Jan. 5, 1937. N. GRUBELIC 2,066,683

PORTABLE FUME REMOVER

Filed June 3, 1933

Fig. 1.

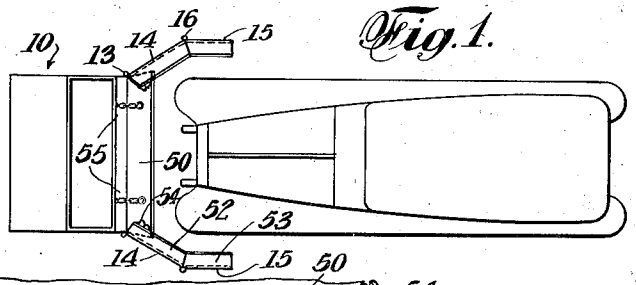


Fig. 2.

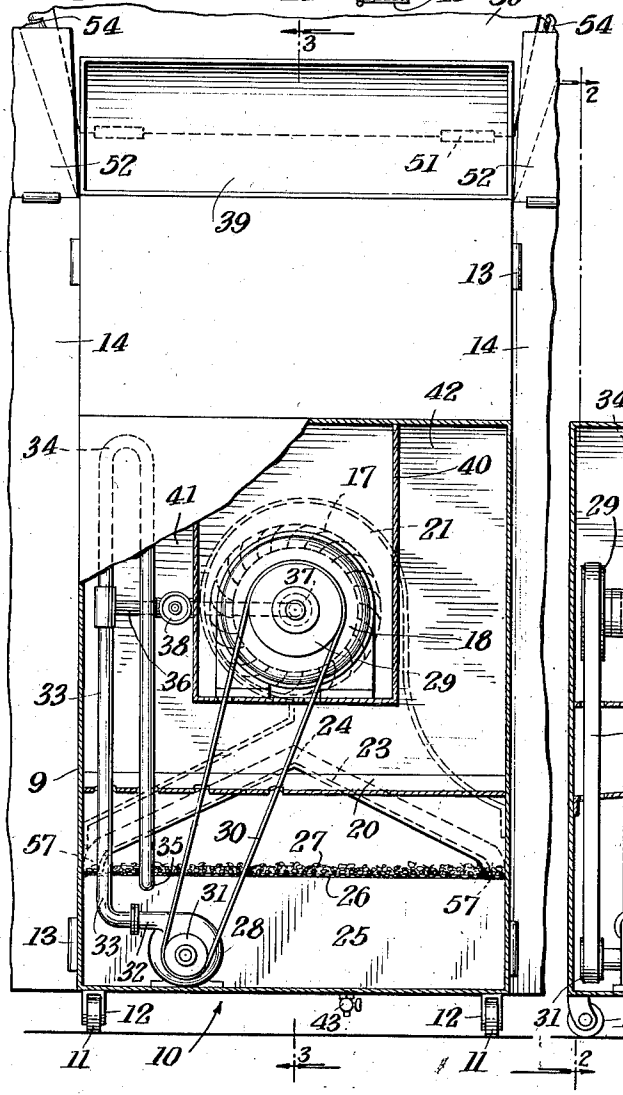
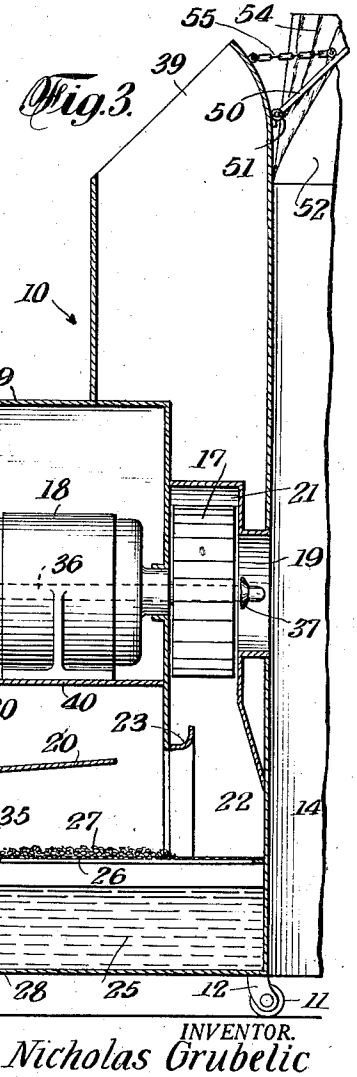


Fig. 3.



INVENTOR.
Nicholas Grubelic
BY Harry Jacobson
ATTORNEY

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PORTABLE FUME REMOVER

Nicholas Grubelic, Great Neck, N. Y.

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8 Claims. (Cl. 91—60)

This invention relates to air-conditioning devices, and is particularly applicable to devices designed to remove fumes from various parts of a room where spraying is done upon automobiles and the like, and to return conditioned air to the room.

It has been customary heretofore, in the spraying of automobiles to paint the same, to use fixed or non-portable booths from which the fume-laden air is drawn and discharged into the outer air. In cold weather, such booths become extremely cold, due to the constant withdrawal of air therefrom, and it therefore becomes uncomfortable and difficult for the operator to work therein. Where the booth is part of a larger room, it is also difficult to maintain a comfortable temperature in a larger room for the same reason. Moreover, the automobile to be sprayed must be moved into the booth with resulting loss of time. The booth is of comparatively expensive construction and the installation of the number of such booths needed to perform small jobs on a number of cars is often unwarranted.

My invention therefore contemplates the provision of portable means for collecting and cleaning the fume-laden air surrounding the object being sprayed, and delivering the cleaned and thus conditioned air back into the room, free of fumes, and at substantially room temperature.

My invention further contemplates the provision of simple, comparatively inexpensive and efficient means which can be readily, conveniently and rapidly moved to the point where the spraying is to be done, for sufficiently enclosing the space in which the fumes are generated, for collecting the fumes, and preventing them from spreading throughout the room, and for cleaning such fumes.

My invention further contemplates the provision of a collapsible and expandible air conditioning unit, adapted to be readily moved to any desired point, and complete in itself, by means of which it becomes possible to confine the fume-laden air and to direct it into the unit, to eliminate the necessity for expensive booths, and to maintain the air in the work room at a convenient temperature.

The various objects of my invention will be clear from the description which follows, and from the drawing, in which,

Fig. 1 is a diagrammatic top plan view of my invention as it appears arranged in proximity to the front end of an automobile.

Fig. 2 is a vertical section of my invention taken on the line 2—2 of Fig. 3.

Fig. 3 is a similar section, taken on the line 3—3 of Fig. 2.

In that practical embodiment of my invention which I have illustrated by way of example, the member 10 constituting the main portion of the apparatus may be made of approximately the width of an automobile, and may be built up of suitable structural steel or the like members such as plates, angles and channels. The frame 9, similarly built up and forming part of the member 10, is used for supporting the various instrumentalities of the device. Said member 10 is preferably mounted upon suitable wheels as 11, supported by the brackets 12, so that the entire apparatus may readily be moved as a complete unit from place to place.

Hinged to each edge of the member 10 as at 13, is a substantially upright side wing as 14 of substantial height and width. Each upright wing may be swung about its vertical pivot 13 into the proper position to partially enclose the space in which the paint fumes are generated, and to obstruct the fume-laden air to prevent it from spreading.

If desired, an additional wing as 15 may be vertically or otherwise hinged as at 16 to the wing 14 so as to provide a greater degree of adjustability and to better encompass or enclose the area in which fumes are generated. Similarly, a top wing as 50 may be hinged to the upper part of the member 10 as at 51 to prevent the fumes from rising out of reach of the air-conditioning means of the apparatus. Additional top wings as 52 and 53, may, if desired, be hinged to, or at or near, the upper horizontal edge of the side wings 14 and 15. To close the gap or space between the adjacent side edges of the top wings, one of said wings such as 50 may carry the flexible sheet 54, so that in any position of the top wing 50, no fumes can escape between it and the adjacent wing. Suitable means such as the chain 55 may be provided to hold the top wings in their proper adjusted positions.

It will be seen that the entire device may be readily rolled on the wheels 11 to the place where the spraying is to be done, and that the various wings may be expanded or opened up and arranged in the proper position to confine the paint fumes in a predetermined area within reach of the suction fan 17 carried by the member 10.

Said suction fan is preferably of the vane or turbine type, being driven by a suitable motor as 18, and is arranged adjacent the inlet opening 19 in the member 10.

The fan is housed in the duct or casing 21

which is open at its discharge end or bottom 22. The bottom portion of the duct is suitably flared to direct the material forwarded by the fan toward the tank 25. The trough 23 is provided at the lower end of the duct 21. Said trough is preferably highest at its mid-point 24 and is inclined downwardly and outwardly from its mid-point. At both of its ends 51, the trough is bent vertically downwardly to deliver any liquid material driven by the fan into the tank 25.

Said tank is arranged at the lower end of the member 10 and is adapted to contain any suitable fume-washing liquid such as water. On the upper open end of the tank is arranged the screen 26, on which rests a quantity of gravel 27. It will be understood that the fumes drawn in through the inlet opening 19 are driven by the fan 17 downwardly through the duct 21, out of the opening 22, and through the gravel-laden screen 26 into the tank 25. Due to the velocity imparted to the fumes by the fan, said fumes tend to agitate and splash about the liquid in the tank, which thereby aids to wash down the paint in the fume-laden air.

The liquid in the tank is also sprayed into and mixed with the fume-laden air to dry the solid particles of paint and to collect and remove said particles from the air. Toward this end, the pump 28 is arranged adjacent the tank and receives liquid therefrom through a suitable pipe. Said pump is preferably driven by the motor 18 through the pulley 29 thereon, the belt 30 and the pump pulley 31, or through any other suitable means. The discharge end 32 of the pump is connected to the riser pipe 33 which is provided with a return bend 34, connected at its lower end 35 to the tank, whereby liquid drawn out of the tank by the pump is driven through the riser pipe 33 and back into the tank.

At an intermediate point of the pipe 33, a branch or by-pass 36 is provided, leading toward the exposed face of the fan 17, and terminating preferably in a spray nozzle as 37. A suitable valve as 38 is interposed in the by-pass 36 to control the amount of water sprayed upon the fan. In operation, a certain amount of water is sprayed upon the fan through the inlet opening, and washes and cools the fume-laden air. The dust particles thus washed from the air are carried down through the duct 21 and into the tank 25. While the water used in the spraying operation tends to splash about, it is nevertheless confined within the duct 21. A large part of the water collects in the trough 23, returning to the tank through said trough. The remainder also finds its way back to the tank.

A suitable baffle plate as 20 is arranged above the tank beyond the duct 21 to prevent undue splashing of liquid and to prevent such splashed liquid from emerging through the air outlet 39. The liquid splashed into the space below the baffle plate 20 serves to cleanse and purify any fume-laden air which may tend to enter the duct 39 without first passing through the screen 26. The motor 18 is suitably enclosed against splashing by any liquid which may pass the baffle plate 20, as by means of the casing 40. The washed air, however, is driven into the discharge flue or outlet 39 by way of the passageways 41 and 42 on each side of the casing 40.

It will be understood that the entire apparatus may be moved to the side of an automobile so that the inner face of the member 10 is substantially parallel to the side of the car, and the wings may be correspondingly opened up or expanded to partly enclose the space about that part of the car to be sprayed. The apparatus may also be moved to any other point where spraying is to be done and the wings suitably arranged so as to prevent the fume-laden air from spreading out of reach of the air currents created by the suction fan. During the spraying operation, the motor 18 is started, whereby the fan is rotated and a spray of water or other liquid directed upon the fan.

The fume-laden air is thereby drawn from the space defined by the member 10 and the various wings or extensions carried thereby into the duct 21 though the opening 19 and washed. Any spaces between the various wings or extensions may be closed as by means of suitable flexible sheets as 54 secured to one or more of the wings and adjusted over the adjacent wing. Particles of dust and dry paint cannot collect upon the fan to unbalance it, due to the spraying thereof with liquid. At the same time, the dust and paint particles are washed down into the tank 25 and there collected, to be later drained when desired by means of the drain cock 43.

It will be understood that both the water and the air are considerably agitated by the fan but that splashing of the water on to the operating mechanism is prevented by the enclosure of the mechanism and by the arrangement of suitable baffles. The result is that clean and fume-free air is delivered back into the room through the air discharge outlet 39 and the necessity for the use of permanent or stationary booths is eliminated while the room temperature is maintained since cold air is not drawn into the room. Nor are the fumes discharged into the outer air to create a nuisance.

It will be seen that I have provided a simple and efficient apparatus, readily movable from place to place where spraying is to be performed, for confining the fumes so that they are within reach of the apparatus, for conditioning the fume-laden air and returning clean air to the room, and that I have provided an apparatus well adapted to meet the severe requirements of practical use.

While I have shown and described certain specific embodiments of my invention, it will be understood that I do not desire to limit myself thereto but intend to claim my invention as broadly as may be permitted by the state of the prior art and the scope of the appended claims.

I claim:

1. Portable air-conditioning apparatus adapted to draw fume-laden air thereinto and to discharge the air free of fumes, comprising a movable support, foldable space-defining means carried by the support, and air-conditioning means carried by the support including a suction fan, a tank adapted to contain liquid arranged below the fan, a duct arranged around the fan and flared at its bottom to direct air toward the tank, means for spraying the fan with liquid from said tank and thereby to cleanse the air drawn into said duct, an air-discharge duct communicating with the inlet duct, and means interposed between said ducts to prevent liquid from leaving the discharge duct.

2. A portable air-conditioning apparatus comprising suction means including a motor for drawing air into said apparatus, means for agitating and washing the air including a pump and an operative connection between the motor and the pump, a casing support carrying said suction means and said air-washing means, said sup-

port having an upright wall provided with an opening intermediate its ends and communicating with said suction means, wheels on said support, and upright, foldable, space-defining extensions carried by said support and extensible beyond said support to partly enclose the sides of the vertical space above any selected area of the floor of a building and to leave said space open at the top and on at least one side, said support partly closing one side of said space and said extensions being adjustable to vary the shape and size of said area and thereby to adjust the size of said space to the minimum required for efficient operation of said suction means.

3. A portable air-conditioning apparatus comprising wheeled means for supporting the apparatus for rolling along a floor and to arrange said apparatus adjacent part of an automobile resting on any part of said floor, said apparatus conditioning the fume-laden air resulting from a paint-spraying operation upon the automobile part, said apparatus comprising a movable casing having an upright wall provided with an opening therein, air suction means arranged at said opening and within the casing, air-washing means arranged within the casing and adjacent the suction means, said air-washing means including a pump, a liquid supply tank, and liquid-spraying means, means for supplying said liquid-spraying means with liquid from the tank through said pump, means for conducting liquid from the washing means back to the tank, and foldable space-defining means open at the top and on one side and of such size as to extend only about that part of the automobile to be sprayed, said means being pivotally mounted about a vertical axis on said casing to extend therebeyond and confining the fumes of the paint-spraying operation to the space above the selected part of the floor and defined by said space-defining means and preventing said fumes from spreading horizontally, the sprayed part being adapted to close the open side of said space-defining means and said suction means preventing the fumes from passing out of the open top of said space-defining means.

4. A portable air-conditioning apparatus comprising a main body member, means for supporting said member for movement from place to place, means for conditioning and washing air carried by said member including an inlet duct, an outlet duct, a tank, a pump communicating with the tank, and means for conducting liquid to the inlet duct from the pump, a suction fan arranged in the inlet duct, and a foldable upright wing pivoted on a vertical axis and carried by said member, and adapted to be arranged in positon to direct fume-laden air into the inlet duct on the operation of said suction fan, and means for preventing discharge of liquid from the outlet duct.

5. A portable apparatus for conditioning air comprising a motor, a casing enclosing said motor, a fan operatively connected to the motor, a duct for said fan including an inlet and an outlet, a tank below the outlet, a pump operatively connected to the motor and communicating with the tank, means for conducting liquid from the pump to the fan, a spray nozzle on said last-mentioned means adapted to spray liquid upon the fan, a trough for the discharge end of said duct leading to the tank, a discharge duct for condiitoned air surrounding the motor, and means interposed between the tank and the motor casing for preventing liquid from being discharged from the discharge duct.

6. A portable air-conditioning apparatus comprising a wheeled member adapted to be moved about from place to place on a floor, said member having an inlet opening therein, a motor compartment carried by said member, a suction fan between the motor compartment and the inlet opening, a tank below the motor compartment and the fan, means for spraying the fan with liquid from the tank, means for conducting the sprayed liquid and air entering the inlet opening to the tank, and a duct leading from the tank and upwardly past the motor compartment, said duct having a discharge opening at the upper end thereof.

7. A self-contained portable air-conditioning apparatus comprising a wheeled casing member having an inlet opening therein, means carried within the member adjacent the opening for drawing air through said opening and for conditioning and washing said air including a motor, a fan, and a pump, said fan and pump being operatively connected to the motor, a discharge duct for the conditioned air having a part thereof within the member and having a terminal part extending therebeyond, and means carried by said member for directing air toward the inlet opening when said air-drawing means is in operation, and collapsible space-defining means comprising upright walls pivoted to swing on a vertical axis to a position beyond said casing to define a space open at the top and around an article to be sprayed.

8. Portable air conditioning apparatus adapted to draw fume-laden air thereinto and adapted to be moved into position adjacent a part of an automobile during the paint-spraying operation on said part comprising a movable support, foldable space defining means carried by the support and open at the top and adapted to surround the sides only of said part, and air conditioning means carried by the support including a fan for preventing fume-laden air from reaching the top of the space defined by the space-defining means, for also washing said air and moving said air to another position, and means at said last-mentioned position and including a tank of liquid for again washing said air.

NICHOLAS GRUBELIC.