A recovery system is disclosed herein which includes spray-gathering exhaust hoods positioned opposite the spraying nozzles. The exhaust hoods cooperatively communicate with inlet ducts which, in turn, connect to a catch box arrangement. An exhaust duct exits from the catch box. Connected in line with the exhaust duct is an exhaust fan arrangement which creates an airflow through the hood-inlet duct-catch box-exhaust duct connection to thereby attract any overspray in the vicinity of the exhaust hoods. The overspray is sucked into the hoods down the inlet duct and is deflected towards the bottom of the catch box by a baffle arrangement within the box. The deflected spray-air mixture physically contacts the walls and bottom of the catch box with a small percentage exiting via the exhaust duct network. The greater percentage of the captured spray is deposited on the bottom of the catch box in an accessible tray, from where it can be readily recovered.

9 Claims, 3 Drawing Figures
RECOVERY SYSTEM FOR SPRAYING APPARATUS

BACKGROUND OF THE INVENTION

This invention pertains in general to product spraying apparatus, but, in particular, to a recovery system for such apparatus whereby a substantial portion of the unused spray material may be recovered and reused. Product-spraying apparatus, obviously, have numerous applications. One such application involves depositing on the surface of glass bottles and containers a dual protective coating. This includes first applying a coat of a thermallydecomposable compound such as stannic chloride, while the bottles are still hot from the bottle forming equipment. This serves to anchor a second, organic, "cold end" coating useful in improving the scratch resistance and lubricity of glass containers. Recent developments in the "hot end" process have prompted the development of a suitable recovery system.

Until recently, it was believed that anhydrous compounds, especially anhydrous stannic chloride, were required in the hot end coating process. The use of the anhydrous stannic chloride led to numerous problems. For example, it was necessary to entrain the tin halide fumes in a dry airstream, since a minimum amount of moisture, introduced into the airstream, would result in a precipitate corrosive to most materials employed in the spraying apparatus. Further, because of the reaction of the metal halide fumes with moisture in the atmosphere, a non-uniform coating was applied to a particular bottle resulting in poor bottle-to-bottle reproducibility. Moreover, the loss of metal halide through such reaction seriously reduced the efficiency of the use of the expensive metal halide reagent. In response to these problems there has been developed a method whereby a liquid containing a stannic chloride hydrate is sprayed onto the heated glass surface. The use of the hydrate avoids the need of air dryers, high pressure feed lines, etc. necessitated by the use of anhydrous stannic chloride fumes. Also, the use of a liquid medium affords much greater control over the thickness and height of the resulting metal oxide coating.

Resort to a liquid spray, containing a stannic chloride hydrate as the coating medium, prompted the development of a suitable recovery system. This is due, in part, to the fact that in the liquid spray process, the spray consists of relatively larger particles as compared with the prior fume process where the anhydrous stannic chloride fumes, reacting with the atmosphere, produced an effluent which consisted of very small particles, very difficult to trap in commercial scrubbers. It is therefore an object of this invention to provide a recovery system for use with a liquid spray apparatus, which can recover a substantial portion of the compound used in the sprayed solution.

It is a further object of this invention to minimize any polluting effects that may be caused by overspray in liquid spraying apparatus.

It is still a further object of this invention, to provide a recovery system which allows the coating process to be carried on in an open application chamber, thereby giving the operator better visual control of the spraying operation resulting in more uniformly coated bottles and better bottle-to-bottle reproducibility.

SUMMARY OF THE INVENTION

Towards the accomplishment of these objectives there is disclosed a device for use with a product coating apparatus which sprays aqueous solutions of coating material towards the item to be coated. The main element of the device is a catch box to which is connected an inlet duct and an exhaust duct. The inlet duct is communicatively connected to an exhaust hood, positioned on the side of the item sprayed opposite the corresponding spray nozzle. An exhaust fan system is connected, in line, with the exhaust duct to create an airflow through the system. The portion of the sprayed solution not actually deposited is drawn into the hood and then into the catch box through the inlet duct. The catch box includes a baffle arrangement for directing the received air-solution mixture downward towards the bottom of the box. A substantial portion of the solution is deposited on the bottom of the catch box which is adapted to provide recovery thereof for subsequent reuse. The portion of the solution not deposited is trapped in a filter located in the exhaust fan system. Where corrosive coating solutions are employed, the material used in the major elements of the recovery system is selected to resist deterioration.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of spraying apparatus including spray exhaust means.

FIG. 2 is an exploded view of an exhaust catch box used in FIG. 1.

FIG. 3 depicts an alternate construction for the catch box portion of the recovery system.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 discloses a typical liquid spray apparatus which, for purposes of illustration, we will assume is used to spray a coating material, in liquid form, on glass bottles. Typically, the sprayed liquid might contain a stannic chloride hydrate which when sprayed on the heated glass results, due to thermal decomposition of the tin compound, in a tin oxide layer being deposited on the glass surface.

The bottle, 10, to be sprayed is moved along in the application process from the bottle forming equipment on its way to the annealing lehr by conveyor belt 12. It passes in front of two pair of liquid atomizer nozzles, 14, (only one pair is shown for clarity purposes) at a controllable rate of speed. Each of the pair of atomizers 14 spray opposite sides of the bottle 10. The atomizers 14, are connected in a known fashion to a pressurized air supply, via air tube 16 and 18 and to a liquid feed drum 20, pressurized through line 22, via tubing 24 serially connected to a pair of flow meters 26 which supply the atomizers' liquid feed line 28.

The liquid feed drum 20 might typically be pressurized to 5 psi. The flow meters 26 would be adjusted to a rate determined by bottle size, conveyor belt speed and desirable coating thickness. The spray nozzles or liquid atomizers 14, typically, operate at 30 psi and are adjusted to give good atomization and bottle coverage. The liquid solution in the drum or feed tank 20 might be a stannic chloride pentahydrate solution having a specific gravity of, typically, 1.3.

Positioned opposite each pair of atomizers 14, is an exhaust hood 30. The hoods are connected through respective sidewalls 32 of intake ducts 34. The intake
ducts 34, pass through suitable openings in the top 36 of catch box 38. The hoods, generally, have a curved design to eliminate sharp corners and recesses. This, and the fact that the hoods are connected to the side walls of the intake ducts, substantially reduces material collecting in all but the catch box.

Exiting from the top 36 of the catch box 38 is an exhaust duct 40. This is, in turn, connected to a replaceable in-line filter 42, which is further connected to appropriate exhaust system 43. By means of duct 44. The exhaust system 43 includes an exhaust fan 46 driven by exhaust motor 48 with the filtered air expelled to the atmosphere by exhaust plenum 50.

FIG. 2 is an exploded view of the catch box 38. The top 36, shown in section, includes cutouts 54 and 56, adapted to receive intake ducts 34. Top 36 also includes a cutout 58 to accommodate exhaust duct 40.

Positioned below the underside of top 36, and securely fastened thereto, is a baffle arrangement 60. It includes a main frame 61 extending continuously around the perimeter of the top 36. It is secured to the downward extending sides of top 36 in any suitable, known fashion. It further includes a main rib 62 secured between opposite sides of the frame 61 and two smaller ribs 64 and 66 secured between the main rib 62 and frame 61. Frame 61 is of sufficient thickness, so that when top 36 is positioned on the tray portion 68 of the catch box 38, frame 61 rests on the top edge 70 of the tray. Ribs 62, 64 and 66 project down into the tray, below the plane of edge 70.

The catch box 38 can be mounted on a dolly 72 and both mounted on a screw jack or scissor jack (not shown) which permits the dolly and tray 68 to be lowered away from the top 36. This facilitates material recovery and cleaning.

FIG. 3 depicts an alternate construction for the catch portion of the recovery system. Catch box 74 includes an outer shell 75 in which is placed a removable tray 76. Access to tray 76 is created by sliding out door 77 positioned in the endwall 78 of shell 75.

Integral with shell 75 is a baffle arrangement 80. Arrangement 80 includes a main rib 82 secured between sidewalls 84 and 78. Secured between rib 82 and sidewalls 86 and 88 are ribs 90 and 92 respectively. Positioned below the baffle arrangement 80 but also secured to each sidewall of shell 75 is a drip trough 94. The drip trough 94 routes the collected liquid spray into the tray 76 from where it can be readily recovered. The topside 96 of shell 75 has cutouts 98 and 100 (not shown) which accommodate the intake ducts 34 in FIG. 1. Further, the top 96 has a cutout 102 to handle exhaust duct 40.

OPERATION

In operation, the items to be sprayed are positioned in front of the atomizers 14. The liquid solution is sprayed via the atomizers onto the outside surfaces of the item to be covered.

Exhaust fan 46 creates a flow of air in the vicinity of the sprayed item 10 causing substantially all of the sprayed solution not deposited to be collected by the corresponding exhaust hood 30.

The air-solution mixture is funneled into the intake duct 34 which directs the airstream down through top 36 into tray 70.

The baffle arrangement 60 insures that the airstream received via the inlet duct 34 is first directed downward towards the bottom of the catch box before it exits through the exhaust duct 40. A substantial portion of the airstream strikes the bottom of the tray 70 (or drip trough 94) with the liquid solution depositing itself in the bottom of the tray.

Whatever amount of the solution remains in the airstream itself, exits the catch box 38 via duct 40. Substantially all of the remaining liquid is entrapped in the filter 42.

Due to the corrosive characteristics of stannic chloride hydrate solutions the materials of construction of the various elements which make up the recovery system in this particular application should be selected for their corrosion resistant properties. Thus, it has been found that the exhaust hoods 30 and the baffle arrangements 64, 80 are more durable if made from titanium sheet. Likewise the intake ducts 34 and the catch box trays 68 or 76 withstand corrosive effects if made from fiberglass reinforced plastic.

The residue which collects in the tray can be easily converted into reusable form. The material deposited in the box which, it has been found, averages better than 50 percent by weight of the material input, is collected and then can be dissolved in water, filtered, then diluted to a proper concentration and resprayed as original material. If it is desired not to respray the collected material in the case where stannic chlorides are used, the residue becomes a very valuable source of scrap because of its high tin content and relative purity.

While the discussion above concerns itself particularly with the spraying of glass bottles with solutions containing a thermal-decomposable tin compound, it is obvious that the catch box system described herein can be used with other liquid spraying apparatus and has broader application than is set forth particularly herein.

Further, particular modifications and variations of the elements of the recovery system disclosed herein can be altered and changed without departing from the scope of the invention described herein and as defined in the claims appended hereto.

What is claimed is:

1. A material recovery system for a glass bottle spraying apparatus wherein the solution sprayed is a liquid containing a tin compound, comprising:
   a. spray channeling means for gathering the solution not deposited on said bottles;
   b. collecting means including a removable tray connected cooperatively with said channeling means; said channeling means including at least one exhaust hood and intake duct, said exhaust hood having generally a curved design, whereby sharp corners and recesses are eliminated or minimized to avoid, otherwise, the collection of said solution in said corners and recesses, said exhaust hood connected to the sidewall of said intake duct, said intake duct straightly extending therefrom downward into the top of said collecting means; c. means for creating a flow of said sprayed, undeposited solution into said channeling means and through said recovery system; said flow creating means including at least one exhaust duct connected to said collecting means, said intake duct and exhaust duct physically arranged at the interface with said collecting means such that said collected spray undergoes a 180° change of direction in passing from said intake duct to said exhaust duct; and
   d. means for deflecting substantially all of said flow entering said collecting means via said intake duct,
downward towards the bottom of said tray and into physical contact therewith said flow of sprayed, undeposited solution entering said collecting means out of said intake duct, substantially parallel to the plane of said deflecting means in a substantially vertical, downward direction, whereby there is insubstantial contact with said deflecting means.

2. The system of claim 1 wherein said flow creating means includes filter means for removing from said flow substantially all of the remaining solution after said flow passes through said collecting means.

3. The system of claim 1 wherein said exhaust hood is made from titanium sheet and where said intake duct and said collecting means is made from fiberglass reinforced plastic.

4. The system of claim 1 wherein said deflecting means includes a baffle arrangement for directing said flow into physical contact with said tray.

5. The system of claim 4 wherein said baffle arrangement includes a drip trough for funneling said flow towards said tray.

6. The system of claim 1 wherein the elements thereof are made from materials which are substantially unaffected by the corrosive properties of stannic chloride hydrates.

7. The system of claim 1 wherein the tin compound is stannic chloride pentahydrate.

8. A material recovery system for use with liquid solution spraying apparatus comprising:
   a. spray channeling means for gathering the solution not deposited on said bottles;
   b. collecting means, including a removable tray, connected cooperatively with said channeling means;
   c. means for creating a flow of said sprayed, undeposited solution into said channeling means and through said recovery system; said flow creating means including at least one exhaust duct connected to said collecting means, said intake duct and exhaust duct physically arranged at the interface with said collecting means such that said collected spray undergoes a 180° change of direction in passing from said intake duct to said exhaust duct; and
   d. means for deflecting substantially all of said flow entering said collecting means via said intake duct, downward towards the bottom of said tray and into physical contact therewith said flow of sprayed, undeposited solution entering said collecting means out of said intake duct, substantially parallel to the plane of said deflecting means in a substantially vertical, downward direction, whereby there is insubstantial contact with said deflecting means.

9. The system of claim 8 wherein said deflecting means includes, a baffle arrangement for directing said flow into physical contact with said tray.

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