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[54] **FLOW-RESPONSIVE VALVE**
17 Claims, 5 Drawing Figs.

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98/115 SB, 118/7, 118/326, 137/83, 251/313
[51] **Int. Cl.** **G06d11/00,**
B05c 11/00
[50] **Field of Search** 251/304;
267/175, 177; 137/83, 87, 99; 98/115 SB; 118/7, 326

[56] **References Cited**

UNITED STATES PATENTS

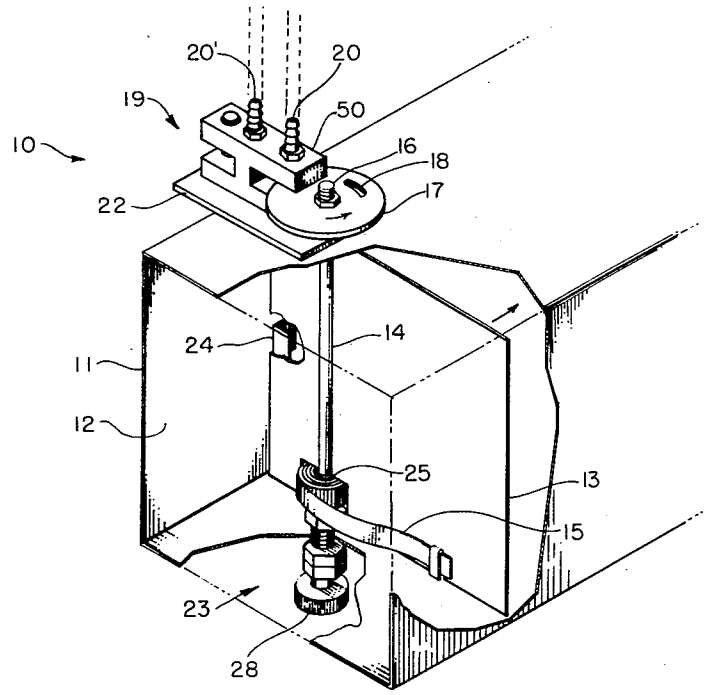
1,859,797	5/1932	Ready	118/326 X
3,396,740	8/1968	Olson	137/87

FOREIGN PATENTS

288,533	5/1953	Switzerland	251/304

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ABSTRACT: A switch includes an orifice connected to a fluid source, which supplies a fluid to the orifice, and an opening spaced from and substantially aligned with the orifice. The opening is connected to a device adapted to be actuated as a result of a fluid flowing from the orifice to the opening. A movable member is in the path of a gaseous flow and is adapted to respond to the gaseous flow. An apertured, displaceable element is adapted to be displaced by movement of the movable member. The displaceable element is position between the orifice and the opening in an interference path with the fluid flow. Displacement of the displaceable element to a position so that the aperture is substantially aligned with the orifice and the opening allows fluid to flow between the orifice and the opening permitting actuation of the device.



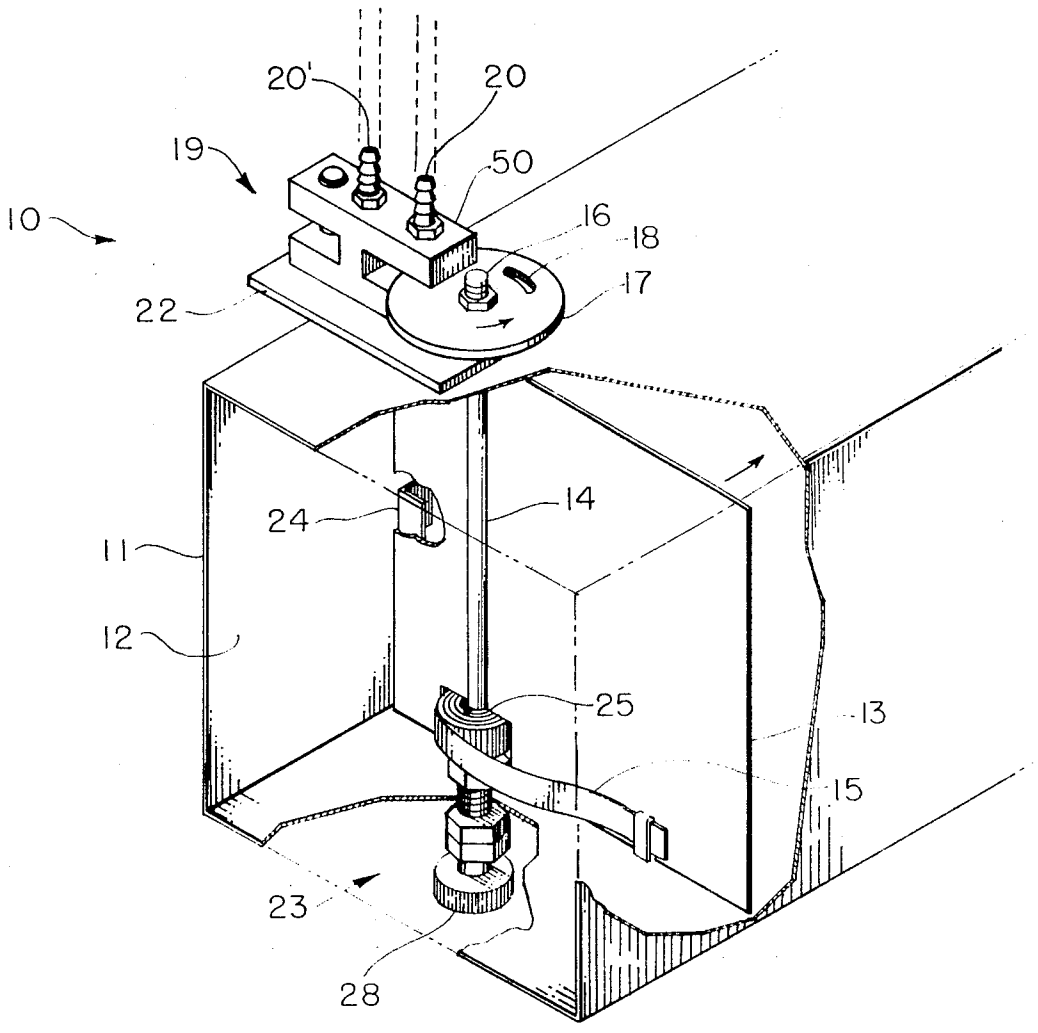


Fig. 1

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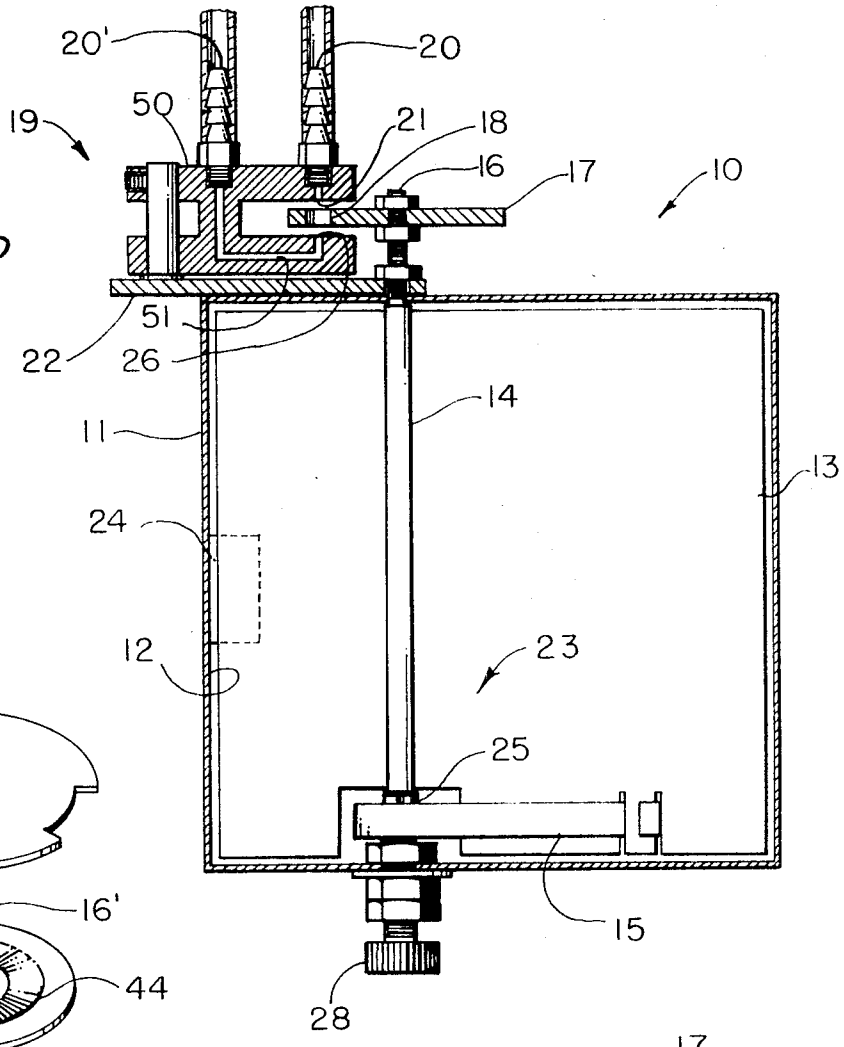


Fig. 2

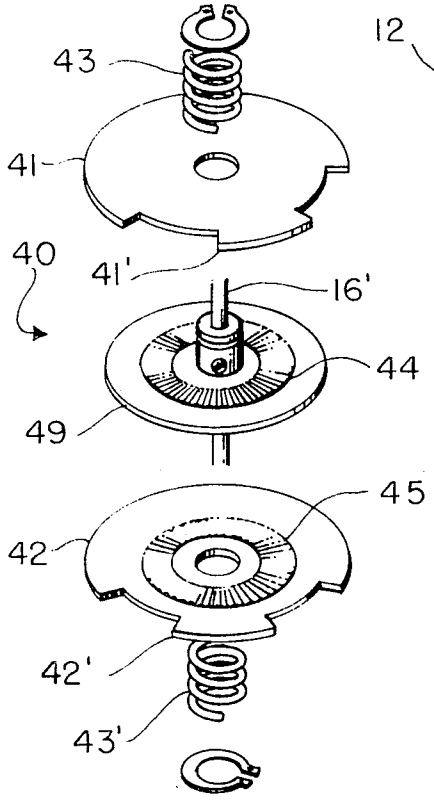


Fig. 4

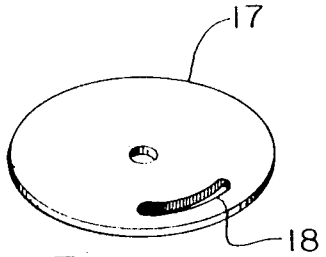


Fig. 3

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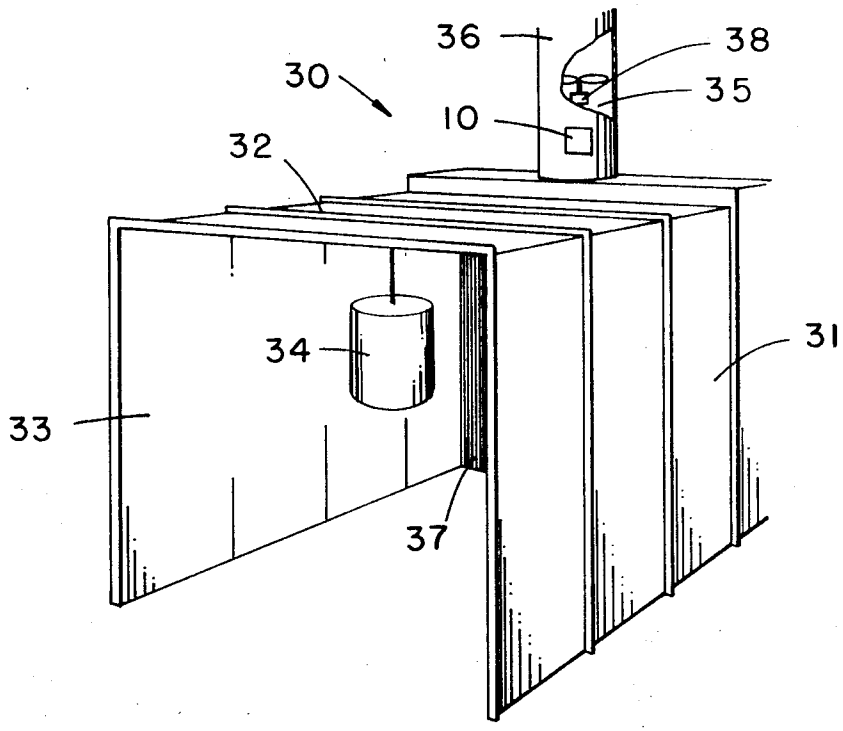


Fig. 5

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FLOW-RESPONSIVE VALVE

The present invention relates to a switch and to a method for causing a device to respond to any one of a plurality of conditions. More particularly, the present invention relates to a switch cooperatively associated with a coating booth. The switch is capable of sensing the ability of an exhaust means to remove contaminated air from the coating area of the booth and to control a spray device in response to such a condition. Moreover, the invention may be adapted for use in exhaust or other gaseous transfer systems where monitoring or control of a plurality of conditions in desired.

Electrostatic charging and depositing of particulate coating materials is an accepted practice in several industries such as the paint-finishing industry. Electrostatic coating of articles of manufacture such as furniture, appliances, toys lighting standards and the like lowers finishing cost by, among other things, reducing the amount of overspray of paint thereby resulting in a paint cost savings.

One of the problems experienced in the use of a coating booth with coating equipment is that of quickly and efficiently removing evolved contaminants such as toxic and/or combustible fumes which may be present in the air from the vicinity of the operator. Another problem which may be experienced in the use of a coating booth with coating equipment is that of preventing the operator from inadvertently bringing a means into contact with the evolved combustible fumes which may cause ignition of the fumes.

Generally, a coating booth includes an enclosure which provides an area within which the coating of articles takes place. The coating booth generally includes an exhaust mechanism for removing fumes, coating particles and the like which may be present in the air contained within the boot. The exhaust mechanism may include a means such as a fan for drawing the evolved fumes, coating particles and the like to and/or through a filter means, which substantially removes the coating particles and the like, to a means such as an exhaust stack which exhausts the filtered air. Generally, if the booth has its top closed and the front thereof open, the air draft developed in the coating area of the booth by the fan is adequate to cause a major portion of the fumes evolved during the coating operation to be transported to and out of the stack. The removal of materials evolved during the coating operation significantly reduces the possibility of subjecting the operator of the coating equipment to toxic and/or combustible fumes, random coating particles and the like. However, difficulties have been encountered in attempting to call the operator's attention to potentially harmful conditions existing in the coating area such as the reduced efficiency of a filter means, the operational failure of a fan and the like so that the operator may take the necessary remedial action before a harmful condition can develop.

Therefore, it is an object of the present invention to provide an article of manufacture which overcomes the problems enumerated hereinbefore.

Another object of the present invention is to provide an article of manufacture for sensing any one of a plurality of conditions which may exist within the confines of a coating booth.

Yet another object of the present invention is provide a switch which is capable of monitoring the efficiency of an exhaust mechanism cooperatively associated with a coating booth.

Yet another object of the present invention is to provide a switch which is actuated by substantially uncontaminated air aspirated into the switch.

A further object of the present invention is to provide a switch capable of monitoring the ability of a fan to create a draft in a coating booth.

Another object of the present invention is to provide a switch having no electrical connections in the immediate vicinity of a coating booth which causes cooperatively associated electrical equipment to be actuated upon the occurrence of any one of several conditions within the confines of the booth.

Yet another object of the present invention is to provide a switch having moving components parts thereof which may be mounted externally of a coating booth.

Another object of the present invention is to provide a switch including the combination of a pivotal member adapted to pivot in response to a gaseous flow and an apertured, arcuately displaceable disk connected to the pivotal member and adapted to interrupt a fluid flow causing deenergization of coating equipment upon the occurrence of a condition.

Yet another object of the present invention is to provide a fluid-actuated switch including a vane having such physical properties that an air flow below a determined flow rate has little, if any, effect on the switch.

Yet another object of the present invention is to provide a switch external of a coating booth which is capable of reacting to the reduced efficiency of a filter means to thereby cause deenergization of cooperatively associated electrostatic coating equipment.

Another object of the present invention is to provide a gaseous-actuated fluid switch external of a coating booth which is capable of sensing a plurality of conditions in a coating area defined by the booth.

A further object of the present invention is to provide a gaseous-actuated fluid switch external of a coating booth thereby substantially preventing, over an extended period of use, a buildup on and in the switch which may deleteriously effect the operation thereof.

Another object of the present invention is to provide a switch which is economical to manufacture, efficient in operation and easy to install on a coating booth.

Yet another object of the present invention is to provide a method for preventing energization of and for deenergizing energized electrostatic coating equipment upon the occurrence of any one of several conditions.

Further objects of the present invention will become apparent upon a further review of the disclosure including the following description, the appended claims and the appended drawings.

In the drawings:

FIG. 1 is a perspective view of the switch with portions thereof cut away;

FIG. 2 is a cross-sectional view of the switch of FIG. 1;

FIG. 3 illustrates an apertured, displaceable element;

FIG. 4 illustrates an adjustable displaceable element; and

FIG. 5 illustrates a coating booth with portions thereof cut away illustrating the switch of the present invention installed in the plenum area associated with the booth.

Generally speaking, the present invention relates to a switch which is capable of sensing the efficiency of an exhaust mechanism cooperatively associated with a coating booth. The switch reacts to a plurality of conditions such as the ability of a fan to draw air from the coating area of the booth through a filter means and the ability of the filter means to remove contaminants from the air drawn from the booth. The switch includes an orifice connected to a source which supplies a fluid under pressure to the orifice. An opening is spaced from the orifice and is substantially aligned with the orifice. The opening may be connected to coating equipment such as an electrostatic coating means which is adapted to be energized as a result of fluid flow from the orifice to the opening. A movable member is in the path of and responsive to a gaseous flow. A displaceable element, which may include an aperture, is connected to the movable member and is adapted to be displaced by movement of the movable member. The displaceable element is positioned between the orifice and the opening so as to be adapted to be in an interference path with the fluid flow. Displacement of the displaceable element causes displacement of the aperture to a position whereby the aperture may be aligned with the orifice and the opening. Alignment of the aperture, the orifice and the opening allows fluid to flow between the orifice and the opening permitting energization of the cooperatively associated coating equipment.

The present invention also relates to a method for deenergizing coating equipment upon the occurrence of a deleterious reduction in the efficiency of a filter means cooperatively associated with a coating booth and/or of a deleterious reduction in efficiency of a means for creating an exhaust air draft through the booth.

Referring now to the drawing, and in particular to FIGS. 1 and 2 of the drawing, reference numeral 10 generally indicated the switch contemplated by the present invention. The switch 10 includes a housing 11 fabricated from a nonflexible material such as metal, plastic and the like. Suitable metallic materials may be steel, aluminum and the like. A suitable plastic material may be polyethylene and the like. The housing 11 includes a passageway 12 which extends the length of the housing. The passageway 12 of the housing is illustrated as being substantially straight; however, the passageway may be irregular, that is, the length of the passageway may be curved or may include a combination of curved and straight sections as long as the flow of gaseous material therethrough is not seriously impeded by forces such as frictional force and the like. The outer periphery of the housing 11 may be any one of several suitable configurations such as square, rectangular, circular, combinations thereof and the like. The periphery of the passageway 12 formed by the housing may be rectangular, square, circular, combinations thereof and the like and need not necessarily conform to the contour of the outer periphery of the housing.

A movable member 13 is suitably positioned within passageway 12. The movable member 13 may be a vane, paddle and the like which is moved by air flowing through the passageway. The movable member 13 may be fabricated from any suitable material having a low density and good rigidity such as metals, plastics and the like. A suitable metal is aluminum and a suitable plastic material is polyethylene. The density of the material used to fabricate the movable member 13 should be low so the movement of the member by a gaseous flow through passageway 12 is substantially proportional to the gaseous flow rate and so that variations in the gaseous flow rate may be detected and reacted to by the member. The movable member 13 is illustrated as having a peripheral contour similar to the peripheral contour of the passageway 12. It is pointed out that the peripheral contour of the member 13 need not necessarily substantially conform to the peripheral contour of the passageway 12. For example, the peripheral contour of the passageway 12 may be generally rectangular or square whereas the peripheral contour of the movable member 13 may be generally circular or vice versa. If the peripheral contour of the movable member 13 approximates the peripheral contour of the passageway 12 or if the peripheral contour of the movable member and the passageway are dissimilar, the radial dimensions of the movable member need not necessarily be such that the movable member extends substantially across the passageway. The moveable member 13 need only extend across the passageway 12 sufficiently far so as to be capable of sensing a gaseous flow through the passageway. Therefore, the movable member 13 may extend partially across the passageway 12.

A rodlike member 14, fabricated from any suitable nonflexible material such as metal, plastic and the like, may be integral with or suitably attached to the movable member 13. If the rod member is attached to the movable member, it may be attached thereto by any suitable means such as by welding, soldering, brazing and the like. The rod member 14 provides an axis about which the movable member 13 may be pivotally displaced. It should be noted that the axis about which the movable member 13 pivots is displaced from the axis of the movable member so that an air flow impinging on the member creates an unstable condition rather than a stable condition acting on the movable member. If an unstable condition acts on the movable member 13, the member will be pivoted whereas if a stable condition acts on the member, the member may not be pivoted.

The rod member 14 and its extremities cooperate to locate the movable member 13 within the passageway 12. The extremities of the rod member 14 are journaled in suitable bearing means so as to permit pivotal displacement of the movable member 13 about an axis determined by the rod member.

A bias means 15 of assembly 23 such as a coil spring has one extremity thereof fixedly attached to the movable member 13 in the manner illustrated in FIGS. 1 and 2. The other extremity of the coil spring 15 may be fixedly attached to a hub 25 of assembly 23 by any suitable means such as soldering, brazing, welding and the like. The hub 25 may include a recess (not shown) which provides a journal for the extremity (not shown) of the rod member 14 opposite extremity 16. A number of turns of the coil spring 15 may be wound around the hub 25. The number of coil turns of the coil spring 15 wound around the hub 25 is proportional to the amount of force, such as air flow, which is required to move the movable member 13 from its normal position. The movement of the movable member 13 from its normal position by an air flow causes the spring 15 to be displaced from its normal position thereby storing energy. Release of the stored energy of the spring 15 may be caused by a reduction in the air flow rate through passageway 12. The released stored energy causes the movable member 13 to return to a position which more closely approximates the normal position of the movable member.

Extremity 16 of the rod member 14 carries, externally of the passageway 12, a displaceable element such as disk 17. The disk 17 may be fabricated from any rigid, low-density material such as aluminum, polyethylene and the like. As shown in FIGS. 1 to 3, the disk 17 may include an aperture 18 formed near the outer periphery of the disk. The aperture 18 may be generally circular, straight or arcuate in length with an aperture of arcuate length being preferred. The arcuate length of the aperture 18 is determined by several facts among which are the amount of pivotal deflection of the movable member necessary to indicate that the draft drawn by the fan through the filter means is sufficient to assure that the booth is being adequately exhausted. Means for varying the arcuate length of the aperture 18 will be discussed herein later.

A valve mechanism 19, including an orifice 20, H-shaped bracket 50, passageway 51 formed in the bracket and an orifice 20', may be suitably supported on the housing by a bracket 22 carried by the housing 11. The orifice 20' communicates with the opening 26 through passageway 51. Therefore the orifice 20 communicates with the opening 21 through passageway 51. The opening 21 is substantially axially aligned with opening 26. The H-shaped bracket may be fabricated from any rigid material such as metal, plastic and the like.

As illustrated in FIGS. 1 and 2, the disk 17 is positioned between the opening 21 and the opening 26 in an interference path with fluid flowing between the orifice 20 and the orifice 20'. Arcuate displacement of the apertured disk 17 by the movement of movable member 13 reacting to a gaseous flow through the passageway 12 may cause the aperture 18 formed in the disk to become substantially aligned with the opening 21 and the opening 26 to thereby allow the fluid present in the orifice 20 to flow to orifice 20'. The fluid at the inlet orifice 20 flows through the passageway 51 formed in the H-shaped bracket to the outlet orifice 20'. The outlet orifice 20' may be connected to a fluid amplifier (not shown) which in turn may be connected to electrostatic coating equipment of the type shown in U.S. Pat. No. 2,893,894; U.S. Pat. No. 3,169,882; U.S. Pat. No. 3,169,883 and the like by any suitable conduit means (not shown) such as by a rubber hose, a plastic tube and the like. The flow of a fluid in the outlet orifice 20' to the cooperatively associated electrostatic coating equipment allows the equipment to be or to remain energized.

The hub 25 of assembly 23, used to provide a journal for the extremity of rod member 14 opposite extremity 16, is connected to an end of the coil spring 15. Rotation of knob 28 in one direction causes the coils of the spring 15 to be wound more tightly around the hub 25 whereas rotation of the knob in the opposite direction causes the coils of the spring to be

wound less tightly around the hub. It should be seen that the more tightly the coils of the spring **15** are wound around the hub **25**, the greater the gaseous flow rate through the passageway **12** must be before the movable member **13** will be pivotally displaced. Therefore, assembly **23** may be used to vary the force required to pivotally displace the movable member **13**. Rotation of the knob **28** of the assembly in either direction does not cause a corresponding pivotal displacement of the movable member since the hub **25** merely provides a journal for the cooperatively associated extremity of rod member **14** and is not fixedly attached to the rod member.

A stop means **24** may be formed in the passageway **12** of the housing **11** to limit the degree of pivotal displacement the movable member **13** may experience.

The arcuate length of the aperture **18** may be varied by any one of several configurations. One such configuration would be the use of two overlying, apertured disks (not shown) capable of being independently displaced by manual means wherein part of each aperture may be occupied by the solid area of the contiguous disk. The longest possible arcuate length of the aperture formed by the contiguous disks would be the arcuate length of the aperture having the shortest arcuate length. The structure disclosed for varying the arcuate length of the aperture is not limiting but merely exemplifies one of several possible structures which may be used to provide an aperture of adjustable length.

FIGURE **4** shows an embodiment of a displaceable element which may be substituted for displaceable element **17** of FIGURE **1**. The extremity **16** carries an adjustable disk means **40** including a drive disk **49** fixedly connected in any suitable manner to the extremity **16**. A pair of adjustable disks **41** and **42**, having a plurality of lobes **41'** and **42'** spaced about the periphery of the disks, are positioned on each side of the drive disk **49** and have a floating characteristic on the extremity **16**. Adjustable disks **41** and **42** are biased by spring means **43** and **43'** toward the drive disk **49** so as to engage with the drive disk. The drive disk **49** may contain a circle of gearlike teeth **44** on each face thereof which mate with the corresponding gearlike teeth **45** on the face of adjustable disks **41** and **42**. The mating teeth of the drive disk and the adjustable disks cooperate so as to retain the adjustable disks **41** and **42** in a fixed position with respect to the drive disk **49**. If the displaceable element **40** of FIGURE **4** is substituted for the displaceable element **17** shown in FIGURES **1** and **2**, the lobes **41'** and **42'** may be used to interrupt the fluid flow between the opening **21** and the opening **26** of valve mechanism **19**. The void space between adjacent lobes may be used to permit a fluid flow between the opening **21** and the opening **26** when the void space between adjacent lobes is aligned with the opening **21** and the opening **26**. If it is desired to adjust one or both adjustable disks with respect to the drive disk **49**, one or both of the adjustable disks may be axially displaced thereby disengaging the teeth on the face of the adjustable disk from mating engagement with the teeth on the face of the drive disk **49**. The adjustable disk is then rotated to the desired position with respect to the drive disk **49**. The lobes of the adjustable disk should be in the required position so as to interrupt the fluid flow between the opening **21** and the opening **26** as desired. The adjustable disk is biased back into engagement with the drive disk **49** by the cooperatively associated spring. It should be seen that if the adjustable disks **41** and **42** are rotatably displaced simultaneously with respect to the drive disk, the length of interruption of the fluid flow by the lobes **41'** and **42'** remains substantially constant. However, if only adjustable disk **41** is rotatably displaceable with respect to the drive disk **49**, the length of interruption of the fluid flow by the lobes **41'** and **42'** may be varied as desired.

FIG. **5** illustrates a coating booth **30** fabricated in three sections designated by reference characters **31**, **32** and **33**. Sections **31** and **33** are in spaced, substantially parallel relationship and serve as the sidewalls of the booth. Section **32** is the top or canopy of the coating booth. The sidewalls and the canopy cooperate to provide a protective stall for an operator using electrostatic coating equipment to coat an object **34** suitably suspended in the coating area of the booth. The sidewalls and the canopy may be fabricated from any suitable metallic material such as sheet metal and the like. The sidewalls and the canopy may be secured together by any suitable means such as by bolting, welding, brazing and the like. The switch mechanism may be installed in any convenient place in the plenum area **35** between the filter means **37** and the fan **38** of the coating booth as shown in FIGURE **5**. With the switch mechanism in the plenum area **35** as illustrated in FIGURE **5**, uncontaminated air externally of the booth is aspirated or drawn through the switch means when the fan **38** is energized. Alternatively, the switch means **10** may be located beyond the fan **38** on the stack **36** in which case air movement in the stack caused by energization of the fan is forced through the switch means.

With the hereinbefore structural disclosure in mind, and by continued reference to the several FIGURES of the drawing, the following analysis of the operation of the present invention will further serve to amplify the novelty thereof.

In operation, with the switch device **10** in the plenum area **35**, a flow of air is aspirated or drawn through the switch device when the fan **38** is energized. Generally, the air flow rate through the passageway **12** is sufficient to cause the member **13** to be pivotally displaced. As the member **13** is pivotally displaced, the coil spring **15** is drawn more tightly about the hub **25** thereby storing energy. The disk **17**, carried by the extremity of **16** of rod member **14**, is arcuately displaced in proportion to the displacement of the movable member **13**. If the fan **38** and the filter **37** are each functioning satisfactorily, the aperture **18** of the disk **17** is arcuately displaced so as to be in approximate alignment with the opening **21** and the opening **26**. Alignment of the aperture **18** of the disk **17** with the opening **21** and the opening **26** permits a fluid, such as air under pressure, to flow from the orifice **20** to orifice **20'**. The fluid flow is transmitted to a fluid amplifier (not shown) which amplifies the fluid and directs the amplified fluid to electrostatic coating equipment (not shown) which allows energization of the electrostatic equipment under substantially safe ventilation conditions. Assuming that the switch means **10** is installed in the plenum area **35** and further assuming the filter **37** is not functioning properly, the increased air flow through the switch means **10** causes the deflection of the disk **17** beyond that desired so that the aperture **18** of the disk is not aligned with the opening **21** and the opening **26** thereby preventing a fluid flow between opening **21** and opening **26**. Assuming that the fan **38** is not functioning properly, the reduced air flow rate through the switch means **10** is insufficient to cause the proper amount of deflection of the aperture **18** of the disk **17** so as to align the aperture with the opening **21** and the opening **26**. As disclosed hereinbefore, if the aperture **18** of the disk **17** is not substantially aligned with the opening **21** and the opening **26**, fluid will not flow throughout the length of passageway **51**. The absence of fluid flow between the opening **21** and the opening **26** prohibits energization of the electrostatic coating equipment.

Although the instant specification is directed to permitting energization of the cooperatively associated electrostatic equipment when fluid flows between the opening **21** and the opening **26**, it is within the scope of the present invention to so design the electrostatic equipment that it may be energized only when a fluid flow does not exist between the opening **21** and the opening **26**. It is seen that the electrostatic coating equipment may be energized only if the exhaust equipment is functioning properly thereby permitting operation of the equipment under substantially safe conditions.

While the invention is illustrated and described in an embodiment, it will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of this invention and as set forth in the appended claims.

Having thus described my invention, I claim:

1. An article of manufacture comprising,

a housing including a passageway for a gaseous flow,

means including spaced-apart first and second openings,

the first opening adapted to be supplied with a fluid under pressure, the second opening substantially aligned with the first opening, the second opening adapted to be connected to a device adapted to be actuated from one state to another state as a result of fluid flow from the first opening to the second opening,

a movable member in the path of the gaseous flow in the passageway and adapted to respond to the gaseous flow, and

a displaceable element including means for allowing a fluid to pass from the first opening to the second opening and connected to the movable member and adapted to be displaced by movement of the moveable member, the displaceable element being positioned between the first opening and the second opening in an interference path with the fluid flow between the first and second opening, predetermined displacement of the displaceable element causing displacement of its means to a position of substantial alignment with the first opening and the second opening allowing the fluid to flow between the first and second openings thereby allowing the device to be actuated from the one state to the other state.

2. The article of manufacture as claimed in claim **1** for providing a switching function, wherein the movable member is a pivotal member substantially perpendicular to the direction of the gaseous flow, the gaseous flow pivoting the pivotal member an amount substantially proportional to the amount of the gaseous flow.

3. The article of manufacture as claimed in claim **2** for providing a switching function, wherein the pivotal member includes means for providing a pivot axis removed from the axis of the pivotal member.

4. The article of manufacture as claimed in claim **3** for providing a switching function, the pivotal member being positioned so as to at least partially extend across the passageway.

5. The article of manufacture as claimed in claim **1** for providing a switching function, further including bias means adapted to store energy upon movement of the movable member in response to the gaseous flow and adapted to release stored energy upon at least a partial cessation of the gaseous flow.

6. The article of manufacture as claimed in claim **5** for providing a switching function, wherein the bias means is a spring.

7. The article of manufacture as claimed in claim **6** for providing a switching function, wherein the spring is in the form of a coil.

8. The article of manufacture as claimed in claim **6** for providing a switching function, further including means for adjusting the tension of the spring.

9 The article of manufacture as claimed in claim **1** wherein the displaceable element means includes a void area which is capable of allowing the fluid to flow therethrough.

10. The article of manufacture as claimed in claim **9** for providing a switching function, wherein the void area has an adjustable length.

11. The article of manufacture as claimed in claim **10** for providing a switching function, wherein the movable member includes a rod member connected thereto for providing a pivot axis, the displaceable element being connected to the rod member and adapted to be arcuately displaced by displacement of the rod member.

12. The article of manufacture as claimed in claim **11** for providing a switching function, the movable member extending at least partially across the passageway, and the displaceable element fixedly attached to a portion of the rod member projecting externally of the housing.

13. The article of manufacture as claimed in claim **12** for providing a switch function, further including a stop means carried by the housing for limiting pivotal movement of the movable member.

14. In combination, a booth and the article of manufacture as claimed in claim **1**, the article adapted to respond to a gaseous flow through the booth.

15. A switch for responding to a gaseous flow through an exhaust mechanism of a coating booth, the switch comprising

a housing including a passageway for a gaseous flow,

a movable member in the path of the gaseous flow and adapted to be moved in accordance with the amount of the gaseous flow through the exhaust mechanism,

means including spaced apart first and second openings the first opening adapted to be supplied with a fluid under pressure and the second opening adapted to be connected to a coating device capable of being activated from one state to another state upon fluid flow from the first opening to the second opening and

a displaceable element connected to the movable member and including means for allowing fluid flow from the first opening to the second opening, the displaceable element initially being in an interference path with the fluid flow between the first and second openings, predetermined displacement of the movable member displacing the means of the displaceable element to a position where fluid at the first opening flows thereby to the second opening allowing activation of the coating device from the one state to the other state.

16. A switch as claimed in claim **15** wherein the means for allowing fluid flow from the first opening to the second opening of the displaceable element is a void area of adjustable length.

17. A switch as claimed in claim **16** wherein the displaceable element is an arcuately displaceable disk.