

[54] POWDER SPRAY BOOTH

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[51] Int. Cl. B05c 11/16, B05c 5/00

[58] Field of Search 98/115 R, 115 SB; 118/326, 118/634, DIG. 7

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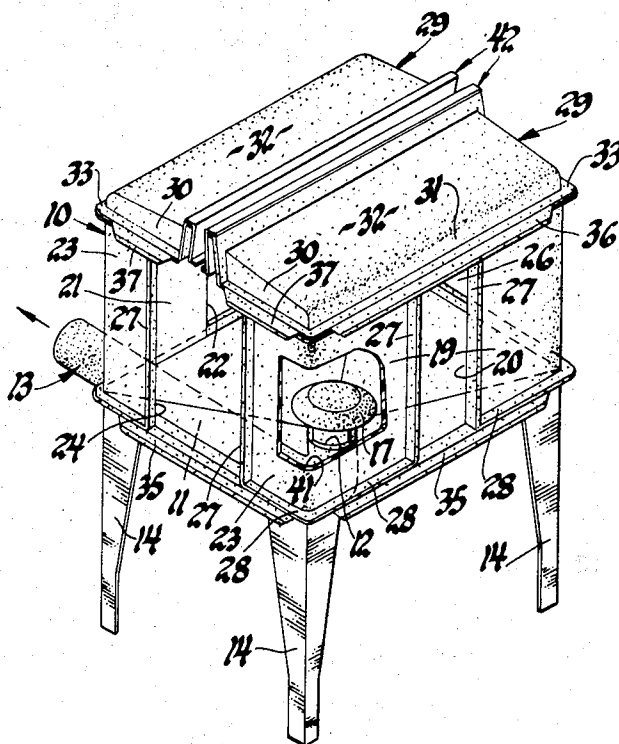
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Assistant Examiner—Henry C. Yuen
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[57] ABSTRACT

A powder spray booth for use with an electrostatic powder spray gun for coating objects in an electrostatic field as said objects are passed through the booth. The booth includes a bottom panel on which is fixedly mounted a front panel, a rear panel and a pair of side panels. A top panel is operatively mounted on top of the last-named panels. All of the aforementioned panels are made from molded fireproof fiber glass material. Each of the side panels is integrally connected to the adjacent front and rear panels by rounded corner portions. The top and bottom panels are each provided with rounded corners. Each of the side walls is provided with an opening for the passage therethrough of a workpiece to be sprayed with powder. The front panel has an opening for admitting a powder spray gun for spraying the workpiece. At least one powder outlet opening is provided in one of the panels. The top panel has a longitudinal opening for the passage therethrough of a supporting means for the workpiece, and a metallic powder collecting means, at ground electrical potential, is disposed around each side of said longitudinal opening in the top panel.

11 Claims, 14 Drawing Figures



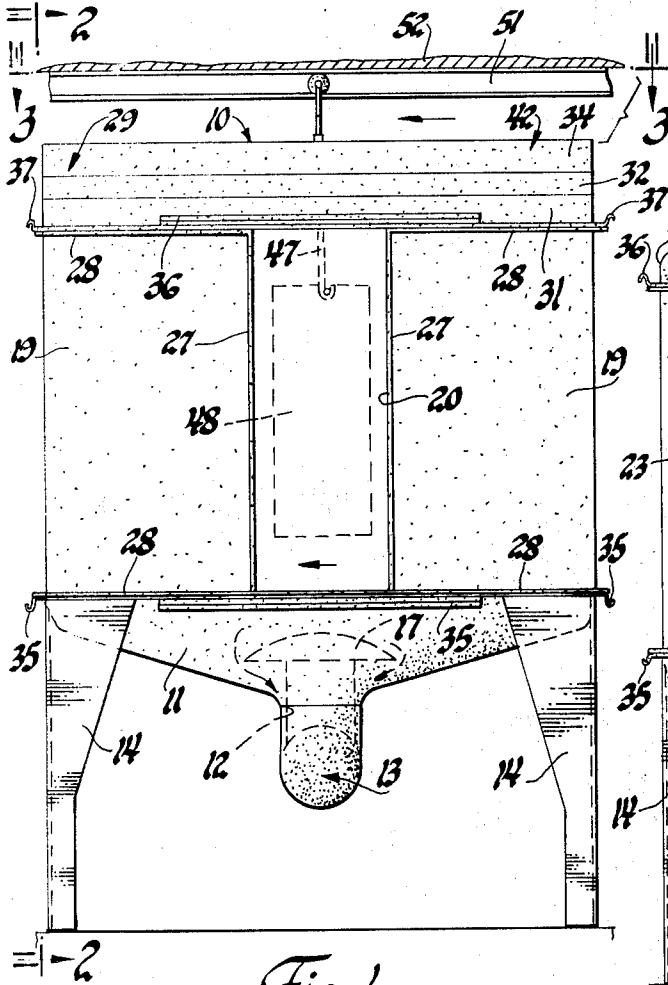


Fig. 1

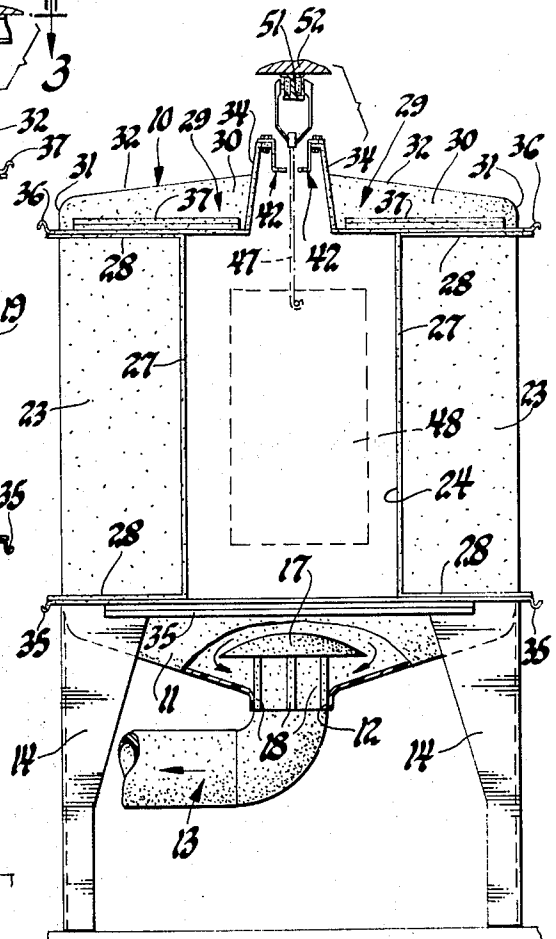


Fig. 2

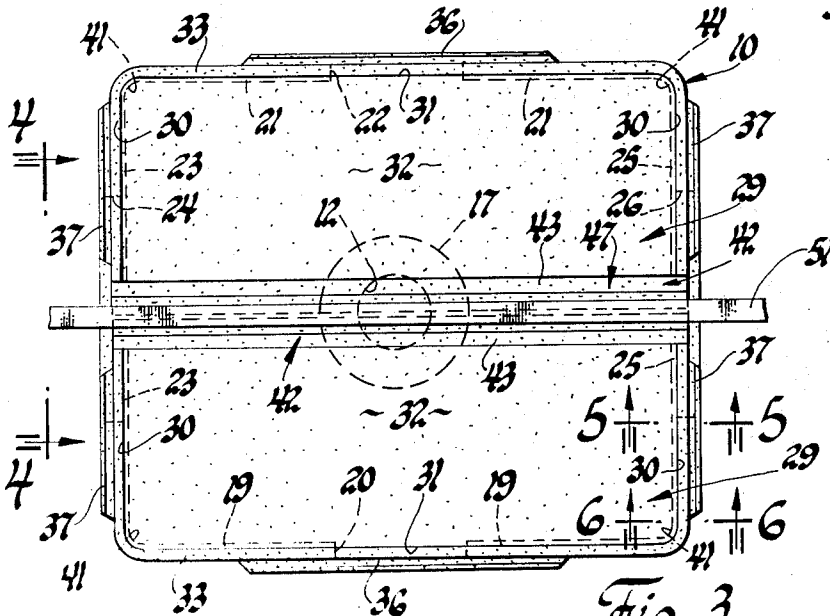


Fig. 3

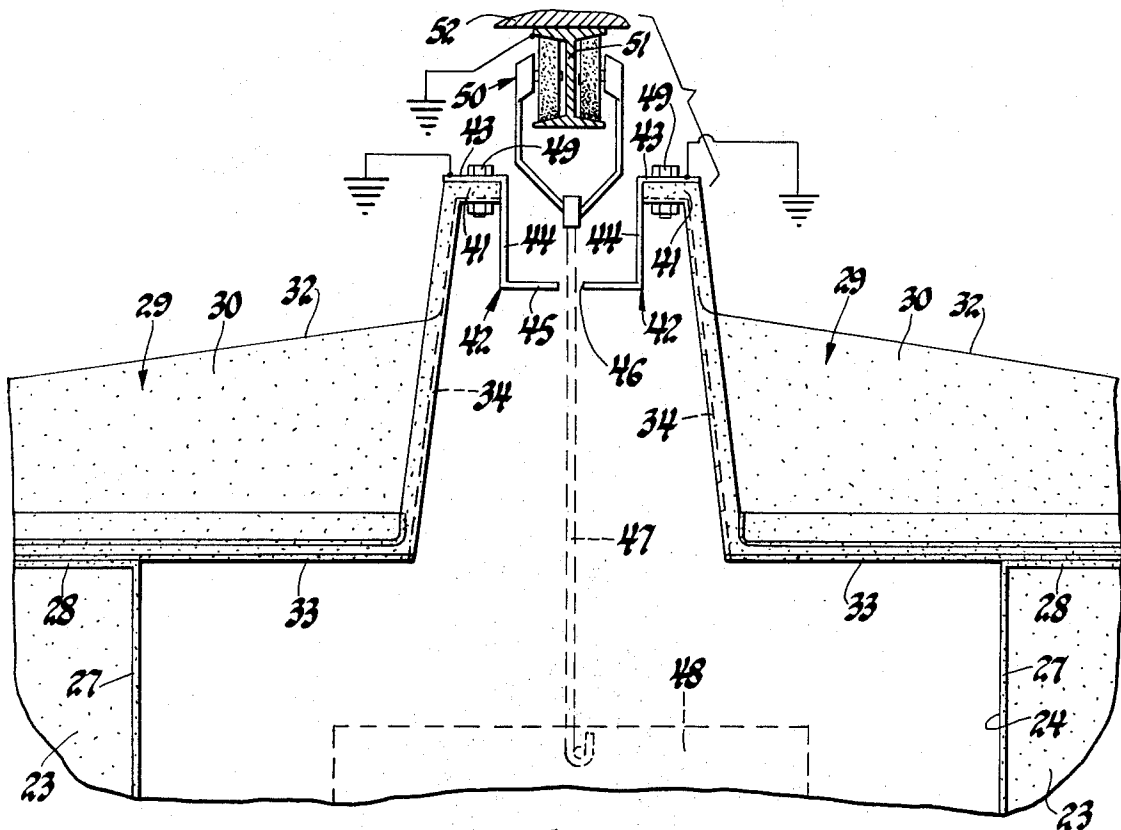


Fig. 4

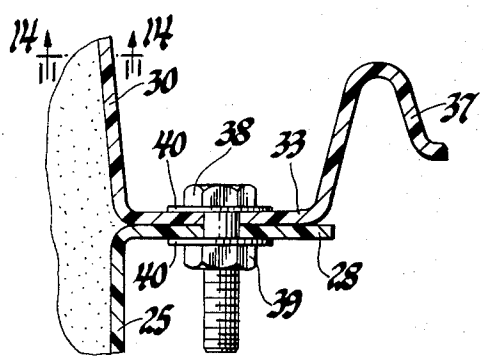


Fig. 5

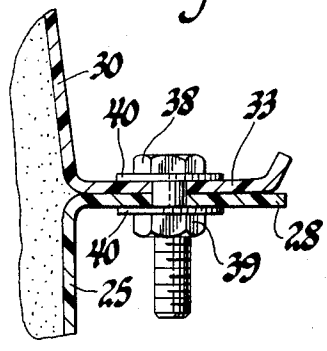


Fig. 6

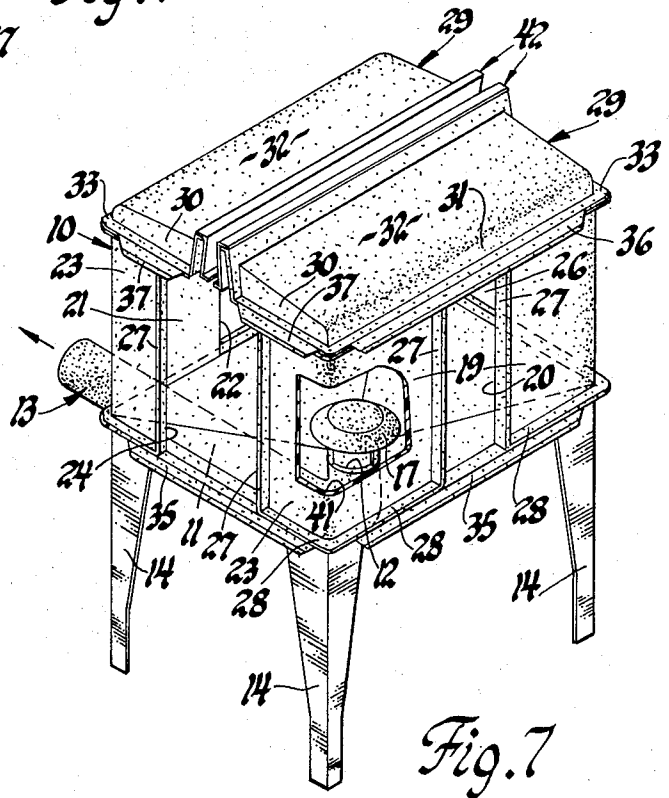


Fig. 7

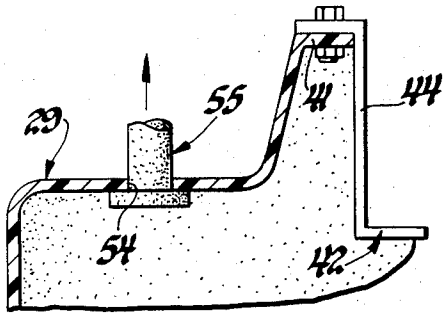


Fig. 8

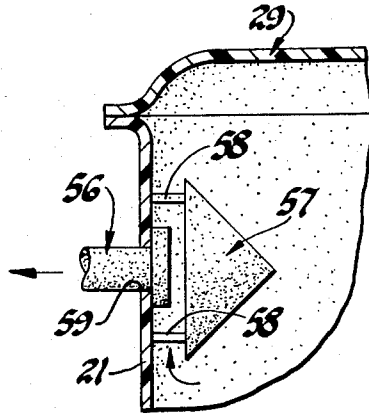


Fig. 9

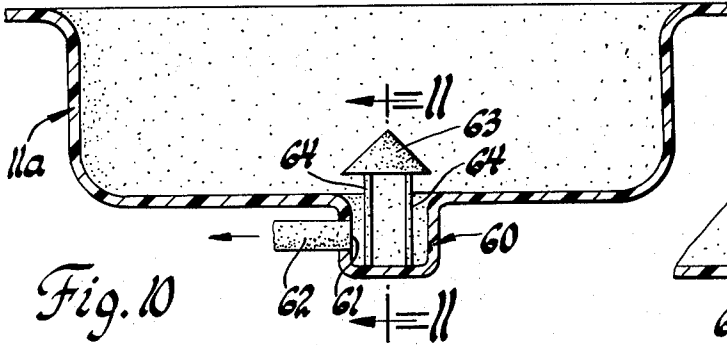


Fig. 10

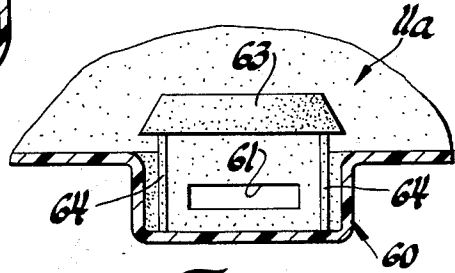


Fig. 11

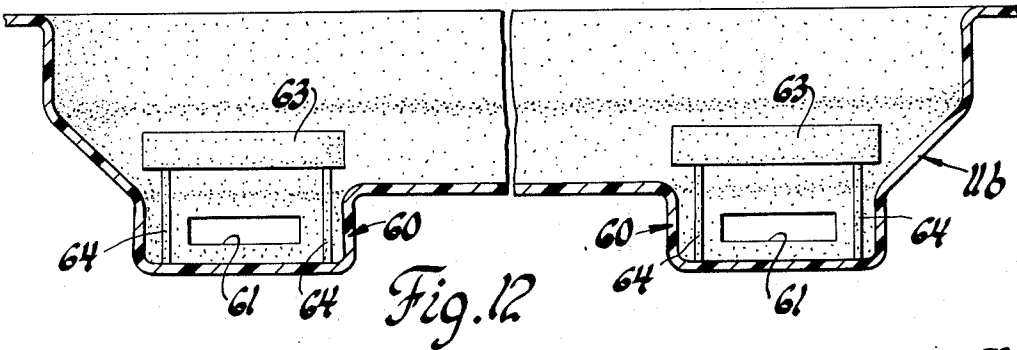


Fig. 12

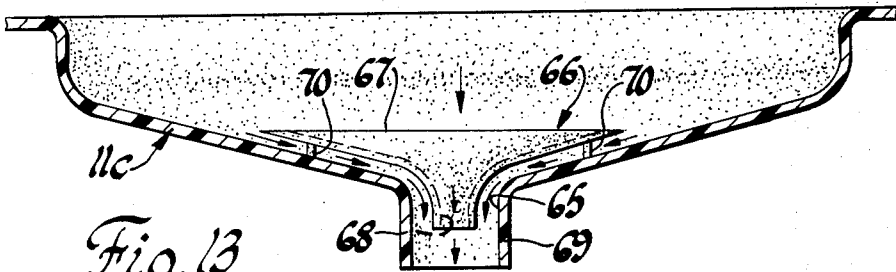


Fig. 13

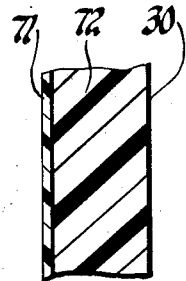


Fig. 14

POWDER SPRAY BOOTH

SUMMARY OF THE INVENTION

The art of electrostatic power coating is well known, and it comprises coating objects in an electrostatic field with particles of ionized powder, as paint powder. The powder is sprayed on said object by an electrostatic powder-spraying apparatus. The object to be sprayed is disposed in a powder spray booth where it is coated while being held stationary or while moving slowly through the booth.

Heretofore powder spray booths have been made of metal, and a disadvantage of such metal booths is that they are dangerous because the powder or dust builds up on the inner surface of the walls and causes fires because the metal will accept an electrical charge and act as a capacitor. Then if the ground connection is accidentally severed a discharge occurs and the electrical charge coupled with the oxygen between the dust particles causes a fire.

A further disadvantage of the prior art powder spray booths is that they have sharp corners between the various panels thereof which makes it difficult to clean the inside of a booth when changing from one colored powder to another. A further disadvantage of the prior art spray booth is that when a part is over the powder outlet opening that is connected to a suitable powder collecting means, the velocity of the powder is such that it does not adequately cover the bottom area of an object being coated, because the powder is short-circuited from the powder spraying apparatus and it passes directly to the outlet. A further disadvantage of the prior art spray booths is that they are noisy. A still further disadvantage of the prior art spray booths is that powder is lost through the opening in the top panel of the booth through which is extended the object or workpiece supporting means.

In view of the foregoing, it is an important object of the present invention to provide a novel and improved powder spray booth which overcomes the aforementioned disadvantages of the prior art spray booths.

It is another object of the present invention to provide a novel and improved powder spray booth which is made of a plurality of molded parts which are operatively connected together, and which are each made from fireproof fiber glass material which will not accept an electrical charge.

It is a further object of the present invention to provide a novel and improved powder spray booth which is provided with round corners which will not trap powder, and which makes cleaning of the booth an easy and quick job when it is desired to change from one colored powder to another colored powder.

It is still another object of the present invention to provide a novel and improved spray booth which is provided with deflector means over the powder outlet opening which reduces the noise level in the booth, and which controls the airflow through the booth so that the powder is distributed more evenly over certain parts as, for example, short, vertical parts being coated in the booth and where they are moved close to the bottom panel.

It is a still further object of the present invention to provide a novel and improved powder spray booth which is provided with a metallic grounding shield along a longitudinal opening in the top panel of the booth through which is extended the object or work-

piece supporting means, whereby any ionized powder that tries to escape from the booth through said opening in said top panel will be attracted to the grounding shield and be captured. The grounding shield comprises two grounded plates that extend the full length of the booth.

Other objects, features and advantages of this invention will be apparent from the following detailed description, appended claims and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front elevational view of a powder spray booth made in accordance with the principles of the present invention.

FIG. 2 is a left-side elevational view of the structure illustrated in FIG. 1, taken along the line 2—2 thereof, and looking in the direction of the arrows.

FIG. 3 is a top plan view of the structure illustrated in FIG. 1, taken along the line 3—3 thereof, and looking in the direction of the arrows.

FIG. 4 is a fragmentary, enlarged, left-side elevational view of the structure illustrated in FIG. 3, taken along the line 4—4 thereof, and looking in the direction of the arrows.

FIG. 5 is a fragmentary, enlarged, elevational section view of the structure illustrated in FIG. 3, taken along the line 5—5 thereof, and looking in the direction of the arrows.

FIG. 6 is a fragmentary, enlarged, elevational section view of the structure illustrated in FIG. 3, taken along the line 6—6 thereof, and looking in the direction of the arrows.

FIG. 7 is an elevational, perspective view of the powder spray booth illustrated in FIGS. 1 through 4.

FIG. 8 is a fragmentary, elevational section view through the top panel of the booth, and showing the provision of a dust outlet opening without a baffle.

FIG. 9 is a fragmentary, elevational section view of the side panel of the booth of the present invention, and showing the provision of a dust outlet opening through the booth side panel.

FIG. 10 is a fragmentary, elevational section view through the bottom panel of a booth, made in accordance with the principles of the present invention, and showing the provision of a dust outlet opening through the side of a depression formed in the bottom panel.

FIG. 11 is an elevational section view of the structure illustrated in FIG. 10, taken along the line 11—11 thereof, and looking in the direction of the arrows.

FIG. 12 is a fragmentary, elevational section view through a bottom panel employed in the present invention, and showing the use of two dust outlet openings in the bottom panel of a spray booth.

FIG. 13 is a fragmentary, elevational section view of a bottom panel of a spray booth made in accordance with the principles of the present invention, and showing the use of a venturi type dust outlet means.

FIG. 14 is a fragmentary, elevational section view through the top panel of the spray booth.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, and in particular to FIGS. 1, 2, 3 and 7 wherein a first embodiment of the invention is illustrated, the numeral 10 generally designates a powder spray booth made in accordance with

the principles of the present invention. The booth 10 includes a bottom panel 11 which has downwardly sloping portions that terminate in a centrally disposed powder outlet opening 12. Operatively connected to the powder opening outlet 12, by any suitable means, is a conduit means, generally indicated by the numeral 13, which is adapted to be connected to a suitable powder collector means. The bottom panel 11 is rectangular in plan configuration and it is provided with a suitable support means. The support means for the bottom panel 11 includes four vertical, angle-shaped support legs 14 which are attached to the corners of the bottom panel 11 by any suitable means. The support legs 14 are made from any suitable material, as a metal or a suitable plastic. The bottom panel 11 is made from a molded fireproof fiber glass material.

As shown in FIGS. 1, 2, 3 and 7, a powder deflector means is disposed over the powder outlet opening 12 in a position spaced upwardly from the bottom panel 11. The illustrated deflector means 17 is circular in plan configuration, and it is convex or saucer-shaped, as viewed from the side thereof. The deflector means 17 is provided with means for supporting it in said spaced position from the bottom panel 11 which includes a plurality of vertically disposed and peripherally spaced apart legs 18. The deflector means 17 and supporting legs 18 are preferably made from the same material from which the bottom panel 11 is made. The supporting legs 18 are secured to the deflector means 17 and to the bottom panel 11 in positions spaced around the opening 12, by any suitable means, as, for example, by a suitable adhesive. The deflector means 17 is larger in diameter than the powder opening outlet 12. For example, in one embodiment the powder opening outlet 12 was formed with a 10 inch diameter and the deflector means 17 was formed with a 25 inch diameter, and the lower end thereof was spaced upwardly 6 inches from the outlet 12.

The booth 10 is provided with a front panel comprising a pair of spaced apart panel portions 19 which are separated by a vertical opening 20. The booth rear panel is formed identical to the booth front panel and comprises a pair of panel portions 21 which are spaced apart by a vertical opening 22. The booth left side panel comprises a pair of panel portions 23 which are spaced apart by a vertical opening 24. As shown in FIG. 3, the booth 10 includes a right side panel comprising a pair of panel portions 25 which are spaced apart by a vertical opening 26. The aforementioned front, rear and side panel portions are each provided with vertical flanges 27 along their vertical free edges and with horizontal flanges 28 along their horizontal free edges. As shown in FIG. 3, each of the side panels is integrally connected to the respective adjacent front and rear panels by rounded corner panel portions.

As best seen in FIGS. 3 and 7, the booth 10 includes a top panel which is formed by a pair of integrally formed top panel portions generally indicated by the numeral 29. Each of the top panel portions 29 includes two longitudinally spaced apart vertical side walls 30, a vertical outer wall 31, an inwardly and upwardly sloping top wall 32, and an inwardly and upwardly sloping flange 34 (FIG. 4). A flange 33 is formed around the lower periphery of the side walls 30 and the outer wall 31. As best seen in FIGS. 3 and 7, each of the top panel portions 29 is provided with outwardly extended eaves 37 along the side edges of the flanges 33, and outwardly

extended eaves 36 along the front and rear flanges 33. The bottom panel 11 is provided with outwardly extended eaves 35 at the lower ends of the openings 20 and 24 between the various panel portions.

The front, rear, and side panels are made from the same molded fireproof fiber glass material from which the bottom panel 11 is made. The various before-described panels are fixedly secured together by any suitable means, as, for example, by suitable bolt and nut means as shown in FIGS. 5 and 6. FIGS. 5 and 6 illustrate the use of a bolt 38, a nut 39, and a pair of washers 40 to secure the flanges 33 and 28 of an upper panel portion 29 and right-side panel. The bolt 38 passes through suitable apertures in the flanges 28 and 33. The top panel portions 29 are connected to the front, rear and side panels by the bolt and nut means shown in FIGS. 5 and 6. The bottom panel 11 is also connected to the front, rear and side panels in the same manner.

As indicated by the numeral 41, in FIGS. 3 and 7, the side panel portions are integrally connected to the front and rear panel portions by rounded inner corners. The various wall portions comprising the top panel portions 29 are also integrally interconnected with rounded corners. The rounded corners at the meeting points between the various wall portions makes it easier to clean the booth every time a customer wants to change paint colors. The fiber glass wall panels also will not accept any electrical charge, whereas, on the other hand, a metal booth will accept the charge to a point and act as a capacitor and then discharge, possibly causing an explosion. The fiber glass panels provide a safer booth.

The powder deflector means 17 distributes the air more evenly over the inlet opening 12. Accordingly, certain workpiece parts which are short in length moved through the booth near the bottom panel 11 are more evenly coated, since the paint powder is not short-circuited past the workpiece part. The deflector means 17 also decreases the noise level in the booth and functions as a noise suppressing means.

As best seen in FIGS. 4 and 7, the booth of the present invention is provided with a longitudinally extended metal grounding shield means along the top thereof between which the workpieces to be sprayed are moved. As best seen in FIG. 4, the top panel peripheral flanges 34 converge and they are each provided on their upper end with a horizontal, inwardly extended flange 41. Operatively connected to the flanges 41 are a pair of metal grounding shield members generally indicated by the numerals 42. The shield members 42 each comprise a substantially S-shaped elongated metal member which includes an upper horizontal flange 43 that is operatively mounted on the upper side of one of the flanges 41. The shield members 42 further include an integral, downwardly and inwardly extended vertical flange or plate 44, and a lower horizontal flange 45 which is integrally formed on the lower end of the plate 44. The inner ends of the flanges 45 are spaced apart by the longitudinal slot 46 through which is adapted to pass the conventional workpiece supporting hooks or other suitable means 47. The hooks 47 carry workpieces 48 through the booth, from the right side of the booth toward the left side of the booth, as indicated by the arrow in FIG. 1.

The shield members 42 are attached to the top panel wall flanges 41 by any suitable means, as by a plurality

of bolt and nut means 49. As shown in FIG. 4, each of the metal grounding shield members 42 is grounded. As shown in FIG. 1, a conventional workpiece hook 47 is operatively mounted on a conventional conveyor trolley apparatus, generally indicated by the numeral 50, which is rollably mounted on a conventional conveyor rail 51, that is fixedly secured to a suitable overhead support means 52, as the overhead of a building and the like. As shown in FIG. 4, the conveyor rail 51 is also grounded.

The two shield members 42 are made from any suitable metal, as for example, they may be rolled from sheets of mild steel. The opening or slot 46 is approximately 1 inch in width. It will be seen that any charged paint powder sprayed into the booth towards workpieces 48 which happens to escape or tries to escape from the booth through the slot 46 will be attracted to the shield members 42 and the paint powder thus will not escape into the room in which the booth is situated. The ionized cloud of paint powder in the booth will be attracted to the grounded shield members 42 if there are not any parts 48 in the booth. The grounded shield members 42 run the full length of the booth.

FIG. 8 is a fragmentary elevational section view of the booth top panel 29, and illustrating the provision of a powder outlet opening 54 formed in the booth top panel. A suitable duct 55 is operatively mounted in the opening 54, and is connected to a suitable dust collecting means. The opening 54 is shown without a deflector means, but it will be understood that any suitable deflector means or baffle may be provided, as for example, the baffle of FIG. 2.

FIG. 9 is a fragmentary elevational section view of the side panel 21 of the booth of the present invention, and showing a powder collecting or outlet duct 56 mounted in a suitable powder outlet opening 59 in the booth side panel 21. The outlet duct 56 would be connected to a suitable dust collecting means. A suitable conical baffle or deflector means 57 is shown as being fixedly mounted by suitable supports 58 over the outlet opening 59. It will be understood that the dust outlet opening 59 and duct 56 illustrated in FIG. 9 could also be used without the baffle 57.

FIGS. 10 and 11 illustrate the use of a rectangular powder outlet opening formed in a depression or sump 60 in the middle of the bottom panel 11a. A dust outlet opening 61 is formed through one of the side walls of the sump 60, and it is operatively connected to a rectangular duct 62 which is adapted to be connected to a suitable dust collecting means. A suitable elongated triangular baffle or deflector means 63 is supported above the opening 61 by suitable support members 64. It will be understood that the outlet opening 61 could also be employed without the use of the baffle 63.

FIG. 12 is a fragmentary elevational section view through a bottom panel 11b which may be used in the invention, and which is provided with two sumps 60 and two of the dust outlet openings 61.

FIG. 13 is an elevational section view through the booth bottom panel 11c which may be used with the present invention. A dust outlet opening 65 is formed in the bottom of the panel, and operatively mounted thereover is an inverted conically shaped funnel member 66 having an open upper end 67 and an open lower end 68. It will be seen that the dust passing downwardly through the venturi member of funnel member 66 creates a venturi effect between the funnel 66 and the side

walls of the opening 65 so as to assist in the collection of powder or dust in the spray booth, and for passing the same into the dust collecting duct 69 which would be connected to a suitable dust collecting means.

FIG. 14 is a section view through the wall of the top panel 30 and it shows the formation or structure in detail of the fireproof fiber glass material employed in forming the booth panels.

All of the booth panels are formed from a fireproof fiber glass material so as to make the spray booth fireproof. The gel used in making the panels is a halogenated unsaturated polyester resin possessing self extinguishing properties. A suitable fireproof gel is one available from Koppers, Inc. of Pittsburgh, Pennsylvania, and is a polyester resin sold under the catalogue number 3465-5. The various panels of the booth are formed by first spraying molding panels with the aforementioned gel provided with a particular pigment as, for example, a white pigment. A thin gel layer is made to a depth of approximately 15 mils of an inch thick. This first thin layer is then covered by a thick second layer consisting of the same resin with the addition of a wax hardener, glass fibers and a separate color pigment, if desired, as green. The wax in the second layer rises to the surface to create a thin wax film allowing the resin to cure. The resultant fireproof material is noncombustible and it is a non-conductor.

In FIG. 14, the numeral 71 designates the white thin layer of fireproof material and the numeral 72 designates the green thick layer of fireproof material. The booth panels are thus formed by a two-step method. It will be understood that any colors may be employed.

In use, the workpiece parts to be sprayed with paint powder are moved into the booth at the right side thereof, as shown in FIG. 1. The operator extends his conventional powder spray gun into either of the openings 20 and 22 and sprays the workpiece parts 48 as they are moved through the booth.

While it will be apparent that the preferred embodiments of the invention herein disclosed are well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change.

What is claimed is:

1. A powder spray booth comprising:

- a. a bottom panel;
- b. support means attached to said bottom panel;
- c. a vertically disposed front panel, a vertically disposed rear panel and a pair of vertically disposed side panels operatively mounted on said bottom panel;
- d. each of said side panels being integrally connected to the adjacent front and rear panels by rounded corner panel portions;
- e. a top panel operatively mounted on the top end of said front, rear and side panels;
- f. at least one of said panels having an opening there-through for spraying powder on a workpiece part in said booth;
- g. at least one of said panels having a powder outlet opening;
- h. said top and bottom panels are each provided with rounded corners on the front, rear and sides thereof; and,
- i. said bottom panel, front panel, rear panel, side panels and top panel are fireproof, and each panel comprises a fiber glass molded panel coated with a

first layer of halogenated unsaturated polyester resin, and a second layer of a mixture of halogenated unsaturated polyester resin, a wax hardener and glass fibers.

- 2. A powder spray booth as defined in claim 1, wherein:
 - a. each of said side panels is provided with an opening for the passage therethrough of a workpiece to be sprayed with powder as it is carried through said booth;
 - b. each of said booth front and rear panels is provided with at least one opening for admitting a powder spray gun for spraying a workpiece part moving through the booth;
 - c. said top panel has a longitudinal opening formed therethrough for the passage therethrough of a workpiece supporting means; and,
 - d. a metallic powder collector means, at ground electrical potential, is disposed along each side of said longitudinal opening in said top panel.
- 3. A powder spray booth as defined in claim 1, including:
 - a. a deflector means disposed over said powder outlet opening in a position spaced apart therefrom.
- 4. A powder spray booth as defined in claim 1, wherein:
 - a. said top panel is provided with a powder outlet opening.
- 5. A powder spray booth as defined in claim 1, wherein:
 - a. at least one of said side panels is provided with a powder outlet opening.
- 6. A powder spray booth as defined in claim 5, in-

cluding:

- a. a deflector means disposed over said powder outlet opening in a position spaced apart therefrom.
- 7. A powder spray booth as defined in claim 1, wherein:
 - a. the bottom panel is provided with a depression having side walls, and one of the side walls of the depression is provided with a powder outlet opening.
- 8. A powder spray booth as defined in claim 7, including:
 - a. a deflector means disposed in operative position over said powder outlet opening in said depression.
- 9. A powder spray booth as defined in claim 1, wherein:
 - a. the bottom panel is provided with a plurality of depressions with each depression having side walls, and one of the side walls of each of the depressions is provided with a powder outlet opening.
- 10. A powder spray booth as defined in claim 9, including:
 - a. a deflector means disposed in operative position over the powder outlet opening in each of said depressions.
- 11. A powder spray booth as defined in claim 1, wherein:
 - a. the bottom panel is provided with a powder outlet opening; and,
 - b. a venturi-type deflector means is disposed in operative position over the powder outlet opening.

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