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(54) **COMBINATION APPLIANCE AND THE USE OF THE COMBINATION APPLIANCE**

(57) A combination appliance (1) comprising a cooking hob (2), which comprises at least one support surface (4) and at least one therein formed recess (11), and at least one extraction device (3), which is arranged below the support surface (4) of the cooking hob (2) and comprises at least one fan (15) for sucking air from the space above the cooking hob (2) through the recess (11) of the support surface (4), and at least one lid (20) for the recess (11), wherein: at least one control module (28), comprising at least one extraction control (18) that controls at

least one operation parameter of the extraction device (3), at least one hob control (6) that controls at least one operation parameter of the cooking hob (2), and at least one interface unit (29) that is at least connected to the extraction control (18) and to the hob control (6), and wherein the interface unit (29) is capable of sending signals to the extraction control (18), wherein the extraction control (18) is controlling the extraction device (3) in response to the signals received from the interface unit (29).

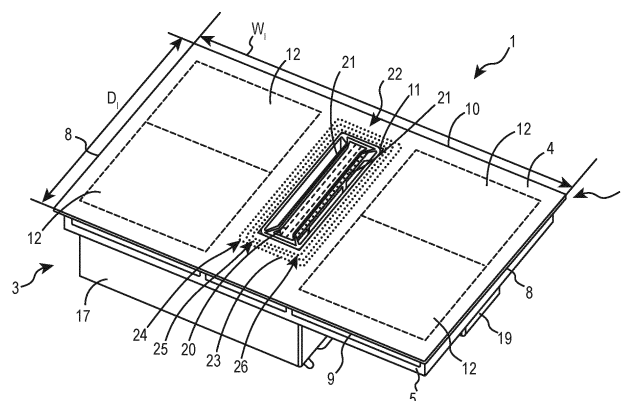


FIG. 1

## Description

**[0001]** The present invention relates to a combination appliance according to the preamble of claim 1. The present invention further relates to a use of the combination appliance according to the claim 15.

**[0002]** In household appliances there is a trend product, which combines a cooking hob unit with a suction hood to suck in air and cooking vapours downwards. These combination appliances usually have one hole in the support surface of the cooking hob and at least one fan for sucking the air above the cooking hob. Examples of such kind of appliances are disclosed in the document DE 20 2011 005 698 U1 or in the document EP 3 511 633 A2.

**[0003]** It is an object of the present invention to provide a combination appliance with an improved user friendliness and/or user convenience, especially the use of the extraction device in accordance with the cooking hob.

**[0004]** The object is achieved for a combination appliance according to the preamble of claim 1 by the features of the characterizing part of claim 1. Optional advantageous designs

of the invention result in part or completely from the dependent claims.

**[0005]** According to the present invention, the combination appliance comprises a cooking hob, which comprises at least one support surface and at least one therein formed recess, and at least one extraction device, which is arranged below the support surface of the cooking hob and comprises at least one fan for sucking air from the space above the cooking hob through the recess of the support surface, and at least one lid for the recess. This means that the combination appliance is a cooking hob with at least one integrated extraction device.

**[0006]** The support surface of the cooking hob is understood to be a carrier plate for cookware, for example pots or pans. Preferably the support surface is completely or partially made of glass ceramic.

**[0007]** The at least one recess, which is arranged in the support surface of the cooking hob, is understood as an opening in the support surface, which allows fluids, for example liquids and/or air, to pass through to the at least one extraction device.

**[0008]** The cooking hob comprises one or more heating zones, wherein each of the heating zones is provided with at least one heat transfer element, for example radiant heaters, induction coils or gas burners. Preferably, the cooking hob is a gas, an induction or a radiant cooking hob.

**[0009]** Furthermore, the combination appliance comprises at least one lid for the recess, wherein preferably the lid is partially or completely arranged or inserted in the recess. The lid is preferably flush mounted with the support surface. The lid is designed as a grid with fluid guiding means or designed as a cover to close the recess completely or only partially. The grid is understood as a cover with openings, wherein the openings are designed

to guide the fluids. Preferably, the cover can be made in one or more pieces.

**[0010]** The at least one extraction device is arranged beneath the support surface of the cooking hob, preferably beneath the entire cooking hob, wherein beneath is to be understood as the direction according to the usual build in direction of the combination appliance. Furthermore, the fan of the extraction device is capable of sucking the air above the support surface through the recess to the fan. The sucked in air will preferably stream through pipings and/or ductsystems and will be released through an opening or within the kitchen cabinet.

**[0011]** The inventive combination appliance is characterized by at least one control module. The control module comprises at least one extraction control that controls at least one operation parameter of the extraction device. Furthermore, the control module comprises at least one hob control that controls at least one operation parameter of the cooking hob. Furthermore, the control module comprises at least one interface unit that is at least connected to the extraction control and to the hob control, wherein the interface unit is capable of sending signals to the extraction control, wherein the extraction control is controlling the extraction device in response to the signals received from the interface unit.

**[0012]** This means that at least one of the operation parameters of the extraction device, preferably the rotational speed of the fan or the power level of the fan or the suction capacity of the fan, is controllable and/or controlled preferably based on at least one of the operation parameters of the cooking hob.

**[0013]** The operation parameters of the extraction device are for example configured as a selection and/or change of the fan and/or a fan power level and/or as a setting of a suction capacity and/or a rotational speed of the fan. This means that if the extraction device comprises more than one fan, preferably each fan can be selected separately, and this selection of the fans can be changed. Additionally or alternatively, the previous selection of the fans can be changed, wherein each fan can be changed individually. Additionally or alternatively the power level of each fan can be changed. If the extraction device comprises more than one fan the power level of the fans can be changed individually or the power level of all fans can be changed simultaneously. In other words, the power level of more than one fans can be changed individually or simultaneously, wherein simultaneously means increasing and/or decreasing the power level of each fan to the same power level or according to the previous power level of each fan increasing or decreasing the power levels at the same level. This means that changing the power level of the fans simultaneously can be either decreasing or increasing the power level of each fan one or more power levels higher or lower, so that the fans still have different power levels, or decreasing and/or increasing the power levels of each fan, so that the fans have the same power level. Additionally or alternatively the suction capacity of the one or more fans

can be adjusted. If the extraction device comprises more than one fan the suction capacity of each fan can be adjusted individually or simultaneously. Simultaneously means increasing and/or decreasing the suction capacity of each fan to the same suction capacity or according to the previous suction capacity of each fan increasing or decreasing the suction capacity with the same value, so that the fans still have a different suction capacity compared to each other. Additionally or alternatively the rotational speed of the fan, preferably of the fan wheel, can be adjusted. If the extraction device comprises more than one fan the rotational speed of each fan can be also adjusted individually or simultaneously. Simultaneously means increasing and/or decreasing the rotational speed of each fan to the same rotational speed or according to the previous rotational speed of each fan increasing or decreasing the rotational speed with the same value, so that the fans still have different rotational speeds.

**[0014]** The operation parameters of the cooking hob are for example configured as a selection and/or change of a heating zone and/or as a setting of a heat output and/or heat output density and/or power level of a heating zone. This means that each heating zone of the cooking hob can be selected and the selection of the heating zones can be changed. The heating zones of one cooking hob can be selected and/or changed individually or simultaneously. Simultaneously means that at least two heating zones can be selected at the same time and/or the selection of these at least two heating zones can be changed. The heat output and/or the heat output density and/or the power level of each heating zones can be adjusted individually or simultaneously. For example, the heat output and/or the heat output density and/or the power level of each heating zone can be adjusted separately. Additionally, the heat output and/or the heat output density and/or the power level of each heating zone can be adjusted simultaneously, wherein simultaneously is understood as increasing and/or decreasing the heat output and/or heat output density and/or the power level of each heating zone to the same heat output and/or heat output density and/or power level of each heating zone or increasing or decreasing the heat output and/or the heat output density and/or power level with the same value, so that the heating zones of the cooking hob still have different heat output and/or heat output density and/or power level.

**[0015]** Preferably the operation parameters of the extraction device and/or the cooking hob are selected from the group comprising the selection and/or change of the fan, regulation of the power level of the fan, the rotational speed of the fan, preferably the rotational speed of the fan wheel, the suction capacity of the fan, interval operations of the extraction device, the power level of the heating zones of the cooking hob, selection of a heating zone and/or changing of a heating zone of the cooking hob, heat output of the heating zones of the cooking hob, heat output density of the heating zones of the cooking hobs.

**[0016]** The interface unit is a communication device between the extraction control and hob control. The interface unit is particularly configured to communicate by means of a wireless and/or wiring connection with the extraction control and the hob control. This means that the interface unit is on the one hand connected with wire or wireless to the extraction control and on the other hand connected with wire or wireless to the hob control. The interface unit is preferably a data processing unit, wherein the data is processed and/or executed, operations are transformed, transmitted and/or stored. In other words, the interface unit preferably receives, transforms, stores, transmits and/or executes data. Furthermore, the interface unit is preferably integrated in and/or a part of the extraction control or in/of the hob control. This means that the interface unit is preferably arranged in the combination appliance. Alternatively, the interface unit may be arranged at an external device, for example an external server, preferably a part of a smart home system, such as Google Home®, Amazon Echo®, Apple Homepod® or the like, and/or a computer device and/or a mobile device, such as a tablet or mobile phone, detached from the combination appliance. In this case, the interface unit is configured to communicate by means of wireless connection to and from the extraction control and/or hob control.

**[0017]** In an advantageous embodiment the combination appliance comprises one or more measuring element and wherein the measuring element is capable of detecting at least one parameter value of the cooking hob and/or the extraction device, wherein the interface unit is capable of processing said parameter value. A measuring element is preferably a timer and/or a sensor, for example temperature sensor, humidity sensor, pot detection sensor, food sensor, RPM sensor, wherein RPM stands for revolutions per minute, photo-optical sensor, piezoelectric sensor, weight sensor, vibration sensor, ultrasonic sensor, water level sensor, and so on. The measuring element is connected to the control module of the combination appliance, preferably the interface unit and/or the extraction control and/or the hob control of the control module. For example, the control module, especially one component of the control module, preferably the interface unit or extraction control or hob control, will receive parameter values from one or more measuring elements. These said parameter values will be converted and/or processed by the interface unit in signals and transmitted to the extraction control. In response to said received signals of the interface unit the extraction control controls and, if necessary, adjusts at least one of the operation parameters of the extraction device, for example increasing or decreasing the power level of the fan or increasing or decreasing the speed of the fan or switching the fan on or off.

**[0018]** The at least one measuring element is part of the combination appliance, for example a part of the cooking hob or the extraction device, or is an element, which is arranged outside of the combination appliance

and wireless connected to the control module of the combination appliance, for example like a food sensor.

**[0019]** Preferably the parameter values of the measuring elements are selected from the group comprising the temperature, the heat output density of a heating zone, the detection of one or more pots, voltage, frequency, current, humidity value, time and/or flame-size.

**[0020]** Furthermore, a preferred embodiment of the inventive combination appliance is characterized in that at least one of the operation parameters of the extraction device, preferably the rotational speed of the fan or the power level of the fan or the suction capacity of the fan, is controlled based on at least one of the parameter values of the at least one measuring element, preferably the temperature and/or the heat output density of a heating zone and/or the detection of cookware and/or time. For example, the extraction control of the extraction device increases or decreases the power level of the fan in accordance to the measured temperature of the heating zone of the cooking hob and the detection of a cookware. In another example the extraction control of the extraction device activates the fan of the extraction device after a cookware has been detected on at least one of the heating zones of the cooking hob and the power level of the heating zone of the cooking hob has been set to a high level, wherein high level is understood as every heat output that is above the average heat output of the heating zone, for example power level 5 out of 9.

**[0021]** Further the setting of operation parameters of the extraction device is preferably also controlled based on the parameter value time. The time is understood as time related to the operation parameters of the cooking hob or related to the measuring elements. For example, time can be measured according to how long the power level or the heat output of the heating zone of the cooking hob has been switched on or has been activated and/or how long has the measuring element measured one of the parameter values. For example, the power level of the heating zone of the cooking hob was set to 9 out of 9 power levels. Therefore, the extraction control of the extraction device activates the at least one fan within seconds and/or minutes, for example to a power level of the fan 4 out of 4. There can be a time delay between heating a heating zone of the cooking hob and activating the fan of the extraction device or between cooling down a heating zone of the cooking hob and decreasing or deactivating the fan of the extraction device. For example, if the power level of the cooking hob is turned low or off, the power level of the fan will be decreased after a predetermined time, which is set by the interface unit, or after another parameter value is measured, for example with a humidity sensor or with a food sensor.

**[0022]** Additionally or alternatively the parameter values of a humidity sensor and/or a vibration sensor and/or a food sensor during a cooking process are measured. These measured parameter values, for example detection of cooking vapours and/or detection of boiling or simmering of the heated food products and/or liquids in the

cookware and/or detection of the temperature of the food products and/or liquids, are considered in controlling the fan of the extraction device. For example the fan of the extraction device will be activated as soon as the boiling or simmering of the food products and/or liquids, and/or cooking vapours and/or high temperatures in the food products and/or liquids are detected. High temperatures are understood as temperatures, that are causing cooking vapours, preferably 100°C and above.

**[0023]** In another preferred embodiment the interface unit comprises a storage for data, preferably reference data and/or user settings and/or default settings. This means that data, preferably default settings, preferably factory settings, is stored in the interface unit. Factory settings can preferably also include settings for cooking recipe and/or settings for food products, for example boiling water, cooking potatoes, frying a steak, etc. This means that the operation parameters of the cooking hob and the extraction device are being set and/or changed by the user only by choosing from cooking recipes or food products, that are stored in the storage of the interface unit.

**[0024]** Alternatively or in addition the received actual parameter values from the measuring elements and/or from the extraction device and/or from the cooking hob are compared to the stored data. Due to deviations of the actual received parameter values in comparison with the stored data, the information will be processed in a signal, that is being transmitted to the extraction control. This signal causes the extraction control to adjust at least one of the operation parameters of the extraction device according to the result of the comparison of the received actual values with the stored data. Preferably, factory settings are stored in the interface unit. A factory setting could be for example, if the power level of one heating zone is increased to its maximum, the power of the fan of the extraction device is turned on and increased over a predetermined time also to its maximum power level. This means that factory settings for often used use cases could be stored in the interface unit.

**[0025]** In another preferred embodiment the control module comprises an user interface, wherein the control module, preferably the interface unit and/or hob control and/or extraction control and/or the user interface, comprises at least one receiver unit, wherein the receiver unit is capable of receiving voice commands, especially from the user. This means that the input and/or commands from the user can be transmitted via voice and/or touch. The said user interface preferably is capable of controlling the extraction control and/or the hob control of the combination appliance. The connection between the user interface and the other elements of the control module of the combination appliance are wireless and/or with wiring. The receiver unit is preferably integrated in the control module of the combination appliance, for example integrated in the interface unit and/or extraction control and/or hob control and/or user interface, wherein the said receiver unit may alternatively or additionally be arranged

at an external device, for example an external server, preferably a part of a smart home system, such as Google Home®, Amazon Echo®, Apple Homepod® or the like, and/or a computer device and/or a mobile device, such as a tablet or mobile phone, which is detached from the combination appliance. Also the user interface may be arranged at an external device, for example a tablet or mobile phone.

**[0026]** The voice commands from the user are received, processed and transmitted to the extraction control, wherein the extraction control selects operation parameters, for example activating or deactivating the fan, or adjusts the operation parameters, for example increasing or decreasing the power level of the fan. Preferably the control module, especially the interface unit and/or the extraction control and/or the hob control, prioritizes the users input. This means that the user input will be executed directly without considering other collected information from measuring elements, or stored settings or alike. If the user wants the combination appliance to interact again automatically, a command has to be sent to the control module of the combination appliance. Preferably said command is entered for example via a touch button on the user interface, which would transmit this command to the interface unit of the combination appliance, and/or via a voice command, which the receiver unit receives and sends to the control module and/or the interface unit and/or the user interface and/or hob control and/or extraction control.

**[0027]** Preferably the user interface comprises an on/off selection element for activating or deactivating the automatic interaction between the components of the control module of the combination appliance, especially the interaction between the interface unit and the extraction device.

**[0028]** In another preferred embodiment user settings of the operation parameters related to the hob control and the extraction control may be saved in the storage of the interface unit. These settings can be saved and/or changed in the interface unit of the control module via touch or voice by the user. The user settings have preferably priority over the other collected, stored, compared and/or processed data and/or parameter values. This means that default settings and/or saved settings regarding the operation parameters of the extraction control may be adjusted by the user. The selections and/or changes of the operation parameters are preferably done by touching the corresponding tool, for example the user interface of the extraction device, or alternatively selecting and/or changing the operation parameters of the extraction device with the voice of the user. Therefore, all users can save their favorite use cases, so that their combination appliance is customized

**[0029]** In another preferred embodiment the control module of the combination appliance is coupled with at least one illumination device, wherein the illumination device comprises at least one or more light sources and wherein the illumination device is arranged in the area

of the recess. Thereby the illumination of the illumination device indicates the use of the extraction device. Therefore, the illumination device is coupled with the control module, preferably with the extraction control, of the combination appliance. The area of the recess is understood to be the surface of the support surface of the cooking hob from which air can be extracted during maximum fan operation. This means in other words, that the area of the recess comprises at least the area of the support surface between the outer lines of the heating zones of the cooking hob, the recess itself and/or the lid, which covers the recess. This means that the illumination device is arranged at a part of the combination appliance, so that the illumination of the illumination device is visible to the user. Preferably, at least one illumination device is arranged at the support surface and/or at the recess and/or at the lid of the combination appliance. The light sources of the illumination device are preferably light-emitting diodes (LEDs). Furthermore, each of the light sources of the illumination device are controllable. This means that the light parameters of each light source of the illumination device can be controlled independently of each other.

**[0030]** Preferably, the control module is capable of controlling at least one light parameter of each light source of the illumination device, preferably activating/deactivating the light source, light intensity and/or light color, as a function of time. This means that the control module of the combination appliance controls each light source of the illumination device. All the data, that is being received by the control module, preferably by the interface unit, especially the operation parameters from the extraction device and/or the cooking hob and/or the parameter values of one or more measuring elements, can indicate changing one or more light parameters of each light source of the illumination device over the time.

**[0031]** In another preferred embodiment one operation parameter of the extraction device, preferably the power level of the extraction device or the rotational speed of the fan, is indicated at the illumination device by changing one or more light parameters over time. This means that the control of the light sources of the illumination device is related to an operation parameter of the extraction device. For example if the power level of the fan or the rotational speed of the fan is increasing or decreasing, the light sources of the illumination device are changing the color and/or changing the light intensity, so that the light sources get brighter or darker, and/or the light sources are activated and deactivated. The light parameters of each light source can be changed individually or simultaneously. Simultaneously means that all light sources are changing the light parameters at the same time. For example, all light sources are switched on or increasing/decreasing the light intensity or changing the color at the same time. Individually means that all the light sources are controlled in a way, that at least partially the light parameters of the light sources differ from each other.

For example, moving lights could be visualized if the adjacent light sources change at least one light parameter during a specified time period. For example, the power level of the extraction device or the rotational speed of the fan indicates a time period, in which all the light sources are switched on and a time period in which all the light sources are switched off. The time period of each adjacent light source starts successively, means one after the other, so that the light is visualized as a moving light. This predefined time period will be repeated as long as the operation parameter of the extraction device is not changed.

**[0032]** Additionally or alternatively to the operation parameter of the extraction device, one operation parameter of the cooking hob, for example selection of one heating zone, indicates changes of one or more light parameters over the time at the illumination device. This means that the control of the light sources of the illumination device can also be related to an operation parameter of the cooking hob. For example, only light sources that are arranged close to the turned on heating zones are changing at least one light parameter over the time. Therefore, the light parameters of each light source can change according to the description above, but if more than one operation parameter and/or parameter values are considered, the light parameters of the light sources may change only partially. For example, only the light sources that are arranged directly adjacent to a turned on heating zone or to a detected cookware are switched on, so that the light parameters in this region of the illumination device will indicate one operation parameter of the extraction device as described above.

**[0033]** Furthermore at least one part of the extraction device includes a sound-absorbing material. An example for a sound-absorbing material is glass fiber. The average sound-absorbing coefficient of a sound-absorbing material is preferably at least 0,8 up to 1,0. Preferably one part of the fan of the extraction device of the combination appliance comprises a sound-absorbing material.

**[0034]** Furthermore at least one component of the extraction device comprises an anti-bacterial material. The anti-bacterial material is to be understood as a material, that is toxic for organic life and therefore germicidal. This means that the anti-bacterial material has antiseptic properties. For example, components of the extraction device are coated with a layer or made of anti-bacterial material. An example for an anti-bacterial material is copper, silver, enamel and functionalized sol-gel systems.

**[0035]** The present invention includes also the use of the combination appliance, according to the description above, as an air filter. This means that the extraction device of the inventive combination appliance can filter pollen, fine dust and unpleasant odors, preferably using only the extraction device of the combination appliance. This means that the extraction device can be turned on independent from the use of the cooking hob of the combination appliance.

**[0036]** Further details, features, combinations of fea-

tures and effects based on the invention result from the following description of preferred, exemplary embodiments of the invention and from the drawings, in which

- 5 **Fig. 1** illustrates a perspective top front view of a combination appliance according to a first embodiment of the invention; and
- Fig. 2** illustrates a front side view of the combination appliance according to Figure 1; and
- 10 **Fig. 3** illustrates schematic a cross-sectional view of a combination appliance according to Figure 1; and
- Fig. 4** illustrates schematic a cross-sectional view of a combination appliance according to a second embodiment; and
- 15 **Fig. 5** illustrates a top view of a combination appliance according to a third embodiment of the invention; and
- 20 **Fig. 6** illustrates a top view of a combination appliance according to a fourth embodiment of the invention; and
- 25 **Fig. 7** illustrates another schematic diagram of the interactions between the components of the control module of the combination appliance; and
- 30 **Fig. 8** illustrates another schematic diagram of the interactions between the components of the control module of the combination appliance; and
- 35 **Fig. 9** illustrates another schematic diagram of the interactions between the components of the control module of the combination appliance.

40 **[0037]** In all figures the same or equivalent parts are marked with the same reference numbers.

**[0038]** Fig. 1 to Fig. 3 illustrates an embodiment of the inventive combination appliance 1 in different views. The combination appliance 1 comprises a cooking hob 2 and an extraction device 3. The cooking hob 2 comprises a support surface 4 and supports the cookware. This means the support surface 4 is the surface, on which the cookware is placed. The support surface 4 is usually made of glass ceramics. The cooking hob 2 further comprises a housing 5, wherein the housing 5 encloses two hob controls 6, for controlling at least one operation parameter of the cooking hob 2, and at least one energy transferring element 7, for example radiant heaters, induction coils or gas burners. The housing 5 is arranged underneath the support surface 4, wherein underneath is understood in the direction of a built-in situation of the combination appliance.

**[0039]** The cooking hob 2 has a width  $W_1$ , a height  $H_1$

and a depth  $D_1$ . The width  $W_1$  of the cooking hob 2 is measured from one side 8 of the support surface 4 to the opposite side 8 of the support surface 4. The depth  $D_1$  of the cooking hob 2 is measured from the front side 9 to the back side 10 of the support surface 4. The height  $H_1$  of the cooking hob 2 is measured from the upper surface of the support surface 2 to the bottom surface of the housing 5 of the cooking hob 2.

**[0040]** The support surface 4 comprises in this illustrated embodiment one recess 11 and four heating zones 12. Alternatively, the support surface may comprise two or more recesses, preferably arranged symmetrically on the support surface around the heating zones 12. The recess 11 is arranged in the middle of the support surface 4 according to the width  $W_1$  of the cooking hob 2. The recess 11 is shaped rectangular and extends in the height direction  $H_1$  from the upper surface of the support surface 2 to the bottom surface of the housing 5 of the cooking hob 2. The recess 11 extends in the depth direction  $D_1$  of the cooking hob 2 at least for one third of the support surface 4 depth, preferably at least for one half of the support surface 4 depth.

**[0041]** The extraction device 3 is arranged directly underneath the housing 5 of the cooking hob 2. The extraction device 3 comprises in this embodiment a grease filter 13 and a liquid collector 14, which are arranged beneath the recess 11. In this embodiment the grease filter 13 is arranged in the liquid collector 14. Further in this embodiment the extraction device 3 comprises one fan 15, that is arranged besides the liquid collector 14. This means that the fan 15 is arranged at one side of the cooking hob 2. The fan 15 sucks in the air from the space above the cooking hob 2 through the recess 11 of the support surface 4. The air flows through the grease filter 13 and through at least one opening 16 in the liquid collector 14 so that the air flow flows into the fan 15. The fan 15 and the liquid collector 14 are enclosed by one extraction device housing 17.

**[0042]** On the other side of the liquid collector 14 at least one extraction control 18, for controlling at least one operation parameter of the extraction device 3, is arranged directly underneath the housing 5 of the cooking hob 2 in a separate extraction control housing 19.

**[0043]** The recess 11 is covered with a removable lid 20, wherein in this embodiment the lid 20 is designed as a grid with fluid guiding means 21. The lid 20 is flush mounted with the upper surface of the support surface 4, so that moving the cookware from one heating zone to another on the support surface 4 of the cooking hob 5 is possible without lifting the cookware.

**[0044]** In the first embodiment according to Fig. 1 to 3 an illumination device 22 is arranged underneath the support surface 4 around the recess 11. The illumination device 22 comprises more than one light source 23, wherein each light source 23 is capable to change one or more light parameters individually from each other and all light sources 23 are preferably light emitting diodes. The light sources 23 are arranged at least in one line

around the rectangular recess 11. This means that it is also possible to have more than one line 24 of light sources 23 arranged around the recess 11. In this embodiment there are three light source lines 24, 25, 26 arranged directly adjacent besides each other and around the recess 11. In a first option according to this design of the illumination device 22 the light parameters of the light sources 23 can be controlled accordingly to the sucked in air through the recess 11 as if the lights are also sucked in. The outer light source line 24, means the light sources 23 furthest away from the recess 11, are switched on first, then the adjacent second light source line 25 is switched on and the first light source line 24 is switched off. Afterwards the third light source line 26, which is adjacent to the second light source line 25 is switched on, and the second light source line 25 is switched off. This will be repeated again as long as the extraction device 3, especially the fan 15 of the extraction device 3, is turned on. The on- and off-time period of each light source line 24, 25, 26 is in accordance with the power level of the fan 15. This means, the higher the power level and/or the faster the rotational speed of the fan 15 is, the shorter is the time period of the successively switched on light sources 23 of each light source line 24, 25, 26.

**[0045]** In a further option according to this design of the illumination device 22 the light parameters of the light sources 23 can be controlled in a way, that the light sources 23 indicate the rotational speed of the fan 15. This means that the light sources 23 are switched on/off in a way, that the switched-on light sources 23 are moving around the recess 11 in a predetermined time period. Therefore, the adjacent light sources 23 are successively switched on and off again. Additionally, the light source lines 24, 25, 26 can be coupled to the power level of the fan 15 of the extraction device 3, so that at power level one of the fan 15 only the light parameters of the light sources 23 of the light source line 26, which is the closest to the recess 11, are being changed. At the power level two of the fan 15 the adjacent light source line 25 is being simultaneously controlled with the inner light source line 26. This indicates to the user that the fan has actually more power. The third light source line 24 will be controlled simultaneously with the other light source lines 26, 25, if the power level of the fan 15 is increased to the next power level.

**[0046]** Of course, all of these options are also only partially possible regarding the control of the illumination device 22, so for example only on the side where the heating zone 12 is activated or cookware is detected, the light sources 23 are controlled in such a way as described above. Furthermore, all of these described options are also usable alternatively or additionally in regard to the other light parameters, like light intensity and/or light color. For example, additionally to the options described above, the color of the light sources 23 may change and/or the intensity of the light sources 23 may change in accordance with the power level of the fan 15. In regard to the light parameter intensity, it is for example possible

to control the light sources 23 in such a way, that the light sources 23 are displayed brighter or darker the higher the power level of the fan 15 is. In regard to the light parameter color of the light sources 23, it is possible to change the color of the light sources 23 according to the power level of the fan 15. For example, the light sources 23 are colored red for a high power level and blue for a low power level.

**[0047]** In Fig. 4 another embodiment of a combination appliance 1 is shown, wherein the only difference to the first embodiment in Fig. 1 to Fig. 3 is the arrangement of the illumination device 22. Here the illumination device 22 is arranged at the inside of the recess 11. The light sources 23 of the illumination device 22 are arranged at least in one horizontal line, which is going around the inner surface of the recess 11. In this embodiment the illumination device 22 comprises an arrangement of the light sources 23 in a matrix form. This means that more than one horizontal line 27 of light sources 23 is arranged at the inner surface of the recess 11. The light sources 23 can be controlled as described in the embodiment before, wherein at least one light parameter changes according to one operation parameter of the extraction device 3 and/or cooking hob 2. Preferably the light sources 23 indicate the power level of the fan 15 or the rotational speed of the fan 15 while changing at least one light parameter over the time. For an example the light sources 23 are controlled accordingly to the sucked in air through the recess 11 as if the illumination is also sucked in. This means that the light sources 23 arranged at the closest to the edge of the support surface 4 are switched on at first. After that the adjacent light sources 23 in the downstream direction of the recess 11 are switched on and the light sources 23 at the edge are switched off. This successively switching on and off of the light sources 23 in accordance to the vertical direction of the combination appliance 1 visualizes the user that the air is sucked in the recess 11 and illustrates moving lights. Also the other described option of controlling the illumination device 22 as described in the first embodiment with the illumination that is running around the recess 11 can be transferred to this embodiment.

**[0048]** Fig. 5 illustrates another inventive embodiment of a combination appliance 1, wherein the only difference to the other two described embodiments is the arrangement of the illumination device 22. Here the illumination device 22 is arranged in the lid 20. Therefore, the lid 20 comprises several light sources 23, which are arranged at the lid 20. Preferably the light sources 23 are arranged at the top and/or at the fluid guiding means 21 and/or at the sides of the lid 20. The illumination device 22 can also be controlled as described in the embodiments before.

**[0049]** Alternatively, it is also possible, that more than one illumination device 22 is arranged at the inventive combination appliance 1. In Fig. 6 three illumination devices 22 are arranged at the combination appliance 1, wherein the first illumination device 22 is arranged adja-

cent to the recess 11 below the support surface 4. Furthermore, the second illumination device 22 is arranged at the lid 20. The third illumination device 22 is arranged inside of the recess 11. In that sense all the three embodiments described above are integrated in one embodiment. All three illumination devices 22 are capable of being controlled together, but each light source 23 is controllable individually. For example, the described above options of controlling the illumination devices 22 can be coupled together so that the light sources 23 on the support surface 4 start and then seamlessly goes over to the light sources 23 of the lid 20 and to the light sources 23 at the recess 11. Therefore, the light sources 23 of each illumination device 22 extends the lighting effect.

**[0050]** All these described options how the illumination device 22 can be controlled, are showing the user directly, on what power level the fan 15 is currently set.

**[0051]** Fig. 7 to Fig. 9 illustrate schematic embodiments of the setup of a control module 28 of the inventive combination appliance 1.

**[0052]** The inventive combination appliance 1 comprises one control module 28. The control module 28 comprises at least one hob control 6, that is capable to control at least one operation parameter of the cooking hob 2, at least one extraction control 18, that controls at least one operation parameter of the extraction device 3, and one interface unit 29, that is at least connected to the extraction control 18 and to the hob control 6. The interface unit 29 is capable of sending signals to the extraction control 18. This means that the interface unit 29 is a communication device between the extraction control 18 and the hob control 6. The interface unit 29 is particularly configured to communicate by means of a wireless and/or wiring connection with the extraction control 18 and the hob control 6, wherein the connections between each other are illustrated in Fig. 7 to Fig. 9 with lines. The interface unit 29 can be part of the combination appliance 1 or can be arranged at an external device as shown in Fig. 7, for example an external server, preferably a part of a smart home system, such as Google Home®, Amazon Echo®, Apple Homepod® or the like, and/or a computer device and/or a mobile device, such as a tablet or mobile phone, that are detached from the combination appliance 1.

**[0053]** Furthermore, measuring elements 30 are coupled to the hob control 6, to the extraction control 18 and/or to the interface unit 29 for measuring parameter values of the cooking hob 2 and/or the extraction device 3. For example, one measuring element 30 is a temperature sensor, which is arranged at each heating zone 12. Therefore, the combination appliance 1 comprises for each heating zone 12 one temperature sensor. Other examples for measuring elements 30 are a pot detecting sensors and/or vibration sensors for detecting boiling of the cookware ingredients, which are also arranged at the cooking hob 2. Examples for measuring elements 30, which are arranged at the extraction device 3, are hu-



midity sensors, that can be arranged at the recess 11, RPM sensors, that measures the speed of the fan 15 and/or water level sensor, that discloses the fill level of spilled liquid, which is collected in the liquid collector 14. Further examples for measuring elements 30 are weight sensors, photo-optical sensors, piezoelectric sensors, ultrasonic sensors, food sensors and/or a timer. Some of these parameter values have to be compared related to time. Therefore, also time is being measured by a measuring element 30.

**[0054]** The information or data that is being received by the measuring elements 30 are transmitted to the interface unit 29. Furthermore, all the information and/or data from the hob control 6 and/or extraction control 18 are also transmitted to the interface unit 29. The interface unit 29 processes all of this information or data and sends a signal to the extraction control 18. The extraction control 18 responds to this received signal from the interface unit 29 by controlling the extraction device 3 accordingly. Controlling the extraction device 3 is understood especially as selecting and/or changing operation parameters of the extraction device 3, wherein these operation parameters are preferably coupled to the light parameters of the illumination device 22.

**[0055]** The interface unit 29 comprises a storage 31 for data, that is being collected and/or that has been saved there as reference data and/or user settings and/or default settings. Furthermore, the inventive combination appliance 1, especially the control module 28 comprises an user interface 32. The user interface 32 comprises at least one receiver unit, wherein the receiver unit is capable of receiving voice commands, especially from the user. The receiver unit is preferably integrated in the control module 28 of the combination appliance 1, for example integrated in the interface unit 29 and/or extraction control 18 and/or hob control 6 and/or user interface 32, wherein the said receiver unit is alternatively or additionally arranged at an external device. The user interface 32 is capable of controlling the extraction control 18 and/or the hob control 6 of the combination appliance 1.

**[0056]** In Fig. 8 and Fig. 9 the schematic setup of the control module 28 differs only compared to the setup in Fig. 7, that the interface unit 29 is directly integrated in the hob control 6 or integrated in the extraction control 18 and that each control module 28 comprises only one extraction control 18 and one hob control 6. Furthermore, the user interface 32 is integrated in this embodiment in the interface unit 29.

#### List of reference numerals

##### [0057]

- 1 combination appliance
- 2 cooking hob
- 3 extraction device
- 4 support surface
- 5 housing

- 6 hob control
- 7 energy transferring element
- 8 side of the support surface
- 9 front side of the support surface
- 10 10 back side of the support surface
- 11 recess
- 12 heating zone
- 13 grease filter
- 14 liquid collector
- 15 15 fan
- 16 opening in liquid collector
- 17 extraction device housing
- 18 extraction control
- 19 extraction control housing
- 20 20 lid
- 21 fluid guiding means
- 22 illumination device
- 23 light source
- 24 first light source line
- 25 25 second light source line
- 26 third light source line
- 27 horizontal line
- 28 control module
- 29 interface unit
- 30 30 measuring element
- 31 storage
- 32 user interface
- $W_l$  width of cooking hob
- $H_l$  height of cooking hob
- 30  $D_l$  depth of cooking hob

#### Claims

- 35 1. A combination appliance (1) comprising a cooking hob (2), which comprises at least one support surface (4) and at least one therein formed recess (11), and at least one extraction device (3), which is arranged below the support surface (4) of the cooking hob (2) and comprises at least one fan (15) for sucking air from the space above the cooking hob (2) through the recess (11) of the support surface (4), and at least one lid (20) for the recess (11),  
**characterized in**  
45 at least one control module (28), comprising at least one extraction control (18) that controls at least one operation parameter of the extraction device (3), at least one hob control (6) that controls at least one operation parameter of the cooking hob (2), and  
50 at least one interface unit (29) that is at least connected to the extraction control (18) and to the hob control (6), and  
wherein the interface unit (29) is capable of sending signals to the extraction control (18),  
55 wherein the extraction control (18) is controlling the extraction device (3) in response to the signals received from the interface unit (29).

2. The combination appliance (1) according to claim 1, **characterized in that** comprises one or more measuring element (30) and wherein the measuring element (30) is capable of detecting at least one parameter value of the cooking hob (2) and/or the extraction device (3), wherein the interface unit (29) is capable of processing said parameter value. 5
3. The combination appliance (1) according to any of the preceding claims, **characterized in that** the operation parameters of the extraction device (3) and/or the cooking hob (2) are selected from the group comprising the selection of the fan (15), regulation of the fan power, the power level of the cooking hob (2), rotational speed of the fan (15), suction capacity of the fan (15), interval operation of the extraction device (3), selection of a heating zone (12) and/or changing of a heating zone (12). 10 15
4. The combination appliance (1) according to claim 2, **characterized in that** the parameter value is selected from the group comprising the temperature, the heat output density of a heating zone (12), the detection of one or more pots, voltage, frequency, current, humidity value, time and/or flame-size. 20 25
5. The combination appliance (1) according to claim 2 to 4, **characterized in that** at least one of the operation parameters of the extraction device (3), preferably the rotational speed of the fan (15) or the power level of the fan (15) or the suction capacity of the fan (15), is controlled based on at least one of the parameter values of the measuring element (30), preferably the temperature and/or the heat output density of a heating zone (12) and/or the detection of cookware. 30 35
6. The combination appliance (1) according to anyone of the preceding claims, **characterized in that** the interface unit (29) comprises a storage (31) for data, preferably reference data and/or user settings and/or default settings. 40
7. The combination appliance (1) according to any of the preceding claims, **characterized in that** the control module (28) comprises an user interface (32), wherein the control module (28), preferably the interface unit (29) and/or the user interface (32), comprises at least one receiver unit, wherein the receiver unit is capable of receiving voice commands. 45 50
8. The combination appliance (1) according to any of the preceding claims, **characterized in that** at least one operation parameter of the extraction device (3), preferably the power level of the fan (15) or the rotational speed of the fan (15), is adjustable by user settings, preferably touch or voice control. 55
9. The combination appliance (1) according to anyone of the preceding claims, **characterized in that** the control module (28) is coupled with at least one illumination device (22), wherein the illumination device (22) comprises at least one or more light sources (23) and wherein the illumination device (22) is arranged in the area of the recess (11) .
10. The combination appliance (1) according to claim 9, **characterized in that** the control module (28) is capable of controlling at least one light parameter of each light source (23) of the illumination device (22), preferably on/off switching, light intensity and/or light color, as a function of time.
11. The combination appliance (1) according to claim 10, **characterized in that** one operation parameter of the extraction device (3), preferably power level, especially the rotational speed of the fan (15), is indicated at the illumination device (22) by changing one or more light parameters over time.
12. The combination appliance (1) according to claim 10 or 11, **characterized in that** one operation parameter of the cooking hob (2), for example selection of one heating zone (12), indicates changes of one or more light parameters over the time at the illumination device (22).
13. The combination appliance (1) according to any of the preceding claims, **characterized in that** the interface unit (29) is integrated in the extraction control (18) or in the hob control (6).
14. The combination appliance (1) according to any of the preceding claims, **characterized in that** at least one component of the extraction device (3) comprises an anti-bacterial material.
15. The use of the combination appliance (1) according to any of the preceding claims 1-14 as an air filter.

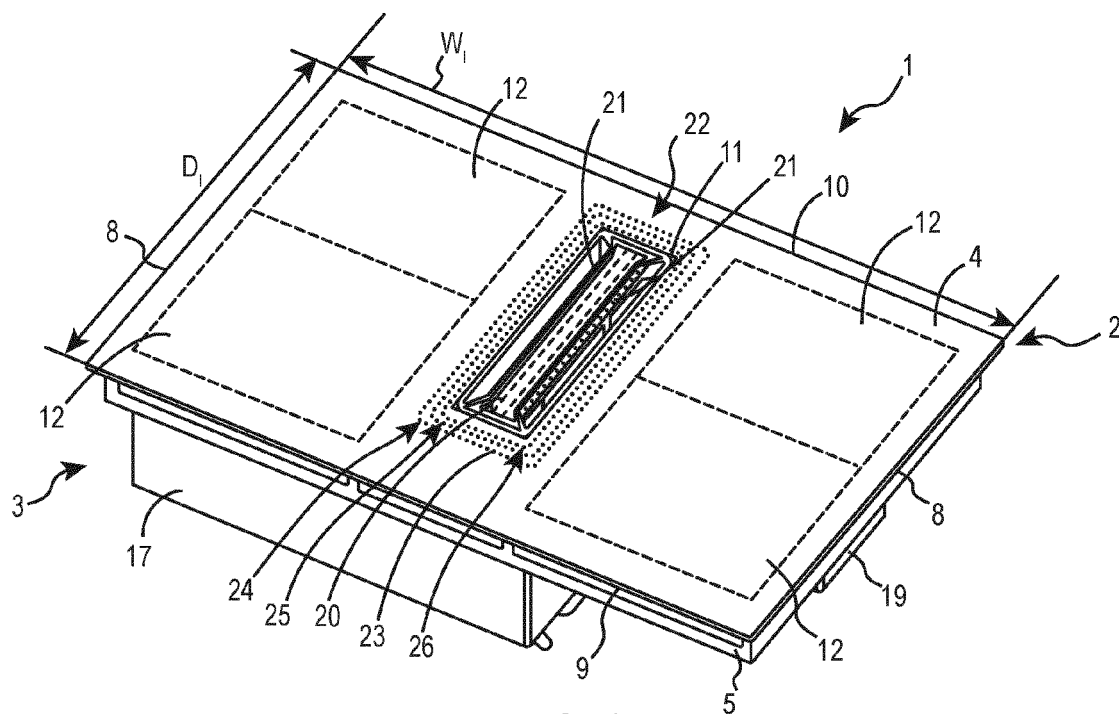


FIG. 1

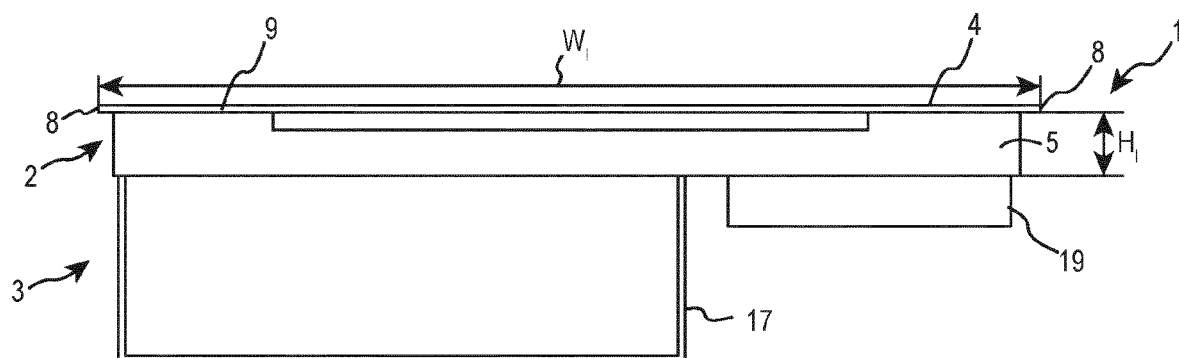


FIG. 2

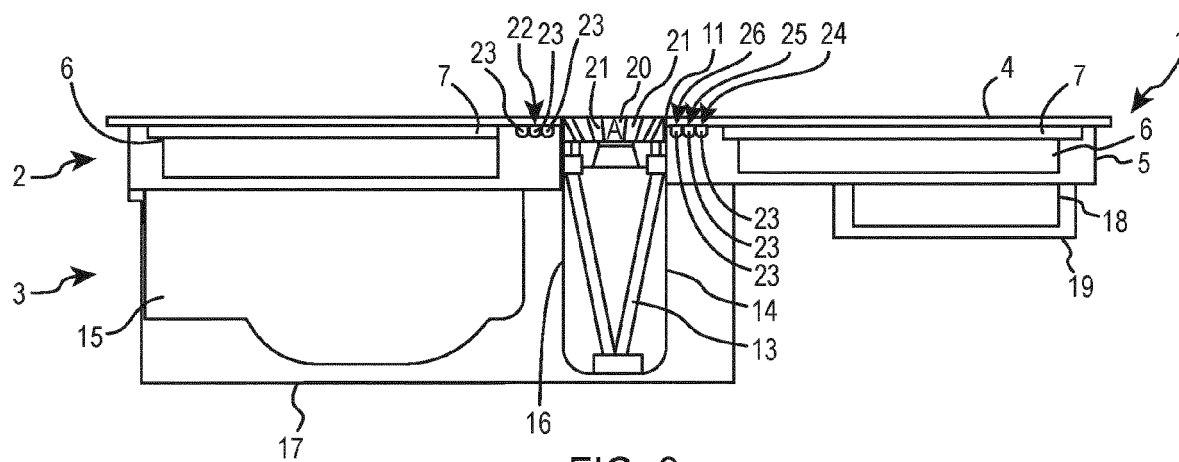


FIG. 3

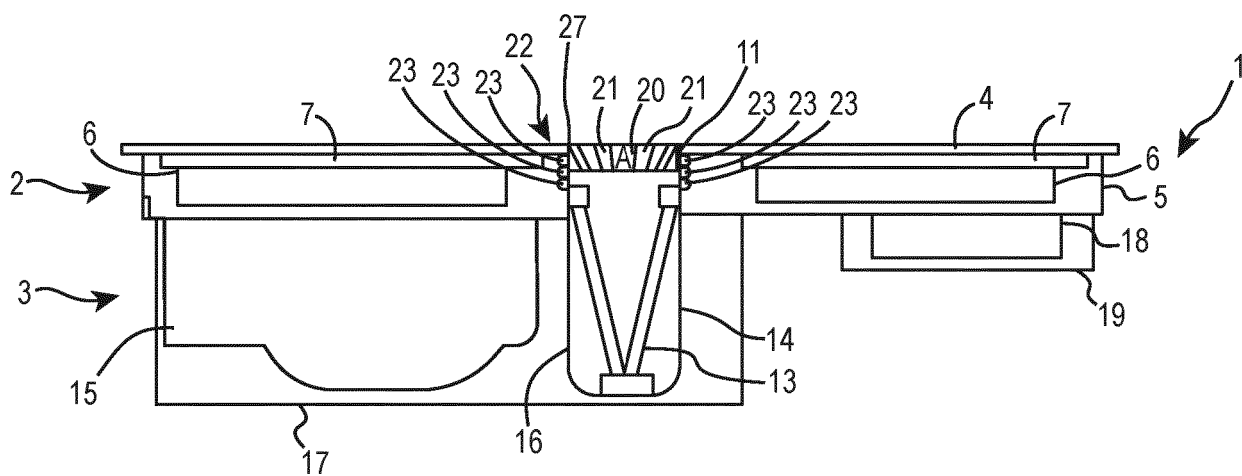


FIG. 4

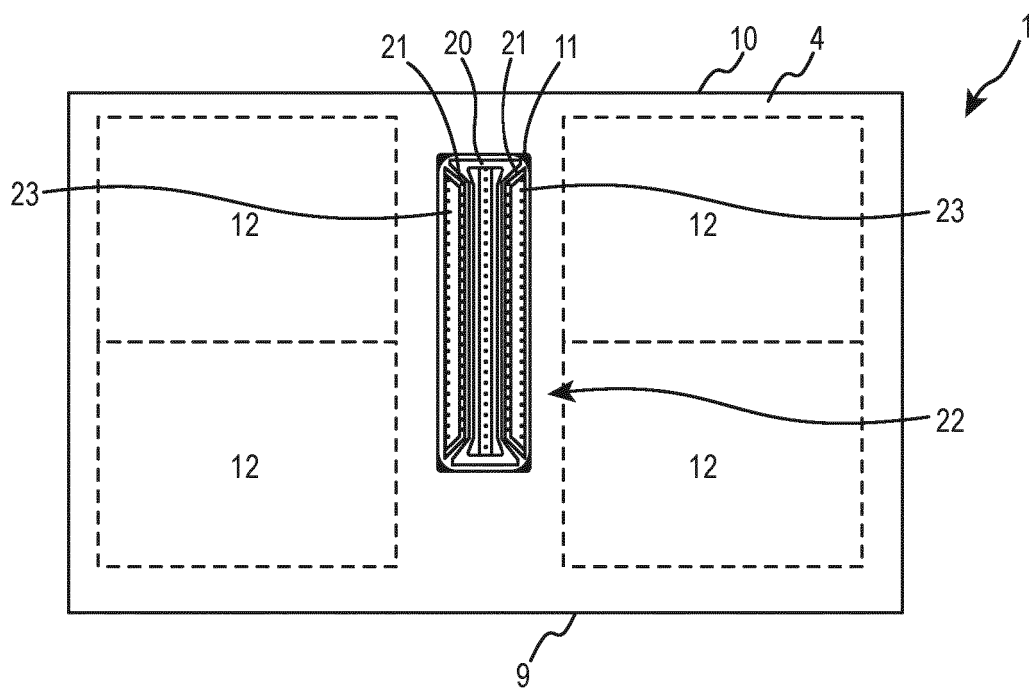


FIG. 5

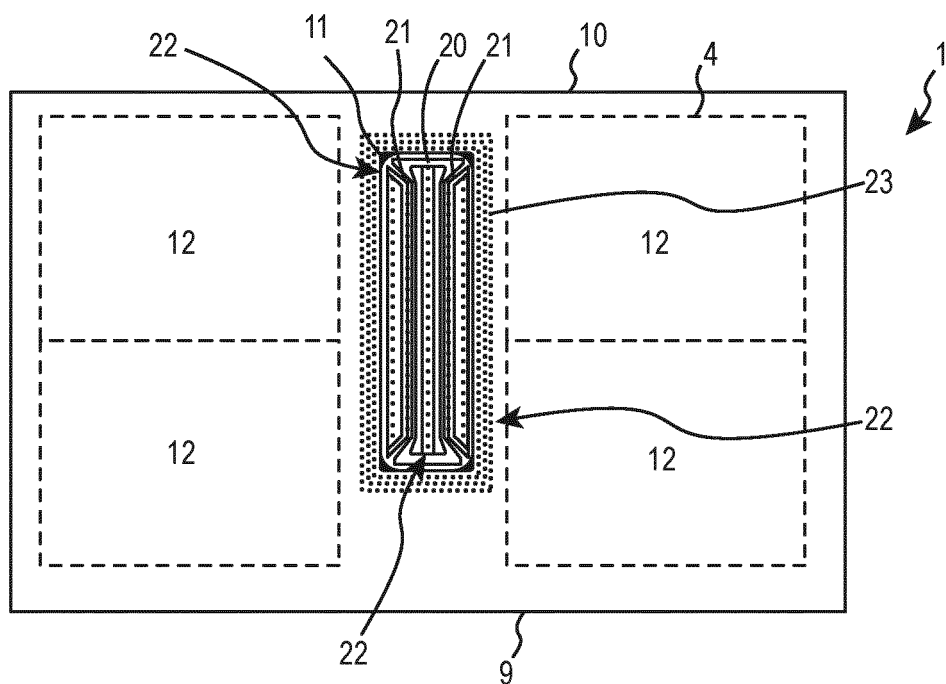


FIG. 6

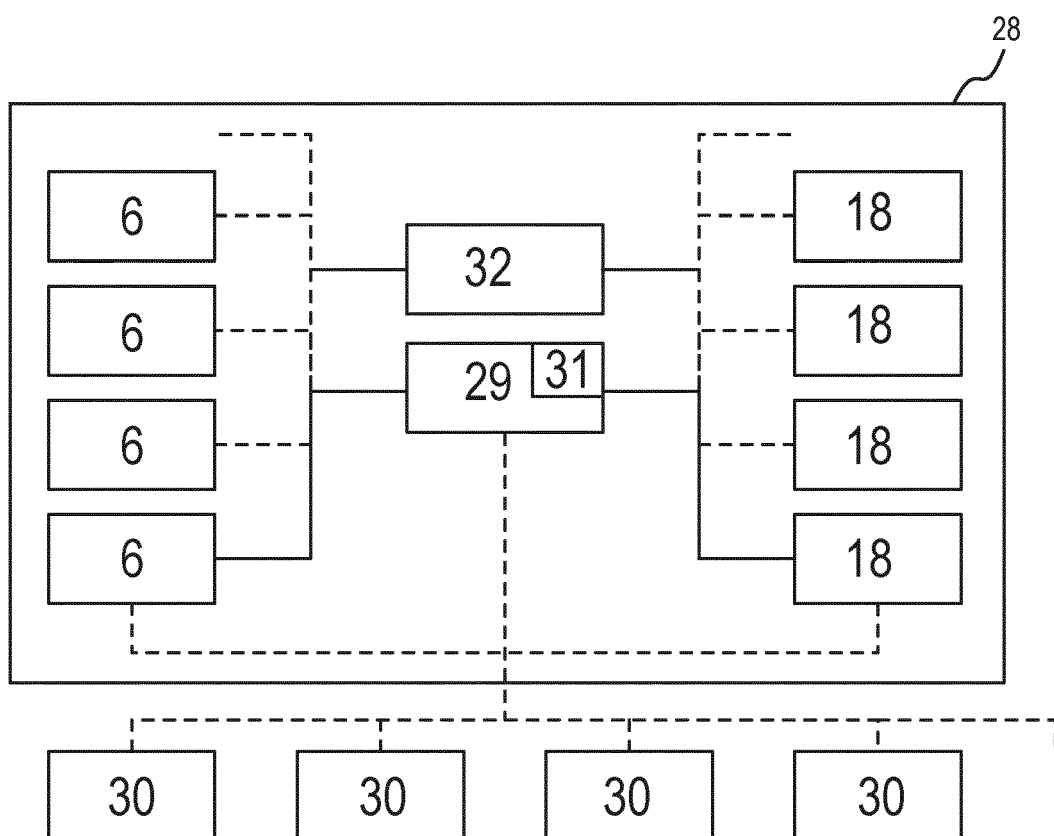


FIG. 7

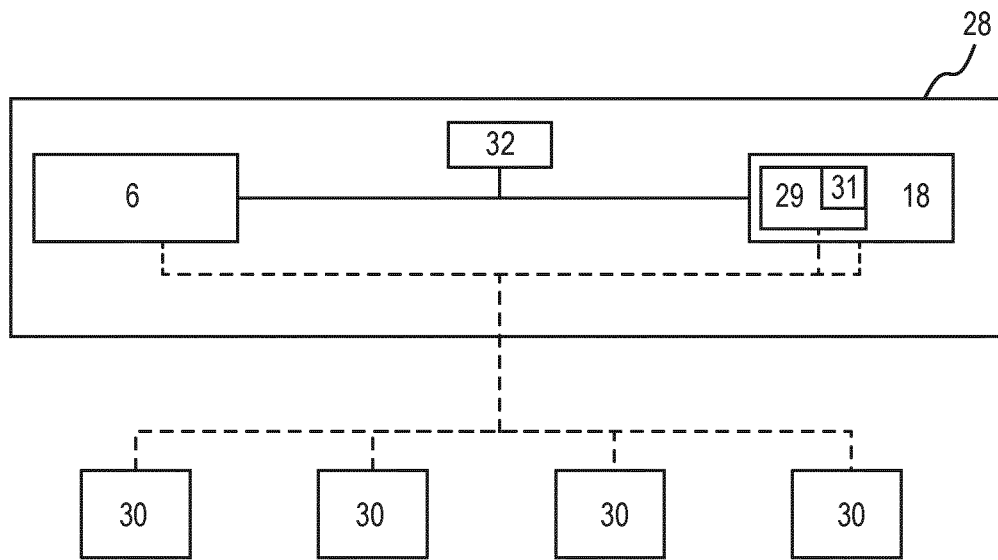


FIG. 8

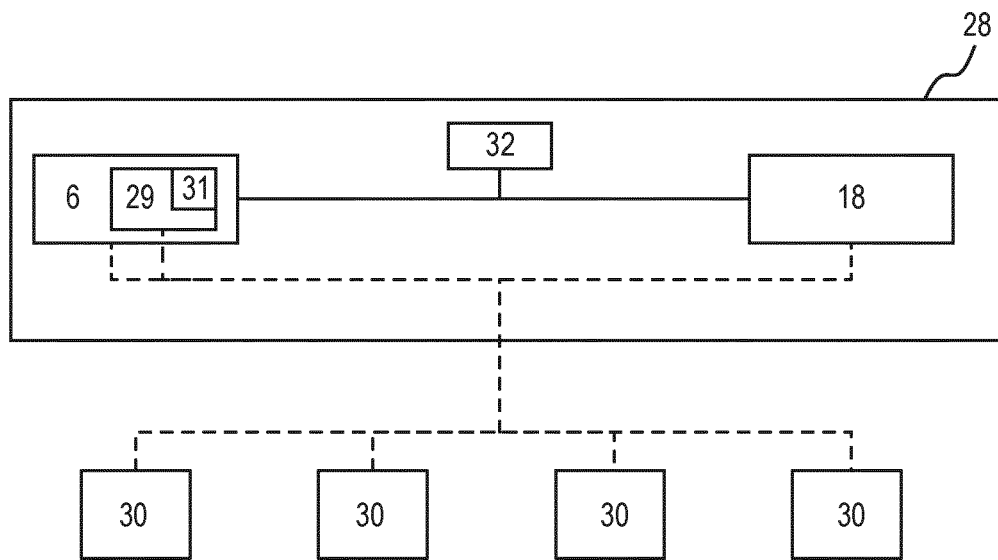


FIG. 9



## EUROPEAN SEARCH REPORT

 Application Number  
 EP 20 18 9681

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2019/238421 A1 (BSH HAUSGERAETE GMBH [DE]) 19 December 2019 (2019-12-19) * Page 6, lines 5-8; page 10, lines 20-24; page 11, lines 12-22; page 2, line 22; claims 1,2,7,11,13 *	1-6, 10-13,15 9,14	INV. F24C7/08 F24C15/20
Y	----- US 2007/023420 A1 (GAGAS JOHN M [US]) 1 February 2007 (2007-02-01) * claim 39 *	1	
X	----- US 2003/111456 A1 (ARNTZ TIMOTHY J [US] ET AL) 19 June 2003 (2003-06-19) * paragraph [0016] *	1	
X	----- DE 10 2017 127229 A1 (MIELE & CIE [DE]) 23 May 2019 (2019-05-23) * claim 1 *	1	
X	----- EP 2 288 853 A2 (MIELE & CIE [DE]) 2 March 2011 (2011-03-02) * claim 1 *	1	
Y	----- DE 10 2018 120740 A1 (SCHOTT AG [DE]) 14 February 2019 (2019-02-14) * figure 6 *	9	TECHNICAL FIELDS SEARCHED (IPC) F24C
Y	----- US 2018/207312 A1 (CHIANG TSUNG-CHE [TW]) 26 July 2018 (2018-07-26) * claim 1 *	14	
X	----- US 2010/163549 A1 (GAGAS JOHN M [US] ET AL) 1 July 2010 (2010-07-01) * paragraph [0185]; figures 5,8 *	1,7,8	
A	----- US 2014/041649 A1 (SINUR RICHARD R [US] ET AL) 13 February 2014 (2014-02-13) * paragraph [0101] *	7,8	
	----- -/--		
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 19 March 2021	Examiner Adant, Vincent
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	

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 EPO FORM 1503 03.82 (P04C01)

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## EUROPEAN SEARCH REPORT

Application Number  
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EPO FORM 1503 03.82 (P04C01)

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 2018/209662 A1 (ADAM JULIEN [FR] ET AL) 26 July 2018 (2018-07-26) * paragraph [0042] * -----	1	
			TECHNICAL FIELDS SEARCHED (IPC)
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 19 March 2021	Examiner Adant, Vincent
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			





Application Number

EP 20 18 9681

**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:

☐ 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 18 9681

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: 2-6, 13, 15(completely); 1(partially)

Combination appliance with interface unit

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2. claims: 7, 8(completely); 1(partially)

Combination appliance with voice control

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3. claims: 9-12(completely); 1(partially)

Combination appliance with illumination

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4. claims: 14(completely); 1(partially)

Combination appliance with anti-bacterial element

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

EP 20 18 9681

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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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19-03-2021

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2019238421 A1	19-12-2019	NONE	
US 2007023420 A1	01-02-2007	NONE	
US 2003111456 A1	19-06-2003	CA 2411377 A1 US 2003111456 A1	14-06-2003 19-06-2003
DE 102017127229 A1	23-05-2019	DE 102017127229 A1 EP 3511633 A2	23-05-2019 17-07-2019
EP 2288853 A2	02-03-2011	EP 2288853 A2 PL 2288853 T3 WO 2009127379 A2	02-03-2011 30-10-2015 22-10-2009
DE 102018120740 A1	14-02-2019	NONE	
US 2018207312 A1	26-07-2018	NONE	
US 2010163549 A1	01-07-2010	NONE	
US 2014041649 A1	13-02-2014	AU 2013256025 A1 CN 104412042 A HK 1208258 A1 US 2014041649 A1 WO 2013166445 A1	20-11-2014 11-03-2015 26-02-2016 13-02-2014 07-11-2013
US 2018209662 A1	26-07-2018	CN 107923630 A EP 3338028 A1 US 2018209662 A1 WO 2017029128 A1	17-04-2018 27-06-2018 26-07-2018 23-02-2017

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- DE 202011005698 U1 [0002]
- EP 3511633 A2 [0002]