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Teich et al.

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[54] **INCINERATOR ASH DISPOSAL SYSTEM**

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[73] Assignee: **Raytheon Company**, Lexington, Mass.

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[52] **U.S. Cl.** ..... **110/8 R**, 110/49 R, 110/165 A

[51] **Int. Cl.** **F23g 5/00**

[58] **Field of Search** ..... 110/8 R, 28 Y, 49 R, 110/165 A

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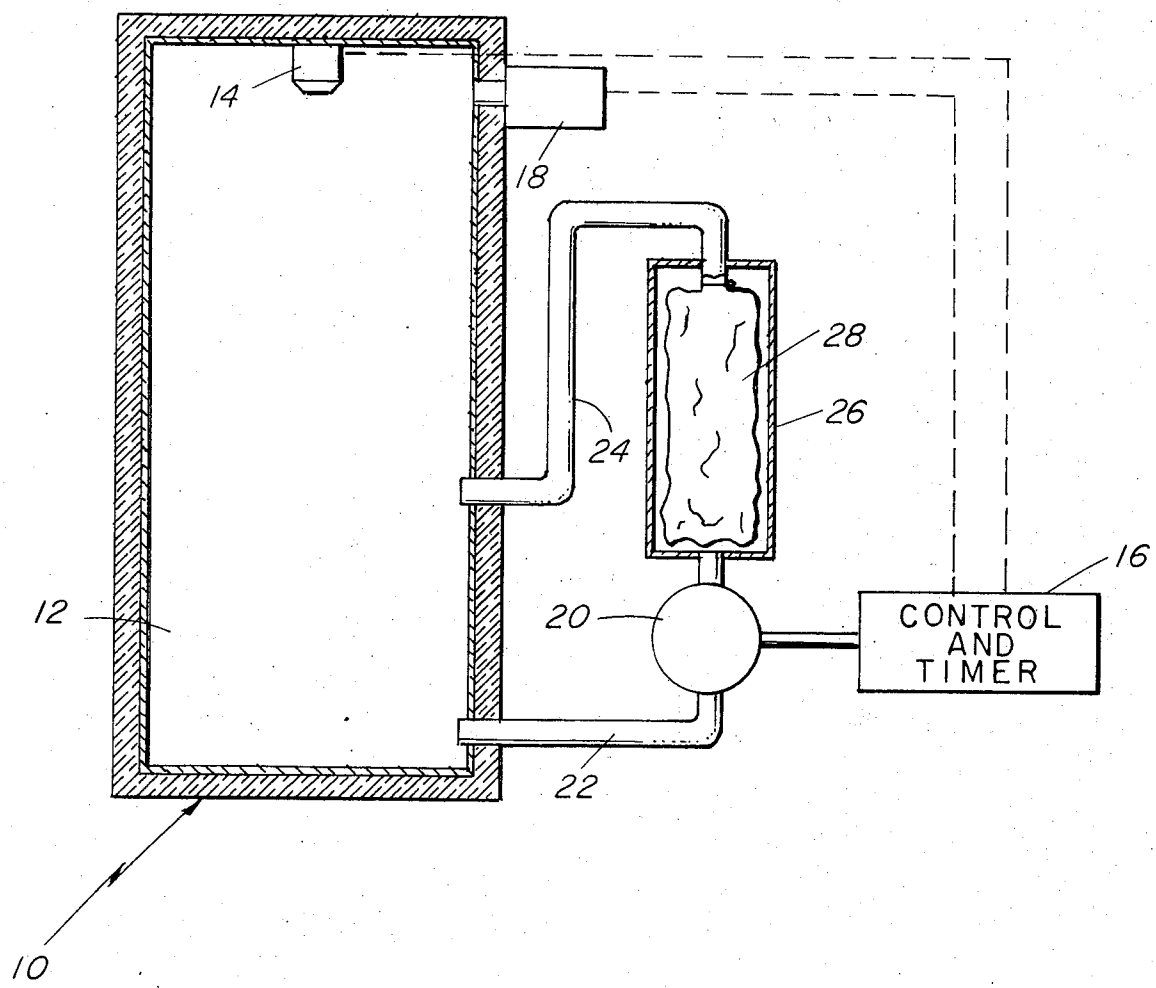
Primary Examiner—Kenneth W. Sprague

Attorney—Harold A. Murphy et al.

[57] **ABSTRACT**

An incinerator having a chamber in which combustion of miscellaneous products occurs to leave a residue in the form of particulate inorganic matter small in weight and volume, and a cleaning system which includes a compressor having a first connection to the chamber for directing air into the chamber for stirring up the dustlike residue and a second connection to the chamber for drawing off the dust-laden air into a cyclone filter or dust separator.

11 Claims, 4 Drawing Figures



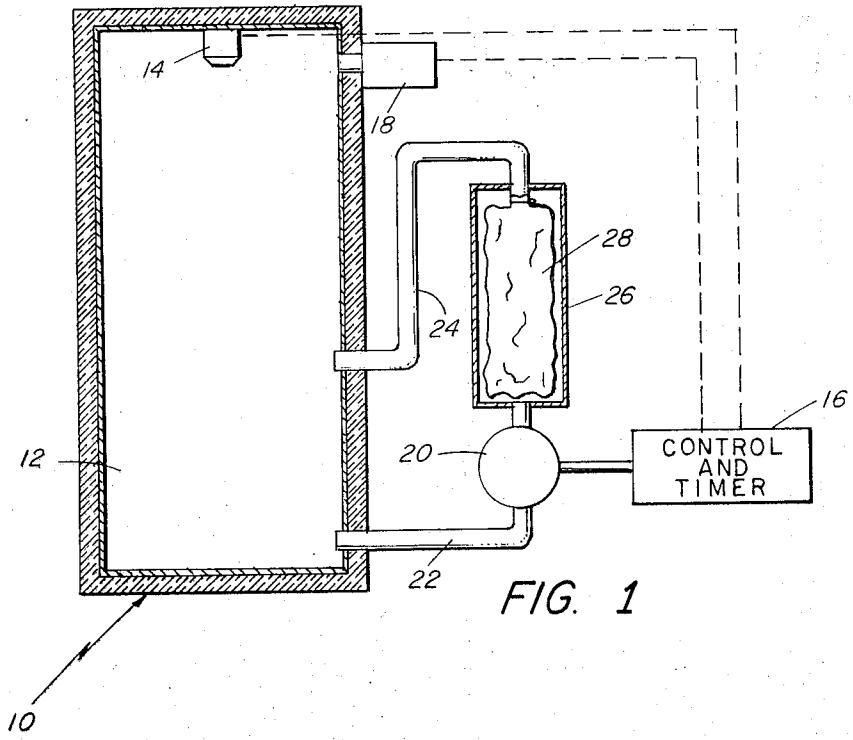

14
18
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16
12
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CONTROL AND TIMER
22
10

FIG. 1

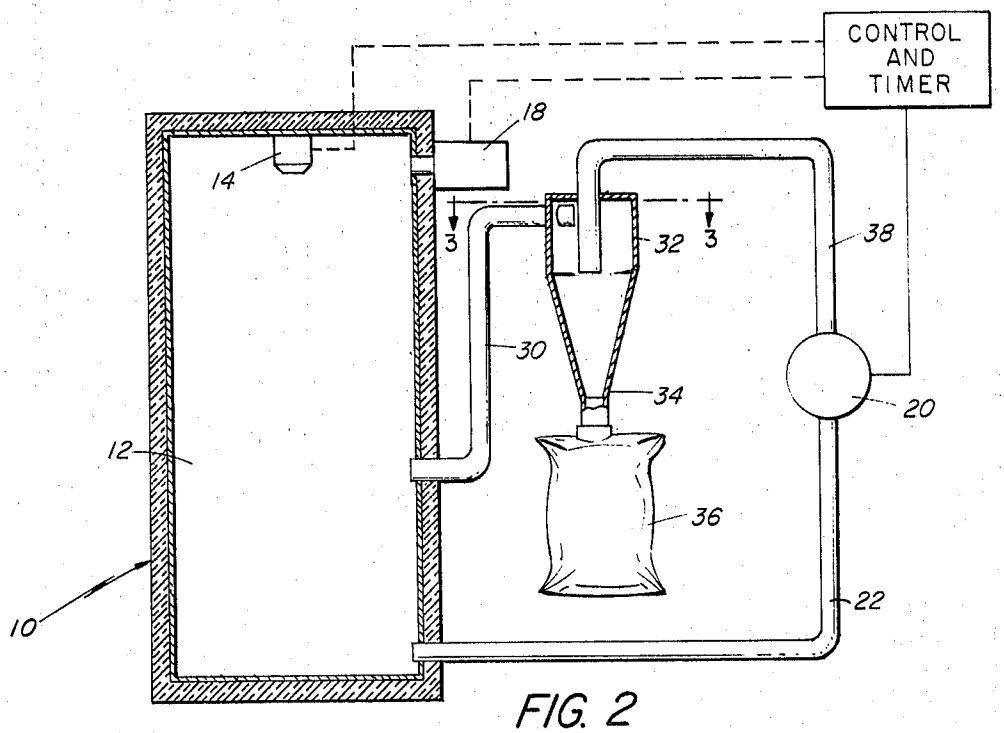

CONTROL AND TIMER
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10

FIG. 2

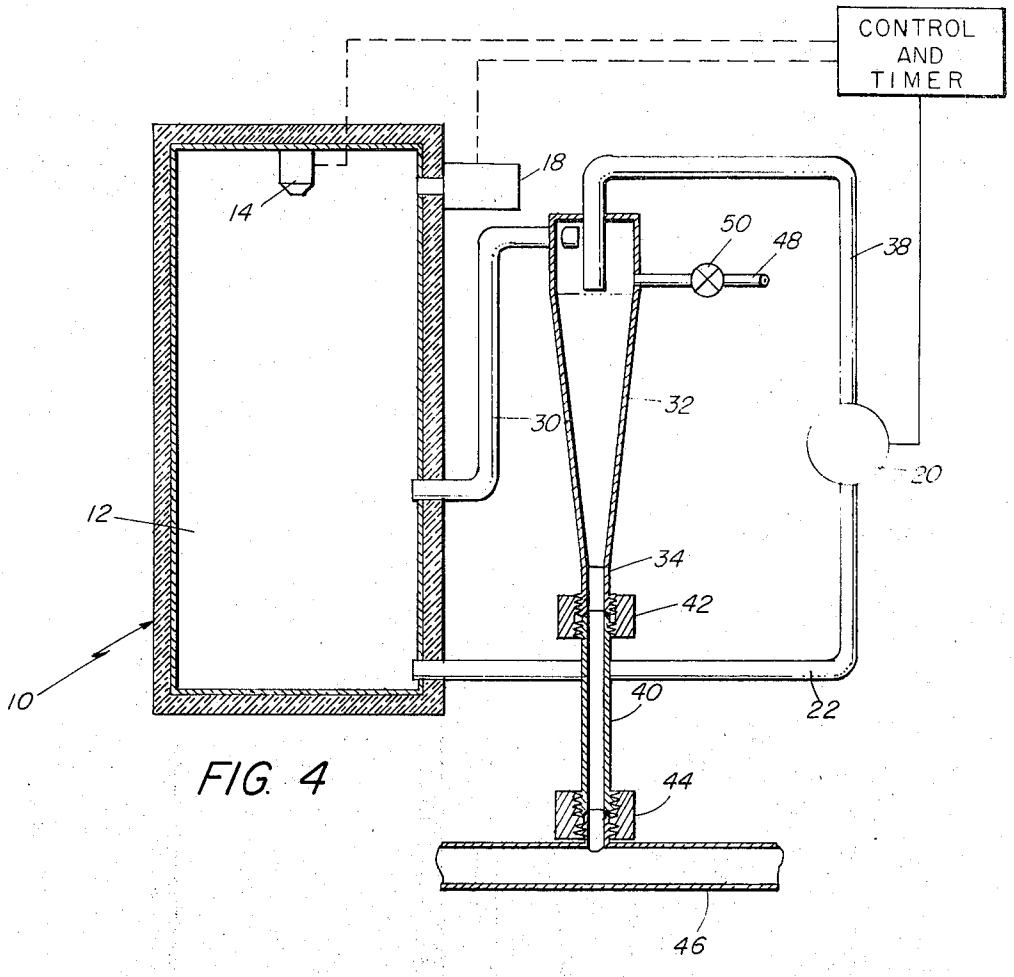

CONTROL AND TIMER
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FIG. 4

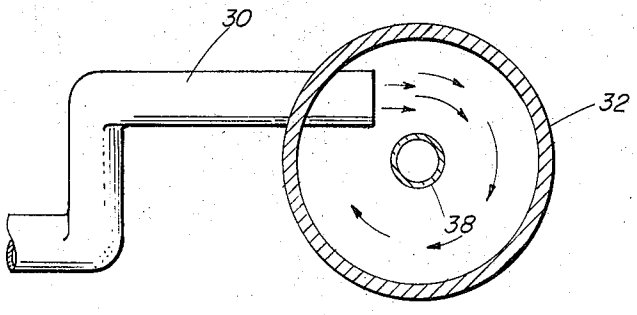

30
32
38

FIG. 3

INCINERATOR ASH DISPOSAL SYSTEM

BACKGROUND OF THE INVENTION

In commonly known types of domestic incinerators an ash drawer is an integral component of the appliance. Ash disposal is a periodic chore which includes emptying the ash drawer which contains burned ash, material which is unburned because of inefficient incineration, and any noncombustibles which have been allowed into the incinerator. Because of unburned material present, the residue is bulky and odorous, and has enough stickiness and strength to cause disposal problems. In particular, it will clog most any automatic handling system.

Vacuum type ash disposal techniques have been tried in such incinerators and have been generally unsuccessful. Merely employing a device such as a common vacuum cleaner system in an incinerator achieves some inefficient degree of cleaning, but sufficient residue remains to provide odor or other objectionable conditions. Furthermore, such devices were made to operate on an individual basis as desired by an operator.

SUMMARY OF THE INVENTION

In accordance with this invention there is provided an automatic ash diposal technique which efficiently performs its function as a sequence in the operation of a complete incineration cycle in a domestic incinerator. The system described herein uses the improved qualities of the fine dustlike ash which is produced by an extremely efficient domestic incinerator such as that which is shown and described in copending U.S. Pat. application Ser. No. 259,324, filed June 6, 1972, and assigned to the same assignee as the present invention. This ash is a dustlike residue of very small particulate material which is extremely light in weight, dry, biologically inert, nonodorous, has no strength or stickiness, and which can be handled in an air stream.

The apparatus of the present invention comprises an ash handling system which includes an air compressor connected by suitable nozzles and ducts to the trash combustion chamber of an incinerator for the proper distribution of input and output air in the chamber whereby the residual dustlike ash is disturbed, agitated or pulverized and made to circulate in the chamber in a pattern which results in the ash being picked up in the air stream which is eventually drawn out of the chamber. The structure of the ash is thereby destroyed and reduced to powder which occupies substantially less volume. The dust-laden air stream then is directed into a bag where the ash is filtered out of the air stream, and the bag is ultimately disposed of when filled, with the filtered air continuing back to the compressor for further cycling.

In one embodiment of the invention the dust-laden air stream is drawn into a cyclone type filter or dust separator for resultant disposal of the filtered-out particulate in the bag. In another embodiment, water is added to the cyclone to suspend the ash, and then flushed down the drain.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objectives of the invention will become apparent from the following description taken in connection with the accompanying drawings, wherein:

FIG. 1 is a schematic illustration of one embodiment of the invention utilizing a filter bag for ash separation;

FIG. 2 is a schematic illustration of another embodiment of the invention utilizing a cyclone filter for ash separation;

FIG. 3 is a horizontal sectional view taken on line 3-3 of FIG. 4 looking in the direction of the arrows; and

FIG. 4 is a schematic illustration similar to FIG. 2 of an embodiment of the invention which utilizes a cyclone filter and water system for elimination of the filtered-out ash.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring more particularly to the drawings, there is shown in FIG. 1 an incinerator **10** which may be, for example, the type shown and described in the aforementioned application Ser. No. 259,324. The incinerator **10** is schematically illustrated as including firewall defining a trash chamber **12** and a burner **14** which may be of the liquid-fueled or electric type. Not shown are other compartments or chambers, such as afterburner, flue, etc., and for further details reference may be made to said copending application.

A control system **16** including a sequence timer is connected to the incinerator components for initiating operation of the burner **14** in any desired manner, and also for controlling automatically an air recirculating pump **18**, including means for initially delaying combustion pending preheating of the afterburner. The control and timer is a well-known type similar to those on washers and other appliances. Therefore, details of this component are omitted here.

In accordance with this invention an automatic ash removal system is provided for removing any residual ash which remains after an incineration cycle has been completed. It has been found that the ash resulting from efficient and complete burning in an incinerator of the type, for example, as shown in the aforementioned copending application, will be a very light, dry, particulate matter, biologically inert and nonodorous. This residue accrues in extremely small amounts due to the extremely efficient combustion of the trash in the chamber **12** as well as of combustion products therefrom.

The ash removal system shown in FIG. 1 includes an air compressor **20** similar, for example, to those used in common vacuum cleaners. However, other air compressors may be utilized with this invention. Compressor **20** is connected to one end of a pipe or conduit **22** which has its other end extending through the wall of the incinerator **10** and terminating within chamber **12** in a position where the air being forced into the chamber by the compressor will stir up the residual dustlike ash and suspend it in a desired circulation pattern. Also similarly connected into the chamber **12** at a point remote from pipe **22** is one end of a second pipe **24** which provides means for exhausting the ash-laden air. Exhaust pipe **24** is connected at its other end, through a closed container **26** which is coupled to the compressor **20**. This pipe **24** and container **26** become a suction line for exhaust of the air from chamber **12**. Within container **26** is a dust-impervious bag **28** which has one end removably connected to the pipe **24** so that the ash-laden air from chamber **12** will pass into the bag **28** which will filter out the ash while permitting the cleaned air to pass back into the compressor **20**. The container **28** is, of course, provided with any suitable

access means (not shown) whereby bags **28** may be removed and replaced when filled.

From the foregoing it will be apparent that efficient cleaning of an incinerator may be automatically achieved. The main controller **16** for the incinerator also controls the cleaning cycle. After a burning cycle is completed, a timer of thermostat, which is set to determine a cooling period sufficient to allow the trash chamber **12** to reach close to ambient temperature, activates the compressor **20.** This forces air through pipe **22** into chamber **12,** causing it to circulate in the desired pattern which results in ash residue being picked up in the air stream, which ash-laden air is then suctioned out through pipe **24** into bag **28** where the ash is filtered out, and the clean air passed back to the compressor **20** for recirculation. AFter several passes, the trash chamber is essentially cleaned of residue, and at the end of the preselected time period the timer in control **16** shuts off the compressor. No personal contact with the ash, or with the incinerator, is required at any time in connection with cleaning other than to replace the bag when desired.

In the embodiment shown in FIG. **2,** a suction pipe **30** has one end connected to the incinerator chamber **12,** similarly to pipe **24** in FIG. **1,** and the other end is connected into the upper end of a cylcone filter **32.** The cyclone filter **32** is a vertically elongated container having a narrow lower neck or end portion **34** to which is secured one end of a disposal bag **36.** Bag **36** is, of course, impervious to dust and may, if desired, be impervious to air. The end of pipe **30** is introduced into the cyclone filter tangential to the inner surface of the filter, as shown best in FIG. **3,** so that incoming ash-laden air will be made to circulate within the filter, as shown by the arrows in FIG. **3.** The ash or dust in the air will spiral downwardly and eventually will deposit in the bag **36.**

A compressor **20** will create the flow of air into the incinerator chamber **12** through pipe **22,** as in the FIG. **1** embodiment. However, an additional coupling pipe **38** is connected at one end to the compressor **20** and has its other end inserted within the filter **32.** Pipe **38** is a suction line which serves to draw the filtered air out of the cyclone filter **32** back to the compressor for recirculation. This system provides an extremely efficient way of cleaning the incinerator. Of course, the control mechanism **16,** shown in FIG. **1,** also will be used with this embodiment of the invention. The only manual effort required with this system is to periodically empty or replace the bag **36.**

The further embodiment of the invention illustrated in FIG. **4** includes the incinerator **10,** compressor **20,** pipes **30, 38** and **22,** and cyclone filter **32,** as in the FIG. **2** embodiment. However, instead of utilizing a disposal bag, this system embodies a pipe **40** which is connected by nut **42** or any other suitable means to the lower end portion **34** of the cyclone filter **32.** The other end of pipe **40** is connectd by suitable means **44** to a drain system **46.** The house water system is connected by a pipe **48** and valve **50** into the upper end portion of filter **32** whereby, when the valve **50** is open, water will be permitted to enter the filter **32** to flush the residual ash dust down the drain **46.**

The valve **50** will, of course, be connected to the control system **16** (FIG. **1**) so that it will be opened only during a cleaning cycle. It has been found that the ash produced by the described type of incinerator does not agglomerate and will not collect in traps or drain pipes so as to cause clogging. Disposal into septic tanks is also feasible. In this system no manual effort whatsoever is required in connection with incinerator cleaning.

From the foregoing it will be apparent that all of the objectives of this invention have been accomplished by the automatic incinerator cleaning systems shown and described. It is to be understood, however, that various changes in the structures shown and described may be made by those skilled in the art without departing from the spirit of the invention as expressed in the accompanying claims. Therefore, all matter shown and described is to be interpreted as illustrative and not in a limiting sense.

We claim:

1. Apparatus of the character described comprising an incinerator having a chamber therein for reception of ash following combustion, and means for cleaning ash from said chamber comprising filter means, and air-circulation means including a compressor for directing a flow of air into said chamber to pulverize ash therein and for suctioning ash-laden air out of the chamber back to the compressor through the filter means.

2. Apparatus as set forth in claim **1** wherein a burner is mounted in said incinerator, and timing means is provided for operating the burner for a controlled time period, and subsequently operating said cleaning means after a predetermined cooling-off period.

3. Apparatus as set forth in claim **1** wherein the filter means includes a sealed container, and a disposal bag within the container mounted so as to receive the ash-laden air, said disposal bag being impervious to said ash and pervious to the air whereby the ash will remain in the bag while ash-free air will continue on to the compressor.

4. Apparatus as set forth in claim **1** wherein said filter means is a cyclone filter, and a disposal bag is connected to the cyclone filter for receiving ash separated from the air by the cyclone filter.

5. Apparatus as set forth in claim **1** wherein said filter means is a cyclone filter having means for connecting a source of incoming fluid to one portion, and means for connecting a second portion to a drain.

6. Apparatus as set forth in claim **3** wherein said incoming fluid connecting means includes a valve, and timing means is provided for opening and closing the valve in conjunction with starting and stopping the cleaning means.

7. Apparatus of the character described comprising an incinerator having a burner therein for burning combustible products, a chamber for reception of ash following combustion, and means for cleaning ash from said chamber comprising filter means, and air circulation means including a compressor, a pipe connecting the compressor with said chamber for directing air into said chamber to agitate ash therein, coupling means connecting said filter means to the compressor for directing air from the filter means to the compressor, and a second pipe connecting the filter means to the incinerator whereby ash-laden air in the incinerator is suctioned toward the compressor through the filter means.

8. Apparatus as set forth in claim **7** wherein the filter means includes a sealed container connected to said coupling means, said second pipe has one end extending into the container, and a disposal bag is attached to

said one end of the second pipe to receive said ash-laden air flowing therefrom.

9. Apparatus as set forth in claim **7** wherein said filter means is a cyclone filter, said second pipe has one end extending into the filter at one end thereof and at an angle such that air entering the filter therefrom will flow in a circular pattern, a disposal bag is attached to the filter to receive ash from said circulating air, and said coupling means includes a third pipe having one end connected to the compressor and its opposite end extending into the filter whereby filtered air is suctioned to the compressor.

10. Apparatus as set forth in claim **7** wherein the filter means is a cyclone filter, said second pipe has one end extending into the filter at one end thereof and at an angle such that air entering the filter therefrom will flow in a circular pattern, said coupling means includes a third pipe having one end connected to the compressor and its opposite end extending into the filter whereby filtered air is suctioned to the compressor, means is provided at the lower end of the filter for connection to a drain, and conduit means is connected to an upper portion of the filter for supplying for connecting the filter to a source of flushing fluid.

11. Apparatus as set forth in claim **10** wherein said conduit means includes a valve, and timing means is provided for opening and closing the valve in conjunction with starting and stopping the cleaning means.

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