Nov. 19, 1963 P. CORTRIGHT 3,111,077

CONVERTIBLE FUMEHOOD

Filed March 19, 1962

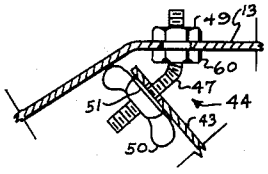


Fig-6

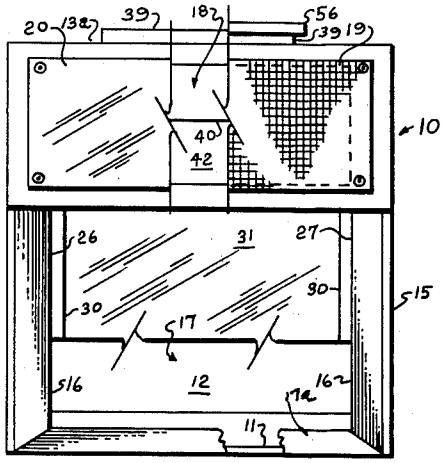


Fig-1

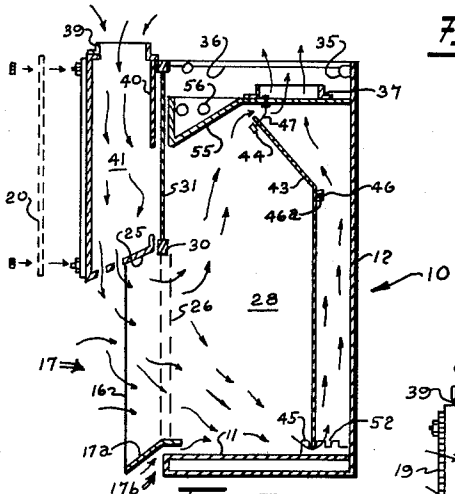


Fig-2

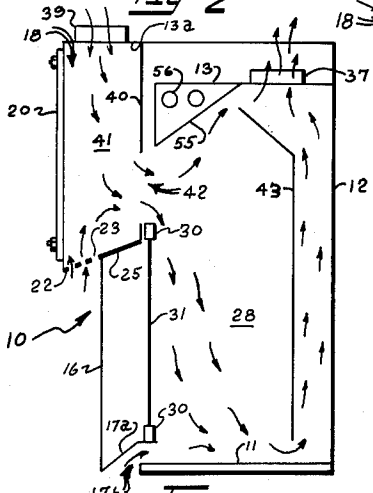


Fig-3

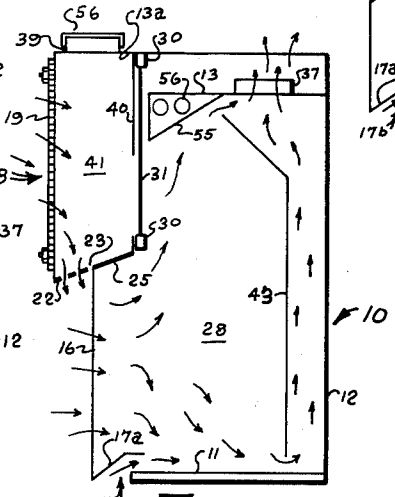


Fig-4

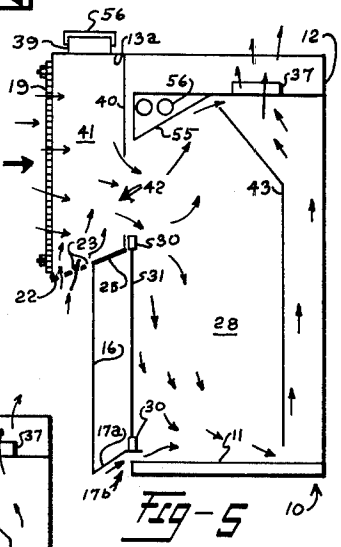


Fig-5

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CONVERTIBLE FUMEHOOD

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This invention relates to fumehoods, and particularly to fumehoods having interchangeable means to convert the said fumehoods from constant volume fumehoods which remove air from a room in which they are installed to air conditioning fumehoods in which the quantity of air removed from the room is controlled, and vice versa.

Prior to my invention, various types of fumehoods were well known and used for the purpose of drawing off undesirable gasses, fumes or other substances which might poison or pollute the air, for the purpose of providing breatheable air around the working area or working chamber associated with the fumehood.

Originally, fumehoods comprised a working chamber having an open front and means usually at the top of the chamber to exhaust air and undesirable gasses or other substances from the chamber. This would permit a person or technician to conduct experiments and other processes within the chamber, and be free from the danger of inhaling the undesirable gasses because the force of the exhaust would remove air from the room in which the fumehood was located through the working chamber, thence through the exhaust duct, carrying the undesirable gasses and not permitting them to enter the room. It was then desirable to provide a transparent protective shield through which the technician could observe the reactions taking place within the fumehood. Such a transparent shield is in the form of a strong glass such as a safety glass or wired glass, and is placed within a sash so that the shield may be moved up or down to provide access to the working chamber.

In conventional fumehoods, closing the shield would reduce the intake area at the face of the working chamber until the intake area would be completely closed and block further flow of air. Thus, provision was made, by means of a grille or other opening, to provide for flow of air and continued operation of the device even though the glass sash was completely closed. In order to overcome the correlated problem of changing the rate of flow of air by enlarging and reducing the size of the front opening of the chamber by raising and lowering the sash, an open grille of substantially the same size as the front opening of the chamber was placed above the front opening and communicating with the working chamber. The sash, which would be just large enough to cover the front opening, as well as the grille, could then be moved up and down to completely cover the grille or completely cover the opening, or in any intermediate position partially to cover the grille and the front opening simultaneously. In this way, that portion of the front opening which would be reduced by the sash would be compensated for by a corresponding portion of the grille which would be uncovered as the sash was lowered.

Thus, air would be removed from the room at a constant rate of flow, whether the sash was up or down. This prevents high air velocities at the lower level of the working chamber which are undesirable. Thus, the constant volume fumehood which may be operated without creating undesirable velocities, even with the sash substantially closed, solves this problem.

However, with the advent of air conditioning, need for a type of hood was dictated which could be operated without drawing large quantities of air from the room in which it was installed, the ideal hood, of course, being one which could supply its own air and would draw no air out of the room in which it was installed. Hoods have

been developed which minimize the withdrawal of room air and are called air conditioning fumehoods.

In principle, these hoods supply air through an intake duct or port. The air is then removed through the exhaust port. In such hoods, there is no grille, and the glass sash may be substantially closed without affecting the velocity of the exhaust system. Such hoods work well with the sash closed. However, when the sash is opened, there is sometimes undesirable leakage of noxious fumes from the working chamber into the room, especially from the lower part of the working chamber.

It is, therefore, an object of this invention to provide an air conditioning fumehood in which an auxiliary air supply is introduced through an intake construction which directs the flow of such air in front of the open face of the working chamber when it is not covered by the sash so as to substantially minimize flow of air and other substances through the open face of the working chamber during the operation of the hood.

It is a further object of this invention to provide a fumehood construction which may be converted from a constant volume hood to an air conditioning hood by a simple and easy interchange of parts.

Further objects and advantages will appear in the specification hereinbelow. These objects and advantages are achieved by the construction illustrated in the accompanying drawings in which:

FIG. 1 is a front elevation illustrating alternate replaceable parts at its upper portion such as a solid closure means shown partially broken off and grille means shown partially broken off with other parts of the figure shown broken away;

FIG. 2 is a medial cross section with the solid closure means in place, showing the solid closure means in extended position in phantom, and also showing air currents by means of arrows when the sash is in up position;

FIG. 3 is a diagrammatic view similar to the sectional view shown in FIG. 2 showing air currents, by means of arrows, which flow when sash is in down position;

FIG. 4 is a diagrammatic view similar to FIG. 3, showing flow of air, by means of arrows, when the solid closure means is removed and the grille means is installed in place thereof and the intake collar is sealed;

FIG. 5 is another diagrammatic view similar to FIG. 4, showing the flow of air, by means of arrows, when the grille means is installed, the intake collar is sealed, and the sash is in down position; and

FIG. 6 is a detail of the top of the adjustable baffle showing the baffle and the top wall in section.

Similar numerals refer to similar parts throughout the several views.

My fumehood may be constructed of any material strong enough for the purpose. It is also desirable for the construction material to be fireproof and for the floor or counter of the device to be acid resistant. I, therefore, provide that the main frame **10** be made of enameled steel coated with acid resistant paint. The floor or counter **11**, should be of a material such as stone, and sufficiently thick to withstand acids, heat and damaging reactions. The floor **11** may be a separate counter-top over which the main frame **10** of the hood is placed, or it may be an integral part of the hood construction.

The main frame **10** has a rear wall **12**, a top wall **13** and side walls **14** and **15**. The front or face wall **16** is formed with a front or face opening **17** at the lower portion thereof and an upper opening **18** at the upper portion thereof adapted to contain or be closed by either a grille **19** or solid closure means **20**. The areas of the face opening **17** and upper opening **18** should be substantially the same.

At the lower end of face opening **17**, I provide a deflector **17***a*. This is desirable to permit entry of air at

the bottom of the working space 31 when the sash is closed. Thus, when the sash is all the way down, the bottom of sash 31 will be closed against the top of deflector 17*a* which still permits an air passage 17*b* through the bottom of the front of the device. When an experiment is set up within the hood, passageway 17*b* will prevent leakage of noxious material because it provides a passage for air to enter the device and leave through the exhaust duct.

The front wall 17 has a forwardly and downwardly depending offset portion 22 which is located between upper opening 18 and the face opening 17. This offset portion contains a series of perforated openings 23 through which air may move. Directly behind the offset portion 22, there is an angled baffle means 25 which is set between walls 14 and 15 of the main frame 10. Sash guides or channels 26 and 27 are associated with walls 14 and 15 respectively to provide means for raising and lowering slideable panel means such as a glazed sash 30 between the upper opening 18, the lower face opening 17, and the working chamber 28 of the device. The sash 30 is provided with a pane of safety glass 31, or wired glass, and is adapted to slide up and down within the sash guides 26 and 27. The height of the sash should be sufficient to cover the lower face opening 17 when completely lowered. The sash 30 may be maintained at various positions by balancing means such as a counterweight or sash balance 35 cooperating with cable 36 attached to the upper end of sash 30.

I provide an exhaust collar 37 in the upper wall 13. Exhaust collar 37 communicates with working chamber 31, and may be attached to any suitable type of duct or other means which may be connected to an exhaust blower or other means of moving the air out of the working chamber 28. I do not show the ducts or the exhaust pumps since these are well known to the art, and may be of any type suitable for the purpose.

At the upper front portion of the device, I provide an inner wall 40 which depends from top wall 13 to a point above the top of the sash 30 when the sash 30 is in lowermost position. This forms an auxiliary chamber 41 defined by either the grille 19 or the solid plate 20, the inner wall 40, the forward upper wall 13*a*, the side walls 14 and 15, and the baffle 25. At the top of chamber 41, I provide an intake collar 39 through forward upper wall 13*a*.

The described construction also leaves an opening below inner wall 40 and above angled baffle 25 designated by reference numeral 42. I also provide an internal angled baffle 43 disposed between upper baffle holders 44 and lower baffle cleats 45. Baffle holders 44 and cleats 45 are attached to the main frame 10.

I provide stainless steel hooks 46 at either side of the rear of baffle 43 which fit into studs 46*a* positioned in walls 14 and 15 respectively. Thus, the baffle 43 is pivotally suspended on the studs 46*a*, and positioned in selected pivoting positions by means of choice of a slot 52 and the cooperating action of the hanger or holding means such as the baffle holders 44.

Baffle holders 44 comprise a stainless steel angled bolt 47 inserted through an appropriate hole 48 and maintained in depending position by means of a nut 49. Lower part of angled bolt 47 is adapted to receive a wing nut 50. There is a lock nut 60 on the angled bolt 47 to help hold it in place. The wing nut 50 may be substituted with an acid-resistant knurled knob with a threaded insert to fit over the end of angled bolt 47. Baffle 43 is thus held in place by means of the described assembly forming the holder 44. It is desirable to have an acid resistant washer 51 between the knurled knob and the baffle 43. It can thus be seen that by placing the lower end of the baffle 43 selectively in any one of the several cuts 52 of cleats 45 and adjusting the upper end of baffle 43 by means of the upper holders 44, the baffle 43 may be placed in a variety of adjustably selected positions.

I also find it desirable to have an angled baffle 55 disposed between a central portion of upper wall 13 and the forward portion of the working chamber as shown in FIG. 2 of the drawings. This baffle 55 may be constructed of safety glass or wired glass and illumination, such as electric lamps in proper lamp sockets 56, may be placed above baffle 55 if it is desired to provide illumination. Otherwise baffle 55 may be made of asbestos board or any other corrosive resistant material, the same as baffle 43, or it may be made of steel or any other suitable material.

The Device as an Air Conditioning Hood

In order to use my fumehood as an air conditioning hood, a suitable duct is attached to intake collar 39 and connected to an input blower to provide an auxiliary air input for the device. Solid plate 20 is attached to the device to cover upper opening 18. The input blower and the exhaust blower (both not shown) are then turned on to provide a flow of air as defined by the arrows in FIG. 3 of the drawings, when sash 30 is placed in down position.

It will be noted that chamber 41 is now formed as a plenum chamber, and the auxiliary air leaves chamber 41 at opening 42 to enter the working chamber 28. Although perforated openings 23 will remain open, the action of the input blower and the exhaust blower are such that the air will nevertheless principally flow through chamber 41 and out of opening 42 to exhaust working chamber 28. Some air will flow upwardly through perforations 23 through chamber 41 and out of opening 42, and some air will flow underneath deflector 17*a* and through air passage 17*b*. The inward flow through perforated openings 23 and through passageway 17*b* insures that there will be no outward flow of air carrying noxious material into the room. This also prevents an undesirable flow of air downwardly out of plenum chamber 41 into the room to disturb the air conditioned air with unconditioned air.

In the ideal air conditioned hood, approximately 25% to 50% of the air will be room air coming through the open face 17. When the sash is in down position, as in FIG. 3 of the drawings, approximately the same amount of air will then flow upwardly through the perforations 23, and inwardly through air passage 17*b*.

Let us assume now that it is necessary to raise the sash 30 in order for the technician to do something inside the working chamber 31. As the sash raises, it closes opening 42 forcing the entire flow of auxiliary air 41 through perforated openings 23 and downwardly across the front of the face opening 17 so that when the sash is entirely in up position, the flow of air will be as shown in FIG. 2 of the drawings. It will thus be seen that a sufficient amount of air is provided by the auxiliary air supply through chamber 41 to cover the entire face of the opening 17 on the outside of the device so that the exhaust blower will suck in mainly this auxiliary air in clearing out the working area 28, and thus, substantially all of the conditioned air is kept in the room, and is not dissipated through the fumehood. This will be the case even though the sash is completely up, and the entire opening 17 is open.

This construction also provides that none of the noxious material in the working chamber 28 may leave through any part of opening 17. The operation of the intake blower and the exhaust blower are designed to provide an average air velocity at the face opening 17 of approximately 100 feet per minute. This, of course, can be varied by changing the speed of the blowers as well as the various openings and baffle arrangements.

The Device as a Constant Volume Fumehood

If it is desired to use the device in an installation where there is no air conditioning problem, it is possible to eliminate the auxiliary air supply which is brought in

through intake collar 39. In order to accomplish this, intake collar 39 is sealed up by means of a valve (not shown) or by means of a threaded cap 56 which may be screwed onto the intake collar 39 upon removal of the duct means or by any other sealing means.

Solid plate 20 is removed and replaced with a grille 19. Thus, chamber 41 is changed, and now when the sash is in down position, there is a free flow of air from the room through grille 19, through chamber 41, and through opening 42 as shown in FIG. 5 of the drawings.

When sash 30 is in upward position, the flow of air would then be from a room through face opening 17 as shown in FIG. 4 of the drawings. Thus, by means of the simple expedient of closing off intake collar 39 and replacing solid arrangement 20 with a grille element 19, the entire character of the device is changed from an air conditioning hood to a constant volume hood.

While I have described my invention in its preferred form, there are other forms which it may take without departing from the spirit and scope of the invention and I, therefore, desire to be protected for all forms coming within the claims apended hereinbelow.

Wherefore I claim:

1. A convertible fumehood having a main frame comprising a working chamber defined by at least one wall, and means at the front thereof to provide at least one face opening in the lower part of said front; an auxiliary chamber located above said face opening having a rear portion adjacent to the upper part of said front of the working chamber with at least one interchamber opening between the said working chamber and the said auxiliary chamber above the said face opening, and at least one outside opening in the said auxiliary chamber for communication from the said auxiliary chamber to outside the device; closure means comprising slideable panel means being sufficiently large to cover said lower face opening and adapted to be moved on guide means on the main frame to selected positions relative to said face opening and said interchamber opening so that when said closure means is moved from said face opening to said interchamber opening, said face opening will be progressively uncovered and said interchamber opening will be progressively covered; said outside opening of said auxiliary chamber adapted to be selectively and alternatively fitted with a solid closure, or a closure with open communication means for gasses; said working chamber having exhaust means for exhausting gasses at an upper portion thereof, and said auxiliary chamber having input blower means connected through an input port and closure means to selectively close or open the said input port to the auxiliary chamber; said auxiliary chamber having a lower portion in the form of a baffle comprising at least one opening, said baffle extending from front to rear of said auxiliary chamber with the rear of said baffle located near an area between the said face opening and the said interchamber opening.

2. The convertible fumehood as defined in claim 1 in which the said slideable panel means comprises transparent material.

3. The convertible fumehood as defined in claim 1 in which the face opening is in a substantially vertical plane, and the said baffle forms an acute angle with the said vertical plane of the said face opening.

4. The convertible fumehood as defined in claim 3 in which the said exhaust means is located near the top of the said working chamber and the said input port is located near the top of the said auxiliary chamber, with said baffle means having a plurality of openings located at the bottom of the said auxiliary chamber, and the outside opening of said auxiliary chamber being located between the said input port and the said baffle.

5. The device as defined in claim 4 in which there is a passageway for gasses underneath the movable closure means and between it and the main frame of the device.

6. A convertible fumehood comprising: a main frame comprising a working chamber having exhaust means to remove gasses or airborne material from the said working chamber; at least one first opening and at least one second opening in the said working chamber being adjacent each other and substantially aligned in planar relationship on a first plane; a closure means sufficiently large to cover either of the said openings and adapted to be moved reciprocally on guide means to selected positions within the said main frame along a second plane relatively near and substantially parallel to the said first mentioned plane, ranging from a first selected position covering the first of said openings, then to a plurality of selected positions covering portions of the said first and second openings, then to a last selected position covering the second mentioned opening; said second mentioned opening communicating with a second chamber having communication means adapted to be selectively connected alternately to input blower means and to positive closure means and said second chamber having other means communicating with the atmosphere and adapted to be selectively alternately connected to positive closure means and to closure means having at least one opening for the passage of gasses; and said second chamber having at least one wall positioned at or near the said first mentioned opening in the said working chamber, said wall having at least one opening for the passage of gasses.

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