Jan. 20, 1931. W. A. READY 1,789,945

SPRAYING APPARATUS AND METHOD OF CONTROLLING SAME

Filed Feb. 10, 1928 3 Sheets-Sheet 1

Fig. 1.

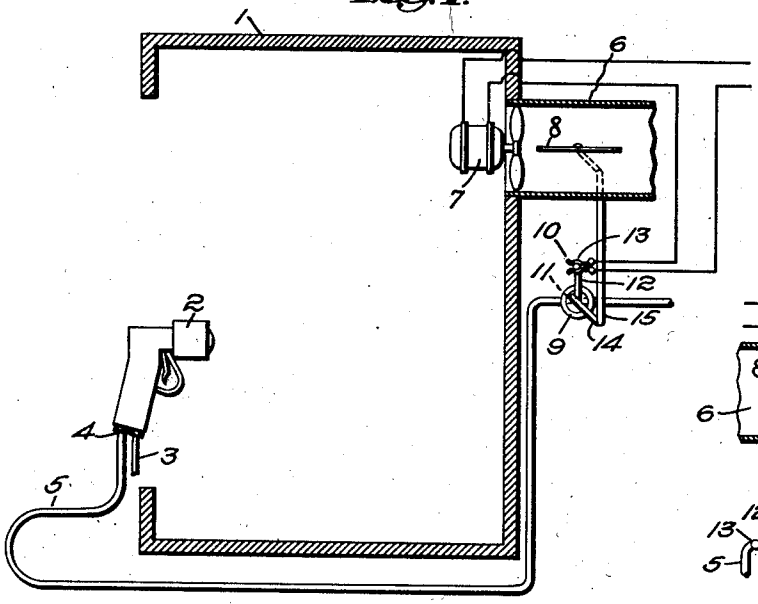


Fig. 2.

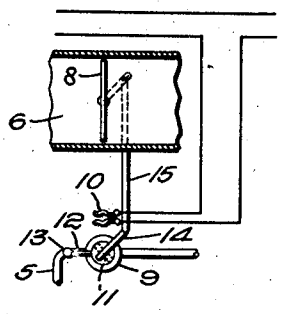


Fig. 3.

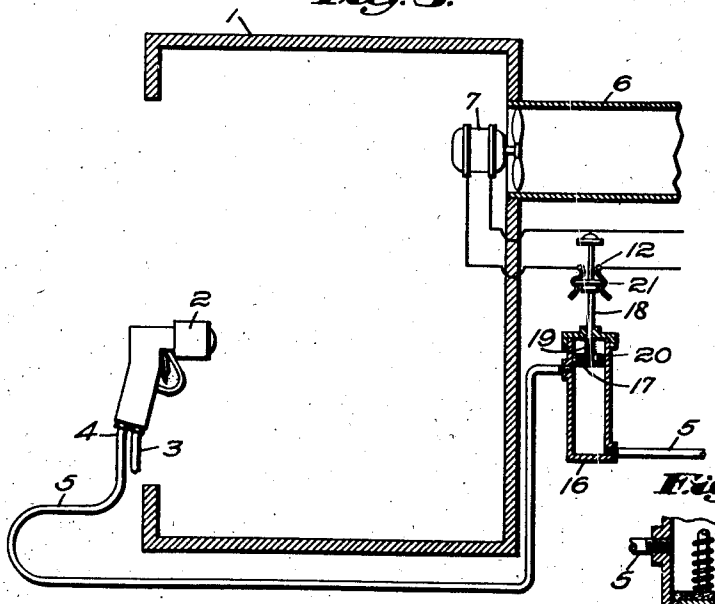


Fig. 4.

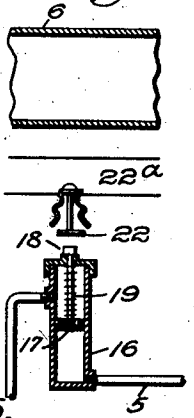
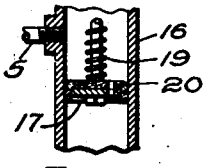


Fig. 5.



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SPRAYING APPARATUS AND METHOD OF CONTROLLING SAME

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Fig. 6.

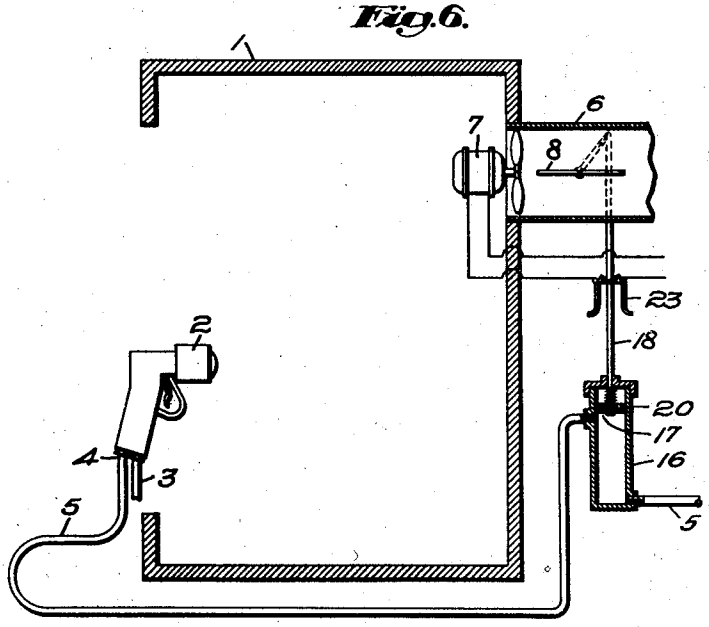


Fig. 7.

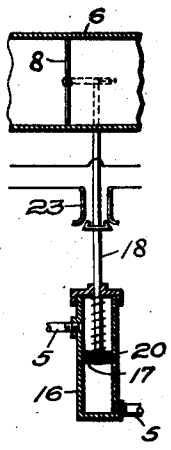


Fig. 8.

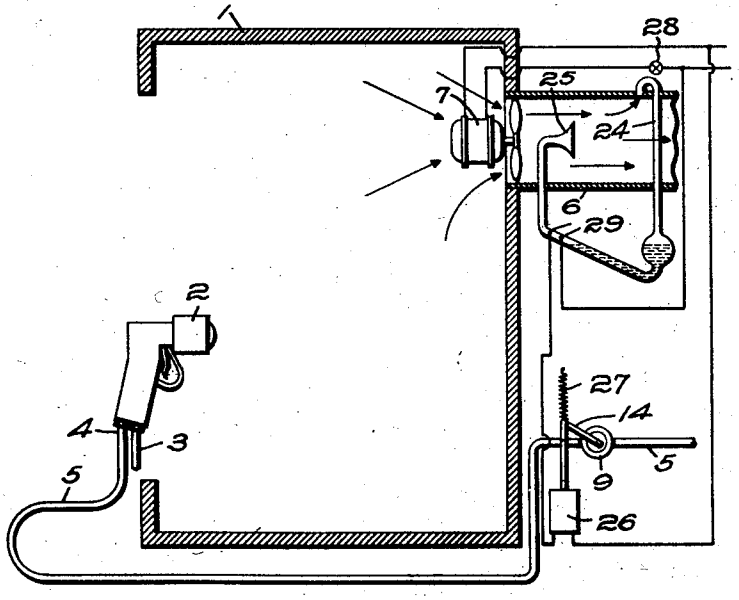
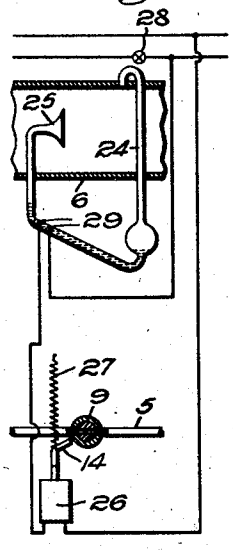


Fig. 9.



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SPRAYING APPARATUS AND METHOD OF CONTROLLING SAME

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Fig. 10.

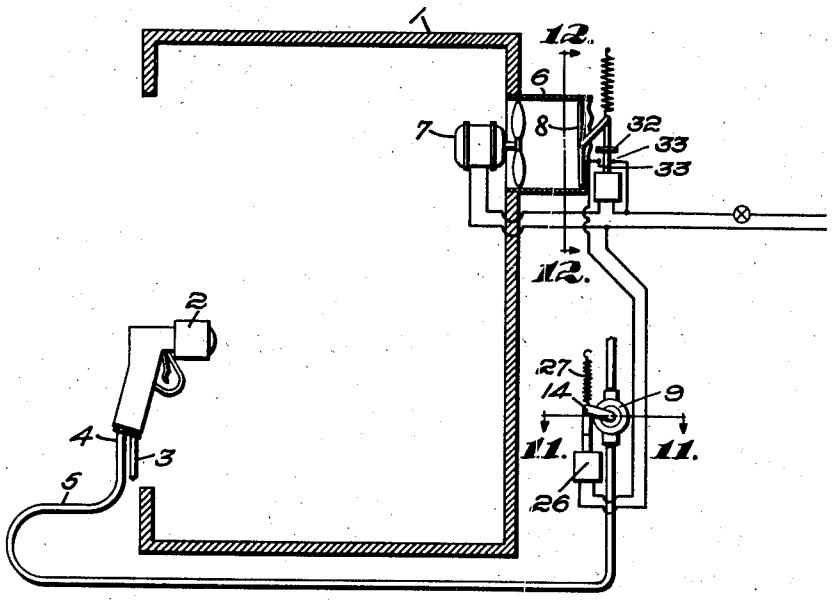


Fig. 11.

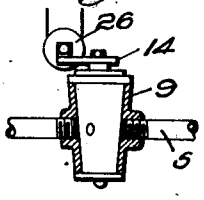
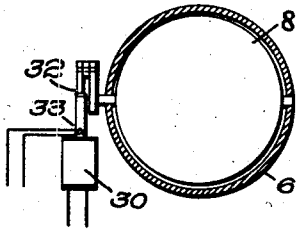


Fig. 12.



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UNITED STATES PATENT OFFICE

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SPRAYING APPARATUS AND METHOD OF CONTROLLING SAME

Application filed February 10, 1928. Serial No. 253,394.

My invention aims to provide improvements in spraying apparatus and more particularly to improvements in paint and like material spraying systems and their method of operation and control.

Reference is made to my co-pending divisional application Serial No. 314,925, filed Oct. 25, 1928.

In the drawings, which illustrate several preferred embodiments of my invention:—

Figure 1 is a diagrammatic view of a paint spraying system showing the hood and flue in cross-section, the other elements being shown more or less diagrammatically in elevation, the damper, valve and contact switch being connected for hand-operation and being shown in their relative positions which they assume when paint may be sprayed;

Fig. 2 is a diagrammatic view showing the damper, valve and electric switch in the positions which they assume when the system is not in operation;

Fig. 3 shows a system similar to that shown in Fig. 1, except that a cylinder and piston means is inserted in the compressed-air supply conduit for controlling the flow of air-pressure therefrom and for automatically closing the blower switch, the switch being operable by hand to open the blower circuit;

Fig. 4 is a diagrammatic view of a portion of the system shown in Fig. 3, indicating the normal relative positions of the piston device and switch when the system is not in operation;

Fig. 5 is an enlarged section of a portion of the cylinder and the piston in the air conduit showing the aperture through the piston;

Fig. 6 illustrates a system similar to that shown in Fig. 3, except that in this instance the piston, switch and damper are positively connected so that when one is operated the other two will be operated with it;

Fig. 7 is a diagrammatic view of a portion of the system shown in Fig. 6 showing the damper closed, the switch opened and the piston closing the air supply;

Fig. 8 shows a spray system which is provided with a main switch, by which the blower may be started and stopped, a mercury switch operated by the draft from the blower and solenoid means for operating the valve in the air conduit to provide a completely electrically controlled system;

Fig. 9 is a diagrammatic view of a portion of the system shown in Fig. 8, illustrating the mercury switch in operation for completing the circuit to the solenoid and showing the valve opened by the solenoid;

Fig. 10 is a diagrammatic illustration of a paint-spraying system which includes a solenoid operated damper and a switch associated therewith for making and breaking a circuit with a solenoid for operation of the valve in the air line;

Fig. 11 is a section on the line 11—11 of Fig. 10 showing the valve and the solenoid; and

Fig. 12 is a section on the line 12—12 of Fig. 10 showing the flue damper and the associated solenoid and switch.

Referring to the drawings, I have illustrated in a more or less general and diagrammatic manner the important features of my invention. In each of the five embodiments of my invention illustrated I have shown apparatus which is particularly, though not exclusively, useful in connection with spraying paint, varnish and the like upon various articles to be coated. In each of the illustrated embodiments, I have shown, in cross-section, a hood or booth 1 in which the article to be sprayed may be located and a suitable spray gun 2 to spray fluid upon the article to be sprayed. For the purposes of illustration, I have shown a spray gun 2 having a conduit connection 3 which may be connected to a paint supply in the usual manner well-known to those skilled in the art. A second connection 4 is shown with a conduit 5 connecting a fluid pressure supply (not shown) to the gun. This fluid pressure is usually compressed-air which forces the paint or the like material from the gun in a spray. I have also shown a flue 6 connected to the hood or booth 1 through which gases and vapors are exhausted. A blower 7 is located in a proper position to create the circulation of air passing through the open side of the booth and carry the obnoxious

odors and gases out through the flue 6. The flue may or may not be provided with the damper 8 as desired.

Heretofore, in the spraying systems of the type above described the air supply was connected to the spray gun in such a manner that a person need merely to release the valve in the spray gun and the material to be sprayed would be ejected from the gun. The blower was operated from a switch but if the operator forgot to turn the switch the ventilating means would not be in operation while he was spraying articles. Many of the fluids used in spraying give off poisonous gases or fumes and in many instances operators have been overcome and been seriously ill, because they forgot to set the blower in operation before beginning to operate the spray gun.

It is dangerous to spray in a hood or booth located in a factory room when other employees are at work without positive operation of the ventilating system, as the other employees are also subjected to the gases and fumes which rebound from the hood or booth. Serious and costly explosions have resulted from filling a room with explosive gases created by spraying when the ventilating system was not in operation.

In order to prevent such accidents, I have provided various methods and mechanisms for controlling the air supply to the spray gun. These mechanisms are so constructed and arranged (as will be more fully hereinafter described) that the ventilating systems must be in operation when the valve means in the air conduit is open to permit the passage of compressed-air to the spray gun.

Referring now to the embodiment of my invention, illustrated by Figs. 1 and 2, I have shown, in addition to the various parts of the system heretofore described, a valve 9 located in the conduit 5. The valve 9 is of the rotary type having a passage 11, shown in dotted lines, which may cut off or permit passage of fluid pressure through the conduit 5 as desired. The rotor part of the valve 9 has a link 12 connected thereto and carries a contact point 13. The rotary part is also provided with a handle 14 connected by a link 15 with the damper 8 for opening and closing it. The damper 8 and link 15 may be omitted. A switch 10 for opening and closing a circuit to stop or start the blower 7 is located near the valve 9.

The operation of the system shown in Figs. 1 and 2 is as follows. Assuming that the damper 8 (if used) is in its closed position, the valve 9 is closed, and the switch circuit is opened, as illustrated in Fig. 2, it would be impossible for an operator to spray fluid from the spray gun 2, because no fluid pressure could pass the valve 9. In order to permit operation of the spray gun 2, the operator must move the handle 14 of the valve 9 from the position shown in Fig. 2 to that shown in Fig. 1. This operation will close the circuit of the blower by forcing the contact point 13 between the points of the switch 10 and at the same time open the valve, as indicated by the dotted-line passage 11. If the damper 8 is used it will be turned to the position shown in Fig. 1 by movement of the handle 14. The operator may now operate the spray gun 2. As the blower is in operation at all times when the gun may be operated it is perfectly safe for the operator to remain in the room in which the booth is located, because the ventilating means will properly take care of the fumes. With the system just described it is impossible to operate the spray gun unless the switch 10 is closed to set the blower 7 in operation and the blower will continue to operate so long as the valve 9 is open.

Referring now to the illustration of my invention shown in Figs. 3, 4 and 5, I have shown other means for securing the same general method of controlling the operation of the flow of fluid pressure and the operation of the blower 7. In this instance, I have inserted a cylinder 16 in the air conduit 5. Within the cylinder, I have provided a piston 17 having a stem 18 extending through one end of the cylinder. The piston 17 is normally pressed to the position shown in Figs. 4 and 5 by a spring 19. A small hole 20 is provided in the piston to act as a "bleeder" so that the air pressure will normally balance itself at both sides of the piston to keep the piston below the point where the conduit 5 leads from the cylinder 16 to the spray gun 2, as shown in Fig. 4. The switch 21, for starting and stopping the blower 7, is located in line with the stem 18 so that the contact member 22 may be pressed into circuit-closing position by the stem, as shown in Fig. 3. The contact member 22 is not connected with the stem and, therefore, it must be released by hand.

In the operation of the system shown in Figs. 3 through 5, the operator need merely open the valve in the spray gun and the rush of air under pressure through the conduit 5 will move the piston 17 in the cylinder 16 from the position shown in Fig. 4 to the position shown in Fig. 5. This movement of the piston presses the contact member 22 between the points of the switch 21 and thereby closes the circuit to the blower 7 to start it in operation. Thus, it will be readily understood that the switch 21 is closed when air under pressure is permitted to pass through the spray gun 2.

The switch contacts may be opened to stop the operation of the blower by pressing on the button 22^a to move the contact 22 into the position shown in Fig. 4, but this may only be

accomplished after the air pressure has been cut off, as shown in Fig. 4.

In the embodiment of my invention illustrated by Figs. 6 and 7, I have shown a system similar to that shown in Figs. 3 through 5, except that I have included a damper 8. In place of the switch 21, I have shown a switch 23 which has a sliding contact secured directly to the piston stem 18. The stem 18 is also secured to the damper so that in operating the piston to admit and cut off the air pressure to the spray gun 2 the switch 23 and damper 8 will be positively operated thereby.

In Figs. 8 and 9, I have illustrated a completely electrically operated system for controlling the opening and closing of the valve 9. Associated with the flue 6 is a mercury switch device comprising a tube 24 having one end opening into the side wall of the flue 6. The other end is located inside of the flue in the path of the draft from the blower. The last mentioned end is in the form of a funnel 25 having its open end facing away from the blower.

The handle 14 of the valve 9 is connected to a solenoid 26 (Figs. 8 and 9) and a spring 27 normally acts upon the handle 14 to hold the valve in closed position, as shown in Fig. 8. A main switch 28 is provided in the blower circuit.

Before paint or the like can be sprayed from the spray gun 2, shown in Fig. 8, the main switch 28 must be operated to close the blower circuit. When the blower is in operation it creates a draft in the flue 6 in the direction of the arrows and as the air currents pass by the funnel 25 a suction is created in the tube 24. This suction, assisted by the pressure of air passing into the end of the tube connected to the flue, will act to raise the mercury (or other suitable electrical conductive fluid) in the sloping part of the tube, so as to make an electrical connection between the ends 29—29 of the wire connected to the tube 24. When this circuit is closed, in the manner just described, the solenoid will operate to turn the valve from the position shown in Fig. 8 to the position shown in Fig. 9. Thus, the valve 9 is opened and air under pressure may pass to the spray gun to permit operation thereof.

This system just described in connection with Figs. 8 and 9 is entirely automatic in its control of the air supply to the spray gun. Once the main switch 28 is operated to close the circuit to the blower the system will be ready for operation. If, however, the electric current should fail, the blower 7 would stop and the mercury would recede from the ends 29—29 connected to the tube 24, thereby breaking the solenoid circuit and the spring 27 would close the valve 9 and stop the flow of compressed air to the spray gun.

In Figs. 10 through 12, I have illustrated a system which is very similar to the one shown and described in connection with Figs. 8 and 9. In this instance, I have shown in addition a damper 8 in the flue 6 and a solenoid 30 and switch 31 connected to the damper 8.

When the main switch 28 is operated to close the blower circuit, the solenoid 30 is energized and turns the damper 8 assisted by the draft of air from the blower 7. The contact point 32 is pulled against the points 33—33 to close the circuit to the solenoid 26 which in turn operates the valve 9 in the same manner as above described in connection with Figs. 8 and 9.

This system of control is completely electrical and automatic. As soon as the electric current fails or the switch 28 is operated to break the circuit the springs associated with the solenoids 26 and 30 operate to close the valve 9 and the damper 8 and the spray gun cannot be operated unless the ventilating system is in operation.

In operating any one of the various paint spraying systems above described, the operator points the spray gun 2 into the hood or booth from the open side thereof, so that the circulation of air through the open side carries the gases away from the operator and out through the flue 6. The cooperation between the air pressure for operation of the spray gun 2 and the ventilating means is such that the operator must perform some act which will set the ventilating system in operation before paint can be sprayed and so long as paint may be sprayed the blower system will remain in operation.

In some instances, the operator must open the valve 9 by hand, in other instances, the valve 9 is opened automatically by merely opening the usual valve in the spray gun 2 and in still other instances, the valve is opened only after the operator has closed a main switch.

While I have illustrated and described various means and methods embodying my invention, I do not wish to be limited thereby and therefore reference is made to the following claims to indicate the scope of my invention.

Claims:

1. Fluid spraying apparatus including a spray gun, a fluid pressure conveying conduit connected to said spray gun, valvular means in said conduit, a booth in which said spray gun is operated, ventilating means associated with said booth, said ventilating means including a draft-creating device and means connecting said valvular means and said draft-creating device whereby the draft-creating device is placed in operation when the valvular means in said conduit is open.

2. Fluid spraying apparatus including a spray gun, a fluid pressure conveying conduit connected to said spray gun, valvular means in said conduit, a booth in which said spray

gun is operated, ventilating means associated with said booth, said ventilating means including an electrically operated blower for circulating the air in said booth and drawing the air through the ventilating means, a control means operatively connecting the valvular means and blower whereby when the valvular means is opened the blower is operated.

3. Fluid spraying apparatus including a spray gun, a fluid pressure conveying conduit connected to said spray gun, valvular means in said conduit, a booth in which said spray gun is operated, ventilating means associated with said booth, said ventilating means including an electrically operated blower for circulating the air in said booth and drawing the air through the ventilating means, a switch for starting and stopping the blower and a connection between the switch and the valvular means whereby when the valvular means is opened the switch is closed to start the blower in operation.

4. Fluid spraying apparatus including a hood or booth, a spray gun for spraying fluid into said hood, a fluid-conveying conduit associated with said gun and a second conduit through which fluid pressure may pass to said gun, valvular means in said second mentioned conduit, ventilating means associated with said hood or booth, said ventilating means including a flue leading from said hood or booth, a damper in said flue and blower means for discharging fumes from said hood through said flue, a switch for opening and closing an electric circuit to said blower and means connecting the damper, switch and valvular means whereby the blower is placed in operation and the damper opened when the valvular means is opened.

5. Fluid spraying apparatus including a hood or booth, a spray gun for spraying fluid into said hood, a fluid-conveying conduit associated with said gun and a second conduit through which fluid pressure may pass to said gun, ventilating means associated with said hood or booth and including an electrically operated blower, a switch for closing and opening a circuit to said blower and automatically acting valvular and switch operating means whereby when fluid pressure is permitted to pass through said gun said switch will be closed to start the operation of said blower.

6. Fluid spraying apparatus including a hood or booth, a spray gun for spraying fluid into said hood, a fluid-conveying conduit associated with said gun and a second conduit through which fluid pressure may pass to said gun, ventilating means associated with said hood or booth and including an electrically operated blower, a switch for closing and opening a circuit to said blower and automatically acting valvular and switch operating means whereby when fluid pressure is permitted to pass through said gun said switch will be closed to start the operation of said blower and a damper also operatively connected for operation by said automatically acting valvular means.

7. In a fluid spraying apparatus of the class illustrated and described, a blower, a spray gun, a fluid pressure conveying conduit connected to said gun, a valve in said conduit and electrically operated means connected between the blower and the valve whereby one is operated upon operation of the other.

8. In a fluid spraying apparatus of the class illustrated and described, a blower, a spray gun, a fluid pressure conveying conduit connected to said gun, a valve in said conduit, a draft flue, a damper associated with said blower and located in said flue, means for operation of said damper and means associated with said valve whereby the valve can be opened only after the damper has been opened.

9. Spraying apparatus of the class described, including a booth 1, a spray gun 2 for forcing fluid against articles located in the booth 1, a conduit 5, a valve 9 in said conduit, a flue 6 for conveying fumes from said booth, a blower 7 for drawing the fumes from said booth and passing them out through said flue and means associated with the blower 7 and valve 9 whereby when the valve is opened the blower is in operation.

10. Spraying apparatus of the class described, including a booth 1, a spray gun 2 for forcing fluid against articles located in the booth 1, a conduit 5, a valve 9 in said conduit, a flue 6 for conveying fumes from said booth, a blower 7 for drawing the fumes from said booth and passing them out through said flue, a damper 8 in the flue 6, and inter-connected means associated with the blower 7, damper 8 and valve 9 whereby when one is operated all are operated.

11. In a paint or the like spraying apparatus, a booth or hood, an air-operated spray gun for spraying articles in said booth or hood, a valve-controlled air-conveying conduit connected to said gun, a ventilating system associated with said booth or hood for removing gases and vapors therefrom when articles are being sprayed and means interconnected between the valve in the air conduit and the ventilating system for controlling their operation.

12. In an apparatus of the class described, a hood or booth, spraying means, for operation within the hood or booth, which when in operation produces gases, ventilating means apart from the hood or booth whereby the gases are removed from the hood or booth and coordinating means for controlling the operation of the spraying means and the operation of the ventilating means whereby

when the spraying means is functioning the ventilating means will be in operation.

13. The combination of apparatus which when in operation creates a harmful or obnoxious gas or vapor and a ventilating system which includes draft creating means for carrying off the gas or vapor as it is created and coordinated means connected between the ventilating system and the apparatus which produces the gas or vapor and adapted to control the operation of both the said apparatus and the draft creating means and by which the said apparatus is permitted to operate only when the ventilating system is in operation.

14. The combination of a gas or vapor producing apparatus with a ventilating system which comprises a flue connected to a room or hood in which said apparatus operates, means for creating a draft through said flue to draw the gas or vapor from the room or hood and means connected between the ventilating system and the apparatus which produces the gas or vapor, adapted to control the operation of both the said apparatus and the means for creating a draft, whereby the said apparatus is permitted to operate only when the ventilating system is in operation.

15. The method of removing gas or vapor from a room or hood in which an apparatus is operated and in which the said apparatus creates a gas or vapor which comprises associating a ventilating system with the room or hood and the apparatus operated therein to take the gas or vapor from the room or hood and also providing a mechanism which interconnects the said apparatus and system to prevent operation of the said apparatus except when the ventilating system is functioning.

16. The method of controlling a fluid spraying apparatus having a spray device, a booth or room in which the spray device is operated, a ventilating system and means connecting the spray device and ventilating system which comprises coordinated control of the spray device and ventilating system through the connecting means, whereby the spray device is prevented from operation except when the ventilating system is in operation.

In testimony whereof, I have signed my name to this specification.

WILLIAM A. READY.