

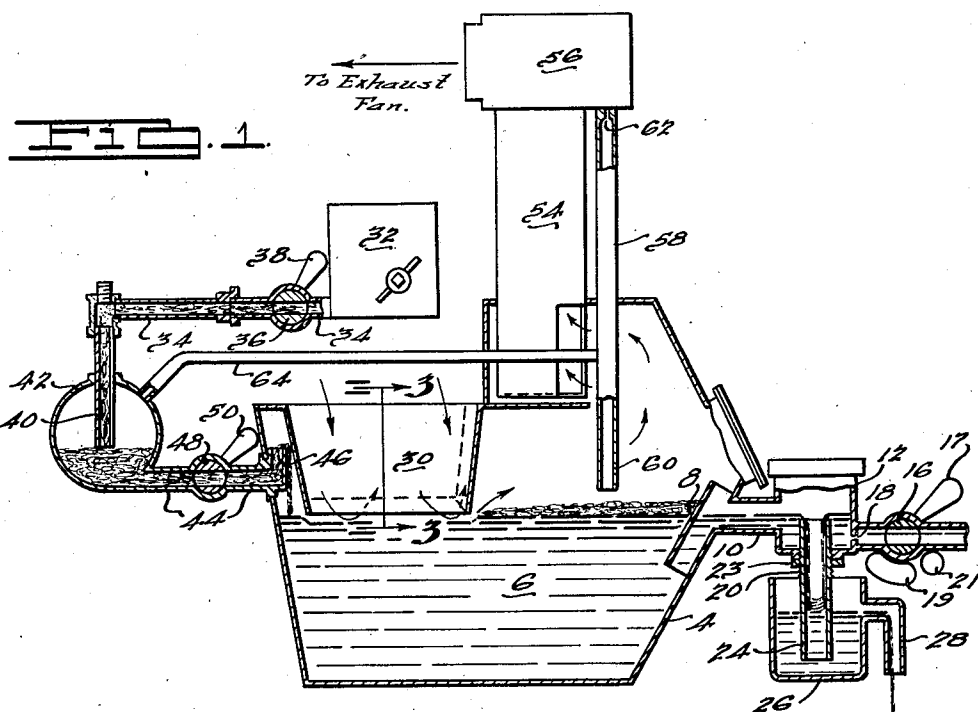
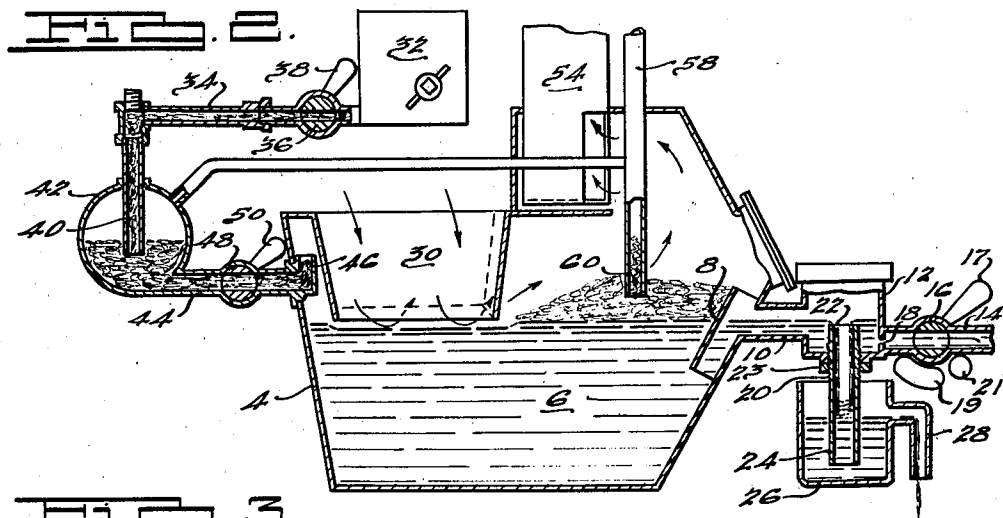
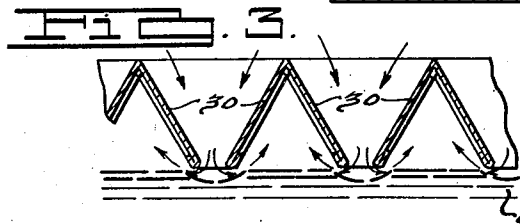
June 26, 1945.

F. P. BINGMAN

2,379,338

AUTOMATIC FOAM-CONTROL FOR AIR CLEANERS

Filed July 14, 1943



INVENTOR.

Frederick T. Bingman.

BY

Harness, Dickey & Pierce.
ATTORNEYS.

UNITED STATES PATENT OFFICE

2,379,338

AUTOMATIC FOAM-CONTROL FOR AIR
CLEANERS

Frederick P. Bingman, Birmingham, Mich., as-
signor to R. C. Mahon Company, Detroit, Mich.,
a corporation of Michigan

Application July 14, 1943, Serial No. 494,607

2 Claims. (Cl. 261—18)

This invention relates to air and gas cleaners. The main objects of this invention are to provide a simple and reliable means for feeding foam-producing compound to the water or other liquid of an air or gas cleaner and to provide such a means which is automatically controlled by the height or thickness of the layer of foam produced and carried on the liquid of the cleaner.

The construction shown in the drawing is of the same general type and character as that disclosed in the application of Giovanni C. Ziliotto, filed of even date herewith, and assigned to the same assignee, but shows a different form of reagent feeding mechanism.

An illustrative embodiment of this invention is shown in the accompanying drawing, in which

Fig. 1 is a vertical, sectional view taken transversely of an air or gas cleaner embodying the present invention and showing the foam-producing reagent or compound being fed to the liquid body of the cleaner.

Fig. 2 is a similar view of the same but showing a sufficient body of foam within the cleaner to stop the flow of foam-producing compound.

Fig. 3 is a fragmentary, sectional view taken on the line 3—3 of Fig. 1.

This application is related to the application of Giovanni C. Ziliotto, Serial No. 494,606, filed of even date herewith and assigned to the same assignee.

In the construction shown in the drawing a covered or enclosed tank 4, of generally rectangular shape, is provided for holding a body of water 6 or other suitable liquid against which is directed the air or gas to be cleaned. The tank 4 is provided with a baffle 8 that covers the opening of a horizontal duct 10 which leads to an overflow chamber 12. Water or other liquid is supplied to the chamber 12 from a pipe 14 through a valve 16 and a restricted orifice 18 which regulates and determines the amount of water being supplied to the tank 4. Handle 17 of the valve 16 is connected to a shield 19 which swings to cover an electric starter control button 21 when the valve is closed. Thus the valve 16 must be open before the apparatus is started in operation and remains open during the operating period.

Chamber 12 is provided with a vertically disposed, exteriorly threaded, overflow pipe 20, the upper end 22 of which is positioned very slightly below the desired liquid level to be maintained within the tank 4. The lower end 24 of the pipe 20 is submerged in a small tank 26 having an overflow pipe 28 communicating therewith at a point above the lower end 24. There is thus

provided an air-sealed outlet for the overflow through the pipe 20. A lock nut 23 is provided on pipe 20 for fixing it in vertically adjusted position.

The air to be cleaned is drawn through a series of horizontally spaced, generally V-shaped, open-bottomed troughs 30, the lower ends of which are spaced only slightly above the normal water level within the tank 4. The air passes downwardly through the troughs, as shown in Fig. 3, and impinges on the water surface so that all the heavier pieces of dirt and dust are entrained by the water at this point.

The action at this point is such as to agitate the water to a considerable extent, not only to aid in the cleaning action and separation of dirt particles from the air, but also for the purpose of churning up and creating a foam from a foam-producing compound or reagent supplied to the tank. The supply of compound is automatically controlled by the depth of the foam layer on the water surface.

A supply of liquid reagent or foam-producing compound is contained in a closed tank 32 having an outlet pipe 34 located near the bottom thereof. Flow through the pipe 34 is controlled by a valve 36 connected to a valve control handle 38. The pipe 34 terminates in a vertically disposed portion 40, located within a closed reservoir 42, with the lower tip end spaced substantially above the bottom of the reservoir.

The reservoir 42 is provided with a reagent feeding or discharge pipe 44 communicating therewith near the bottom thereof at a point substantially below the normal reagent level therein and having an upstanding discharge end portion 46 located within the tank 4. The top end of the portion 46 is positioned very slightly lower than the lower end of the pipe 40. Passage of reagent through the pipe 44 is manually controlled by a valve 48 connected to a valve operating handle 50. The valve operating handles 17 and 50 are connected to be operated in synchronism.

Air passing through the cleaner tank has the liquid separated therefrom by a series of vertical, cylindrical separator tubes 54 whose details, including the separation and functioning thereof, are fully disclosed in Bingman Patent No. 2,191,187, issued February 20, 1940. The upper ends of the separator tubes 54 terminate in a header 56 which is connected to an exhaust fan (not shown) in the customary manner.

Means are provided for controlling the feeding of foam-producing reagent from the reservoir 42 into the tank 4 and comprise a vertically

positioned, vacuum control pipe 58 having its lower end 60 extending within the tank 4 and spaced a predetermined distance, such as four or six inches, above the normal liquid level therein. The upper end of the pipe 58 is attached to and communicates with the header 56, and the communication therewith is through a restricted orifice 62.

A conduit 64 is connected to and provides communication between the pipe 58 and the upper part of the reagent reservoir 42 above the normal liquid level therein. Communication is thus provided between the air space above the reagent in the reservoir 42 and the space within the tank 4 above the liquid therein through the lower end 60 of the pipe 58 so that the air pressure within the reservoir 42 and within the top of the tank 4 are substantially the same as long as the lower end 60 of the pipe 58 remains open. The discharge end 46 of the feeding pipe 44 being lower than the lower end of the pipe 40 permits a gravity flow of reagent to the tank 4 as air passes into the uncovered end of the pipe 40.

Automatic control and regulation of the flow of foam-producing reagent is accomplished in the following manner. It is an inherent characteristic of this structure that the air pressure within the header 56 is at all times, during operation, less than the air pressure within the upper part of the tank 4. However, as long as the lower end 60 of the pipe 58 remains uncovered, the air pressure within the reservoir 42 and the top of the tank 4 will be the same due to the connection and communication through the pipe 64. When the foam carried on the liquid within the tank 4 has been generated by the agitation of the water by the incoming air to be cleaned to such an extent as to build up a layer sufficiently thick or high as to close the lower end 60 of the pipe 58, as shown in Fig. 2 of the drawing, the air pressure within the reservoir 42 is lowered by withdrawal through the orifice 62. Thereby the reagent liquid level within the reservoir 42 is raised so as to close the lower end of the pipe 40. Inasmuch as the tank 32 is closed, reagent therein will not flow into the reservoir 42 until air is again admitted through the pipes 40 and 34.

As soon as the foam level within the tank 4 has been lowered sufficiently to uncover the lower end 60 of the vacuum control pipe 58, the air pressure within the reservoir 42 is raised to the same as that within the top of the tank 4, and feeding of the foam-producing reagent through the duct 44 is again resumed. In this way any desired foam level is automatically maintained within the tank 4, and the thickness thereof depends upon the spacing of the lower end 60 of the vacuum control pipe 58 above the liquid level within the tank.

It is to be understood that the term "air" as used herein and in the appended claims is intended to include all gases and the like, as it is evident that the invention herein disclosed is equally well adapted for gas cleaners.

What is claimed is:

1. The combination of an air cleaner having an enclosed tank for containing a body of liquid

to be contacted by the air to be cleaned, and a foaming reagent feeder for said tank comprising an air-tight supply tank for a reagent, an enclosed reservoir, a gravity flow duct from said tank to said reservoir terminating in spaced relation below the top thereof for maintaining a pre-determined liquid level therein with an air space thereabove, a reagent feeding duct having an inlet communicating with said reservoir at a point below the normal liquid level therein and having an outlet within said tank at slightly lower level than the normal liquid level in said reservoir whereby reagent being fed from said reservoir uncovers the end of said supply tank duct, thus permitting air to enter said duct, an equalizing duct providing communication between the air space in said reservoir and the interior of said tank for equalizing the air pressures therein, the tank end of said equalizing duct being located in spaced relation above the liquid therein, and a restricted duct providing communication between said last-mentioned duct and a source of air pressure normally lower than that within said tank, whereby the tank end of said equalizing duct may be restricted by foam on the liquid body so that the source of relatively lower air pressure reduces the air pressure within the reservoir and thereby controls the flow of reagent through said feeding duct.

2. In an air cleaner, an enclosed tank for containing a body of liquid to be contacted by the air to be cleaned, an air inlet duct for said tank arranged to direct the air to be cleaned against the surface of the liquid, a reagent feeder for said tank comprising an air-tight supply tank for a foam-producing reagent, an enclosed reservoir, a gravity flow duct from said tank to said reservoir terminating in spaced relation below the top thereof for maintaining a pre-determined liquid level therein with an air space thereabove, a reagent feeding duct having an inlet communicating with said reservoir at a point below the normal liquid level therein and having an outlet within said tank at slightly lower level than the normal liquid level in said reservoir whereby reagent being fed from said reservoir uncovers the end of said supply tank duct, thus permitting air to enter said duct, an equalizing duct providing communication between the air space in said reservoir and the interior of said tank for equalizing the air pressures therein, the tank end of said duct being located in spaced relation above the liquid therein, a restricted duct providing communication between said last-mentioned duct and a source of air pressure normally lower than that within said tank, the arrangement being such that the air pressure within said tank and reservoir is substantially the same until foam upon the liquid within the tank attains sufficient depth or height to restrict the duct end in the space thereabove whereupon the source of relatively lower air pressure reduces the air pressure within the reservoir and thereby controls the flow of reagent through said feeding duct.

FREDERICK P. BINGMAN.