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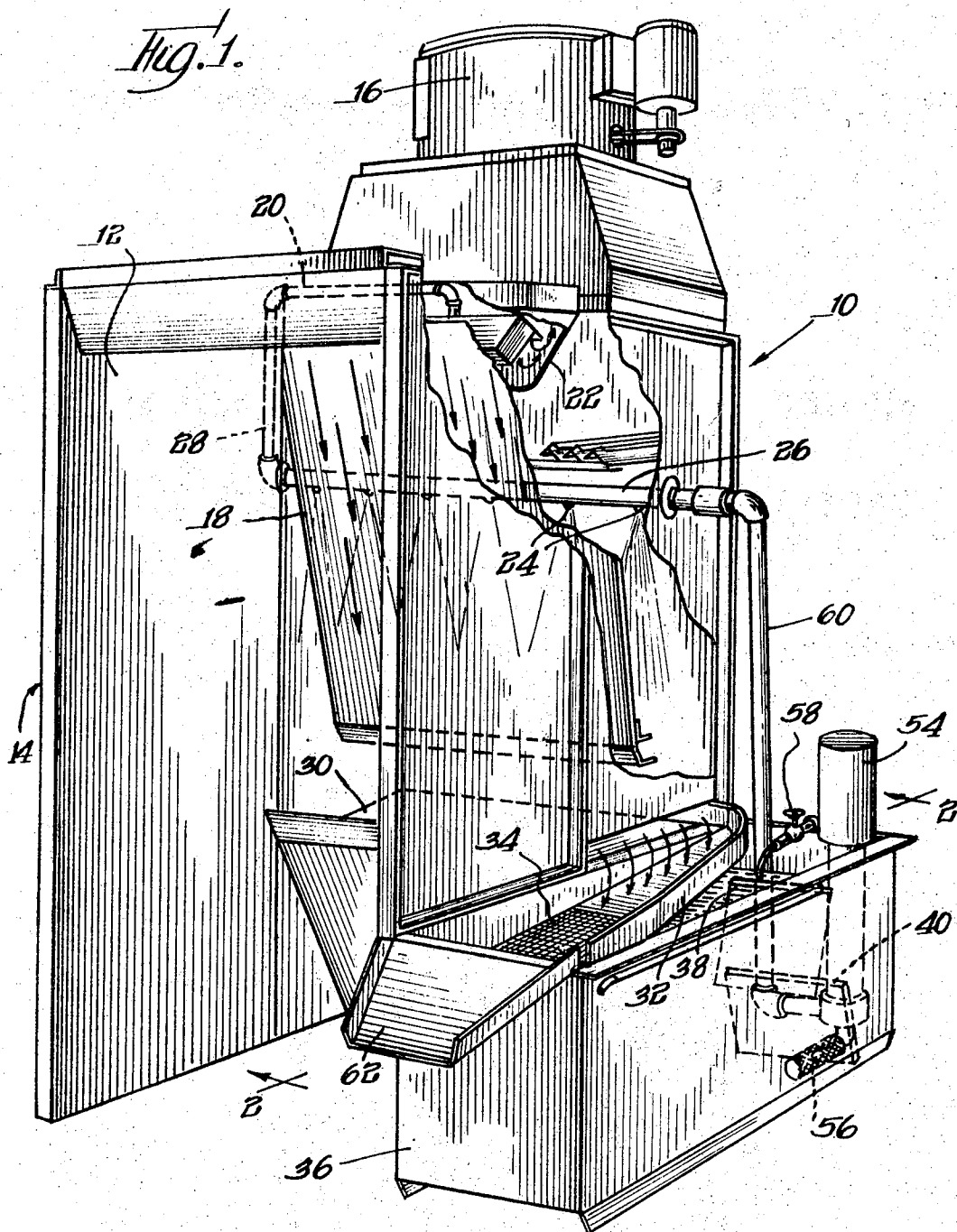
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3,341,016

SPRAY BOOTH (SELF-CLEANING)

Filed Aug. 23, 1965

2 Sheets-Sheet 1



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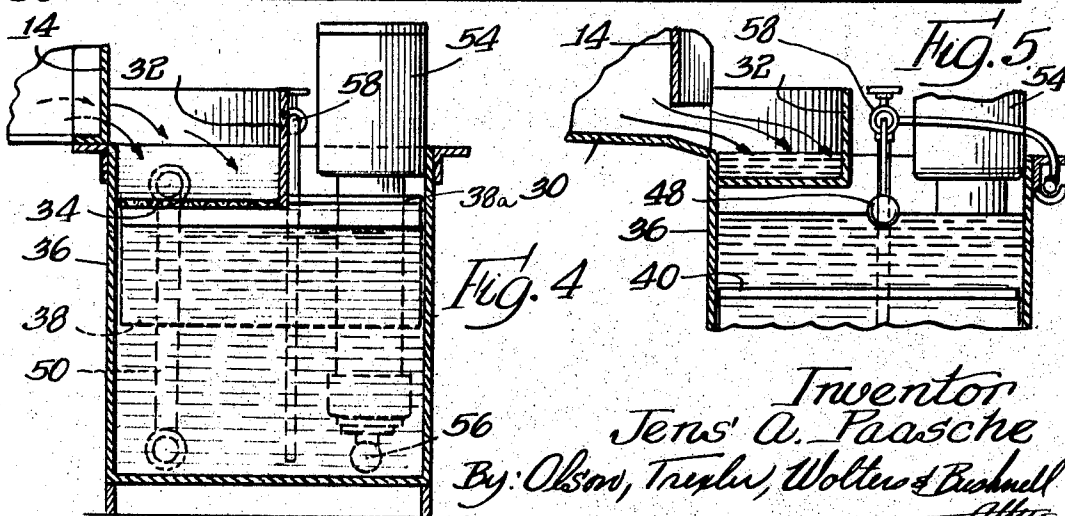
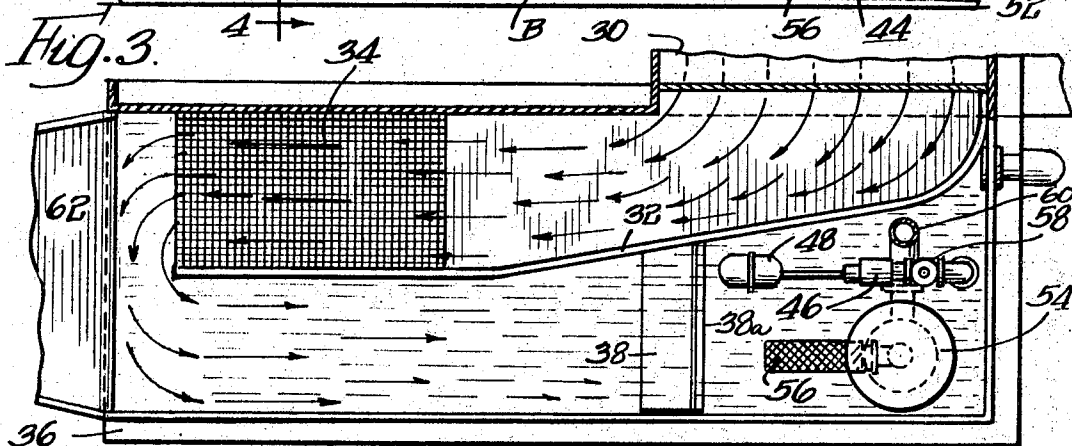
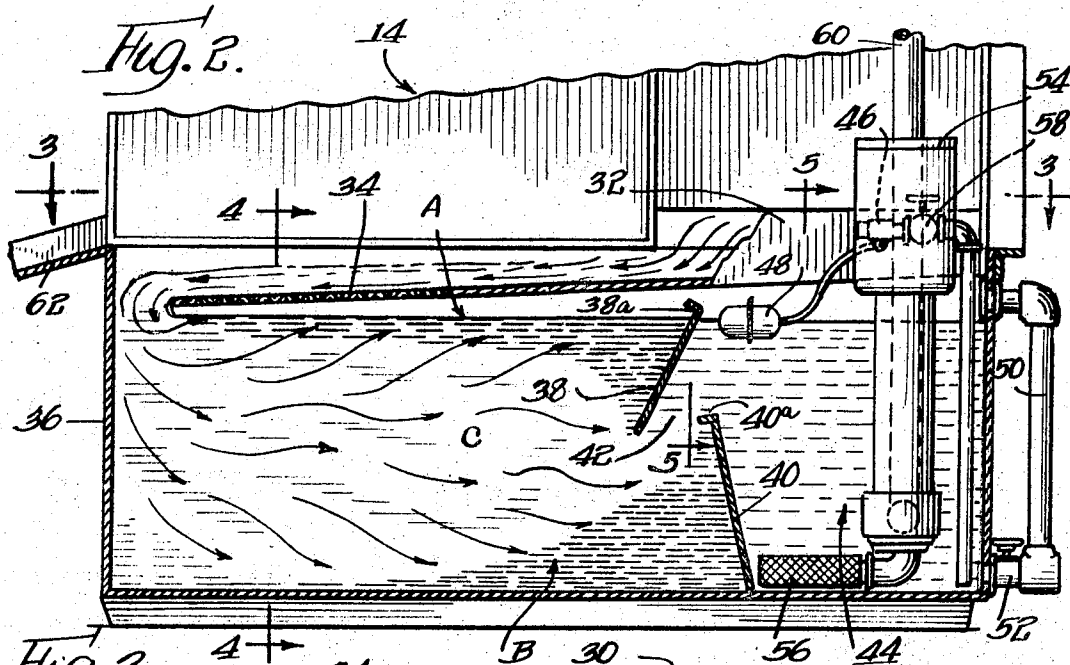
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SPRAY BOOTH (SELF-CLEANING)

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2 Sheets-Sheet 2



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SPRAY BOOTH (SELF-CLEANING)

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9 Claims. (Cl. 210-73)

This invention relates generally to spray booths and more particularly to means for and methods of separating spray materials such as paint particles and the like from liquid such as water employed in the spray booth for receiving excess spray or "over spray" materials.

It has heretofore been known, as evidence by applicant's issued Patents 2,788,954 and 3,123,455, to provide spray booths for collecting excess spray or "over spray" from the working space in which spray coating methods have been practiced. It has also been common practice to employ liquid such as water flowing downwardly along the walls defining such work space to receive such excess spray materials and to direct the collected materials to a receiving area in the lower portion of the booth. Applicant has experienced commercial success in using apparatus of the type shown in his above-mentioned patents but has continued to exert his efforts in this particular field with the view of more efficiently and expeditiously handling the contaminated liquid as it flows from the spray booth.

It has also been the practice to cause the liquid (water) from which the contamination in the form of paint particles and the like have been removed to be returned to the spray booth for again receiving spray materials. It is very important that this re-directed water be as free as possible from any contamination. Both from the standpoint of health and safety, it is important that the separation of spray material from the water not only be as complete as possible but also that such separation take place in an area positioned externally of the spray booth. This reduces possibility of explosion hazards.

It is therefore one of the primary objectives of the present invention to provide method and apparatus whereby contaminated liquid such as water directed externally from a spray booth may be so processed as to assure substantially complete separation of the contaminating material from the water before returning the water to the spray booth.

More specifically the invention contemplates method and apparatus for controlling the rate of flow of the upper and lower levels of contaminated material in a reservoir so as to establish an intermediate area of substantially uncontaminated liquid which may be re-directed to a spray booth.

Still more specifically, it is an object of the present invention to so process contaminated liquid flowing from a spray booth or the like as to assure floatable spray materials to remain at the upper level of a reservoir and heavier or non-floatable spray materials to be precipitated and remain at the lower level of the reservoir with the clear relatively uncontaminated liquid positioned intermediate said upper and lower levels.

A further object of the present invention is to provide improved methods and apparatus for separating spray material such as paint and the like from water in such a manner as to facilitate removal of both floatable and non-floatable spray materials after such materials have ac-

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cumulated in the form of sludge within a reservoir or tank.

The foregoing and other objects and advantages will be more apparent from the following detailed description when considered in connection with the accompanying drawings wherein:

FIG. 1 is a perspective view disclosing a spray booth device incorporating means for separating spray materials such as paint particles and the like from water discharged from the spray chamber;

FIG. 2 is a fragmentary sectional view taken substantially along the line 2-2 of FIGURE 1;

FIG. 3 is a horizontal sectional view taken substantially along the line 3-3 of FIGURE 2;

FIG. 4 is a detailed vertical sectional view taken along the line 4-4 of FIGURE 2; and

FIG. 5 is a fragmentary sectional view of the upper portion of the reservoir means.

Referring now to the drawings more in detail wherein like numerals have been employed to designate similar parts throughout the figures. It will be seen that the spray booth equipment incorporating the present invention is designated generally by the numeral 10, FIG. 1. A spray booth chamber 12 is defined by a housing designated generally by the numeral 14. For the purpose of describing one practical improvement of the present invention it is not deemed necessary to describe in detail the various structural features of the housing 14 and the parts associated therewith. It should suffice to point out that the upper portion of the housing 14 supports a ventilating unit 16 which draws spray vapors toward the back of said chamber. This directs the atomized spray material such as paints and the like into contact with water flowing downwardly along a curtain panel 18. A spray of water is directed against this panel 18 from the upper margin thereof, this water flows from a conduit or pipe 20. Water supplied through the pipe 20 is directed to an overflow water tank 22 which directs a sheet or curtain of water along the front side of the rearwardly inclined curtain panel 18. In addition, a series of manifold nozzles 24 are employed to deliver water in the form of sprays from a conduit or pipe 26 connected with the pipe 20 through a pipe 28.

It will be apparent from the foregoing that excess spray material, sometimes referred to as "over spray" is accumulated by water flowing downwardly along the curtain panel 18, the direction of flow being indicated by the directional arrows in FIG. 1. This curtain of contaminated water is received in a trough or runway 30 positioned at the lower margin of panel 18. In order to reuse the contaminated liquid received by the trough or runway 30, the accumulation of spray materials such as paint particles must first be removed. Thus, contaminated liquid flowing along the runway 30 spills over into a second runway designated by the numeral 32. The flow of contaminated liquid from the runway 30 into the runway 32 is indicated by the downwardly curved arrows in FIG. 1. Contaminated liquid flows along the generally horizontal or slightly inclined runway 32 over a sludge collector filter screen 34.

Some of the solid spray material particles carried along with the flow of liquid in the runway 32 will be held by the screen 34 while the finer solid particles will pass through the screen. For a clear understanding of the functioning of the contamination separator about to be described, specific attention is directed to FIGS. 2-5 inclusive. It will be noted that liquid flowing along the run-

way 32 and over the screen 34 associated therewith ultimately flows downwardly at the discharge end of the runway (see FIG. 2), into a reservoir or tank 36.

From the discharge extremity of the runway 32 and its associated screen 34, the liquid which still contains a considerable amount of spray material particles, flows generally from the left end of the reservoir 36 as viewed in FIG. 2 toward the right extremity thereof. The rate of flow of the liquid in the reservoir is controlled by upper and lower baffle means 38 and 40 respectively. These baffles traverse the reservoir and as the liquid in the reservoir moves from left to right, as indicated by the directional arrows of FIG. 2, the upper baffle 38 functions to retard the flow rate of the upper body of the liquid in the reservoir thus permitting floatable spray particles to accumulate at the upper level of the liquid body. Likewise, the lower baffle which traverses the lower portion of the reservoir 36 serves to retard the horizontal movement of the liquid in the lower area of the reservoir, thus enhancing precipitation or settling of the heavier non-floatable spray particles as indicated in FIG. 2. In this figure, the upper or floating particles are indicated generally by the letter A and the lower non-floatable particles precipitated in the bottom of the reservoir are designated generally by the letter B.

With the arrangement just described, an area designated by the letter C, FIG. 1 disposed between the accumulated lower spray particles B and the upper flowing particles A is substantially free from any contamination. This relatively uncontaminated liquid or water passes through an opening 42 defined by the adjacent upper and lower margins of the respective baffles 38 and 40. The upper margin of the baffle 40 functions somewhat as a weir in permitting the overflow of uncontaminated liquid and simultaneously functions to trap the spray material or sludge B behind it. The upper margin of the baffle 40 is preferably formed with lateral lip 40a in order, more effectively, to prevent the passage of spray material particles over the upper margin of the baffle 40. The baffle 38 carries a similar lip 38a.

The right extremity of the reservoir or tank 36 as viewed in FIGS. 2 and 3, is provided with an area or chamber designated by the numeral 44 to receive the relatively uncontaminated liquid from the area C referred to above. A suitable valve, 46, the opening and closing of which is controlled by a float 48, is employed to prevent the overflow of liquid in the reservoir 36. An overflow pipe or conduit 50 may also be employed to cooperate in maintaining the level of the liquid in the reservoir. An overflow valve fitting 52 is incorporated at the lower extremity of the conduit 50. With the liquid in the area 44 of the reservoir 36 substantially free of contamination, it is in condition to be withdrawn from the reservoir by a suitable pump 54. This pump is connected with a filter or screen 56 at the lower intake extremity to screen out any sludge particles which may be present in the chamber 44. If additional water is required to raise the level thereof in the reservoir 36, it is only necessary to open a valve 58 which will cause water from an outside source to be delivered to the bottom of the tank.

The pump 54 serves to direct the relatively uncontaminated liquid from the reservoir 36 through a vertical conduit or pipe 60 which is coupled with the previously mentioned pipe 26, FIG. 1. After the above described apparatus has been functioning for a period of time, it will require cleaning to remove the accumulated spray material or sludge from the upper surface of the screen 34, from the bottom of the reservoir 36. Thus, the sludge accumulated along the upper surface of the screen 34 may from time to time be scraped from the screen and deposited in a sludge chute 62.

From the foregoing it will be apparent that the above described apparatus may be used to practice my improved and novel method of separating sludge or spray material

from the liquid or water used in spray booths. This is accomplished by directing contaminated liquid along a given path in a generally horizontal direction, causing such liquid to be directed downwardly into a reservoir, and then retarding the horizontal flow of the upper and lower areas of the liquid sufficiently to permit floatable material to gather at the top of the liquid level and non-floatable material to accumulate at the bottom of the reservoir. The next step of the method consists in withdrawing the substantially or relatively uncontaminated liquid positioned between the upper and lower levels of contaminated liquid in the reservoir and then employing this withdrawn liquid for the purpose of collecting spray material. Reference has been made to the runway 30 and 32 as being generally horizontal and this terminology is used advisedly to include runways which have sufficient inclination to direct liquid properly from one position to another. If the inclination of the runway 32 for example is excessive the proper functioning of the screen 34 would be affected. It is therefore desired to have the pitch or inclination of this runway sufficiently gradual to insure proper functioning of the entire system.

Spray booths of the types herein described are often referred to as a self-cleaning type of spray booth. For the purpose of illustrating one practical embodiment of the invention a spray booth is disclosed in the drawings wherein only the rear panel receives a curtain of water. Obviously the present invention contemplates the use of other spray booths wherein both the rear and side panels are equipped with means for providing water curtains. The sludge or spray material floating along the top of the water in the reservoir may be skimmed off the surface periodically and disposed of without interrupting the functioning of the equipment. It has been found for example that the equipment may function continuously during an entire working day with only a few minutes time spent in skimming off the floating sludge. The heavier sludge settling to the bottom of the reservoir or tank may be removed when a change of fresh water is needed. Thus for example after the machine has been functioning during the day, a night attendant may remove the settled sludge with a spark-free scoop or spade, and thereafter flush the tank with a hose, the valve 52 being opened to facilitate complete cleaning of the tank. This simple procedure reduces maintenance costs to a minimum compared with relatively high costs heretofore experienced when a machine is shut down for a day or two to permit proper cleaning. The present method and apparatus makes for increased efficiency and economy in operation.

The sludge collector water tank or reservoir 36 may be installed outside of the spray booth proper, either on the floor or below the floor. Thus the spray chamber 12 may be automatically washed and ventilated to the floor line. This enhances the safety of operation, reduces fire hazards and in general introduces a housekeeping convenience because of the ease with which sludge may be removed.

It should be understood that while the foregoing specification describes spray booth equipment of a specific design, modifications and changes may be made without departing from the spirit and scope of the appended claims.

The invention is claimed as follows:

1. A spray booth comprising housing means providing a chamber for receiving spray material such as paint and the like, means for directing liquid into said chamber for receiving excess spray material, liquid receiving means disposed at the lower portion of said housing means, generally horizontally disposed runway means for receiving and directing the flow of contaminated liquid from said liquid receiving means, reservoir means for receiving contaminated liquid delivered to said runway means, means for retarding the horizontal flow of contaminated liquid in the upper portion of said reservoir means, second means for retarding the horizontal flow of contaminated

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liquid in the lower portion of said reservoir means, discharge means disposed intermediate the upper and lower portions of said reservoir means for directing the flow of intermediate, relatively uncontaminated liquid, and means for returning said relatively uncontaminated liquid to said chamber.

2. A spray booth comprising housing means providing a chamber for receiving spray material such as paint and the like, means for directing liquid into said chamber for receiving excess spray material, liquid receiving means disposed at the lower portion of said housing means, generally horizontally disposed runway means for receiving and directing the flow of contaminated liquid from said liquid receiving means, reservoir means for receiving contaminated liquid delivered to said runway means, baffle means for retarding the horizontal flow of contaminated liquid in upper portion of said reservoir means, second baffle means for retarding the horizontal flow of contaminated liquid in the lower portion of said reservoir means, discharge means disposed intermediate the upper and lower portions of said reservoir means for directing the flow of intermediate, relatively uncontaminated liquid, and means for returning said relatively uncontaminated liquid to said chamber.

3. A spray booth comprising housing means providing a chamber for receiving spray material such as paint and the like, means for directing liquid into said chamber for receiving excess spray material, liquid receiving means disposed at the lower portion of said housing means, generally horizontally disposed runway means for receiving and directing the flow of contaminated liquid from said liquid receiving means, reservoir means for receiving contaminated liquid delivered to said runway means, baffle means for retarding the horizontal flow of contaminated liquid in upper portion of said reservoir means, second baffle means for retarding the horizontal flow of contaminated liquid in the lower portion of said reservoir means, discharge means presented between the free margins of said baffle means intermediate the upper and lower portions of said reservoir means for directing the flow of intermediate, relatively uncontaminated liquid, and means for returning said relatively uncontaminated liquid to said chamber.

4. A spray booth comprising housing means providing a chamber for receiving spray material such as paint and the like, means for directing liquid into said chamber for receiving excess spray material, liquid receiving means disposed at the lower portion of said housing means, generally horizontally disposed runway means for receiving and directing the flow of contaminated liquid from said liquid receiving means, filter means associated with said runway means, reservoir means for receiving contaminated liquid delivered to said runway means, means for retarding the horizontal flow of contaminated liquid in upper portion of said reservoir means, second means for retarding the horizontal flow of contaminated liquid in the lower portion of said reservoir means, discharge means disposed intermediate the upper and lower portions of said reservoir means for directing the flow of intermediate, relatively uncontaminated liquid, and means for returning said relatively uncontaminated liquid to said chamber.

5. Means for receiving water contaminated with spray material such as paint and the like including reservoir means, generally horizontally disposed runway means located at the upper portion of said reservoir means for receiving and directing the flow of contaminated liquid, filter means having a downstream end terminating adjacent a wall of said reservoir means and forming a continuation of said runway means to permit precipitation of spray material therethrough and the downstream end of said filter means being spaced from said wall to permit overflow and downward discharge of said contaminated liquid from the end of said filter means into said reservoir means, baffle means spaced horizontally from

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said end of said filter means and positioned beneath said runway means for retarding the horizontal flow of contaminated liquid in the upper portion of said reservoir means, second baffle means cooperatively associated with said first baffle means and located at the lower portion of said reservoir means for retarding the horizontal flow of contaminated liquid in that vicinity, the free margins of said baffle means being located and spaced from each other in an area intermediate the upper and lower fluid levels of said reservoir means for directing the flow of intermediate relatively uncontaminated liquid, and means for returning said relatively uncontaminated liquid from said reservoir means.

6. A spray booth comprising housing means providing a chamber for receiving spray material such as paint and the like, means for directing liquid into said chamber for receiving excess spray material, liquid receiving means disposed at the lower portion of said housing means, generally horizontally disposed runway means for receiving and directing the flow of contaminated liquid from said liquid receiving means, reservoir means positioned externally of said housing means for receiving contaminated liquid delivered to said runway means, means for retarding the horizontal flow of contaminated liquid in upper portion of said reservoir means, second means for retarding the horizontal flow of contaminated liquid in the lower portion of said reservoir means, discharge means disposed intermediate the upper and lower portions of said reservoir means for directing the flow of intermediate, relatively uncontaminated liquid, and means for returning said relatively uncontaminated liquid to said chamber.

7. The method of separating spray material such as paint particles and the like from liquid such as water which includes the steps of directing water contaminated with such spray materials along a generally horizontal path, directing said contaminated liquid downwardly from said path into a reservoir, retarding the horizontal flow of the upper portion of the contaminated liquid in said reservoir to permit the accumulation of floatable spray material, retarding the horizontal flow of contaminated liquid in the lower portion of said reservoir to permit the precipitation of non-floatable spray material, and directing the relatively uncontaminated liquid position between the upper and lower levels of the liquid in said reservoir to an area from which said liquid may be used to again receive spray material.

8. The method of separating spray material such as paint particles and the like from liquid such as water which includes the steps of directing water contaminated with such spray materials along a generally horizontal path, directing said contaminated liquid downwardly from said path into a reservoir, retarding the horizontal flow of the upper portion of the contaminated liquid in said reservoir by directing said liquid against baffle means to permit the accumulation of floatable spray material, retarding the horizontal flow of contaminated liquid in the lower portion of said reservoir by directing said liquid against baffle means to permit the precipitation of non-floatable spray material, and directing the relatively uncontaminated liquid positioned between the upper and lower levels of the liquid in said reservoir to an area from which said liquid may be used to again receive spray material.

9. The method of separating spray material such as paint particles and the like from liquid such as water which includes the steps of directing water contaminated with such spray materials along a generally horizontal path, screening some of the spray materials from the liquid as it moves along said path, directing said contaminated liquid downwardly from said path into a reservoir, retarding the horizontal flow of the upper portion of the contaminated liquid in said reservoir to permit the accumulation of floatable spray material, retarding the horizontal flow of contaminated liquid in the lower portion of said reservoir to permit the precipitation of non-floatable

spray material, and directing the relatively uncontaminated liquid positioned between the upper and lower levels of the liquid in said reservoir to an area from which said liquid may be used to again receive spray material.

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