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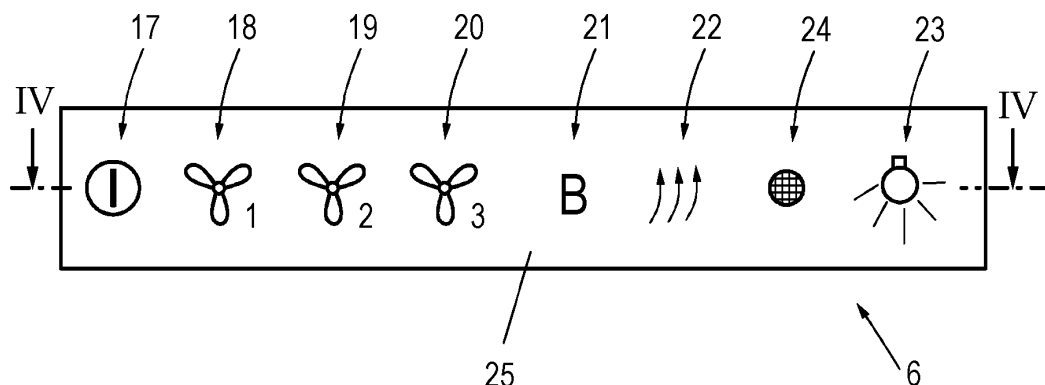
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(54) **VENTILATION DEVICE, ESPECIALLY DOWNDRAFT HOOD, AND METHOD FOR OPERATING A VENTILATION DEVICE**

(57) Ventilation device, especially downdraft hood, for a cooking hob (2), comprising an actuator (3) for moving a telescoping section (5) of the ventilation device (1) between a fully retracted position (9) and a fully extended position (10) and a control unit (7) designed to control the actuator (3) to move the telescoping section (5) depending on a user input received via a main input element (17), wherein the control unit (7) is designed to control a fan (8) and/or an illumination device (31) for illuminating

the cooking hob (2) depending on a user input received via at least one secondary input element (18 - 23) and depending on the position of the telescoping section (5) and/or in that the control unit (7) is designed to evaluate at least one error condition and to control a respective backlight (30) for illuminating the respective secondary input element (18 - 23) depending on the fulfilment of the error condition.

**FIG. 3**



## Description

**[0001]** The invention concerns a ventilation device, especially a downdraft hood for a cooking hob, comprising an actuator for moving a telescoping section of the ventilation device between a fully retracted position and a fully extended position and a control unit designed to control the actuator to move the telescoping section depending on a user input received via a main input element. Additionally, the invention concerns a method for operating a ventilation device.

**[0002]** Exhaust hoods that ventilate a cooking area are a common feature used in conjunction with cooking hobs. Since typical exhaust hoods can limit the access to the cooking hob, downdraft hoods are increasingly used that create a downward air stream to pull fumes from the area of the cooking hob. For design reasons and to allow for less usage of kitchen space when such a downdraft hood is not used, a vent for pulling in fumes from the cooking hob can be installed on a telescoping section of the ventilation device that can completely or at least largely retract into the cooking hob itself or when the ventilation device is configured as a separate device into a workbench in the proximity of the hob. When the ventilation device is switched on, the telescoping section can be moved into an extended position and a fan can be activated.

**[0003]** The extension of the telescoping section can e.g. be blocked by obstacles. It is known to stop the extraction movement in midway if this is the case. When the ventilation device is operated in a non-optimal position of the telescoping section or when other issues lead to a non-optimal operation for extended amounts of time the life span of the ventilation device, especially of the electric system of the ventilation device can be reduced.

**[0004]** The object of the present invention is therefore to improve such a ventilation device and to especially increase the life span of the device.

**[0005]** The object is solved by a ventilation device as initially discussed, wherein the control unit is designed to control a fan and/or an illumination device for illuminating the cooking hob depending on a user input received via at least one secondary input element and depending on the position of the telescoping section and/or wherein the control unit is designed to evaluate at least one error condition and to control a respective backlight for illuminating the respective secondary input element depending on the fulfilment of the error condition.

**[0006]** It was recognized that an operation of an illumination device and/or a fan in certain positions of the telescoping section can be disadvantageous and that a user might not be aware of this fact and therefore try to operate the fan and/or the illumination device in these positions. By taking the position of the telescoping section into account when controlling the fan and/or the illumination device due to a user input, this problem can be alleviated. It is especially possible to only allow for an operation of the fan or the selection of a certain fan speed and/or an

operation of the illumination device at certain positions of the telescoping section, especially only in the fully extended position.

**[0007]** It was also recognized that the life span of a ventilation device can be reduced when a user tries to operate the device when certain error conditions apply, e.g. when there is a problem with the supplied current, when filters are not correctly inserted, when the telescoping section is blocked by an object, etc. In many cases the user is not aware that such an operation might be a problem. It is therefore highly relevant to communicate the fulfilment of an error condition and therefore the existence of a problem for the operation of the ventilation device to a user. At the same time, an increase of cost and complexity of the ventilation device should be avoided. It was recognized, that it is therefore advantageous to use the backlight of at least one secondary input element to communicate the fulfilment of the error condition. Such backlights are often present anyway and can e.g. normally light up in a first colour, e.g. white, when an error condition of a certain level has been detected, and in a second color, e.g. red, when another level of error condition has been detected. By controlling these backlights in a specific way, e.g. by using a certain colour for the backlight or preferably by flashing the backlight, the fulfilment of the error condition can be communicated to the user without the need for additional output devices.

**[0008]** The ventilation device can be a separate appliance from the cooking hob. It can be mounted in close proximity to the cooking hob to allow for a good ventilation of the area of the cooking hob. The telescoping section can preferably move vertically from the fully retracted position to the fully extended position. In the fully retracted position, the upper edge of the telescoping section can e.g. be flush with the upper edge of the cooking hob or a workbench. Alternatively, the upper edge can be in close proximity to the surface and e.g. extend by a few cm above this surface. In the fully extended position, an opening of the telescoping section that feeds a vent channel of the ventilation device can be arranged in a certain height above the surface, e.g. at least 20 cm or at least 30 cm above the surface to ensure a sufficient draft in the area of a top end of pots etc.

**[0009]** The secondary input elements can be essentially invisible for a user when the backlight is inactive. It is e.g. possible that only the main input element is visible when the ventilation device is switched off. A user interface can be formed as a flat panel, e.g. a flat glass surface. The main input element can be marked on the surface, e.g. by printing and/or etching. The positions of the secondary input elements can be established by e.g. installing a mask that is back lit by the backlight to display the respective markers when the backlight is switched on.

**[0010]** Preferably, the backlight of the respective secondary input device can be controlled to emit light of two colors, e.g. red light and white light. This can be achieved by using separate backlight element, e.g. LEDs, or by using a backlight with a color control, e.g. an RGB-LED.

The backlight can act as a power indicator. When the ventilation device is switched off or shutting down all of the backlights can be disabled. When the ventilation device is switched on or starting up the backlights can be active and active or selected secondary input elements can be marked by changing the color. E.g. non-active secondary input elements can be lit with a first color, e.g. white, and active secondary input elements can be lit with a second color, e.g. red.

**[0011]** The main input element can act as a power switch for the ventilation device. When the ventilation device is switched off all backlights can be switched off and/or the telescoping section can be moved in the fully retracted position. When the ventilation device is switched on all backlights can be activated and the telescoping section can be moved to the fully extended position. Once the fully extended position is reached, the fan can automatically be activated, preferably at a first, low speed. The operational state of the backlight of one of the secondary input elements can be changed, e.g. the color of the backlight can be changed, to indicate that this secondary input element and the associated fan speed is selected. The fan speed can then be changed by touching a different secondary input element.

**[0012]** The illumination device can be switched off by default even after switching on the ventilation device. It can be switched on by actuating a specific secondary input element. The state of operation of the backlight of this secondary input element can be switched depending on the operational state of the illumination device.

**[0013]** Switching on or off of the ventilation device can require a long pressing or touching of the main input element, e.g. to avoid an accidental activation or deactivation of the ventilation device. It is also possible to recognize short actuations of the main input element. These can e.g. temporarily switch off the fan and/or the illumination device while the telescoping section remains in the fully extended position.

**[0014]** The ventilation device can comprise a base, that can especially be mounted below a workbench or the cooking hob, and the telescoping section that can be vertically extended by an actuator. Close to the top of the telescoping section one or more openings can be provided that connect to a vent channel that extends downwards towards the base. At least one fan that can either be attached to the base or to the telescoping section can drive the ventilation by sucking air into the at least one opening of the telescoping section and outputting it at another position, preferably after filtering it. Typically, two different types of filters are used. Fat or oil in the air can be filtered by e.g. a wire mesh filter that can be regularly cleaned, e.g. once a week. Charcoal filters can be used to remove or reduce odor. This filter can e.g. be replaced every six months.

**[0015]** The control unit can be designed in such a way that a user input received via the respective secondary input element only triggers a change of an operational state of the fan and/or the illumination device when the

telescoping section is in the fully extended position. It was recognized that the current absorption of the driver of the fan can be sub-optimal when the telescoping section is not fully extended. The same driver is usually operating the illumination device. This can result in a malfunction and damage of the electric system. Such an accidental reduction of the life span by the user can be avoided when inputs to the secondary input elements are ignored or at least a requested change of operation is not performed when the telescoping section is not in the fully extended position.

**[0016]** The different operational states for the fan can e.g. be a switched off state and an operation at different speeds. An operational state of the fan can also be a state in which the fan is operated at a certain speed or certain pattern of speeds for a given time interval. It is e.g. possible that one of the secondary input elements activates a boost mode, in which the fan is operated at a high speed for a given amount of time, e.g. for five or ten minutes. It is also possible that a secondary input element activates a state in which the fan is operated for an extended time, e.g. one hour, at a relatively low speed. This is also called breeze mode. Other secondary input elements can be used to select different predetermined fan speeds.

**[0017]** The illumination device can be switched between two operational states, namely an on state and an off state. It is also possible, that additional operational states are available, e.g. different intensity states or states in which an illumination with different colors is performed.

**[0018]** As already discussed, a change of an operational state of the fan and/or an illumination device can be indicated by a change of the operational state of an associated backlight. When the change of the operational state of the fan and/or the illumination device is blocked due to the telescoping section not being in the fully extended position, the backlights can stay in their previous configuration or a certain lighting pattern can indicate, that the requested functionality is currently not available.

**[0019]** Inputs on the main input element should at least be processed when the telescoping section is in the fully retracted and the fully extended position to allow for a switching between these positions or between the on and off state as discussed above. Preferably, an actuation of the main input element during the movement of the telescoping section from the fully retracted position to the fully extended position or vice versa can pause this movement. This can be useful, e.g. when a user recognizes that the movement might be blocked and therefore intends to manually pause the movement. Once the movement is paused, another actuation of the main input element can restart the paused movement.

**[0020]** It is also possible that a different actuation, e.g. a long touching or pressing of the main input element, can reverse the movement direction. E.g. a long press during a pause while the telescoping section moves towards the fully extended position can move the telescop-

ing section to the fully retracted position and switch off the ventilation device. To indicate that the ventilation device is shutting down the backlights of the secondary input elements can be deactivated. On the other hand a long press during a pause while the telescoping section is moving from the fully extended position towards the fully retracted position can reactivate the ventilation device, therefore moving the telescoping section to the fully extended position and optionally reactivating the fan and/or the illumination device and/or the backlights for the secondary input elements.

**[0021]** A respective secondary input element can be used to select one of multiple fan speeds and/or modes of operation for the fan and/or to switch the illumination device on and off. The ventilation device can e.g. comprise three secondary input elements that are assigned to different fan speeds. By actuating one of these secondary input elements the user can select the associated fan speed. As previously discussed, additional secondary input elements can trigger operational states of the fan in which the fan is operated with a given speed or speed pattern for a given amount of time. This can e.g. be the previously discussed boost or breeze mode.

**[0022]** The illumination device is preferably controlled by a single secondary input element. Each actuation of this secondary input element can switch the illumination device on, if it was off, and vice versa.

**[0023]** The user interface of the ventilation device can comprise additional indicators and/or input elements. E.g. a backlit input element can be provided wherein an active backlight can indicate a filter alarm and the input element can e.g. be used to disable or reset this alarm. Inputs on the additional input element can also be ignored when the telescoping section is not in the fully extended position.

**[0024]** The control device can be designed to control the backlight of at least one of the secondary input elements in such a way that it flashes repeatedly when the error condition is fulfilled. In other words, the control device can switch the operational state of the backlight repeatedly when the error condition is fulfilled. Preferably, the backlight can be switched on and off repeatedly. It is also possible to switch the color of the backlight between two or more colors repeatedly. A lighting pattern that changes over time is especially recognizable for a user and therefore clearly indicates that there is a problem.

**[0025]** The control device can be designed to control the backlights of multiple or all of the secondary input elements in such a way that they flash synchronously when the error condition is fulfilled. The use of multiple backlights that flash synchronously further improves the recognizability of the error condition by a user.

**[0026]** The control unit can be designed to evaluate two or more different error conditions and to control the respective backlight for illuminating the respective secondary input element depending on which of the error conditions is fulfilled. Preferably, each of the backlights can illuminate the respective secondary input element in

at least two different colors, e.g. white and red, wherein the control unit is designed to control the backlight or backlights to flash in a selected color, when at least one of the error conditions is fulfilled, wherein the selected color depends on which of the different error conditions is fulfilled. It is e.g. possible to indicate a critical error by a red flashing of the backlights and a less critical error by a white flashing of the backlights etc.

**[0027]** The error condition or one of the error conditions can be fulfilled when a telescoping section is stopped in a position between the fully extended and the fully retracted position, especially when this stop is not caused by user input, and/or when an error concerning a supplied electrical current is detected and/or when an obstacle is detected and/or when a service opening of the ventilation device is not closed correctly and/or when a filter is not inserted correctly and/or when a hardware error is detected.

**[0028]** The discussed errors can be detected by a multitude of sensors. The provided current can e.g. be monitored by at least one volt meter or ampere meter of the ventilation device or an information concerning the current quality can be provided by a driving circuit for driving the fan, the actuator and/or the illumination device.

**[0029]** A detected obstacle can especially be an obstacle that can hinder the extension or retraction of the telescoping section. Obstacles can be detected by sensors, e.g. ultrasound sensors, or by the fact that they block or hinder a retraction or extension of the telescoping section. E.g. a blocking obstacle can be recognized by monitoring the current drawn by the actuator. Advantageously, relatively simple and thus preferably cheap sensors can be used, for example selected from the group comprising contacts, which may close when the drawer hits an obstacle.

**[0030]** The state of service openings of the ventilation device and/or the incorrect insertion of a filter can be checked by sensors. Relatively simple sensors, e.g. contacts that close when the filter or the service door is in a correct position, can be used.

**[0031]** Hardware errors can be recognized during a self-check. It can also be an indication of a hardware error when the control unit provides a control signal to command the actuator to move the telescoping section and no movement is detected and/or the current draw of the actuator does not correspond to the expected current draw.

**[0032]** As previously discussed, the fulfilment of different error conditions can be displayed to the user in different ways, especially by using a different color of the flashing backlights. The previously discussed conditions can be grouped. Especially critical errors or errors that hinder the movement of the telescoping section can be indicated by a flashing first color and other errors, that do not hinder the movement of the telescoping section, e.g. an incorrect state of a filter drawer or a different service opening, can be indicated by a different flashing color.

**[0033]** When the stopping of the telescoping section is

caused by a blockade of the movement or when an obstacle is detected that hinders the movement, the movement can be stopped and it can be tried several times, e.g. three times with a pause of e.g. two or three seconds, to repeat the movement. If the movement is not possible after repeated tries the error condition can be fulfilled. In such case a partial movement in opposite direction (e.g. some seconds or some centimeters) may be executed to allow removal of such obstacle.

**[0034]** Besides the discussed ventilation device the invention also concerns a method for operating a ventilation device, especially a downdraft hood, for a cooking hob, wherein the ventilation device comprises an actuator for moving a telescoping section of the ventilation device between a fully retracted position and a fully extended position and a control unit designed to control the actuator to move the telescoping section depending on a user input received via a main input element. The control unit controls a fan and/or an illumination device for illuminating the cooking hob depending on a user input received via at least one secondary input element and depending on the position of the telescoping section and/or the control unit evaluates at least one error condition and controls a respective backlight for illuminating the respective secondary input element depending on the fulfilment of the error condition.

**[0035]** Features discussed with respect to the inventive ventilation device can be also be added to the inventive method and vice versa.

**[0036]** The above and further aspects, features and advantages of the present invention will be further discussed with respect to the following embodiments of the present invention and the accompanying drawings which show schematically:

- |               |                                                                                                        |
|---------------|--------------------------------------------------------------------------------------------------------|
| Figs. 1 and 2 | an embodiment of the ventilation device according to the present invention in two states of operation, |
| Figs. 3 and 4 | detailed views of the user interface of the ventilation device shown in figs. 1 and 2, and             |
| Fig. 5        | a flowchart of an embodiment of the method according to the present invention.                         |

**[0037]** Figs. 1 and 2 show two operational states of a ventilation device 1 that is integrated into a work bench 12 comprising a cooking hob 2. In fig. 1 the ventilation device is not in use and a telescoping section 5 is in a fully retracted position. When a user actuates a user interface 6, that will be discussed in more detail with reference to fig. 3 and 4 later, a control unit 7 of the ventilation device controls an actuator 3 to move the telescoping section 5 into a fully extended position 10 shown in fig. 2. To move the telescoping section 5 an actuator 3, e.g. an electrical motor, interacts with a moving mechanism 4 that is implemented as a telescoping rod in the example shown in figs. 1 and 2. Obviously other moving mechanisms could also be used, e.g. the use of a fixed cograil on the base 11 of the ventilation device 1 and a cog attached to a motor that is attached to the telescoping section 5.

**[0038]** In the fully extended position 10 shown in fig. 2 the ventilation device 1 acts as a downdraft hood. Fumes that can e.g. originate from pans or cooking pots on the cooking hob 2 can be drawn into an opening 13 of the telescoping section 5 that feeds into a vent channel 14 and pulled downwards by a fan 8 when the fan 8 is active. The air is then ejected through two filters 15, 16, wherein the filter 15 can be a fat filter and the filter 16 can be a charcoal filter. The arrangement of the fan 8 and the filters 15, 16 is purely exemplary. The filter can in other embodiments not be attached to the base 10 but to the telescoping section 5. The filters can be arranged on either side of the fan 8. It might e.g. be advantageous to place the filter 15 upstream from the fan 8 to avoid a deposition of fat on the fan 8.

**[0039]** The interaction of a user with the ventilation device 1 will now be described with additional reference to figs. 3 and 4 that show an exemplary design of the user interface 6. Fig. 3 shows a view of the user interface 6 from the top and fig. 4 shows a cut along the line IV-IV in fig. 3.

**[0040]** The user interface provide a main input element 17 that is used to trigger a movement of the telescoping section between the fully retracted position 9 and the fully extended position 10 and vice versa. The main input element 17 can especially be an on/off-switch. The user interface 6 also comprises multiple secondary input elements 18 - 23 that allow a user to control the fan 8 and an illumination device 31 for illuminating the cooking hob 2. Optionally there can be an additional input element 24, that can e.g. allow to acknowledge or reset warnings concerning the filters 15, 16, e.g. a warning that indicates that one of the filters 15, 16 should be switched or cleaned.

**[0041]** As shown in fig. 4 the surface of the user interface 6 can be formed by a transparent plate 25, e.g. a glass plate. Touches in the areas of the main input element 17, the secondary input elements 18 - 23 and the additional input element 24 can be detected by respective sensors 26, 27, e.g. capacitive or inductive touch sensors. The use of such sensors 26, 27 to detect touches on a surface is well known in the prior art and will not be discussed in detail.

**[0042]** Of the icons shown in fig. 3 that mark the positions of the input elements 17 - 24 only the icon for the main input element 17 can be visible when the ventilation device 1 is switched off. This can e.g. be achieved by printing a marker 28 for the main input element 17 on top of the plate 25. The icons for the further input elements 18 - 24 can be defined by a mask 29 that is only a transparent in areas where lines of the respective icons should appear. By activating a respective backlight 30 the icons

and therefore the position of the secondary input elements 18 - 23 and the additional input element 24 can be shown.

**[0043]** When the ventilation device 1 is switched off the telescoping section 5 can be moved to the fully retracted position 9 and stay in this position. Optionally the back lights 30 can be deactivated. Therefore only the main input element 17 can be visible in the switch off state.

**[0044]** By actuating the main input element 17 a user can switch the ventilation device 1 on. In this case the control unit 7 can control the actuator 3 to move the telescoping section 5 to the fully extended position 10. To indicate to a user that the ventilation device 1 was switched on at least some of the backlights 30, especially the backlights of all secondary input elements 18 - 23, can be switched on. It is possible, that the backlights 30 can be switched between different colors, e.g. by using multiple colored LEDs or by providing an RGB-LED. During start up e.g. all secondary input elements 18 - 23 can have a white backlight.

**[0045]** Once the fully extended position 10 shown in fig. 2 is reached the fan 8 can automatically be switched on, e.g. with a first speed associated with the secondary input element 18. By actuating the secondary input elements 18, 19, 20 a user can select a fan speed. By select the secondary input element 21 a user can select a high fan speed for fixed amount of time, e.g. for two or five minutes. Actuating the secondary input element 22 an operational state of the fan 8 is selected wherein the fan is driven at a relatively low speed for an extended amount of time, e.g. one hour. By actuating a secondary input element 23 the user can switch the illumination device 31 on or off.

**[0046]** A selected fan speed or operation mode or state of the illumination device 31 can be indicated by switching the operational state, especially the color, of the backlight 30 associated with the respect secondary input element 18 - 23.

**[0047]** The discussed secondary input elements 18 - 23 are purely exemplary. It would also be possible to use a different set of secondary input elements to control the fan 8 and/or the illumination device 31. E.g. individual discussed secondary input elements could not be present or there could be additional secondary input elements to provide a selection of more fan speeds, more fan operating modes or different states of the illumination device 31, e.g. to select different intensities or colors of the lighting.

**[0048]** To avoid a reduction of life span of the ventilation device 1 it is advantageous to only operate the fan 8 and/or the illumination device 31 in selected positions of the telescoping section 5, especially only in the fully extended position 10. An operation in different positions might reduce the life span of the ventilation device 1. Therefore the control unit 7 is designed to control the fan and the illumination device 31 depending not only on a user input received via the secondary input elements 18

- 23, but also depending on the position of the telescoping section. Preferably a user input received via the secondary input elements 18 - 23 only triggers a change of an operational state of the fan 8 and the illumination device 31 when the telescoping section 5 is in the fully extended position 10.

**[0049]** The control unit 7 is also designed to recognize several error conditions and to communicate the presence of these error conditions to a user. When certain error conditions are fulfilled the control unit 7 can change the operating state of at least one of the back lights 30. Preferably some or all of the back lights of the secondary input elements 18 - 23 can flash repeatedly and synchronously when certain error conditions are detected. As previously discussed the back lights 30 can be able to illuminate the plate 25 in at least two colors. It is therefore possible, to communicate a less critical error, that might e.g. concern the closing of a service opening of the ventilation device 1 or an incorrect placement of the filters 15, 16, by repeatedly flashing the back lights 30 in a first color, e.g. white. Errors that are more critical and that e.g. prohibit a movement of the telescoping section 5 might be communicated by flashing the back lights 30 in a second color, e.g. red. Such an error condition might be fulfilled when it is recognized, e.g. from a current provided to the actuator 3 or via a position sensor, that the movement of the telescoping section 5 did stop without this stoppage being triggered by a user input or by the control unit 7. Such a stoppage might e.g. be caused by a hardware defect or by the blocking of the movement by an object. It is also possible that the control unit 7 or other components of the ventilation device 1 are able to recognize errors concerning a provided current and/or hardware errors. Multiple approaches for monitoring the health of a device are well known in the prior art and will not be discussed in detail.

**[0050]** When a movement is blocked by an object it might also possible to just pause the movement for a short time and then retry to move the telescoping section 5. An error can only be indicated when a movement is still not possible after a given amount of retries. Additionally, in such error condition the movement may be executed in opposing direction, preferably for a predetermined distance and/or duration, e.g. for two seconds and/or two centimetres to free the object or obstacle, particularly if an error may be indicated when a movement is still not possible after a given amount of retries

**[0051]** The additional input element 24 and the associate back light 30 can be used to indicate a necessary servicing of the filters 15, 16 and to acknowledge or reset such a filter warning. The back light 30 illuminating the additional input element 24 can e.g. be always of when there is no filter warning pending. The control unit can monitor the time, the amount of uses of the ventilation device 1 or other parameters since the last servicing of the filter 15 and/or 16. Once a triggering condition is fulfilled, e.g. when the ventilation device 1 was operated for a given time, the back light 30 of the additional input el-

element 24 can be activated when the ventilation device 1 is switched on. It is also possible to block the operation of the ventilation device 1 until the filter warning is dismissed, e.g. by actuating the additional input element 24.

**[0052]** The ventilation device 1 might be able to recognize a switch of the filters 15, 16. It is however also possible that filter alerts are manually reset once a servicing is performed, e.g. by actuating the additional input element 24 for a given amount of time, e.g. two seconds. To provide a consistent user experience, it is possible that user inputs at the additional input element 24 are also ignored when the telescoping section 5 is not in the fully extended position 10.

**[0053]** The main input element 17 should be polled also when the telescoping section 5 is in the fully retracted position 9. Advantageously inputs via the main input element 17 can also be recognized while the actuator 3 is moving the telescoping section 5 between the positions 9, 10 and/or while the telescoping section 5 is resting in an intermediate position between the positions 9 and 10.

**[0054]** It is e.g. possible that an actuation of the main input element 17 during the movement of the telescoping section 5 temporally pauses this movement. This can be advantageous since a user might recognize that an obstacle might be in the way of further extending or retracting the telescoping section 5 and therefore pause the movement and remove the object. The movement can resume with a short touch of the input element 17. While the movement of the telescoping section 5 is stopped the main input element can also be actuated, e.g. by a longer touch that extends e.g. at least one second, to revert the movement direction.

**[0055]** Fig. 5 shows a flowchart concerning a method for operating the ventilation device 1. The flowchart only shows a few essential steps for reporting an error to a user and for controlling the fan 8 and the illumination device 31 of the ventilation device.

**[0056]** The method could obviously be extended with the features of the ventilation device that were already discussed with respect to figs. 1 to 4. For reasons of clarity only a limited set of features are shown and discussed.

**[0057]** In step S1 the control unit 7 determines parameters concerning the state of the ventilation device 1. It can e.g. determine the position of the telescoping section 5, that can e.g. be determined from a control history of the actuator 3 or via a separate sensor. Additionally, the quality of a provided current, an opening or closing state of a service door, the correct placement of the filters 15, 16, the presence of obstacles etc. can be monitored by respective sensors.

**[0058]** In step S2 the control unit determines if at least one of multiple error conditions is fulfilled. Error conditions that could be checked were already discussed above with respect to figs. 1 to 4.

**[0059]** If at least one of the error conditions is fulfilled the method branches to a step S3. In this step the control unit 7 controls the backlights 30 of all the secondary input

elements 18 - 23 to blink synchronously. As discussed above a color of the blinking can be chosen depending on which of the error conditions is fulfilled.

**[0060]** If none of the error conditions is fulfilled the control unit checks in the step S4, if any of the secondary input elements 18 - 23 were actuated, e.g. by reading out the outputs of the sensors 27. If none of the secondary input elements 18 to 23 were actuated the method returns to step S1.

**[0061]** In step S5 the control unit 7 determines from the position of the telescoping section determined in step S1 if the telescoping section 5 is in the fully extended position 10. If this is not the case, the input that was recognized in step S4 is discarded and the method returns to step S1.

**[0062]** If the position indicates that the telescoping section 5 is in the fully extended position 10 the control unit 7 outputs a control signal to control the fan 8 and/or the illumination device 31, depending on which of the secondary input elements 18 - 23 was actuated.

**[0063]** The steps S1 to S6 only concern the output of error signals and the processing of inputs received via the secondary input elements 18 - 23. Other parts of the control of the ventilation device, especially concerning the control of the actuator 3 in dependence of user inputs via the main input element 17 and concerning the additional input element 24 can be performed as discussed above in the context of figs. 1 - 4.

#### List of reference numerals

##### [0064]

|    |                          |
|----|--------------------------|
| 1  | ventilation device       |
| 2  | cooking hob              |
| 3  | actuator                 |
| 4  | moving mechanism         |
| 5  | telescoping section      |
| 6  | user interface           |
| 7  | control unit             |
| 8  | fan                      |
| 9  | fully retracted position |
| 10 | fully extended position  |
| 11 | base                     |
| 12 | work bench               |
| 13 | opening                  |
| 14 | vent channel             |
| 15 | filter                   |
| 16 | filter                   |
| 17 | main input element       |
| 18 | secondary input element  |
| 19 | secondary input element  |
| 20 | secondary input element  |
| 21 | secondary input element  |
| 22 | secondary input element  |
| 23 | secondary input element  |
| 24 | input element            |
| 25 | plate                    |

26 sensor  
 27 sensor  
 28 marker  
 29 mask  
 30 back light  
 31 illumination device

S1 - S6 step

## Claims

1. Ventilation device, especially downdraft hood, for a cooking hob (2), comprising an actuator (3) for moving a telescoping section (5) of the ventilation device (1) between a fully retracted position (9) and a fully extended position (10) and a control unit (7) designed to control the actuator (3) to move the telescoping section (5) depending on a user input received via a main input element (17), **characterized in that** the control unit (7) is designed to control a fan (8) and/or an illumination device (31) for illuminating the cooking hob (2) depending on a user input received via at least one secondary input element (18 - 23) and depending on the position of the telescoping section (5) and/or **in that** the control unit (7) is designed to evaluate at least one error condition and to control a respective backlight (30) for illuminating the respective secondary input element (18 - 23) depending on the fulfilment of the error condition.
2. Ventilation device according to claim 1, **characterized in that** the control unit (7) is designed in such a way, that a user input received via the respective secondary input element (18 - 23) only triggers a change of an operational state of the fan (8) and/or the illumination device (31) when the telescoping section (5) is in the fully extended position (10).
3. Ventilation device according to claim 1 or 2, **characterized in that** a respective secondary input element (18 - 23) is used to select one of multiple fan speeds and/or modes of operation for the fan (8) and/or to switch the illumination device (31) on and off.
4. Ventilation device according to one of the preceding claims, **characterized in that** the control device (7) is designed to control the backlight (30) of at least one of the secondary input elements (18 - 23) in such a way that it flashes repeatedly when the error condition is fulfilled.
5. Ventilation device according to one of the preceding claims, **characterized in that** the control device (7) is designed to control the backlights (30) of multiple or all of the secondary input elements (18 - 23) in such a way that they flash synchronously when the

error condition is fulfilled.

6. Ventilation device according to one of the preceding claims, **characterized in that** the control unit (7) is designed to evaluate two or more different error conditions and to control the respective backlight (30) for illuminating the respective secondary input element (18 - 23) depending on which of the error conditions is fulfilled.
7. Ventilation device according to claim 6, **characterized in that** each of the backlights (30) can illuminate the respective secondary input element (18 - 23) in at least two different colors, wherein the control unit (7) is designed to control the backlight (30) or backlights (30) to flash in a selected color, when at least one of the error conditions is fulfilled, wherein the selected color depends on which of the different error conditions is fulfilled.
8. Ventilation device according to one of the preceding claims, **characterized in that** the error condition or one of the error conditions is fulfilled when the telescoping section (5) is stopped in a position between the fully extended and the fully retracted position and/or when an error concerning a supplied electrical current is detected and/or when an obstacle is detected and/or when a service opening of the ventilation device is not closed correctly and/or when a filter (15, 16) is not correctly inserted and/or when a hardware error is detected.
9. Method for operating a ventilation device, especially a downdraft hood, for a cooking hob (2), the ventilation device (1) comprising an actuator (3) for moving a telescoping section (5) of the ventilation device (1) between a fully retracted position (9) and a fully extended position (10) and a control unit (7) designed to control the actuator (3) to move the telescoping section (5) depending on a user input received via a main input element (17), **characterized in that** the control unit (7) controls a fan (8) and/or an illumination device (31) for illuminating the cooking hob (2) depending on a user input received via at least one secondary input element (18 - 23) and depending on the position of the telescoping section (5) and/or **in that** the control unit (7) evaluates at least one error condition and controls a respective backlight (30) for illuminating the respective secondary input element (18 - 23) depending on the fulfilment of the error condition.

FIG. 1

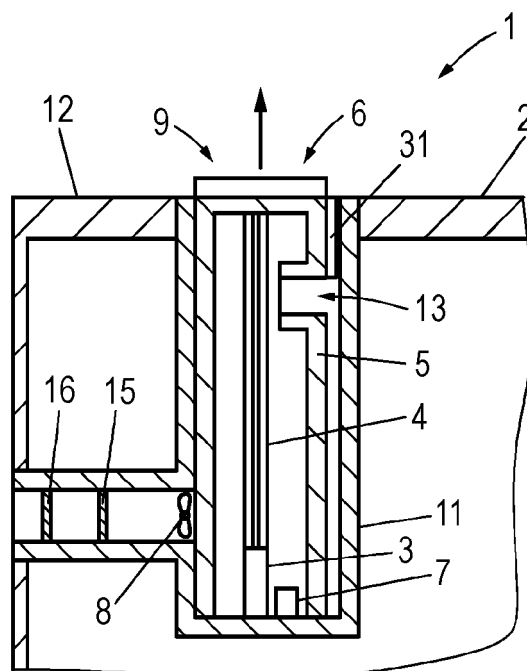


FIG. 2

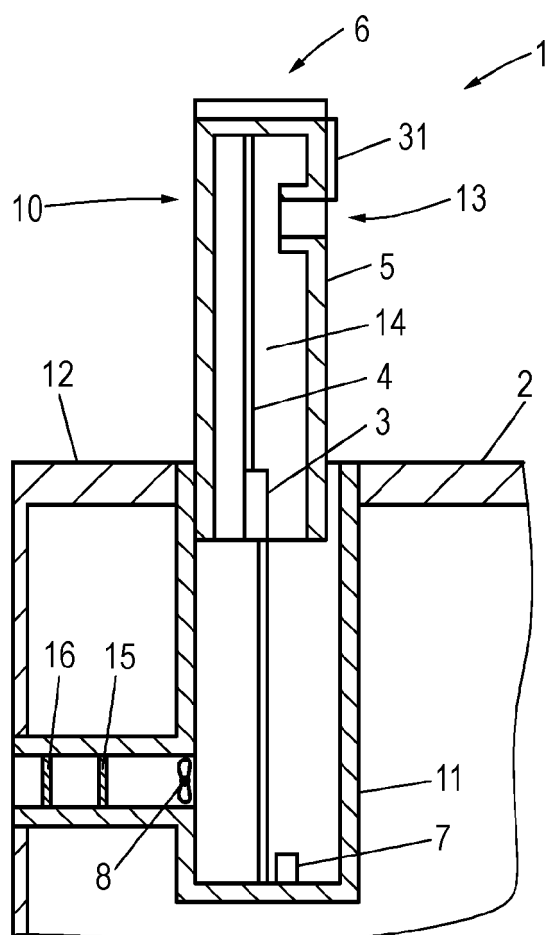


FIG. 3

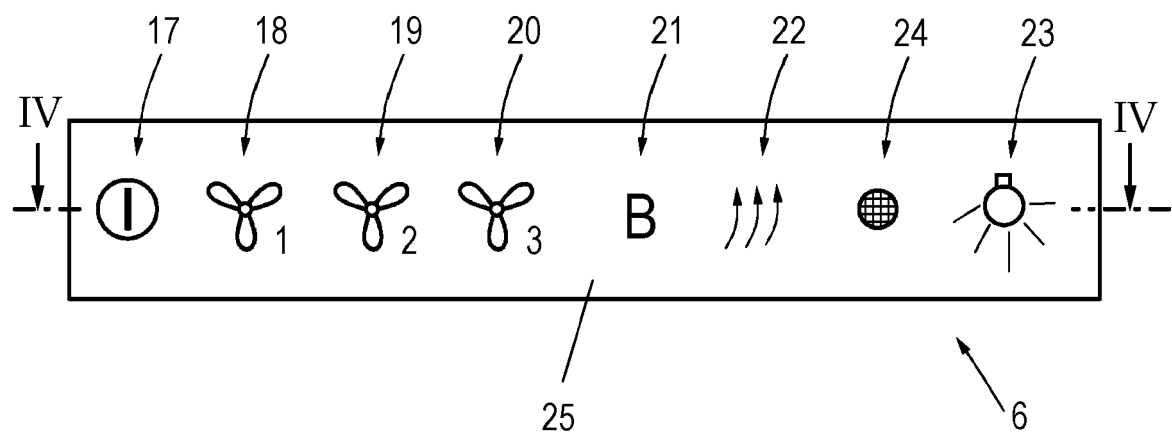


FIG. 4

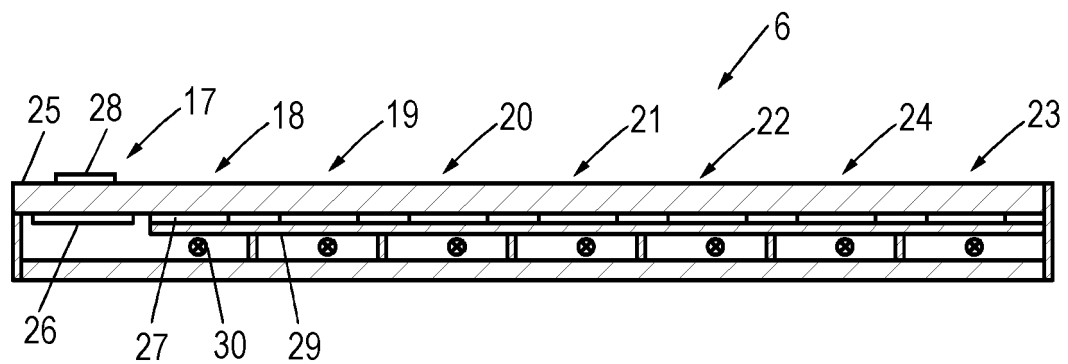
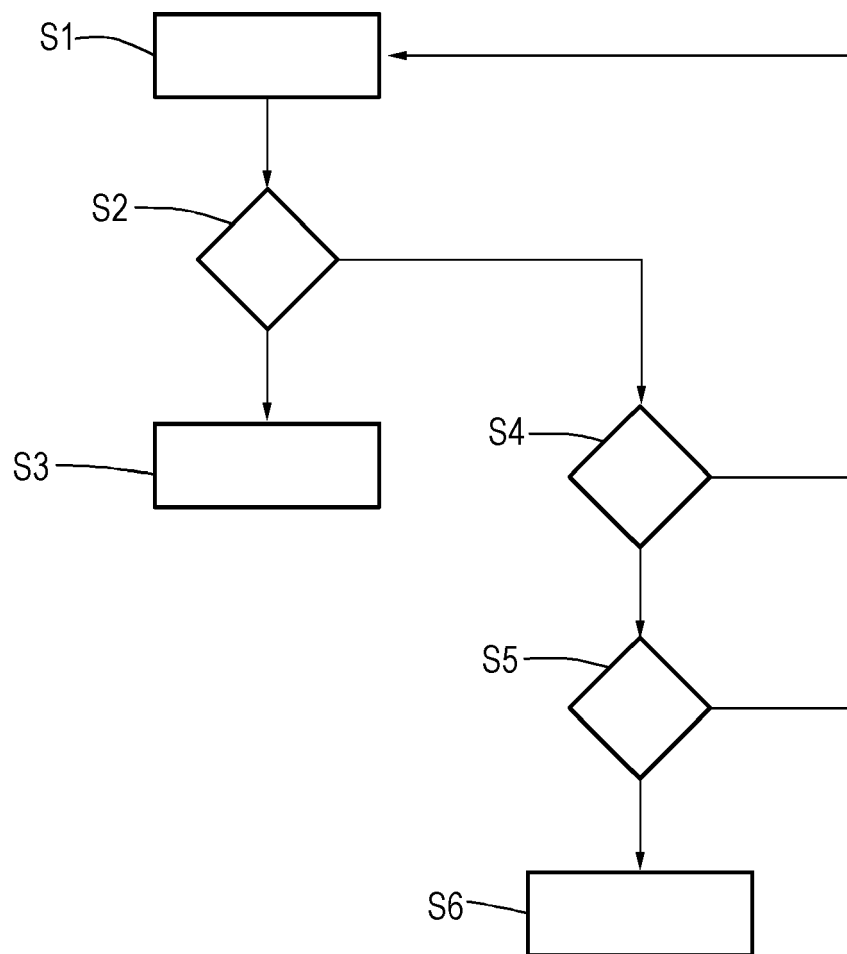


FIG. 5





## EUROPEAN SEARCH REPORT

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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                               |                                  |                                                |
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| <del>The present search report has been drawn up for all claims</del>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                               |                                  |                                                |
| Place of search                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                               | Date of completion of the search | Examiner                                       |
| The Hague                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                               | 13 October 2020                  | Adant, Vincent                                 |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document<br>T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding document |                                                                               |                                  |                                                |

EPO FORM 1503 03.82 (P04C01)



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**CLAIMS INCURRING FEES**

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

**LACK OF UNITY OF INVENTION**

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☒ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

4-8(completely); 1, 9(partially)

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

**LACK OF UNITY OF INVENTION  
SHEET B**

Application Number

EP 20 16 1363

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-3, 9(all partially)

Ventilation device with fan control

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2. claims: 1-3, 9(all partially)

Ventilation device with illumination device control

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3. claims: 4-8(completely); 1, 9(partially)

Ventilation device with evaluation of error condition

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
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