

CLAIMS

1. Coffee beans roasting system comprising :

5 - a coffee beans roasting apparatus (10), said apparatus comprising :

- . a chamber (1) dedicated to roasting of coffee beans,
- . a heating device (2) to supply a flow of hot air to the chamber,
- . at least one first temperature probe (5) to regulate the temperature of air supplied by the heating device, said first temperature probe being positioned outside the chamber,

10 . a control system (80) configured to control the heating device and configured to reproduce roasting curves each of said roasting curves providing a set of points ($T_{@t_i}$; t_i) representing the temperature to be applied at discrete successive times t_i , respectively, said control of the heating device being based on the temperature T_{reg} regulated by the at least one first temperature probe,

15 and

- at least one second temperature probe (3) configured to be introduced temporarily inside the roasting apparatus to measure the temperature inside the roasting chamber, and

20 - at least one means configured to create a pressure loss of the flow of hot air while the chamber is void of coffee beans in order to simulate the presence of coffee beans inside the chamber during a roasting operation.

2. Coffee beans roasting system according to the precedent claim, wherein :

25 - the heating device (2) of the roasting apparatus comprises an air flow driver (21) and a heater (22) and the control system of the roasting apparatus is configured to operate said air flow driver to adjust the flow of air,

and

30 - the means configured to create a pressure loss of the flow of hot air while the chamber is void of coffee beans is the air flow driver (21).

3. Coffee beans roasting system according to Claim 1 or 2, wherein the means configured to create a pressure loss of the flow of hot air while the chamber is void of coffee beans comprises at least one removable device designed to restrict the flow of hot air inside and/or downstream the chamber (16, 16a, 16b, 16c), optionally said at least one removable device designed to restrict the flow of air comprises a grid, a mesh, a plate with at least one hole and/or a pipe with a venturi design.

4. Coffee beans roasting system according to the Claim 3, wherein the at least one removable device designed to restrict the flow of hot air inside and/or downstream the chamber is an integrated and movable part of the coffee beans roasting apparatus (10), and
5 the roasting apparatus comprises means configured to move the at least one device and to position said device temporary and removably inside or at the outlet of the chamber of the roasting apparatus.

5. Coffee beans roasting system according to Claim 3, wherein :
10 - the dedicated roasting chamber (1a) of the coffee beans roasting apparatus is removable from the roasting apparatus, and
- the coffee beans roasting apparatus comprises an area designed to receive and hold said removable dedicated roasting chamber, and
- the at least one removable device designed to restrict the flow of hot air inside and/or
15 downstream the chamber is part of a calibration chamber (1b), said calibration chamber being configured to be introduced removably inside the holding and receiving area in place of the dedicated chamber.

6. Coffee beans roasting system according to the Claim 3, wherein the means configured to
20 create a pressure loss of the flow of hot air while the chamber is void of coffee beans comprises granular inert objects (17), said granular inert objects being designed to simulate coffee beans.

7. Coffee beans roasting system according to any one of the precedent claims, wherein the
25 roasting apparatus comprises means configured to position said at least one second temperature probe (3) temporary and removably inside or at the outlet of the chamber of the roasting apparatus.

8. Coffee beans roasting system according to the precedent claim, wherein the at least one
30 second temperature probe (3) is an integrated part of the coffee beans roasting apparatus (10) and the roasting apparatus comprises means to move said at least one second probe in the conduit connected to the outlet of the chamber.

9. Coffee beans roasting system according to the Claim 7, wherein the at least one second
35 temperature probe (3) is a device external to the coffee beans roasting apparatus (10) and the coffee beans apparatus comprises an opening designed to introduce the at least one

second temperature probe (3) in an airtight manner inside the chamber or in the conduit (14) connected to the outlet of the chamber.

10. Coffee beans roasting system according to Claim 7, wherein :

- 5 - the dedicated roasting chamber (1a) of the coffee beans roasting apparatus is removable from the roasting apparatus, and
- the coffee beans roasting apparatus comprises an area designed to receive and hold the removable dedicated chamber, and
- the at least one second temperature probe (3) is part of a calibration chamber (1b), said
- 10 calibration chamber being configured to be introduced inside the holding and receiving area in place of the dedicated roasting chamber.

11. Coffee beans roasting system according to Claim 1 wherein the coffee beans roasting apparatus (10) comprises :

- 15 - a chamber (1b) dedicated to calibration, said calibration chamber comprising :
 - . the at least one second temperature probe (3),
 - . and optionally at least one device designed to restrict the flow of air in order to simulate the presence of coffee beans inside the chamber during a roasting operation,
- and
- 20 - means to guide the flow of hot air supplied by the heating device (2) either to the chamber (1a) dedicated to roasting of coffee beans or to the chamber (1b) dedicated to calibration.

12. Coffee beans roasting system according to any one of the precedent claims, wherein the control system (80) of the roasting apparatus is configured :

- 25 - to receive input of measured temperature by said second temperature probe, and
- to implement a calibration process of the roasting apparatus (10) based on said input.

13. Calibration chamber (1b) configured to be introduced in place of the roasting chamber (1a) of a coffee beans roasting apparatus, said coffee beans roasting apparatus (10)

- 30 comprising :
 - . a roasting chamber (1a) to contain coffee beans, said chamber being removable,
 - . a heating device (2) to supply a flow of hot air to the chamber,
 - . at least one first temperature probe (5) to regulate the temperature of air supplied by the heating device, said first temperature probe being positioned outside the chamber,
 - 35 . a control system (80) configured to control the heating device and configured to reproduce roasting curves each of said roasting curves providing a set of points ($T_{@t_i}$; t_i) representing the temperature to be applied at discrete successive times t_i , respectively,

said control of the heating device being based on the temperature T_{reg} regulated by the at least one first temperature probe,

said calibration chamber comprising :

- at least one second temperature probe (3).

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14. Calibration chamber according to the precedent claim. wherein said calibration chamber comprises at least one device designed to restrict the flow of hot air inside said calibration chamber, optionally said calibration chamber comprises :

- a first plate (16a) pierced by holes and positioned at the bottom of the calibration chamber,

10 - a second plate (16c) pierced by holes and positioned downstream the at least one second temperature probe (3), the holes being designed to lead the flow of air to converge to the at least one second temperature probe,

- a third plate (16b) pierced by holes and positioned between the first plate and the at least one second temperature probe.

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15. Calibration chamber according to Claim 13. wherein said calibration chamber is a tube, said tube presenting a transversal section inferior to the transversal section of the roasting chamber of the roasting apparatus, optionally said tube comprises :

- a first plate (16a) pierced by at least one hole and positioned at the bottom of the calibration chamber, and/or

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- a second plate (16c) pierced by at least one hole and positioned downstream the at least one second temperature probe (3).

16. Process for calibrating the roasting apparatus of a system according to any one of
25 Claims 1 to 12 comprising the steps of :

a - introducing temporarily the at least one second temperature probe (3) inside the roasting apparatus,

30 b - while the chamber is void of beans, controlling the heating device to reproduce a preset curve R_{set} , said preset curve providing a series of points ($T_{set@t_i}$; t_i) representing the temperature $T_{set@t_1}$, $T_{set@t_2}$, ... $T_{set@t_{final}}$ to be applied at preset corresponding successive times t_1 , t_2 , ..., t_{final} respectively, said control being based on the temperature T_{reg} measured by the at least one first temperature probe (5),

35 and creating a pressure loss of the flow of hot air in order to simulate the presence of coffee beans inside the chamber during said reproduction of the preset curve R_{set} ,

c - during the reproduction of the preset curve R_{set} , measuring the temperature T_{cal} in function of time inside the chamber at the at least one second temperature probe enabling the determination of at least a set of points ($T_{cal}@t_i$; t_i),

- 5 d - comparing the temperature $T_{cal}@t_i$ measured at at least one time t_i with the temperature $T_{ref}@t_i$ at said same time t_i of a pre-determined reference curve R_{ref} obtained with the master roasting apparatus (M), said reference curve R_{ref} representing the temperature T_{ref} measured in the chamber of the specific master apparatus (M) while controlling the heating device of the master apparatus to reproduce said preset curve R_{set} ,

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e - based on this comparison, calibrating the roasting apparatus (X) by applying a correction to the feedback loop regulation, preferably by applying a correction to the temperature T_{reg} measured by the first temperature probe (5) or by applying a correction to the temperatures $T@t_i$ provided by the roasting curves to be reproduced by the roasting apparatus (X).

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