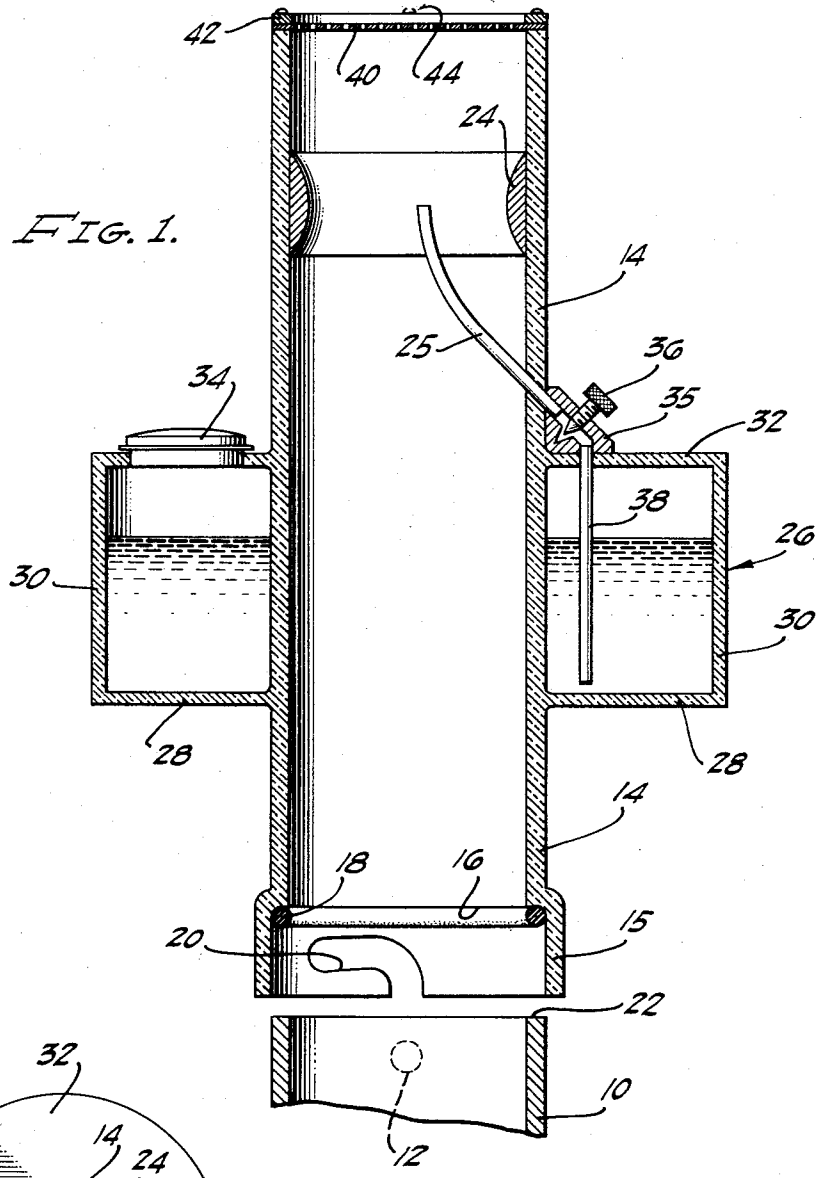
Jan. 19, 1960 J. H. HOLTHER 2,921,832

METHOD OF VAPORIZING

Filed July 11, 1956

FIG. 1.



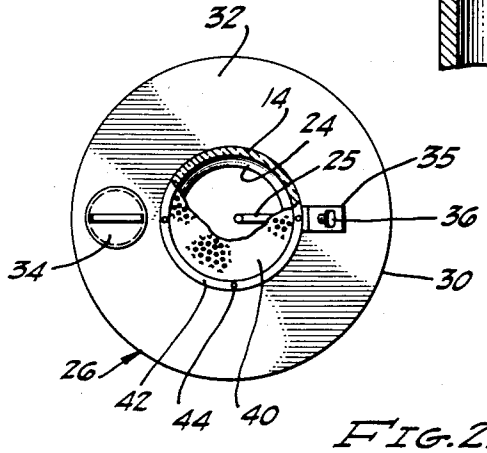


FIG. 2.

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METHOD OF VAPORIZING

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2 Claims. (Cl. 21—53)

This invention relates to an accessory for an air circulating apparatus of the portable blower type, which accessory is adapted for releasable attachment to the apparatus in communication with the discharge outlet thereof to be used, for example, for the purpose of vaporizing a liquid agent and of diffusing the vaporized agent into the atmosphere.

A portable apparatus of this type is commonly in domestic use and is provided with various interchangeable attachments for utilizing the discharged air stream for various specific purposes. For example, one attachment may be used as a nozzle to create an air jet to dislodge dust from inaccessible crevices. Another attachment may be a hair drier.

The general object of the present invention is to provide an accessory interchangeable with such attachments for increasing the utility of the apparatus by making possible the additional function of effectively diffusing a bacteria-inhibiting agent into the atmosphere.

The invention is specifically directed to the problem of diffusing triethylene glycol into the atmosphere to such extent as to decisively inhibit bacteria growth on dust particles floating in the atmosphere. Heretofore, an attempt has been made to solve this problem by wetting a pervious member with triethylene glycol and exposing the member to the air stream discharged from the blower apparatus. This procedure has the advantage of insuring that the triethylene glycol is thoroughly vaporized, but it has the fatal defect of being inherently incapable of releasing the chemical at an adequate rate to sterilize a room space of even moderate volume.

It has been suggested heretofore that an aqueous solution be sprayed or otherwise introduced into the air stream in finely divided liquid form, but it has been found that a temperature of the order of magnitude of 110° F. or higher is required for adequate vaporization, and some provision must be made, not only to generate the required heat, but also to permit effective transfer of the heat to the finely divided liquid agent.

The present invention solves the problem without the addition of any special heating means whatsoever, and does so by taking advantage of the fact that, when such an air stream discharged from a blower is retarded by a relatively fine mesh screen, or other suitable means, a zone of relatively high temperature is created, the heat being the heat of compression of the air. The complete solution to the problem consists in first restricting the discharged air stream to create a low pressure zone for the introduction of the liquid agent into the air stream by suction, and then retarding the air stream for the dual purpose of providing the high temperature zone and of keeping the finely divided chemical or liquid entrained in the heated air for a sufficient time interval for effective heat transfer and complete vaporization of the liquid agent.

The presently preferred embodiment of the invention comprises a passage member for communication with the outlet of the blower apparatus with a restriction in the

passage member to create a local increase in velocity and corresponding local reduction of pressure. A reservoir is united with the passage means for holding a supply of the liquid solution and a fluid duct of small cross section extends from the reservoir to the region of the restriction for feeding the liquid agent into the air stream. Finally, means such as a fine mesh screen is provided to resist the discharge of air from the passage means for the purpose of creating the required high temperature zone.

The preferred practice of the invention is further characterized by the mounting of an annular solution reservoir around the passage means to be supported thereby, and the use of transparent or semitransparent plastic material for fabricating both the reservoir and the passage means. Such an arrangement makes the interior of the passage means, as well as the interior of the reservoir, visible for observation during the vaporizing operation.

The features and advantages of the invention will be apparent from the following detailed description considered with the accompanying drawing.

In the drawing, which is to be regarded as merely illustrative:

Fig. 1 is a longitudinal, sectional view of the presently preferred embodiment of the invention; and

Fig. 2 is a fragmentary plan view.

The embodiment of the invention shown in Fig. 1 is interchangeable with attachments that are commonly used on a portable air circulating apparatus in communication with the outlet thereof. Fig. 1 shows a tubular portion **10** of such an apparatus that forms its discharge outlet, the tubular portion being provided with three peripheral lugs **12** for cooperation with corresponding bayonet slots of the attachments.

The particular embodiment of the invention shown in Fig. 1 comprises a passage member **14** having an enlarged lower end portion **15** that forms an internal circumferential shoulder **16** and is dimensioned to telescope over the tubular portion **10** of the portable apparatus. A sealing ring **18** of resilient rubber-like material fits inside the enlarged end portion **15** and seats against the internal shoulder **16**. The enlarged end portion **15** has three bayonet slots **20** to cooperate with corresponding bayonet lugs **12**. Each bayonet slot **20** is of the curved configuration shown for cooperation with the corresponding lug **12** to draw the passage member **14** axially towards the tubular portion **10** in such a manner as to cause the edge or rim **22** of the tubular portion **10** to compress the ring **18** against the shoulder **16** in a sealing manner.

The passage member **14** discharges into the atmosphere and has a restricted portion for local increase in the velocity of the air stream therethrough with consequent local drop in the static pressure of the air stream. For this purpose, the passage member **14** may be of substantially uniform tubular configuration with a restricting member **24** mounted therein to form a restricting throat for the creation of a local low pressure region. In the construction shown, the restricting member **24** is a ring-shaped member of the configuration shown that is suitably bonded in place.

A small fluid duct or tube **25** terminates in the low pressure region inside the venturi ring **24** to supply the liquid agent solution to the air stream and to serve as a discharge nozzle for the liquid agent. This supply tube **25** for the liquid agent may be placed in communication with a body of the liquid agent in any suitable manner, and preferably will be provided with an adjustment valve to vary the rate of flow of the liquid agent therethrough.

In this particular embodiment of the invention, the tube **25** is in communication with a supply reservoir **26** of annular configuration that encircles the tubular portion **10** and is united therewith for support thereby. The

reservoir 26 has an annular bottom wall 28, a cylindrical peripheral wall 30, and an annular top wall 32. The top wall 32 is provided with a convenient fill opening that is normally closed by a removable plug 34.

In the construction shown, the tube 25 for discharging the liquid agent into the venturi throat extends through the wall of the tubular passage member 14 from a valve body 35 that has a manually adjustable needle valve member 36. A second similar small tube 38 extends from the valve body 35 through the top wall 32 into the interior of the reservoir 26 near the bottom thereof.

Downstream from the venturi member 24, the passage member 14 is provided with suitable means to retard the air stream for drop in velocity with accompanying rise in pressure and consequent rise in temperature. Such a retarding means divides the air stream into numerous small streams, and, for this purpose, may be a perforate member such as a screen or the like. Screens of 20 to 120 mesh have been found acceptable for this purpose, the test for acceptance being whether or not provision of such a flow-retarding means causes the temperature of the air stream to be of a minimum of the order of magnitude of 110° F. Apparently, this temperature of the air stream between the venturi member 24 and the screen 40 is derived from the heat of compression generated in the blower apparatus. The screen 40 may be a wire cloth disk clamped between the rim of the passage member 14 and a retaining ring 42, the retaining ring being removably mounted on the rim by means of small screws 44.

Preferably, the device, including the passage member 14 and the reservoir 26, is made of transparent or semi-transparent plastic material to make visible not only the interior of the reservoir, but also to make visible the interior of the passage member 14. The valve body 35 comprises a triangular block of such plastic material with a suitable bore therethrough throttled by the valve member 36.

The manner in which the device serves its purpose may be readily understood from the foregoing description. A suitable liquid agent is placed in the reservoir 26, for example a solution of one part triethylene glycol to approximately 10 or more parts of water. The device is mounted on the blower outlet by the described bayonet connection and the portable blower is energized to force a stream of air through the passage member 14. The reduction in pressure in the region of the venturi throat member 24 causes a pressure differential between the interior of the reservoir 26 and the interior of the passage member to cause the liquid agent to flow through the tubes 38 and 25 for discharge into the air stream.

The air stream contains substantial heat of compression generated by the blower, and the provision of the screen 40 retards the air stream in a manner to conserve the heat of compression to the extent, at least, of maintaining a temperature of approximately 110° F. on the upstream side of the screen 40. The screen 40 is positioned far enough away from the liquid supply tube 25 and the venturi throat member 24 to provide a time interval in the heated portion of the air stream to permit sufficient heat transfer from the air stream to the finely divided liquid agent to cause the desired vaporization of the liquid agent at the desired rate. As a result, a sufficient quantity of the triethylene glycol is evaporated into the heated air stream to result in the atmosphere of the surrounding room space reaching a concentration of at least one part of triethylene glycol to four hundred million parts of atmosphere. This concentration is sufficient to inhibit bacteriological growth on dust in the atmosphere. Since the liquid agent should be uniformly distributed throughout the atmosphere, the blower apparatus should run for a substantial period of time with the feed of the liquid agent retarded by the needle valve member 36 sufficient for continuous dispensation throughout the prolonged time period.

If the temperature of the air stream on the upstream side of the screen 40 is not relatively high, the triethylene glycol precipitates and thus defeats its purpose. The minimum temperature varies with the humidity, and, for average humidity, should be on the order of 110° F. The use of an 80-mesh screen 40 with a typical portable blower-type air circulating apparatus has been found to result in a temperature on the order of 120° F. in the heat-transfer region of the passage member.

Final vaporization is accomplished by the flashing of the finely divided liquid particles as they escape from the screen into the lower pressure of the atmosphere.

My description in detail of the selected embodiment of the invention will suggest various changes, substitutions and other departures from my disclosure that properly lie within the spirit and scope of the appended claims.

Having described my invention, I claim:

1. A method of introducing a vapor of a volatile liquid into a room space, characterized by the use of a recirculating compressing blower means for discharging a stream of air into the room space, said method including the steps of: confining said discharge stream of air in a region and providing numerous small openings for restricted release of the air stream from the region into the atmosphere of the room thereby to provide resistance to discharge of air from the region to maintain the pressure of the air stream in the region above atmospheric pressure for conserving the heat of compression of the air stream to maintain a temperature of at least 110° F. in the region; restricting the air stream in said region at an intermediate zone of the region to provide a local low pressure in said zone; and introducing said liquid into said low pressure zone to cause the liquid to be entrained by the air stream whereby heat is transferred from the air stream in said region to the liquid for vaporization of at least a portion of the entrained liquid in said region.

2. A method as set forth in claim 1 in which said liquid is fed into said low pressure zone at a rate for vaporization of a portion of the liquid in said region by heat transfer thereto and vaporization of an additional portion by flashing action outside said region immediately downstream from said restricted openings.

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