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SPRAYING BOOTH INSTALLATION EMPLOYING FILTERS

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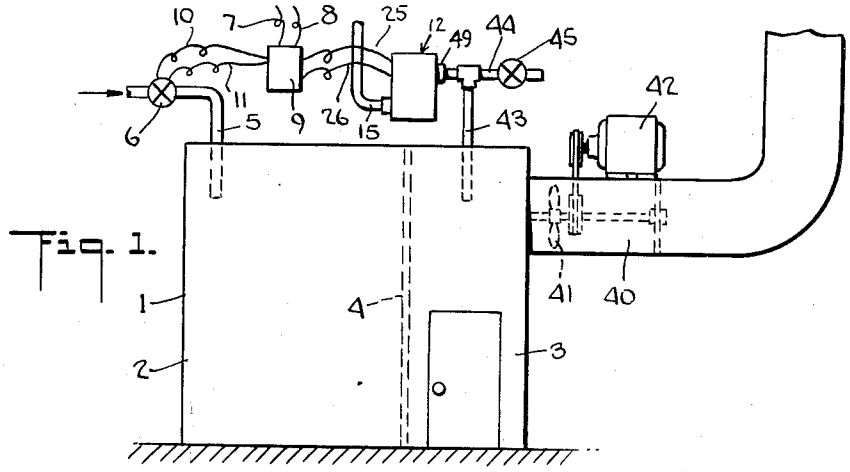


Fig. 1.

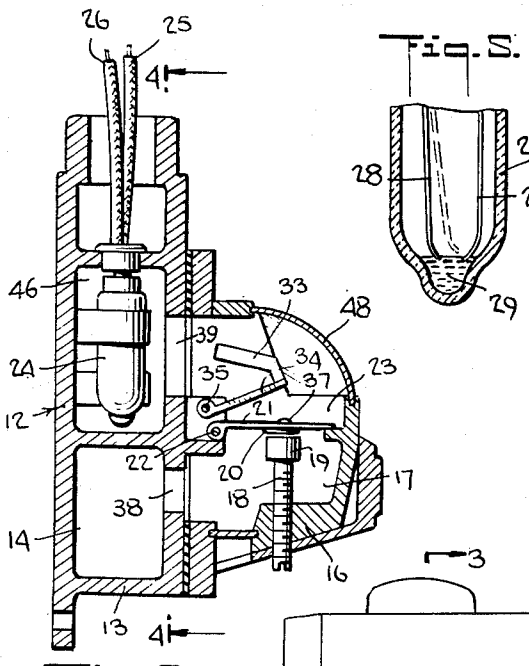


Fig. 3.

Fig. 5.

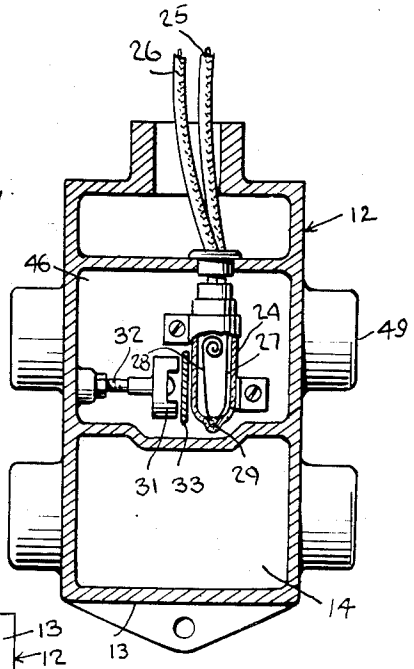


Fig. 4.

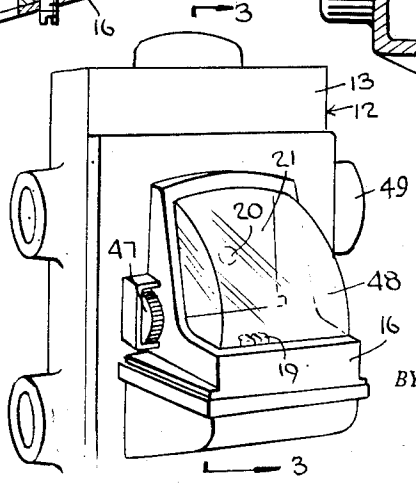


Fig. 2.

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SPRAYING BOOTH INSTALLATION EMPLOYING FILTERS

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2 Claims. (Cl. 183—37)

This invention relates generally to spray booths of the type in which paint spraying takes place, and has particular reference to an improved installation provided with means by which the noxious and dangerous air in such a booth is assuredly evacuated, and the paint particles entrained in the evacuated air are trapped and prevented from being exhausted into the atmosphere.

It is the general object of the invention to provide controlled protective means by which proper evacuation of the air and fumes can be assured, and the health and safety of the occupant of the booth safeguarded; to prevent the accumulation of dangerously explosive and fire inducing mixtures of volatile gases; and to trap the entrained airborne paint particles.

It is well known in the spraying or coating art that the constant breathing of fumes created by nitro-cellulosic or other materials used in spray-painting is likely to be injurious to health. Also, the volatile portions of the sprayed paint tend to accumulate and produce inflammable and explosive gaseous mixtures. Hence, efforts are regularly made to provide means for constantly evacuating the noxious and explosive and inflammable air from spraying chambers as well as for filtering out and capturing the air-entrained particles of the paint. It has been found, however, that the filters employed for collecting the flying paint particles become increasingly coated or clogged, so that, as an ultimate result, the suctional effect of the air-exhausting means operating to withdraw air from the booth is materially reduced and the usefulness of such means is thus destroyed.

It is one of the specific objects of my invention to provide a means by which the flow of the spraying material or paint in the spraying booth, for use in carrying on the spraying operations, will be automatically shut off whenever the exhaustion of air from the booth is excessively retarded by clogged or coated filters. This prevents the operator from continuing the spraying operations under potentially dangerous and unsafe conditions, and prevents resumption of such operations until he has cleaned or replaced the clogged filters.

It is a more particular object of the invention to provide an improved extremely sensitive pressure-responsive means that acts to automatically close a valve for controlling the flow of the spraying material. The pressure-controlled means is preferably an electric switch that is responsive to and will be operated by reduction of air pressure in an air outlet area in the spray booth beyond a filtering screen.

It is another particular object of the invention to provide a control means that is adjustable to permit the "shut-off" point to be accurately set at any desired predetermined minimum air flow into and out of the spray booth.

For the attainment of these and other objects to be hereinafter set forth, I have devised the arrangement of parts described in the following specification, and more particularly set forth in the claims appended hereto.

In the accompanying drawing, wherein an illustrative embodiment of the invention is disclosed:

Figure 1 is an elevational view of a spraying booth installation constructed in accordance with the invention;

Figure 2 is a perspective view of the pressure-controlled switch employed for causing cessation of flow of the spraying material;

Figure 3 is a sectional view, taken substantially on the line 3—3 of Figure 2;

Figure 4 is a sectional view, taken substantially on the line 4—4 of Figure 3;

Figure 5 is an enlarged sectional view through a portion of the mercury switch.

Referring to the drawing, 1 indicates generally a spraying booth in which the spraying operations take place. The booth may be constructed in any of the conventional ways and it includes the spraying chamber 2 and the air outlet chamber indicated at 3. These chambers are separated by a wall 4, which may consist in whole or in part of one or more filters which act to capture the spraying material entrained in the air suctionally drawn through them. The spraying operations take place within the chamber 2. Leading into this chamber is a conduit or pipe 5 connected to a source of air under pressure (not shown), the flow of such air through the conduit 5 being controlled by a solenoid valve 6. The end of the conduit 5 within the spraying chamber 2 is adapted to connect to one or more hoses terminating in spray nozzles in a manner well-known. The solenoid of the valve 6 is controlled by a electric circuit, leading from any suitable source of power (not shown) by way of the wires 7 and 8. These wires enter into the connection box 9, and from this box the wires 10 and 11 extend to the solenoid valve 6.

The electrical circuit which operates the solenoid valve 6 is controlled by a pressure-operated switch shown in detail in Figures 3 to 5 inclusive, and generally indicated at 12. This pressure-operated switch 12 includes a casing 13 formed with an air chamber 14 which communicates with the atmosphere by way of the conduit 15. Secured on the casing 13 is a housing 16 formed with a lower chamber 17 in communication with chamber 14 by way of the passage or port 38. Threadably mounted for vertical adjustment in the lower wall of the housing 16 is a screw 18, provided at its upper end with a head 19 of permanently magnetized material. Magnet 19 is located directly below a piece of magnetizable material 20 secured to one of the faces of a pivoted plate or flap 21, pivoted at 22 to a part of the housing 16.

Under normal operating conditions, the flap 21 is in its lowered or closed position as shown in Figure 3, and it is maintained in this position by the magnetic attraction between the parts 19 and 20. When the flap is in this lowered or closed position, it serves as a partition member to close off communication between the lower air-filled chamber 17 and an upper chamber 23 in the housing 16.

Mounted in the casing 13, above the chamber 14, is a mercury switch 24 of known construction, connected by wires 25 and 26 into the solenoid valve circuit by way of the connection box 9. The circuit arrangement is such that as long as the switch 24 remains closed, the solenoid valve 6 will remain open and the flow of compressed air will continue past valve 6 and through conduit 5 into the spraying chamber 2.

The normal operating position of the pressure-controlled switch 12 is that shown in Figure 3. The flap 21 is in its lowered position, and the two contacts 27 and 28 of the mercury switch 24 are immersed within the mercury 30, so that the switch is in its closed position. The mova-

ble contact 28 is held in this closed position by means of a permanent magnet 31 secured at the end of an adjustable stem 32 mounted on one of the walls of the housing 16. The arrangement is such that when the magnet 31 is prevented from exerting its magnetic influence upon the contact 28, the contact will spring to its open position as shown in dotted lines in Figure 5. This will at once break the circuit to the solenoid valve 6 and the flow of compressed air through the conduit 5 will be discontinued.

The means for rendering the magnet 31 ineffective with respect to switch contact 28 consists of a movable baffle member in the form of a plate 33. This plate is carried at the end of an arm 34 pivotally mounted at 35 in a position above the flap 21. The arm 34 is shown in Figure 3 in its lowered position, where it is normally maintained by suitable stop means. In this position the plate or baffle member 33 lies beyond the field of action of the magnet 31 so that the magnet can exert its magnetic influence on switch contact 28 to hold the contact in its closed position. When the flap 21 is swung upwardly, by means to be presently explained, a projection 37 provided on the upper surface of flap 21 will strike the arm 34 and swing the arm upwardly on its pivot 35 to an extent to cause the baffle member or plate 33 to be interposed between the magnet 31 and the contact 28 as shown in Figure 4, thus preventing the magnet 31 from exerting its magnetic influence on the contact 28, and permitting the contact 28 to move by an inherent resilience to open position as shown in dotted lines in Figure 5.

The air outlet chamber 3 of the spraying booth is provided with the exhaust passage 40 in which a suction fan 41 is operative to draw air from the outlet chamber, this fan being operated by the motor shown at 42 or by other suitable means. The upper chamber 23 of housing 16 is in communication, through opening 39, with the upper chamber 46 in the casing 13. From this chamber a connection is established, through opening 49, with piping 43 which leads to the interior of the outlet chamber 3. This piping is provided with a lateral extension 44 open to atmosphere and through which the flow of air can be accurately controlled by means of a valve 45, preferably but not necessarily a needle valve.

The operation of the described structure is as follows: In normal operation, the parts of the pressure-controlled valve 12 are in the positions shown in Figure 3. At this time, the mercury switch 24 is in its closed position, being maintained in such position by the magnetic action of magnet 31 on the switch contact 28. Thus, the circuit to the solenoid valve 6 is closed and the valve is consequently held open so that the flow of compressed air through conduit 5 into the spraying booth is unimpeded. While the spraying operation is taking place, the air in chambers 2 and 3 is being exhausted by the action of the fan 41, and paint particles entrained in the air are being collected by the filter 4. This collection of the paint by the filter will cause the filter to become increasingly clogged or loaded with the spraying material and as that occurs, air flow through the filter by the action of the fan 41 will be more and more retarded so that the exhausting means will be failing in its primary purpose, namely, the removal of noxious fumes, as well as inflammable or explosive mixtures, from the spraying chamber. As a result, the fan 41 will suctionally exhaust more and more air from the outlet chamber alone, resulting in a correspondingly reduced air pressure therein. As this occurs, the increasing differential between the gradually reduced air pressure in the chamber 23, and the maintained atmospheric pressure in the lower chamber 17, will ultimately become effective to overcome the magnetic attraction between parts 19 and 20 and to swing the flap 21 suddenly upwardly. On its upward swing, flap 21 will swing the arm 34 on its pivot 35 in a manner to cause the arm 34 to move its baffle member 33 between the magnet 31 and switch contact 28, thus causing the switch contact to spring to open position. This will at once break the circuit to the solenoid valve 6 causing it to close and to shut off the flow of air through conduit 5.

As the flap 21 swings to its raised position by reason of the reduced air pressure above it and the normal atmospheric pressure beneath it, it will reach a position beyond its pivotal dead center so that it will remain up, thus holding the arm 34 with its baffle member 33 between the magnet 31 and the switch contact 28, until the flap is manually lowered. This lowering action of flap 21 is performed by means of the knob 47 positioned externally of the housing 16 and fixed on the pivot 22 of the flap 21. A glass or other transparent window 48 is provided on the housing 16 so that the position of the flap 21 and arm 34 can be observed.

By the proper regulation of the valve 45 a certain amount of outside air is permitted to constantly enter into the pipe 43 and thence into the outlet chamber 3. Through this arrangement it has been found that the rate of pressure reduction on the low-pressure side of the switch can be diminished to a desirable degree, and rather accurately controlled, whereby a practical regulation of the control of the pressure switch can be consistently had, causing said switch to open reliably at the moment that a predetermined reduced pressure in the outlet chamber occurs. The occurrence of such a reduced pressure in the outlet chamber is of course an indication that the flow of air through the spray booth has diminished to a predetermined minimum below which it is unsafe and undesirable to permit further usage and occupancy of the spray booth to take place.

Although I have described only a single embodiment of the invention, it is obvious that the invention is not necessarily restricted thereto, but is broad enough to cover all structures coming within the scope of the annexed claims.

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

1. In an apparatus of the character described, a spraying booth containing a spraying chamber and an air outlet chamber, a filter interposed between the chambers, exhaust means communicating with the outlet chamber, spray-actuating air supply means controlled by a valve operated through an electric circuit, a pressure-controlled switch in said circuit, means for maintaining said switch closed while air pressure in the outlet chamber is maintained above a predetermined level, means controlled by a drop in said air pressure to open the switch to thereby close the valve and shut off the flow of spray-actuating air into the spraying chamber, and means connected into the outlet chamber for regulatably admitting outside air into said chamber.

2. In an apparatus of the character described, a spraying booth divided into a spraying chamber and an air outlet chamber, a filter interposed between the chambers, means for supplying spray-actuating compressed-air into the spraying chamber, means for air-exhausting the outlet chamber, a pressure switch connected to the outlet chamber and affected by the reduction of air pressure therein, an electric circuit controlling the flow of spray-actuating air into the spraying chamber, said switch being included in said circuit and acting to open the circuit when the air pressure in the outlet chamber falls below a predetermined level, an air-supply conduit connected from atmosphere to the outlet chamber, and a needle valve in said conduit for controlling the flow of air into said chamber and operative to do so while the exhaust means is in operation, the air flow through said needle valve serving to reduce the rate of pressure reduction in said outlet chamber.

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