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(54) **LABORATORY SUCTION HOOD**

(57) Suction hood (1), in particular of the type used in chemical and biological laboratories, comprising a body (2) which encloses a work space (3) open at a front side (8d) and comprising a work plane (5) having a front portion (5'), wherein the work space (3) is in flow communication with suction means (17) adapted to convey air, fumes and/or vapors from the work space (3) to an evacuation duct (16), wherein the suction hood (1) comprises means (18) for delivering a vertical air flow, arranged at the front side (8d) of the body (2) and facing downwards, so as to convey an air curtain onto the front portion (5') of the work plane (5).

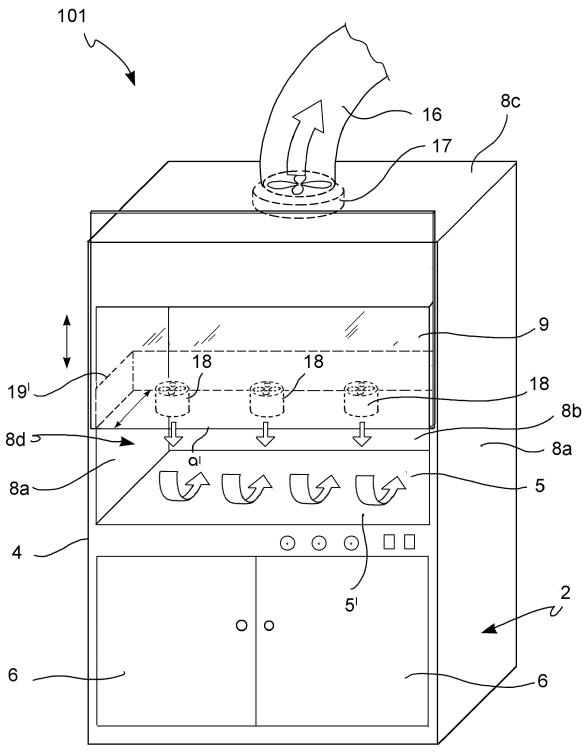

FIG. 2

EP 3 395 453 A1

Description

[0001] The present invention relates to a suction hood, in particular of the type used in chemical and biological laboratories.

[0002] Chemical and biological processes which imply a given risk for the safety and health of operators and of the environment must be performed under specific suction hoods. Such suction hoods, which may be of different type, in particular for normal processes or for distillation (i.e. with lowered platform) or without platform (the so-called walk-in suction hoods), are characterized by a base on which a platform rests, a work space placed over the platform and surrounded by side and bottom walls and by a front wall made of glass or similar transparent material, which is slidable such as to allow the closing and the partial or total opening, and finally by a roof, which forms the hood itself, which comprises an air, gas and fume evacuation duct provided with appropriate suction means. The evacuation duct conveys air, gas and fumes out of the building in which the laboratory is housed, normally after passing through appropriate pollutant filtering and/or abatement systems.

[0003] In this type of suction hoods, the air flow aspirated from the environment of the laboratory by the suction means must be sufficiently high to prevent the pollutants present under the hood from exiting frontally, whereby invading the laboratory environment. In other words, an air flow directed univocally from the environment of the laboratory towards the work space under the hood and from here towards the evacuation duct must be established. In order to ensure the aforesaid isolation of the environment laboratory, it can be calculated that a conventional suction hood must work with flow rates from about 650 to about 1100 m^3/hr.

[0004] The need is therefore felt to provide a suction hood which can ensure an optimal protection for the operator and for the laboratory environment as a whole, while minimizing energy consumption related to its use.

[0005] Such a drawback is solved by a suction hood as outlined in the appended claims, the text of which implicitly forms an integral part of the present description.

[0006] Further features and advantages of the present invention will become apparent from the description of some exemplary embodiment, given here by way of non-limiting example, with reference to the following drawings:

Figure 1 is a perspective view of a first embodiment of the suction hood of the invention;

Figure 2 is a perspective view of a second embodiment of the suction hood of the invention;

Figures 3A and 3B show section side views of a particular of the suction hood of the invention, in two different operating conditions;

Figure 4 is a perspective view of a third embodiment of the suction hood of the invention.

[0007] With reference to figure 1, the suction hood according to the invention, indicated by reference numeral 1 as a whole, comprises a body 2 which encloses a work space 3.

[0008] The body 2 comprises a base block 4 having a work plane 5 on top which forms the lower surface of the work space 3. The base block 4 may be provided with doors 6, which allow the access to an inner space to stow materials or instruments and may comprise knobs, switches or other controls 7 for switching on, adjusting or controlling light, suction or other installations with which the hood may be provided.

[0009] In some embodiments, in particular in hoods of the so-called walk-in type, the base block 4 is missing, so that the work plane 5 coincides with the floor surface of the hood. However, in the present description, the expression "work plane" in the case of walk-in hoods will also mean this floor surface.

[0010] The body 2 further comprises side wall 8a, rear wall 8b and upper wall 8c, which delimit the work space 3 on four sides, while the front side 8d is open.

[0011] A lifting-lowering panel 9 made at least in part of transparent material, such as for example glass, crystal or polymeric material, is slidingly mounted on the front side of the body 2. The lifting-lowering panel 9 allows the total closing or partial or total opening of the front side of the body 2, allowing operative access to the work space 3 and, in all cases, the visual access to it, i.e. also with the panel all down.

[0012] As shown in figure 3A, the lifting-lowering panel 9 comprises a counter-weight member 10 which comprises a counter-weight 11 connected to the panel 9 by system of rope 12 and pulley 13, which allows, in an entirely conventional manner, to position the lifting-lowering panel 9 at the required working height. The working height is allowed from the lower position of the lifting-lowering panel to a maximum of 60 cm from the work plane. Typically, the operator works with the lifting-lowering panel at 50 cm from the work plane.

[0013] The counter-weight member 10 further comprises stop means 14 connected to the cable 12, so as to prevent the lifting-lowering panel 9 from suddenly dropping if the cable 12 breaks (figure 3B).

[0014] Such stop means 14 are known and may be, for example, similar to those conventionally used as stop means of the rolling shutters. They comprise a lever 15 actuated by a spring which, when the cable 12 tears, triggers the lever 15 to the extended position (figure 3B), so as to fit in suitable notches (not shown) present on the edge of the walls 8a, 8b of the body 2.

[0015] The upper wall 8c of the body 2 comprises a hole from which an air, fume and vapor evacuation duct 16 departs. The evacuation duct 16 comprises suction means 17, e.g. a suction fan, typically at the hole of the upper wall 8c.

[0016] The evacuation duct 16 conveys the air, the fumes and/or the vapors towards the outside of the building and typically comprises a treatment system (filtering,

abatement etc.).

[0017] The suction hood 1 described hereto is entirely conventional.

[0018] The suction hood 1 of the invention further comprises means 18 for delivering a vertical air flow, arranged at the front side 8d of the body 2 and facing downwards, so as to convey an air curtain onto the front portion 5' of the work plane 5.

[0019] In the embodiment shown in figure 1, the delivery means 18 are placed in a housing 19 obtained under the front portion 8c' of the upper wall 8c of the body 2. Such a housing 19 comprises an air intake, e.g. a grid (not shown), for aspirating air from the laboratory environment.

[0020] The housing 19 may be positioned immediately under the upper wall 8c or, preferably, in a lower position, typically on the level of the working height of the lifting-lowering panel 9, which, as mentioned, is normally between 40 and 60 cm from the work plane 5.

[0021] In the embodiment shown in figure 2, the housing 19' of the delivery means 18 is positioned on the inner face of the lifting-lowering panel 9, near its lower edge 9'.

[0022] The delivery means 18 comprise one or more fans (five in figure 1 and three in figure 2) or similar ventilation devices.

[0023] As shown by the arrows in the figures, the air curtain is sent by the delivery means 18 towards the front portion 5' of the work plane 5, and thus - by virtue of the suction operated by the suction means 17 connected to the evacuation duct 16 - is directed towards the inside of the work plane 5, and thus aspirated upwards by said suction means 17.

[0024] In some embodiments (not shown in the drawings), the front portion 5' of the work plane 5 comprises a suction grid, so as to create a vertical air curtain which separates the work space 3 from the external environment of the laboratory.

[0025] In the embodiment shown in figure 4, the suction hood 201 is configured so as to create a frontal air curtain directed from the bottom upwards.

[0026] Therefore, such an embodiment comprises delivery means 18', also in this case chosen from one or more fans or similar ventilation devices arranged with the delivery opening facing upwards.

[0027] The delivery means 18' are contained in a housing 19" arranged under the front portion 5' of the work plane 5. The front portion 5' comprises, in this case, a delivery grid 20 from which air exits to form an air curtain which partially separates the work space 3 from the external environment before being aspirated by the suction means 17.

[0028] One or more suction grids 21 of a portion of air from the external environment on the front and/or on the sides of the base block 4, at the housing 19".

[0029] The housing 19, 19', 19" preferably has a length extension substantially equal to the width of the front side 8d of the body 2 and a depth of about 3-10 cm.

[0030] For the purposes of correct operation of the suction hood 1, the flow rate of the delivery means 18, 18' must be slower than the flow rate of the suction means 17. So, a given amount of air will be aspirated directly through the front opening of the hood 1, 101, 201, so as to avoid absolutely the release of polluted air towards the laboratory; however, such an amount is considerably reduced by virtue of the air curtain which creates a barrier effect.

[0031] It can be calculated that for a suction hood of standard size, e.g. with a work space of about 1 m^3 or slightly larger, the flow rate aspirated by the suction means 17 will be, for example, of 300-310 m^3/hr, while in a traditional suction hood, i.e. without the delivery means 18, it will be generally from 650 to 1100 m^3/hr.

[0032] In the case shown herein, the flow rate of the supply means 18 may be, for example, of 200-210 m^3/hr. However, it will be possible to appropriately size the air flows by reducing the aspirated flow up to 50 m^3/hr and the air curtain to about 30 m^3/hr without because of this penalizing the protection of the operator and of the laboratory environment.

[0033] Conversely, in a 1200 mm wide traditional suction hood, with a lifting-lowering panel positioned at a working height of 50 cm and thus with an air entry section of 0.6 m^2, the inlet suction flow may vary from 0.3 m/s to 0.7 m/s, so as to create a front protection barrier for the operator. Also calculating the slow suction speed of 0.3 m/s, the flow rate will be 0.3 x 0.6 x 3600 = 648 m^3/hr.

[0034] The advantages of the suction hood 1 of the invention are not simply less consumption of electricity of the suction means 17 and the delivery means 18, but also concern air conditioning costs (cooling in summer and heating in winter) of the laboratory environment. For example, according to the calculation performed above, a saving from 350 to 800 m^3/hr of conditioned air can be obtained with respect to a traditional suction hood.

[0035] It is apparent that only some particular embodiments of the present invention have been described, to which those skilled in the art will be able to make all changes required to adapt it to particular applications, without departing from the scope of protection of the present invention.

Claims

1. A suction hood (1, 101, 201) comprising a body (2) which encloses a work space (3) open at a front side (8d) and comprising a work plane (5) having a front portion (5'), wherein the work space (3) is in flow communication with suction means (17) adapted to convey air, fumes and/or vapors from the work space (3) to an evacuation duct (16), **characterized in that** the suction hood (1) comprises means (18, 18') for delivering a vertical air flow, arranged at the front side (8d) of the body (2) or of the front portion (5') of the work plane (5) and facing either downwards or upwards, respectively, so as to create an air curtain

configured to separate the work space (3) from an external environment.

2. A suction hood (1, 101, 201) according to claim 1, wherein the flow rate of the delivery means (18, 18') is slower than the flow rate of the suction means (17).

3. A suction hood (1, 101, 201) according to claim 1 or 2, wherein the body (2) comprises a base block (4), which comprises said work plane (5) on top, and side wall (8a), rear wall (8b) and upper wall (8c), and wherein a partially or totally transparent lifting-lowering panel (9) is slidingly mounted on the front side (8d) of the body (2).

4. A suction hood (1, 101, 201) according to claim 1 or 2, wherein the hood is of the walk-in type and wherein the work plane (5) coincides with a floor surface of the hood.

5. A suction hood (1, 101, 201) according to any one of claims from 1 to 4, wherein the lifting-lowering panel (9) comprises a counter-weight member (10) which comprises a counter-weight (11) connected to the panel (9) by a system of cable (12) and pulleys (13).

6. A suction hood (1, 101, 201) according to claim 5, wherein the counter-weight member (10) comprises stop means (14) connected to the cable (12), so as to prevent the lifting-lowering panel (9) from suddenly dropping if the cable (12) breaks.

7. A suction hood (1, 101, 201) according to claim 6, wherein the stop means (14) comprise a lever (15) actuated by a spring which, when the cable (12) tears, triggers the lever (15) to the extended position, so as to fit in suitable notches present on the edge of the side walls (8a, 8b) of the body (2).

8. A suction hood (1) according to any one of claims from 1 to 7, wherein the delivery means (18) are arranged in a housing (19) formed under the front portion (8c') of the upper wall (8c) of the body (2), the housing (19) comprising an air intake, e.g. a grid, for aspirating air from the laboratory environment.

9. A suction hood according to claim 8, wherein the housing (19) is positioned at the work height level of the lifting-lowering panel (9).

10. A suction hood (101) according to any one of claims from 1 to 7, wherein the delivery means (18) are arranged in a housing (19') positioned on the inner face of the lifting-lowering panel (9), close to its lower edge (9').

11. A suction hood (201) according to any one of claims from 1 to 7, wherein the delivery means (18') are placed in a housing (19") positioned under the front portion (5') of the work plane (5), and wherein the front portion (5') of the work place (5) comprises a delivery grid (20), and the front and/or the sides of the base block (4) comprise one or more suction grids (21) at said housing (19").

12. A suction hood (1, 101, 201) according to any one of claims from 8 to 11, wherein the housing (19, 19', 19") has a length extension substantially equal to the width of the front side (8d) of the body (2) and a depth of about 3-10 cm.

13. A suction hood according to any one of claims 1 to 12, wherein the delivery means (18, 18') comprise one or more fans or similar ventilation devices.

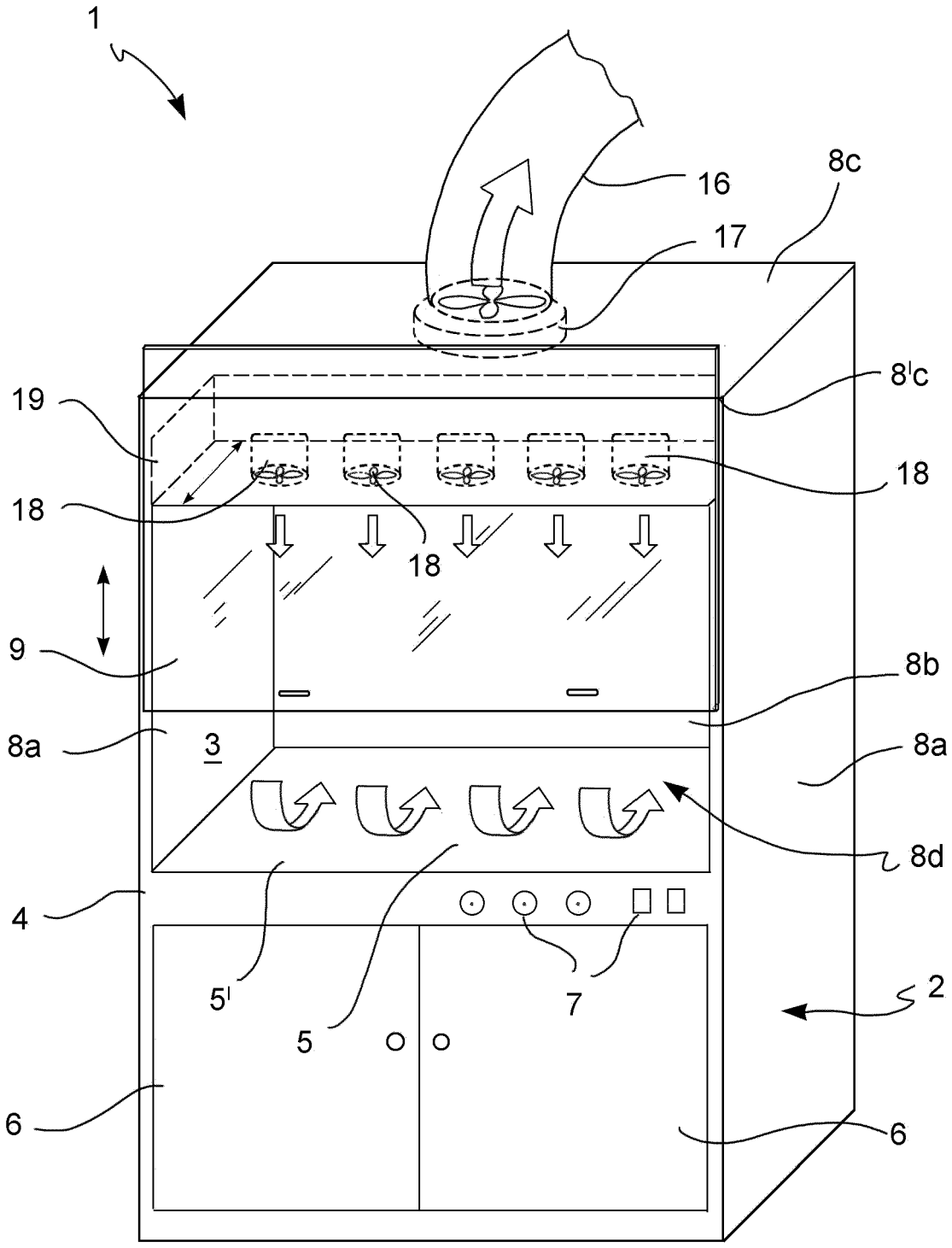

FIG. 1

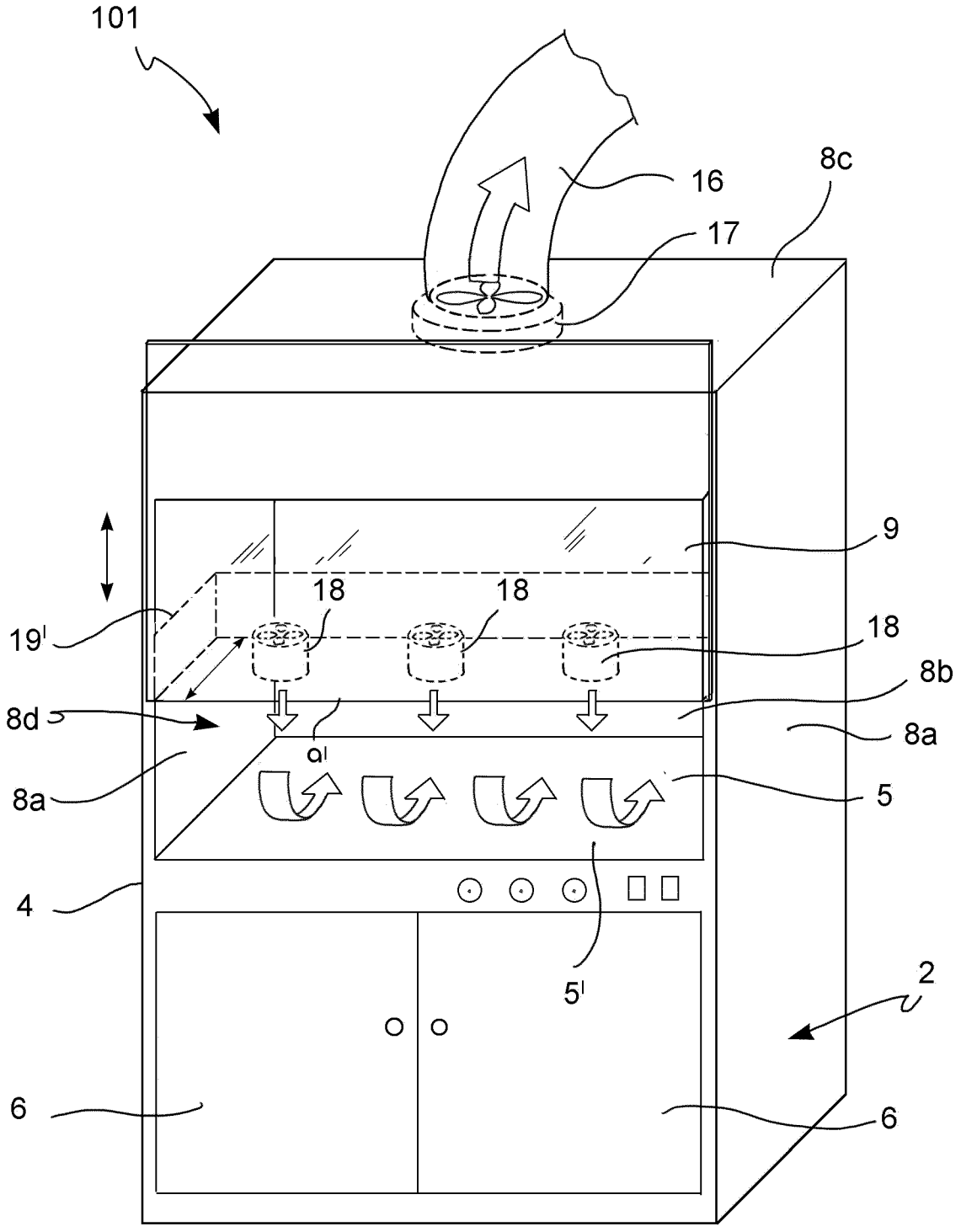

FIG. 2

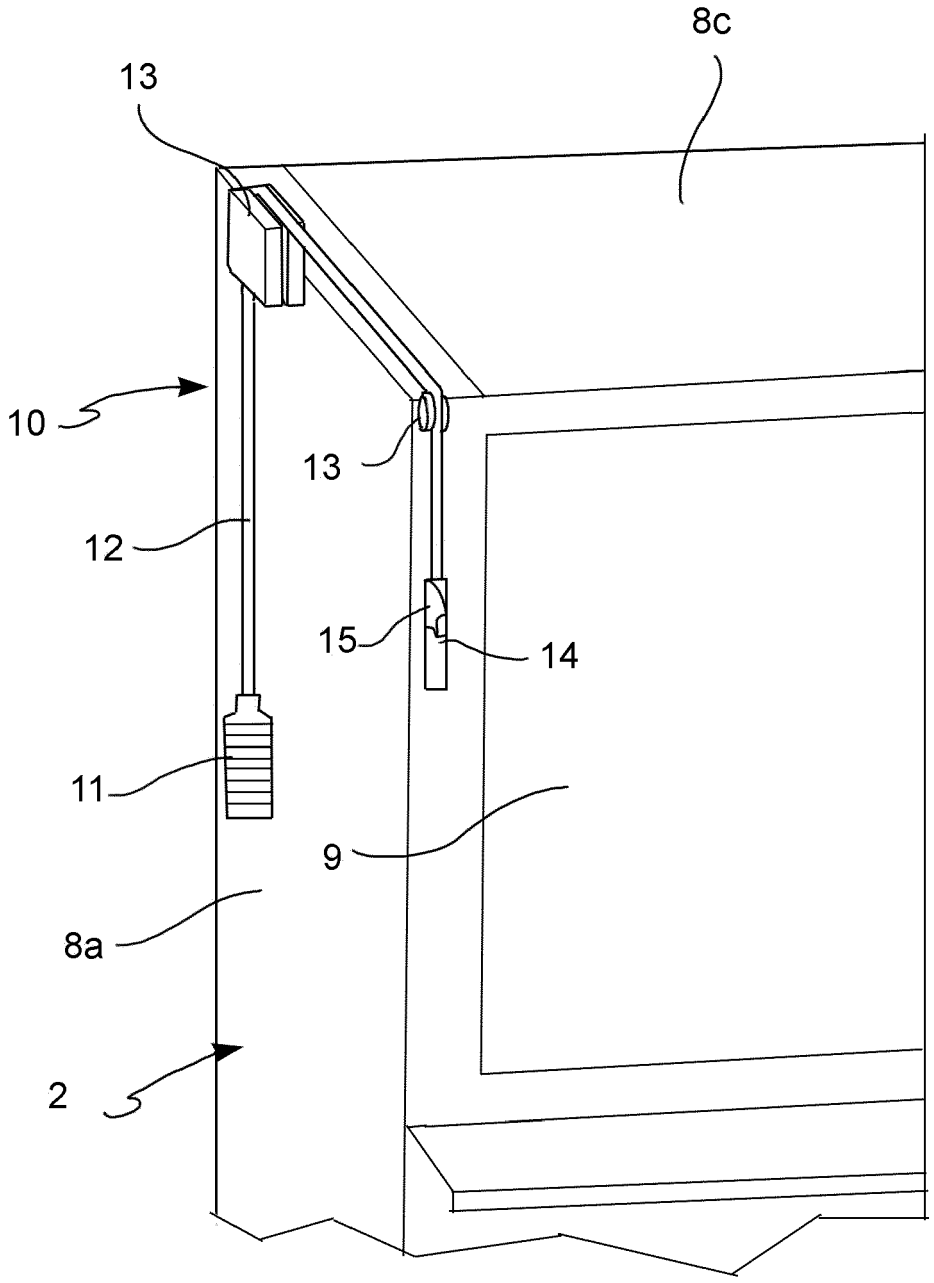

FIG. 3A

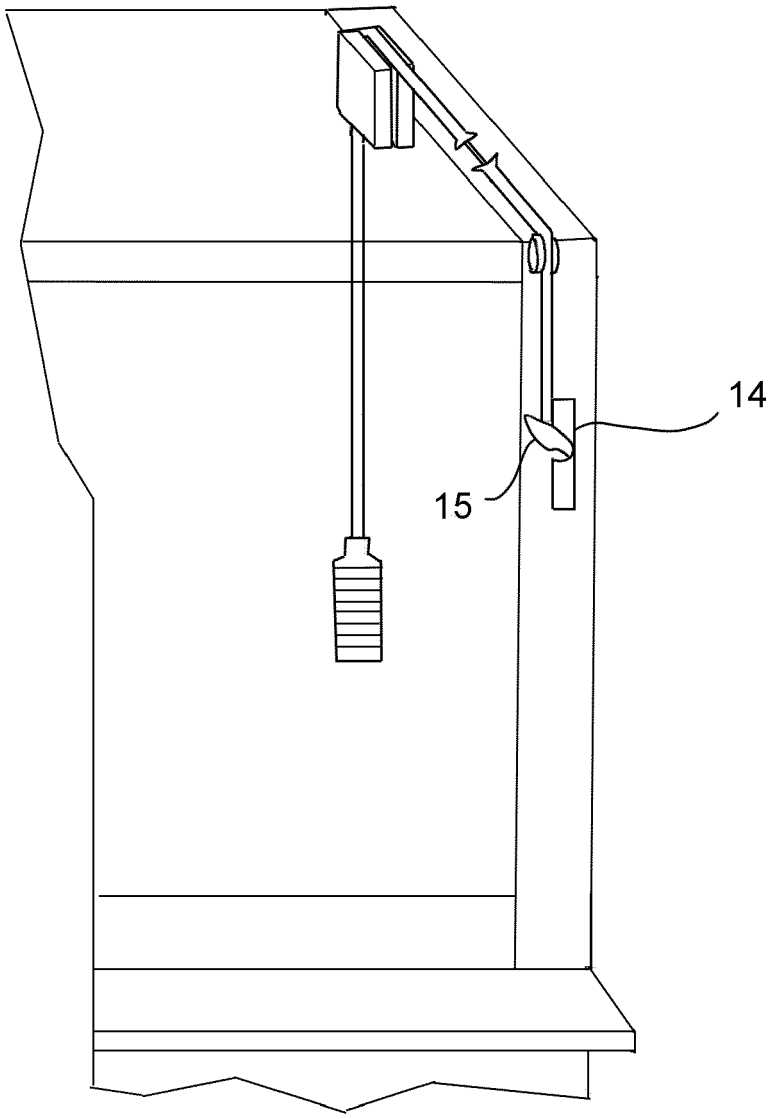

FIG. 3B

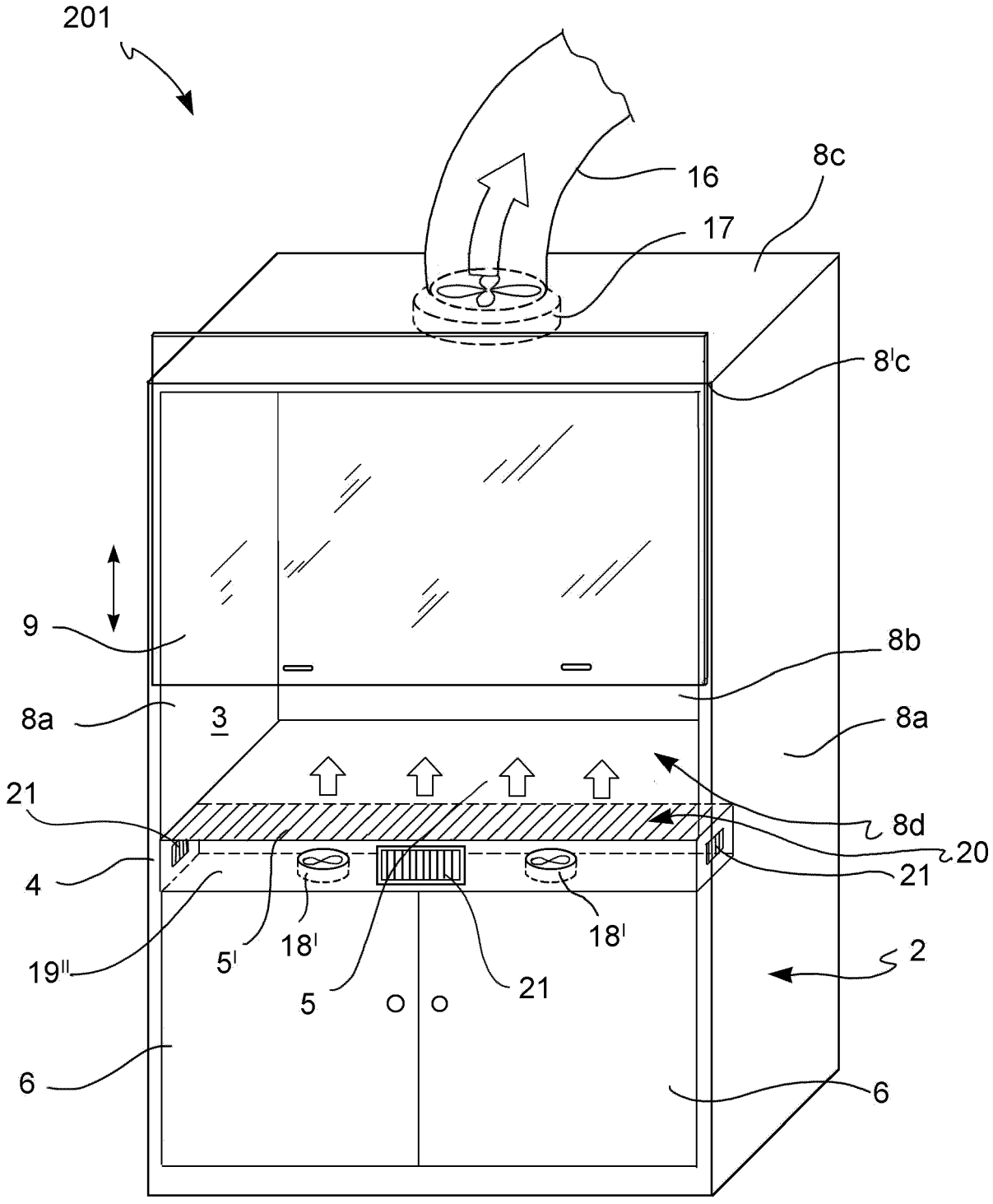

FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 18 16 8659

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	29 August 2018	van der Zee, Willem

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EUROPEAN SEARCH REPORT

Application Number
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Place of search	Date of completion of the search	Examiner
The Hague	29 August 2018	van der Zee, Willem

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