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(54) Oven and method for its operation

(57) The invention relates to an oven (1), especially to a domestic oven, with a cooking cavity (2), wherein radiant heating means (3) are arranged in the cavity (2) for grilling food placed in the cavity (2). To improve the grilling performance the invention is characterized in that

fan means (4) are arranged in the cavity (2) for generating a slow air flow (5) within the cavity (2), wherein the air flow (5) is low enough not to influence significantly the radiation heat (6) of the grill means (3). Furthermore, the invention relates to a method for operating such an oven.

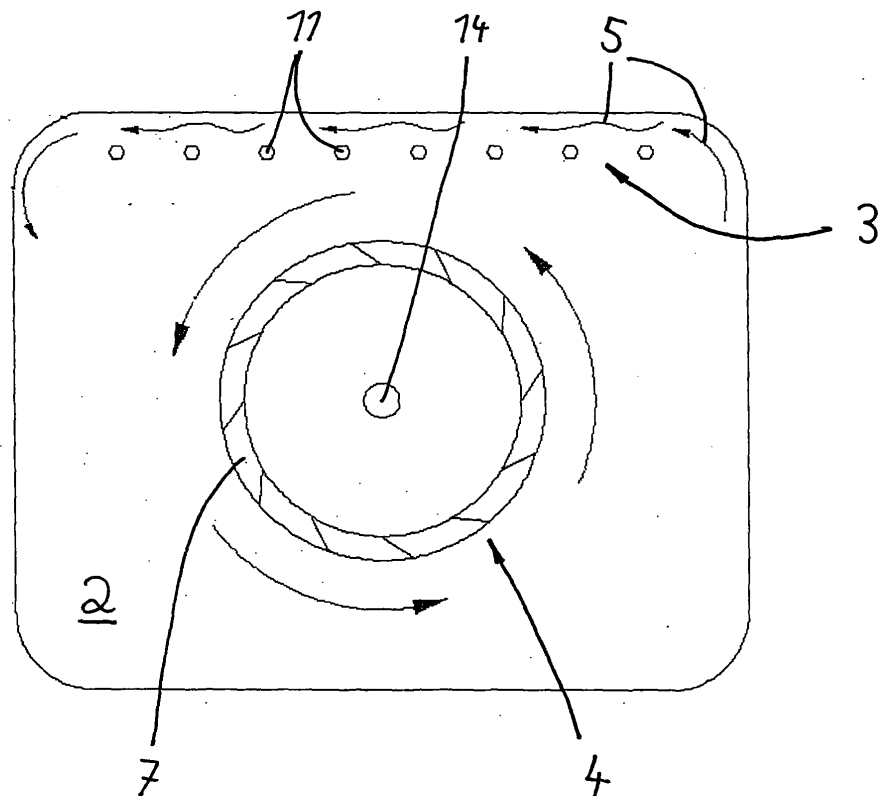


Fig. 3

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Description

[0001] The invention relates to an oven, especially to a domestic oven, with a cooking cavity, wherein grill means are arranged in the cavity for grilling food placed in the, cavity. Furthermore, the invention relates to a method for operating such an oven.

[0002] Ovens of this kind are well known in the art and useful for an effective grilling of food placed in the cavity of the oven. The grill function used today does not use any convective movement of the air in the oven cavity. On the contrary, it is aimed that the heat is transferred almost to 100 % to the food by radiation to obtain a good grilling result. When the grill is used in this way, the top part of the oven is heated by radiation and most importantly by natural convection around the grill element, as long as it is mounted inside the cavity.

[0003] In distinction to hot air ovens the heat is transferred during the grilling operation mainly by radiation, which is beneficial in some cases. In the case of a hot-air cooking operation air is heated and fed to the food in the cavity.

[0004] The grill element will normally reach a surface temperature above 500 to 600 °C. Consequently, the temperature of the cavity roof can easily reach more than 400 to 450 °C. Below the grill the air is only heated slowly, because the natural convection primarily occurs around the grill element. Therefore, the air in the lower part of the oven is only heated slowly by a combination of conduction in the air and heating from the walls and bottom that are heated by the radiation from the grill. Therefore, the food is mainly heated by radiation from the grill element.

[0005] Due to the quite high temperatures of the roof of the cavity during grilling operation it is problematic to cover the inside of the cavity with a non-stick coating which normally cannot bear temperatures above 325 °C.

[0006] Therefore, it is an object of the invention to provide an oven, especially a domestic oven, which allows an effective grilling operation but makes sure that the maximum temperature of the roof of the oven does not exceed a temperature at which the use of a usual non-stick coating would not be possible. Furthermore, the efficiency of the grilling operation has to be improved.

[0007] The solution of this object according to the invention relating to an oven is characterized in that fan means are arranged in the cavity for generating a slow air flow within the cavity, wherein the air flow is low enough not to influence significantly the radiation heat of the grill means.

[0008] The air flow produced by the fan means is to be "low", i. e. it is not comparable to the air flow used in hot-air ovens. Consequently, the radiation heat effect should be maintained substantially. The heat brought into the food is aimed to be at least 75 % due to radiation. In the case of hot-air ovens the main heat introduction into the food is done by convection of the hot air and not by radiation.

[0009] More specifically, the fan means are adjustable to having a fan rotating with a speed between 50 rpm and 1,000 rpm. Compared with the fan employed for a hot-air oven, which usually operates at a speed between 1,500 and 2,500 rpm, the fan speed according to the present invention is relatively low, i. e. at a maximum of about 66 % of the minimum speed of a fan used for hot-air applications. Preferably, the fan means are adjustable to having the fan rotating with a speed between 200 rpm and 600 rpm.

[0010] As can be seen, a relatively low air flow is produced according to the present invention.

[0011] The fan means can be arranged at a reverse side of the cavity, opposite to a door of the cavity. Furthermore, the grill means can be arranged in a top region (roof region) of the cavity.

[0012] Preferably, the grill means are formed by a heating coil which extends in a plane. Usually, the grill means are an electrical heating element.

[0013] The method for operating an oven, especially of a domestic oven, employs an oven with a cooking cavity, wherein grill means are arranged in the cavity for grilling food placed in the cavity. The method is characterized in that an air flow is generated by fan means, which are arranged in the cavity, wherein the air flow is low enough not to influence significantly the radiation heat of the grill means.

[0014] Preferably, the fan of the fan means is operated at a speed between 50 rpm and 1,000 rpm, most preferably at a speed between 200 rpm and 600 rpm.

[0015] The present invention thus describes a combined use of the grill element of the oven with a fan mounted preferably at the back wall of the oven cavity, operated at a speed preferably between 50 and 800 rpm. Such a fan is normally present in a convection oven and is normally also equipped with a ring-shaped heating element, to provide hot air for the convection cooking mode. Hot air cooking normally involves a fan speed of 1,500 to 2,500 rpm, but at this high speed the grill element is cooled to such a degree that the heat is mainly transferred by convection, which is aimed for in the case of a hot-air oven.

[0016] However, by lowering the speed the invention has observed the following beneficial effect: The roof of the oven is no longer heated by the cushion of hot air from the natural convection around the grill element; the grill element is still hot enough to make sure that the main heat transfer to the food is done by radiation. The slow air speed resulting from the slow fan ensures that a more even distribution of the air temperature is obtained. This in fact improves the result of the grilling compared to normal grill mode as the gentle convection provides an extra heat transfer without drying the surface excessively. In addition the grill effect becomes more uniformly distributed.

[0017] The slow fan moves the air heated by the grill element away from the roof, and thereby roof temperatures of less than 325 °C can be maintained even with

grill element surface temperatures up to 550 °C.

[0018] Consequently, the invention has the following advantages:

[0019] The grilling effect is distributed more evenly on the food as it is a combination of radiation and convection, but with a large percentage of it from radiation.

[0020] The maximum temperature in the roof of the oven and on the top part of the walls is reduced to below 325 °C for an oven centre air temperature setting of 250 °C, making the use of non-stick coatings with temperature limits in this range inside the cavity possible.

[0021] The grilling performance of a household oven grill is thus improved significantly.

[0022] In the drawings an embodiment of the invention is depicted.

Fig. 1 shows schematically a cross-sectional side view of a domestic oven,

Fig. 2 shows the cavity of the oven in view "A" according to fig. 1 with a fan standing still (static grill mode) and

Fig. 3 shows the cavity of the oven in view "A" according to fig. 1 with rotating fan (slow fan grill mode).

[0023] Fig. 1 shows a domestic oven 1. It has a cooking cavity 2 which can be opened by a door 9 to put food into the cavity 2 and to take cooked food out of it. The oven 1 is equipped with grill means 3. The grill means are a heating coil 11 which are arranged in the top region 10 (roof region) of the cavity 2. Opposite to the door 9, the cavity 2 has a reverse side 8. Here, fan means 4 are arranged. The fan means 4 have a fan 7 which is mounted on a shaft 12, which in turn is driven by an electrical motor 13.

[0024] The view "A" according to fig. 1 is shown in fig. 2. Here the fan 7 is not moving. The grill means 3 are on power so that radiation heat 6 is generated which is shown in fig. 2 only schematically.

[0025] The operation according to the invention is depicted in fig. 3. Here the fan 7 is rotating around the axis 14. Thus, a slow air flow 5 is generated which is indicated by arrows.

[0026] According to the invention the fan means 4 are arranged in the cavity 2 for generating the slow air flow 5 within the cavity 2, wherein the air flow 5 is low enough not to influence significantly the radiation heat 6 of the grill means 3. Specifically, the fan 7 rotates with a revolution which is relatively low compared with usual operation in hot-air ovens. Here, the speed of the fan 7 is at a maximum of 1,000 rpm, preferably significantly below that value.

[0027] The slow air flow 5 thus cools the roof of the cavity 2 in such a way that the maximum temperature is approximately below 325 °C. This allows the coating of the inside of the cavity with a non-stick cover which facilitates to keep the inside of the cavity 2 clean.

[0028] Also, the efficiency of the grilling operation is improved. The heat is better distributed, but without having an effect as known from hot-air applications. On the contrary the major part of the heat introduction is done by radiation, so that the food in the cavity is grilled.

[0029] It is possible to connect the motor 13 with a control unit so that a desired speed of the fan 7 can be adjusted and maintained. It is possible to input the desired revolution of the fan. First suitable effects are obtained when the fan 7 rotates with a speed of 50 rpm. This speed is not comparable with that one necessary to establish a hot-air mode.

Reference Numerals

[0030]

- | | |
|----|----------------------|
| 1 | Oven (domestic oven) |
| 2 | Cavity |
| 3 | Grill means |
| 4 | Fan means |
| 5 | Slow air flow |
| 6 | Radiation heat |
| 7 | Fan |
| 8 | Reverse side |
| 9 | Door |
| 10 | Top region |
| 11 | Heating coil |
| 12 | Shaft |
| 13 | Motor |
| 14 | Axis |

Claims

1. Oven (1), especially domestic oven, with a cooking cavity (2), wherein grill means (3) are arranged in the cavity (2) for grilling food placed in the cavity (2), **characterized in that** fan means (4) are arranged in the cavity (2) for generating a slow air flow (5) within the cavity (2), wherein the air flow (5) is low enough not to influence significantly the radiation heat (6) of the grill means (3).
2. Oven according to claim 1, **characterized in that** the fan means (4) are adjustable to having a fan (7) rotating with a speed between 50 rpm and 1,000 rpm.
3. Oven according to claim 2, **characterized in that** the fan means (4) are adjustable to having the fan (7) rotating with a speed between 200 rpm and 600 rpm.
4. Oven according to at least one of claims 1 till 3, **characterized in that** the fan means (4) are arranged at a reverse side (8) of the cavity (2), opposite to a door (9) of the cavity (2).

5. Oven according to at least one of claims 1 till 4, **characterized in that** the grill means (3) are arranged in a top region (10) of the cavity (2).
6. Oven according to at least one of claims 1 till 5, **characterized in that** the grill means (3) are formed by a heating coil (11) which extends in a plane. 5
7. Oven according to at least one of claims 1 till 6, **characterized in that** the grill means (3) are an electrical heating element. 10
8. Method for operating an oven (1), especially a domestic oven, which has a cooking cavity (2), wherein grill means (3) are arranged in the cavity (2) for grilling food placed in the cavity (2), 15
characterized in that
an air flow (5) is generated by fan means (4), which are arranged in the cavity (2), wherein the air flow (5) is low enough not to influence significantly the radiation heat (6) of the grill means (3). 20
9. Method according to claim 8, **characterized in that** a fan (7) of the fan means (4) is operated at a speed between 50 rpm and 1,000 rpm. 25
10. Oven according to claim 9, **characterized in that** the fan (7) of the fan means (4) is operated at a speed between 200 rpm and 600 rpm. 30

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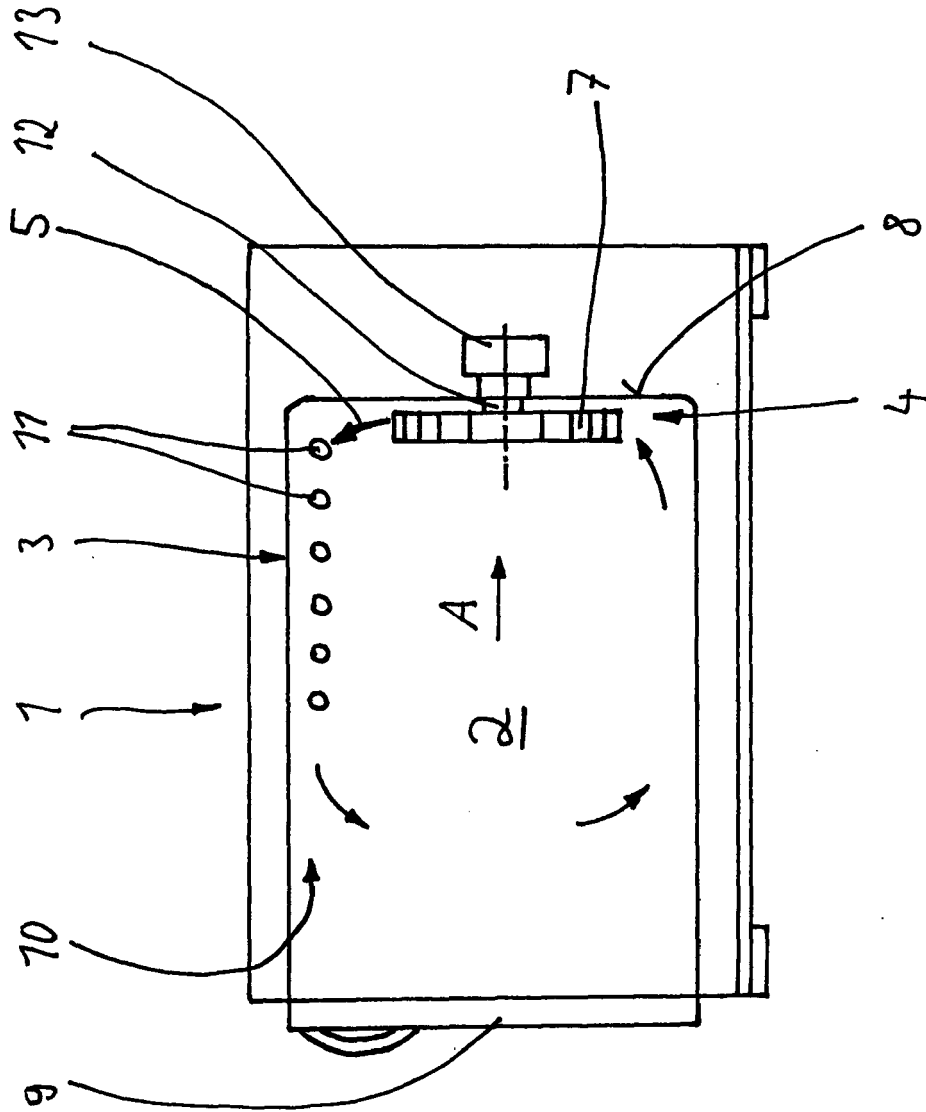


Fig. 1

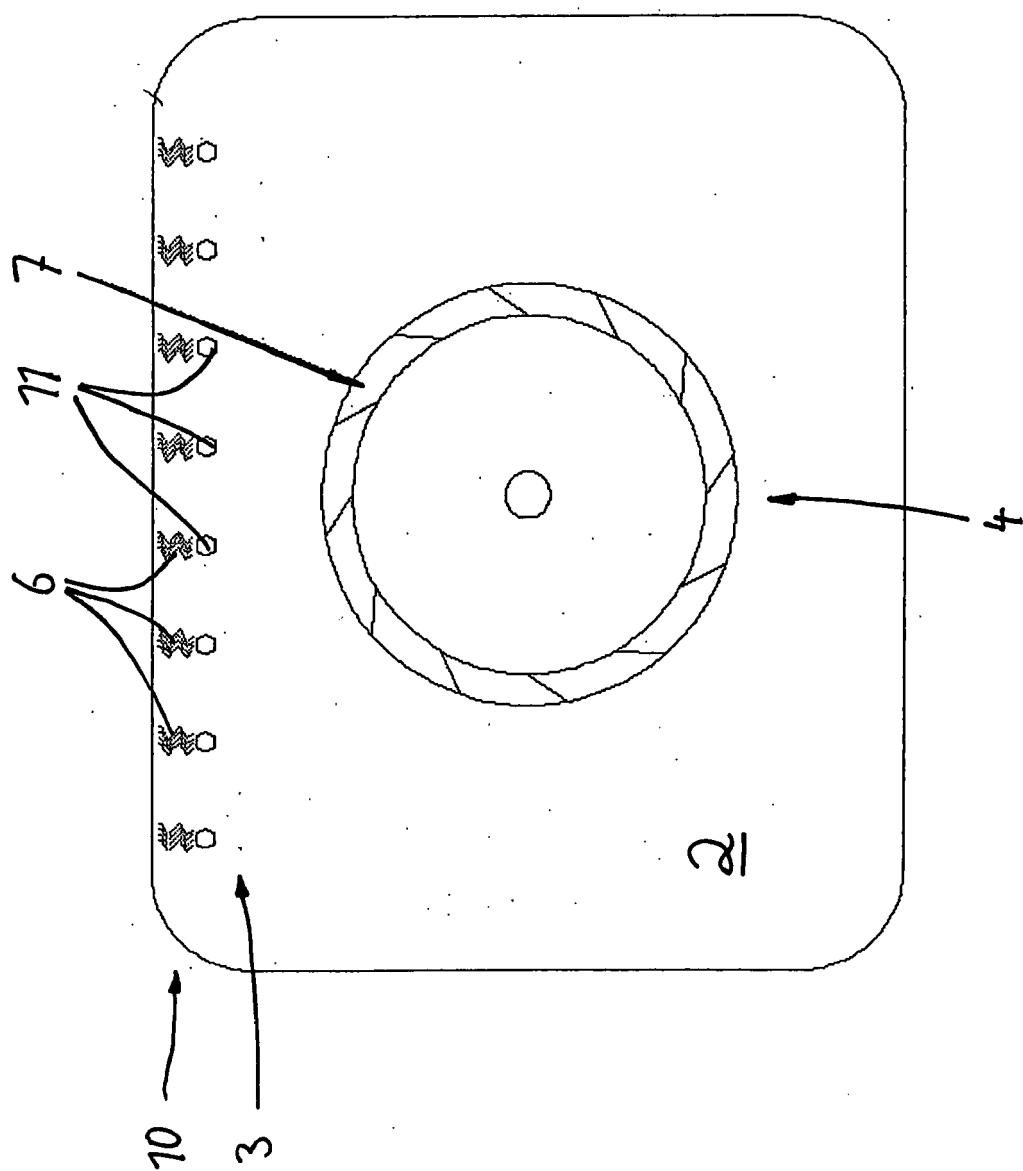


Fig. 2

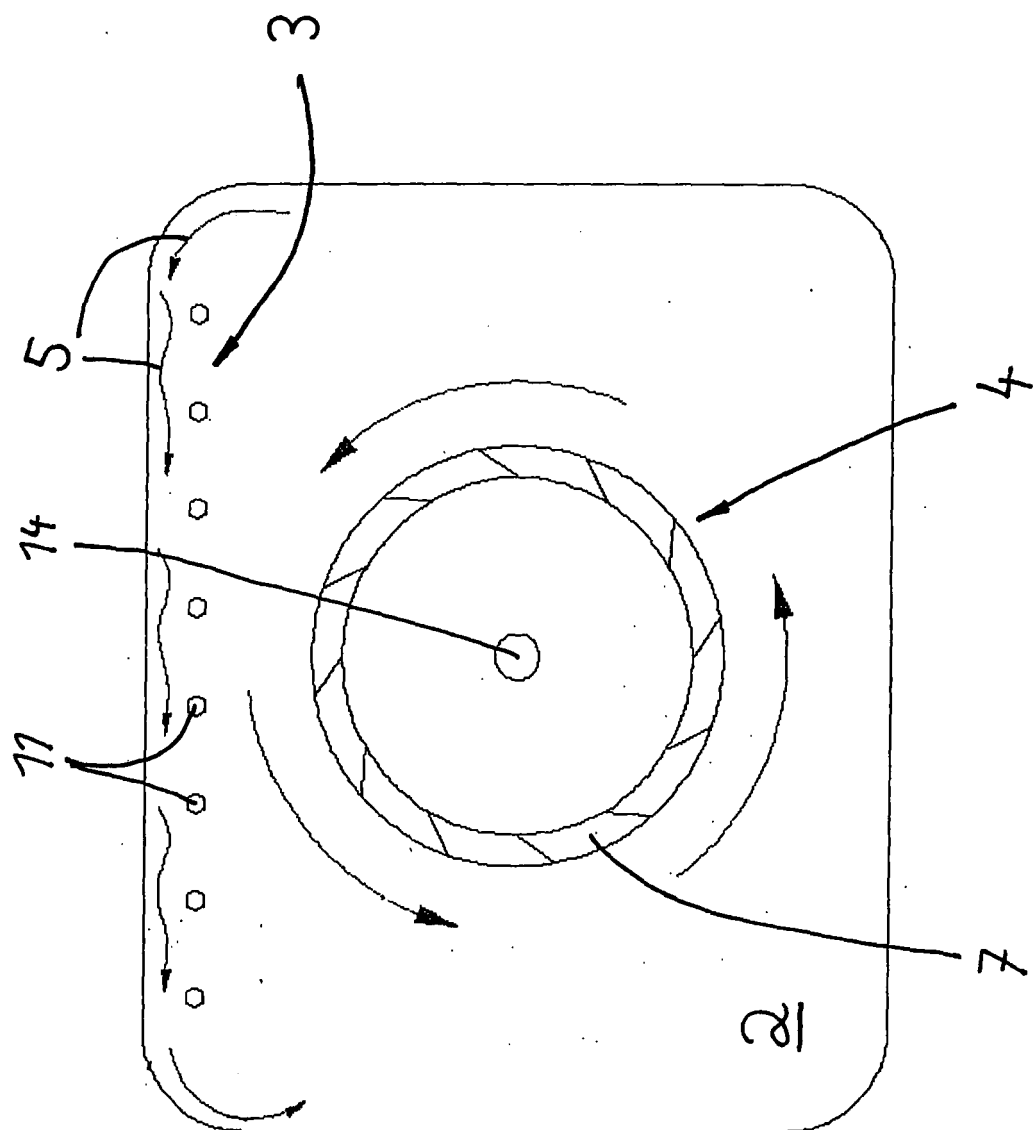


Fig. 3



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 00 1286

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 24 August 2007	Examiner VON MITTELSTAEDT, A
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)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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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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