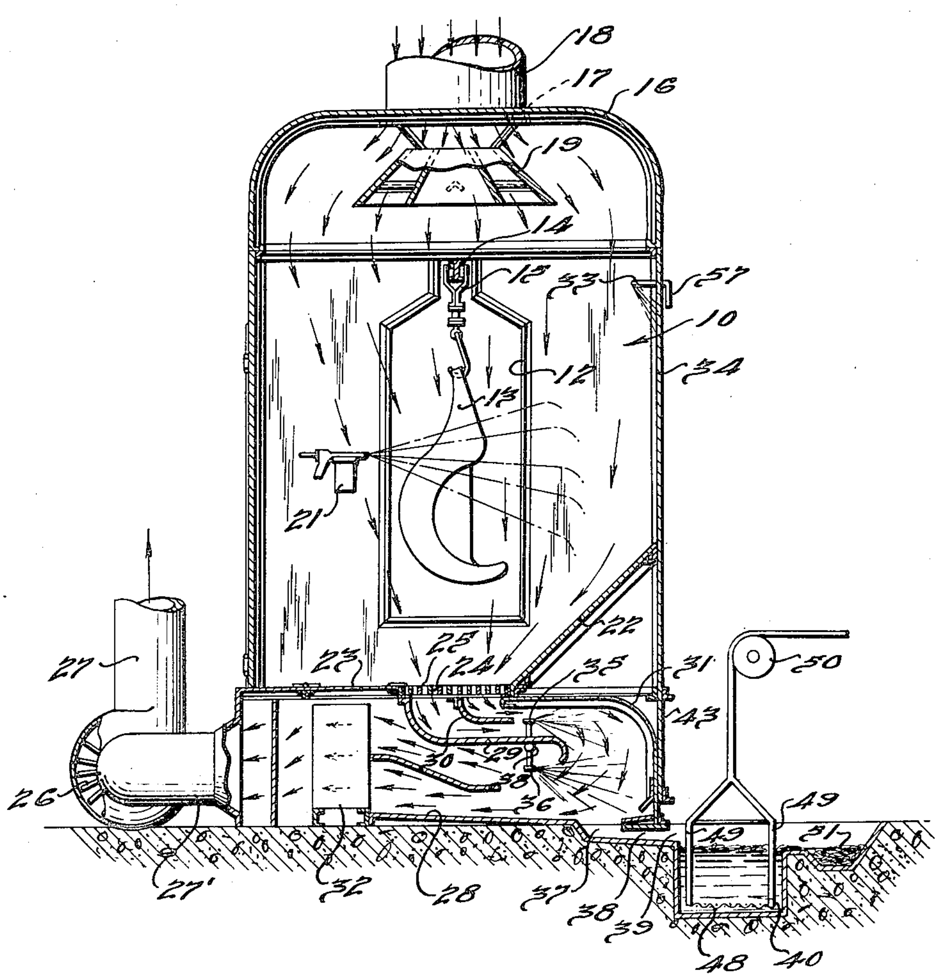
Dec. 23, 1941. S. G. SAUNDERS ET AL. 2,267,426

PROCESS FOR RECOVERING SOLIDS OF EXCESS SPRAYED COATING MATERIALS

Filed Oct. 29, 1938



INVENTORS.
Seymour G. Saunders,
Harry Morrison.
BY Harness, Lind, Patee & Harris.
ATTORNEYS.

Patented Dec. 23, 1941

2,267,426

UNITED STATES PATENT OFFICE

2,267,426

PROCESS FOR RECOVERING SOLIDS OF EXCESS SPRAYED COATING MATERIALS

Seymour G. Saunders, Bloomfield Hills, and Harry Morrison, Detroit, Mich., assignors to Chrysler Corporation, Highland Park, Mich., a corporation of Delaware

Application October 29, 1938, Serial No. 237,616

4 Claims. (Cl. 106—287)

This invention relates to an improved process and medium for recovering the non-volatile ingredients, commonly called solids, of excess sprayed surface coating materials and for preventing sticking of such material and their solids to the walls in which they are contained and it is a further development of the inventions described in our copending application, Serial No. 169,278, filed October 15, 1937, issued July 22, 1940, as Patent No. 2,208,646.

More particularly the invention pertains to the recovery of solids from the atmosphere and from the walls of spray chambers in which paint, lacquer, natural and synthetic enamels and the like are being applied.

The term "solids" as used herein and as conventionally employed in the surface coating art refers to those portions of surface coating material which remain, either in their initial or chemically altered form, in a normally set deposit of such coating materials, including the nonvolatile vehicle and pigment if the latter is present in the coating material.

One of the main objects of the invention is the provision of an improved recovery and adhesion preventing process and medium which will meet all the requirements set forth in said above mentioned application and which in addition embodies the use of a water suspension of inert solids of low concentration that will not discolor white and light colored coating materials.

Another object of the invention is the provision of a medium of this character which when applied to the walls of a spray booth or other surfaces in which surface coating material is contained, immediately provides on such surfaces a coating which does not permit access of the excess sprayed coating material thereto and which can be readily removed from such surfaces by scraping or by the application of steam thereto.

A further object of the invention is the provision of a medium of this character which renders the solids of coating materials precipitated and collected therein substantially non-adhesive to surfaces by which it is contained both during the recovery and subsequent handling stage of the process.

A still further object of the invention is the provision of an improved medium of this kind which is mainly insoluble in any of the conventional surface coating material solvents and which is stable even at comparatively low temperatures in the absence of alkalinity or other characteristics which tend to injure the recovered products.

An additional object of the invention is the provision of a recovery medium of this character which is chemically compatible with the finished materials resulting from the recovered products as well as physically non-injurious to white as well as light colored coating materials thereto and which therefore need not be removed with that precision which is required when the presence of the recovery medium has a detrimental effect upon the recovered product.

Another object of the invention is the provision of a recovery medium of this kind which has a corrosion resisting action on the walls and other surfaces of a spray booth and associated recovery system with which it contacts.

Other objects of the invention are the provision of a medium of this kind which when applied to wall surfaces of a spray booth or to similar surfaces prevents the adhesion of excess sprayed coating material and solids thereto and facilitates the use of coating material solids precipitating liquids which normally are not capable of rendering the solids deposited thereby non-adhesive or otherwise prevent such solids from sticking to the surfaces by which they are contained; and to provide a material of this kind which can be used to advantage in the absence of the practice of recovery of solid materials to eliminate frequent cleaning and the resulting shut down of spray booths and spraying systems.

Additional objects of the invention are the provision of an improved recovery medium in which the solids of coating materials are insoluble and thus precipitate; to provide a recovery medium of this character in the presence of which conversion of the recovered product to an insoluble or other state not suitable for re-use is prevented and in which the solids are precipitated in a readily removable form and having the various ingredients thereof present in re-usable proportions; to provide a coating material solids precipitating medium which retains the resulting precipitate in such state that it can be directly redissolved in solvents of the same character as those from which it was previously recovered to form a coating material of the same order as that in which such solids had initially been included.

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

The figure is a diagrammatic vertical sectional view of a spray booth, illustrating a recovery process embodying the invention in which the improved recovery medium is adapted to be employed.

The improved recovery medium for spraying applications comprises a suspension of talc in a suitable vehicle and is preferably formed by mixing one part of dry talc with one part of water to the consistency of a smooth paste. To four parts of the resulting paste is added one part of raw linseed oil and this is mixed to a smooth consistency. The linseed oil, talc and water mixture may then be diluted with water to a desired concentration, 2% to 5% of the mixture in water being suitable for continuous spray recovering processes.

The foregoing type of solution may be used in spray booth of various constructions, the booth disclosed being illustrative of a workable recovery installation.

In the drawing is shown one form of spray chamber, generally designated by the numeral 10, with which the solid matter recovery apparatus may be used. The spraying chamber includes a casing having end walls 11 provided with registering openings 12 for accommodating the passage of articles 13 through the interior thereof. The articles are preferably conveyed through the spray chamber 10 by a conveyor which includes a rail 14 extending longitudinally of the chamber 10 and located at the upper extremities of the openings 12 thereof. The rail 14 is adapted to movably support a plurality of carriers 15 which are preferably attached to a continuous conveyor chain (not shown). The spray chamber 10 has a roof 16 in which is formed an air inlet opening 17 that communicates with a conduit 18 leading from an external or internal source of air. Disposed immediately below the air inlet 17 is an inverted frusto-conical deflector 19 having vanes 20 so constructed and arranged as to distribute the air current entering the inlet 17 throughout substantially all portions of the interior of the chamber 10. Provided at the lower longitudinal extremity of the spray chamber 10 on the side thereof opposite from the location at which the coating material is discharged upon the articles by a spray gun 21, or other suitable means, is an inclined baffle 22 which slopes downwardly and inwardly toward the central portion of the floor 23 of the chamber. An air outlet opening 24 is provided in the floor 23 adjacent the lower extremity of the baffle 22 for permitting the escape of the air admitted through the inlet 17. A grille 25 is disposed in the outlet opening 24 for the purpose of preventing the passage of articles or spray gun parts or other devices which may accidentally be dropped in the spraying chamber.

The air current is drawn through the inlet opening 17 and through the interior of the spraying chamber 10 by a blower 26 located externally of the spraying chamber and having a discharge conduit 27 which preferably leads to the atmosphere. The blower 26 includes an inlet conduit 27' which communicates with an air passage 28 disposed below the spraying chamber 10 and extending longitudinally thereof. The passage 28 leads from the outlet 24 of the spraying chamber 10 and is provided at its inlet end with curvilinear baffles 29 and 30 which direct the air passing through the outlet 24 rightwardly as viewed in Fig. 3 toward the right extremity of the passage 28. The lowermost baffle 29 extends rightwardly further than the baffle 30 but it terminates in spaced relation to the right extremity of the passage 28 so as to permit the air current to be reversed in direction of flow by a curvilinear baffle 31 located at the upper right extremity of the air passage, as viewed in Fig. 3. The air current flows around the right extremity of the lowermost baffle 29 and then continues in a leftward course toward the blower 26. An eliminator 32 is provided adjacent the outlet of the air passage 28 for removing any liquid such as spray coating material, or the precipitating agent introduced into the air current in the manner hereinafter set forth, before the air enters the blower 26 and discharge pipe 27.

The spray chamber 10 and the air passage 28 are provided with means for subjecting the air current circulated through the system to the action of an agent for precipitating the solids of the excess sprayed coating material which is carried by the air current. The precipitating agent preferably comprises liquid which not only washes or otherwise removes the sprayed coating material from the air current but which also precipitates the solid constituent thereof.

In the form of the invention illustrated, a discharge pipe 33 having a plurality of relatively small outlet orifices or other spray forming means, extends longitudinally of the spray chamber 10 and is located adjacent the back wall 34 thereof as illustrated in Fig. 3. The orifices, or spray devices of the discharge pipe 33 are so constructed and arranged as to direct the precipitating agent upon the internal surface of the rear wall 34 and to cause the liquid to flow downwardly thereon substantially in the form of a sheet or curtain. The liquid precipitating agent is then directed inwardly toward the outlet opening 24 by the inclined baffle 22 and ultimately flows through the outlet openings 24 along with the air current. That portion of the excess sprayed coating material which impinges upon the sheet or curtain of liquid precipitating agent discharged by the pipe 33 is removed from the air current and the solids thereof are precipitated from their solvent. Any portion of the air ladened with spray coating material which is not subjected to the washing and precipitated action of the agent discharged by the pipe 33 is thoroughly treated with precipitating agent by a pair of spray devices 35 and 36 located in the left end portion of the air passage 28. The uppermost spray devices 35 includes a plurality of outlet orifices or spray nozzles which discharge the precipitating agent in the direction of travel of the air current flowing through the section of the passage 28 above the baffle 29, and the spray device 26 likewise includes a plurality of orifices or discharge nozzles which spray precipitating agent in a direction opposite to the direction of flow of the air current through that portion of the air passage 26 located below the baffle 29. In this manner the precipitating agent is applied to the air current of the passage 28 at the location therein where the air current is reversed in the direction of movement.

Provided in the lower wall of the air passage 28 is an outlet 37 for accommodating the flow of the precipitating agent and solids of the spray coating material therefrom. The outlet 37 communicates with an elongated passageway or conduit 38 having a discharge outlet 39 which communicates with a sump 40, as illustrated.

The recovered solids from many sprayed surface coating materials will sink to the bottom of the sump in the form of a sludge and in this case the solids may be conveniently removed from the sump 40 by the aid of a liquid pervious screen 48 which is preferably disposed at the bottom of each sump 40. Cables 49 are attached to the screen 48 and preferably extended over a pulley 50 so as to enable convenient vertical movement of the screen 48 from the interior of its sump when it is desired to displace the precipitated solids therefrom.

The solids of some sprayed surface coating materials, are found to float on the top of the liquid, in the form of a scum or sludge of soft cheese or liver-like consistency, the particles of solids being cohered together in masses. The precipitate may be conveniently removed from the sump 40 by scraping the floating scum-like substance so formed into a trough 51 from which it may be conveniently removed for further operation in accordance with the recovery process.

The precipitated solids obtained in either of the foregoing ways include the non-volatile vehicle dispersed coloring matter or pigment if any and substantially all other ingredients which comprise the solids of surface coating materials. In this recovery product, the pigment if present is thoroughly dispersed in the non-volatile vehicle in substantially that condition produced by the original grinding operations employed in the initial manufacture of the coating material. These recovered products are then separated from the precipitating agent, preferably by initially removing the main portion of the latter in a press or by allowing the sludge to drain. For some purposes more complete removal of the precipitating agent may be desirable and in this event the precipitating agent is preferably washed out or extracted, with suitable solvent therefor which will not dissolve or otherwise seriously disturb the condition of the recovered solids. The presence, however, of relatively small amounts of the graphite of the precipitating medium are perfectly compatible with the recovered coating material solids and can be allowed to remain therein. The thus reconditioned recovered material may then be dissolved in a solvent of the same character as that from which it had previously been separated in order to produce surface coating material which is otherwise wasted.

Irrespective of the saving resulting from the recovery of excess sprayed coating materials, the use of precipitating agents in the foregoing manner and in which the solids of the coating material are not soluble or rendered gummy, is of substantial value. The elimination of the nuisance problems involved in the discharging of air from spray booths into atmosphere in densely inhabited regions, as well as the saving in cleaning of the apparatus and removing from the walls thereof, deposited solid and semi-solid accumulations represent a material saving in spray booth operation even though no attempt is made to re-use the recovered coating materials.

The precipitating medium may be withdrawn periodically from the sump 40, filtered if desired and recirculated and re-used.

The sludge recovered by precipitation with the above mentioned medium may be separated from the main bulk of the precipitating medium and directly dissolved in a suitable coating material solvent and the resulting mixture of solution may be centrifuged in a cream type separator, for example, to obtain the recovered coating material.

In some coating material spraying applications, the excess sprayed coating material can be economically recovered by treating the walls of the spray booth, or portions thereof, with a film forming composition which prevents the deposition and accumulation of the excess sprayed material on the walls. An improved film forming composition of this kind may be formed by producing a smooth paste from 500 parts by weight of dry powdered talc and 300 parts by weight of water. To this paste is added 185 parts by weight of an emulsion of linseed oil and rosin-size which is produced by stirring a mixture of 20% rosin-size (70% rosin and 30% water) and 80% boiled linseed oil. Then 20 parts by weight of bentonite clay is dispersed in 125 parts by weight of water and added to the rosin-size, talc and linseed oil mixture.

The foregoing surface film forming composition may be applied to the walls of a spray booth or other surface with which the excess sprayed coating material contacts with a brush, rag or other suitable means. A film of desired thickness may be built up in one or several applications, final films of $\frac{1}{16}$ inch being free from sagging. The film air dries to a semi-hard state and does not chip or flake off. Dry films may be scraped off with a knife or removed by a forced blast of hot water or steam. During setting of the film, the rosin and oil content thereof is believed to collect mainly at the surface forming an exterior impervious skin with some of the water and talc next to the spray booth wall surface, excessive sticking of the film to the walls being prevented by the low concentration of binder at the side adjacent the wall. Drying oils other than linseed oil, such as soya bean oil, China-wood oil and Perilla oil, may be used.

The walls of spray booths in which the black or dark colored surface coating materials are being sprayed may be treated with a composition substantially identical to the foregoing and made in accordance with the same procedure but in which 500 parts of "Aquadag" is included in place of talc. Aquadag is a readily available trade product comprising a colloidal suspension of graphite in water and has a concentration of substantially 22% graphite.

By washing spray booth walls which have been so treated continuously with a light spray of cold water or periodically with hot water or steam, the deposited material may be flushed into a sump and collected and removed in the foregoing manner. When the wall surfaces are thus coated, the solids of excess sprayed coating material may be precipitated and conveyed in a medium, such as water, which would not alone prevent adhesion of the recovered product to the surfaces with which it contacted. Coating of spray booth walls with a film of this kind may also be relied upon to prevent adhesion of excess sprayed materials thereto and to simplify cleaning thereof in instances where recovery is not practiced.

Although but several specific embodiments of the invention are herein shown and described, it will be understood that various changes in the steps of the process and in the materials and apparatus employed may be made without departing from the spirit of the invention.

We claim:

1. The process of recovering solids of excess sprayed coating materials which comprises precipitating said solids by subjecting said excess sprayed coating material to treatment with a water suspension of a suspensoid comprising powdered talc, and separating said precipitate from said water suspension.

2. The process of recovering solids of excess sprayed coating materials which comprises precipitating said solids by subjecting said excess sprayed coating material to treatment with a wa-

ter suspension of a suspensoid comprising powdered talc and dissolving the resulting solids in a coating material solvent in the presence of portions of some of said suspension.

3. The process of recovering solids of excess sprayed coating materials which comprises precipitating said solids by subjecting said excess sprayed coating material to treatment with a water suspension of a suspensoid comprising powdered talc, separating said precipitate from the main bulk of said water suspension, dissolving the resulting solids in a coating material solvent, and separating the dissolved solids from residual quantities of said water suspension by centrifuging the mixture thereof.

4. The process of recovering solids of excess sprayed coating materials which comprises applying on the surfaces within which said excess sprayed coating material and solids thereof are contained and with which they contact a solid film of a water suspension of a suspensoid comprising finely divided talc to prevent adhesion of said excess sprayed coating material thereto, precipitating said solids within said surfaces by subjecting said excess sprayed coating material to treatment with a water suspension of a suspensoid comprising powdered talc separating the resulting precipitate from said water suspension.

SEYMOUR G. SAUNDERS.
HARRY MORRISON.