Dec. 25, 1951 K. C. THOMPSON 2,579,626

VAPORIZER

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Fig. 1.

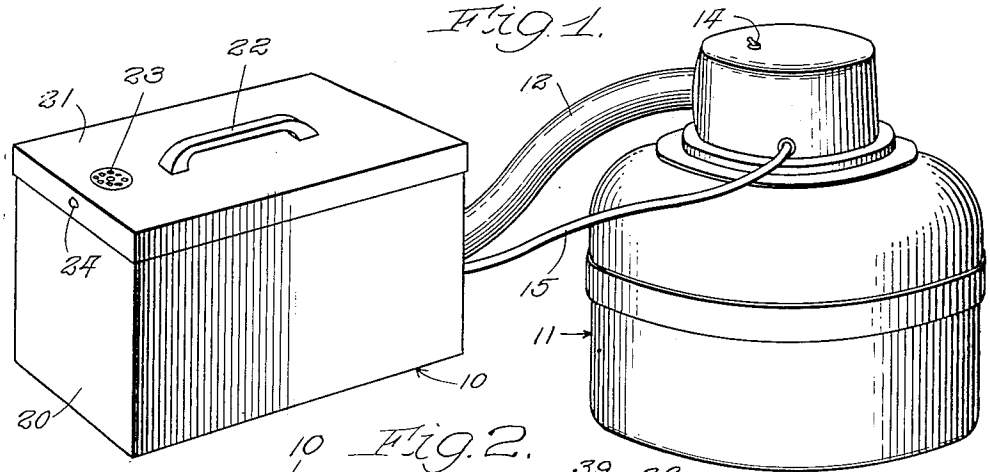


Fig. 2.

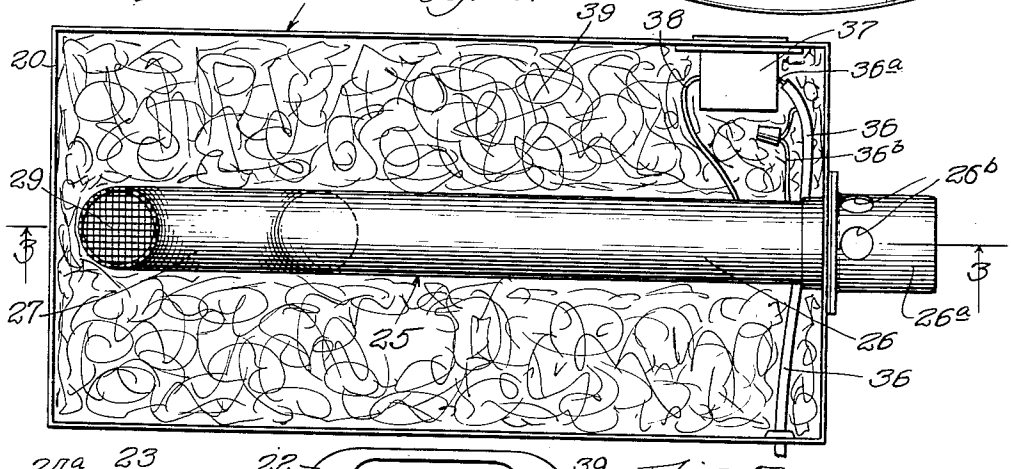


Fig. 3.

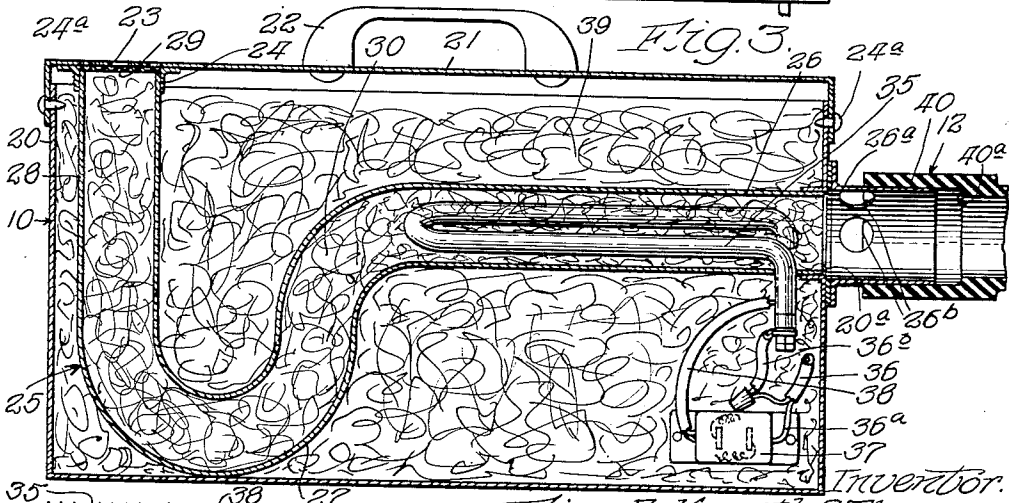
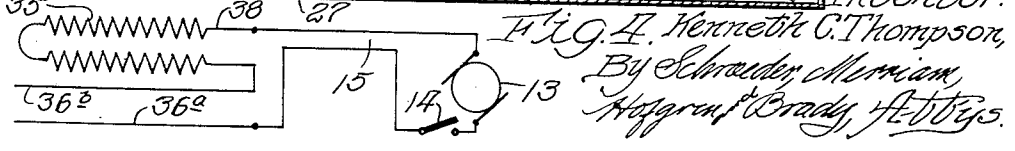


Fig. 4.



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VAPORIZER

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14 Claims. (Cl. 219—38)

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This invention relates to a vaporizer, and more particularly to a vaporizer attachment unit for use with a power unit providing a flow of air, such as a vacuum cleaner.

One feature of this invention is that it provides an improved vaporizer; another feature of the invention is that it provides a vaporizer in which air is blown through a passage having the material to be vaporized therein, and means are provided for heating the air flowing through said passage; a further feature of the invention is that means are provided in the air passage for retarding the flow of air therethrough and for increasing the surface area of the material to be vaporized; still another feature of the invention is that the means for retarding the flow of air are of heat-conductive material having a portion in heat exchange relationship with the heating means for heating the material to be vaporized; yet a further feature of the invention is that means are provided for reducing the flow of air through the passage below the normal output of the power unit; an additional feature of the invention is that means are provided for connecting the heating means in series with the motor means of the power unit for reducing the speed of operation thereof; still an additional feature of the invention is that it includes means providing an air connection between the power unit and the air passage, this means having at best one bleeder opening therein for reducing the flow of air through the passage; and yet a further feature of the invention is that the means providing the air connection is movable for covering desired portions of the bleeder opening.

Other features and advantages of the invention will be apparent from the following specification and from the drawings, in which:

Fig. 1 is a perspective view of the vaporizer including the attachment unit and the power unit;

Fig. 2 is a top plan view of the attachment unit, said unit being disconnected from the power unit and having its cover and most of the insulation removed;

Fig. 3 is a longitudinal section along the line 3—3 of Fig. 2, with the cover and part of the insulation replaced, and showing means for connecting the attachment unit to the power unit; and

Fig. 4 is a diagram of the electric circuit of the apparatus.

While the vaporizer disclosed and claimed herein has other uses than that particularly described,

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the vaporizer is particularly advantageous for use as a vaporizer in controlling disease.

It has been found that triethylene glycol, when vaporized in the air, suppresses the virus which causes the common cold, thereby greatly reducing the incidence of transfer of colds among occupants of a room or other enclosure. However, because of the chemical structure of triethylene glycol it is not possible merely to boil it or to heat it at random in order to vaporize it into the air, and no satisfactory yet simple arrangement has been devised for vaporizing this material properly to saturate a room or other enclosure, particularly in homes and offices.

While triethylene glycol boils at a temperature of the order of 550 degrees Fahrenheit, this material decomposes when it is heated to about 270 degrees Fahrenheit, and the decomposition produces noxious odors. Consequently, in a room or other enclosure it is undesirable to boil triethylene glycol to produce the vapor in the air, and in consequence of the high boiling point of the material it is not possible to evaporate a sufficient quantity to get good results merely by heating triethylene glycol to a temperature below its decomposition point, as 230 or 240 degrees, and then blowing cool (room temperature) air across it. I have found, however, that if warm air (preferably in the range from about 190° to about 240° Fahrenheit) is blown past the surface of triethylene glycol (particularly if the triethylene glycol is pre-heated to about the same temperature as the air), the triethylene glycol will vaporize in an appreciable amount sufficient to saturate an ordinary room within a very short time.

The present invention, in addition to providing an improved vaporizer attachment unit, is designed so that the attachment unit may be connected to the air outlet of a conventional vacuum cleaner so that the vacuum cleaner acts as the power unit for providing a flow of air. Means are provided connecting the power unit to an air passage in the attachment unit, and means are also provided for reducing the flow of air through the passage below the normal output of the power unit.

In order to accomplish this, I prefer to connect the heating element of the attachment unit in series with the motor of the vacuum cleaner to reduce the speed of the motor and thus reduce the air output of the vacuum cleaner below its normal level. Furthermore, means are provided in the air passage for retarding flow of air therethrough and at least one bleeder opening is provided between the power unit and the air passage

together with means for covering portions of this opening as desired so that a proper quantity of air may flow through the air passage of the attachment unit so that the air becomes heated to the proper temperature despite normal changes in the voltage of the power source.

Air is retarded in its flow through the air passage by means of a fibrous mass of material substantially filling the air passage. In addition to retarding the flow of air this fibrous material acts as a "wick" and greatly increases the surface area of the material to be vaporized. By utilizing a fibrous mass of heat-conductive material, as metallic shavings or wool, having a portion in heat exchange relationship with the heating means I am able to raise the temperature of the film of triethylene glycol carried by the strands or individual shavings of the mass, thereby greatly increasing the efficiency of the evaporating process.

Referring now to the drawings, the apparatus includes a vaporizer attachment unit designated generally at 10 which may be connected to a power unit designated generally at 11 by means of a connecting hose designated generally at 12.

The power unit here illustrated comprises a conventional vacuum cleaner, although it will be understood that I intend the term "power unit" to cover any motor means for supplying a stream of air. While any vacuum cleaner having an outlet through which air is blown may be utilized, I prefer to utilize a "Silver-King" vacuum cleaner of the type shown. The power unit is operated by an electric motor enclosed therein and designated 13 in Fig. 4, an on-off switch 14 being provided for controlling the operation of the motor, and a line cord 15 being provided for connecting the motor to a conventional source of power, as for example, conventional commercial 110 volt electric power. The line terminates in a conventional plug.

The attachment unit is mounted within a housing comprising a rectangular box 20 having a lid 21 provided with a carrying handle 22 and having a perforated opening 23 adjacent one end. The cover 21 may be securely mounted on the box 20 by means of screws, as shown at 24. Projecting from the bottom of the cover and surrounding the opening 23 is a tubular flange 24.

A tubular member designated generally at 25 is mounted within the housing. This member preferably comprises a metal pipe having a horizontal inlet portion 26 including a portion 26a which projects out of one end of the housing 20 through an opening 20a in an end wall of the housing. The portion 26a has a plurality of bleeder openings 26b in its wall outside the housing. The horizontal inlet portion 26 merges into an intermediate portion 27 providing a reservoir below the level of the inlet portion for material to be vaporized, and the reservoir portion merges into an upwardly extending outlet portion 28 the upper end of which is covered with a screen 29.

Within the bore of the tubular member is a mass of fibrous material 30. This mass preferably is composed of heat-conductive material, and may be formed of copper or other metallic shavings or wool. As may be seen in Fig. 3, the mass of copper shavings substantially fills the bore of the member 25, and this mass serves three important functions. The mass acts as a "wick" for increasing the surface area of the material to be vaporized, a quantity of this material being poured into the top of the outlet portion 28 when the cover 21 is removed so that the material flows down through the mass of copper shavings into the reservoir portion 27. As the material flows into the reservoir a film of the material to be vaporized remains on the copper strands, thus presenting an extremely large surface area of material to be vaporized.

The second function of this mass of fibrous material is to retard the flow of air through the passage so that the air will have time to become heated to the proper temperature and will pass slowly adjacent the material to be vaporized, thus giving a more complete vaporizing action. As a third function, utilizing a mass of heat-conductive material with a portion in heat exchange relationship with the heating means in the passage results in preheating the film of material on the strands of fibrous material independently of the heating action of the air which is flowing through the passage, thus providing for most efficient evaporation.

The means for heating air flowing through the passage 25 comprises an electric heating element 35 which in the particular embodiment shown is in the form of a U and extends within the inlet portion 26 of the passage. This heating element may be a conventional electric element having a power rating preferably of the order of 330 watts, when connected directly across a conventional electric supply line, although it will be understood that its heating rating will be much less, as for example about half this wattage effectively, when the element is operating in series with the motor of the power unit supplying air. A line cord 36 enters the housing 20 through an opening in one side, and one wire 36a of the line cord is connected to one terminal of a conventional outlet socket 37 which is mounted in a wall of the housing 20. The other wire 36b of the line cord is connected to one terminal of the heating element 35, and the other terminal of the heating element is connected by means of a lead 38 to the other terminal of the socket 37. The housing 20 may be packed with heat insulating material 39, which may be fibreglass or other like material.

As shown in Fig. 3 the connecting hose 12 terminates in a rubber nipple 40 which is slidable on the projecting tubular portion 26a of the pipe 25, which is provided with a stop shoulder 40a so located that the nipple may be slid onto the tubular member 26a substantially to cover the openings 26b if desired.

In the operation of the device a quantity of triethylene glycol, as for example about two ounces, may be poured into the upper end of the portion 28 of the tubular member 25, the triethylene glycol flowing down through the metal wool into the reservoir 27 and leaving a film of triethylene glycol on the metal wool. The cover may then be placed upon the attachment unit and the unit may be connected to the power unit 11 by means of the flexible hose 12, thus providing an air connection between the power unit and the passage 25. The line cord 15 of the power unit is then plugged into the socket 37 so that the motor 13 of the power unit is connected in series with the heating element 35. Since this heating element is essentially a resistor, the applied voltage is divided between the element 35 and the motor 13, reducing the speed of the motor and cutting down the air output of the power unit to a level below its normal value. When the cord 36 is connected to a source of voltage, the element 35 becomes heated, and since a portion of the metal wool

30 is in contact with the heating element the metal wool conducts heat to the film of triethylene glycol and this film is heated independently of the air flowing through the passage. Air flows through the hose 12 into the intake 26 of the passage 25 where it is heated by the element 35, the mass of shavings 30 retarding the flow of air through the passage 25 so that proper heating action will occur.

While the series connection of the heating element and motor and the retarding action of the shavings 30 are so designed that the air is heated to a temperature within a range from approximately 190 degrees Fahrenheit to approximately 240 degrees Fahrenheit, it sometimes is necessary to compensate for substantial voltage variations which will vary the speed of operation of the motor 13. It is well known that during times of excessive load, as in the evening, the voltage of a commercial power supply drops several volts below its rated level which prevails during normal usage. Because of the retarding effect of the fibrous mass 30 a portion of the air will flow out of the bleeder openings 26b. By sliding the nipple 40 towards or away from the housing 20 any desired portion of these bleeder openings may be covered to regulate the amount of air and speed of flow in the passage 25 so that the air and the triethylene glycol may be heated to a temperature high enough to produce efficient vaporization, but too low to cause decomposition of the triethylene glycol. I have found that temperatures within the range of approximately 190 degrees to approximately 240 degrees provide the best results, although some variation from these limits are workable. A vaporizer of the form here illustrated has very satisfactorily vaporized between nine and ten grams of triethylene glycol into a room within a half hour, starting cold and including the time (normally about three minutes) required for the heating element to heat up to operating temperature, and with the air leaving the vaporizer at a maximum of 235° F.

While I have described the invention as a vaporizer of triethylene glycol, it will be understood that the vaporizer may be used with other substances to kill or suppress bacteria, virus, or other microscopic air borne bodies; and that the vaporizer may be used with other substances for other purposes.

While I have shown and described certain embodiments of my invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims.

I claim:

1. A vaporizer of the character described, comprising: a power unit for providing a flow of air, said unit including motor means; vaporizing means including an air passage and reservoir for material to be vaporized, means for heating air flowing through said passage, and means in said passage for increasing the surface area of the material to be vaporized, this last means being of heat-conductive material for heating the material to be vaporized; and readily removable means providing an air connection between said unit and said air passage.

2. Apparatus of the character claimed in claim 1, wherein the heating means are in the air passage and wherein the means for increasing the surface area of the material to be vaporized comprises fibrous heat-conductive material extending throughout substantially the entire length of said passage and having a portion in heat exchange relationship with the heating means.

3. A vaporizer of the character described, comprising: a power unit for providing a flow of air, said unit including motor means; vaporizing means including an air passage and reservoir for material to be vaporized, means for heating air flowing through said passage, and means in said passage for increasing the surface area of the material to be vaporized; means providing an air connection between said unit and said air passage; and heat conducting means for reducing the flow of air through said passage below the normal output of said unit.

4. A vaporizer of the character described, comprising: a power unit for providing a flow of air, said unit including electric motor means; vaporizing means including an air passage and reservoir for material to be vaporized, electrically operated means in said passage for heating air flowing therethrough, and a mass of fibrous heat-conductive material in and substantially filling said passage for increasing the surface area of the material to be vaporized and for retarding the flow of air through said passage, said mass substantially filling said passage and having a portion in heat exchange relationship with the heating means; means providing an air connection between said unit and said air passage; and means for connecting the heating means in series in the circuit of the motor means for reducing the speed of operation thereof.

5. A vaporizer of the character described, comprising: a power unit for providing a flow of air, said unit including electric motor means; vaporizing means including an air passage and reservoir for material to be vaporized, electrically operated means in said passage for heating air flowing therethrough, and a mass of fibrous heat-conductive material in and substantially filling said passage for increasing the surface area of the material to be vaporized and for retarding the flow of air through said passage, said mass substantially filling said passage and having a portion in heat exchange relationship with the heating means and wherein the density of said mass of materials is sufficient substantially to retard the flow of air through said passage, and wherein the means providing an air connection has a bleeder opening therein for reducing the flow of air through said passage below the output of said unit.

6. Apparatus of the character claimed in claim 5 wherein the air flowing through said passage is heated to a temperature below 270° F.

7. Apparatus of the character claimed in claim 5 wherein the air flowing through said passage is heated to a temperature within the range from of the order of 120° to the order of 240° F.

8. A vaporizer attachment unit of the character described for use with a power unit providing a flow of air, comprising: means providing an air passage and reservoir for material to be vaporized; an electric heater in said passage; a mass of heat conducting fibrous material in said passage for increasing the surface area of the material to be vaporized and for retarding the flow of air through said passage; and readily removable means for connecting said passage to the air outlet of said unit.

9. Apparatus of the character claimed in claim 8, wherein said mass is of heat-conductive material and substantially fills said passage, said mass

having a portion in heat exchange relationhip with said heater for heating the material to be vaporized.

10. Apparatus of the character claimed in claim 8, wherein the means providing an air passage and reservoir comprises a member having a passage with an inlet portion for housing the heater, an intermediate portion providing a reservoir below the level of said inlet portion and an upwardly extending outlet portion, and wherein said mass extends from said reservoir into said outlet portion.

11. A vaporizer attachment unit of the character described for use with a power unit in a conventional vacuum cleaner providing a flow of air, and having an electric motor, comprising: means providing an air passage and reservoir for material to be vaporized; an electric heater in said passage; a mass of heat conducting fibrous material in said passage for increasing the surface area of the material to be vaporized and for retarding the flow of air through said passage; means for connecting said passage to the air inlet of said unit; and leads connected to said heater to adapt said heater to be connected in series with said motor.

12. A vaporizer attachment unit of the character described for use with a conventional vacuum cleaner having an electric motor providing a flow of air, comprising: a housing; a tubular member in said housing providing an air passage and reservoir for material to be vaporized, said member having a horizontal inlet portion, an intermediate portion providing a reservoir below the level of said inlet portion and an upwardly extending outlet portion; an electric heater in the inlet portion of said passage for heating air flowing therethrough; a mass of metal shavings substantially filling said passage for retarding the flow of air through said passage, said mass having a portion extending into the outlet portion of said passage forming means for increasing the surface area of the material to be vaporized, and said mass having a portion in contact with said heater for heating the material to be vaporized; an electric terminal socket on said housing; and leads connecting said heater to said socket whereby the heater may be connected in series with said motor to reduce the speed of operation thereof.

13. A vaporizer attachment unit of the character described for use with a conventional vacuum cleaner having an electric motor providing a flow of air, comprising: a housing; a tubular member in said housing providing an air passage and reservoir for material to be vaporized, said member having a horizontal inlet portion projecting out of said housing and having at least one opening in its wall outside said housing, an intermediate portion providing a reservoir below the level of said inlet portion and an upwardly extending outlet porton; an electric heater in the inlet portion of said passage for heating air flowing therethrough; a mass of metal shavings substantially filling said passage for retarding the flow of air through said passage, said mass having a portion extending into the outlet portion of said passage forming means for increasing the surface area of the material to be vaporized, and said mass having a portion in contact with said heater for heating the material to be vaporized; an electric terminal socket on said housing; a readily removable hose providing an air connection between said vacuum cleaner and the inlet portion of said tubular member, the connecting end of said hose being movable on the extending portion of said tubular member for covering portions of said opening as desired; and leads connecting said heater to said socket whereby the heater may be connected in series with said motor to reduce the speed of operation thereof.

14. Apparatus of the character claimed in claim 13, wherein the air flowing through said passage is heated to a temperature within a range of 190–240 degrees Fahrenheit.

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