United States Patent

Farris

[15] **3,661,323**

[45] **May 9, 1972**

[54] ODOR NEUTRALIZING DEVICE

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

[21] Appl. No.: **44,997**

[52] **U.S. Cl.** .....**236/93,** 21/74 R, 98/30, 126/113, 236/44 R, 239/75, 261/39 R

[51] **Int. Cl.** **A61l 9/04**

[58] **Field of Search** .....21/74, 121–123; 98/30; 236/44 B, 44; 261/93, 52; 55/418, 279; 239/58, 75; 261/39 R, 26, DIG. 65, DIG. 15, 119; 126/113

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Primary Examiner—William E. Wayner

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[57] **ABSTRACT**

An odor neutralizing device for use with a heating and/or air conditioning system having an air return duct and a blower for use in a self-contained apparatus having an air passage with a fan or blower. The device includes a housing having an air inlet and an air discharge chamber and a container for the odor neutralizing material attached to the housing and communicating with the two chambers and forming an air passage therebetween. A thermostatically controlled valve senses the temperature of the air flowing through the chambers and varies the flow of air to maintain a substantially constant odor neutralizing vapor-to-air ratio regardless of air temperature.

17 Claims, 10 Drawing Figures

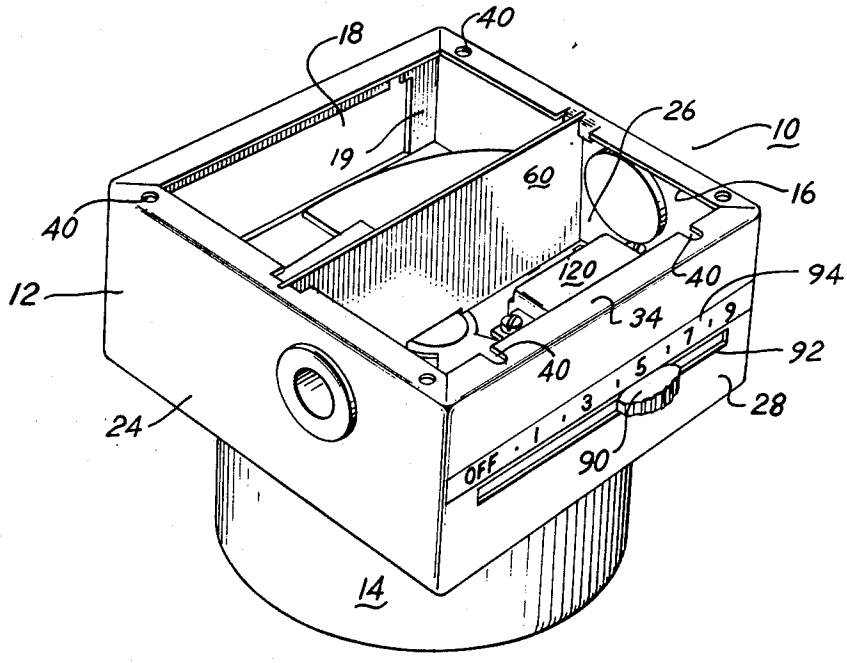
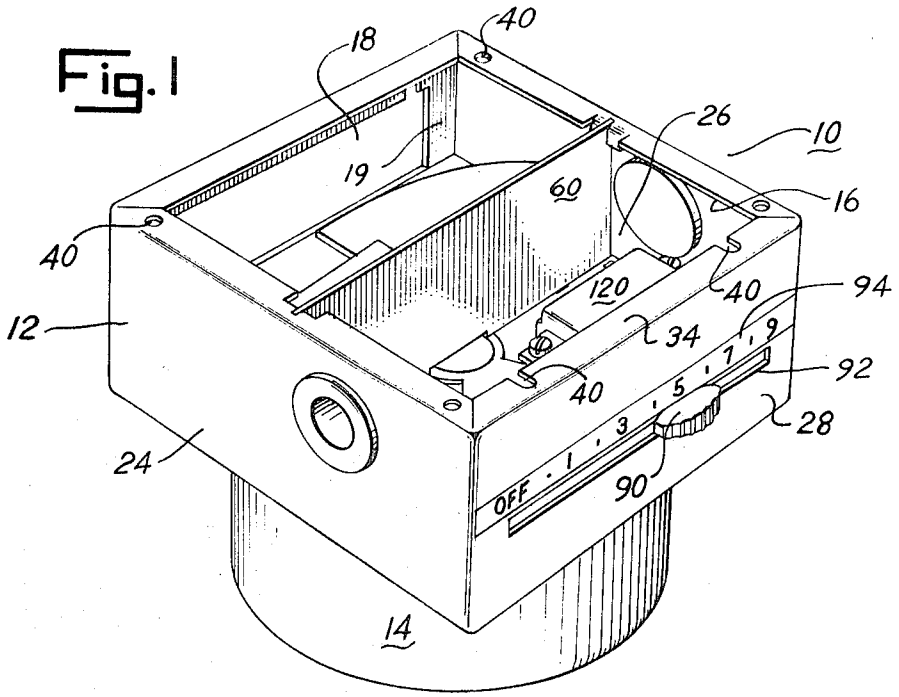


Fig. 1



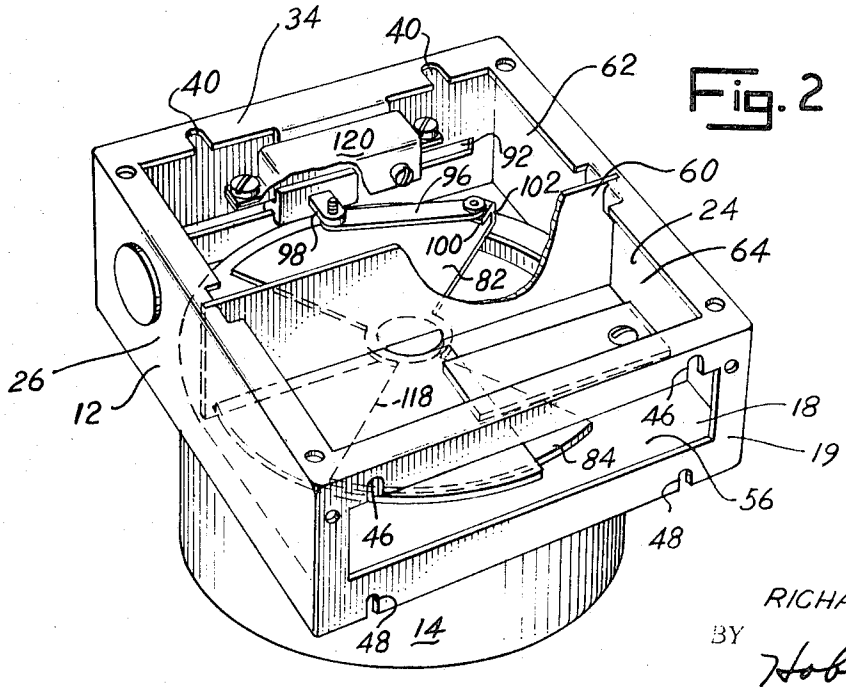


Fig. 2

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Fig. 3

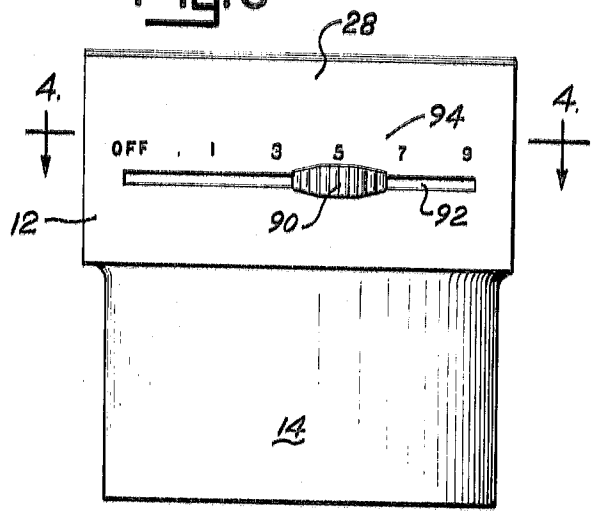
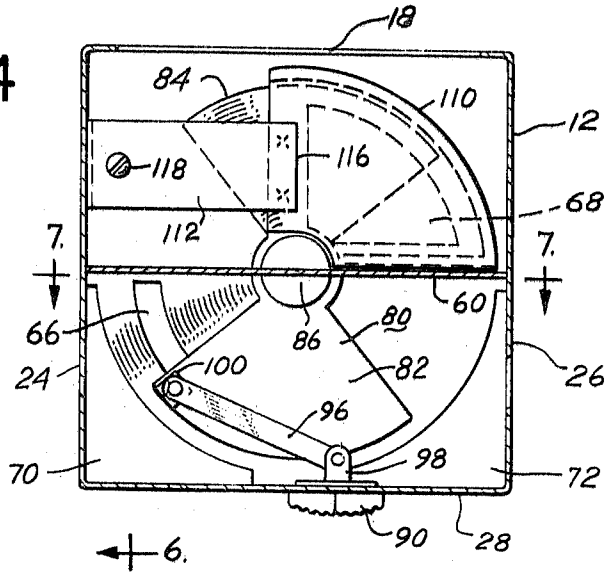


Fig. 4



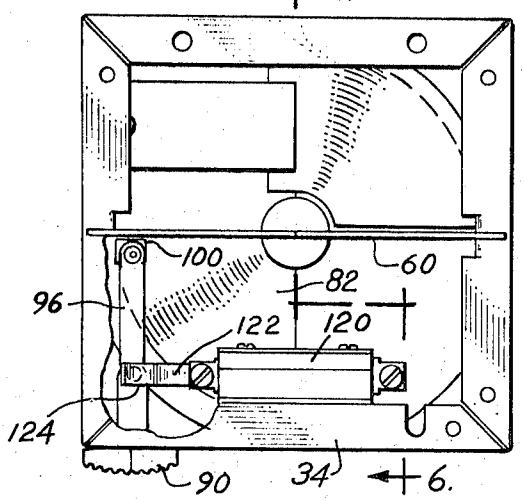


Fig. 5

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Fig. 6

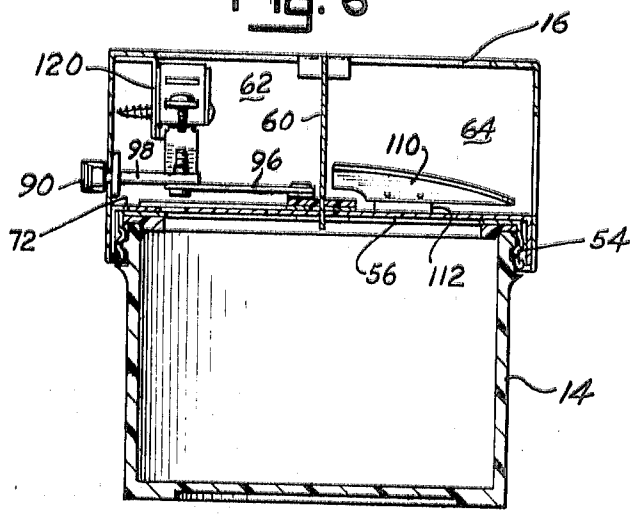


Fig. 8

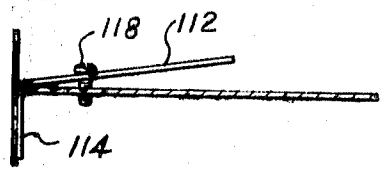
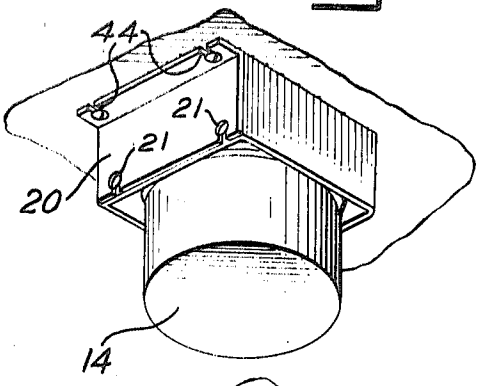


Fig. 9



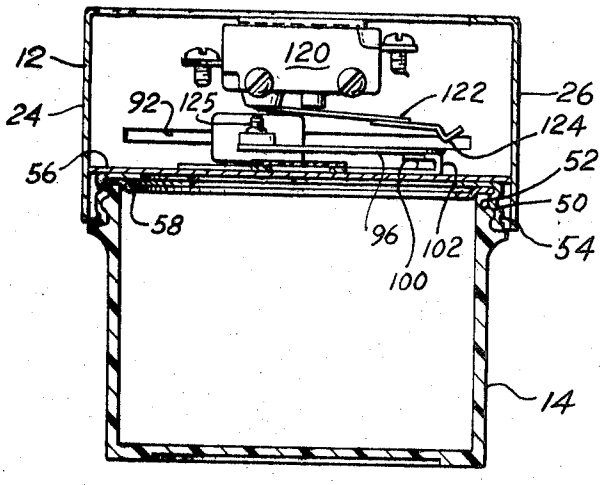


Fig. 7

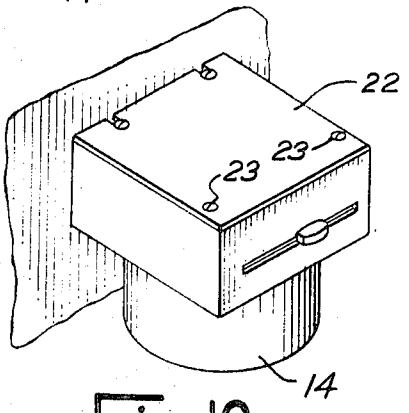


Fig. 10

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ODOR NEUTRALIZING DEVICE

Consistent with the total comfort concept now being advanced by the air conditioning industry, the modern dwelling is equipped to control effectively the majority of nature's assorted discomforts, including cold, heat, humidity, dust, pollen and smoke, with a minimum of noise and inconvenience. To accomplish any reasonable form of indoor environmental control ranging from basic heating up to total equipped standards efficiently, requires that the equipment structure be well insulated and tightly constructed, to prevent excessive outdoor pollution of the desirable indoor environment. Ideally, the natural uncomfortable outside elements should stay outside and the created comfortable inside conditions should remain inside. However, any unattended uncomfortable inside environmental conditions also remain inside; thus, any indoor atmospheric problem not treated directly by the central system is augmented by the conditions and construction necessary to accommodate the system.

The total comfort concept encompasses central heating, cooling/dehumidification, humidification, and air cleaning; however, one significant indoor environmental problem common to all dwellings remaining essentially unsolved and actually being accentuated by factors relating directly to modern air conditioning is offensive odors resulting from normal home environmental living conditions. With the conventional systems, a modern home, built to current total comfort standards, could be warm in winter, cool in summer, provide ideal humidity levels at all time, be practically devoid of dust, pollen, smoke, insects, and noise, and yet be permeated with offensive odors. None of the present total comfort facilities will influence these offensive odors other than to efficiently distribute them throughout the dwelling and ensure that as little as possible escapes to the outside, thus forming what is normally referred to as "ambient odor" which is the continuing odor, generally nondescript, found in every home. The ambient odor in any given dwelling tends to be peculiar to that particular dwelling, inasmuch as the total is created by a vast multitude of individual odor sources such as cooking odors, wax on the kitchen floor, wallpaper, drapes, cigarette smoke, basement drains, and the like. Eliminating one source of ambient odor has no significant bearing on the balance. However, humans will become immune to a given low level odor, such as household ambient odor, after sustained exposure to that odor, and may conclude that the house is in an odor-free condition.

Household odors can be controlled, at least in part, by dilution, veil, desensitization, and absorption, singly or in combination. For example, offensive indoor odor levels can sometimes be reduced by ducting in and mixing outside air with inside air. This approach, however, has many inherent weaknesses in that dilution pulls in cold, heat, humidity, dust and other pollutants, placing a severe strain on heating and air conditioning systems, or necessitating a higher initial investment and increasing operating costs. An offensive odor can also be covered with another stronger and, hopefully, more pleasant odor. This practice, which is referred to as veiling, can be accomplished through the electronic generation of ozone, a gas or chemical dispersion. Certain chemical vapors may also be used which deaden the membranes of the nose, thus eliminating the ability to smell any offensive odor. Some aerosol type spot household deodorants employ this approach with a degree of success; but the principle is distasteful and does not lend itself to the extended exposure necessary for effective central odor control. Some chemicals are capable of absorbing odors, the most common of these being charcoal. Basically, absorption can remove odor efficiently, but any advantages of charcoal and chemical absorbers, when considered for the control of odor throughout a dwelling, are nullified by some major disadvantages. For example, a large quantity of the absorbent agent is required to effectively cope with the typical residence and the necessary absorbent device is therefore quite cumbersome. The principle requires that the air conditioning system be either originally designed or substantially modified to accept the device, and initial installation and replacement are both difficult and rather expensive.

One of the principal objects of the present invention is to provide an odor neutralizing device and system which overcomes the inherent disadvantages of the prior odor handling and/or conditioning systems and methods and which is relatively simple in construction and operation and can be readily installed in old or new home heating and air conditioning systems without making any changes in the basic system or requiring any motors, blowers or fans in addition to those of the original heating and air conditioning system.

Another object of the invention is to provide a self-contained and compact odor neutralizing device which can be mounted on and connected directly into the return air duct, either on the side or bottom thereof, and which can be readily and conveniently serviced and regulated without rendering the basic heating and/or air conditioning equipment even temporarily inoperable.

Still another object of the invention is to provide a deodorizing device which is so constructed and installed that it in no way interferes with the operation of the basic heating and air conditioning equipment, whether the device is in operation or not, and which, in cooperation therewith, provides full and uniform odor neutralizing effect throughout the entire dwelling or other structure in which the equipment is installed.

A further object is to provide an odor neutralizing device which can be easily and accurately controlled to provide optimum performance, and which, while being used in conjunction with the heating and/or air conditioning equipment, can be operated regardless of whether the equipment is being used to heat or cool and can be controlled independently of the controls of the basic equipment on which the device is installed.

Another object of the invention is to provide a device of the aforesaid type which may be adjusted to an infinite variety of intensity levels and will maintain the selected level within rather narrow limits, and which utilizes a solid, semi-solid or liquid chemical for performing the odor neutralizing action and maintains a constant evaporating rate regardless of the level or amount of the neutralizer in the device or the temperature of the air passing through the device.

Additional objects and advantages of the invention will become apparent from the following description and accompanying drawings, wherein:

FIG. 1 is a perspective view of the present odor neutralizing device showing the device before it is installed;

FIG. 2 is a perspective view of the present device showing the device and the internal mechanism thereof at a 180° view from that shown in FIG. 1;

FIG. 3 is a front elevational view of the present device;

FIG. 4 is a horizontal cross sectional view of the device shown in the preceding figures, the section being taken on line 4 — 4 of FIG. 3;

FIG. 5 is a top plan view of the device shown in the preceding figures, with a portion of the housing broken away to illustrate the construction and operation of one of the control mechanisms therein;

FIG. 6 is a vertical cross sectional view of the device, the section being taken on line 6 — 6 of FIG. 5;

FIG. 7 is a vertical cross sectional view of the device taken on line 7 — 7 of FIG. 4;

FIG. 8 is an enlarged side elevational view of a thermostatically controlled element;

FIG. 9 is a perspective view illustrating one type of installation on a return air duct of a heating and air conditioning system; and

FIG. 10 is a perspective view illustrating another type of installation on an air return duct.

Referring more specifically to the drawings, numeral 10 indicates generally the present odor neutralizing device, 12 the housing in which the control mechanism is disposed, and 14 a container for the odor neutralizing material, the container being secured to the underside of the housing and projecting downwardly therefrom. The housing is designed to be mounted either on the bottom of an air return duct, as illustrated in FIG. 9, or on the side of an air return duct, as illus-

trated in FIG. 10. The open top 16 is used as the communicating passage for the air when the device is mounted on the bottom of the air return duct, and the side opening 18 is used as the air passage when the device is mounted on the side of an air return duct. When the unit is mounted on the underside of the duct, as illustrated in FIG. 9, opening 18 in rear panel 19 is closed by a plate 20 secured to the housing by screws 21, and when the device is mounted on the side of a duct, opening 16 is closed by a plate 22 secured to the housing by screws 23.

In the embodiment of the invention illustrated in the drawings, housing 12, which is constructed of sheet metal, is rectangular shaped and has side walls 24 and 26 and front panel 28, the two side walls and front panel being joined integrally to one another. A flange 34 on the upper edge of panel 28 contains two slots 40 for receiving screws for securing the device to the bottom wall of an air duct, with the open top being in communication with an opening in said wall, and the rear plate 20 contains two slots 44 for receiving mounting screws to support the rear of the device. Slots 46 and 48 in the rear panel 19 receive screws for securing the device in operative position on a vertical wall of an air duct having a hole communicating with opening 18.

The odor neutralizing container 14 is cylindrical in shape and is secured to the underside of the housing by threaded portion 50 on the upper rim thereof engaging a corresponding threaded portion 52 on skirt 54 of the housing. The housing has a bottom panel 56 secured to the side walls and to skirt 54, and the upper rim of the container seats on a gasket 58 which in turn is pressed onto the underside of bottom panel 56, thus forming a fluid-tight connection between the upper rim of the container and the underside of bottom panel 56.

The housing compartment is separated by a vertical partition 60 which extends from one side wall to the other, dividing the compartment into a front chamber 62 and a rear chamber 64, the front chamber being the air intake chamber and the rear chamber being the air discharge chamber. Communication between the two chambers is through opening 66 in bottom 56 in the front chamber and opening 68 in the bottom in the rear chamber, these two openings being operatively connected by container 14 for the flow of fluid from chamber 62 through the container 14 and thence to chamber 64. The air passing through the device enters chamber 62 through openings 70 and 72 at the lower front corners between the housing walls and skirt 54, and leaves through open top 16 or opening 18 depending upon whether the device is mounted on the bottom or side of the air return duct. When the device is mounted on a horizontal wall of the duct, the duct wall closes the open top above air inlet chamber 62, but contains a port communicating through the open top with air outlet chamber 64. A top plate with an opening into chamber 64 may be used in place of the duct wall as the means forming the top wall of chamber 62.

The two openings 66 and 68 are controlled by a rotatable valve 80 having a plate-like element 82 in the intake chamber to control the flow of air through opening 66 and a plate-like element 84 in the air outlet chamber to control the flow of air through opening 68. The two elements are connected at their inner ends and are pivotally mounted at the center of the housing on a pin 86 which permits the two elements of the valve to move freely in unison on the upper surface of bottom panel 56 as the elements 82 and 84 are moved to open and close the two openings. Valve 80 is controlled by a hand or operating knob 90 movable along slot 92 and graduated scale 94 on the front panel 28 of the housing. The knob is connected to the valve by a linkage 96, shown as a rod or bar, which is connected at one end to an internal projection 98 on knob 90 at one end, and to a projection 100 on an upturned flange 102 on the inner edge of valve element 82. The size of opening 66 and the degree of movement of valve element 82 are somewhat critical, in that the effectiveness of the inflowing air, even if the air flow is relatively small, is substantially greater when opening 66 is first opened than when it is nearly fully opened. The construction and relationship of the control knob and valve element 82 can be moved at a direct linear rate and yet obtain the desired amount of air flow to give the desired concentration of odor neutralizing vapors in the air. This is accomplished by the position of knob 90 relative to knob projection 100. It is seen that as the knob is moved to the right as viewed in FIG. 4, substantial movement of the knob will result in only a small movement of the valve element toward open position. As the knob is moved further to the right, the relative position of rod 96 to projection 100 and flange 102 results in substantially equal movement of the knob and the valve. The first part of the movement of knob 90 to the right is substantially parallel with flange 102, but thereafter it is substantially perpendicular to said flange, thus resulting in the variable degree of opening with the linear movement of the knob along the scale or dial on the front panel of the device.

In order to compensate for the increased volatility of the odor neutralizing composition and hence the concentration of the composition in the air discharged from the device, as the temperature increases, a temperature compensating means is included in the device. This consists of a plate valve 110 disposed above opening 68 and controlled by a leaf or plate-like thermostatic element 112 secured at one end to bottom panel 56 by a downwardly extending portion 114, seated tightly between the bottom panel and the adjacent side wall, and attached at the other end 116 to valve plate 110. An adjustment screw 118, extending downwardly through holes in the thermostatic element and the bottom panel, adjusts the position of the plate valve above opening 68, and hence the flow capacity of the opening, for any given temperature. Tightening the screw restricts the air flow through opening 68, and loosening the screw increases the flow through the opening. When the temperature is relatively low, the thermostatic element moves plate valve 110 to its maximum position away from opening 68 to permit the maximum air flow through openings 66 and 68 and container 14 to give the maximum saturation of the air with the odor neutralizing vapors. As the temperature rises, the thermostatic element moves plate valve 110 toward opening 68, thereby restricting the air flow through the opening. The air from opening 68 passes along the underside of the plate valve and thence outwardly around the periphery of valve 110 into chamber 62 from which it is then discharged to the duct system. The plate valve 110 continually varies its position under the control of the thermostatic element in accordance with variations in the temperature of the air passing through the device.

Since the blower or fan on the main heating and air conditioning system must be on in order for the present device to be operable, and since there may be times when there would be no demand for either heating or cooling but yet a requirement for deodorizing, a control switch 120 is incorporated in the unit for turning the blower on and off as the present device is made operable or inoperable. Switch 120 is mounted behind the front panel and has a switch operating lever 122 with a V-shaped contact end member 124 which is engaged by an adjustment screw 125 on linkage 96 as knob 90 moves the linkage to the position to fully close valve 80. As the control knob is moved to the right, as viewed in FIGS. 3, 4, and 5, the linkage moves away from member 124, thus permitting lever 122 to operate switch 120 to turn on the blower on the main heating and air conditioning system if it is not already on. The switch thus overrides the blower control circuitry of the main system and retains the blower in operation as long as the control knob is at a position away from "Off" at the extreme left hand end of the operating scale. If the system is on when the control knob is moved to the right, the switch has no effect on the operation of the blower. However, in the event the main control system for the blower is interrupted, the fan will continue to operate as a result of the closing of switch 120. When the control knob 90 is moved to the left, the blower will discontinue operation if the main circuitry is open.

The odor neutralizing or counteracting material may be a variety of different substances, and may either be in a liquid or

solid form. The container is preferably constructed of transparent or translucent material, such as polyethylene, so that the amount of material in the container can be readily determined. When the container approaches empty, it can be easily removed from the device by unscrewing it from skirt **54**, filling the container, and then returning it to its operating position beneath the housing, or the container may be replaced by another filed, disposable container.

In the operation of the present odor neutralizing device with the device mounted on an air return conduit in the manner illustrated in either FIGS. **9** or **10** and with the odor neutralizing material in container **14**, movement of knob **90** from "Off" position toward the right hand end of scale **94** first results in the gradual movement of valve elements **82** and **84** in the counterclockwise direction, thus opening openings **66** and **68**. Air flows through passages **70** and **72** through chamber **62**, downwardly through opening **66**, into container **14** where it mixes with vapors from either a solid or liquid neutralizing material. The air now laden with the neutralizing material passes upwardly through opening **68** and chamber **64** and thence through either the top **16** or through opening **18** into the air return duct on which the device is mounted. The knob is normally set at some position which gives the desired amount of odor neutralizing material in the air. It is normally not adjusted frequently, since the odor conditions of a dwelling usually do not change rapidly except under such conditions as heavy cooking and cleaning. As the temperature changes from time to time, thermostatic element **112** varies the position of plate valve **110** above opening **68**, thereby maintaining a substantially constant ratio of air to neutralizing vapors. In the event the functioning of the device is not necessary, knob **90** is moved to the "Off" position when rod **96** closes valve elements **82** and **84** over openings **66** and **68**, preventing the flow of air through the device, and simultaneously trips open switch **120**, permitting the blower of the central heating and air conditioning system to discontinue operation unless it is otherwise required in the system.

The present odor neutralizing device may be used as a component in a self-contained apparatus having an air duct or passage containing its own blower or fan. The device is either mounted in or on the air passage in such a manner that at least a portion of the air passing through the air passage will be diverted through the device, in the manner previously described herein, to infiltrate the air flowing through the passage with the odor neutralizing material from container **14**. The apparatus or system containing the present device may be a portable floor or table model or a wall mounted unit.

While only one embodiment has been described in detail herein, various changes and modifications may be made without departing from the scope of the invention.

I claim:

1. An odor neutralizing device for use with an air passage of a system having a blower therein: a housing, a partition in said housing dividing said housing into a first chamber having an air inlet passage and a second chamber having a port for communicating with the air passage, a bottom member for each of said chambers, a container for odor neutralizing material mounted on said housing beneath said bottom members, an opening in each of said bottom members communicating with said container, a valve element closing one of said openings, a control means for varying the degree of opening of said valve element, and a thermostatically controlled valve means for controlling the flow of air through one of said openings to increase the flow of air therethrough with a decrease in temperature of the air passing through said chamber.

2. An odor neutralizing device as defined in claim **1** in which a valve element closes the other of said openings and is operatively connected to said first valve element for opening and closing said openings simultaneously.

3. An odor neutralizing device as defined in claim **1** in which said valve element is mounted on a pivot means and opens and closes through an arcuate movement.

4. An odor neutralizing device as defined in claim **3** in which said control means for varying the degree of opening of said valve element includes a linear movable means and a linkage connecting said means with said valve element.

5. An odor neutralizing device as defined in claim **2** in which said valve element is mounted on a pivot means and opens through an arcuate movement.

6. An odor neutralizing device as defined in claim **5** in which said control means for varying the degree of opening of said valve element includes a linear movable means and a linkage connecting said means with said valve element.

7. An odor neutralizing device as defined in claim **1** in which a switch is controlled by said control means for controlling the operation of a blower in said system.

8. An odor neutralizing device as defined in claim **6** in which a switch is controlled by said control means for controlling the operation of a blower in said system.

9. An odor neutralizing device as defined in claim **1** or **8** in which said thermostatically controlled valve means consists of a plate-like member movable toward and away from the opening to said second chamber in response to changes in air temperature.

10. An odor neutralizing device as defined in claim **9** in which a thermostatic element is attached to said plate-like member and an adjustment screw varies the position of said member relative to the opening in said second chamber in response to changes in air temperature.

11. An odor neutralizing device as defined in claim **1** in which said container is constructed of translucent material and is threadedly secured to said housing beneath the bottom members of said chambers.

12. An odor neutralizing device as defined in claim **1** in which said housing contains a horizontally opening port and a vertically opening port for mounting said housing on the vertical wall of the air passage or on a horizontal wall of a duct.

13. An odor neutralizing device for use with an air passage of a system having a blower therein: a housing, a member in said housing having an air inlet opening communicating with ambient air and an air outlet opening communicating with the air passage, walls defining an air flow chamber communicating with one of said openings, a container for odor neutralizing material connected to said member and interconnecting said openings, a valve element closing one of said openings, a control means for varying the degree of opening of said valve element, and a thermostatically controlled valve means for controlling the flow of air through one of said openings to increase the flow of air therethrough with a decrease in temperature of the air passing through said chamber.

14. An odor neutralizing device as defined in claim **13** in which a valve element closes the other of said openings and is operatively connected to said first valve element for opening and closing said openings simultaneously.

15. An odor neutralizing device as defined in claim **13** in which said valve element is mounted on a pivot means and opens and closes through an arcuate movement.

16. An odor neutralizing device as defined in claim **13** in which a switch is controlled by said control means for controlling the operation of a blower in said system.

17. An odor neutralizing device as defined in claim **13** in which said thermostatically controlled valve means consists of a plate-like member movable toward and away from the openings to said chamber in response to changes in air temperature.

* * * * *