

Sept. 30, 1941.

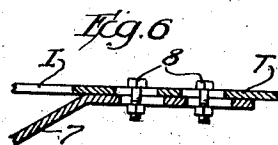
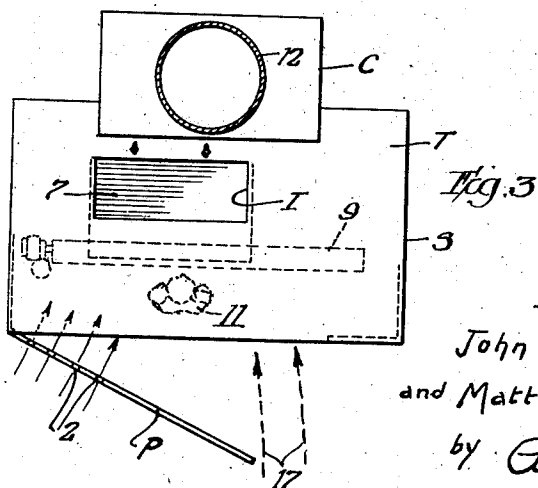
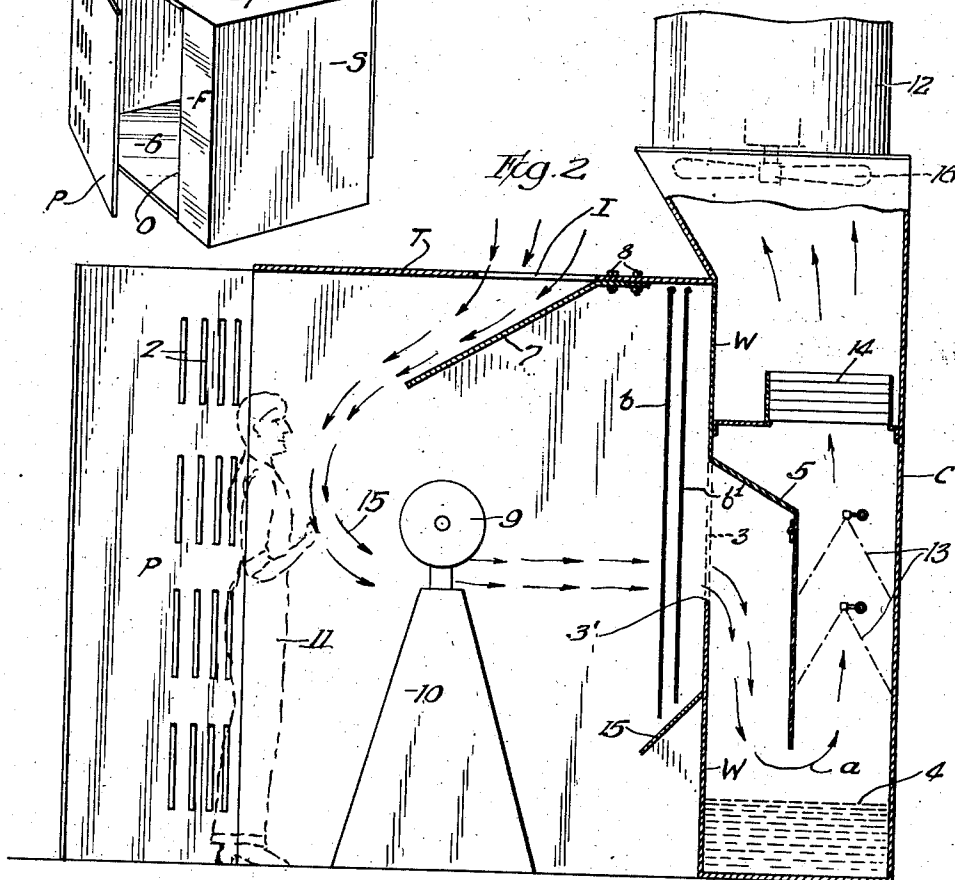
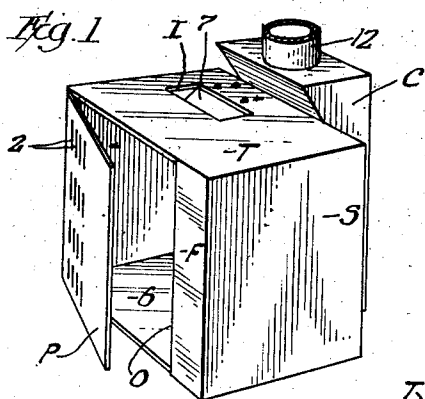
J. F. ROCHE, JR., ET AL

2,257,516

OPERATOR-PROTECTING SPRAY BOOTH

Filed March 1, 1938

2 Sheets-Sheet 1



Inventors:
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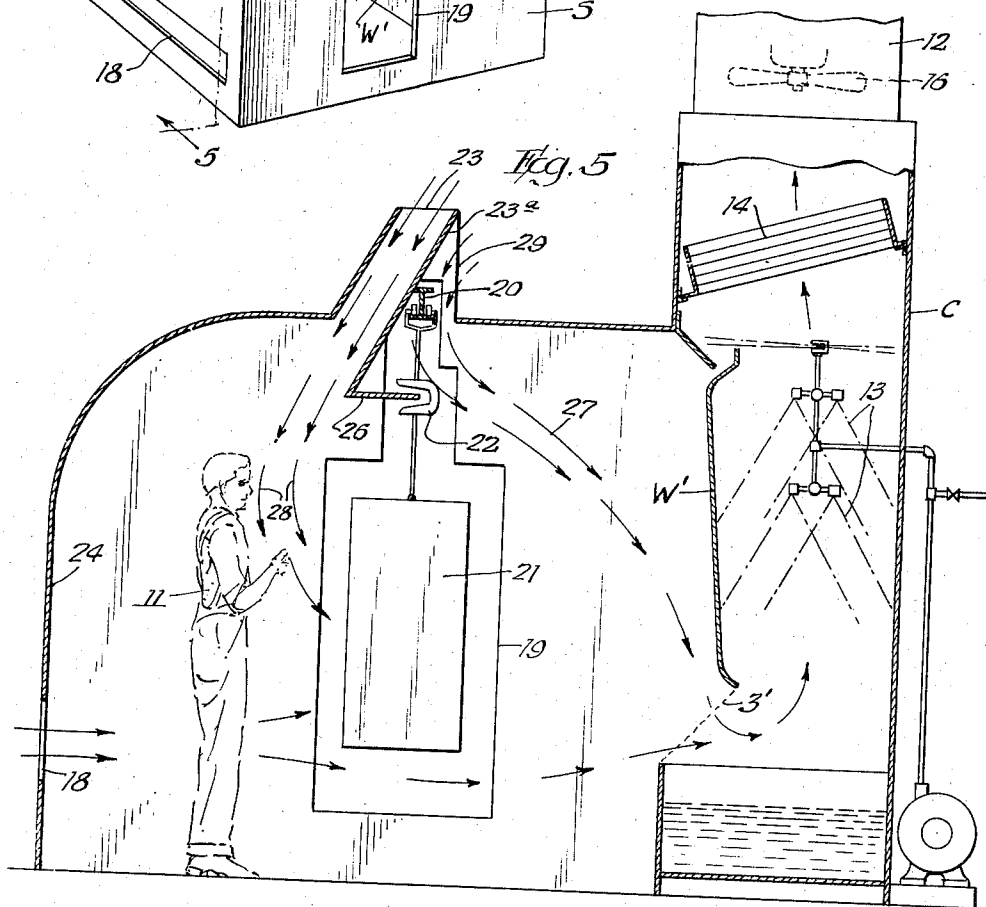
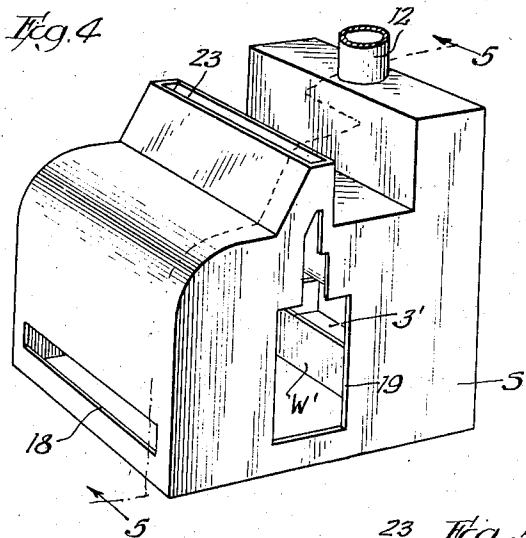
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OPERATOR-PROTECTING SPRAY BOOTH

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UNITED STATES PATENT OFFICE

2,257,516

OPERATOR-PROTECTING SPRAY BOOTH

John F. Roche, Jr., Oak Park, and Matt Darbyshire, Chicago, Ill., assignors to Binks Manufacturing Company, Chicago, Ill., a corporation of Delaware

Application March 1, 1938, Serial No. 193,320

6 Claims. (Cl. 91-60)

Our invention relates to booths within which work is performed and out of which air is drawn to carry off fumes, siliceous particles or the like so as to prevent such injurious materials from being breathed by the workman, its general objects being those of providing booths of this class which will effectively protect the spray device operator or other workman from breathing air vitiated by products of the working process, without requiring an undesirably large volume of air to be moved through the booth for that purpose, and without hampering the workman.

In the spray coating of a comparatively small object it is commonly customary to have the spray gun operator stand either in front of or inside the spray booth within which the object is supported, with the operator facing the rear wall of the booth, and with the spray-receiving object disposed between the operator and the rear wall of the booth. It likewise is customary to have the part of the rear wall toward which the fumes of the coating material are directed by the spray appliance terminate at an elevation lower than that of the object, and to provide means for drawing air rearwardly from the booth under the lower edge of the said rear wall part and thereafter past fume-material precipitating means to an exhaust flue.

In practice, the air draft through such a booth has been adequate, with the booth closed at its top and open at its front, for carrying the major part of the fumes of homogeneous coating materials away from the spray gun operator and out of the booth.

However, difficulties have been encountered when the sprayed material is not homogeneous, and particularly when this material consists of solid particles suspended in a carrying liquid of much lower specific gravity, as for example with a so-called vitreous enamel consisting of finely ground vitreous particles suspended in a speedily vaporizable liquid. With such a material, the velocity of the projected spray imparts a higher momentum to the vitreous particles than it does to the particles of the liquid carrier, so that the heavier vitreous particles not only tend to flick out of the liquid particles but also may rebound in various directions from the object which is being sprayed.

Since at least a part of the sprayed object is usually disposed at lower elevation than the spray-gun holding hand of the operator, the air drawn toward this booth outlet will flow mainly below the level of the operator's shoulders; so that this air flow will not retard the rebound of

such vitreous particles toward the head of the operator. Owing to the just recited conditions, the sprayer of a vitreous enamel is apt to breathe air laden sufficiently with ceramic dust to cause silicosis. Respiratory ailments may likewise occur during the spraying of other materials, or during turning or grinding operations which involve the detaching of particles adapted to vitiate the air in the booth.

In one of its major objects, our invention aims to overcome the just recited serious difficulties by constructing booths so that a part of the air which is to draw the fumes or other waste particles toward the fume-material-collecting rear booth wall and out of the booth will first pass the head and upper body portion of the operator, so that the latter can continuously breathe fresh and unvitiated air. Moreover, our invention aims to arrange the air flow through the booth so that the just mentioned part of the air will move downwardly in front of the operator's head, for downwardly deflecting fumes or other particles which may rebound toward the operator's head.

Furthermore, our invention aims to construct operator-housing booths of the just recited characteristics so that some of the additional air, needed for carrying fumes or detached particles toward the rear wall of the booth and thereafter past the usual washing provisions to a flue, will also direct the said downwardly moving air rearwardly, after the last named part of the air has moved downwardly below the head and chest of the operator. In addition, our invention aims to construct such booths so that the previously recited air movements can be obtained without subjecting the operator to any objectional draft.

In a still further object, our invention aims to provide booth constructions of the just recited beneficial characteristics, constructed so that the desired operation of the workman can be upon objects which are successively moved through the booth by a conveyor or the like.

Illustrative of the manner in which we accomplish the above listed general objects, as well as other more detailed objects:

Fig. 1 is a perspective view of a booth embodying our invention and designed for housing and protecting an operator while working on a rotatable object as for example during a turning or grinding operation.

Fig. 2 is an enlarged vertical section, taken along the line 2-2 of Fig. 1, including a stand supporting a rotatable work piece, with dotted lines indicating both a suitable position of the workman, and with arrow lines indicating the

flow of the part of the fresh air which is to be breathed by the operator.

Fig. 3 is a plan view of the booth of Figs. 1 and 3, drawn on a scale intermediate of those figures, with arrow lines indicating the directions in which additional air enters through slots in the door-like front plate and through the frontal booth opening adjacent to the free edge of that plate.

Fig. 4 is a perspective view of another embodiment of our invention, constructed for allowing the work pieces to be moved through the booth by a conveyor.

Fig. 5 is an enlarged vertical section, taken along the line 5-5 of Fig. 4 and including portions of a conveyor, a work-piece suspended from the conveyor, and a dotted line picturing of a workman positioned for spraying this work-piece.

Fig. 6 is an enlargement of a portion of Fig. 2, showing the adjustable supporting of the air deflector which underhangs the upper air inlet.

In the embodiment of Figs. 1 to 3, the main part of the operator-protecting booth is a rectangular housing having imperforate riser sides S, a top T provided with an air inlet I which is desirably nearer to the rear than to front of the said housing, and a front F which has a relatively wide opening O. Extending from one riser edge of this opening (after the manner of a partially open door) is a shield plate P which extends forwardly at a desirably sharply acute angle to the plane of the booth front F, leaving sufficient space adjacent to its free riser edge for the entry of the operator and the transporting of work-pieces and tools into the booth. This shield plate is provided, desirably only near the riser edge at which it is connected to an adjacent part of the box-like housing, with air ports, such as the slots 2 in Figs. 1 to 3, the upper air inlet I also being nearer to the same riser side of the housing.

The rear wall W has an opening 3 intermediate of its height, desirably in form of a slot extending across the entire interior width of a taller rear compartment C, the bottom portion of which rear compartment stores water 4 for collecting otherwise wasted material. Extending rearwardly downward from the upper edge of the opening 3 and thereafter downwardly, and freely spaced from the rear wall of the said compartment is a baffle 5 which has its lower edge at a higher elevation than the level of the said water 4.

A direct horizontal flow of air, fumes and the like rearwardly from the booth proper to the said connecting opening 3 is prevented by the usual baffling, as by two fume-material collecting baffles b and b' consecutively spaced forwardly from the rear booth wall W and provided with apertures which preferably are relatively staggered in the two baffles. These baffles preferably have their lower edges at an elevation intermediate that of the floor 6 of the booth proper and of the lower edge 3' of the said connecting opening 3, and the baffles are freely underhung by an inclined baffle 15 which is supported by and slopes forwardly downwardly from the rear wall W of the booth proper.

A direct downward flow of air into the booth through the inlet I in the top of the booth is likewise prevented by an air deflector 7 which underhangs the upper air inlet I in the booth top T and slopes forwardly downward, this deflector being desirably fastened to the said top (as in Fig. 6) by bolts 8 extending through slots in

both the said deflector and top, so that the deflector can be adjusted as to the distance of its forward end from the front of the booth.

During the use of our just described two-compartment booth, as for example for some finishing operation on a cylindrical work piece 9 supported by a stand 10, the workman 11 stands between the said stand and the front of the booth. When the usual suction fan 16 is running for drawing air upwardly past the usual water sprays 13 and the eliminator 14, and for ejecting that air through the flue 12, the suction draws air out of the booth proper (or forward compartment) through the connecting opening 3.

The resulting rearward draft then draws air rearwardly into the work compartment through the opening at the free edge of the shield plate P and the slots in that plate, and also downwardly through the upper inlet I. However, the sloping deflector 7 below the inlet guides the admitted air so that this flows downwardly in front of the operator's head and shoulders, after which air admitted through the said slots aids in curving the flow rearwardly (as along the arrow lines 15 of Fig. 2) past the work piece 9 and toward the rear opening 3. Moreover, some of the slots 2 in the doorlike shield P may extend higher than the top of the workman's head, thereby causing some air also to be drawn rearwardly past and even above his head. Consequently, owing to the joint result of the upper air inlet, the air-guiding baffle 7 and the slots in the said shield, the air breathed by the workman is entirely free of the injurious particles which may result from the working operation.

By disposing the upper inlet I nearer to the booth side at which the frontal shield is connected to the remainder of the booth than to the opposite booth side, I also allow the major part of the frontally admitted air to enter (as along the arrow lines 17 of Fig. 3) without subjecting the operator to an undesirable draft. Moreover, as will readily be understood without further picturing, the frontal shield plate may be hinged to the remainder of the booth, thereby permitting an adjustment of the air admitted past the free riser edge to the door.

However, while we have heretofore described an embodiment of our invention which has proven both convenient and effective for accomplishing our recited objects, many changes may be made without departing either from the spirit of our invention or from the appended claims.

For example, when our operator-protecting booth is to be used for working on objects moved consecutively into the forward or working compartment, we provide the sides S of this same compartment with counterpart and enlarged openings 19 (Figs. 4 and 5) through the upper portion of which openings a conveyer track 20 extends. Each such opening is shaped for allowing a work piece 21 to move freely through its main part, and also allowing clearance for work-suspending means 22.

Then we desirably admit the breathable air through a chute 23 which slopes downward forwardly for directing the air downwardly between the operator 11 and the work-piece, with the rear wall 23' corresponding to the air deflector 7 in Figs. 1 and 2. Also, instead of the frontal air admitting provisions of Figs. 1 we employ a front 24 which is closed except for a horizontal slot 18, which desirably extends substantially across the said front and at an ele-

vation approximating that of the booth outlet opening 31.

In addition, we desirably provide a second air inlet 29 for admitting air downwardly behind the rear wall 23a of the said chute, and provide a horizontal baffle plate 26 extending rearwardly from the lower end of the said chute wall 23a to prevent the admitted air from flowing directly downward upon the work-piece. With the just named baffle thus disposed, the air admitted through the booth top behind the said air chute is drawn downwardly rearward (as along the arrow lines 27) through the suction produced by the flue fan, and this air carries fumes or the like with it, while the operator breathes only the uncontaminated air which enters through the chute 23 and thereafter moves along the arrow lines 28.

Thus the construction of each of our illustrated embodiments readily guards the operator against respiratory troubles, such as heretofore had prevented a more extensive use of certain materials. Moreover, by suitably proportioning the various air inlet provisions of either embodiment to the general dimensions of the booths, the characteristics of the materials which otherwise would cause respiratory ailments, and the rate at which these materials are to be consumed, we can also effect the desired safeguarding of the operator's health without moving so large a quantity of air as to increase the operating costs unduly because of the power required for moving the air.

We claim as our invention:

1. A booth for housing a piece of work at which particles of material will be cast into adjacent space with high momentum during work operations, comprising side walls, front and rear walls having air inlet and outlet means respectively, so arranged that a stream of air may travel rearwardly through the chamber past a predetermined work location, a top having an opening for entry of air into the booth, means for causing a flow of air through said booth from front to rear thereof and downwardly through said top opening, and guide means below the last mentioned opening so located as to extend downwardly into the chamber toward the front wall at a position above said work location and in such manner as to direct a downwardly flowing stream of air into the space between the work location and the front wall at a position adjacent to said work location, whereby particles cast from the work into the adjacent space will be caught by the downwardly flowing stream in front of the work location and diverted into the rearwardly flowing stream.

2. A booth for housing a piece of work at which particles of material will be cast into adjacent space with high momentum during work operations comprising side walls, front and rear walls having air inlet and outlet means respectively, so arranged that a stream of air may travel rearwardly through the booth past a predetermined work location, a top having an opening for entry of air into the booth, said opening extending transversely of the booth, means for causing a flow of air through the booth from front to rear of the latter and inwardly through said top opening, and a guide wall extending downwardly into said booth from the rear edge of said top opening and forwardly of the front edge of the latter to a position above said work location, said guide wall being so positioned as to direct a downwardly flowing stream of air into the space between the work location and the front wall at a position adjacent to said work location, whereby

particles cast from the work into the chamber will be caught by the downwardly flowing stream in front of the work location and diverted into the rearwardly flowing stream.

3. A booth for housing a piece of work at which particles of material will be cast into adjacent space with high momentum during work operations, comprising side walls, front and rear walls having air inlet and outlet means respectively, so arranged that a stream of air may travel rearwardly through the booth past a predetermined work location, a top having an opening for entry of air into the booth, means for causing a flow of air through said booth from the front to rear thereof and inwardly through said top opening, an air guide means below said top opening so located as to extend toward the front of the booth over the said work location and in such manner as to direct a downwardly flowing stream of air into the space between the front wall and the work location but nearer to the latter, whereby particles cast from the work are intercepted by the downwardly flowing air stream and directed into said rearwardly flowing air stream, said top opening being located nearer to one of said side walls than to the other, the front wall of the booth being also provided with air inlet ports located near said one of said side walls for assisting in diverting the downwardly flowing stream of air, the inlet in the front of said booth being located nearer to the other of said side walls.

4. A booth for housing a piece of work at which particles of material will be cast into adjacent space with high momentum during work operations, comprising side walls, front and rear walls having air inlet and outlet means respectively, so arranged that a stream of air may travel rearwardly through the booth past a predetermined work location, a top having an opening for entry of air into the booth, means for causing a flow of air through said booth from the front to rear thereof and inwardly through said top opening, an air guide means below said top opening so located as to extend toward the front of the booth over the said work location and in such manner as to direct a downwardly flowing stream of air into the space between the front wall and the work location but nearer to the latter, whereby particles cast from the work are intercepted by the downwardly flowing air stream and directed into said rearwardly flowing air stream, said booth comprising an upright panel adjacent to the forward edge of one side of the booth, and a shield extending from the forward edge of the other side of the booth at an acute angle to the common plane of the said two edges, the shield having air ports only in a part thereof adjacent to the forward edge of the other side of the booth.

5. A booth for housing a piece of work at which particles of material will be cast into adjacent space with high momentum during work operations, comprising side walls, front and rear walls having air inlet and outlet means respectively, so arranged that a stream of air may travel rearwardly through the booth past a predetermined work location, a top having an opening for entry of air into the booth, means for causing a flow of air through said booth from the front to rear thereof and inwardly through said top opening, an air guide means below said top opening so located as to extend toward the front of the booth over the said work location, said air guide means comprising a chute sloping forwardly and downwardly and having its rear wall extending

downwardly below the said top, and in such manner as to direct a downwardly flowing stream of air into the space between the front wall and the work location but nearer to the latter, whereby particles cast from the work are intercepted by the downwardly flowing air stream and directed into said rearwardly flowing air stream.

6. A booth for housing a piece of work at which particles of material will be cast into adjacent space with high momentum during work operations, comprising side walls, front and rear walls having air inlet and outlet means respectively, so arranged that a stream of air may travel rearwardly through the booth past a predetermined work location, a top having an opening for entry of air into the booth, means for causing a flow of air through said booth from the front to rear thereof and inwardly through said top opening, an air guide means below said top opening so located as to extend toward the front of the

booth over the said work location and in such manner as to direct a downwardly flowing stream of air into the space between the front wall and the work location but nearer to the latter, whereby particles cast from the work are intercepted by the downwardly flowing air stream and directed into said rearwardly flowing air stream, said top being provided with an auxiliary air inlet opening adjacent to said first mentioned opening and rearwardly of said guide means, whereby said guide means guides the air entering the booth through said auxiliary opening, and a substantially horizontal baffle extending rearwardly from the lower end of said guide means for preventing the air entering through said auxiliary opening reaching said work location.

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