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Vertue

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[54] **SPRAY BOOTH**

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[52] **U.S. Cl.** **118/634;** 118/326; 118/629

[51] **Int. Cl.²** **B05C 11/16**

[58] **Field of Search** ..... 118/634, 326, 630, 309, 118/629, 313, 316, 324; 98/115 SB

[56] **References Cited**

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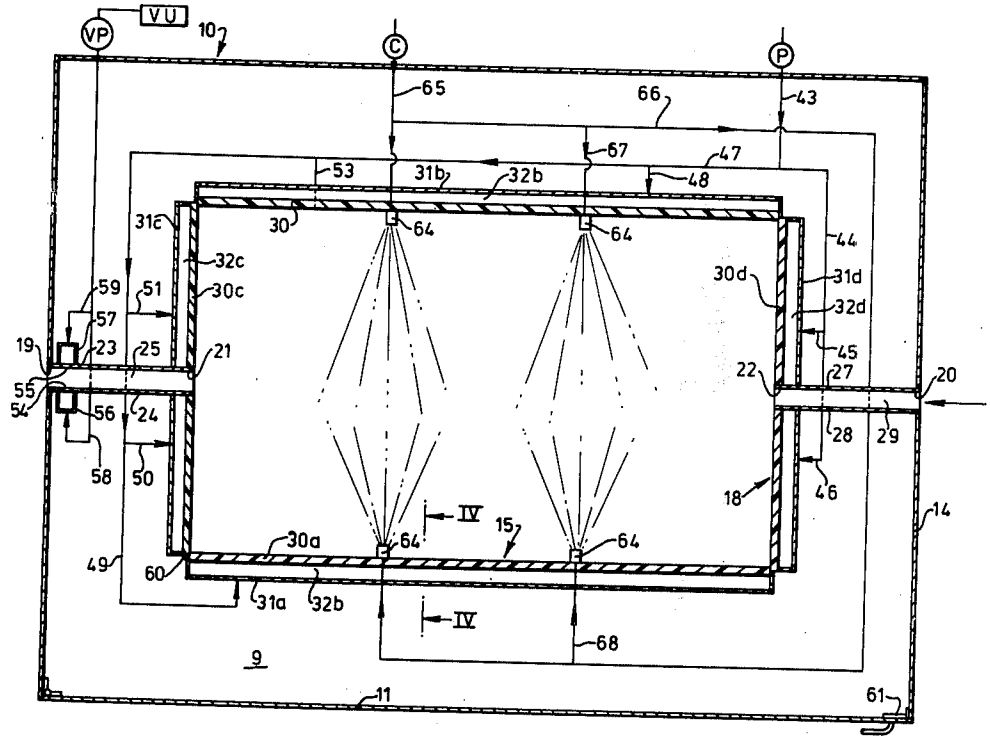
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Assistant Examiner—Douglas Salser
Attorney, Agent, or Firm—Sughrue, Rothwell, Mion, Zinn & Macpeak

[57] **ABSTRACT**

A spray booth for use in the electrostatic spraying of powder paint has a spray chamber defined by walls, at least one of which has a wall panel facing inwardly of the spray chamber and made of porous material. An enclosure of gas-impervious material secured in sealed relation to the side of the wall panel opposite to the spray chamber forms, with the panel, a gas chamber, to which gas is supplied under pressure. The gas passes through the porous panel and thereby counteracts deposition of paint powder on the panel, thus facilitating cleaning of the booth and color changeover and reducing color contamination after color changeover.

11 Claims, 4 Drawing Figures



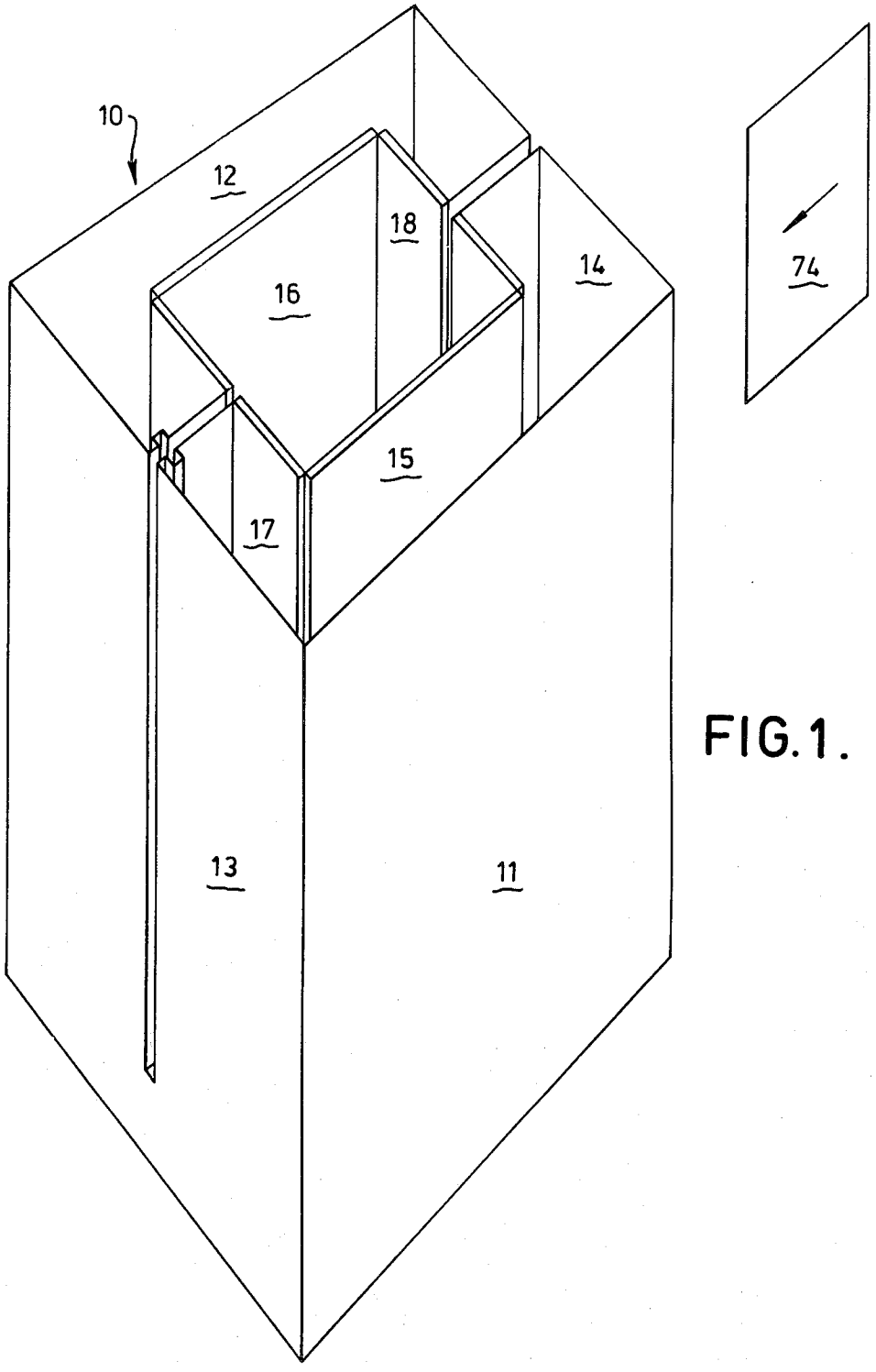


FIG. 1.

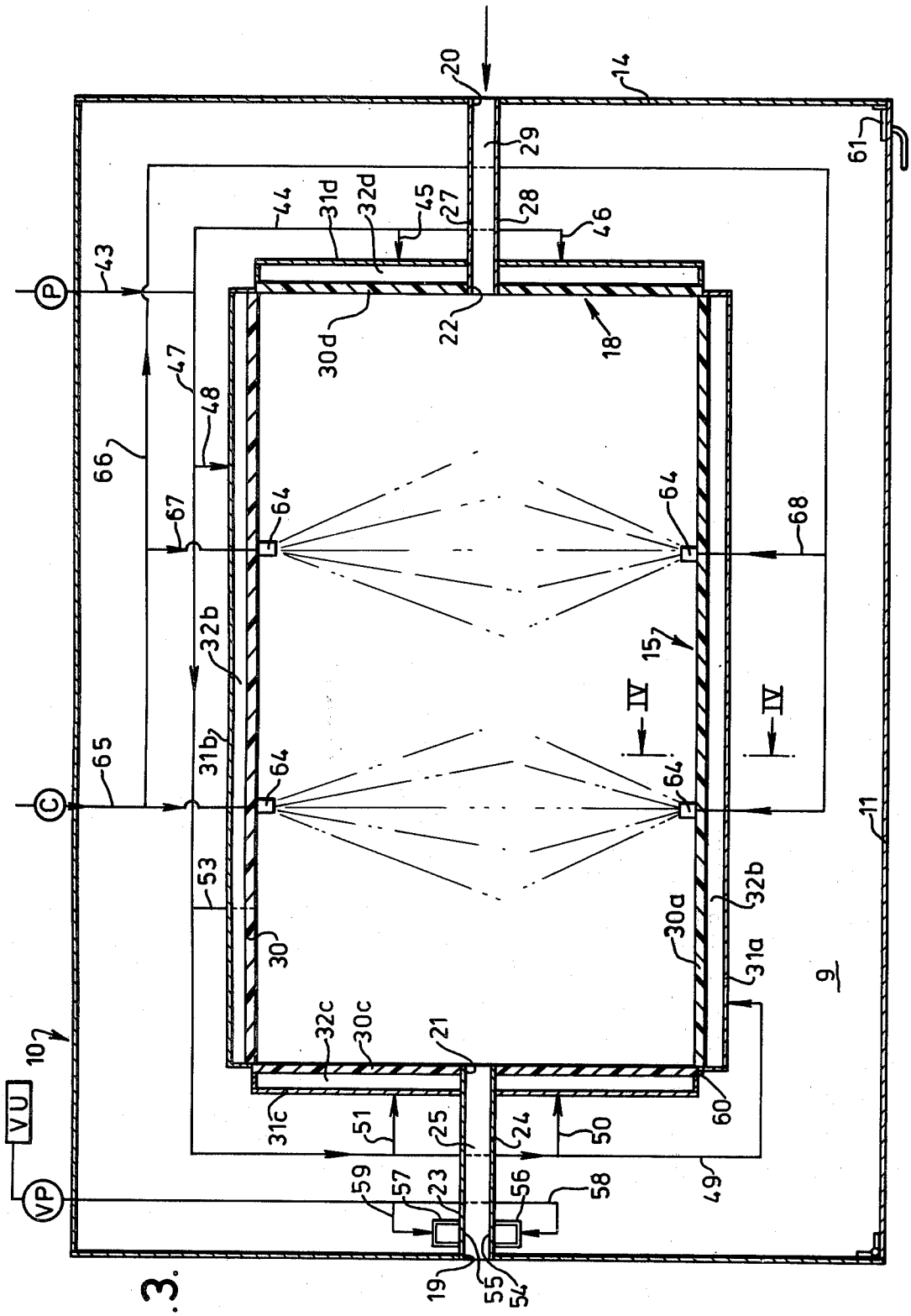
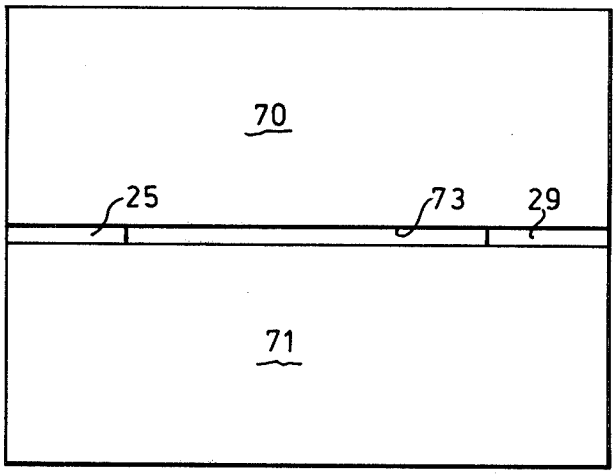

20
14
29
61
44
31d
32d
45
27
28
46
43
P
30d
22
18
47
48
66
67
64
64
68
32b
15
IV
IV
65
31b
64
64
C
11
53
32b
30a
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31a
9
32c
30c
21
10
VU
31c
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50
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VP
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FIG. 3.

FIG. 2.



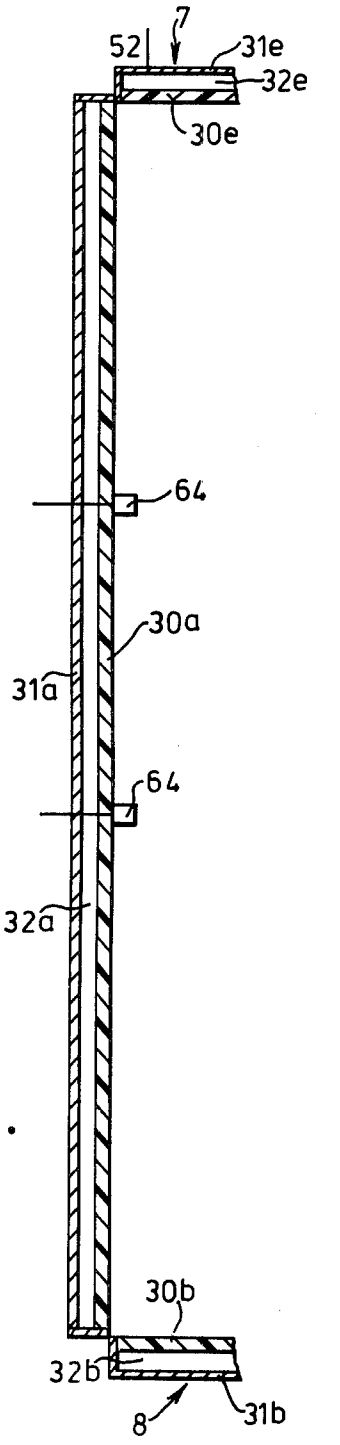


FIG. 4.

SPRAY BOOTH

The present invention relates to spray booths, and is particularly, but not exclusively, useful in connection with spray booths employed for the electrostatic spraying of powder paints.

In the spraying of powder paints, workpieces suspended on an overhead conveyor are moved by the conveyor in sequence through a spray booth. Within the spray booth, powder paint ejected from a spray gun, and electrostatically charged on ejection from the gun, is deposited on the workpieces, which are subsequently conveyed from the spray booth through an oven where the deposited powder paint is heated to cure the paint.

The spray guns employed to deposit the powder paint on the workpieces within the spray booth may be fixed in position or automatically reciprocated in the spray booth or may be held in the hand of an operator standing outside the spray booth and reaching through an opening in one side of the spray booth.

A portion of the spray powder ejected from the spray gun does not become deposited on the workpieces, and tends to drift about in the spray chamber and may eventually become deposited on the walls and the bottom of the spray chamber. Periodically, it is necessary to remove the powder which has become deposited on the walls or the bottom of the spray chamber, in order to prevent an excessive build-up of such deposited powder and also in order to avoid contamination when, having employed a powder paint of one color or polymer, it is desired to change over to utilization of a powder paint of a different color or polymer.

The removal of the powder deposited on the walls and the bottom of the spray chamber necessitates the spray booth being inoperative for considerable lengths of time.

It is accordingly an object of the present invention to provide a novel and improved spray booth through which articles to be sprayed can be moved on a conveyor and in which deposition of sprayed but unused paint powder on the walls of the spray booth is counteracted.

According to the present invention, a spray booth comprises a plurality of walls defining a spray chamber, at least one of said walls comprising a wall panel having one side facing inwardly of said spray chamber, said wall panel comprising a porous material, an enclosure of gas-impervious material at the opposite side of said wall panel and secured in sealed relationship to said wall panel to form with said panel a gas chamber, and means for supplying gas under pressure into said gas chamber.

In operation, gas, preferably air, supplied under pressure into the gas chamber passes through the porous material of the wall panel into the spray chamber. The effect of the passage of gas from the side of the wall panel facing inwardly of the spray chamber is to carry away from the wall panel the majority, if not all, of any sprayed but unused particles of paint powder drifting around within the spray chamber. In this way, deposition of such sprayed but unused paint powder particles on the wall panel is effectively counteracted.

The spray chamber is defined by a top, a bottom and four vertical walls forming the front, rear and side walls of the spray chamber, and each having a wall panel comprising a porous material and an enclosure of gas-impervious material on the opposite side of the wall panel to the spray chamber. An opposed pair of the walls are formed with openings from the passage through the spray booth of a conveyed workpiece. Opposed walls of an outer housing, spaced outwardly of the spray chamber walls, are also formed with openings for the passage of conveyed workpieces or one or more openings for workpieces introduced into the spray chamber by hand or on a trolley, and the openings of the opposed walls of the outer housing are joined by the partitions to the openings of the spray chamber walls, the partitions forming inlet and outlet passages for the workpieces. The partition walls of the outlet passage are formed with slots, through which gas is discharged under pressure or drawn by vacuum to form a gas curtain across the outlet passage, which prevents leakage from the outer housing of sprayed but unused paint particles.

The invention will be more readily understood from the following description of the preferred embodiment thereof given by way of example with reference to the accompanying drawings, in which:

FIG. **1** shows a diagrammatic view, taken in perspective, of a spray booth with the cover of the spray booth omitted to facilitate illustration of the interior of the spray booth;

FIG. **2** shows a plan view of the spray view of FIG. **1** with the cover of the spray booth in position;

FIG. **3** shows a plan view taken in horizontal section through the spray booth of FIGS. **1** and **2**; and

FIG. **4** shows a view taken in section through one wall of the spray chamber along the line IV—IV of FIG. **3**.

Referring firstly to FIGS. **1** to **3** of the accompanying drawings, the spray booth illustrated in those figures has an outer housing which is indicated generally by reference numeral **10** and which is made of sheet metal.

The outer housing **10** has a front wall in the form of a pivoted door **11**, a rear wall **12**, opposed side walls **13** and **14**, a bottom **9** and a cover formed in two separate halves **70** and **71** and an opening (not shown) may be provided for the egress of powder overspray.

Spaced inwardly of the walls of the housing **10**, there is a spray chamber having, as shown in FIGS. **1** and **4**, a front wall **15**, a rear wall **16**, opposed side walls **17** and **18**, a top **7** and a bottom **8**, of which the latter two are shown partly broken away in FIG. **4**.

The side walls **13** and **14** of the outer housing **10** are formed with openings in the form of vertical slots **19** and **20**.

The side walls **17**, **18** of the spray chamber are formed with two corresponding openings in the form of vertical slot **21**, **22**. Partition walls **23**, **24** and **25** extend between the slot **19** in the wall **13** of the outer housing **10** and the slot **21** in the wall **17** of the spray chamber. The partition walls **23**, **24** and **25** form an upwardly open outlet passage for the purpose described hereinafter.

Similarly, the slot **20** in the outer housing wall **14** and the slot **22** in the spray chamber wall **18** are joined by partition walls **27**, **28** and **29**, forming an upwardly-open inlet passage.

The walls **15**, **16**, **17** and **18**, the top **7** and the bottom of the spray chamber are formed by wall panels **30***a* to **30***f* extending around the spray chamber. Each of these wall panels has an inner face facing inwardly of the spray chamber and, at its opposite side, an outer face which is surrounded by a gas-impervious enclosure **31***a*

to 31*f*, respectively. The enclosures 31*a* to 31*f* are made of sheet metal and form, together with the wall panels 30*a* to 30*f*, gas chambers 32*a* to 32*f*.

The wall panels 30*a* to 30*f* are made of a porous material. This porous material may, for example, comprise porous polyvinylchloride, ceramic material or a porous asbestos, which may be in the form of webbing or matting, and accordingly it is to be understood that the expression "panel" as employed in this disclosure and in the following claims is not intended to be restricted to rigid or self-supporting panels but may include panels of a flexible material such as webbing or matting.

A compressed air pump, illustrated diagrammatically at P, is connected by pipelines 43 to 53 to the interiors of the gas chambers 32*a* to 32*f* for supplying air under pressure into the latter.

The partition walls 23 and 24 of the outlet passage are formed with vertical, opposed suction slots 54 and 55. Channel-shaped housing 56 and 57 are provided over the slots 54 and 55, respectively, at the outer sides of the outlet passage partition walls 23 and 24 for applying a partial vacuum to the suction slots 54 and 55. The vacuum is applied to the interiors of the channel-shaped housings 56 and 57 by pipes 58 and 59 extending from a vacuum pump VP, which is connected to a vacuum unit VU for collecting powder drawn in through the slots 54 and 55.

The spray chamber front wall 15 is secured by vertical hinges, of which one is illustrated in FIG. 3 and indicated by reference numeral 60, to the spray chamber wall 17 and is pivotable from the position in which it is shown in FIG. 3 into an opened position to permit access to the interior of the spray chamber. Alternatively, the spray chamber could be provided with a horizontally pivotal door (not shown). It will, of course, be appreciated that the door 11 forming the front wall of the outer housing 10 must be opened before the spray chamber door formed by the wall 15 can be fully opened. A latch 61 of any suitable type is provided for securing the outer housing door 11 in its closed position.

Spray nozzles 64 are mounted on the inner sides of the spray chamber walls 15 and 16 for discharging a spray of powder paint across the central portion of the spray chamber from opposite sides thereof. The spray powder, entrained in a stream of compressed air, is supplied to the spray nozzle 64 through pipelines 65 to 68, the powder being picked up in the stream of compressed air from a hopper (not shown) by means of a powder pickup device illustrated diagrammatically by C.

As can be seen from FIG. 2, the cover of the spray booth is provided as two separate halves 70 and 71, which are spaced apart by a gap 73. The gap 73, which extends across the whole of the spray booth and through the top 7 of the spray chamber, is disposed directly above and in alignment with the inlet and outlet passages defined by the partition walls 23, 24, 27 and 28. The purpose of these inlet and outlet passages and of the gap 73 is to allow a workpiece 74, shown in FIG. 1, to be carried on an overhead conveyor through the spray chamber, spraying of opposite sides of the workpiece 74 being effected by the spray guns 64 during the passage of the workpiece 74 through the spray chamber.

Suction slots (not shown) corresponding to the suction slots 54 and 55, and associated housings (not shown) corresponding to the housings 56 and 57 may be provided horizontally along the gap 73 and vertically along the slot 20 to further assist in preventing the egress of excess powder.

In the present embodiment of the invention, the spray booth is intended for use with workpieces, such as the workpiece 74, in the form of vertically extending plates, and accordingly the inlet and outlet passages between the walls of the spray chamber and the outer housing 10 are formed as upwardly open vertical slots. However, it will of course be appreciated that the invention is in no way restricted to such workpiece or passage shapes, and that the shapes and disposition of the inlet and outlet passages for the workpieces may be varied in dependence on the shape of the workpieces which are to be sprayed and may, for example, take the form of horizontal slots. Also, the workpiece could be rotated as it is sprayed. Moreover, the invention is not restricted to closed spray booths such as that illustrated in the accompanying drawings, but may with advantage also be employed in spray booths of the type which are formed with an opening in one side through which spraying is effected by an operator manually supporting a spray gun, or indeed in spray booths in which workpieces are stationary instead of being supported by a conveyor.

In operation, workpieces such as the workpiece 74 are fed in succession through the inlet and outlet passages and the spray chamber, and thence through an oven for heating powder paint sprayed and electrostatically deposited on the workpieces in the spray chamber. During such operation, compressed air is supplied to the gas chambers 32*a* to 32*f* from the pump P through the pipelines 43 to 51. The compressed air thus supplied to the interiors of the gas chambers 32*a* to 32*f* passes through the porous wall panels 30*a* to 30*f* and counteracts deposition thereon of spray powder discharged by the spray guns 64 and not deposited on the workpieces. Such unused sprayed powder may be collected by a hopper (not shown) at the bottom of the spray booth and recirculated to the spray guns 64.

The sprayed but unused powder within the spray chamber is prevented from escaping from the spray booth through the outlet passage by being drawn through the vacuum slots 54 and 55 in the outlet passage partition walls 23 and 24 and collected in the vacuum unit VU.

It has been found in practice that the passage of the compressed air through the porous wall panels 30*a* to 30*f* materially reduces deposition of the paint powder on these wall panels, and in this way facilitates cleaning of the interior of the spray booth, and is of particular advantage in enabling rapid changeover from powder paint of one color to powder paint of another color without contamination of the workpieces by powder paint of the intially or previously employed color. In this way, the time required to change over from the use of one powder paint color to a different powder paint color can be substantially reduced, so that undesirably long periods during which the spray booth cannot be employed due to changeover of powder paint color are avoided.

I claim:

1. A spray booth comprising:

a top, a bottom and a plurality of walls defining a spray chamber;

at least one of said walls comprising a wall panel having one side facing inwardly of said spray chamber;

said wall panel comprising a porous material;

an enclosure of gas-impervious material at the opposite side of said wall panel and secured in sealed relationship to said wall panel to form with said panel a gas chamber;

means for supplying gas under pressure into said gas chamber;

an outer housing spaced outwardly of said walls;

an opposed pair of said walls and opposed walls of said outer housing defining upwardly open openings for the passage of a conveyed workpiece through said spray booth and through said spray chamber; and

partition walls extending from the openings in said opposed spray chamber walls to said opposed outer housing walls and forming an inlet passage and an outlet passage for movement of the workpiece to and from the interior of said spray chamber.

2. A spray booth as claimed in claim **1**, wherein said porous material comprises porous asbestos.

3. A spray booth as claimed in claim **1**, wherein said porous material comprises porous polyvinylchloride.

4. A spray booth as claimed in claim **1**, wherein said partition walls of the outlet passage define suction slots, and means are provided for applying a partial vacuum to said suction slots to suck unused spray material from said outlet passage.

5. A spray booth comprising:

a top, a bottom and four walls defining a spray chamber, said four walls forming front, rear and side walls of said spray chamber;

each of said top, said bottom and said four walls comprising a panel having one side facing inwardly of said spray chamber;

each of said panels comprising a porous material;

at least one enclosure of gas-impervious material at the opposite side of each of said panels; said enclosures being secured in sealed relationship to the respective panels to form, with said panels, gas chambers;

means for supplying gas under pressure into said gas chambers;

an outer housing spaced outwardly of said walls;

an opposed pair of said walls and opposed walls of said outer housing defining upwardly open openings for the passage of a conveyed workpiece through said spray booth and through said spray chamber; and

partition walls extending from the openings in said opposed spray chamber walls to said opposed outer housing walls and forming an inlet passage and an outlet passage for movement of the workpiece to and from the interior of said spray chamber.

6. A spray booth as claimed in claim **5**, wherein said enclosures are formed by sheet metal sealingly secured to said panels, and said porous material comprises a rigid, self-supporting material.

7. A spray booth as claimed in claim **5**, wherein an opposed pair of said walls define openings for the passage of a conveyed workpiece through said spray chamber, and at least one spray gun is mounted within said spray chamber.

8. A spray booth as claimed in claim **5**, wherein one of said walls comprise a door pivotable into an open position to allow access to the spray chamber.

9. A spray booth as claimed in claim **5**, wherein said walls are spaced inwardly of an outer housing.

10. A spray booth as claimed in claim **5**, wherein said porous material comprises porous asbestos.

11. A spray booth as claimed in claim **5**, wherein said porous material comprises porous polyvinylchloride.

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