(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 148 810**
A1

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **85850002.8**

(22) Date of filing: **03.01.85**

(51) Int. Cl.⁴: **F 24 F 3/16**, B 08 B 15/02

(30) Priority: **10.01.84 SE 8400102**

(43) Date of publication of application: **17.07.85**
Bulletin 85/29

(84) Designated Contracting States: **AT BE CH DE FR GB IT LI NL**

(71) Applicant: **ULTRAMARE AB, Karlsbodavägen 13-15, S-161 30 Bromma (SE)**

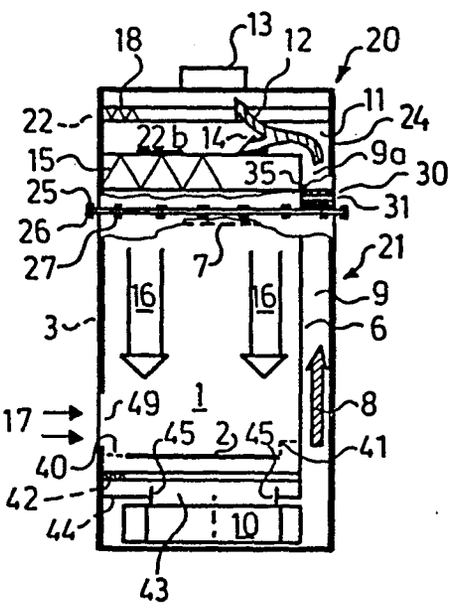
(72) Inventor: **Bergseth, Bertil, Ljusnevägen 33, 121 61 Johanneshov (SE)**

(74) Representative: **Lindblom, Erik J., Caroline Östbergs väg 5, S-122 35 Enskede (SE)**

(54) An apparatus defining a confined working area which is ventilated by a flow of cleansed ventilation air.

(57) Apparatus for defining a confined working area (1) ventilated with a cleansed flow of ventilation air, in which apparatus a first air-stream (8) is generated by a fan (10) and caused to pass an air-stream dividing or distributing means, and in which a first part-flow (12) is evacuated and a second part-flow (14) is passed through a filter (15), to form a cleansed air-flow (16) which is passed to the working area (1). The apparatus is provided with means (49) which co-act with the working area in a manner to supply air to the working area (1) in an amount commensurate with the amount of air evacuated in the first part-flow (12). A filter assembly (20) comprising a filter (15) is detachably connected to a unit (21) in which the confined working area is defined, thereby to form a readily removable and exchangeable assembly.

It is suggested that Fig. 2 is used in the Abstract for publication.



EP 0 148 810 A1

0148810

TITLE OF INVENTION:

An apparatus defining a confined working area which is ventilated by a flow of cleansed ventilation air

TECHNICAL FIELD

The present invention relates to apparatus in which there can be defined a confined working area ventilated by a stream of cleansed ventilation air. In particular, the invention relates to such an apparatus in which a first air-stream, generated by a fan, is caused to pass air-stream dividing means, and in which a first part of the divided air-stream is evacuated and a second part of the air-stream is passed through a filter and forms a flow of cleansed air in the working area. The apparatus is provided with means which co-act with the working area in supplying a quantity of air sufficient to compensate for the air evacuated in the first part-flow of the air-stream.

Although apparatus of this nature may find use in various fields, they have been found particularly beneficial when working with substances which, even in small concentrations, can promote allergies and poison the operator. Naturally, in work of this nature it is imperative that the operator is protected against the substance in question and that the product is protected against contamination. One example of such work is the preparation of cytostatics.

BACKGROUND ART

Various apparatus are known to the art which are intended to form a confined working area ventilated with a flow of cleansed ventilation air, where a first air-stream, generated by a fan, is caused to pass an air-stream distributing or dividing means, and where a first part-flow of the air-stream is evacuated from the apparatus and a second part-flow of said air-stream is passed

through a filter, to form a flow of condensed air which is passed to said working area. Means are provided for co-acting with the working area in a manner to supply air thereto in quantities which compensate for the air evacuated in said first part-flow.

Such previously known apparatus operate on the principle of passing air through a so-called microfilter and of causing the cleansed air-flow exiting from the filter to spread vertically over the working area, whereafter a major part of this exiting air-flow is returned to the microfilter and re-cleansed therein, and then returned to the working area. Part of the air-flow which has passed through the working area is passed through a second microfilter and then evacuated through an air outlet. This constantly creates an air deficiency, which is made up, however, by drawing in a corresponding quantity of air from an adjacent room or space, through one or more slots provided in the proximity of the working area. In this way there is created an air-curtain or air-stream operative in preventing air from passing from the working area into the space adjacent thereto.

One example of such known apparatus is that sold by Ultramare AB, Bromma, Sweden, under the tradename "LAF Renluftsbänk CK-3".

BRIEF DISCLOSURE OF THE INVENTION

TECHNICAL PROBLEM

It is obvious that when such apparatus are used for preparing cytostatica, a filter which is used for long periods of time will become heavily coated with particles, which even in low concentrations can promote allergies and create poisonous conditions. Consequently, a qualified technical problem in respect of such apparatus is one of providing ways and means by which these filters can be changed when necessary with simple manual manipulations.

A further technical problem is one of enabling a filter to be changed without the risk of the operator coming

into contact with the particles collected on the filter.

Another qualified technical problem with apparatus of the aforesaid kind is one of enabling the filter or filters, together with requisite filter holders, to be readily removed, and of enabling all parts to be made from a material which can be destroyed or sterilized.

A still further technical problem related to such apparatus is that of enabling the filter to be readily incorporated in an assembly which can be removably attached to a unit containing the confined working area, and of enabling a complete assembly, including the filter or filters, filter holding means etc., to be readily removed and changed.

Another technical problem is one of enabling a filter assembly to be detachably connected to a unit including the working area, and of enabling the filter assembly to be attached in a manner which assures safety in operation, i.e. to be attached in a gas-tight manner.

Another problem which prevails in apparatus of the aforementioned kind is one of providing a separate multi-filter assembly which can be detachably connected to a unit containing the working area, in which assembly the filters are so arranged that a first part-flow of air and a second part-flow of air are distributed in a predetermined or given fashion.

Another technical problem is one of providing a detachable filter assembly for use in the aforesaid unit where the filter or filters can be attached directly to wall means in the assembly housing with the air of simple attachment means, preferably with the aid of an adhesive or the like.

It will be understood that an air passage is required between the filters of the filter assembly and the fan generating said air-stream. Consequently, a further technical problem is one of enabling this air passage to be readily covered when desired, and preferably also sealed against the filter assembly immediately prior to removing

said assembly.

Another related technical problem is one of providing in the vicinity of the air passage a slot which can be safely sealed-off with guarantee against leakage while the apparatus is in use, and along which a plate can be inserted in a manner to cover and seal-off the air passage as required, immediately the filter assembly is to be removed and replaced.

A still further technical problem is one of providing apparatus of the aforesaid kind in which a fan assembly is located separate from the filter assembly. This further simplifies the apparatus, by enabling the filters to be fitted into an individual assembly which can, in turn, be readily removed from the remainder of the apparatus.

Another technical problem is one of providing between said assemblies simple fastening means which are capable of connecting the assemblies in an air-tight manner, while enabling said assemblies to be readily disconnected one from the other, when removing and changing the filter assembly.

SOLUTION

The present invention provides an apparatus in which there is defined a confined working area ventilated with a cleansed flow of ventilation air, in which apparatus a first air-stream generated by fan means is caused to pass an air-stream dividing means, and in which a first part-flow of said divided air-stream is evacuated from the apparatus and a second part-flow thereof is passed through a first filter to provide a flow of clean air to the working area. Means are provided for supplying air to said working area in an amount commensurate with the amount of air evacuated in said first part-flow, therewith to compensate for said evacuated air-flow.

In accordance with the invention it is now proposed that the first filter is incorporated in an assembly capable of being detachably connected to a unit or housing

in which the aforesaid confined working area is defined. This provides conditions for constructing a readily detachable and exchangeable filter assembly.

According to one embodiment of the invention, the filter assembly and all parts associated therewith are made from a material which can be destroyed and/or sterilized.

Conveniently, the filter assembly comprises first and second filters, of which the first filter is intended to filter the first part-flow of air and the second filter is intended to filter the second part-flow of air, the filter characteristics being mutually adapted to produce a given distribution between the said air part-flows.

It is also proposed that the filters shall be capable of being mounted in the assembly, and in particular on walls of the assembly housing, with the aid of an adhesive or the like.

According to a further embodiment of the invention an air passage is arranged between the filter assembly and the unit in which said confined working area is defined, said air passage being arranged to co-operate with means intended to cover and preferably to seal-off said passage, preferably when removing the filter assembly from said unit.

An edge portion of the filter assembly facing the confined working area and an edge portion of the unit containing said confined working area facing the filter assembly are arranged to co-act with one another in a manner to connect said assembly to said unit.

Mutually facing edge portions are arranged to co-act with means for joining said edge portions together in a gas-tight fashion.

According to one particularly advantageous embodiment, there is arranged in the filter assembly at a location joining the air passage a slot which is sealed by means of a film of material, such as a plastics material, a rubber material or the like. Also provided is a plate which is

intended for insertion into the slot when removing the filter assembly, this plate upon insertion severing the material film and closing-off the slot. The plate has a shape and form which ensures that the slot is at least fully covered, and preferably also totally sealed-off.

ADVANTAGES

The main advantages afforded by an apparatus according to the invention reside in the conditions created whereby one unit or assembly forming part of said apparatus can be readily removed therefrom and replaced therein, this assembly or unit containing the requisite filters, without needing to make special provisions for protecting the operator against the effect of highly concentrated allergy-promoting and poisonous particles collected on the filters.

The main characteristic features of apparatus according to the invention are set forth in the characterizing clause of Claim 1.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in more detail with reference to an illustrative embodiment thereof possessing the characteristic features of the invention and shown in the accompanying drawings, in which

Figure 1 is a frontal view of an apparatus constructed in accordance with the invention;

Figure 2 is substantially a sectional view taken on the line II-II in Figure 1;

Figure 3 is a frontal view of the apparatus, with certain components shown in section so as to illustrate the nature of the interior of the apparatus more clearly;

Figure 4 is a perspective view of a plate intended

for insertion into a slot, to seal-off an air passage;

Figure 5 is an end view of a plate inserted to a position in which it covers and seals the air passage;

Figure 6 is a side view of a cover serving as a sealing means;

Figure 7 is substantially a sectional view of a second embodiment of the present invention and

Figure 8 is substantially a sectional view of a third embodiment och the present invention.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to the drawings, there is thus shown an apparatus in which there is defined a confined working area 1 which is ventilated with a cleansed flow of ventilation air. The working area is defined by a bottom wall 2, a front wall 3 and three side walls 4, 5 and 6, and a grid-like roof 7, all of which form part of a unit 21.

A first air-stream 8 generated by a fan (not shown) and passing through a passage 9 is introduced into a chamber 11 and there caused to pass air-stream dividing means which divides the air-stream into a first part-flow 12, which is evacuated from the apparatus through an air-outlet means 13, and a second part-flow 14 which is passed through a filter arrangement 15, to form a cleansed air-stream 16, which is passed to the working area 1.

The working area 1 is arranged to co-act with means 48,49 in a manner to supply air 17 in an amount sufficient to fully compensate for the air evacuated in the first part-flow 12.

Connected to the unit 21 in which the working area 1 is defined is a filter assembly 20 comprising, inter alia the aforementioned filter 15 and being connected to the unit 21 in a manner which enables it to be readily connected to and disconnected from said unit.

The filter assembly 20, which comprises the filter 15, a further filter 18, and requisite attachment means, etc., is made of a material which can be totally destroyed and/or sterilized, so that the whole assembly can be

destroyed in a suitable destruction chamber when removed from the unit 21.

As beforementioned, the illustrated filter assembly 20 has two filters 15,18. The filter 18 is intended to filter the first air part-flow 12, while the filter 15 is intended to filter the second air part-flow 14. The filters 15 and 18 are arranged so as to provide a given division between the air-streams. Preferably, the arrangement is such that 30 % of the air-stream 8 passing through the channel 9 exits through the outlet 13, while 70% of said air-stream passes through the filter 15.

In this respect it is important that the filters are each dimensioned so that the reduction in pressure-drop is adapted to the desired flow distribution. In addition, the filters shall be so adapted that blocking of the filters by particles carried in the air passing therethrough has an equal effect on all filters, so that the desired distribution of said air part-flows is still achieved even when the filters have been in use for a long periods of time (say 3 years). Separate means determining the distribution of said air-flow may also be incorporated.

It is also important that the air-flow 16 entering the working area 1 is a vertical laminar air-flow. This flow will have a velocity of 0.35-0.5 m/sec., preferably about 0.4 m/sec.

In the illustrated embodiment, respective filters 15, 18 are attached to wall portions of the assembly housing (not referenced) with the aid of simple means, such as an adhesive or the like.

Thus, the filter 15 is attached to wall portions 22, 22a, 22b, and also to a wall portion or partition 35, when such a partition or wall portion is found, while the filter 18 is attached to wall portions 22. 22a, 22b and 24. As will be seen from Figure 1, the filter 15, and the optional partition wall 35, form a defining wall of a passage 9a in the assembly 20, this passage 9a constituting a continuation of the passage 9 in the unit 21.

As shown in Figure 4, the air passage formed between the filter assembly 20 and the unit 21 defining the working area 1 is arranged to co-act with closure means 32 by means of which the said passage can be covered, as required, and preferably sealed-off, particularly when disconnecting the filter assembly 20 from the unit 21.

An edge portion 25 of the filter assembly 20 facing the unit 21 defining the working area 1 and an edge portion 26 of the unit 21 facing the filter assembly 20 are arranged to co-act with one another in a manner to connect the filter assembly to said unit.

The two mutually facing edge portions 25,26 are connected together in a gas-tight fashion with the aid of separate means. In the illustrated embodiment, the aforesaid edge portions 25,26 have the form of flanges which are joined together with fasteners in the form of bolts 27' and associated nuts 27, although it will be obvious that equivalent fasteners can be used.

A seal is normally required, however, between the mutually facing surfaces of the flanges 25 and 26.

The filter assembly 20 incorporates in the proximity of the air-passage 9a a slot 30, which in the illustrated embodiment is completely sealed-off with the aid of a sealing film 31, which may be a plastics film, a rubber film or a film of some other suitable material (see also Figure 6). One end of the aforesaid member 32, here in the form of a plate, is arranged to be inserted into the slot 30, thereupon to cut the plastics or rubber film 31 and to permit the plate 32 to be pushed into the slot in a manner to fully close the same.

Conveniently, the lower part 24a of the wall portion 24 has provided therein a groove or track 33 in which one end 33a is located in the plane of the mouth of the slot 30. The plate has a side portion 32a which is received in the groove 33, and an opposite side portion 32a' which is received in a further groove 33' located at the bottom of the partition wall 35 opposite the groove 33, therewith to guide the plate 32 in its movement in the slot 30,

to cover the passage 9a.

Thus, when changing the filter assembly 20 all that is required is for the fasteners 27 to be removed and the assembly brought out of engagement with the unit 21, whereupon the filter assembly can be transferred to a destruction unit. This task can be carried out without requiring the operator to be dressed in special protective clothing. It is proposed that when removing the filter assembly, the aforesaid plate 32 is pushed to its passage-closing position in the aforedescribed manner, to eliminate the risk of exposing the operator to dust on the filters 15 and 18.

Arranged in the lower part of the confined working area 1 are slots or holes 40,41 through which the air-stream 16, together with the compensating air-stream 17, passes. Advantageously, all of the air-stream 17 is able to pass through the opening 40, together with a minor part of the air-stream 16, or in the absence of any such part, while the air-stream 16 is able to pass through the opening or slot 41.

In the illustrated embodiment, there is arranged in the lower region of the unit 21 an additional filter 42 through which the air-stream passes prior to passing through an opening 43 and entering the fan 10. In order to guard against those instances when liquid spills into the working area 1 in such large quantities that the filter 42 is unable to accommodate all of the liquid present, there is conveniently provided in the lower region of the unit 1, downstream of the filter 42, a bottom member 44 having a collared or flanged edge portion 45 arranged in a manner to guide liquid away from the bottom member 44 to a receiving station, without the liquid coming into contact with the fan 10.

The filter 42 advantageously comprises a protective net-structure or some other suitable guard means, operative in preventing large particles, such as needles, plugs, cotton-wool pads, hair, and other extraneous material, for example, shreds of cloth deposited when cleaning the

inside of the unit 21, from falling into the fan 10 and entering the passage 9 downstream thereof.

Alternatively, if thought necessary, the additional filter may be one which is active in filtering-off smaller particles and/or liquid.

As illustrated in Figure 1, the apparatus may be provided in a known manner with control means 46 for controlling the speed of the fan 10 and for regulating the velocity of the air-flow in conjunction with gauge means 47. In this latter respect, it is particularly advantageous to determine the velocity of the air-stream 8.

As will be seen from Figure 1, the front wall 3 of the unit 21 has provided therein openings 48,49 through which the operator is able to extend his/her arms in order to carry out work in the confined working area 1.

Figure 5 is a sectioned end-view of the arrangement illustrated in Figure 4, with the plate 32 inserted.

When removing the filter assembly 20 from the unit 21, a sealing compound 50,51 is suitably placed between the partition 35 and the plate 32, and between the wall 24 and said plate, so as to eliminate the risk of particles entrapped in the unit 21 from escaping therefrom.

Figure 6 is a sectional view of a sealing means 30' included in a cover plate 52, which is held pressed in sealing engagement with said wall portions via holding means 53,54. This seal is preferably attached to the cover plate 52. Subsequent to inserting the plate 32 into the grooves 33,33', the cover plate 52 can again be applied to seal the open crack.

Thus, the invention provides a replaceable assembly 20 which when being removed from the unit 21 can be fully sealed so as to ensure that the contaminated sides and surfaces of the filters and assembly components are not exposed.

Examples of material which can be readily destroyed in the present context are wood-fiber laminates, cardboard or cellulose-based materials, plastics materials, metallic

materials which can be combusted or vaporized in a destruct-furnace.

Examples of sterilizable materials are sheet steel and other metallic materials, glass, fibre-glass laminates, etc..

It will be understood that the invention is not restricted to the aforedescribed exemplary embodiment, and that modifications can be made within the scope of the following claims.

Thus Figure 7 is illustrating substantially in a sectional view a second embodiment of the invention, in which the filter 15 and the fan 10 are arranged in a top portion or assembly 20 and thus as a unit be removed from the portion 21 as illustrated previously.

Figure 8 is illustration substantially in sectional view a third embodiment of the invention, in which the filter is arranged in a bottom portion or assembly 20', which may be removed from the portion 21 as illustrated previously. The filter may be arranged inclined as illustrated and the fan 10 is arranged in the top portion of the housing 21.

CLAIMS

1. Apparatus in which there is defined a confined working area (1) ventilated with a stream of cleansed ventilation air, in which apparatus a first air-stream (8) generated by a fan (10), is caused to pass an air-stream dividing means, and in which a first part-flow (12) is evacuated and a second part-flow (14) is caused to pass through a filter (15) to form a cleansed air-flow (6) which is passed to the working area (1), and which apparatus is provided with means (49) which co-act with the working area to supply air thereto in a quantity sufficient to compensate for the air evacuated with the first part-flow (12), characterized in that a filter assembly (20) comprising a filter (15) is detachably connected to a unit (21) in which the confined working area is defined, therewith to form a readily removable and exchangeable assembly.

2. Apparatus according to Claim 1, characterized in that the filter assembly (20) and all parts associated therewith are manufactured from a material which can be destroyed or which is sterile and non-toxic subsequent to being treated in a destruct furnace.

3. Apparatus according to Claim 1, characterized in that the filter assembly includes two filters (15,18), one for the first part-flow (14) and one for the second part-flow (12).

4. Apparatus according to Claim 3, characterized in that the filters are adapted to create a given division between the said part-flows.

5. Apparatus according to Claim 1, characterized in that respective filters are secured in the assembly with the aid of an adhesive or like means.

6. Apparatus according to Claim 1, characterized in that an air passage (9) is arranged between the filter assembly and the unit defining said confined working area; and in that means are provided for covering or sealing said

air passage when the filter assembly (20) is to be removed.

7. Apparatus according to Claim 1, characterized in that an edge portion (25) of the filter assembly (20) facing the unit (21) in which the confined working area is defined, and an edge portion (26) of the said unit (21) facing the filter assembly (20) are arranged to co-act with one another.

8. Apparatus according to Claim 7, characterized in that the mutually facing edge portions are joined together in a gas-tight fashion by means of separate means (27,27').

9. Apparatus according to Claim 6, characterized in that the filter assembly (20) is provided in the proximity of the air passage with a slot (30) which is sealed by means of a seal (31); and in that a plate (32) is arranged to be inserted into said slot, the shape and form of said plate being such as to cover said passage.

10. Apparatus according to Claim 9, characterized in that the seal is covered by a cover plate.

11. Apparatus according to Claim 9, characterized in that the plate is sealed against the passage.

12. Apparatus according to claim 1, characterized in that the fan and the filter are arranged in a top assembley

13. Apparatus according to claim 1, characterized in that the filter is arranged in a bottom assembley and the fan is arranged in an uppermost portion of a unit.

0148810

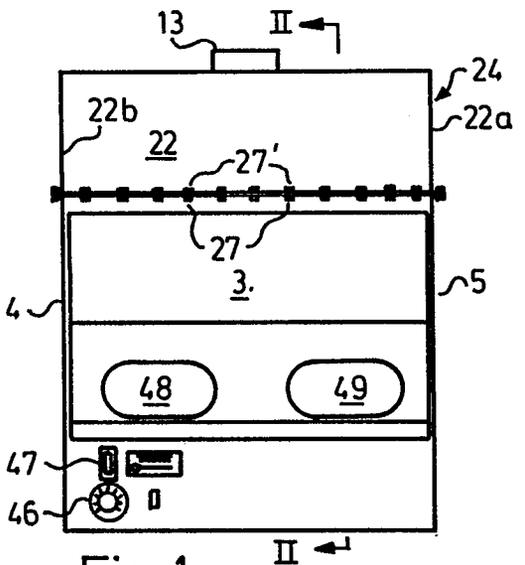


Fig. 1

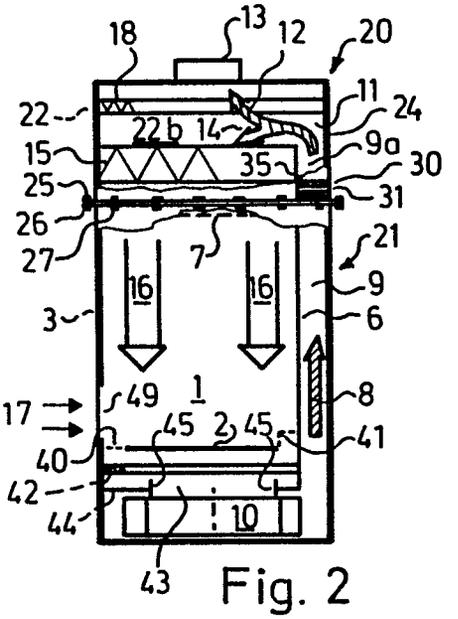


Fig. 2

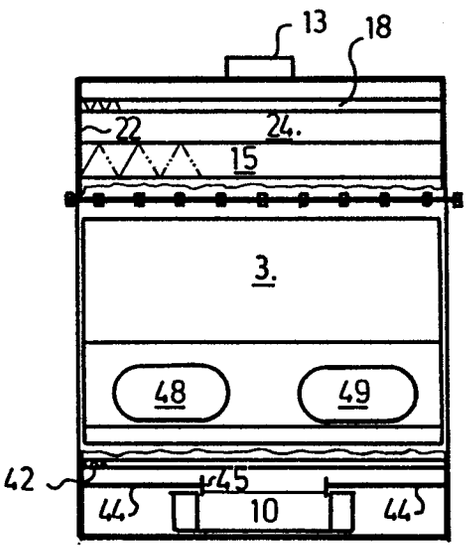


Fig.3

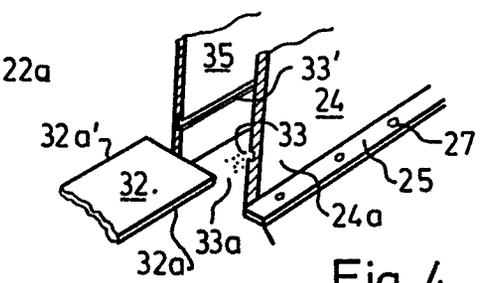


Fig. 4

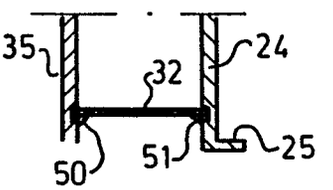


Fig. 5

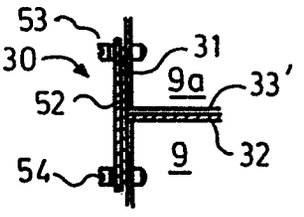


Fig. 6

0148810

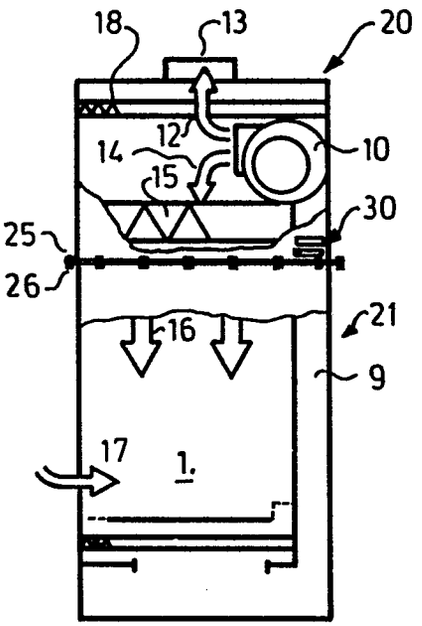


Fig. 7

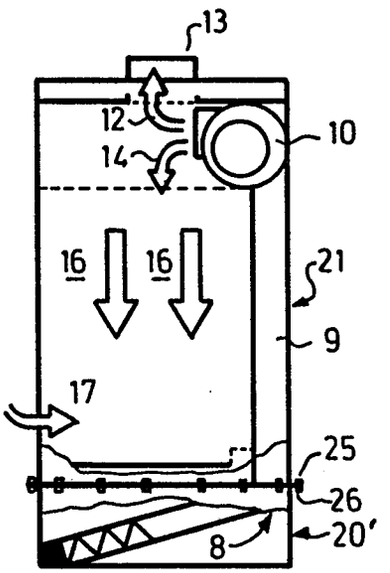


Fig. 8

European Patent Office

EUROPEAN SEARCH REPORT

0148810
Application number

EP 85 85 0002

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	EP-A-0 005 925 (HOWORTH) * Whole document *	1	F 24 F 3/16 B 08 B 15/02
A	DE-A-2 042 930 (ELECTROLUX) * Figures 3-4 *	1	
A	US-A-3 375 640 (PELOSI) * Column 2, lines 52-55 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

F 24 F
B 01 L
B 08 B
A 61 L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	02-04-1985	COLAS R.P.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO Form 1503 03.82