

(19)



(11)

**EP 4 530 536 A1**

(12)

## EUROPEAN PATENT APPLICATION

(43) Date of publication:  
**02.04.2025 Bulletin 2025/14**

(51) International Patent Classification (IPC):  
**F24C 14/00 (2006.01)**

(21) Application number: **23315371.7**

(52) Cooperative Patent Classification (CPC):  
**F24C 14/005**

(22) Date of filing: **27.09.2023**

(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 ME MK MT NL  
NO PL PT RO RS SE SI SK SM TR**  
Designated Extension States:  
**BA**  
Designated Validation States:  
**KH MA MD TN**

(72) Inventors:  
• **LUBRINA, Yves**  
Glenview, IL 60025 (US)  
• **LAGET, Fabrice**  
Glenview, IL 60025 (US)

(74) Representative: **HGF**  
**HGF SAS**  
Chez Regus - Rennes Cesson  
2 rue Claude Chappe  
35510 Cesson Sévigné (FR)

(71) Applicant: **Illinois Tool Works Inc.**  
Glenview, IL 60025 (US)

### (54) DESCALING CIRCUIT

(57) The invention relates to a descaling circuit (200) for a combination oven (100), the circuit (200) comprising: a descaling feed line (230) configured to provide descaling material (220) to a boiler (110) of the combination oven (100); a liquid reservoir (240); a bypass line (250) fluidly connecting the descaling feed line (230) to the liquid reservoir (240) such that a descaling material is provided to the liquid reservoir (240) from the source of descaling material (220), in use; and an oven cavity feed line (260) configured provide descaling material from the liquid reservoir (240) to an oven cavity (120).

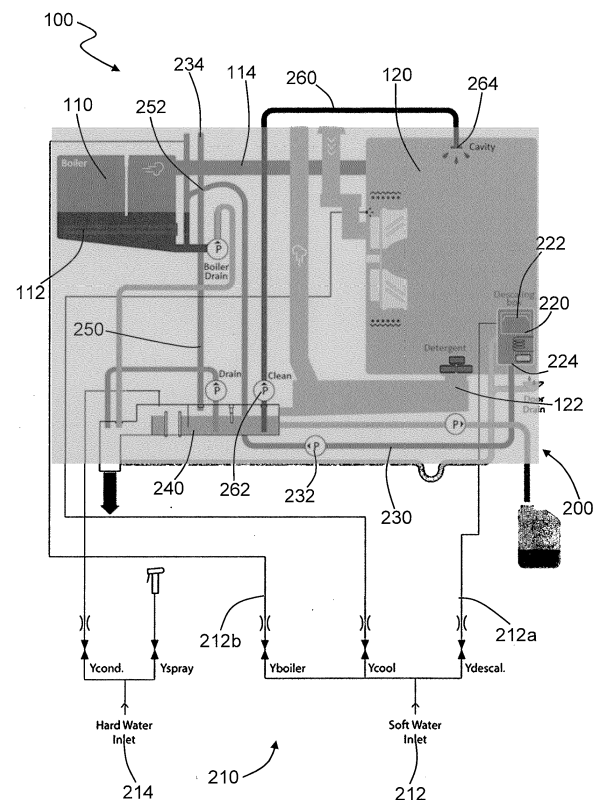


FIGURE 1

**EP 4 530 536 A1**

## Description

### Technical field of the invention

[0001] This invention relates generally to a descaling circuit. More specifically, although not exclusively, this invention relates to a descaling circuit for an oven, and in particular a combination oven, a combination oven comprising a descaling circuit and a method of descaling a combination oven.

### Technical background

[0002] Combination ovens, commonly known as combi ovens, are multifunction ovens that provide both steam and convection cooking technology and are often found in commercial or professional kitchens.

[0003] These ovens include an integrated boiler arranged to provide steam to an oven cavity in order to enable the steam cooking function. Due to their frequency of use in a commercial kitchen, a descaling cycle must be regularly carried out on the boiler and oven cavity.

[0004] It has been found that a separate descaling cycle must often be carried out on each of the boiler and oven cavity, wherein each cycle relies on a separate source of descaling material. It will be appreciated that this increases the time and complexity of oven maintenance.

[0005] In some other cases, a separate descaling cycle is carried out that relies on a single source of descaling material, wherein material used to descale the boiler is then used to descale the oven cavity or vice versa. It will be appreciated that the effectiveness of the second descaling cycle, i.e. that carried out with used material, is less effective than the first descaling cycle.

### Summary of the invention

[0006] It is therefore a first non-exclusive object of the invention to provide a descaling circuit for a combination oven that overcomes, or at least mitigates, the aforementioned drawbacks of the prior art descaling cycles discussed above.

[0007] In accordance with the present invention a descaling circuit for a combination oven is provided, the descaling circuit comprising: a descaling feed line configured to fluidly connect a source of descaling material to a boiler of the combination oven; a liquid reservoir; a bypass line fluidly connecting the descaling feed line to the liquid reservoir such that a portion of descaling material is provided to the liquid reservoir from the source of descaling material, in use; and an oven cavity feed line configured to fluidly connect the liquid reservoir to an oven cavity of the combination oven such that descaling material provided to the liquid reservoir from the bypass line can be provided to the oven cavity, in use.

[0008] The liquid reservoir may be or may comprise a

multi-function liquid reservoir.

[0009] The descaling circuit may comprise a source of descaling material.

[0010] The descaling feed line may comprise a descaling feed pump configured to convey descaling material from the source of descaling material to the boiler, e.g. in use.

[0011] The descaling feed pump may comprise a liquid handling pump, for example a centrifugal pump or a screw pump.

[0012] The bypass line may be fluidly connected to the descaling feed line.

[0013] The bypass line may be connected to the descaling feed line, e.g. downstream of the descaling feed pump.

[0014] The bypass line may be connected to the descaling feed line by a branch pipe.

[0015] The bypass line may be connected to the descaling feed line by a T-piece or T-connector.

[0016] The connection between the descaling feed line and the bypass line may be configured to prevent backflow of descaling material along the descaling feed line towards the descaling feed pump.

[0017] The branch pipe may be configured to prevent backflow of descaling material along the descaling feed line towards the descaling feed pump.

[0018] The descaling feed line may comprise an inverted U-profile upstream of the connection between descaling feed line and bypass line.

[0019] The liquid reservoir may be positioned lower or at a lower elevation than the boiler, e.g. in use.

[0020] The descaling feed line may comprise an apex upstream of the connection between the descaling feed line and the bypass line.

[0021] The descaling feed line may comprise a vent. The vent may be located upstream of the connection between the descaling feed line and the bypass line.

[0022] The bypass line may have a smaller flow area than the descaling feed line.

[0023] Less than 50% of the descaling material conveyed along the descaling feed line, in use, may be provided to the liquid reservoir by the bypass line.

[0024] More than 50% of the descaling material conveyed along the descaling feed line, in use, may be provided to the boiler.

[0025] The oven cavity feed line may comprise a feed pump configured to convey descaling material from the liquid reservoir to the oven cavity, e.g. in use.

[0026] The feed pump may comprise a liquid handling pump, for example a centrifugal pump or a screw pump.

[0027] The oven cavity feed line may terminate with one or more nozzles or spray heads (hereinafter nozzles). The one or more nozzles may be configured to be located within the oven cavity and wherein, in use, the descaling material is provided to the oven cavity via the one or more nozzles.

[0028] The descaling circuit may comprise a drain line. The drain line may be configured to connect the oven

cavity to the liquid reservoir and configured to drain descaling material from the oven cavity to the liquid reservoir, e.g. in use.

**[0029]** The descaling material may comprise a descaling solution.

**[0030]** The descaling material may comprise a powder. The powder may be located within a container, receptacle, tank or reservoir (hereinafter container). The container may be connected with a supply of liquid, e.g. water. The supply of liquid may pass through the powder so as to form the descaling material or descaling solution. The descaling feed line may be connected to the container.

**[0031]** The descaling material may be located within a container, receptacle, tank or reservoir.

**[0032]** The descaling material may be located within a compartment of the combination oven.

**[0033]** The container, receptacle, tank or reservoir may be located within a compartment of the combination oven.

**[0034]** Another aspect of the invention provides a combination oven comprising: a boiler; an oven cavity; and a descaling circuit as described above.

**[0035]** Another aspect of the invention provides a combination oven comprising: a boiler; an oven cavity; and a descaling circuit configured to provide a descaling material to the boiler and the oven cavity, the descaling circuit comprising: a descaling feed line fluidly connecting a source of descaling material to the boiler; a liquid reservoir; a bypass line fluidly connecting the descaling feed line to the liquid reservoir such that a portion of the descaling material is provided to the liquid reservoir from the source of descaling material, in use; an oven cavity feed line fluidly connecting the liquid reservoir to the oven cavity such that the descaling material provided to the liquid reservoir from the bypass line can be provided to the oven cavity, in use.

**[0036]** The combination oven may comprise a source of descaling material.

**[0037]** The descaling feed line may comprise a descaling feed pump configured to convey descaling material from the source of descaling material to the boiler, in use.

**[0038]** The bypass line may be connected to the descaling feed line downstream of the descaling feed pump.

**[0039]** The oven cavity feed line may comprise a feed pump configured to convey descaling material from the liquid reservoir to the oven cavity, e.g. in use.

**[0040]** According to another aspect of the invention, there is provided a method of descaling a combination oven as described above, wherein the method comprises: conveying descaling material along the descaling feed line from a source of descaling material to the boiler using the descaling feed pump; conveying a portion of the descaling material being conveyed along the descaling feed line along the bypass line to the liquid reservoir; conveying the descaling material along the oven cavity feed line from the liquid reservoir to the oven cavity using the feed pump.

**[0041]** For the avoidance of doubt, any of the features

described herein apply equally to any aspect of the invention. For example, the descaling circuit may comprise any one or more features of the combination oven or the method relevant to the descaling circuit and vice-versa.

**[0042]** Within the scope of this application it is expressly intended that the various aspects, embodiments, examples and alternatives set out in the preceding paragraphs, in the claims and/or in the following description and drawings, and in particular the individual features thereof, may be taken independently or in any combination. That is, all embodiments and/or features of any embodiment can be combined in any way and/or combination, unless such features are incompatible. For the avoidance of doubt, the terms "may", "and/or", "e.g.", "for example" and any similar term as used herein should be interpreted as non-limiting such that any feature so-described need not be present. Indeed, any combination of optional features is expressly envisaged without departing from the scope of the invention, whether or not these are expressly claimed. The applicant reserves the right to change any originally filed claim or file any new claim accordingly, including the right to amend any originally filed claim to depend from and/or incorporate any feature of any other claim although not originally claimed in that manner.

#### Brief description of the figures

**[0043]** Embodiments of the invention will now be described by way of example only with reference to the accompanying drawings in which:

Figure 1 is a schematic of a combination oven and descaling circuit in accordance with the present invention.

#### Detailed description of the invention

**[0044]** Referring now to Figure 1, there is shown a combination oven 100 having a descaling circuit 200 configured to carry out a descaling cycle. The combination oven 100 includes a boiler 110 connected to an oven cavity 120. The boiler 110 is configured to provide steam to the oven cavity 120, in use, in order to enable a steam cooking function.

**[0045]** As will be described in greater detail below, the combination oven 100 includes a water supply 210 having a soft water inlet 212 and a hard water inlet 214. A first stream 212a of the soft water inlet 212 is provided to the descaling circuit 200, and in particular to a source of descaling material 220. The source of descaling material 220 is fluidly connected to the boiler 110 by a descaling feed line 230, and is fluidly connected to a liquid reservoir 240 by a bypass line 250. An oven cavity feed line 260 fluidly connects the liquid reservoir 240 to the oven cavity 120 such that descaling material that is conveyed along the bypass line 250 to the liquid reservoir 240 can be conveyed to the oven cavity 120. Therefore, descaling material can be provided to each of the boiler 110 and

oven cavity 120 from a single source of descaling material 220, without having to re-use any descaling material.

[0046] The boiler 110 includes a water supply, provided by a second stream 212b of the soft water inlet 212, and a heating element 112. A conduit 114 fluidly connects the boiler 110 to the oven cavity 120 to allow the passage of steam. The floor of the oven cavity 120 includes a drain 122 fluidly connected to the liquid reservoir 240 and is configured to drain descaling material, grease, cleaning product, air and condensate from the oven cavity 120. The drain 122 may evacuate air to avoid overpressure in the oven cavity 120.

[0047] The source of descaling material 220 is provided within a container 222 and is shown within the oven cavity 120 in Figure 1. However, it will be appreciated that this need not be the case. Instead, the source of descaling material 220 may be located within a separate compartment of the combination oven 100.

[0048] The source of descaling material 220 comprises a powder in this embodiment, and the water supply 212a is configured to pass through the powder from the top of the container 222 towards the bottom of the container 222 so as to form a descaling solution. The descaling feed line 230 is connected to the floor 224 of the container 222.

[0049] The descaling feed line 230 includes a descaling feed pump 232 downstream of the container 222. The descaling feed pump 232 is a centrifugal pump in this embodiment and is configured to convey the descaling solution from the source of the descaling material 220 to the boiler 110. As is shown in Figure 1, the boiler 110 is elevated relative to the source of descaling material 220 and therefore the descaling feed pump 232 is arranged to provide the necessary head in order to provide the descaling solution to the boiler 110. It will be appreciated that the portion of the descaling feed line 230 passing behind the liquid reservoir 240 is continuous, and not broken as may be suggested by Figure 1.

[0050] The bypass line 250 is fluidly connected to the descaling feed line 230 downstream of the descaling feed pump 232 via a branch pipe 252. In order to prevent backflow of descaling solution from the bypass line 250 towards the descaling feed pump 232, the descaling feed line 230 includes a vent 234.

[0051] In the present embodiment, the liquid reservoir 240 is positioned at a lower elevation than the boiler 110 and the branch pipe 252 such that a portion of the descaling solution being conveyed along the descaling feed line 230 by the descaling feed pump 232 is provided to the liquid reservoir 240 via the bypass line 250. In particular, less than 50% of the descaling material conveyed along the descaling feed line 230 is provided to the liquid reservoir 240 by the bypass line 250.

[0052] The oven cavity feed line 260 includes a feed pump 262, in the form of a centrifugal pump in this embodiment, configured to convey the descaling solution from the liquid reservoir 240 to the oven cavity 120. As is shown in Figure 1, the oven cavity 120 is elevated relative to the source of liquid reservoir 240 and therefore the feed

pump 262 is arranged to provide the necessary head in order to provide the descaling solution to the oven cavity 120.

[0053] The oven cavity feed line 260 terminates with one or more nozzles 264 located within the oven cavity 120. In use, the descaling solution is provided to the oven cavity 120 via the one or more nozzles 264. In addition to descaling, it will be appreciated that the oven cavity feed line 260 is also used for cleaning and rinsing the oven cavity 120.

[0054] In order to carry out a descaling cycle on both the boiler 110 and the oven cavity 120 of the combination oven 100, in use, the descaling solution is conveyed along the descaling feed line 230 from the source of descaling material 220 to the boiler 110 using the descaling feed pump 232. A portion of the descaling solution being conveyed along the descaling feed line 230 is conveyed along the bypass line 250, via the branch pipe 252, to the liquid reservoir 240. From the liquid reservoir 240, the descaling solution is conveyed along the oven cavity feed line 260 to the oven cavity 120 using the feed pump 262. Therefore, a descaling solution is provided to each of the boiler 110 and oven cavity 120 from a single source of descaling material 220 without re-using descaling material.

[0055] It will be appreciated by those skilled in the art that several variations to the aforementioned embodiments are envisaged without departing from the scope of the invention.

[0056] It will also be appreciated by those skilled in the art that any number of combinations of the aforementioned features and/or those shown in the appended drawings provide clear advantages over the prior art and are therefore within the scope of the invention described herein.

## Claims

1. A descaling circuit (200) for a combination oven (100), the circuit (200) comprising:

a descaling feed line (230) configured to fluidly connect a source of descaling material (220) to a boiler (110) of the combination oven (100);  
a liquid reservoir (240);  
a bypass line (250) fluidly connecting the descaling feed line (230) to the liquid reservoir (240) such that a portion of descaling material is provided to the liquid reservoir (240) from the source of descaling material (220), in use; and  
an oven cavity feed line (260) configured to fluidly connect the liquid reservoir (240) to an oven cavity (120) of the combination oven (100) such that descaling material provided to the liquid reservoir (240) from the bypass line (250) can be provided to the oven cavity (120), in use.

2. A descaling circuit (200) according to claim 1, comprising a source of descaling material (220).
3. A descaling circuit (200) according to claim 2, wherein the descaling feed line (230) comprises a descaling feed pump (232) configured to convey descaling material from the source of descaling material (220) to the boiler (110), in use. 5
4. A descaling circuit (200) according to claim 3, wherein the bypass line (250) is connected to the descaling feed line (230) downstream of the descaling feed pump (232). 10
5. A descaling circuit (200) according to any preceding claim, wherein the bypass line (250) is connected to the descaling feed line (230) by a branch pipe (252). 15
6. A descaling circuit (200) according to claim 5, wherein the branch pipe (252) is configured to prevent backflow of descaling material along the descaling feed line (230) towards the descaling feed pump (232). 20
7. A descaling circuit (200) according to any preceding claim, wherein the oven cavity feed line (260) comprises a feed pump (262) configured to convey descaling material from the liquid reservoir (240) to the oven cavity (120). 25  
30
8. A descaling circuit (200) according to any preceding claim, wherein the oven cavity feed line (260) terminates with one or more nozzles (264) configured to be located within the oven cavity (120) and wherein, in use, the descaling material is provided to the oven cavity (120) via the one or more nozzles (264). 35
9. A descaling circuit (200) according to any preceding claim, comprising a drain line (122) configured to connect the oven cavity (120) to the liquid reservoir (240) and configured to drain descaling material from the oven cavity (120) to the liquid reservoir (240). 40
10. A combination oven (100) comprising: 45
  - a boiler (110);
  - an oven cavity (120); and
  - a descaling circuit (200) according to any claims 1 to 9. 50

55

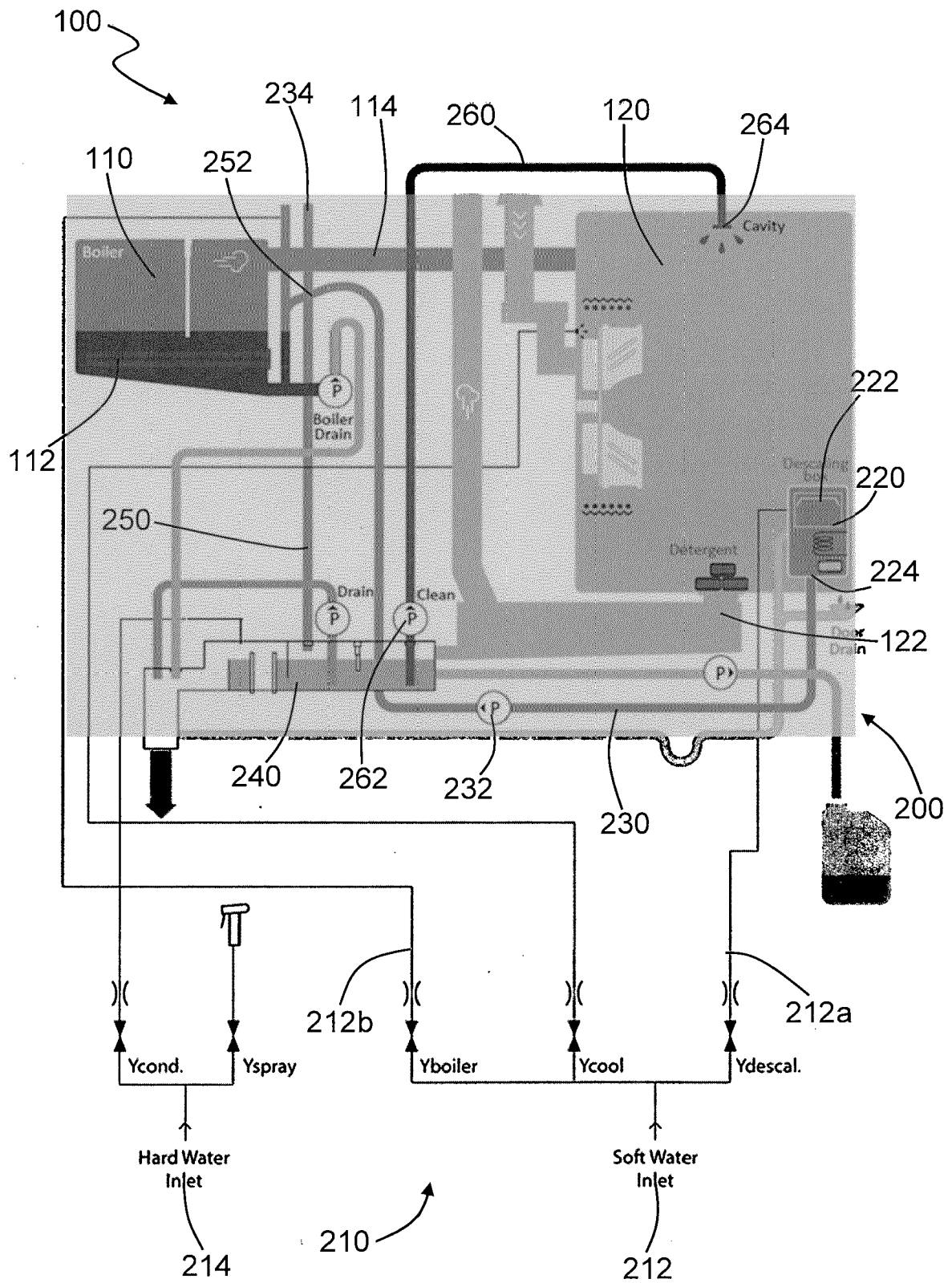


FIGURE 1



## EUROPEAN SEARCH REPORT

Application Number

EP 23 31 5371

## 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | EP 1 953 458 A1 (RATIONAL AG [DE])<br>6 August 2008 (2008-08-06)<br>* paragraphs [0077] - [0078]; figure 1 *<br>----- | 1-10                             | INV.<br>F24C14/00                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                       |                                  | TECHNICAL FIELDS SEARCHED (IPC)         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                       |                                  | F24C                                    |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                       |                                  |                                         |
| Place of search                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                       | Date of completion of the search | Examiner                                |
| The Hague                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                       | 9 February 2024                  | Meyers, Jerry                           |
| CATEGORY OF CITED DOCUMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                       |                                  |                                         |
| X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document<br>T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>.....<br>& : member of the same patent family, corresponding document |                                                                                                                       |                                  |                                         |

EPO FORM 1503 03.82 (P04C01)

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.

09-02-2024

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date |            |
|-------------------------------------------|---------------------|----------------------------|---------------------|------------|
| EP 1953458                                | A1                  | 06-08-2008                 | DE 102007005502 A1  | 31-07-2008 |
|                                           |                     | EP                         | 1953458 A1          | 06-08-2008 |
|                                           |                     | EP                         | 1980792 A2          | 15-10-2008 |
| -----                                     |                     |                            |                     |            |

EPO FORM P0459

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