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

(11) **EP 3 919 195 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
09.08.2023 Bulletin 2023/32

(21) Application number: **20177959.2**

(22) Date of filing: **03.06.2020**

(51) International Patent Classification (IPC):
B08B 15/02 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B08B 15/023

(54) A FUME CUPBOARD AND A METHOD FOR CONTROLLING SUCH FUME CUPBOARD

RAUCHSCHRANK UND VERFAHREN ZUR STEUERUNG EINES SOLCHEN RAUCHSCHRANKS

SORBONNE ET PROCÉDÉ DE COMMANDE D'UNE TELLE SORBONNE

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(43) Date of publication of application:
08.12.2021 Bulletin 2021/49

(73) Proprietor: **InnoGUARD UtvecklingsGrupp AB**
243 32 Höör (SE)

(72) Inventor: **Jönsson, Johan**
222 36 Lund (SE)

(74) Representative: **Hansson Thyresson AB**
PO Box 73
201 20 Malmö (SE)

(56) References cited:
EP-A1- 2 711 098
WO-A1-95/13146
WO-A1-2016/116408
CN-A- 106 077 012
CN-A- 110 038 417
FR-A1- 3 066 931
US-A- 5 240 455
US-A1- 2003 197 450
US-A1- 2006 079 164
US-A1- 2017 182 527

EP 3 919 195 B1

Description

TECHNICAL FIELD

[0001] The present invention relates to a method for controlling a fume cupboard and such fume cupboard.

BACKGROUND

[0002] A fume cupboard is a ventilated enclosure where harmful materials can be handled safely. The fume cupboard captures contaminants and prevents them from escaping into an environment around the fume cupboard by using an exhaust blower to draw air and contaminants in and around the hood's work area away from the operator so that inhalation of and contact with the contaminants are minimized. Access to the interior of the hood is through an opening which can be closed with a sash which typically slides up and down to vary the opening into the hood.

[0003] Large air volumes are drawn out from a building when a fume cupboard is installed and activated. This affects the heating or cooling of the building since it is tempered and treated air that is extracted. This has environmentally and financial effects due to an increased electrical power consumption for heating/cooling of the supply air, which leads to increased heating/cooling costs.

[0004] An example of background art is for instance US 2006/079164 A1.

[0005] From the above it is understood that there is room for improvements and the invention aims to solve or at least mitigate the above and other problems.

SUMMARY

[0006] The invention is defined by the appended independent claims. Additional features and advantages of the concepts disclosed herein are set forth in the description which follows, and in part will be obvious from the description, or may be learned by practice of the described technologies. The features and advantages of the concepts may be realized and obtained by means of the instruments and combinations particularly pointed out in the appended claims. These and other features of the described technologies will become more fully apparent from the following description and appended claims, or may be learned by the practice of the disclosed concepts as set forth herein.

[0007] In a first aspect, a process for deactivating a fume cupboard is provided. The fume cupboard comprises an open front section which is closable by means of a front sash, a work chamber enclosed by side sections, a bottom section, a back side section, and a top section provided with an exhaust opening. The fume cupboard further comprises an electrical power measuring unit configured to measure electrical power consumption of the fume cupboard. The process comprises the steps of:

- determining, by means of the electrical power measuring unit, if an electrical power consumption of the fume cupboard fulfills a predetermined threshold condition; if so:
- closing the front sash of the fume cupboard,
- switching an electrical power for the fume cupboard off; and
- controlling an air flow through the fume cupboard to a minimum flow.

This method is advantageous in that the air flow through the fume cupboard is lowered, which results in lowered environmental impact, and reduced costs for a property owner due to reduced heating/cooling/treating of supply air.

[0008] In one embodiment, the electrical power measuring unit is configured to measure the electrical power consumption of one or more electrical power outlets of the fume cupboard. It is advantageous to measure power consumption of electrical power outlets in order to determine if work is being performed in the fume cupboard.

[0009] In one embodiment, the predetermined threshold condition is zero power consumption. This indicates that no electrical equipment is connected to the power outlet(s) of the fume cupboard, and is thus an indication that no work is being performed in the fume cupboard.

[0010] In one embodiment, the process further comprises measuring a volatile organic compound (VOC) content in the air flow through the exhaust opening by means of a volatile organic compound (VOC) sensor. If the measured volatile organic compound (VOC) content is not equal to zero, the deactivation process is interrupted. If the volatile organic compound (VOC) content is not equal to zero, it means that a process is going on in the fume cupboard, and the fume cupboard should thus not be deactivated.

[0011] In one embodiment, the process further comprises measuring an air temperature of the air flow through the exhaust opening by means of a temperature sensor. If the temperature value is not equal to a supply air temperature, the deactivation process is interrupted. If the temperature differs from a supply air temperature, it means that a process is going on in the fume cupboard, and the fume cupboard should thus not be deactivated.

[0012] In one embodiment, the process further comprises detecting presence in a gap between the front sash and the bottom section by means of a first presence detection means. If presence is detected, the deactivation process is interrupted. If presence is detected, it means that someone is working in the fume cupboard, and the fume cupboard should thus not be deactivated.

[0013] In one embodiment, the process further comprises detecting presence in the room where said fume cupboard is located by means of a second presence detection means. If presence is detected, the deactivation

process is interrupted. If presence is detected in the room of the fume cupboard, it means that someone may intend to perform work in the fume cupboard, and the fume cupboard should thus not be deactivated.

[0014] In one embodiment, the process further comprises blocking the front sash in the closed position. This is advantageous in that the fume cupboard must be unblocked before any work may start therein.

[0015] In a second aspect, a fume cupboard comprising an open front section which is closable by means of a front sash, and a work chamber enclosed by side sections, a bottom section, a back side section, and a top section is provided. The top section is provided with an exhaust opening. The fume cupboard further comprises an electrical power measuring unit configured to measure electrical power consumption of the fume cupboard; and a control unit operatively connected to the electrical power measuring unit for receiving an input signal indicative of the electrical power consumption. The control unit is configured to deactivate the fume cupboard into an inactive state when the electrical power measuring unit measures the electrical power consumption to fulfill a predetermined threshold condition. The inactive state of the fume cupboard comprises: the front sash is configured to be closed and blocked; the electrical power supply for electrical power outlets in the fume cupboard is configured to be turned off; and an air flow through the fume cupboard is configured to be controlled to a minimum flow.

[0016] This fume cupboard is advantageous in that the air flow through the fume cupboard is lowered, which results in lowered environmental impact, and reduced costs for a property owner due to reduced heating/cooling/treating of supply air.

[0017] The actions of the inactive state of the fume cupboard are advantageous in that they prevent work from being performed in the fume cupboard, or save energy.

[0018] In one embodiment, the minimum flow is approximately 0.1-20 l/s, preferably 5-15 l/s, more preferred 8-12 l/s, and most preferred 10 l/s. This advantageous in that it is a large reduction compared to the air flow through an active fume cupboard.

[0019] In one embodiment, the control unit is configured to be in operative connection with an air flow regulation unit configured to adjust the air flow through the fume cupboard. It is advantageous to operatively connect an air flow regulation unit with the control unit, in that the air flow through the fume cupboard may be precisely controlled.

[0020] In one embodiment, the fume cupboard further comprises a volatile organic compound (VOC) sensor in operative communication with the control unit and configured to measure a volatile organic compound (VOC) content in the exhaust air. The volatile organic compound (VOC) content in the exhaust air is a favourable variable to measure in order to be able to determine when the fume cupboard is to be put in an inactive state.

[0021] In one embodiment, the fume cupboard further comprises a first presence detector in operative communication with the control unit and configured to detect presence in a gap between the front sash and the bottom section. The presence detector is favourable in order to be able to determine if a person is performing work in the fume cupboard.

[0022] In one embodiment, the fume cupboard further comprises a second presence detector in operative communication with the control unit and configured to detect presence in a room in which the fume cupboard is located. The presence detector is favourable in order to be able to determine if a person is present in the room, which means that work may be intended to be performed in the fume cupboard.

[0023] In one embodiment, the fume cupboard further comprises a temperature sensor in operative communication with the control unit and configured to measure a temperature of the exhaust air. The temperature of the exhaust air is a favourable variable to measure in order to be able to determine when the fume cupboard is to be put in an inactive state.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] In order to best describe the manner in which the above-described embodiments are implemented, as well as define other advantages and features of the disclosure, a more particular description is provided below and is illustrated in the appended drawings. Understanding that these drawings depict only exemplary embodiments of the invention and are not therefore to be considered to be limiting in scope, the examples will be described and explained with additional specificity and detail through the use of the accompanying drawings in which:

Fig. 1 is a schematic side view of a disclosed fume cupboard with an electrically powered-on heating device,

Fig. 2 is a schematic block diagram of a disclosed fume cupboard.

Fig. 3 is a partly cut out schematic side view of the fume cupboard shown in Fig. 1,

Fig. 4 is a flowchart for a deactivation process for said fume cupboard, and

Fig. 5 is a flowchart for a lock-down process for said fume cupboard.

[0025] Further, in the figures like reference characters designate like or corresponding parts throughout the several figures.

DETAILED DESCRIPTION

[0026] Various embodiments of the disclosed methods and arrangements are discussed in detail below. While specific implementations are discussed, it should be un-

derstood that this is done for illustration purposes only.

[0027] In the description and claims the word "comprise" and variations of the word, such as "comprising" and "comprises", does not exclude other elements or steps.

[0028] Hereinafter, certain embodiments will be described more fully with reference to the accompanying drawings.

[0029] This application relates to a fume cupboard, and how the fume cupboard can be automatically deactivated in a safe manner. Since fume cupboards are usually used for possibly hazardous work, comprising fumes, vapors, steams, odours, sprays, splashes, etc., it is important, and regulated by law and standards, that a minimum airflow must be provided through the fume cupboard at all times when work is being performed therein. The air flow through a fume cupboard is approximately 200 l/s in an active work state. Since there currently is no good way of determining whether work is being performed in a fume cupboard, a consequence is that most fume cupboards are drawing out 200 liters of treated (dehumidified, heated, cooled etc.) air every second. In a building housing several or many fume cupboards, this adds up to huge quantities of air. It would be beneficial, both in an environmental aspect, and in a financial aspect, to have a fume cupboard which is configured to determine if work is being performed within the fume cupboard, and if no work is being performed, the fume cupboard is configured to enter a passive or inactive state where the ventilation is lowered to a minimum, e.g. to an air flow of approximately 10 l/s.

[0030] The inventor of the present invention has after insightful reasoning and inventive thinking designed a fume cupboard that is configured to determine when no work is going on inside the fume cupboard, and which is then configured to enter a passive/inactive state. The fume cupboard is further configured to re-enter the active state as soon as work is being initiated inside the fume cupboard. The fume cupboard comprises a control unit which is configured to initiate a deactivation process as soon as a first condition is fulfilled. This condition is that there is an electrical power consumption of the fume cupboard is below a predetermined threshold value. This fume cupboard and a method of controlling the fume cupboard will be more thoroughly described below.

[0031] Figs 1 and 3 disclose a fume cupboard 10 which basically is a cabinet having a work chamber 13 enclosed by a housing with a front section 15 which is openable for letting air flow from the outside of the fume cupboard 10 into and through the work chamber 13. The front section 15 is openable by means of a front sash 17 which is configured to be movable between a raised and a lowered position. When the front sash is in the raised position an opening is formed between the front sash 17 and the bottom section 18. The front sash 17 is configured to be operable both manually and automatically by means of a motor (not shown) controlled by a control unit 40. The front sash 17 further comprises a lock or blocking device (not shown) configured to be operated by the control unit 40. The blocking device is e.g. an electromagnetic lock configured to act upon suspension shafts of the front sash 17.

[0032] The housing comprises a closed back side 14, closed side sections 16, a closed bottom section 18 and a top section 20 provided with an exhaust opening 22. Normally, an external exhaust fan or similar device (not shown) is arranged to provide the air flow through the fume cupboard 10.

[0033] A motorized damper unit 30 in operative connection with the control unit 40 of the fume cupboard 10 is arranged in a duct 23 connected to the exhaust opening 22 of the fume cupboard 10. The damper unit 30 may be any kind of suitable damper unit, e.g. a throttle damper, iris damper, or any other kind of suitable damper. In various embodiments, the damper unit 30 comprises position detectors providing a feedback signal indicative of the position of the damper 30.

[0034] In Fig. 1, the fume cupboard 10 in use, i.e. in the active state, is disclosed. This means that activity is going on/work is being performed inside the fume cupboard 10. All work in the fume cupboards 10 require some kind of electrical equipment 12 to be connected to an electrical power outlet 46 of the fume cupboard 10 and consuming electrical power. In Fig. 1 this is represented by a sample container 28 arranged on a heater 12, which in turn is arranged on a work chamber floor plate 24. The heating plate 12 is used to heat up the sample container 28 and any samples or objects located therein. The heater 12 is connected to the electrical power outlet 46. Further, the fume cupboard 10 is provided with other electrically powered units, such as lamps 27, electrical motors for the front sash 17, and for adjustment of working height.

[0035] The control unit 40 of the fume cupboard 10 is provided in a control device 42, as shown in Fig. 2. The control unit 40 is operatively connected to an electrical power measuring unit 44. The electrical power measuring unit 44 is arranged to measure the electrical power supplied to the fume cupboard 10 at regular time intervals. The electrical power measuring unit may in some embodiments be exchanged for an electrical current measuring unit. The electrical power feeds e.g. the lamps 27 or other lighting in the hood 10, the heating device 12, and/or any other equipment that may be used in the fume cupboard 10, such as automatic stirrers etc. When no electrical equipment is connected to the electrical power outlet(s) 46 and being active, the electrical power measuring unit 44 is configured to provide a signal corresponding to a zero supply level to the control unit 40. As soon as any electrical equipment is switched on, the electrical power measuring unit 44 is configured to provide an electrical power supply signal corresponding to the present electrical power supply level to the control unit 40.

[0036] The fume cupboard 10 is provided with at least one temperature sensor 47, arranged in the upper portion of the work chamber 13, preferably in the vicinity of the

exhaust opening 22. The fume cupboard 10 is also provided with a volatile organic compound (VOC) sensor 48, arranged in the exhaust opening 22, configured to detect any volatile organic compounds present in the exhaust air.

[0037] The front sash 17 is provided with a first presence detector 50, which preferably is an active presence detector. The active presence detector 50 is arranged as an IR curtain extending along the length of the front sash 17. The active presence detector 50 IR curtain is directed downwards, towards the bottom section 18 of the fume cupboard 10. It is configured to detect if any part of a person, e.g. a hand, is present in the opening formed between the front sash 17 and the bottom section 18.

[0038] The front sash 17 is also provided with a second presence detector 49, which preferably is a passive presence detector, e.g. a passive IR detector. The passive presence detector 49 is configured to detected if a person is present in front of the fume cupboard 10. The range of the passive presence detector 49 is approximately 1-3 meters, preferably 2 meters, from the front section 15 of the fume cupboard 10.

[0039] Presence in relation to the fume cupboard 10 may also be detected indirectly by means of sensors detecting operator performed movement of the front sash 17, utilization of the electrical power outlets etc.

[0040] When work is taking place in the fume cupboard 10, air is flowing in the direction of arrow A into the work chamber 13 through the opening formed by the raised front sash 17. The flow of air is directed towards the exhaust opening 22 provided in the upper portion of the fume cupboard 10. The air flowing through the work chamber 13 brings fumes, vapours etc towards along the dashed arrows, and out through the exhaust outlet 22, along arrow B.

[0041] In order to save energy, and thus costs, the fume cupboard 10 is configured to enter an inactive state when no work is being performed in the work chamber 13. In order to determine if work is being performed or not, the control unit 40 is configured to perform a deactivation process 100, comprising monitoring the activities taking place in and around the fume cupboard 10. This process 100 is shown in the flowchart of Fig. 4. If the deactivation process 100 indicates that no work is being performed in the fume cupboard 10, the control unit 40 is configured to follow a lock-down process 200, shown in the flowchart in Fig. 5.

[0042] The control unit 40 is configured to monitor the following variables in order to determine if certain conditions are fulfilled. The variables are monitored continuously and not in any certain order. Different variables may be monitored at different time intervals, but all variables are monitored regularly and not in dependence of each other. The conditions need not be fulfilled in any certain order, but when all conditions are fulfilled, the lock-down process 200 is configured to be initiated.

1) The electrical power measuring unit 44 is configured to measure 101 the electrical power consumption of the fume cupboard 10 . When the electrical power consumption in the fume cupboard 10 is below a threshold value 102, the electrical power measuring unit 44 is configured to transmit a signal to the control unit 40. A power consumption below a certain predetermined threshold value indicates that no electrical activity is taking place in the fume cupboard 10. That is, no heating plate is active, no stirring equipment is active etc. This is an indication that no work is taking place in the fume cupboard 10. The electrical power consumption being below the predetermined threshold value is a prerequisite for the lock-down or deactivation process to begin. If the electrical power consumption is not below the predetermined threshold value, the lock-down process will not commence, even if all other below mentioned conditions are fulfilled.

The electrical power consumption may be determined in two ways. A first method comprises measuring the power consumption of the electrical power outlet(s) 46 of the fume cupboard 10. In this case, the threshold value is zero, which means that no active electrical equipment 12 is connected to the electrical power outlets 46. Another method for determining if the electrical power consumption indicates that no work is being performed comprises measuring the total power consumption of the fume cupboard 10. That is, the electrical power consumption of the electrical power outlet(s), motor driving the front sash 17, lamps/lighting 27, sensors etc. In this case, the threshold value is not equal to zero, since the fume cupboard 10 is always consuming electrical power due to the sensors checking for presence, volatile organic compounds (VOC's), the control unit 40 requires electrical power etc. The electrical power consumption of these devices/units are known and provided to the control unit 40. By adding these known parts of the electrical power consumption, a threshold value is obtainable. Thus, the control unit 40 is configured to initiate the lock-down process 20 when the measured electrical power consumption originates only from the fume cupboard 10 itself.

2) The control unit 40 is configured to analyze a volatile organic compound (VOC) content in the exhaust air 103, measured by means of the volatile organic compound (VOC) sensor 48. The control unit 40 is configured to analyze the change of the volatile organic compound (VOC) content in order to determine if the content is decreasing 104, compared to an earlier measurement value. A decreasing value indicates that the work process is slowing down or ending. When the value equals zero, it is an indication that no process is taking place in the fume cupboard 10, and that the lock-down process 200 is configured to continue.

3) The control unit 40 is further configured to analyze a temperature value in the exhaust air 105, as meas-

ured by means of the temperature sensor 47. The control unit 40 is configured to analyze the change of the temperature value in order to determine if the temperature is decreasing, compared to an earlier measurement value 106. A decreasing temperature value indicates that the work process in the work chamber 13 is slowing down or ending. The temperature of the supply air A into the fume cupboard 10 is also measured, by a second temperature sensor (not shown). When the extract air has the same temperature as the supply air, it is an indication that no heat generating process is taking place in the fume cupboard 10, and thus the lock-down 200 process is configured to continue.

4) The control unit 40 is configured to analyze 107 data transmitted from the active presence detector 50 arranged on the front sash 17. Since the active presence detector 50 is configured to detect the presence of e.g. hands in the opening below the front sash 17, it is an indication that no one is working at the fume cupboard 10 when the active presence detector 50 has not registered any signal for a predetermined time period. The predetermined period of time is 5-15 minutes, preferably 7-10 minutes and most preferred 8 minutes. When no presence detection has been made during this time period, the lock-down process 200 is configured to continue.

Further, the active presence detector 50 registers the level of light in the room where the fume cupboard 10 is arranged. If the registered light level is below a certain boundary value, it is an indication that no one is working in the room.

5) The control unit is configured to analyze 107 data transmitted from the passive presence detector 49. If the passive presence detector has not registered any presence for a predetermined period of time, this is an indication that no person is present in the room, and thus that no work is being performed in the fume cupboard 10. The predetermined period of time is preferably 5-15 minutes, preferably 7-10 minutes and most preferred 8 minutes. When no presence detection has been made during this time period, the lock-down process 200 is configured to continue.

[0043] When the above conditions (electrical power consumption below a predetermined threshold value, volatile organic compound (VOC) content below a certain threshold value, a temperature value being consistent with an external temperature, no presence detected in the opening of the front sash 17, and no presence detected in the room) are fulfilled, the control unit 40 is configured to initiate the lock-down process 200 in order for the fume cupboard 10 to enter the inactive state. Fig. 3 shows the fume cupboard 10 in the inactive state.

[0044] The first step of the lock-down process 200 is that the control unit 40 controls 201 the motor coupled to the front sash 17 such that the sash 17 enters a lowered position. In the lowered position, a few centimeters gap is left between the work chamber floor plate 24 and the front sash 17. This is due to safety regulation stating that a certain air flow through the fume cupboard 10 must be maintained at all times. The gap is however small enough such that no person can reach into and perform any work within the fume cupboard 10.

[0045] When the front sash 17 is operated to the lowered position, the control unit 40 is configured to block 202 the front sash 17. The front sash 17 may thus not easily be opened by a user. Preferably, the front sash 17 is unblocked only if a user maneuvers a control panel provided on the fume cupboard 10.

[0046] Thereafter, the control unit 40 is configured to switch off 203 the electrical power to the electrical power outlet(s) 46 of the fume cupboard 10 such that no electrical equipment 12 can be active inside the fume cupboard 10. The electrical power may also be switched off for the lamp 27 or other lighting present in the cupboard 10. The control unit 40, the sensors and detectors, the damper unit 30 etc. are however still provided with electrical power.

[0047] Thereafter, the air flow through the fume cupboard 10 is controlled 204 to a lower flow rate, as shown in Fig. 3. The air flow is controlled by means of the motorized damper unit 30 in operative connection with the control unit 40.

[0048] The flow rate of the inactive state is approximately 0.1-20 l/s, preferably 5-15 l/s, more preferred 8-12 l/s, and most preferred 10 l/s.

[0049] If any of the above mentioned condition ceases to be fulfilled at any time of the deactivation process 100, the process will be interrupted, and the control unit 40 is configured to return the fume cupboard 10 into the active state again.

[0050] If a person passes the deactivated fume cupboard 10, the passive presence detector 49 will register this, and transmit a signal to the control unit 40. The control unit 40 is configured to show a message on a display (not shown) arranged on the front of the fume cupboard 10. The displayed message comprises information regarding the fume cupboard 10 being in an inactive state, and possibly also a question if the fume cupboard should enter the active state. The display may be any kind of suitable display. In one embodiment, the display is a touch-screen which the person may press on in order to re-enter the fume cupboard 10 into the active state.

[0051] If the active presence detector 50 registers presence in the gap below the front sash 17 when the fume cupboard 10 is deactivated, it transmits a signal to the control unit 40 which in turn is configured to re-activate the fume cupboard 10. The same happens if a person grabs the front sash 17 and tries to open it.

[0052] If a presence is detected in the gap below the front sash 17, or the front sash 17 is being forced open, it is likely that it is a person who intends to perform work in the fume cupboard 10. It is thus beneficial that the fume cupboard 10 enters the active state immediately, without any further interaction with the person. However, if pres-

ence is only detected in the room, it is not as likely that it is a person intending to perform work in the fume cupboard 10, as a person may have many other reasons for entering the room where the fume cupboard 10 is located. It is thus beneficial that the fume cupboard 10 is not configured to automatically re-enter the active state solely based on detected presence in the room. This saves heating/cooling/treating of air, and thus costs and the environment.

[0053] The various embodiments described above are provided by way of illustration only and should not be construed to limit the invention. For example, the principles herein may be applied to any kind of fume cupboard, or fume hood.

Claims

1. A process (100) for deactivating a fume cupboard (10) comprising an open front section (15) which is closable by means of a front sash (17), a work chamber (13) enclosed by side sections (16), a bottom section (18), a back side section (14), and a top section (20) provided with an exhaust opening (22), the fume cupboard (10) further comprising an electrical power measuring unit (44) configured to measure electrical power consumption of the fume cupboard (10); the process comprising the steps of:

   - determining (102), by means of the electrical power measuring unit (44), if an electrical power consumption of the fume cupboard (10) fulfills a predetermined threshold condition; if so:
   - closing (201) the front sash (17) of the fume cupboard (10),
   - switching (203) an electrical power for the fume cupboard (10) off; and
   - controlling (204) an air flow through the fume cupboard (10) to a minimum flow.

2. The process according to claim 1, wherein the electrical power measuring unit (44) is configured to measure the electrical power consumption of one or more electrical power outlets (46) of the fume cupboard (10).

3. The process according to claim 2, wherein the predetermined threshold condition is zero power consumption.

4. The process according to any one of the preceding claims, further comprising measuring a volatile organic compound (VOC) content in the air flow through the exhaust opening (22) by means of a volatile organic compound (VOC) sensor (48), and if the measured volatile organic compound (VOC) content is not equal to zero, interrupting the deactivation process (100).

5. The process according to any one of the preceding claims, further comprising measuring an air temperature of the air flow through the exhaust opening (22) by means of a temperature sensor (47), and if the temperature value is not equal to a supply air temperature, interrupting the deactivation process (100).

6. The process according to any one of the preceding claims, further comprising detecting presence in a gap between the front sash (17) and the bottom section (18) by means of a first presence detection means (50), and if presence is detected, interrupting the deactivation process (100).

7. The process according to any one of the preceding claims, further comprising detecting presence in the room where said fume cupboard (10) is located by means of a second presence detection means (49), and if presence is detected, interrupting the deactivation process (100).

8. The process according to any one of the preceding claims, further comprising blocking the front sash (17) in the closed position.

9. A fume cupboard (10) comprising an open front section (15) which is closable by means of a front sash (17), and a work chamber (13) enclosed by side sections (16), a bottom section (18), a back side section (14), and a top section (20), wherein the top section (20) is provided with an exhaust opening (22), the fume cupboard (10) further comprising

   an electrical power measuring unit (44) configured to measure electrical power consumption of the fume cupboard (10);
   a control unit (40) operatively connected to the electrical power measuring unit (44) for receiving an input signal indicative of the electrical power consumption;
   wherein the control unit (40) is configured to deactivate the fume cupboard (10) into an inactive state when the electrical power measuring unit (44) measures the electrical power consumption to fulfill a predetermined threshold condition, and
   wherein the inactive state comprises: the front sash (17) is configured to be closed and blocked, the electrical power supply for electrical power outlets (46) in the fume cupboard (10) is configured to be turned off, and an air flow through the fume cupboard (10) is configured to be controlled to a minimum flow.

10. The fume cupboard (10) according to claim 9, wherein the minimum flow is approximately 0.1-20 l/s, preferably 5-15 l/s, more preferred 8-12 l/s, and most preferred 10 l/s.

11. The fume cupboard (10) according to any one of claims 9-10, wherein the control unit (40) is configured to be in operative connection with an air flow regulation unit (30) configured to adjust the air flow through the fume cupboard (10).

12. The fume cupboard (10) according to any one of claims 9-11, further comprising a volatile organic compound (VOC) sensor (48) in operative communication with the control unit (40) and configured to measure a volatile organic compound (VOC) content in the exhaust air.

13. The fume cupboard (10) according to any one of claims 9-12, further comprising a first presence detector (50) in operative communication with the control unit (40) and configured to detect presence in a gap between the front sash (17) and the bottom section (18).

14. The fume cupboard (10) according to any one of claims 9-13, further comprising a second presence detector (49) in operative communication with the control unit (40) and configured to detect presence in a room in which the fume cupboard (10) is located.

15. The fume cupboard (10) according to any one of claims 9-14, further comprising a temperature sensor (47) in operative communication with the control unit (40) and configured to measure a temperature of the exhaust air.

Patentansprüche

1. Verfahren (100) zum Deaktivieren eines Abzugs (10), umfassend einen offenen Frontabschnitt (15), der mittels eines Frontschiebers (17) verschließbar ist, eine Arbeitskammer (13), die von Seitenabschnitten (16) umschlossen ist, einen Bodenabschnitt (18), einen hinteren Seitenabschnitt (14) und einen oberen Abschnitt (20), der mit einer Abluftöffnung (22) versehen ist, wobei der Abzug (10) ferner eine elektrische Leistungsmesseinheit (44) umfasst, die konfiguriert ist, um den elektrischen Leistungsverbrauch des Abzugs (10) zu messen; das Verfahren umfassend die Schritte:

- Bestimmen (102), mittels der elektrischen Leistungsmesseinheit (44), ob ein elektrischer Leistungsverbrauch des Abzugs (10) eine vorbestimmte Schwellenbedingung erfüllt; und wenn dies der Fall ist:
- Schließen (201) des Frontschiebers (17) des Abzugs (10),
- Abschalten (203) einer elektrischen Leistung für den Abzug (10); und
- Steuern (204) eines Luftstroms durch den Abzug (10) auf einen minimalen Strom.

2. Verfahren nach Anspruch 1, wobei die elektrische Leistungsmesseinheit (44) ausgelegt ist, um den elektrische Leistungsverbrauch einer oder mehrerer elektrischer Leistungsausgänge (46) des Abzugs (10) zu messen.

3. Verfahren nach Anspruch 2, wobei die vorbestimmte Schwellenwertbedingung ein Nullleistungsverbrauch ist.

4. Verfahren nach einem der vorstehenden Ansprüche, ferner umfassend das Messen eines Gehalts an flüchtigen organischen Verbindungen (VOC) in dem Luftstrom durch die Abluftöffnung (22) mittels eines Sensors (48) für flüchtige organische Verbindungen (VOC), und wenn der gemessene Gehalt an flüchtigen organischen Verbindungen (VOC) nicht gleich Null ist, Unterbrechen des Deaktivierungsverfahrens (100).

5. Verfahren nach einem der vorstehenden Ansprüche, ferner umfassend das Messen einer Lufttemperatur des Luftstroms durch die Abluftöffnung (22) mittels eines Temperatursensors (47), und wenn der Temperaturwert nicht gleich einer Zulufttemperatur ist, Unterbrechen des Deaktivierungsverfahrens (100).

6. Verfahren nach einem der vorstehenden Ansprüche, ferner umfassend das Erfassen von Vorhandensein in einem Spalt zwischen dem Frontschieber (17) und dem Bodenabschnitt (18) mittels eines ersten Anwesenheitserfassungsmittels (50) und falls das Vorhandensein erfasst wird, Unterbrechen des Deaktivierungsverfahrens (100).

7. Verfahren nach einem der vorstehenden Ansprüche, ferner umfassend das Erfassen der Anwesenheit in dem Raum, in dem sich der Abzug (10) befindet, mittels eines zweiten Anwesenheitserfassungsmittels (49) und, wenn die Anwesenheit erfasst wird, das Unterbrechen des Deaktivierungsverfahrens (100).

8. Verfahren nach einem der vorstehenden Ansprüche, ferner umfassend das Blockieren des vorderen Frontschiebers (17) in der geschlossenen Position.

9. Abzug (10), umfassend einen offenen Frontabschnitt (15), der mittels eines Frontschiebers (17) verschließbar ist, und eine Arbeitskammer (13), die von Seitenabschnitten (16), einem Bodenabschnitt (18), einem hinteren Seitenabschnitt (14) und einem oberen Abschnitt (20) umschlossen ist, wobei der obere Abschnitt (20) mit einer Abluftöffnung (22) versehen ist, wobei der Abzug (10) ferner umfasst:

eine elektrische Leistungsmesseinheit (44), die konfiguriert ist, um den elektrischen Leistungsverbrauch des Abzugs (10) zu messen;
eine Steuereinheit (40), die mit der elektrischen Leistungsmesseinheit (44) operativ verbunden ist, um ein Eingangssignal zu empfangen, das den elektrischen Leistungsverbrauch angibt;
wobei die Steuereinheit (40) konfiguriert ist, um den Abzug (10) in einen inaktiven Zustand zu deaktivieren, wenn die elektrische Leistungsmesseinheit (44) den elektrischen Leistungsverbrauch misst, um eine vorbestimmte Schwellenbedingung zu erfüllen, und
wobei der inaktive Zustand umfasst: den Frontschieber (17) der konfiguriert ist, um geschlossen und blockiert zu werden, wobei die elektrische Leistungsversorgung für elektrische Leistungsausgänge (46) in dem Abzug (10) konfiguriert ist, um abschaltbar zu sein, und ein Luftstrom durch den Abzug (10) konfiguriert ist, um auf einen minimalen Durchfluss gesteuert zu werden.

10. Abzug (10) nach Anspruch 9, wobei der Mindestfluss etwa 0,1-20 l/s, vorzugsweise 5-15 l/s, mehr bevorzugt 8-12 l/s und am meisten bevorzugt 10 l/s beträgt.

11. Abzug (10) nach einem der Ansprüche 9 bis 10, wobei die Steuereinheit (40) konfiguriert ist, um mit einer Luftstromregelungseinheit (30) in operativer Verbindung zu stehen, die konfiguriert ist, um den Luftstrom durch den Abzug (10) anzupassen.

12. Abzug (10) nach einem der Ansprüche 9 bis 11, ferner umfassend einen Sensor (48) für flüchtige organische Verbindungen (VOC), der in operativer Verbindung mit der Steuereinheit (40) steht und konfiguriert ist, um einen Gehalt an flüchtigen organischen Verbindungen (VOC) in der Abluft zu messen.

13. Abzug (10) nach einem der Ansprüche 9 bis 12, ferner umfassend einen ersten Anwesenheitsdetektor (50), der in operativer Verbindung mit der Steuereinheit (40) steht und konfiguriert ist, um das Vorhandensein in einem Spalt zwischen dem Frontschieber (17) und dem Bodenabschnitt (18) zu erfassen.

14. Abzug (10) nach einem der Ansprüche 9 bis 13, ferner umfassend einen zweiten Anwesenheitsdetektor (49), der in operativer Verbindung mit der Steuereinheit (40) seht und konfiguriert ist, um das Vorhandensein in einem Raum zu erfassen, in dem sich der Abzug (10) befindet.

15. Abzug (10) nach einem der Ansprüche 9 bis 14, ferner umfassend einen Temperatursensor (47), der in operativer Verbindung mit der Steuereinheit (40) steht und konfiguriert ist, um eine Temperatur der Abluft zu messen.

Revendications

1. Procédé (100) permettant de désactiver une sorbonne (10) comprenant une section avant ouverte (15) qui peut se fermer au moyen d'un volet frontal (17), une chambre de travail (13) enfermée par des sections latérales (16), une section inférieure (18), une section côté arrière (14), et une section supérieure (20) pourvue d'une ouverture d'évacuation (22), la sorbonne (10) comprenant en outre une unité de mesure d'alimentation électrique (44) configurée pour mesurer la consommation d'alimentation électrique de la sorbonne (10) ; le procédé comprenant les étapes consistant à :

- déterminer (102), au moyen de l'unité de mesure d'alimentation électrique (44), si une consommation d'alimentation électrique de la sorbonne (10) remplit une condition seuil prédéterminée ; dans l'affirmative :
- la fermeture (201) du volet frontal (17) de la sorbonne (10),
- la commutation (203) d'une alimentation électrique pour la sorbonne (10) sur arrêt ; et
- la commande (204) d'un débit d'air à travers la sorbonne (10) sur un débit minimal.

2. Procédé selon la revendication 1, dans lequel l'unité de mesure d'alimentation électrique (44) est configurée pour mesurer la consommation d'alimentation électrique d'une ou plusieurs prises d'alimentation électrique (46) de la sorbonne (10).

3. Procédé selon la revendication 2, dans lequel la condition seuil prédéterminée est une consommation d'alimentation nulle.

4. Procédé selon l'une quelconque des revendications précédentes, comprenant en outre la mesure d'une teneur en composés organiques volatils (COV) dans le débit d'air à travers l'ouverture d'évacuation (22) au moyen d'un capteur à composés organiques volatils (COV) (48), et si la teneur en composés organiques volatils (COV) n'est pas égale à zéro, l'interruption du procédé de désactivation (100).

5. Procédé selon l'une quelconque des revendications précédentes, comprenant en outre la mesure d'une température d'air du débit d'air à travers l'ouverture d'évacuation (22) au moyen d'un capteur de température (47), et si la valeur de température n'est pas égale à une température d'air d'alimentation, l'interruption du procédé de désactivation (100).

6. Procédé selon l'une quelconque des revendications précédentes, comprenant en outre une détection de présence dans un espace entre le volet frontal (17) et la section inférieure (18) au moyen d'un premier moyen de détection de présence (50), et si une présence est détectée, l'interruption du procédé de désactivation (100).

7. Procédé selon l'une quelconque des revendications précédentes, comprenant en outre une détection de présence dans la pièce où ladite sorbonne (10) est localisée au moyen d'un second moyen de détection de présence (49), et si une présence est détectée, l'interruption du procédé de désactivation (100).

8. Procédé selon l'une quelconque des revendications précédentes, comprenant en outre un blocage du volet frontal (17) dans la position fermée.

9. Sorbonne (10) comprenant une section avant ouverte (15) qui peut se fermer au moyen d'un volet frontal (17), et une chambre de travail (13) enfermée par des sections latérales (16), une section inférieure (18), une section côté arrière (14) et une section supérieure (20), la section supérieure (20) étant pourvue d'une ouverture d'évacuation (22), la sorbonne (10) comprenant en outre

une unité de mesure d'alimentation électrique (44) configurée pour mesurer la consommation d'alimentation électrique de la sorbonne (10) ;
une unité de commande (40) connectée de façon opérationnelle à l'unité de mesure d'alimentation électrique (44) destinée à recevoir un signal d'entrée indiquant la consommation d'alimentation électrique ;
dans laquelle l'unité de commande (40) est configurée pour désactiver la sorbonne (10) dans un état inactif lorsque l'unité de mesure d'alimentation électrique (44) mesure que la consommation d'alimentation électrique remplit une condition seuil prédéterminée, et
dans laquelle l'état inactif comprend : le volet frontal (17) est configuré pour être fermé et bloqué, l'alimentation électrique pour les prises d'alimentation électrique (46) dans la sorbonne (10) est configurée pour être mise à l'arrêt, et un débit d'air à travers la sorbonne (10) est configuré pour être commandé à un débit minimal.

10. Sorbonne (10) selon la revendication 9, dans laquelle le débit minimal est d'approximativement 0,1 à 20 l/s, de préférence 5 à 15 l/s, plus préférablement 8 à 12 l/s, et le plus préférablement 10 lls.

11. Sorbonne (10) selon l'une quelconque des revendications 9 à 10, dans laquelle l'unité de commande (40) est configurée pour être en connexion opérationnelle avec une unité de régulation de débit d'air (30) configurée pour ajuster le débit d'air à travers la sorbonne (10).

12. Sorbonne (10) selon l'une quelconque des revendications 9 à 11, comprenant en outre un capteur à composés organiques volatils (COV) (48) en communication opérationnelle avec l'unité de commande (40) et configuré pour mesurer une teneur en composés organiques volatils (COV) dans l'air d'évacuation.

13. Sorbonne (10) selon l'une quelconque des revendications 9 à 12, comprenant en outre un premier détecteur de présence (50) en communication opérationnelle avec l'unité de commande (40) et configuré pour détecter une présence dans un espace entre le volet frontal (17) et la section inférieure (18).

14. Sorbonne (10) selon l'une quelconque des revendications 9 à 13, comprenant en outre un second détecteur de présence (49) en communication opérationnelle avec l'unité de commande (40) et configuré pour détecter une présence dans une pièce dans laquelle la sorbonne (10) est localisée.

15. Sorbonne (10) selon l'une quelconque des revendications 9 à 14, comprenant en outre un capteur de température (47) en communication opérationnelle avec l'unité de commande (40) et configuré pour mesurer une température de l'air d'évacuation.

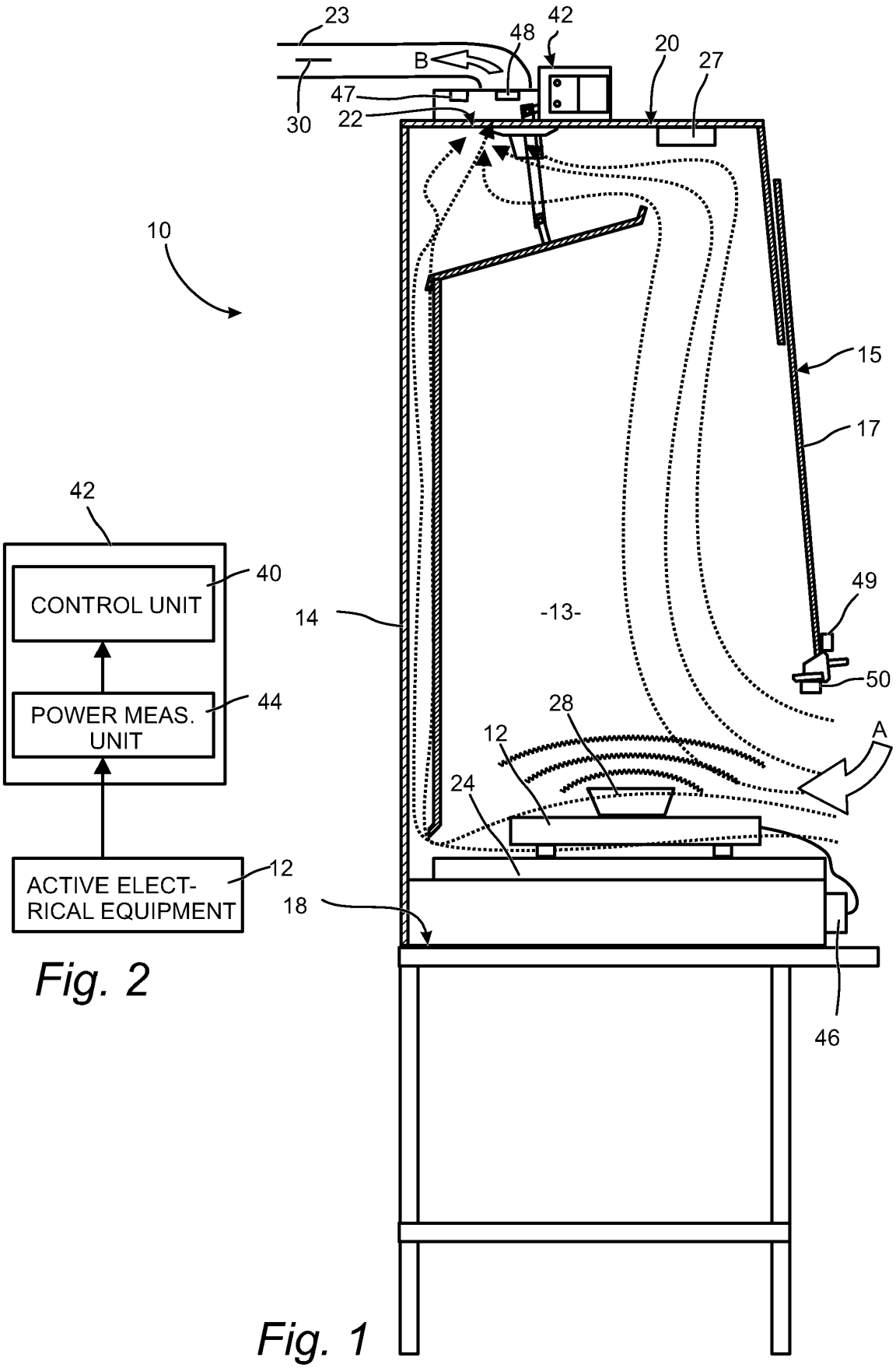
23
48
42
B
20
27
47
22
30
10
15
17
42
CONTROL UNIT
40
14
-13-
49
50
POWER MEAS. UNIT
44
28
12
A
24
ACTIVE ELECT-RICAL EQUIPMENT
12
18
46

Fig. 2

Fig. 1

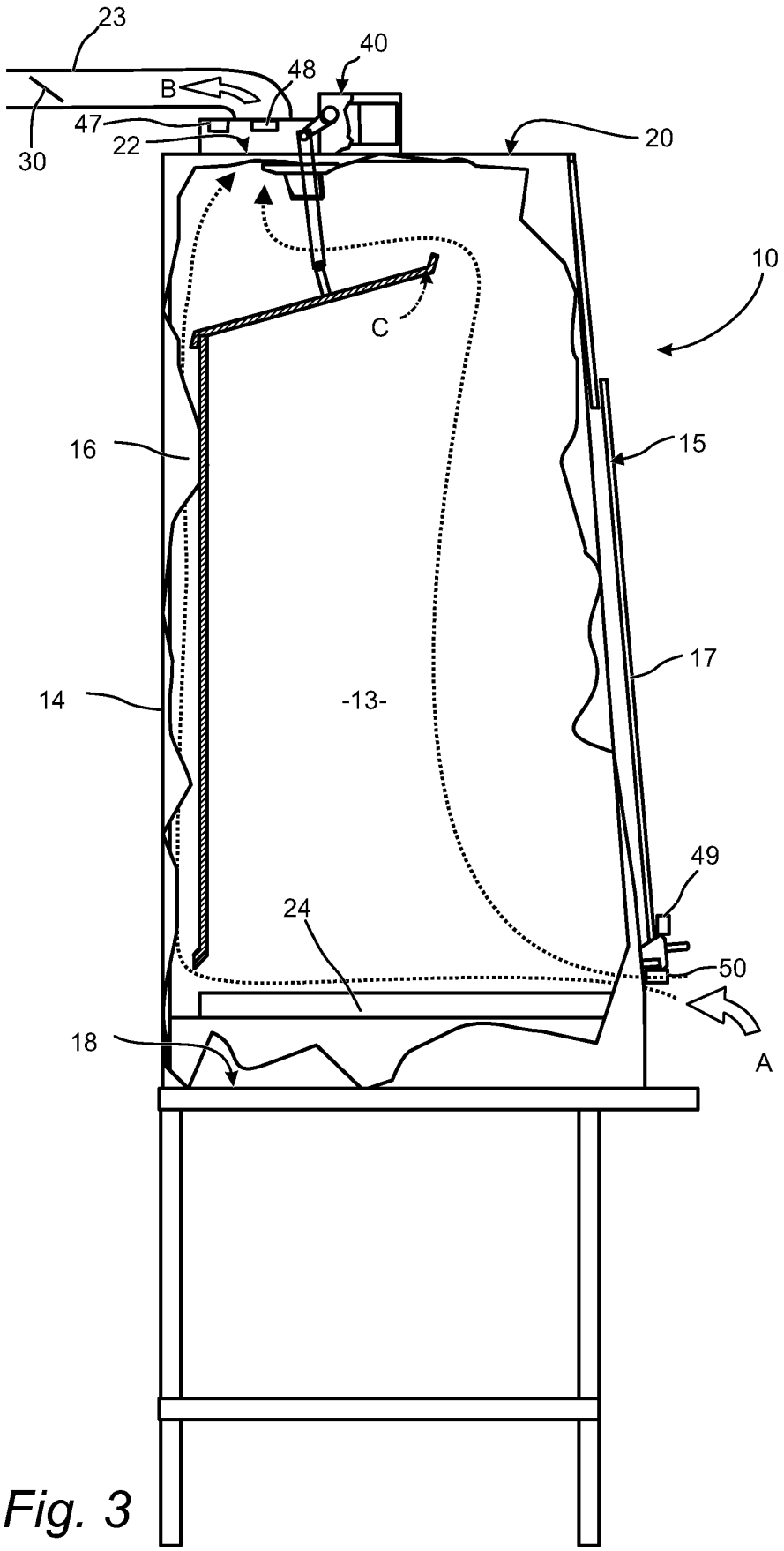

Fig. 3

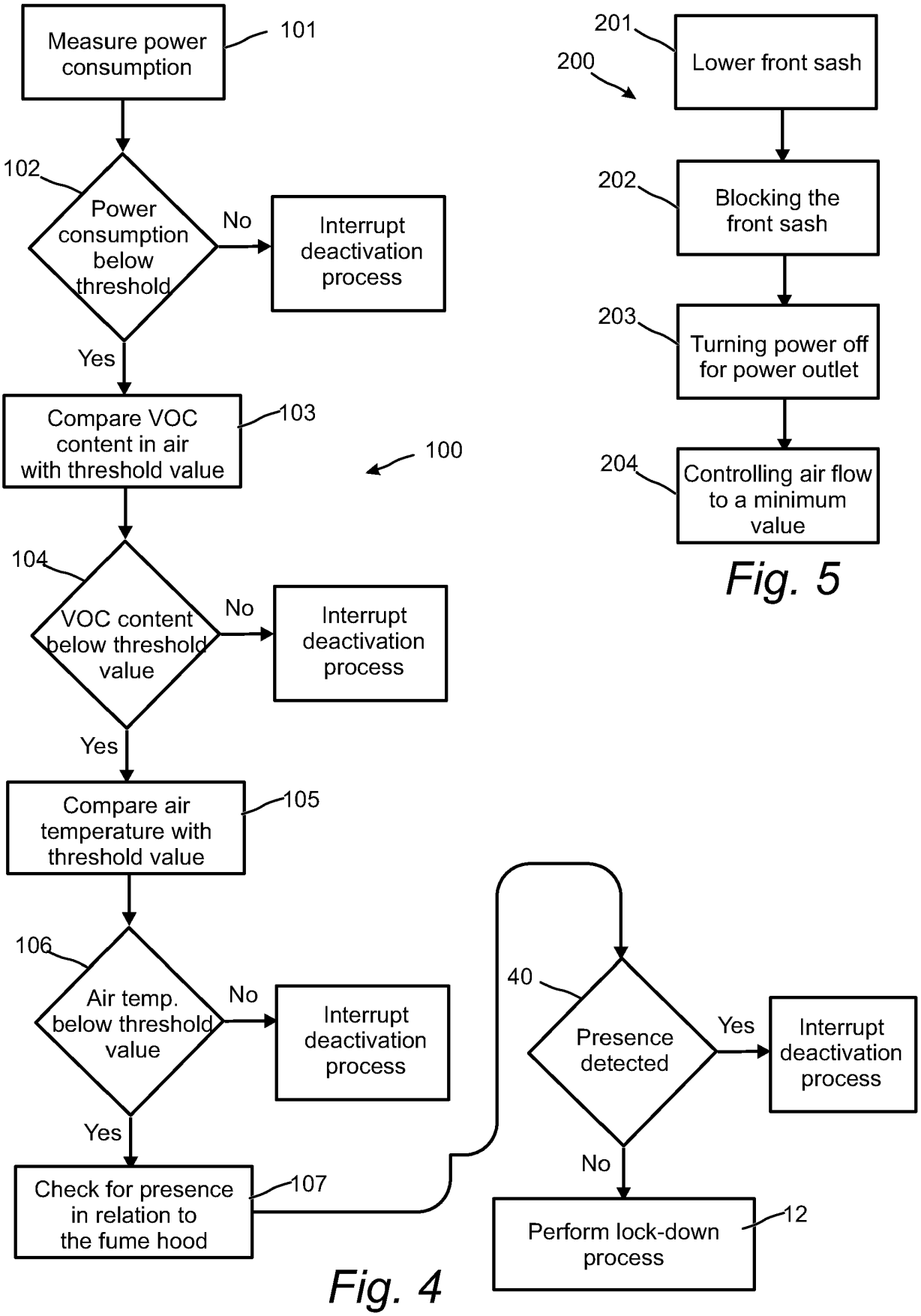
Measure power consumption
101
102
Power consumption below threshold
No
Interrupt deactivation process
Yes
Compare VOC content in air with threshold value
103
100
104
VOC content below threshold value
No
Interrupt deactivation process
Yes
Compare air temperature with threshold value
105
106
Air temp. below threshold value
No
Interrupt deactivation process
Yes
Check for presence in relation to the fume hood
107
40
Presence detected
Yes
Interrupt deactivation process
No
Perform lock-down process
12

Fig. 4

201
200
Lower front sash
202
Blocking the front sash
203
Turning power off for power outlet
204
Controlling air flow to a minimum value

Fig. 5

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 2006079164 A1 **[0004]**