



(11) **EP 3 557 141 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**23.10.2019 Bulletin 2019/43**

(51) Int Cl.:  
**F24C 15/20<sup>(2006.01)</sup>**

(21) Application number: **18425028.0**

(22) Date of filing: **17.04.2018**

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

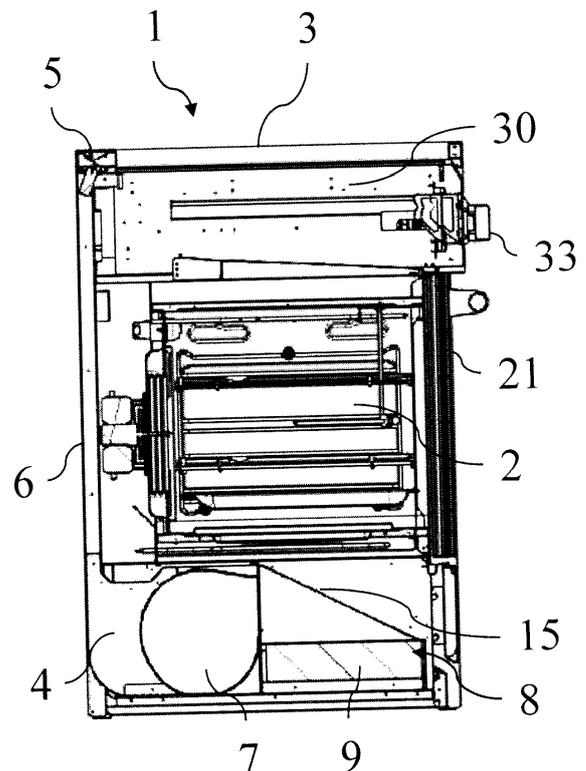
(71) Applicant: **Steel S.r.l.**  
**41012 Carpi (MO) (IT)**

(72) Inventor: **Po, Auro**  
**41012 Carpi (MO) (IT)**

(74) Representative: **Antonucci, Emanuele**  
**BOTTI & FERRARI S.R.L.**  
**Via Montebello, 2**  
**40121 Bologna (IT)**

(54) **Cooker of the freestanding type with a integrated fume extraction and filtration system**

(57) Cooker (1) of the freestanding type comprising: an oven compartment (2); a top cooking hob (3); a fume extraction path (4) intercepted by one or more filters (9), fully incorporated in the body of said cooker (1), said path (4) comprising a vertical inverted flue (6) with a substantially flat form positioned along a rear section of said cooker (1) and connecting an inlet opening (5) positioned on the level of the cooking hob (3) to a vacuum chamber (7) situated underneath said oven compartment (2).



**Fig. 4**

## Description

### Field of application

**[0001]** The present invention relates to the sector of large electric household appliances for the kitchen, in particular kitchen units of the type comprising a top cooking hob and an oven compartment housed underneath said cooking hob.

### Prior art

**[0002]** It is known there exists the need, in the sector of household and/or industrial cookers, to extract the fumes resulting from the cooking or the heating of food on top of the hotplates or burners of the cooking hob. These fumes may be then conveyed outside of the building, by means of a special connection to a flue, or introduced back into the internal environment after suitable filtration designed to remove the particles of grease and eliminate the cooking odours.

**[0003]** Conventionally, extraction of the fumes is performed by means of a hood arranged above the cooking hob. Recently, however, an alternative solution has been introduced, this solution consisting in extracting said fumes downwards through an opening formed in the said cooking hob or at a short distance from it. This solution gives rise to certain advantages, first and foremost that of concealing the top hood which is often difficult to incorporate in an aesthetically neutral manner into the kitchen furnishings.

**[0004]** Hitherto different technical solutions have been proposed for realizing the aforementioned systems for downwards extraction of the fumes. The most common solutions use a rear telescopic panel which extends upwards so as to define the fume extraction openings, or an extraction system which is directly incorporated below the cooking hob and connected by means of special ducts to a conveying path formed in the kitchen unit.

**[0005]** All the embodiments proposed hitherto have in any case relatively large dimensions or at least a high constructional complexity. In most cases these dimensions exclude the possibility of incorporating an oven in the said furniture unit which supports the cooking hob and requires a built-in design in order to hide part of the fume conveying path.

**[0006]** The technical problem underlying the present invention is therefore that of providing a cooker of the freestanding type which houses an oven compartment and incorporates inside it the entire fume extraction and filtration system and also has the characteristics of being constructionally simple and faultless during operation.

### Summary of the invention

**[0007]** The aforementioned technical problem is solved by a freestanding cooker comprising: an oven compartment; a top cooking hob; a fume extraction path

which is fully incorporated inside the body of said cooker and extends between an inlet opening on the level of the cooking hob and an outlet portion, said path being intercepted by an extraction fan intended to move the fumes along the path and by one or more filters for said fumes; said extraction fan being housed inside a vacuum chamber positioned underneath said oven compartment; said path further comprising a vertical inverted flue with a substantially flat form positioned along a rear section of said cooker, behind said oven compartment, said inverted flue connecting the inlet opening to the vacuum chamber.

**[0008]** The structure of the fume extraction system described above, in particular owing to the innovative flat element of the inverted flue and the specific spatial arrangement of the various components, is unusually compact and may be advantageously housed inside the body of a freestanding cooker with conventional dimensions.

**[0009]** Preferably, the inlet opening may be a longitudinal slit which extends at the rear of the cooking hob, namely along a rear edge of the kitchen unit, behind the plurality of hotplates or burners of the cooking hob. Owing to this configuration, the longitudinal slit is perfectly aligned with the inverted flue underneath it, avoiding deviations in the flow and the presence of crevices which are difficult to clean.

**[0010]** Preferably, the inverted flue has a thickness the same as or smaller than that of the inlet opening situated above it so as to define an effective constriction which increases the speed of the flow along the downward section.

**[0011]** Significantly, the flat inverted flue has a relatively small thickness, preferably less than 10 cm, even more preferably less than 5 cm.

**[0012]** The inverted flue may advantageously have a form tapered toward its base, whereat said inverted flue is connected to the vacuum chamber.

**[0013]** Preferably, said inverted flue is an insert, separate from a muffle which defines internally the oven compartment. The inverted flue, owing to its particularly thin form, is therefore situated inside the narrow gap - defined by the extension of the side covering panels and the top skirting - separating the oven muffle from the wall next to which the cooker is arranged.

**[0014]** Preferably, the outlet portion of the fume path connects the vacuum chamber to one or more outlet openings emerging in the surrounding environment, namely there is no connection between the fume conveying path and a flue pipe. The outlet openings may be advantageously positioned at the front of the cooker, underneath the opening of the oven compartment.

**[0015]** The outlet openings may take the form of a plurality of slits which are aligned on one or more levels or a grille or may take some other form suitable for the function of expelling the fumes which have been conveniently filtered and cooled.

**[0016]** The outlet portion may also comprise, preferably in a position immediately upstream of the outlet openings, at least one filter for the fumes.

**[0017]** This filter takes the form of an active-carbon or self-cleaning plasma filter unit.

**[0018]** Preferably, the active-carbon filter and the plasma filter are defined by modules which may be easily interchanged, at least during the stage of initial assembly of the cooker, without modifying the other components of the appliance.

**[0019]** For this purpose the filter unit is preferably a box-shaped element which is accessible at the bottom of the cooker body and is designed to be passed through by the stream of fumes flowing out from the vacuum chamber and conveniently directed downwards by a deviating element.

**[0020]** A further filter, having the main function of capturing the particles of grease present in the fumes, is preferably mounted along the inverted flue, i.e. upstream of the extraction fan.

**[0021]** The cooker according to the present invention preferably comprises a closing lid for the inlet opening. Said lid can be pivoted between a closed position, where it closes off the inlet opening, and an open position, where it does not close off the inlet opening, allowing extraction of the fumes.

**[0022]** Preferably, the lid can also be arranged in a third maintenance position, which allows the user to access the grease capture filter mounted inside the inverted flue.

**[0023]** In particular, in the closed position, the plate which defines the lid is positioned horizontally, flush with the contour of the inlet opening; in the open position, said plate is positioned inclined; in the maintenance position, if present, the plate is positioned with an inclination greater than that of the open position.

**[0024]** Advantageously, the lid may have, associated with it, a linear actuator which, when operated, is subject to a displacement from a retracted position into an extended position. This displacement accompanies the movement of the lid from the closed position into the open position.

**[0025]** The linear actuator comprises preferably a heat-expandable material, for example: a wax, which causes extension of the stem of said actuator. The thermal expansion and contraction of the heat-expandable material therefore define the displacement from the retracted position into the extended position and vice versa. The heat-expandable material is heated locally by an electrical resistance which is passed through by current only in the event of operation of the linear actuator.

**[0026]** Heating of the heat-expandable wax requires a considerable amount of time, roughly between 5 seconds and one minute. Thus, the displacement of the linear actuator - and the respective opening of the lid - is delayed with respect to operation which is conveniently performed at the moment of activation of the extraction fan.

**[0027]** There is therefore a substantial time delay between opening of the lid of the extraction system and activation of the fan. This delay results in a vacuum peak at the moment of opening, which allows advantageously

correct and immediate redirection of the stream of cooking fumes downwards.

**[0028]** It should be noted that such a time delay may be achieved using systems different from the heat-expandable actuator described above, for example by means of electronic timing of the delay.

**[0029]** Preferably, the connection between linear actuator and lid consists of a simple bearing contact between the stem of the actuator and a pushing surface of the lid, defined for example by an inclined lug of the main surface. Moreover, the lid reaches a gravitational equilibrium in the closed position.

**[0030]** Thus, if in the event of displacement towards the extended position it is the linear actuator which pushes the lid into the open position, when the actuator itself assumes again the rest position, or retracted position, the lid returns into the closed position simply by means of gravity.

**[0031]** Operation of the linear actuator ceases preferably at the moment of deactivation of the extraction fan, following which - with a time delay similar to that described for displacement into the extended position - the actuator recovers the retracted position, allowing gradual and non-immediate closure of the fume inlet opening.

**[0032]** Further characteristic features and advantages will emerge more clearly from the detailed description provided hereinbelow of a preferred, but not exclusive embodiment of the present invention, with reference to the attached figures, provided by way of a non-limiting example.

#### Brief description of the drawings

##### **[0033]**

Figure 1 shows a perspective view of a cooker according to the present invention;

Figure 2 shows a perspective view of the cooker according to Figure 1 from a rear view point;

Figure 3 shows a front view of the cooker according to Figure 1;

Figure 4 shows a side view of the cooker, cross-sectioned along the plane A-A of Figure 3;

Figure 5 shows a cross-sectioned view of a detail of the system for opening the fume inlet lid of the cooker of Figure 1, with said lid in the closed position;

Figure 6 shows a cross-sectioned view of the detail of Figure 5 with the fume inlet lid in the open position.

##### Detailed description

**[0034]** With reference to the attached Figure 1, a free-standing cooker according to the present invention is

generally denoted by 1.

**[0035]** Said cooker 1 is shown in the attached drawings in its normal working configuration. The relative and absolute positions and the orientations of the various elements which form the unit - defined by means of terms such as "upper" and "lower", "above" and "below", "horizontal" and "vertical" or other equivalent terms, must always be interpreted with reference to this configuration.

**[0036]** Other terms, such as "front" and "rear", "in front of" or "behind" and equivalent terms, are to be interpreted from the viewpoint of a user facing frontally the command interface of the cooker 1 in the operating position, the parts closest to the user being regarded as being at the front.

**[0037]** The cooker 1 comprises an oven compartment 2 defined by a muffle 11 surrounded by side panels 20 and having an upper module 30 arranged above it. The oven compartment 2 is closed at the front by a conventional hatch-door 21 which can be opened.

**[0038]** The upper module 30 comprises at the top a cooking hob 3 with a plurality of hotplates or burners 31 which in this case are five in number. Obviously, in the context of the present invention, the cooking hob may have any number and/or type of hotplate or burner (for example: of the gas or induction type).

**[0039]** The cooking hob 3 is surrounded by a raised frame defined laterally by two panels aligned with the aforementioned side panels 20; at the front by a straight profiled part 34 which is situated above the control interface 33; at the rear by a skirting 32 preferably made of metal and with a rectangular cross-section.

**[0040]** The top profile of the skirting 32 has, formed therein, an inlet opening 5 with an elongated shape which defines the entrance to a path 4 for extraction of the cooking fumes generated at the front by the heating of food on the cooking hob 3.

**[0041]** The aforementioned path continues with an inverted flue 4, which has a substantially flat shape or small thickness and is associated underneath the skirting 32 and behind the muffle 11, inside a gap which is left between the latter and the ideal plane of contact with a rear wall.

**[0042]** The inverted flue 4, which is preferably made of metal (for example: stainless steel), extends vertically with a downward tapering trapezoidal profile. Its thickness, which is substantially constant, is substantially smaller than the thickness of the inlet opening 5 situated above it.

**[0043]** A grease catching filter, with a preferably mechanical action, not shown in the attached figures, is preferably arranged inside the inverted flue 4.

**[0044]** At the bottom the inverted flue 6 is connected to a closed vacuum chamber 7 containing an extraction fan inside it.

**[0045]** An outlet portion 8 of the fume extraction path 4 extends downstream of the vacuum chamber 7. This outlet portion 8 has, at the extraction fan delivery, an inclined baffle 15 for deviating the flow of the fumes down-

wards in the direction of a filter unit 9.

**[0046]** The filter unit 9 may be alternatively an active-carbon filter or a plasma filter of the self-cleaning type. A hatch 16 is provided underneath the cooker 1 for access to said filter unit 9.

**[0047]** Downstream of the filter unit 9, the fume extraction path 4 continues at the front towards a series of front outlet openings 12 which in the example described here are defined by slits aligned on two different levels. The outlet openings 12 extend in an area underneath the hatch-door 21 for closing the oven compartment 2.

**[0048]** During use, the extraction fan generates a major vacuum which is discharged inside the inverted flue 6 until it reaches, via the inlet opening 5, the area of the cooking hob 3. The vacuum generated on the level of the hob and forced by the constriction of the inverted flue 4 attracts the vapour and the fumes generated by the cooking of food, at a speed much faster than the natural movement of the fumes upwards.

**[0049]** It should be noted that the fume extraction path 4 has a particularly compact structure and passes around the oven compartment 2; in fact the inverted flue 6 is situated behind the oven compartment 2; the vacuum chamber 7 and the subsequent outlet portion are situated underneath the oven compartment 2.

**[0050]** The inlet opening 5 may be selectively closed by means of a lid 10.

**[0051]** The lid 10 is defined by a plate 18 pivoting about a hinging axis 17 and provided at the bottom with an inclined lug defining a pushing surface 14.

**[0052]** The lid 10 may be arranged in three different positions, identified below:

a closed position - shown in Figure 5 - in which the plate 18 is situated flush with the top surface of the skirting 32, completely closing off the inlet opening 5;

an open position - shown in Figure 6 - in which the plate 18 is slightly inclined with respect to the top surface of the skirting 32, allowing the fumes access to the underlying inverted flue 6;

a maintenance position - not shown in the present figures - in which the plate 18 is fully rotated or in contact with the outer profile of the inlet opening 5, which allows the user to access the underlying grease capture filter for replacement operations.

**[0053]** It should be noted how the lid 10 is hinged at the rear of the profile of the plate 18, such that, during rotation, the latter is raised with respect to the plane of the skirting 32 with the opening directed towards the cooking hob 3.

**[0054]** The closed and maintenance positions of the lid 10 are both gravitational equilibrium positions, where the weight of the plate 18 is displaced respectively to one side or the other of the hinging axis 17. The open position is instead not an equilibrium position.

[0055] In order to achieve and maintain temporarily said open position a linear actuator 13 with a stem 19 is provided so as to exert a pressure on the pushing surface 14 indicated above.

[0056] The linear actuator 13 is conveniently arranged at the interface between the skirting 32 and the inverted flue 6 and is completely concealed from the user's view.

[0057] The linear actuator 13 comprises internally a heat-expandable wax which determines the extended or retracted position of the stem 19. In the rest configuration - with the wax cold - the stem 19 is in a retracted position; in the actuating position - where the wax is locally heated by means of an electrical resistance - the stem 19 is in an extended position. Heating and cooling of the wax require a considerable amount of time, roughly about 30 seconds, such that the displacement of the stem 19 is delayed with respect to operation of the linear actuator 13.

[0058] The linear actuator 13 is conveniently operated upon activation of the extraction fan. Thus, after a delay due to heating of the wax inside the device, the lid 10 is brought into the open position. The delay advantageously defines a transitory vacuum peak which is useful for re-directing the cooking fumes during the start of extraction.

[0059] Operation of the linear actuator 13 ceases with switching off of the extraction fan. Thus, after a delay due to cooling of the wax inside the device, the stem 19 is retracted into the rest position and the lid 10 assumes again the closed position by means of gravity.

[0060] It should be noted that the maintenance position of the lid 10 cannot be reached by means of the linear actuator 13, but only by means of manual operation on the part of the user.

[0061] Obviously a person skilled in the art, in order to satisfy any specific requirements which might arise, may make numerous modifications and variations to the cooker described above, all of which are contained moreover within the scope of protection of the invention, as defined by the following claims.

## Claims

1. Cooker (1) comprising: an oven compartment (2); a top cooking hob (3); a fume extraction path (4) extending between an inlet opening (5) on the level of the cooking hob (3) and an outlet portion (8), said path (4) being intercepted by an extraction fan intended to move the fumes along the path (4) and by one or more filters (9) for said fumes; **characterized in that** said cooker (1) is of the freestanding type, said path (4) being fully incorporated in the body of said cooker (1); said extraction fan being housed inside a vacuum chamber (7) positioned underneath said oven compartment (2); said path (4) further comprising a vertical inverted flue (6) with a substantially flat form positioned along a rear section of said cooker (1), behind said oven compartment (2), said

inverted flue (6) connecting the inlet opening (5) to the vacuum chamber (7).

2. Cooker (1) according to claim 1, wherein said inlet opening (5) is a longitudinal slit which extends at the rear of the cooking hob (3).
3. Cooker (1) according to claim 2, wherein said inverted flue (6) has a thickness equal to or smaller than that of the inlet opening (5) situated above it.
4. Cooker (1) according to claim 3, wherein said inverted flue (6) has a form tapering toward its base, whereat said inverted flue (6) is connected to the vacuum chamber (7).
5. Cooker (1) according to claim 3 or 4, wherein said inverted flue (6) is an insert that is separate from a muffle (11) which defines internally the oven compartment (2).
6. Cooker (1) according to claim 5, wherein said outlet portion (8) connects the vacuum chamber (7) to one or more outlet openings (12) emerging in the surrounding environment.
7. Cooker (1) according to claim 6, wherein said outlet portion (8) comprises at least one filter (9) for the fumes, said filter (9) taking the form of an active-carbon filter unit.
8. Cooker (1) according to claim 6, wherein said outlet portion (8) comprises at least one filter (9) for the fumes, said filter (9) taking the form of a plasma filter unit.
9. Cooker (1) according to claim 6, wherein said outlet portion (8) comprises at least one filter (9) for the fumes, said filter (9) taking the form of an interchangeable active-carbon or plasma filter unit.
10. Cooker (1) according to one of claims 2 to 9, comprising a lid (10) pivotable between a closed position, where it closes off the inlet opening (5), and an open position, where it does not close off the inlet opening (5), allowing extraction of the fumes.
11. Cooker (1) according to claim 10, wherein an anti-grease filter is arranged inside said inverted flue (6), said lid (10) being able to be arranged in a maintenance position designed to allow access to said anti-grease filter by a user.
12. Cooker (1) according to one of claims 10 or 11, wherein said lid (10) is associated with a linear actuator (13) which, when operated, is subject to a displacement from a retracted position into an extended position which accompanies the movement of the lid

(10) from the closed position into the open position.

13. Cooker (1) according to claim 12, wherein said linear actuator (13) is operated upon activation of the extraction fan, said displacement from the retracted position into the extended position being completed with a substantial time delay relative to the start of operation.

5

14. Cooker (1) according to claim 13, wherein said linear actuator (13) comprises a heat-expandable material, thermal expansion and retraction of which determine the displacement from the retracted position into the extended position and vice versa, said heat-expandable material being selectively heated by an electric resistance passed through by current in the event of operation of the linear actuator (13).

10

15

15. Cooker (1) according to one of claims 13 or 14, wherein said linear actuator (13) is connected by means of simple bearing contact on a pushing surface (14) of the lid (10), interruption of operation of said linear actuator (13) at the moment of deactivation of the extraction fan causing, with a substantial time delay, the return of said linear actuator (13) from the extended position into the retracted position and allowing the movement by means of gravity of the lid (10) from the open position into the closed position.

20

25

30

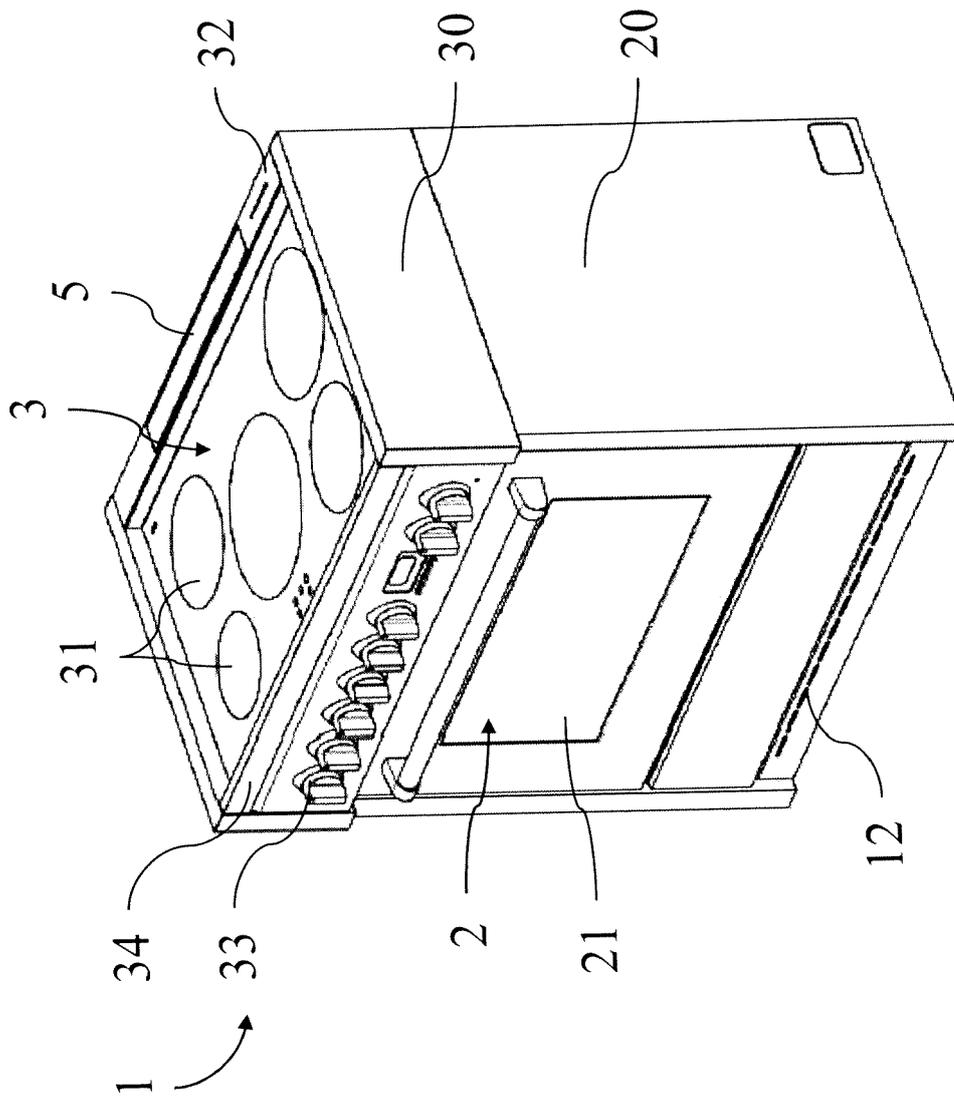
35

40

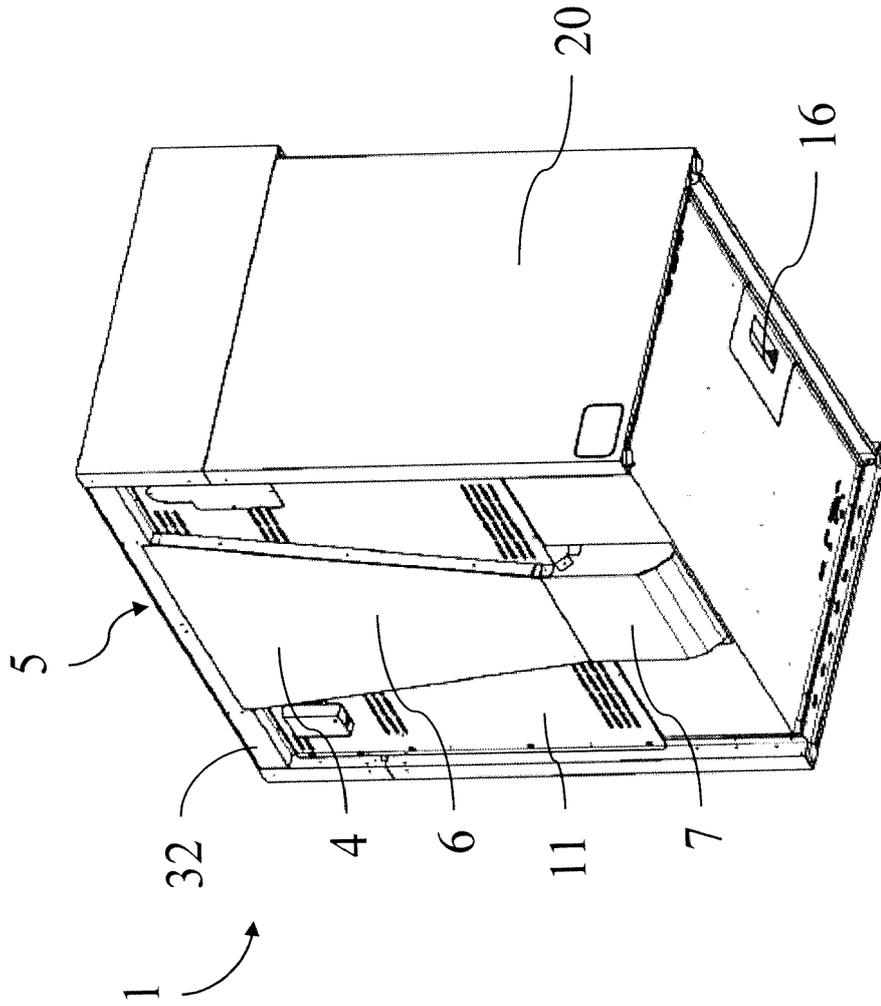
45

50

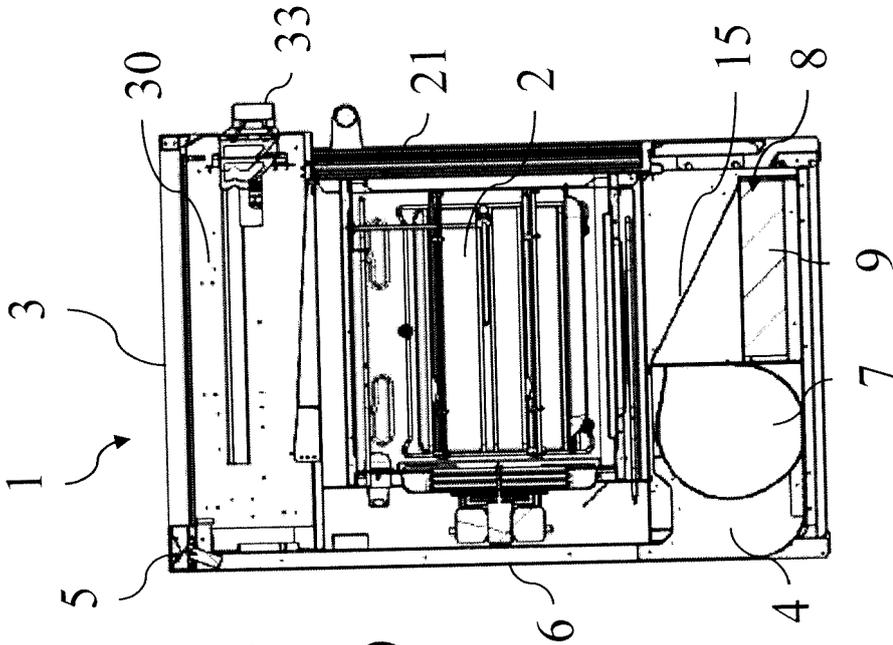
55



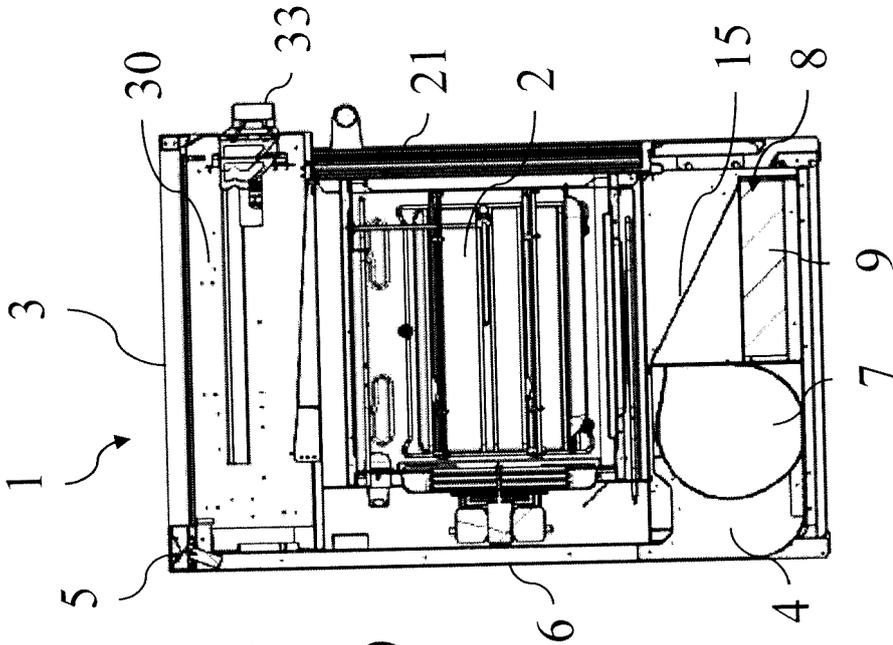
**Fig. 1**



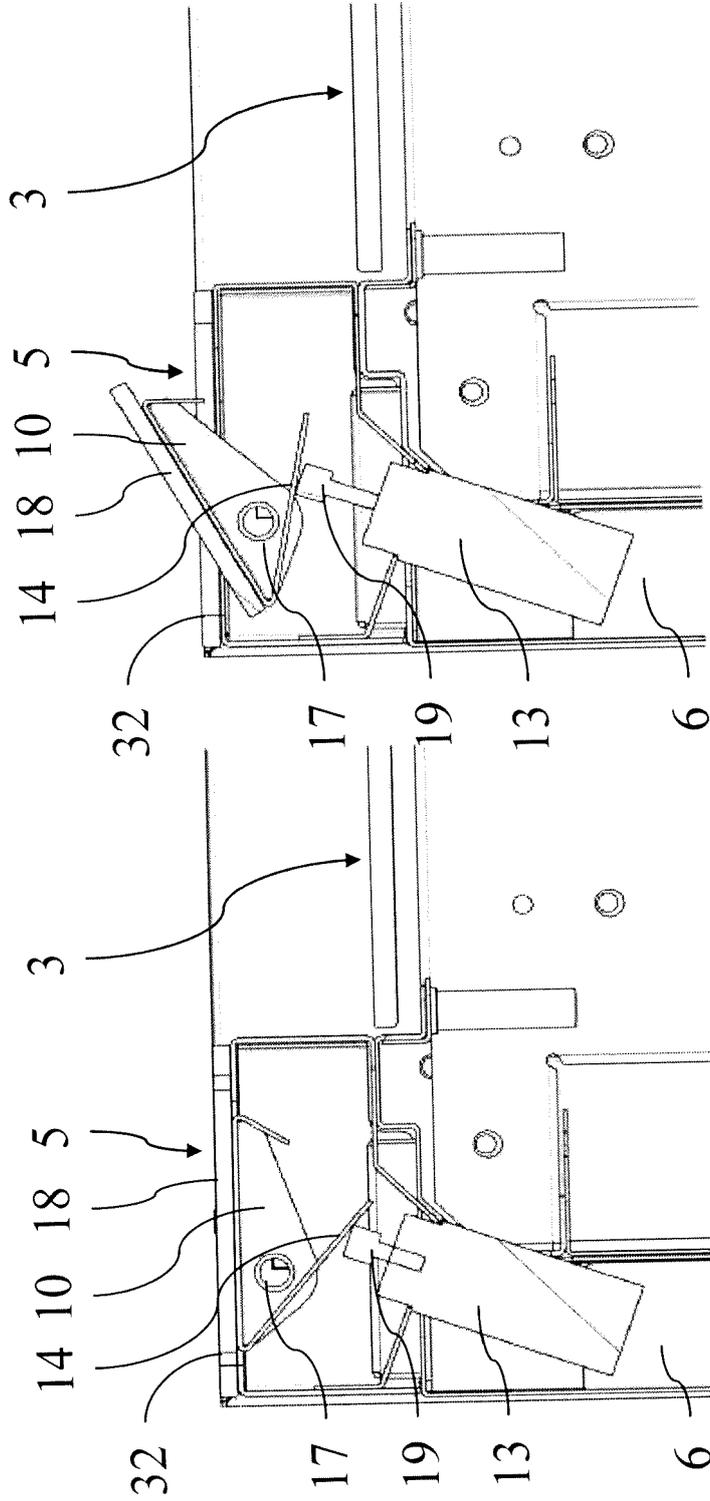
**Fig. 2**



**Fig. 3**



**Fig. 4**



**Fig. 6**

**Fig. 5**



EUROPEAN SEARCH REPORT

Application Number  
EP 18 42 5028

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y A	FR 1 156 581 A (JACQUES DUBOIS) 19 May 1958 (1958-05-19) * column 1, line 1 - column 1, line 10 * * column 1, line 23 - column 1, line 27 * * column 3, line 10 - column 3, line 18 * * column 3, line 24 - column 3, line 45 * * column 4, line 4 * * column 4, line 7 - column 4, line 14 * * column 4, line 49 - column 5, line 2 * * figures 2, 3 *	1-13,15 14	INV. F24C15/20
Y	EP 3 301 375 A1 (MIELE & CIE [DE]) 4 April 2018 (2018-04-04) * paragraphs [0001], [0002], [0004], [0006], [0007], [0008], [0009], [0015], [0021] * * figure 11 *	1-13,15	
Y	EP 3 045 824 A1 (BERBEL ABLUFTECHNIK GMBH [DE]) 20 July 2016 (2016-07-20) * paragraphs [0002], [0003], [0004], [0017], [0029], [0030], [0053] * * figures 1, 4 *	12,13,15	TECHNICAL FIELDS SEARCHED (IPC) F24C
Y	US 4 766 880 A (VON BLANQUET GEORG [DE]) 30 August 1988 (1988-08-30) * column 1, line 6 - column 1, line 11 * * column 1, line 29 - column 1, line 36 * * column 1, line 53 - column 2, line 1 * * column 2, line 22 - column 2, line 26 *	13,15	
A	EP 1 912 024 A2 (ELECTROLUX PROFESSIONAL SPA [IT]) 16 April 2008 (2008-04-16) * figure 2 *	4	
A	US 2 586 023 A (GILLETTE BENJAMIN A) 19 February 1952 (1952-02-19) * figure 2 *	4	
----- -/--			
1 The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 4 October 2018	Examiner Jalal, Rashwan
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	

EPO FORM 1503 03.02 (P04C01)



EUROPEAN SEARCH REPORT

Application Number  
EP 18 42 5028

5

10

15

20

25

30

35

40

45

50

55

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	EP 0 390 988 A1 (NEW WORLD DOMESTIC APPLIANCES [GB]) 10 October 1990 (1990-10-10) * figure 4 *	4	
A	----- US 2010/163549 A1 (GAGAS JOHN M [US] ET AL) 1 July 2010 (2010-07-01) * paragraph [0143] * -----	14	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
Place of search The Hague		Date of completion of the search 4 October 2018	Examiner Jalal, Rashwan
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	

1  
EPO FORM 1503 03.02 (P04C01)

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

EP 18 42 5028

5

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 The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

04-10-2018

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
FR 1156581	A	19-05-1958	NONE	
EP 3301375	A1	04-04-2018	DE 102016117787 A1 EP 3301375 A1	22-03-2018 04-04-2018
EP 3045824	A1	20-07-2016	DE 102015200642 A1 EP 3045824 A1	21-07-2016 20-07-2016
US 4766880	A	30-08-1988	DE 3601460 A1 GB 2185566 A US 4766880 A	23-07-1987 22-07-1987 30-08-1988
EP 1912024	A2	16-04-2008	EP 1912024 A2 US 2008087272 A1	16-04-2008 17-04-2008
US 2586023	A	19-02-1952	NONE	
EP 0390988	A1	10-10-1990	DE 68903272 D1 DE 68903272 T2 EP 0390988 A1 ES 2035552 T3 GB 2212608 A US 4889104 A	26-11-1992 13-05-1993 10-10-1990 16-04-1993 26-07-1989 26-12-1989
US 2010163549	A1	01-07-2010	NONE	