Nov. 23, 1965 H. N. GROW ETAL 3,218,953

FUME HOOD CONSTRUCTION

Filed Feb. 21, 1963 4 Sheets-Sheet 1

Fig. 1.

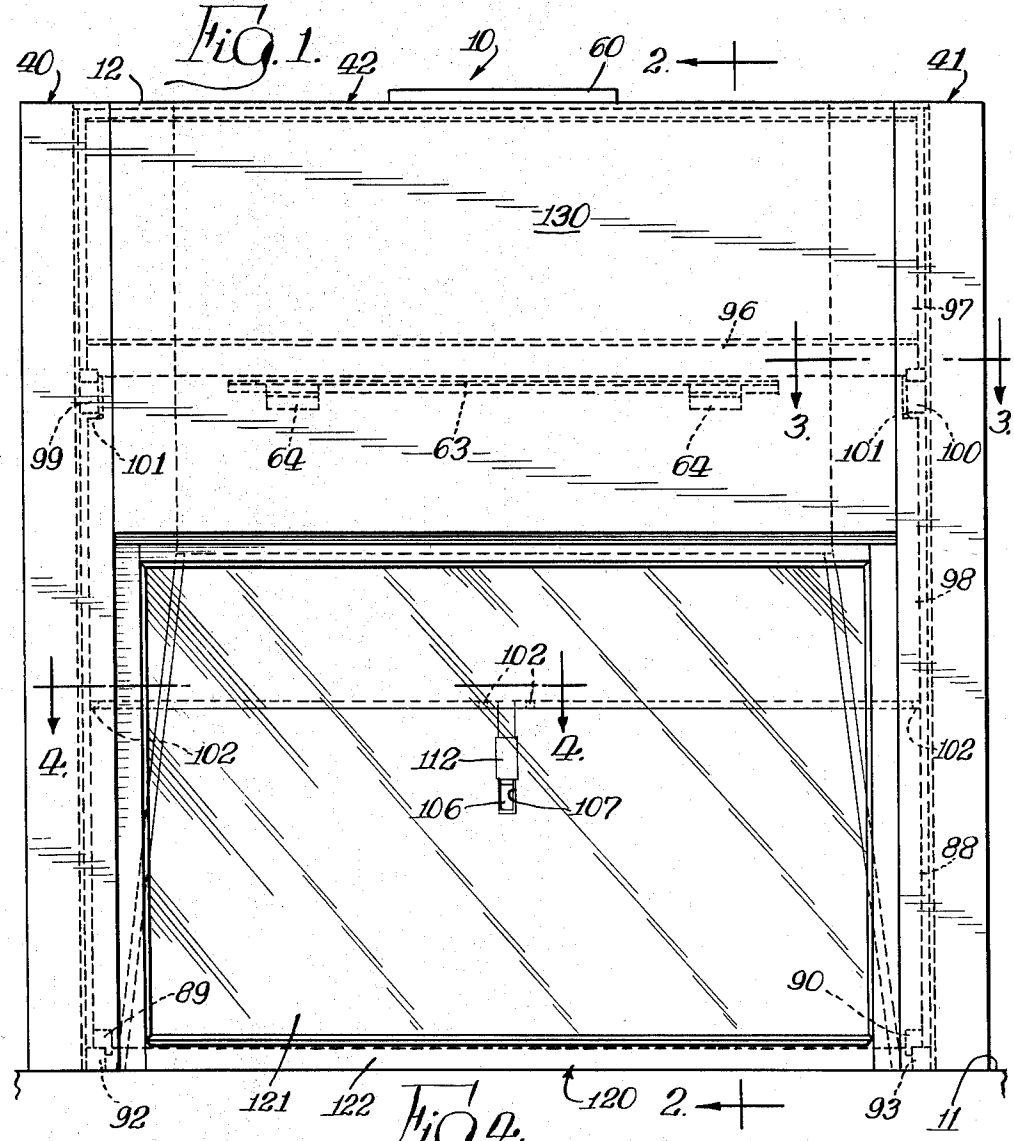

Fig. 4.

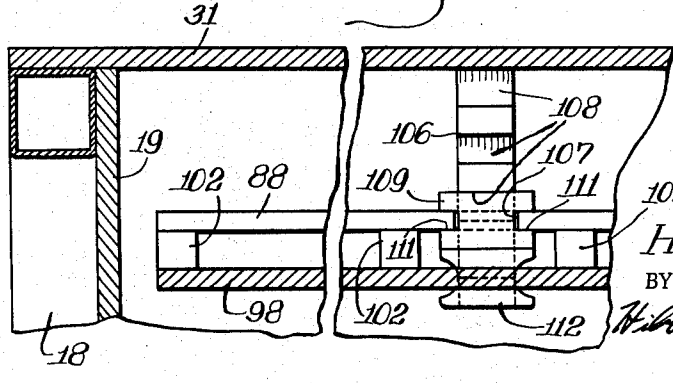

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Fig. 2.

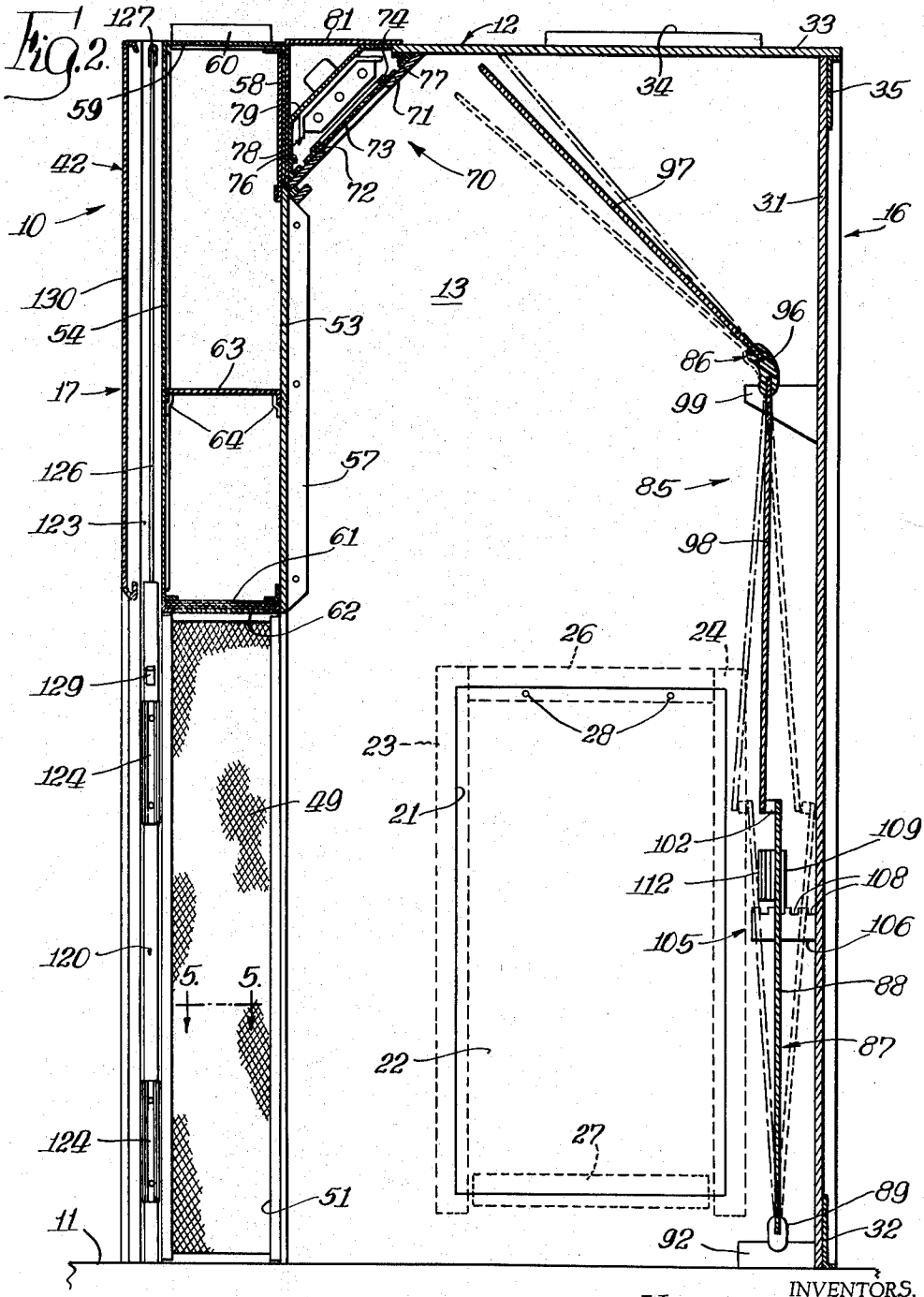
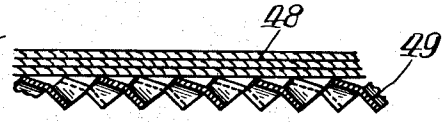


Fig. 5.



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FUME HOOD CONSTRUCTION

Filed Feb. 21, 1963 4 Sheets-Sheet 3

Fig. 3.

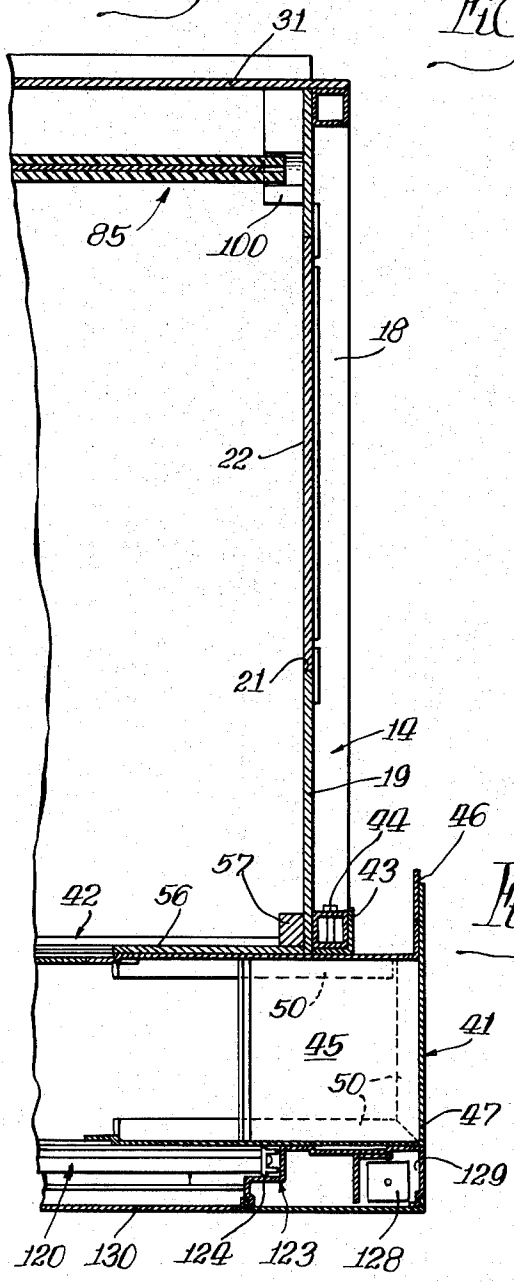


Fig. 6.

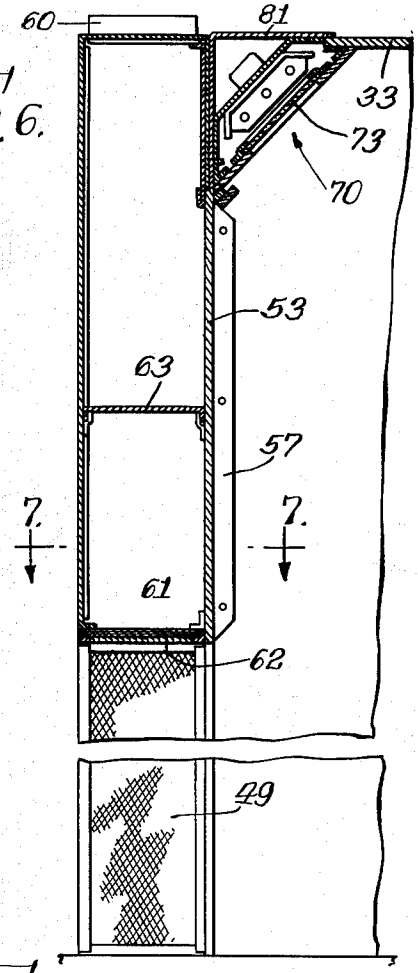
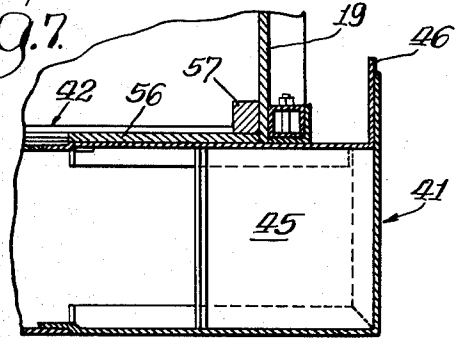


Fig. 7.



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FUME HOOD CONSTRUCTION

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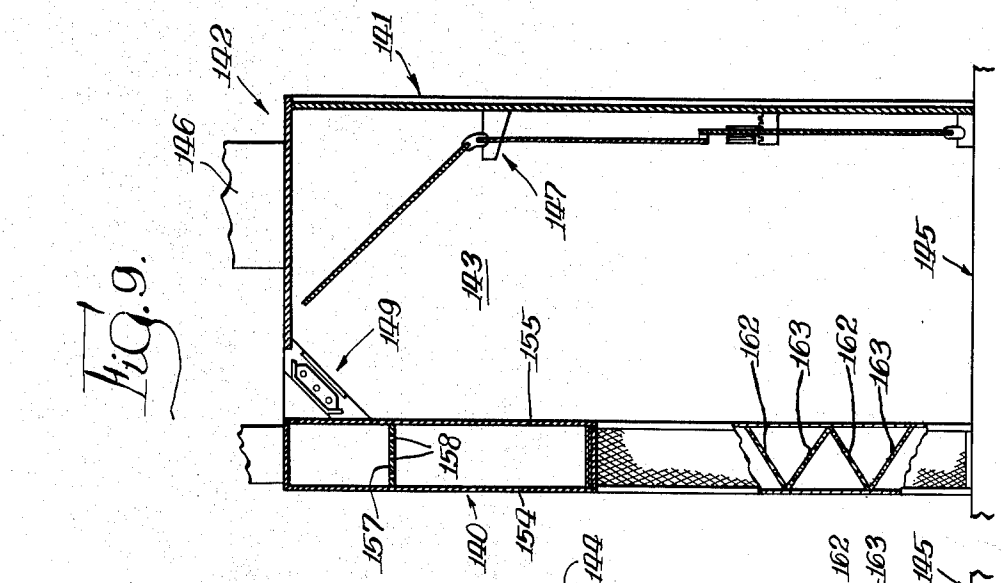

Fig. 9.

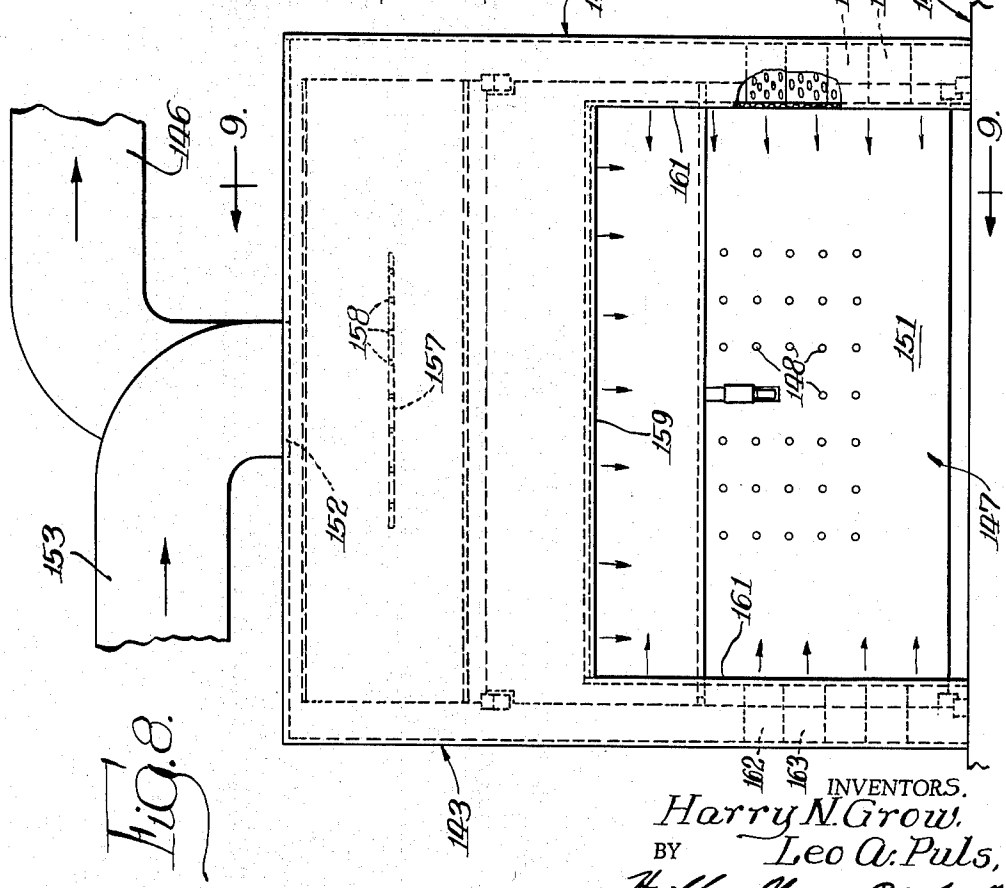

Fig. 8.

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United States Patent Office 3,218,953 Patented Nov. 23, 1965

3,218,953

FUME HOOD CONSTRUCTION

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Filed Feb. 21, 1963, Ser. No. 260,128
3 Claims. (Cl. 98—115)

This invention relates to fume hoods, and, more particularly, to a fume hood for use in a chemistry laboratory and the like.

It is a primary object of this invention to provide a fume hood including novel means for introducing into the fume hood air taken from the room in which the hood is located as well as air from an external source.

It is another object to provide a fume hood of the foregoing character, wherein air from an external source is introduced at the sides of an access opening of the hood.

Another object is to provide a hood of the foregoing character, having means for evenly distributing air flow at the sides of the access opening.

Still another object is to provide a fume hood having a novel baffle for regulating the flow of air to an exhaust opening of the hood.

A still further object is to provide a fume hood of the foregoing character, wherein the surfaces of the hood exposed to corrosive fumes are made of a non-corrodable material.

Other objects and advantages of the invention will become apparent from the following description taken in conjunction with the accompanying figures of the drawings, in which:

FIG. 1 is a front elevational view of a fume hood embodying the invention;

FIG. 2 is an enlarged sectional view taken along the line 2—2 of FIG. 1;

FIG. 3 is an enlarged fragmentary sectional view taken on the line 3—3 of FIG. 1;

FIG. 4 is an enlarged fragmentary sectional view taken on the line 4—4 of FIG. 1;

FIG. 5 is an enlarged fragmentary sectional view taken on the line 5—5 of FIG. 2;

FIG. 6 is a fragmentary sectional view similar to a portion of FIG. 2, showing an alternative form of the fume hood;

FIG. 7 is an enlarged fragmentary sectional view taken on the line 7—7 of FIG. 6;

FIG. 8 is a front elevational view showing another alternative form of the fume hood; and

FIG. 9 is a sectional view taken on the line 9—9 of FIG. 8.

In general, a fume hood embodying the invention is a generally box-like unit adapted to be positioned on a base, and comprises back, top and two side walls. An exhaust opening is formed in the top wall. A front wall, which forms an air supply unit, has an access opening and a secondary air inlet. Room air enters the access opening, and secondary air from an external source enters the air inlet and flows through air passageways to an air outlet at the sides comprising the vertical and top sides of the access opening. Air from these two sources flows through the hood and out through the exhaust opening. Filter and screen assemblies are positioned in the air outlets, and baffles are positioned in the air pasageways to evenly distribute air flow through the air outlets.

Mounted within the structure between the access and exhaust openings is an adjustable baffle for regulating the flow of air through the hood. The flow regulator baffle comprises upper and lower baffle sections, each section being mounted adjacent the back wall for pivotal

movement about a horizontal axis. The pivotal axis of the upper section is intermediate its top and bottom edges and the axis of the lower section is at its bottom edge. The top edge of the lower section is flexibly attached to the bottom edge of the upper section, and an air passageway is provided between the two sections. Air passageways are also provided over and under the two baffle sections, the relative sizes of the latter passageways being adjustable by pivoting the baffle sections.

A sash assembly for closing the access opening and a light assembly may also be provided, and the interior inner surfaces of the hood exposed to corrosive fumes may be made of non-corrodable material.

The fume hood shown in FIGS. 1 to 5 is indicated generally by the numeral **10** and is adapted to be positioned on a base indicated generally by the numeral **11**. The hood **10** comprises a top wall **12**, two side walls **13** and **14**, a back wall **16**, and a front wall **17**. The upper surface of the base **11** forms a bottom wall for the hood **10**.

Each side wall **13** and **14** comprises a substantially rectangular frame member **18** (FIG. 3) which may be formed from a tubular material such as aluminum or steel, and a side panel **19** preferably made of a non-corrodable material. The side panels **19** are secured to the frame members **18** preferably by bonding. If desired, an opening **21** may be formed in either or both side panels **19**, which is normally closed by a removable section **22** also preferably formed from a non-corrodable material. The section **22** is held in place in the opening **21** by two vertical cleats **23** and **24**, and upper cleat **26** and a bottom cleat **27**. The vertical cleats **23** and **24** and the upper cleat **26** are secured to the outside surface of the side panel **19** with a portion overlying section **22**. The bottom cleat **27** is secured to the outside surface of the section **22** with a portion overlying the panel **19**. The upper edge of the section **22** is secured to the top cleat **26** by screws **28**, preferably made of nylon. The section **22** may be taken out of the opening **21** by removing the screws **28** and then tilting the section **22** inwardly and lifting it upwardly.

The back wall **16** comprises a back panel **31** (FIGS. 2 and 3) which is positioned against the rearward edges of the side panels **19** and overlies the rearward outer surfaces of the frame members **18**. The back panel **31** is secured to the frame members **18** by either bonding or by screws. In the event screws are used, they preferably do not extend into the interior of the hood so that they cannot be reached by corrosive fumes. The back wall also preferably includes an angular member **32** having one arm secured to the outside lower edge of the back panel **31** as by bonding, and its other arm seated on the upper surface of the base **11**.

The top wall **12** comprises a top panel **33** which overlies the upper surface of the frame members **18** of the side walls **13** and **14** and the upper edge of the back panel **31** of the back wall **16**, and is secured to the frame members **18**. The top panel **33** is also secured to one arm of an angle **35** which has its other arm secured to the back panel **31**. The top panel **33** has an exhaust opening formed therein adjacent the back wall **16**, and a cylindrical flange **34** may be provided around this opening for attachment to a duct of a blower system.

The front wall **17** forms an air supply unit, and has an access opening and a secondary air inlet formed in it. The front wall **17** comprises left and right cornerposts **40** and **41** (FIGS. 1 and 3) secured to the side walls **13** and **14**, respectively, and a center assembly **42** which extends between and is secured to the two cornerposts **40** and **41**. Each cornerpost comprises an angle **43** (FIG. 3) which is seated against the forward and outer side

surfaces of the adjacent frame member **18** and secured thereto by a plurality of vertically spaced nut and bolt combinations **44**. A column **46** is secured as by welding to the forward side of each angle **43**, the outer edge portion of each column **46** being turned rearwardly as shown in FIG. 3. Each cornerpost also includes a cover **47** which has a portion spaced forwardly of the column **46**, and an outer portion which is also turned rearwardly and is secured as by welding to the rearwardly turned edge portion of the column **46**. The top and bottom edges of the column **46** and the cover **47** may be folded inwardly as shown at **50** in FIG. 3, and the upper and lower ends of each cornerpost may be enclosed by suitable plates **45**.

As shown in FIG. 1, the inner edges of the columns **46** and the covers **47** of the two cornerposts **40** and **41** slant inwardly and upwardly from the base **11** to the center assembly **42**, these slanted edges of the cornerposts forming two sides of the access opening. The surface of the base **11** forms the bottom side of the access opening and the lower edge of the center assembly **42** forms the top side of the access opening.

The space between the inner slated edges of the columns **46** and the covers **47** form air outlets. With reference to FIGS. 2 and 5, a filter **48** and a screen **49** are enclosed by a suitable frame **51** and positioned across each outlet. The inner edges of the columns **46** and covers **47** may be turned toward each other, and the frame **51** secured as by screws to these inturned edges. The filter **48** may be made of a plurality of matter layers of expanded metal. The screen **49** is also preferably made of expanded metal but having greater thickness and mesh than the filter material and it is positioned such that its strands slant toward the interior of the hood, as shown in FIG. 5. By this construction, when secondary air passes through the outlets, it is directed into the interior of the hood by the slanted strands. In FIG. 3, the filter and screen assembly has been removed for convenience of illustration.

The center assembly **42** of the front wall **17** is above the access opening, and comprises an inner panel **53** (FIG. 2) secured at its vertical side edges to the two columns **46**, and an outer panel **54** spaced forwardly of the inner panel **53** and having its vertical side edges secured to the two covers **47** of the cornerposts. The inner panel **53** is preferably made of a non-corrodable material. Further, the inner surfaces of the columns **46** are also preferably lined with sheets **56** (FIG. 3) of non-corrodable material, and a non-corrodable corner brace **57** may be secured as by bonding to each side panel **19** and the adjacent corner brace **57**.

The upper edge of the inner panel **53** is spaced below the upper edge of the outer panel **54**, and a metal bracket **58** (FIG. 2) is secured to the inner panel **53** and extends up to the level of the upper edge of the outer panel **54**. A top cover **59** is secured to the upper edges of the outer panel **54** and the bracket **58**, the cover **59** enclosing the top of the front wall **17** and having a secondary air inlet formed therein. A flange **60** may be formed around this inlet opening.

At the bottom of the center portion **42**, a filter **61** and a screen **62** are provided which may be similar to the filter **48** and the screen **49** shown in FIG. 5. The filter **61** and the screen **62** may be mounted in a suitable frame and secured to the bottom edges of the back and front panels **53** and **54**, and the strands of the screen **62** are formed to direct air into the interior of the structure.

With reference to FIGS. 1 and 2, a horizontal distributing baffle **63** is fastened to the inner and outer panels **53** and **54** for the purpose of improving the flow characteristics of secondary air flowing from the air inlet to the outlets at the sides of the access opening. The baffle **63** has downturned forward and rearward edges which extend behind clips **64** (FIG. 2) secured to the inner and outer panels **53** and **54**. Thus the baffle **63** may be removed simply by lifting it upwardly. Further, this baffle **63** may be perforated if desired.

When in use, the flange **60** is connected to an external source of secondary air which may be air from outside the building, from a corridor, etc. This secondary air is supplied under pressure and flows through the passageway formed between the inner and outer panels **53** and **54** of the front wall **17**, around the baffle **63** and out of the front wall **17** through the outlets at the sides of the access opening. The filters **48** and **61** cause a slight back pressure to be built up within the air passageway of the front wall **17** by restricting the flow of air through them, and this back pressure causes the flow of air through the three filters **48** and **61** to be substantially evenly distributed. The screens **49** and **62** protect the filters **48** and **61** and also direct the secondary air into the interior of the hood. Due to the slanted inner edges of the columns **46** and the covers **47**, the cross sectional area of the air passageways at the vertical sides of the access opening is greater at the top than at the bottom of the access opening. Accordingly, the flow of air through the outlets in the vertical sides will be substantially evenly distributed throughout the height thereof.

The fume hood further includes a light assembly, indicated generally by the numeral **70**, for lighting the interior of the hood **10**. The light assembly **70** comprises a sheet **71**, preferably made of a non-corrodable material, which has its end edges in abutment with and secured to the side panels **19** of the side walls **13** and **14**, and its rearward edge in abutment with the panel **33** of the top wall **12**. From the top panel **33**, the sheet **71** slants downwardly and toward the front wall **17**. An opening **72** is formed in the sheet **71**, and a pane **73** of translucent material such as glass is positioned over the opening **72** on the upper side of the sheet **71** and is held in place by a bracket **74**. Two generally V-shaped braces **76** and **77** are secured to the outer surface of the sheet **71** at its forward and rearward edges, the rearward brace **77** also being secured to the undersurface of the top panel **33**. The light assembly **70** further includes a three bulb fluorescent light fixture **78** having the outside of its reflector secured to a bracket **79**. The light fixture **78** is supported by a cover **81** which is secured to the bracket **79** and has a portion overlying the top panel **33** of the top wall **12**. The cover **81** is further secured by screws to the V-shaped bracket **76**. The light fixture **78** may be easily removed for maintenance simply by lifting the cover **81** and the light assembly **78** out of the hood.

The flow of air through the fume hood is regulated by a baffle **85** mounted between the access opening of the front wall **17** and the exhaust opening of the top wall **33**. The baffle **85** comprises an upper section **86** adjacent the back wall **16** for pivotal movement about a horizontal axis which is intermediate its top and bottom edges, and a lower section **87** mounted adjacent the back wall **16** for pivotal movement about a horizontal axis which is adjacent its bottom edge.

The lower section **87** comprises a lower panel **88** and two lower pivot blocks **89** and **90** (FIGS. 1 and 2), the two pivot blocks **89** and **90** being secured to the lower corners of the lower panel **88**. Preferably a slot is formed in the upper surface of each of the pivot blocks **89** and **90** which receives the bottom edge of the panel **88**, and the pivot blocks **89** and **90** are preferably bonded to the lower panel **88**. The lower baffle section **87** is supported on two lower support blocks **92** and **93** which may be bonded to the side panels **19** of the side walls **13** and **14** at the lower rear corners of the hood. Arcuate grooves are formed in the upper surfaces of the support blocks **92** and **93**, and the lower surfaces of the pivot blocks **89** and **90** are also arcuate and are seated in the grooves of the blocks **92** and **93**.

The upper baffle section **86** comprises an upper pivot strip **96** which is secured to the bottom and top edges of an upper panel **97** and an intermediate panel **98**. The

upper pivot strip **96** has two slots formed in it, into which the lower and upper edges of the panels **97** and **98** extend, these slots preferably being formed at an obtuse angle of, for example, 135°. The upper section **85** is positioned so that the lower panel **98** extends generally downward toward the base **11** and the upper panel **97** slants upwardly toward the top wall **12** and forwardly.

The upper pivot strip **96** extends across the entire width of the panels **97** and **98**, and is supported at its ends by two upper support blocks **99** and **100** which are preferably secured to the side panels **19** of the side walls **13** and **14** by bonding. An arcuate groove is formed in the upper surface of each block **99** and **100** which receives the lower arcuate surface of the upper pivot strip **96**. The upper corners of the intermediate panel **98** are recessed, as the points indicated generally by the numeral **101** (FIG. 1), to provide space for the upper support blocks **99** and **100**.

The bottom edge of the intermediate panel **98** is attached to the top edge of the lower panel **88** by a plurality of spaced apart flexible connectors **102** (FIGS. 1 and 2). The connectors **102** maintain the adjacent edges of the panels **88** and **98** in fixed spaced apart relation.

The horizontal widths of the three panels **88**, **97** and **98** and the upper pivot block **96** are made somewhat less than the distance between the side panels **19** of the side walls **13** and **14** so that air gaps exist between the vertical edges of the panels **88**, **97** and **98** and the inner surfaces of the side panels **19**.

The upper and lower baffle sections **86** and **87** are pivotal from an intermediate position, indicated in full lines in FIG. 2, to a bottom panel closed position indicated by dashed lines in FIG. 2, and a bottom panel open position indicated by dash dot lines in FIG. 2. In the bottom panel closed position, the top edge of the lower panel **88** rests against the back panel **31** and the top edge of the upper panel **97** is spaced a considerable distance from the top wall **12**. Air flows to the exhaust opening over the top edge of the upper panel **97**, through the space between the bottom and top edges of the intermediate and lower panels **98** and **88**, and around the vertical edges of the upper and intermediate panels **97** and **98**. This position of the baffle is preferable when lighter than air fumes are to be exhausted since they tend to rise to the top of the hood. When heavier than air fumes are to be exhausted, the baffle sections may be pivoted to the bottom panel open position where the top edge of the lower panel **88** is spaced a considerable distance from the back wall **16** and the top edge of the upper panel **97** engages the top wall **12**. Fumes and air then flow through the space between the bottom edge of the lower panel **88** and the upper surface of the base **11** and the back panel **31**, through the space between the bottom and top edges of the intermediate and lower panels **98** and **88**, and along the vertical edges of the three panels **88**, **97** and **98**. The fumes do not flow over the top edge of the upper panel **97** since it engages the top wall **12**. In the intermediate position, the top edges of the upper and lower panels are spaced from the panels of the top and bottom walls and air flows around the top and bottom edges of the baffle and through the space between the baffle sections. The heights of the baffle panels are preferably chosen such that the adjacent edges of the intermediate and lower panels are at substantially the height of a beaker when mounted above a standard Bunsen burner, and since the space between these two panels is always open, fumes from the beaker will be quickly withdrawn.

From FIG. 2 it will be noted that the center of gravity of the upper baffle section **86** is to the left of its horizontal axis of rotation, which produces a tendency of an upper baffle section **86** to pivot in the counterclockwise direction, and consequently the lower baffle section to pivot in the clockwise direction. To maintain the baffle sections at a selected position, a baffle latch **105** (FIGS. 1 and 2) is provided. This latch **105** comprises a ratchet block **106** secured to the back panel **31** of the back wall **16**, the block extending through a vertical slot **107** (FIGS. 1 and 4) formed at the upper center of the lower panel **88**. The ratchet block **106** has a plurality of notches **108** formed in its upper surface which receive a downwardly extending lip formed on the lower end of a stop block **109**. The stop block **109** is slidably mounted for movement in a vertical direction within the slot **107** of the lower panel **88** by means of two vertically extending grooves **111** formed in opposite sides of the stop block **109**, the vertical margins of the slot **107** extending into the grooves **111**. A handle **112** may be secured as by bonding to the forward side of the stop block **109**. To adjust the position of upper and lower sections of the baffle **85**, the handle **112** and the stop block **109** are lifted to an upward position where the lip of the stop block **109** is out of engagement with the ratchet block **106**. The stop block **109** may then be moved in either the forward or rearward direction until the sections of the baffles are in the desired position, and the stop block **109** is then lowered to bring its lip into one of the grooves **108** of the ratchet block **106**. Since the ratchet block **106**, in this instance, has five grooves **108**, the baffle **85** may be locked in any one of five positions including the three positions previously described.

The fume hood may also include a sash assembly mounted on the front wall **17** for varying the amount of room air drawn into the hood and for closing the access opening of the front wall when desired. With reference to FIGS. 1 to 3, the sash assembly comprises a sash **120** having a panel of glass **121** secured within a rectangular frame **122**. The sash **120** is preferably constructed such that its inner surface, which may be exposed to corrosive fumes, is constructed entirely of a non-corrodable material. A column **123** is secured to the cover **47** of each cornerpost **40** and **41**, and the sash **120** is slidably mounted for movement in a vertical direction within a slot formed between each column **123** and the adjacent cover **47** of the cornerpost. Guides **124** (FIGS. 2 and 3) are secured to the vertical edges of the sash **120** as by screws, the guides **124** being positioned within the slots of the columns **123** and guiding the movement of the sash **120**. Means is preferably provided for counterbalancing the weight of the sash **120**, this means comprising a cord **126** (FIG. 2) attached at one end to each vertical side of the sash **120** and passed over the top of the pulley **127**. The cords **126** are attached at their other ends to weights **128** (FIG. 3). The pulleys **127** (FIG. 2) are rotatably mounted on the columns **123** adjacent their upper ends. A stop **129** (FIG. 2) may be secured to each vertical edge of the sash **120** and positioned to engage a suitable strap (not shown) secured to each column **123** adjacent its upper end and thereby limit the upward movement of the sash **120**. Above the access opening of the front wall **17**, the space between the two columns **123** is preferably enclosed by a front cover **130** (FIGS. 1 to 3) which extends between and is secured to the two columns **123**.

When the sash **120** is in the lowered position, substantially all of the air passing through the hood enters through the secondary outlets at the sides of the access opening. As the sash **120** is raised, the proportion of room air to secondary air entering the hood progressively increases.

FIGS. 6 and 7 show a portion of the front wall of a fume hood which may be identical with the fume hood shown in FIGS. 1 to 5 with the exception that the sash assembly and the columns **123** are eliminated. In the construction shown in FIGS. 6 and 7, room air always enters the hood in addition to the secondary air entering the fume hood through the air outlets at the sides of the access opening.

FIGS. 8 and 9 show another alternative construction of the fume hood. This fume hood comprises a front wall **140**, a back wall **141**, a top wall **142**, two side walls **143** and **144**, and a bottom wall formed by a base **145**. The walls **141** may be identical with the corresponding walls of the hood shown in FIGS. 1 to 6. An exhaust opening is formed in the top wall **142** and is provided with a flange **146** which may be connected to an exhaust duct. A flow regulator baffle **147** is mounted within the hood for regulating the flow of air to the exhaust opening. The baffle **147** may be the same as the baffle **85** shown in FIG. 2 with the exception that a plurality of openings **148** may be formed in the lowermost panel to prevent fumes from accumulating at the forward surface of this panel. These openings **148** may be eliminated if desired. Further, a light assembly **149** which may be identical with the light assembly **70** shown in FIG. 2, is preferably mounted at the juncture of the front and top walls **140** and **142** for lighting the interior of the hood.

The front wall **140** is preferably secured to the two side walls **143** and **144**, and has an access opening, indicated generally by the numeral **151**, and a secondary air intake **152** formed therein. The intake **152** may be connected to a secondary air duct **153** extending from an external source of air under pressure. The front wall **140** has spaced apart front and back panels **154** and **155** which form an air passageway therebetween leading from the secondary air intake **152** to the upper horizontal and two vertical sides of the access opening **151**. A horizontal distributing baffle **157**, which is preferably provided with perforations **158**, is mounted within the air passageway below the secondary air intake **152**. This baffle **157** again may be removably mounted on clips (not shown) as shown in FIG. 2.

The access opening **151** on its upper horizontal and two vertical sides is separated from the air passageway of the front wall **140** by screen and filter assemblies. The numeral **159** indicates the screen and filter assembly for the upper horizontal side of the access opening **151** and the numeral **161** indicates the screen and filter assemblies for the two vertical sides of the access opening. The assemblies **159** and **161** are the same as those shown in FIGS. 2 and 5. A double thickness of filter material may be provided in the upper assembly **159** to increase the restriction of air flow at the upper side of the access opening **151** and thereby improve the air flow characteristics at the vertical sides of the access opening **151**. Further, a plurality of pressure control baffles **162** and **163** are preferably mounted in the portion of the air passageway adjacent each vertical side of the access opening **151**. The baffles **162** and **163** are preferably perforated, and the baffles **162** slope upwardly from the front panel **154** in the direction of the back panel **155** while the baffles **165** slope downwardly from the front panel **154** toward the back panel **155**, the baffles **162** and **163** thus having a zig-zag arrangement. The edges of the adjacent baffles **162** and **163** preferably engage each other, and are provided to ensure a satisfactory secondary air flow pattern at the vertical sides of the access opening **151**.

Where the use of a non-corrodable material is referred herein, a composition comprising Portland cement and asbestos fibers mixed with acid resisting bond and filter is preferred.

We claim:

1. A fume hood comprising front, back, top and two side walls secured together in a box-like configuration, said top wall having an exhaust opening formed therein and said front wall having an access opening formed therein, and a baffle mounted between said access and exhaust openings, said baffle comprising upper and lower sections each in the form of a generally rectangular panel, horizontal pivot means mounted on adjacent walls adjacent said back wall for mounting said upper and lower sections, said pivotal means for said upper section being intermediate its top and bottom edges and the pivotal axis of said lower section being adjacent its bottom edge, and a plurality of flexible connector means spaced along the adjacent edges of said upper and lower sections and holding said sections in spaced relation to form a gap, the bottom edge of said lower section being spaced from said back wall and the top edge of said lower section being movable into and out of engagement with said back wall on pivoting said lower section to the control flow of air from the lower part of the hood, and the top edge of said upper section being movable into and out of engagement with said top wall on pivoting said upper section to control the flow of air from the upper part of said hood.

2. A fume hood as in claim **1**, wherein the bottom edge of said upper section is spaced forwardly of the top edge of said lower section to permit flow of air therebetween for all pivoted positions of said sections, the flow of air from the upper and lower parts of the hood being inversely variable by pivoting said upper and lower sections.

3. A fume hood as in claim **1**, and further including an adjustable latch means comprising a part secured to one of said walls of said fume hood and a part mounted on one of said sections for holding said baffle in an adjusted position.

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