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(71) Applicant: **Unox S.p.A.**
35010 Vigodarzere (Padova) (IT)

(72) Inventor: **FRANZOLIN, Enrico**
35010, VIGODARZERE PD (IT)

(74) Representative: **Modiano, Micaela Nadia**
Dr. Modiano & Associati SpA
Via Meravigli 16
20123 Milano (IT)

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(54) Oven with forced hot air circulation, particularly for cooking food

(57) An oven with forced hot air circulation, particularly for cooking food, comprising a muffle (11) in which the food to be cooked is placed and to the rear of which a ventilation chamber (12) is associated, the chamber being connected to the muffle (11) and accommodating means for the heating and forced circulation of air. The forced circulation means are constituted by at least one fan (13, 113, 114), the shaft (15) of which is supported

and actuated by a motor drive (16) which is fixed externally with respect to the back (17) of the chamber (12), the shaft (15) passing through a hole (18) in the back (17), the rim of which forms, with the shaft (15), an annular intake port (19); the cross-section of the intake port (19) is such as to optimize the exchange of air inside the oven (10), in relation to the position and cross-section of the inlet (20) of a stack (21) for venting from the ventilation chamber (12).

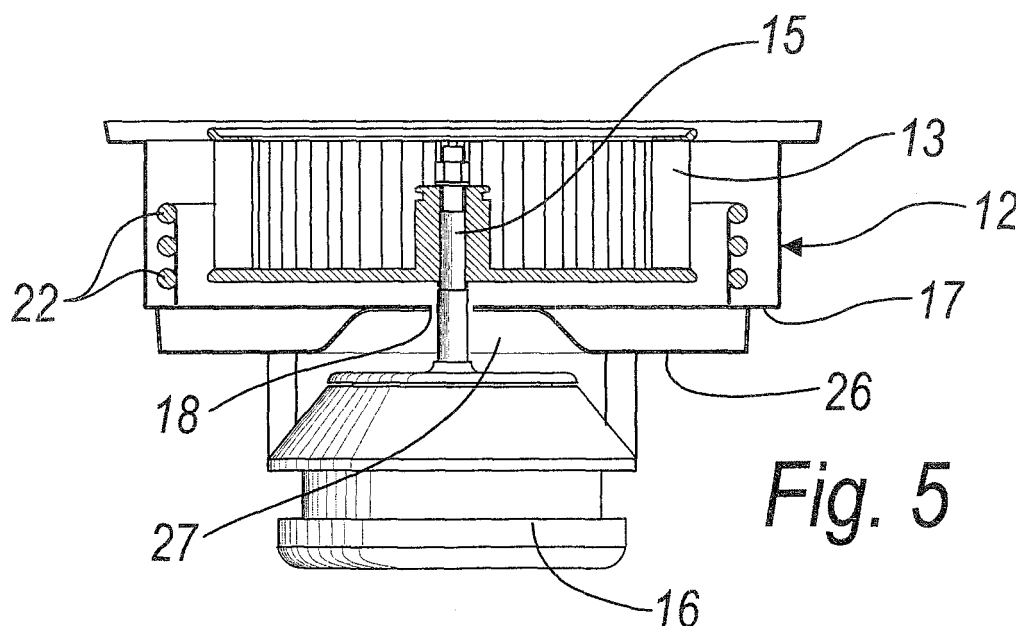


Fig. 5

Description

[0001] The present invention relates to an oven with forced hot air circulation, particularly for cooking food.

[0002] Ovens with forced hot air circulation for cooking food generally comprise a muffle, in which the food to be cooked is arranged and behind which a ventilation chamber is associated, such chamber being connected to the muffle and accommodating means for producing the heating and forced circulation of air.

[0003] Such hot air circulation ovens are highly appreciated because of their ability to cook in an optimum manner food even when fully loaded, thanks to the uniform and constant distribution of the airflow within the muffle.

[0004] However, water vapor, released by the food being cooked, forms within the muffle.

[0005] This steam is detrimental to the quality of the cooking of many foods, especially croissants and brioches, which instead of browning due to the formation of a fragrant surface crust fail to rise, assuming a rubbery consistency.

[0006] Further, the accumulation of steam inside the oven can cause inconvenience when the oven access door is opened, since the steam, in addition to annoying a user while removing the food from inside the oven, can escape in such an amount that it cannot be aspirated completely by the hood that is generally arranged above the oven and spreads undesirably into the surrounding environment.

[0007] For quick evacuation of the steam from the muffle, ovens are currently known which have, for example, means for the controlled inflow of air, which are constituted by a tube which is connected to the inside of the oven at one end and to the outside at the other end.

[0008] The inlet of the tube arranged outside is controlled by a mushroom-type flow control element, which is actuated by a solenoid inductor and is contrasted by a compression spring.

[0009] The end of the tube that lies inside the oven instead tapers, so that when the flow control element is open, air flows into the muffle by being aspirated by the lower pressure caused by the smaller cross-section of the tube end (Venturi effect).

[0010] Moreover, opposite the air intake tube there is a vent stack for the outflow of the steam, which is propelled by the incoming air.

[0011] These intake means, although being controlled and easily programmable in coordination with the steps for cooking the food, are formed by several components, which are expensive as such and in terms of assembly time.

[0012] Further, the internal end of the air intake tube is arranged in a corner of the muffle, while the inlet of the stack is at the opposite corner.

[0013] This arrangement does not allow to optimize the uniformity of the temperature and humidity in the muffle, with consequent different cooking qualities for the food.

[0014] The aim of the present invention is to provide an oven with forced hot air circulation, particularly for cooking food, which can obviate the drawbacks of known types of oven.

[0015] Within this aim, an object of the present invention is to provide an oven which is structurally simpler and cheaper, both in terms of components and in terms of assembly times.

[0016] Another object of the present invention is to provide an oven in which the steam is evacuated no less effectively than in known ovens.

[0017] Another object of the present invention is to provide an oven in which the degree of humidity in the muffle is more uniform than in known ovens.

[0018] A further object of the present invention is to provide an oven with forced hot air circulation, particularly for cooking food, which can be manufactured cheaply with known systems and technologies.

[0019] This aim and these and other objects, which will become better apparent hereinafter, are achieved by an oven with forced hot air circulation, particularly for cooking food, of the type which comprises a muffle in which the food to be cooked is placed and to the rear of which a ventilation chamber is associated, said chamber being connected to said muffle and accommodating means for the heating and forced circulation of air, said oven being characterized in that said forced circulation means are constituted by at least one fan, the shaft of which is supported and actuated by a motor drive which is fixed externally with respect to the back of said chamber, said shaft passing through a hole in said back, the rim of which is adapted to form, with said shaft, an annular intake port whose cross-section is such as to optimize the exchange of air inside the oven, in relation to the position and cross-section of the inlet of a stack for venting from the ventilation chamber.

[0020] Further characteristics and advantages of the invention will become better apparent from the following detailed description of a preferred but not exclusive embodiment thereof, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a rear perspective view of an oven according to the invention;

Figure 2 is a perspective view of the air heating and circulation means of an oven according to the invention in a first embodiment;

Figure 3 is a view of a detail of an oven according to the invention in its first embodiment;

Figure 4 is a sectional view of another detail of an oven according to the invention;

Figure 5 is a sectional side view of an oven according to the invention;

Figure 6 is a perspective view of the air heating and circulation means of an oven according to the invention in a second embodiment thereof.

[0021] With reference to the figures, an oven with

forced hot air circulation, particularly for cooking food, according to the invention, is generally designated by the reference numeral 10.

[0022] The oven 10 comprises a muffle 11, in which the food to be cooked is placed.

[0023] A ventilation chamber 12 is arranged to the rear of the muffle 11 and is connected thereto.

[0024] The chamber 12 accommodates means for the heating and forced circulation of air.

[0025] In a first embodiment of the invention, shown in Figures 1 to 5, the forced circulation means are constituted by a fan 13, a shaft 15 of which is supported and actuated by a motor drive 16, which is fixed externally with respect to a back 17 of the chamber 12.

[0026] The means for heating the air inside the ventilation chamber 12 are constituted by a coiled electrical resistor 22.

[0027] The coils 22 surround the fan 13, heating the air which it propels radially.

[0028] The shaft 15 passes through a hole 18, which is provided in the back 17 and the rim of which, according to the invention, forms with the shaft 15 an annular intake port 19.

[0029] The shaft, differently from what is known, therefore does not rest on the rim of the hole 18 by interposing gaskets or bearings, but is supported in a cantilevered fashion by the motor drive 16.

[0030] Intake occurs, as shown schematically in Figure 4, owing to the lower pressure that occurs inside the chamber 12 in the region that surrounds the shaft 15 and thanks to the cross-section of the annular port 19, which is such as to optimize the exchange of the air within the oven 10, in relation to the position and cross-section of an inlet 20 of a stack 21 for venting from the chamber 12.

[0031] The motor drive 16, which in the embodiment described here is an electric motor, is fixed by means of screws to a sheet metal support 26, which has, around the hole 18, a concave portion 27 suitable to increase the Venturi effect generated by the annular port 19, forming a region at lower pressure than the space that surrounds the motor drive 16, which draws air which is then aspirated by means of the annular port 19 into the chamber 12.

[0032] The intake of the air by means of the port 19 that surrounds the shaft 15 causes the ambient-temperature air to strike both the motor 16 and the fan 13, cooling their components (bearings, the shaft 15, et cetera) and accordingly extending their life.

[0033] The motor drive 16 of an oven 10 according to the invention operates at a temperature which is up to 35°C lower than the motor drives provided in known ovens.

[0034] The inlet 20 of the vent stack 21 is open on the back 17 of the ventilation chamber 12 and is provided with baffle means, which are adapted to optimize the conveyance of the humid air to be eliminated into the stack 21.

[0035] The inlet 20 of the vent stack 21 opens in the

region of maximum pressure of the air stream on the internal face of the back 17 of the ventilation chamber 12.

[0036] In this region, the humid air is therefore propelled directly into the stack 21.

5 **[0037]** In the first embodiment of the oven 10 according to the invention described so far, which has a single fan 13, the baffle means are constituted by a flap 23 which is perpendicular to the back 17.

10 **[0038]** The flap 23 is arranged on a diameter of the inlet 20, a position which has been found experimentally to be the optimum one, since the motor drive 16 is of the reversible type.

15 **[0039]** This entails that the flap 23 must divert with equal efficiency the air in the intake 20 both when said air arrives predominantly against one face thereof and when it arrives against the opposite face.

[0040] In particular, the flap 23 lies substantially on a plane which is tangent to the cylinder formed by the coils of the resistor 22.

20 **[0041]** The flap 23 has a substantially L-shaped contour, with a first part 23a thereof which is arranged in the ventilation chamber 12 and is rigidly coupled thereat to the back 17 with threaded couplings, while a second part 23b thereof is inserted within the inlet 20.

25 **[0042]** In a second embodiment of the oven according to the invention, designated by the reference numeral 110 in Figure 6, there are two fans 113 and 114.

30 **[0043]** In such second embodiment, the baffle means are constituted by a portion 123a of a partition 123 which is perpendicular to the back 117 of the chamber 112.

[0044] The partition 123 separates the ventilation chamber into two compartments 112a and 112b, each of which contains one of the two fans 113 and 114.

35 **[0045]** The partition 123 is also perpendicular to the bottom 124 of the ventilation chamber 112.

[0046] The inlet 120 is arranged substantially centrally between the two fans 113 and 114, a position in which its ability to collect the vapors propelled by the fans is optimized.

40 **[0047]** The flap 23 of the first embodiment of the invention and the partition 123 of the second embodiment are both made of blanked and folded metal plate, with great savings in material and machining.

45 **[0048]** In practice it has been found that the invention thus described solves the problems noted in known types of oven with forced hot air circulation, particularly for cooking food.

[0049] In particular, the present invention provides an oven which is structurally simpler and cheaper, both in terms of components and in terms of assembly times.

50 **[0050]** Particularly complicated components dedicated to intake and electrically-actuated flow control elements, as in known types, are in fact not present.

55 **[0051]** Moreover, the present invention provides an oven in which the steam is evacuated no less effectively than in known ovens, and indeed more effectively, thanks to the particular placement of the stack inlet in the point of maximum pressure of the air on the back 17 of the

ventilation chamber 12.

[0052] Further, the present invention provides an oven in which the degree of humidity in the muffle is more uniform than in known ovens, thanks to the intake of air from outside in a central region of the ventilation chamber.

[0053] Such central intake region adds the advantage of reduced overheating of the motor drive 16 and of the shaft 15, with consequent advantages regarding the lifespan of these components.

[0054] Moreover, the present invention provides an oven with forced hot air circulation, particularly for cooking food, which can be manufactured cheaply with known systems and technologies.

[0055] In practice, the materials employed, so long as they are compatible with the specific use, as well as the dimensions, may be any according to requirements and to the state of the art.

[0056] The disclosures in Italian Patent Application No. PD2005A000099 from which this application claims priority are incorporated herein by reference.

[0057] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. An oven with forced hot air circulation, particularly for cooking food, of the type which comprises a muffle (11) in which the food to be cooked is placed and to the rear of which a ventilation chamber (12) is associated, said chamber being connected to said muffle (11) and accommodating means for the heating and forced circulation of air, said oven (10) being **characterized in that** said forced circulation means are constituted by at least one fan (13, 113, 114), the shaft (15) of which is supported and actuated by a motor drive (16) which is fixed externally with respect to the back (17) of said chamber (12), said shaft (15) passing through a hole (18) in said back (17), the rim of which is adapted to form, with said shaft (15), an annular intake port (19) whose cross-section is such as to optimize the exchange of air inside the oven (10), in relation to the position and cross-section of the inlet (20) of a stack (21) for venting from the ventilation chamber (12).
2. The oven according to claim 1, **characterized in that** said inlet (20) of the vent stack (21) is open on the back (17) of the ventilation chamber (12) and is provided with baffle means adapted to optimize the conveyance, in the stack (21), of the humid air to be eliminated.
3. The oven according to one or more of the preceding claims, **characterized in that** said inlet (20) of the vent stack (21) opens in the region of maximum pressure of the air stream on the internal face of the back (17) of said ventilation chamber (12).
4. The oven according to one or more of the preceding claims, **characterized in that** said motor drive (16) is fixed to a metal plate support (26), which has, around the hole (18), a concave portion (27), which is adapted to increase the Venturi effect generated by the annular port (19), said concave portion (27) being adapted to form a region of lower pressure with respect to the space that surrounds the motor drive (16), which draws air suitable to be aspirated by means of the annular port (19) inside the chamber (12).
5. The oven according to one or more of the preceding claims, **characterized in that** said means for heating the air inside the ventilation chamber (12) are constituted by a coiled electric resistor (22), its coils being adapted to surround said at least one fan (13, 113, 114), heating the air moved radially thereby.
6. The oven according to one or more of the preceding claims, **characterized in that** it comprises one of said at least one fan (13), said baffle means being constituted by a flap (23), which is perpendicular to the back (17) of the chamber (12) and is arranged on a diameter of said inlet (20).
7. The oven according to claim 6, **characterized in that** said flap (23) is substantially L-shaped, a first part thereof (23a) being arranged in the ventilation chamber (12) and being rigidly coupled to said back (17), a second part thereof (23b) being inserted within said inlet (20).
8. The oven according to claims 6 and 7, **characterized in that** said flap (23) lies substantially on a plane which is tangent to the cylinder formed by the coils of the resistor (22).
9. The oven according to claims 1 to 5, **characterized in that** it comprises two of said at least one fan (113, 114), said baffle means being constituted by a portion (123a) of a partition (123), which is perpendicular to the back (117) of the chamber (112) and is adapted to separate said ventilation chamber into two compartments (112a, 112b), each of which contains one of said two fans (113, 114).
10. The oven according to claim 9, **characterized in that** said partition (123) is perpendicular to the bottom (124) of the ventilation chamber (112).
11. The oven according to one or more of the preceding

claims, **characterized in that** said flap (23) and said partition (123) are made of thin blanked and folded sheet metal.

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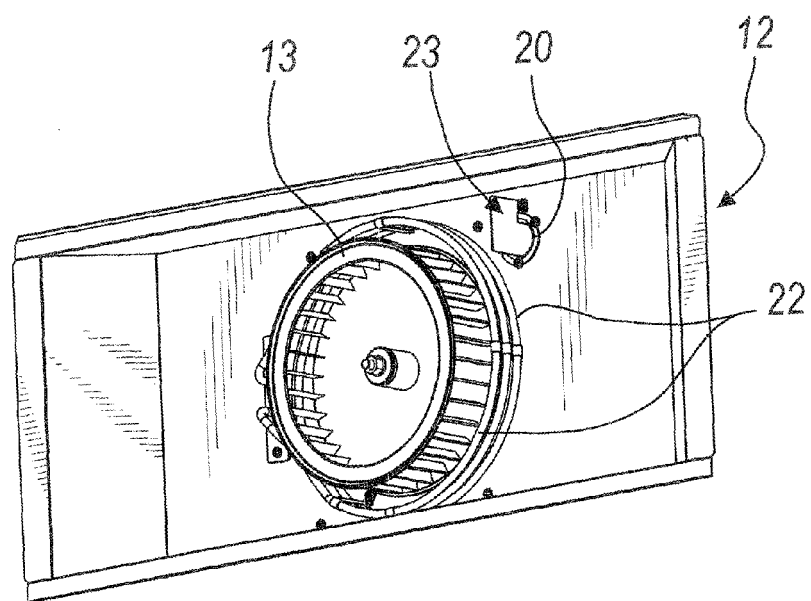
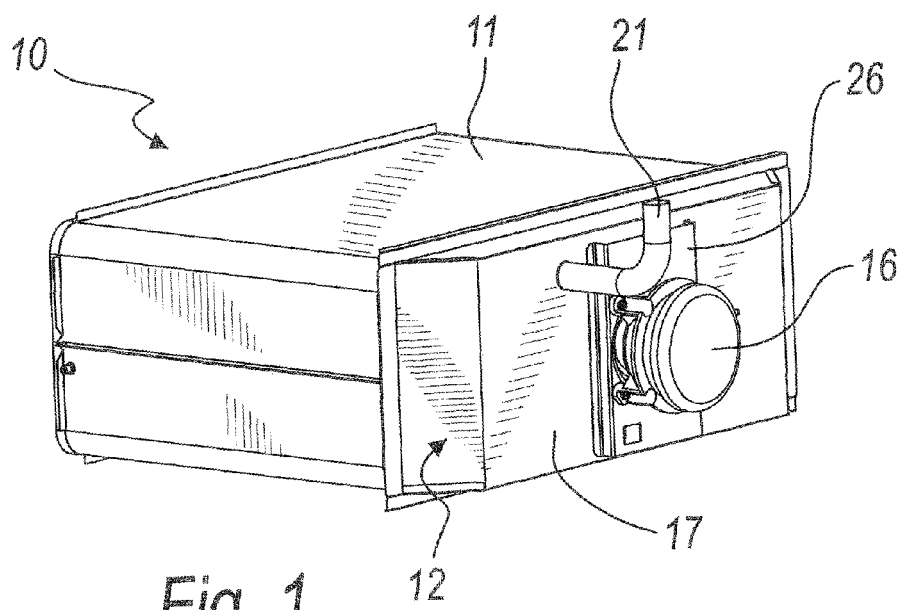
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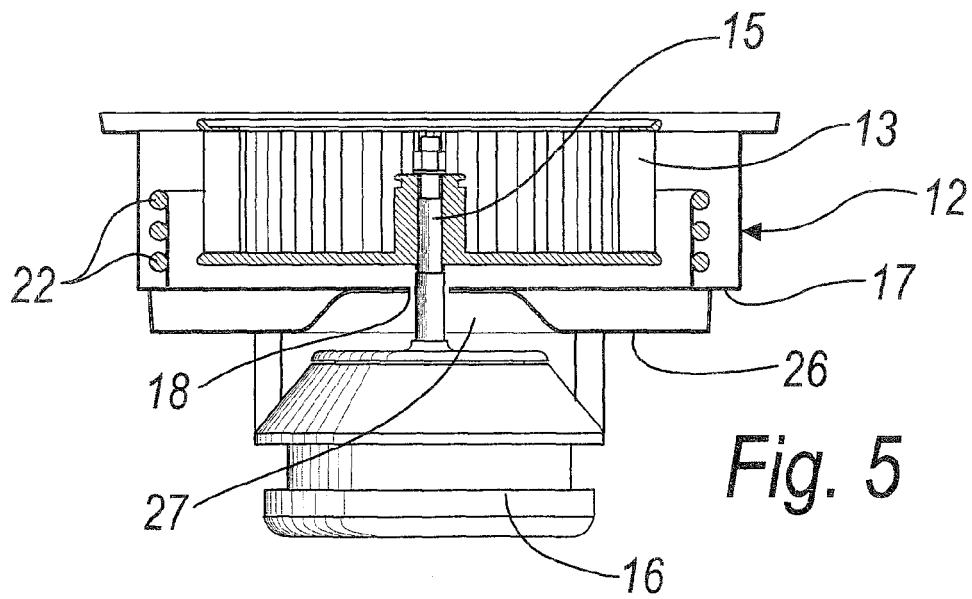
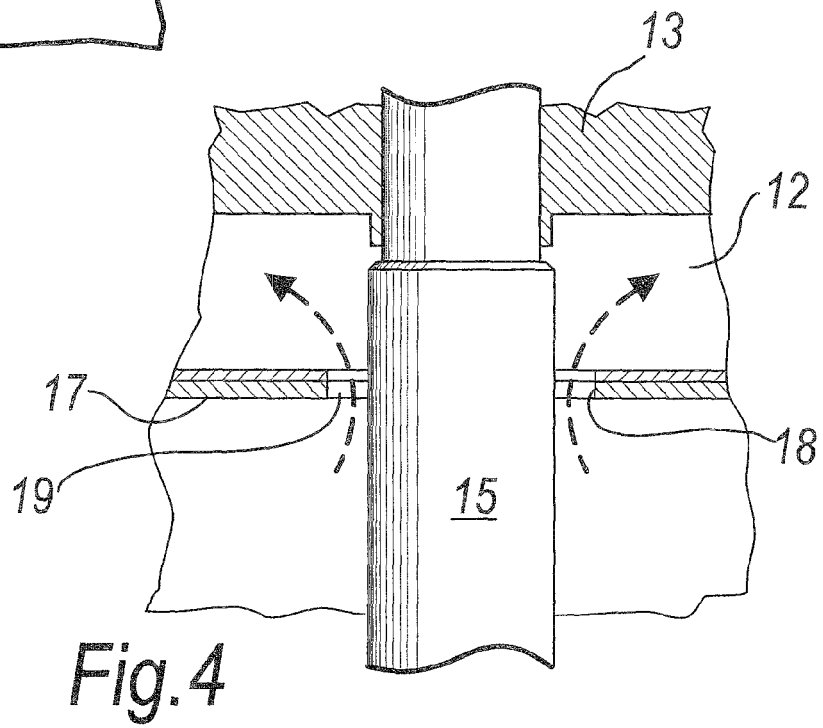
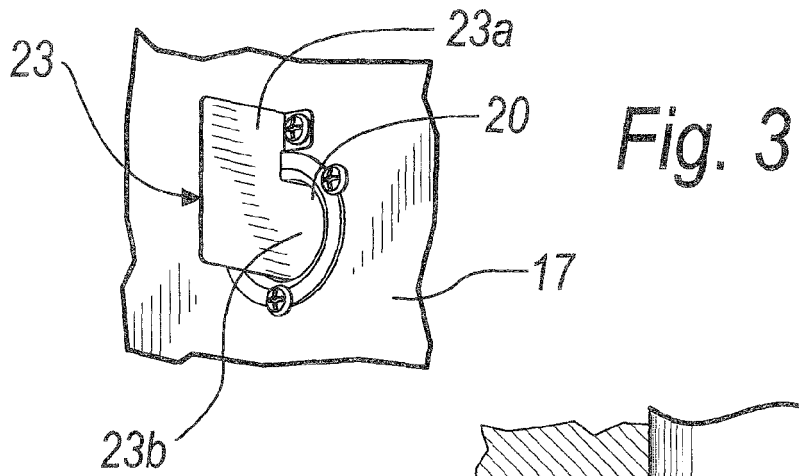
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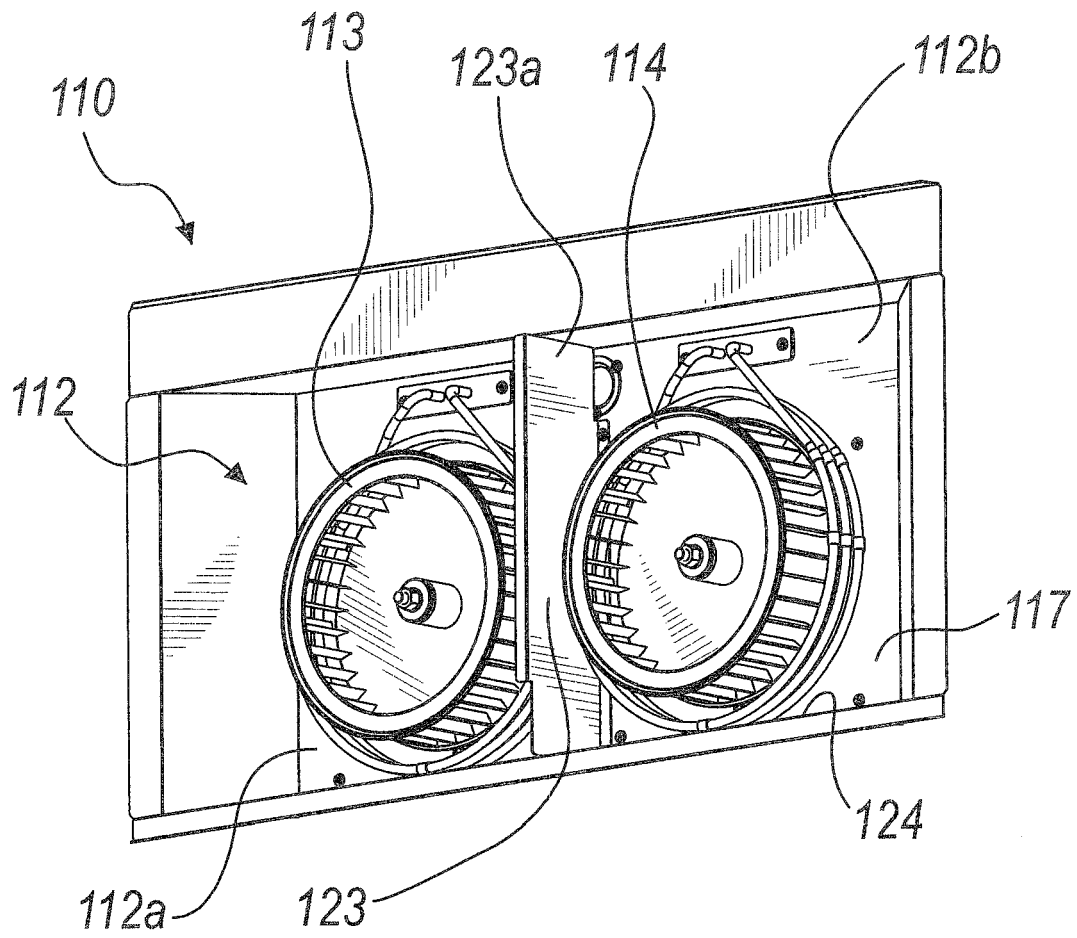


Fig. 6

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- IT PD20050099 A [0056]