travelled by smoke flowing over and through the filtering agents; and the number of metallic edges which this flow encounters. Of course this effect is finally increased once again by the presence of the expanded metal cylindrical enclosure walls, through which the smoke must also make two passes on its journey to the exterior.

It is important to mention the aspect of filter strip thickness, and the density with which they are compacted into the cartridge basket. Each of these aspects, singly and in combination, affect the flow rate of the exhaust products, as well as the resistance of the filter medium itself to heat build-up. Thus, it is important not only to maintain the foregoing factors within a range at which combustion heat does not incinerate the filter elements itself; but also to select a degree of filter strip compactness which gives an adequate filtration without unduly impeding the discharge of combustion products. Since the cartridge entraps a portion of the solid exhaust products, it may be properly said to be pervious only to partial passage of the emission. The degree of this partiality of passage may be regulated by varying the compactness or density of the central filtering medium strips **43**. Also, of course, a similar effect is achieved by varying the width of the strips, and the sizes of the perforations therein, as well as those in the closure walls **45**, **46** and **47**.

Of course, it should be appreciated that several structural aspects of the foregoing apparatus need not be specifically as described in order to function in accord with the invention. For example, the expanded metal strips **43**, or the expanded metal walls **45**, **46** and **47**, need not necessarily be formed of aluminum metal. And, moreover, the basket walls **45**, **46** and **47**, as already described, could be eliminated without rendering the filter cartridge ineffectual.

Any number of other variations, modifications, substitutions, additions, adaptations, or equivalencies to the present invention will be perceived by those skilled in the art, upon examination of the specification drawings, and claims here presented; and all of such variations, modifications, substitutions, additions, adaptations and equivalencies are to be treated as within the spirit of the present invention, the scope of which is limited only by the hereinafter appended claims.

What is claimed is the following:

1. A removable smoke filter cartridge for a waste incineration chamber cover with an emission vent therein, comprising:

a frame member removably engaged through said vent interceptingly of emission therethrough, and interiorly of said incineration chamber; and

a filtration medium of strips of expanded metal coiled into randomly serpentine orientation and stuffed into said frame;

said frame being positioned to permit emission of incineration products by flow through said filtration medium and said emission vent.

2. The apparatus of claim **1** with the additional structure comprising:

an expanded metal closure around a substantial portion of said filter medium to achieve additional filtration.

3. The apparatus of claim **1** with the additional structure comprising:

peripheral flange means on said filter cartridge for supportive, removable engagement thereof into said vent in said incinerator cover.

* * * * *