

Claims

1. A microwave oven (10) comprising an oven cavity (14) for the goods (17) to be heated and a microwave generator (28) coupled to a rotational antenna (32) adjacent a wall (14a) of the oven cavity for radiating the microwave energy generated by the microwave generator (28) into the oven cavity (14), said wall (14a) being provided with a concave reflector (22) located behind said rotational antenna (32) characterised in that said reflector (22) is shaped so as to concentrate the microwave energy reflected by the reflector towards the centre of the oven cavity so as to direct microwave energy towards the goods (17) to be heated.
2. A microwave oven as claimed in Claim 1, characterised in that the rotational antenna (32) and the reflector (22) are separated from the oven cavity (14) by means of a microwave-transparent grease shield (46).
3. A microwave oven as claimed in Claims 1 or 2, characterised in that the rotational antenna (32) is supported in a dielectric bushing (36) provided in the reflector (22).
4. A microwave oven as claimed in any of Claims 1 to 3, characterised in that the rotational antenna (32) is rotated by means of an air flow which is guided directly towards the rotational antenna (32).
5. A microwave oven as claimed in Claim 4, characterised in that the rotational antenna (32) is provided with turbine blades (33).
6. A microwave oven as claimed in Claim 4 or 5, wherein the apparatus further comprises a blower (40) for providing said air flow and for cooling a heat producing part of the oven.
7. A microwave oven as claimed in claim 6, wherein said blower (40) cools the microwave generator and said control panel as well as causing cooking vapours to be expelled.
8. A microwave oven as claimed in any of Claims 1 to 7, characterised in that the microwave generator (28) is coupled to the rotational antenna (32) by means of a waveguide (26).

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9. A microwave oven as claimed in Claim 8, wherein said waveguide (26), said cavity wall (14a) and said reflector (22) are made of only two punched sheet-metal components.
10. A microwave oven as claimed in Claim 8, characterised in that the rotational antenna (32) is coupled to the waveguide (26) by means of a coupling probe (34) extending through the reflector (22) into the waveguide (26).
11. A microwave oven as claimed in Claim 10 when dependent on Claim 3, characterised in that the coupling probe (34) also constitutes a rotational axle for the rotational antenna (32) in the dielectric bushing (36).
12. A microwave oven as claimed in any of Claims 1 to 11, characterised in that the rotational antenna (32) has directional characteristics and produces a planar microwave field.
13. A microwave oven as claimed in any one of the preceding claims, wherein said reflector (22) has the shape of a truncated cone.
14. A microwave oven as claimed in Claim 13, wherein the angle of inclination of the sloping section of the cone in the range of about 25 to 40 degrees.
15. A microwave oven as claimed in Claim 4 and either Claim 8 or any of Claims 9 to 14 when appended to Claim 8, wherein said wave guide (26) reduces in cross-sectional area and the air flow flows through said wave guide to the antenna (32) whereby the reducing in cross-sectional area of the wave guide increases the air flow speed.

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EPO
Munich

Dear Sirs,

E_____ P_____ A_____
in the name of _____

Further to the Communication received from the Examining Division, we file in triplicate amended claims and a correspondingly amended description.

Claim 1 has been amended so as to be clearly distinguished from the three citations both in terms of novelty and inventive step (A54 & A56).

In particular, Claim 1 has been amended to state that the reflector 22 is shaped to concentrate the directed microwave energy towards the centre of the oven cavity. The basis for this amendment can be found on Pg 3 in the second paragraph and in particular the last sentence. Basis for this amendment can also be found on Page 7 of the description: 1st paragraph - particularly lines 7 and 8. Claim 1 is also now in two-part format based on D III.

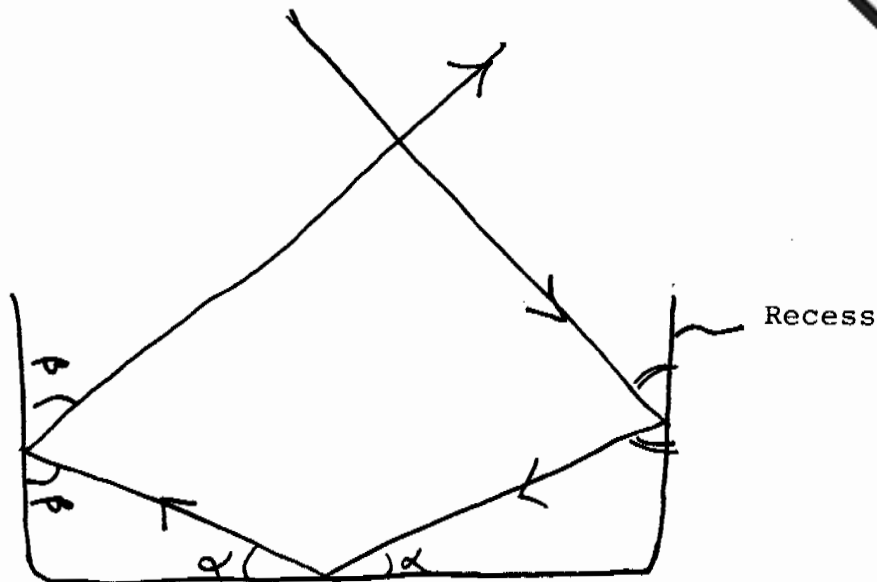
Following this amendment, it is clear that the present invention, as defined in Claim 1 is both novel and inventive over document III. (D III)

Whilst it is admitted that D III discloses a concave reflector, this reflector has a completely different shape from that proposed by the present invention. Indeed, the functions of these two reflectors are quite different.

D III provides reflector or recess 20 to ensure that the "microwave field reaches practically the entire oven cavity" and is a "widely spread rotating" field (Pg 2 last paragraph). To achieve this, multiple reflection within the recess is encouraged so that a scatter effect is obtained. In other words, each microwave is discouraged from being reflected only once by the recess and concentrating in a single region of the oven cavity.

A typical path for a microwave entering the recess 20 is illustrated by way of example.

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Accordingly, D III suffers from the very problem which the present invention is seeking to solve, i.e. to reduce the number of reflections which a microwave must make before being absorbed by the product to be heated. This is because each reflection made results in energy being lost. Whilst the present invention has been concerned with, particularly, such losses as a result of reflection on cavity walls, it is in fact irrelevant whether there are multiple reflections on the cavity walls or the recess walls, this will still result in energy loss.

By way of complete contrast to D III, the present invention is concerned with the reducing the number of reflections and concentrating the microwave energy on the product. This is obtained by the characterising features of Claim 1 as amended. In particular, it is not the mere fact that a cavity or concave reflector is provided that it is important but rather the selection of the shape thereof that is of importance. In particular, the shape should be such as to concentrate energy towards the centre of the cavity i.e. where any food product would be arranged for heating or cooking.

The shape of the reflector has been defined functionally as it is believed that this is an appropriate situation for use of such a definition as permitted in certain circumstances (see Guidelines). More particularly, the skilled man would be able to put the invention into effect based on this functional definition using nothing more than trial and error. In support of this, we refer to Page 7 lines 27 which describes the reflector as being analogous to an optical deflector which is well known. It is clear from this that the skilled man would be able to carry out the invention without too much effort, in view of Claim 1's definition.

Thus, for example the skilled man would realise that the reflector could be in the form, described in the description,

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of a suitably shaped truncated cone, the angles of which are preferably in the range 25-40°. The angle of the cone would be selected on the nature of the cavity to ensure energy concentration and may be in certain circumstance outside this range. The skilled man would also realise that the reflector could be cup-like or have a parabolic curve and still fulfil the requirements of the invention. This would require no inventive skill.

The characterizing features of Claim 1 are not disclosed in DI, DII or DIII and nor are they a routine modification. Accordingly not only is Claim 1 novel over each of these documents and, in particular DIII, but it is also inventive.

Furthermore, in support of the novelty and inventive step of the present invention, it is submitted that part of the invention lies in the recognition of the problem that the efficiency of the oven is reduced by the reflections. None of the prior art disclose or even suggest this problem and DIII teaches away from this. DIII, in contrast, teaches that reflections are desirable to order to obtain a uniform field.

Indeed DIII as a whole teaches away from the present invention. DIII and the present invention in reality represent divergent approaches to different problems and provide incompatible teachings.

The objections raised by the Examiner in the communication have been circumvented and accordingly it is believed that the objections raised in paragraphs 1 to 9 no longer apply.

Since this is the first communication, the applicant has made use of the opportunity provided by R 86(2) and has made some voluntary amendments.

In particular, the applicant has added new Claims 6 & 7 which are directed to the feature that a single air blower can be used to provide more than one function. More particularly it has been claimed that the blower can rotate the antenna as well as cooling a heat producing part of the oven. The basis for this claim can be found on the fourth paragraph of Page 8. The generalization included in Claim 6 is based on the statement that many "variants" in the air flow is possible (lines 25 & 26) thus indicating that not all features of the airflow described are essential. Claim 7 is of course based on lines 26 to 29 of that Page.

Moving on to new Claim 9, the basis for this claim can be found in lines 15-28 of Page 6 and, in particular, lines 23-28.

New Claim 13 is based on the sentence on Page 5, lines 7-9.

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The angle range for the sides of the cone as defined in new Claim 14 can be found on Page 7, lines 31 to 33. From the wording of this sentence i.e. "a useful range is ...", it is clear that these are not necessarily the only angles contemplated and thus need not be included in Claim 13. Furthermore a further distinction between DIII is provided by this range. DIII only has a "slight truncated conical shape" (Pge 2 lines 1 & 2) i.e. around 90° and clearly is not within the range contemplated by this claim. Furthermore, as discussed earlier, there is no suggest of the advantages which can be obtained with a truncated cone having inclined sides within the range of that claim.

Finally Claim 15 is directed to the concept of guiding air through a reduced cross-sectional area wave guide to increase its speed so that reliable rotation of the antenna can be obtained. The basis for this claim can be found on Page 8, last paragraph.

The applicant hereby reserves the right to file a divisional application in respect of any matter of the application regardless of whether it has been deleted by virtue of any amendment resulting from this response.

The applicant hereby requests oral proceeding should the Examiner wish to reject this application.

Please acknowledge receipt of this letter by returning the enclosed form 1037.

YF

Mr. X
Professional Representative

NOTES

I propose that the client should consider filing a divisional application under A 76 directed to the air blower providing more than one function. (If this is of commercial interest) A proposed main claim is attached.

The claim includes all the feature of old Claim 1 since there is no real basis in the specification for omitting any of these features and particularly the reflector which has been presented, in effect, throughout the specification as essential.

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As to the amendment itself, this has been based on Page 8 of the description. There may be some question as to whether the generalization included in Claim 1 of the sentence lines 26-29 would constitute added matter. I would argue that the first sentence of that same paragraph provides the basis for the language used, i.e. that many variants are possible. I would of course include a sub-claim to the blower cooling the microwave generator and control panel, driving the antenna and expelling cooking vapours as a fall back position.

A microwave oven (10) comprising an oven cavity (14) for the goods (17) to be heated and a microwave generator (28) coupled to a rotational antenna (32) adjacent a wall (14a) of the oven cavity for radiating the microwave energy generated by the microwave generator (28) into the oven cavity (14), said wall being provided with a concave reflector (22) located behind said rotational antenna (32) so as to direct microwave energy toward the goods (17) to be heated, characterized in that the oven (10) comprises a single air blower (40) for providing an air flow to drive said rotational antenna and cool at least one heat producing part of the oven.

The client may also wish to consider the possibility of filing a divisional directed to the two component construction of cavity wall, reflector and wave guide. A proposed claim is attached.

The basis for this claim is to be found on page 6 lines 15 to 28 and in particular, the last sentence of that paragraph.

In general the time limit for filing a divisional application is up to the time that the proposed text under R51(4) is approved (although this is currently the subject of an Enlarged Board appeal ...).

A microwave oven (10) comprising an oven cavity (14) for the goods (17) to be heated and a microwave generator (28) coupled to a rotational antenna (32) adjacent a wall (14a) of the oven cavity for radiating the microwave energy generated by the microwave generator (28) into the oven cavity, said wall being provided with a concave reflector (22) located behind said rotational antenna (32) so as to direct microwave energy toward the goods (17) to be heated, the oven further having a wave guide (26) for transferring microwave energy from the microwave generator (28) to the antenna, characterized in that the said wall (14a), the reflector (22) and the waveguide (26) are formed from only two punched sheet metal components: