

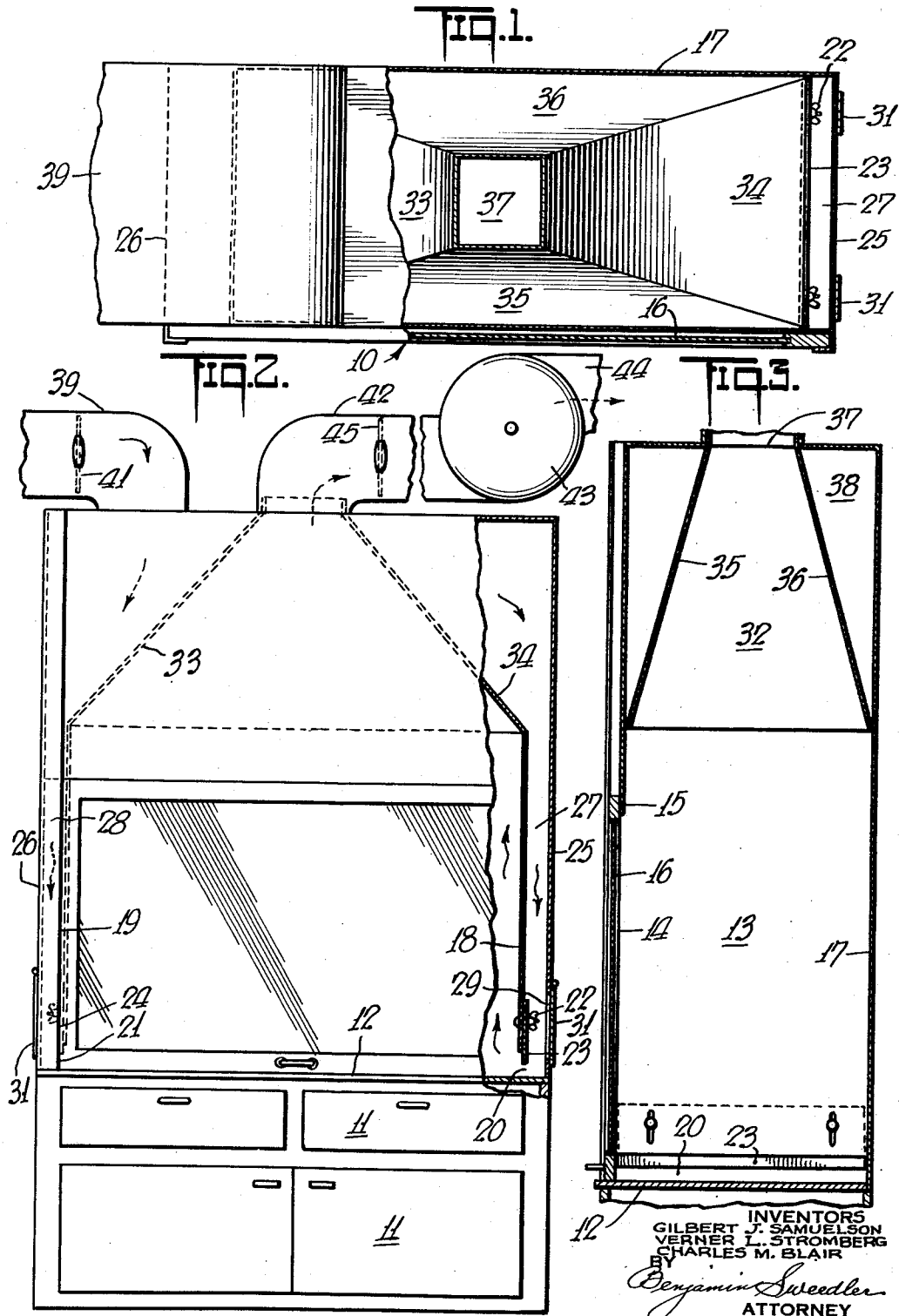
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VENTILATED FUME HOODS

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VENTILATED FUME HOODS

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This invention relates to ventilated fume hoods for laboratory and other uses, in which hoods chemical reactions may be carried out and from which toxic and/or odoriferous vapors and gases removed, thereby providing sanitary, healthy and safe working conditions for personnel.

Fume hoods have been proposed designed so as to reduce the load on heating and air conditioning equipment for the rooms or buildings in which the fume hoods are located. Such fume hoods have involved a blower for supplying air from an outside source to the working space of the hood, complicated damper or baffling members for controlling the flow of the air into the working space and an exhaustor for removing from this working space vapors and gases generated therein, as well as the air introduced thereinto. Such fume hoods are objectionable for a number of reasons, the more important of which are:

(1) They are excessively complicated and unnecessarily elaborate in design, and, hence, costly to build and maintain.

(2) They operate under positive pressure conditions in the working space which leads to leakage into the room particularly through service door openings or through openings caused by imperfect fitting of the service door over the service door opening.

(3) With separate blowers for supplying fresh air and exhausting the working space it is necessary that the exhaust blower be of greater capacity than the input blower; otherwise air and other gases inevitably flow from the hood into the room in which it is disposed. This being the case, such fume hoods invariably remove a certain percentage of air from the room in which the hood is disposed, thus burdening air conditioning and heating equipment.

(4) If for any reason the exhaust blower stops or its efficiency is diminished by a restriction in the exhaust duct, fumes from the hood may be blown by the input blower directly into the room in which the hood is disposed.

(5) They are designed to be operated with the service door open, relying on the supply of fresh air by the input blower to minimize the amount of air taken from the room in which the hood is positioned. With the service door open, of necessity, a substantial amount of air is taken from the room with consequent increased load on the heating and air conditioning equipment.

It is among the objects of the present invention to provide a fume hood which obviates or minimizes the above noted disadvantages, which is simple in design and therefore relatively inexpensive to construct and maintain and which is efficient in operation.

Other objects and advantages of this invention will be apparent from the following detailed description thereof.

In the accompanying drawing forming a part of this specification and showing for purposes of exemplification a preferred form of this invention, without limiting the claimed invention to this illustrative instance,

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Figure 1 is a top plan view, partly in elevation and partly in section, of a fume hood embodying this invention;

Figure 2 is a front view, partly in elevation and partly in section, of the fume hood of Figure 1; and

Figure 3 is a vertical section through this fume hood.

In the drawings, 10 is a fume hood desirably in the form of a parallelepiped cabinet or housing having sliding drawers 11 in the base thereof just below working surface 12. Working space 13 just above working surface 12 has a service opening 14 in front wall 15 controlled by a vertically sliding door or sash 16 equipped with a window of glass or other transparent material, as customary. This door is slidably mounted so that it can completely or partially close service opening 14. The mounting for the door, for example, may be of the well known type involving a counterweight, so that the door can be moved to any desired position to regulate the extent of the service opening 14 and remain in the position to which it is moved. As such construction of the door is well known in the art, it is believed further description thereof is unnecessary.

The working space 13 is defined by the working floor or surface 12, back wall 17, front wall 15 having the service opening 14 therein, and side walls 18 and 19. Each of the side walls 18 and 19 terminates short of the working surface to provide openings 20 and 21 extending across substantially the full depth of the working space, as best shown in Figure 3. Suitably secured, as, for example, by bolts and wing nuts 22, to the side walls 18 and 19 are adjustable plates 23, 24 which can be moved and then fastened in position by the wing nuts 22, to control the height or depth of the openings 20 and 21. Side walls 18 and 19 cooperate respectively with side walls 25 and 26 of the hood to provide side wall channels 27 and 28, the function of which will be hereinafter described. Desirably each of the side walls 25 and 26 is provided with openings 29 which may be closed by access doors 31. Openings 29 permit access to the adjustable plates 23, 24 to effect their adjustment.

Back wall 17, front wall 15 and the side walls 18 and 19 merge into the base of a pyramidal top 32 defined by side plates 33, 34 and front and rear plates 35, 36 which lead from the top of the working space to exit port 37. Plates 33, 34, 35 and 36 defining this pyramidal top are disposed within the housing of the hood at the top thereof forming an annular plenum chamber 38 which surrounds the pyramidal top 32, as clearly shown in all three figures of the drawing. The base of this plenum chamber 38, as best shown in Figure 2, communicates at its opposite sides with the channels 27 and 28. The top of the plenum chamber communicates with a conduit 39 leading to a source of fresh air disposed preferably outside the building in which the fume hood may be positioned. A damper 41 in conduit 39 controls the flow of air therethrough into the plenum chamber; this damper is particularly desirable when operating at winter temperatures because it may then be set to give a minimum flow of cold air to effectively ventilate the working space 13.

It will be understood that the pyramidal top 32 may be of integral construction and may be built integral with the back wall 17, front wall 15 and side walls 18 and 19 defining the working space 13.

Exit port 37 at the top of the pyramidal roof leads into a conduit 42 having therein an exhaust blower 43 of any well known type, which exhausts waste air as well as fumes, vapors and gases from the working space through the pyramidal top 32 and discharges the same through conduit 44 leading to a point outside the building in which the fume hood may be positioned. A back draft damper 45 controls the discharge effected by the blower 43. Damper 45 is adjustable to provide a con-

trolled small negative pressure, i. e., pressure somewhat below atmospheric, in the working space; which pressure, once the damper is properly positioned, is maintained substantially constant at the desired small negative value.

The single blower 43 on the exhaust side automatically supplies all of the needed air which enters through conduit 39 and flows, as indicated by the arrows on the drawing, through the plenum chamber 38 into and through the side wall channels 27 and 28 through the ducts 20 and 21, across the working surface 12 into the working space 13. The waste air, fumes, vapors and gases generated exit through the pyramidal roof 32 and conduits 42 and 44. When the service door 16 is closed all of the air introduced into the working space enters from conduit 39 through the communicating plenum chamber 38 and side wall channels 27 and 28 leading into the openings 20 and 21. When door 16 is open some air is also drawn in from the room in which the fume hood is disposed through the service opening.

In the operation of the hood, the air flowing through the openings 20 and 21 creates turbulence in the lower part of the working space causing mixing of this air with the fumes, vapors and gases generated. The smooth rapid flow which takes place under the influence of the exhauster 43 from the upper part of the working space and through the pyramidal top 32 efficiently removes the mixture of waste air, fumes, vapors and gases from the working area.

The fume hood of this invention has been found free of the objections hereinabove noted of prior designs. It will be noted it involves a single blower for effecting introduction of fresh air and exhausting the working space. Moreover, it eliminates the necessity of using complicated damper or baffling members for controlling the flow of air. It is therefore a marked simplification of prior constructions, and, hence, is less costly to build and maintain.

The fume hood of this invention, it will be further noted, can be operated with the service door 16 closed, so that no air is removed from the room in which the hood is positioned. This results in a substantial reduction in the load on heating and air conditioning equipment. Furthermore, since the fume hood operates under a slight negative pressure, leakage into the room is minimized, particularly as compared with prior constructions in which the working space operates under positive pressure. Whenever it is desired to effect removal of a certain percentage of the air from the room in which the hood is disposed, as may be the case, for example, when operating under moderate ambient temperature conditions or when it is desired to use the hood to ventilate the room in which it is positioned, this can be accomplished by simply opening the service door 16 to the desired extent. The fume hood of this invention is therefore versatile, particularly in that it lends itself to use in rooms where air conditioning or heating is used without increasing the load on such air conditioning or heating equipment, as well as to use where the fume hood is employed to effect, in part at least, ventilation of the room in which it is positioned.

Opening of the service door 16 to permit manipulation within the hood for such time as may be necessary to effect such manipulation, as a practical matter, exercises little effect on the load on the heating or air conditioning equipment, since, as a general rule, the time during which the service door is open for this purpose is relatively insignificant. Of course, if desired, the hood may be equipped with any well known type of remote manipulators, so that the service door may be kept closed at all times.

Since certain changes in the fume hood of this invention may be made without departing from the scope of this invention it is intended that all matter in the above description and shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A fume hood comprising, in combination; a front wall having a service opening, outer side walls and a back wall defining a working chamber having a working surface; a door for opening and closing said service opening; a pyramidal top the lower side edges of which are spaced from the said outer side walls; an annular plenum chamber surrounding said top; inner side walls spaced from said outer side walls and extending substantially the full width of said hood, the top edges of said inner side walls being connected to the lower side edges of said top and said inner side walls having their lower edges terminating a short distance above said working surface to define side wall openings just above said working surface, the said inner and outer side walls defining side wall channels leading from the base of said plenum chamber to said side wall openings; said side wall channels and said side wall openings extending substantially the full width of said hood and providing the sole communication between said plenum chamber and said working chamber; said plenum chamber communicating with a source of air outside the room in which said fume hood is disposed; an exhaust duct leading from the upper end of said pyramidal top to a point outside said room; and a single exhaust blower communicating with said exhaust duct; whereby the working chamber is maintained under a negative pressure and air flows from said source of air into and through the plenum chamber, said side wall channels, said side wall openings, across said working surface into said working chamber and said air and fumes generated in said working chamber are exhausted through said pyramidal top.

2. A fume hood comprising, in combination; a front wall having a service opening, outer side walls and a back wall defining a working chamber having a working surface; a door for opening and closing said service opening; a pyramidal top the lower side edges of which are spaced from the said outer side walls; an annular plenum chamber surrounding said top; inner side walls spaced from said outer side walls and extending substantially the full width of said hood, the top edges of said inner side walls being connected to the lower side edges of said top and said inner side walls having their lower edges terminating a short distance above said working surface to define side wall openings just above said working surface, the said inner and outer side walls defining side wall channels leading from the base of said plenum chamber to said side wall openings, said side wall channels and said side wall openings extending substantially the full width of said hood and providing the sole communication between said plenum chamber and said working chamber; said plenum chamber communicating with a source of air outside the room in which said fume hood is disposed; an exhaust duct leading from the upper end of said pyramidal top to a point outside said room; a single exhaust blower communicating with said exhaust duct; and a back draft damper in said exhaust duct; whereby the working chamber is maintained under a negative pressure and air flows from said source of air into and through the plenum chamber, said side wall channels, said side wall openings, across said working surface into said working chamber and said air and fumes generated in said working chamber are exhausted through said pyramidal top.

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