

Jan. 22, 1952

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SPRAY BOOTH

Filed Oct. 9, 1946

2 SHEETS—SHEET 1

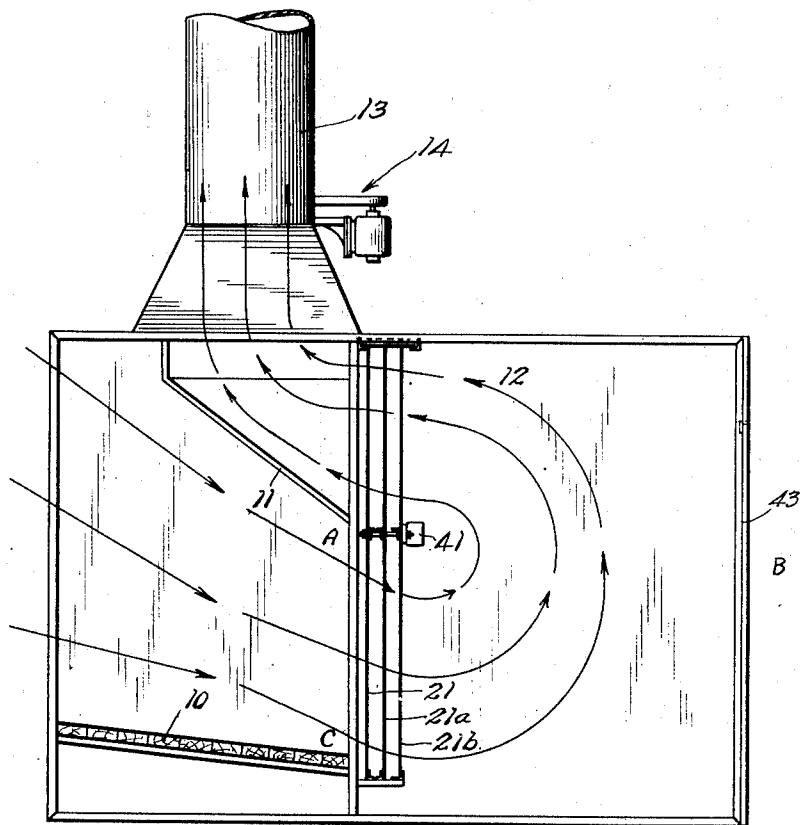


Fig. 1.

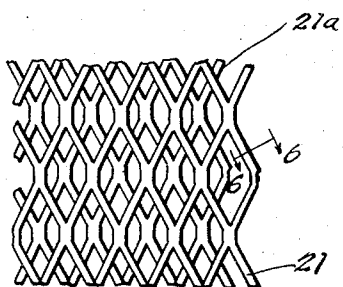


Fig. 5.



Fig. 6.

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2 SHEETS—SHEET 2

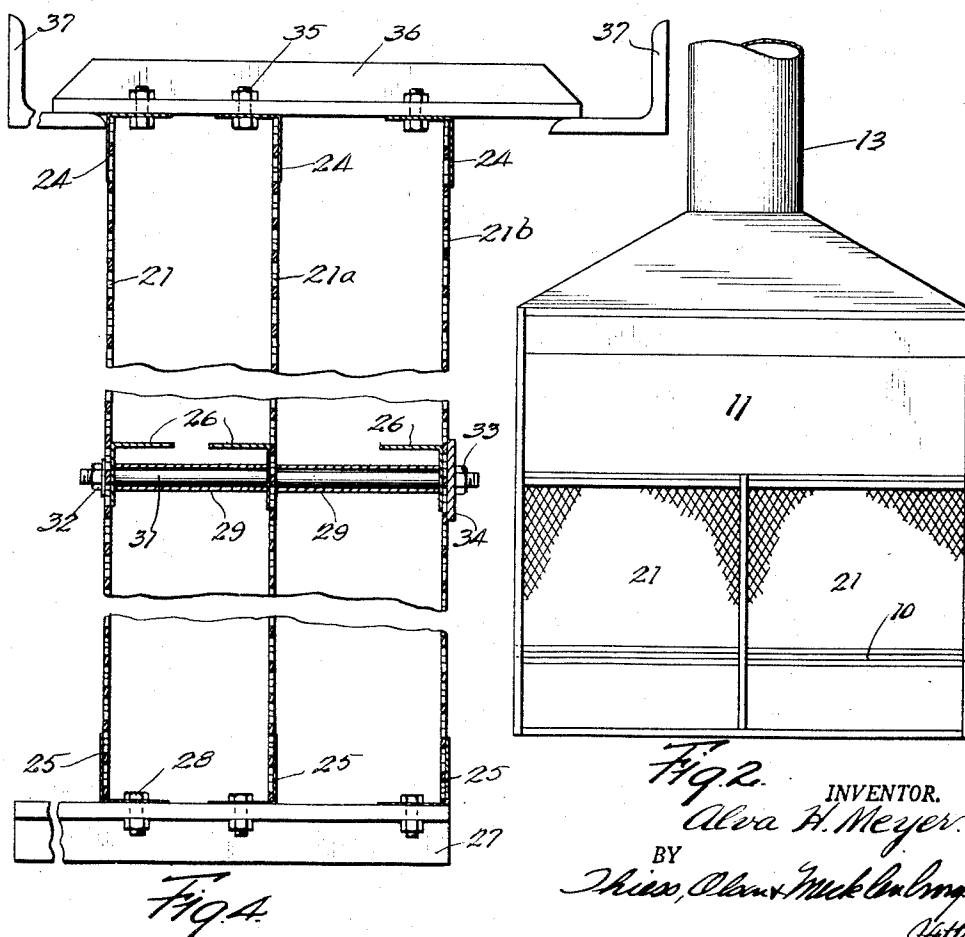
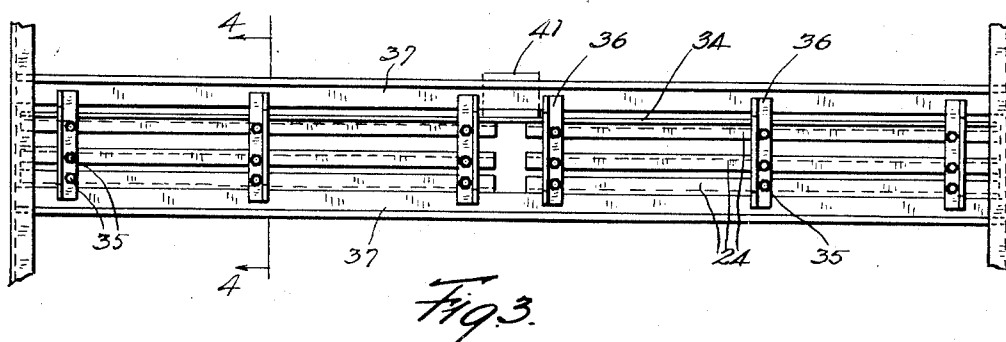


Fig. 2.

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UNITED STATES PATENT OFFICE

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SPRAY BOOTH

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3 Claims. (Cl. 183—58)

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This invention relates to improvements in spray booths, particularly those employed for spraying reclaimable material.

In the art of spray finishing, the object to be finished is placed on a suitable platform within a booth, the front of the booth being open and the remaining sides and top forming a hood to which a stack is connected. An exhaust fan in or near the stack is effective to remove any fumes, atomized paint or lacquer, or particulate sprayable material from the spraying region, the principal object being the avoidance of inhalation of such fumes or material by the operator. In the art of vitreous or porcelain enameling particularly, the material sprayed on the object and the conditions of operation of prior apparatus are such that only about fifty per cent of the material adheres to the object, the principal part of the remainder being wasted through the stack, and some small part being deposited on the interior of the booth wherefrom it may be reclaimed. However, under those conditions—for example, scraping the material from the walls and floor of the booth—adulteration may readily occur, and the expense of separating out the adulterant is often costlier than the value of the reclaim.

One process to which the instant invention is specifically applicable is that of applying vitreous or porcelain enamel to metal surfaces—for example, reflectors of the type used in electric lighting, tubs for washing machines, and so forth. These are conventionally of metal to which the usual ground coat is first applied by dipping or spraying, after which the glazing material is applied by means of a spray gun. Many glazing formulas are used, each manufacturer having his own conception of the proportions to be used, the art being largely an empirical one. In so far as the present disclosure is concerned, the composition is immaterial, the essence of the invention residing in the reclamation of the material for reuse. As sprayed, the material contains a fluid element serving as a vehicle for, or as a component with, certain particulate materials, such as frit, whiting, clays, and other ingredients. After spraying, the fluid element evaporates so that a considerable part of the solids settle on the floor or other parts of the booth.

One prior method has been to utilize a water bath through which the stack draft draws the surplus material. In this form the solids settle to the bottom of the container and the fumes are exhausted to atmosphere. Another method employs a water spray or water curtain to dislodge the particles from the air stream. Both modes of

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reclamation are decidedly unsatisfactory, since the water dissolves the clayey as well as other materials and renders the reclaim unfit for use unless it is restored by the addition of the robbed elements. Moreover, a water bath involves a substantially larger exhaust fan motor.

Of importance also is the need for preventing emission of the frit or other siliceous material through the stack, which would otherwise create an atmospheric condition about the enameling room conducive to silicosis.

In order to avoid the shortcomings of prior methods and means heretofore pointed out, the principal object of my invention is the provision, in conjunction with a spray booth, of a perforate baffle or screen interposed between the spraying site and the stack, upon which baffle a substantial percentage of the particulate sprayed material may settle to be reclaimed, the material separating the apertures being of such area as to interfere with normal stack draft only to the minimum extent.

Another object is to provide a baffle, as aforesaid, comprised of a plurality of spaced, like screens, the apertures of each of which are staggered with respect to the next adjacent screen to increase the proportion of reclaim.

An additional object is to provide a plurality of screens for the purpose aforesaid, arranged in series in the air stream through the booth.

Another object is to provide a disposition of such screens in the exhaust duct which will act at widely spaced-apart points in the air stream to afford primary and succeeding particle-separating functions.

Still another object is to provide means for removing the material adhering to the screens by vibration.

A further object is to position the baffle aforesaid in a chamber interposed between the spraying site and stack, and which chamber is provided with a door through which the reclaim may be removed.

Another object is to provide reclaiming screens, as aforesaid, which are themselves finished in porcelain enamel or a similar glazed finish which is effective to cause temporary adhesion of the particulate material thereto, but which will not resist removal of the same upon vibration of the screens.

In the drawings, which show one form in which the invention may be embodied in practice:

Fig. 1 is a side elevational view of the spray booth showing the assembly of the baffle in rela-

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tion thereto, and with the right side panel of the booth removed for convenience in illustration;

Fig. 2 is a front view of the booth showing the widthwise extent of the baffle;

Fig. 3 is a plan view of the baffle assembly in its relation to the booth;

Fig. 4 is a cross-sectional view taken on the line 4—4 of Fig. 3;

Fig. 5 is a partial detail of the baffle screens; and

Fig. 6 is a cross-sectional detail taken on the line 6—6 of Fig. 5 to indicate the nature of the deposit on a screen.

The invention is capable of adaptation to a spray booth of any type usually employed for spraying of reclaimable material as hereinbefore discussed, and by way of example I have shown a booth comprising a floor, side walls, a roof and a rear wall of sheet metal or other suitable panel material, the framework being of angle iron as shown. For supporting the articles in a position convenient for spraying, a fixed metal-sheathed, wooden platform 10, or a revoluble platform (not shown), may be provided, the operator standing in front of the booth, i. e., to the left side of Fig. 1.

In order to provide duplex action on the part of a single assembly of screens, provision is made to direct the air and its suspended matter in a tortuous path, as indicated by arrows in Fig. 1, an inclined baffle 11 being mounted in the spraying chamber, as shown, to direct the air stream through the lower portion of the baffle assembly into a rear chamber 12, the air stream then flowing through the upper portion of the baffle and thence to the stack 13. An exhaust fan of any known type is mounted with its impeller within the stack, the driving motor and belt being indicated at 14.

The baffle assembly, best seen in Figs. 3 and 4, comprises two sections, each including three screens or perforate sheets 21, 21a and 21b having suitably shaped apertures therein, the material illustrated in Fig. 5 being ordinary expanded metal having relatively large openings separated by the metal lattice. The number of screens is shown as three, although two, or more than three may be found better under some circumstances. However, I have found that in order to obtain maximum reclaiming efficiency, the apertures of one screen should be staggered with respect to the one next adjacent. Thus in Fig. 5, screens 21 and 21a are staggered, while screen 21b being offset with respect to screen 21 is not visible in the drawing. The complete baffle comprises a right-hand and a left-hand section, each section including three screens, although it will be understood that division of the baffle into sections is not imperative, and that moreover more than two sections may be found convenient from the standpoint of manufacture and maintenance. Moreover, the apertures in the screen may be slots disposed at any angle and defined by bars or rods set into a frame.

Each screen is reinforced and supported at its top, bottom, and center, respectively, by bent plates 24, 25, and 26 united thereto by welding or otherwise. Positioning of the screens depthwise of the booth is maintained by short angle iron struts 27 secured to the plates 25 by bolts 28, there being three such struts at the bottom of each section of the baffle. Approximately midway of the height of the sections are located the plates 26 heretofore referred to, the depthwise spacing of the screens in this region being effected by

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tubular spacers 29, tie rods 31, and nuts 32 and 33, the nuts 33 also securing a bar 34 extending across both sections of the baffle, and for a purpose to be explained. Plates 24 are attached by bolts 35 to angle iron struts 36 resting on the transversely positioned angle iron supports 37 secured to the framework of the booth at its sides. Struts 36 are preferably not fastened to the supports 37 in order that the screen assembly may float and avoid agitation and consequent loosening of parts of the booth while the screens are vibrated in a manner to be pointed out, and may also, by fore and aft shifting thereof, be removed from the supports 37 for maintenance.

In operation excess sprayed material is carried by the air stream, as already explained, through the screens 21, 21a, and 21b to the rear, and then through the screens again from the rear toward the stack. Thus a two-stage screening or reclaiming function results to materially enhance the efficiency of the process. It will be obvious that, if desired, the air stream may be directed by appropriate duct construction to pass through only one set of screens. However, under some circumstances it may be preferred to pass the air stream through more than two sets of screens. Nor is it necessary that the screens be oriented as shown, but one set may be at right angles or at some other angle to another set.

The screens are preferably finished by porcelain enameling, this finish having been found to retain a maximum deposit while permitting easy shaking-out thereof.

This latter step is attained by providing a vibrating unit of any conventional form—for example, an eccentric weight carried on a motor shaft, the motor being bolted to a housing. The vibrator is shown schematically at 41 and is fixed to the bar 34 in any convenient way. Control of the motor of the vibrator may be by a push-button switch at the front of the booth in order that the operator may, at necessary and convenient intervals, set the vibrator into motion to shake the screens. Material thus dislodged from the screens falls to the floor of the chamber 12, from which, by means of a door 42, the material may be removed and reused. In Fig. 6 there is indicated a typical accumulation of deposit on the screen. By reason of the flat surface of the lattice, the deposit tends to accumulate in an inverted pile, and in this way the screen is able to gather and retain a large quantity of material before shaking-out becomes necessary.

One form of baffle found well adapted to the reclamation of the frit as used in porcelain enameling comprises screens of 18 gauge metal, the openings being generally diamond-shaped having axes of $\frac{1}{8}$ " and $1\frac{3}{4}$ ", and the screens being spaced $2\frac{3}{8}$ " apart. In this case the screens are laterally offset one-half the horizontal pitch distance. By properly staggering the apertures in the screens, and proportioning the ratio of lattice area to aperture area, the conditions resulting in removal of an optimum amount of material from the air stream with minimum obstruction of air flow may be established. With my type of screen and arrangement thereof, eddy currents in and around the apertures of the screen are dispensed with, and pick-up of material from the air stream is far greater than with similar means heretofore known.

It will be recognized that some part of the enamel particles will settle out from the air stream and drop to the floor of the chamber 12. To in-

crease the reclaim from this source, the velocity of the air stream may be reduced by making the dimension A—B greater than the dimension A—C. A fifty per cent greater dimension has been found suitable. Thus the slower moving air stream will deposit a greater yield within the chamber 12.

While I have shown a particular embodiment of my invention, it will be understood, of course, that I do not wish to be limited thereto since many modifications may be made, and I therefore contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A spray booth for coating articles comprising a casing, a spray coating chamber in the front of the casing for receiving an article to be sprayed and coated, a collecting and recovery chamber in the casing in the rear of the coating chamber, a fan to produce a suction air current through said chambers, a screen unit suspended between and separating the two chambers, said screen unit comprising two or more vertical sheets of expanded metal spaced apart and with laterally staggered openings and ribs, struts at the top and at the bottom of said sheets and midway between secured thereto and holding said sheets properly positioned in said unit, the said unit being suspended from the upper struts in floating engagement with the casing, and a vibrator engaging the medial struts of the unit to vibrate said sheets to dislodge material settling thereon from the said air current and to drop it in the said collecting and recovery chamber in dry condition.

2. A spray booth comprising a horizontal casing, a material reclaiming screen vertically across said casing and dividing the same into a front spray coating chamber and a rear collecting and recovery chamber, a support in the coating chamber for an article to be spray-coated, a plate across said front chamber extending from the inside top of the casing in advance of the screen to a line substantially midway vertically of the said screen, an outlet stack connecting with the top of the casing over the portion defined by the said plate and screen, a fan for causing a suction air current serially through the coating chamber and the lower part of the screen below the said plate into and through the collecting and recovery chamber and reversely out through the upper part of the screen above the said plate and

thence into the stack, means for mechanically vibrating said screen medially to discharge material settled thereon down into the collecting and recovery chamber, and a door in said collecting chamber to provide access thereto for the removal of said deposited material.

3. A spray booth comprising a horizontal casing, a material reclaiming screen vertically across said casing and dividing the same into a front spray coating chamber and a rear collecting and recovery chamber, a support in the coating chamber for an article to be spray-coated, a sloping plate across said front chamber extending from the inside top of the casing in advance of the screen to a line substantially midway vertically of the said screen, an outlet stack connecting with the top of the casing over the portion defined by the said plate and screen, a fan for causing a suction air current serially through the coating chamber and the lower part of the screen below the said plate into and through the collecting chamber by a U-turn and reversely out through the upper part of the screen above the said plate and thence into the stack, said collecting and recovery chamber being larger in cross-sectional area than said lower part of the screen to slow up the current of air in its passage through the collecting and recovery chamber for the depositing of material from the current itself, means for mechanically vibrating said screen to discharge material settled thereon down into the collecting chamber, and a door in said collecting chamber to provide access thereto for the removal of said deposited material.

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