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(54) A FUME HOOD AND A METHOD FOR OPERATING A FUME HOOD

(57) A fume hood (10) with an open front section and work chamber (13), and a top section (20), wherein the top section (20) is provided with an exhaust opening (22), the fume hood (10) further comprising an evacuation channel (29) between the work chamber (13) and the exhaust opening (22), a top gate (30) for automatically changing an air flow opening (34) at an upper section of the work chamber (13); a to measure power consumption of electrically powered units (12) of the fume hood (10); an actuator (36) arranged to adjust the top gate (30); a control unit (40) operatively connected to the power measuring device (44) for receiving an input signal indicative of the power consumption, and to the actuator (36) for adjusting the air flow opening (34).

A method for operating a fume hood (10), comprising evacuation of air through the evacuation channel (29); measuring power consumption of the electrically powered units (12); increasing a size of the air flow opening (34) at an increased level of power consumption; and evacuation of an increased amount of air through the air flow opening (34) to said exhaust opening (22) at an increased level of power consumption.

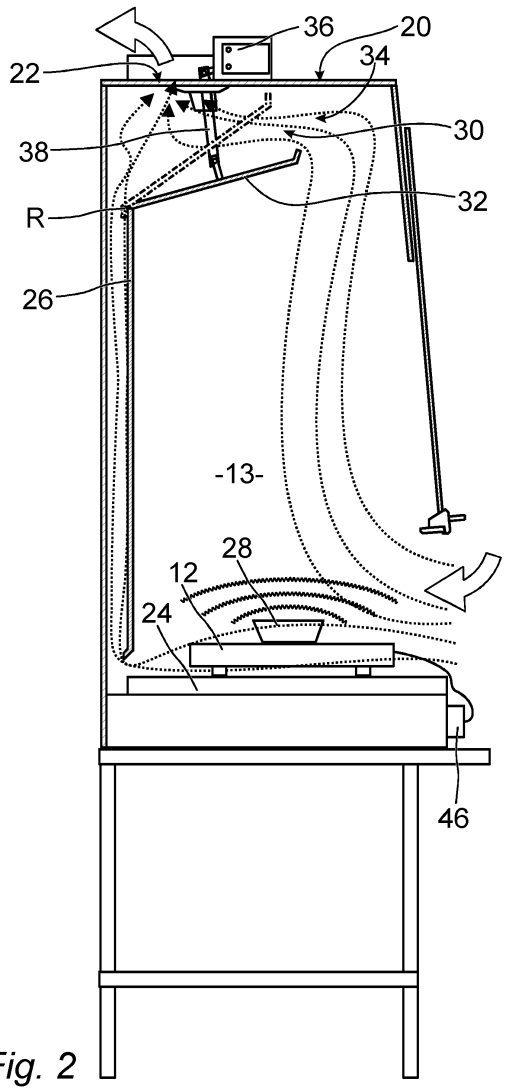

Fig. 2

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Description

TECHNICAL FIELD

[0001] The present invention relates to a fume hood and a method for operating a fume hood.

BACKGROUND

[0002] A fume hood is a ventilated enclosure where harmful materials can be handled safely. The fume hood captures contaminants and prevents them from escaping into an environment around the fume hood 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] An airflow through the opening will have a velocity and the velocity of the airflow needs to be maintained at a lowest level also when conditions inside the fume hood are changing.

[0004] 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

[0005] 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.

[0006] In a first aspect there is disclosed a fume hood with an open front section and work chamber enclosed by side sections, a bottom section, a back side section, and a top section, wherein the top section is provided with an exhaust opening, the fume hood further comprising an evacuation channel between the work chamber and the exhaust opening, a top gate for automatically changing an air flow opening at an upper section of the work chamber; a to measure power consumption of electrically powered units of the fume hood; an actuator arranged to adjust the top gate; a control unit operatively connected to the power measuring device for receiving an input signal indicative of the power consumption, and to the actuator for adjusting the air flow opening in dependence of the measured power consumption and increasing the air flow opening at an increased power consumption level.

[0007] In a second aspect there is disclosed a method for operating a fume hood, comprising an open front section and work chamber enclosed by side sections, a bottom section, a back side section, and a top section, wherein the top section is provided with an exhaust opening, the method comprising evacuation of air through an evacuation channel between the work chamber and the exhaust opening; measuring power consumption of electrically powered units of the fume hood; increasing a size of an air flow opening at an upper section of the work chamber at an increased level of power consumption; and evacuation of an increased amount of air through the air flow opening to said exhaust opening at an increased level of power consumption.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] 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 partly cut out schematic side view of a disclosed fume hood,
- Fig. 2 is a schematic side view of the fume hood shown in Fig. 1 with a powered on heating device, and
- Fig. 3 is a schematic block diagram of a disclosed fume hood.

[0009] Further, in the figures like reference characters designate like or corresponding parts throughout the several figures.

DETAILED DESCRIPTION

[0010] Various embodiments of the disclosed methods and arrangements are discussed in detail below. While specific implementations are discussed, it should be understood that this is done for illustration purposes only. A person skilled in the relevant art will recognize that other components, configurations, and steps may be used without parting from the spirit and scope of the disclosure.

[0011] 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.

[0012] Hereinafter, certain embodiments of a fume hood will be described more fully with reference to the

accompanying drawings. It will be apparent to those skilled in the art that various modifications and variations can be made without departing from the inventive concept. Other embodiments will be apparent to those skilled in the art from consideration of the specification and practice disclosed herein. The embodiments herein are provided by way of example so that this disclosure will be thorough and complete, and will fully convey the scope of the inventive concept, and that the claims be construed as encompassing all equivalents of the present inventive concept which are apparent to those skilled in the art to which the inventive concept pertains. If nothing else is stated, different embodiments may be combined with each other.

[0013] The embodiment of a fume hood 10 shown in Fig. 1 and Fig. 2 is used during normal operation, and a heating plate or heating device 12 present at a bottom section of the fume hood is switched off. The fume hood basically is a cabinet having a work chamber 13 enclosed by a housing with an open front section for letting in an external air flow flowing into the work chamber. 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 provided to provide the air flow through the fume hood.

[0014] Since there is no heating of object present in the fume hood a major part of the air flow will follow a work chamber floor plate 24 around a sample container 28 and up through an evacuation channel 29 between an inner rear wall 26 and the closed back side 14. Only a minor part of the air flow will exit the work chamber 13 as a top flow through an air flow opening 34 over a top gate 30. The top gate comprises a baffle or turning vane 32 extending over at least a substantial part of the distance between the side sections 16. At these conditions, the top flow will not cause any problems or jeopardize the intended function of the fume hood. The top gate 30 can be adjusted to change the air flow opening as will be further described below with reference to Fig. 2. In the embodiment shown in Fig. 1 and Fig. 2, the top gate 30 is adjusted by rotating the turning vane 32 as indicated by arrow A in Fig. 1. During normal conditions, the top gate 30 is adjusted to maintain the air flow opening 34 at a minimal size.

[0015] The fume hood 10 of Fig. 2 is provided with different electrically powered units, such as lamps, electrical motors for a front sash, and for adjustment of working height, and a heating plate 12 arranged on the 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 air entering the work chamber 13, will also be heated and there will be an air flow directed upwardly towards a top section of the fume hood and the air flow opening 34. The heated air will cause an increased air pressure in the working chamber 13 and disturb the intended air flow directions.

[0016] During these conditions, the air flow in the work chamber can be improved by increasing the air flow opening 34, so as to allow more air to pass through and to reach the exhaust opening 22 without causing problems. In the embodiment shown in Fig. 1 and Fig. 2, the turning vane 32 can be rotated around an axis R from the position shown in Fig. 1 to the position shown in Fig. 2. As a result, the air flow opening 34 is considerably increased and so is the top gate 30. The turning vane 32 is connected to an actuator 36 through an articulated arms device 38. At high levels of power consumptions, the top gate 30 is adjusted to maintain the air flow opening 34 at a maximum size.

[0017] As indicated in Fig. 3, the actuator 36 is controlled by a control unit 40 in a control device 42. The control unit 40 is operatively connected to a power measuring unit 44. The power measuring unit 44 is arranged to continuously measure the power supplied to the heating device 12. When the heating device 12 is not present or not activated, the power measuring unit 44 will provide a signal corresponding to a zero supply level to the control unit 40. As soon as the heating device 12 is switched on, the power measuring unit 44 will provide a power supply signal corresponding to the presently power supply level to the control unit 40. The control unit 40 will provide a control signal to the actuator 36 to move the articulated arms device 38 to rotate the turning vane 32 correspondingly. The rotation of the turning vane 32 will adjust the top gate 30 for adjusting the air flow opening 34 in dependence of the measured power consumption of the heating device 12. In various embodiments, the actuator 36 and/or the articulated arms device 38 comprise position detectors 48 providing a feedback signal indicative of the position of the actuator 36 and/or the articulated arms device 38.

[0018] In various embodiments, the rotation of the turning vane 32 will be initiated without delay after detecting power supply to the heating device 12. The control unit 40 can be arranged to adjust the air flow opening 34 in accordance with different modes. In one mode, the adjustment can be stepwise and depending on different threshold levels of power consumption. In various embodiments, adjustment is made in proportion to the actual power consumption to achieve good compensation for the increased air pressure caused by the heating of the heating device 12. Preferably, an increased air flow opening will be maintained for a time period after receiving a signal indicative of lowered or stopped power consumption in heating device 12, so as to allow excess air to be removed from the work chamber 13 without causing undesired situations.

[0019] In the embodiment of the control device 42 shown in Fig. 3, the power measuring unit 44 is connected to the control unit 40 and an output signal is produced. In various embodiments, the heating plate 12 is connected to a power outlet 46 in the fume hood specifically designed to allow measuring of the power consumption. In such embodiments, the power measuring unit 44 can be connected to the power outlet 46 to measure the actual

power that is output to the heating plate 12. The control unit 40 evaluates the output signal from the power measuring unit 44 and sends a control signal to the actuator 36 based on the present level of power consumption. The actuator 36 receives the control signal and starts a movement of the articulated arms device 38 on the basis of the control signal.

[0020] 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 remotely controlled device. Those skilled in the art will readily recognize various modifications and changes that may be made to the present invention without following the example embodiments and applications illustrated and described herein, and without departing from the scope of the present disclosure.

Claims

1. A fume hood (10) with an open front section and 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 hood (10) further comprising
an evacuation channel (29) between the work chamber (13) and the exhaust opening (22),
a top gate (30) for automatically changing an air flow opening (34) at an upper section of the work chamber (13);
a to measure power consumption of electrically powered units (12) of the fume hood (10);
an actuator (36) arranged to adjust the top gate (30);
a control unit (40) operatively connected to the power measuring device (44) for receiving an input signal indicative of the power consumption, and to the actuator (36) for adjusting the air flow opening (34) in dependence of the measured power consumption and increasing the air flow opening (34) at an increased power consumption level.

2. The fume hood as claimed in claim 1, further comprising a turning vane (32) connected to and controlled by the actuator (36) to be moved for adjusting the top gate (30).

3. The fume hood as claimed in claim 2, further comprising an articulated arms device (38) arranged between said actuator (36) and said turning vane (32), so as to rotate said turning vane (32) between a closed position in which the air flow opening (34) is of a minimal size, and an open position in which the air flow opening (34) is of a maximum size.

4. The fume hood as claimed in claim 1, further comprising a power outlet (46) for connection of electrically powered units (12), wherein said power measuring device (44) is connected said power outlet (46).

5. The fume hood as claimed in claim 1, further comprising an inner rear wall (26) enclosing together with the back side section (14) the evacuation channel (29) between the work chamber (13) and the exhaust opening (22).

6. The fume hood as claimed in claim 2, further comprising at least one position detector (48) providing a feedback signal indicative of the position of the turning vane (32).

7. The fume hood as claimed in claim 6, wherein the position detector (48) is connected to the actuator (36) and/or an articulated arms device (38).

8. The fume hood as claimed in claim 1, wherein the position detector (48) is connected to the control unit (40).

9. A method for operating a fume hood (10), comprising an open front section and 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 method comprising
evacuation of air through an evacuation channel (29) between the work chamber (13) and the exhaust opening (22);
measuring power consumption of electrically powered units (12) of the fume hood (10);
increasing a size of an air flow opening (34) at an upper section of the work chamber (13) at an increased level of power consumption; and
evacuation of an increased amount of air through the air flow opening (34) to said exhaust opening (22) at an increased level of power consumption.

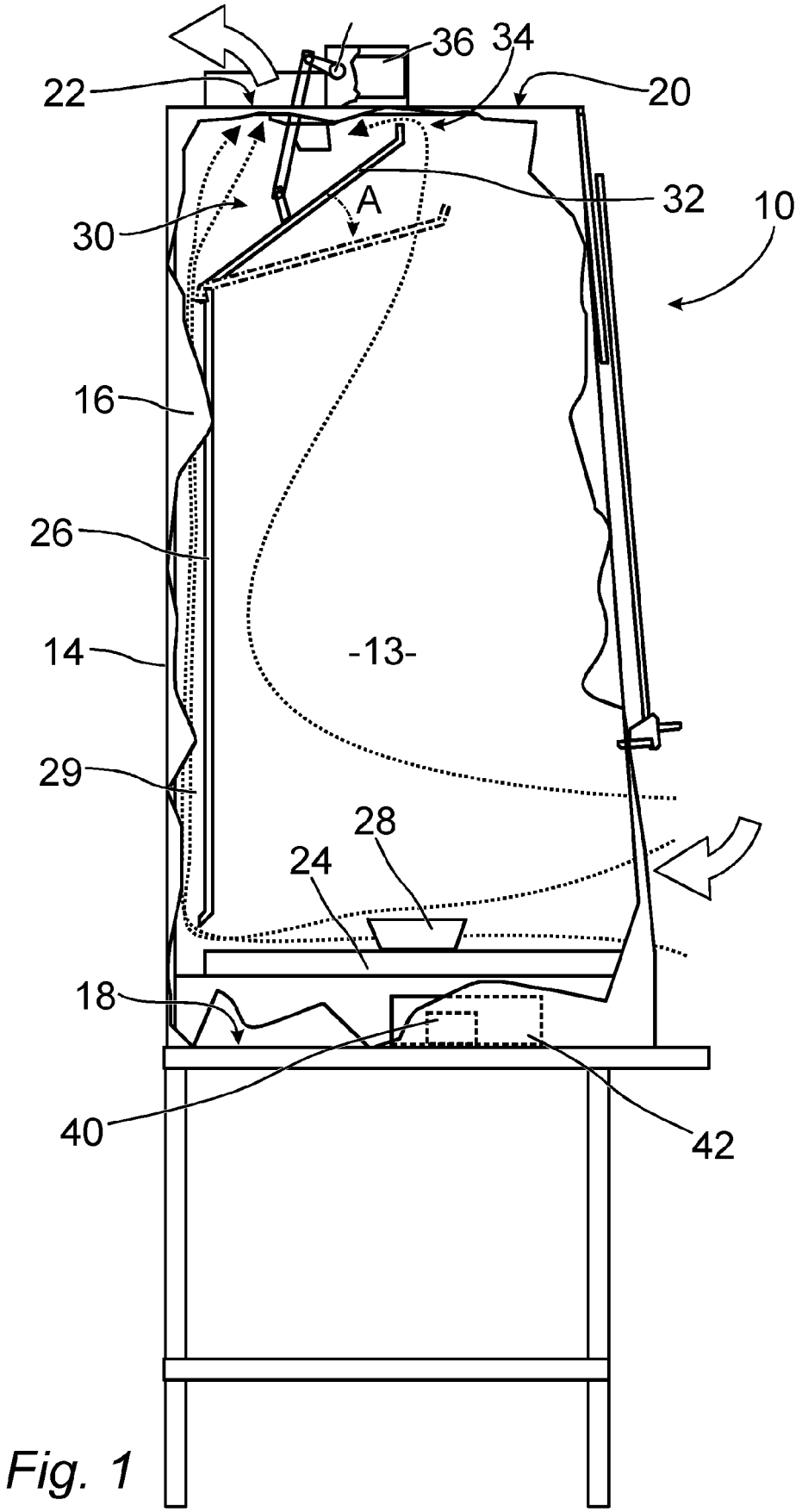
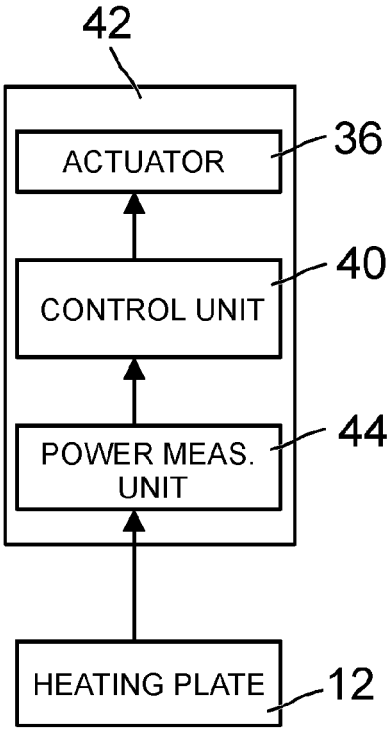


Fig. 1


42
ACTUATOR
36
CONTROL UNIT
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POWER MEAS. UNIT
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HEATING PLATE
12

Fig. 3

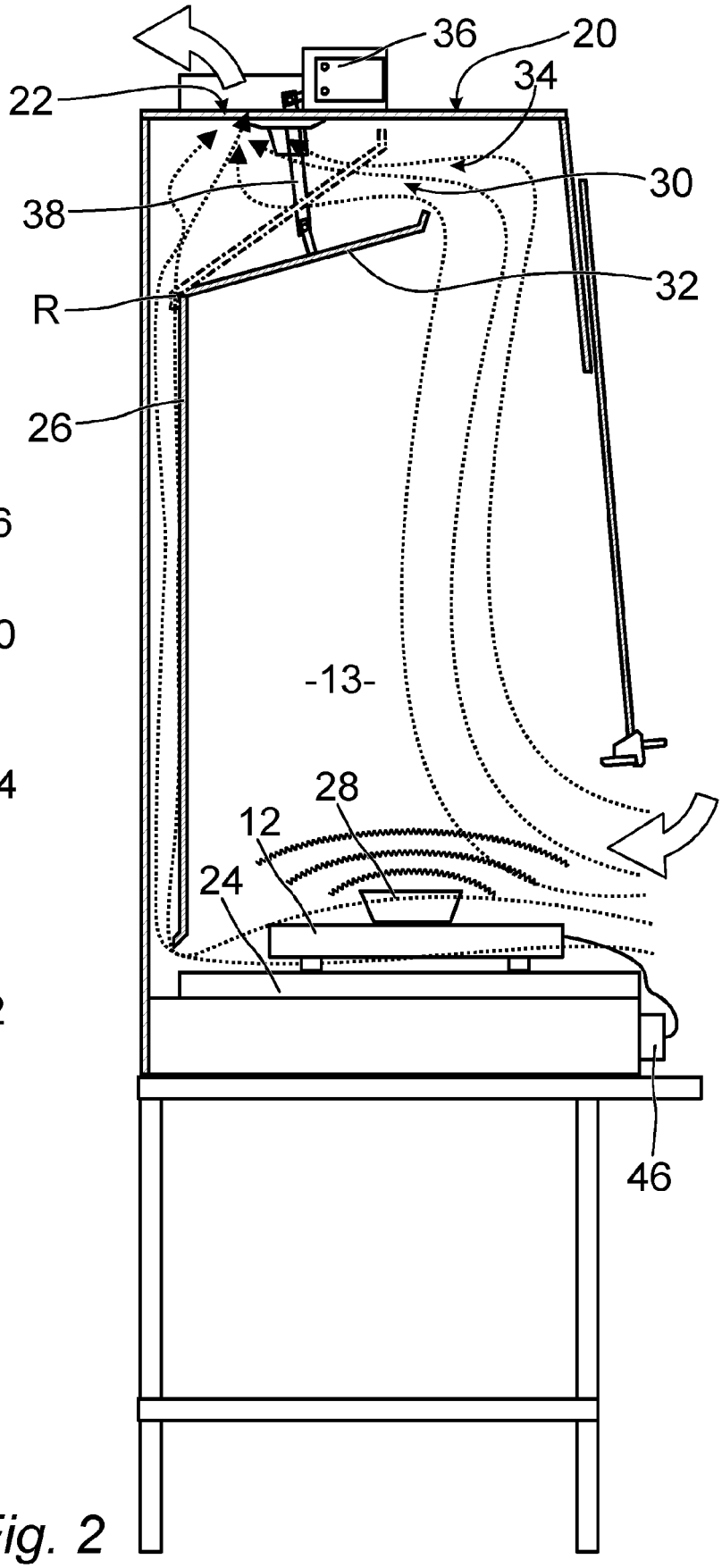
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Fig. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 20 16 5536

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 4 741 257 A (WIGGIN MERLON E [US] ET AL) 3 May 1988 (1988-05-03) * abstract; figure 1 * * column 2, line 50 - column 3, line 41 *	1-9	INV. B08B15/02
A	US 2007/062513 A1 (GAGAS JOHN M [US]) 22 March 2007 (2007-03-22) * abstract *; figures 1,5 * * paragraphs [0067], [0094], [0099]; claims 1,16,17 *	1-9	

TECHNICAL FIELDS SEARCHED (IPC)

B08B
F24C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	2 November 2020	Plontz, Nicolas

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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02-11-2020

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82