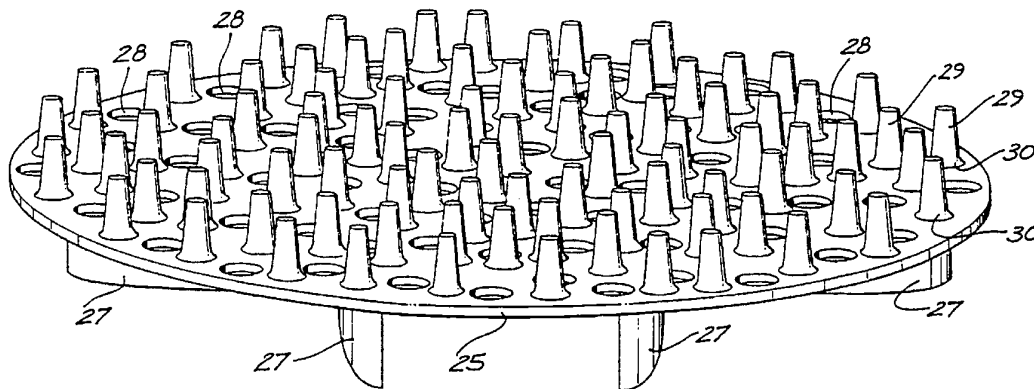




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification⁵ : A47J 36/34, 43/00, 43/18, A21B 3/00, F24C 15/16</p>	A1	<p>(11) International Publication Number: WO 94/16606</p> <p>(43) International Publication Date: 4 August 1994 (04.08.94)</p>
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(54) Title: APPARATUS FOR MICROWAVE COOKING



(57) Abstract

An apparatus for allowing air to circulate around food being heated in a microwave oven serves to expose a substantial surface area of the bottom of the food to the air circulating in the microwave oven under the control of the microwave oven fan. The apparatus has a base (25) which, in use, is normally supported on a rotating turntable of the microwave oven and rotates with the turntable. The apparatus also has a plurality of spaced apart support structures (29) or raised legs which extend upwardly from the base (25) and support the food in spaced relation thereto so that air may circulate in the space between the bottom of the food and the base (25). Slots (28) passing through the base may be present and these will allow air to flow from beneath the base (25) to the space around the support structures (29). Additionally, the apparatus may include air flow directional structures (27) which extend downwardly from the base (25) and can be supported on the turntable. The air flow directional structures (27), which may have curved profiles to preferentially direct air, co-operate with the slots (28) to direct air to flow from beneath the base (25) to the space around the support structures (29).

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APPARATUS FOR MICROWAVE COOKINGFIELD OF THE INVENTION

The present invention relates to the microwave heating or cooking of food and, in particular, to an apparatus that
5 can be used in conjunction with a conventional microwave oven to improve the quality of food cooked therein.

BACKGROUND ART

It is a common problem that when some pre-baked foods, such as pastries, battered fish and pizzas which have a high
10 moisture content, are heated or cooked in a microwave oven, the resulting product frequently has a soggy or soupy consistency that is generally found unpalatable.

In order to improve its palatability, the soggy product is often reheated in the same microwave oven or placed in a
15 conventional electric heating oven to evaporate the excess moisture therefrom. Although this may remove some of the moisture from the product, it may also have the undesired affect of burning parts of the food, such as the edges of a pastry, and is wasteful of energy.

It has been found that most of the moisture in soggy
20 microwaved foods accumulates at the bottom of the food nearest the plate upon which the food sits. This has been attributed to poor or ineffective air circulation in the region between the food and the microwave plate, which is
25 thought to create a sink for the concentration of moisture exited during microwave energization of the water molecules in the food.

It is, therefore, an object of the present invention to

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improve the circulation of air around food being heated or cooked in a microwave oven so as to avoid the shortcomings of the prior art.

SUMMARY OF THE INVENTION

5 According to the invention there is provided an apparatus for allowing air to circulate around food being heated in a microwave oven, said apparatus comprising a base adapted to be supported on a rotating turntable of the microwave oven, and a plurality of spaced apart support means
10 extending upwardly from the base for supporting the food in spaced relation to the base, the arrangement being such that during microwave heating, air circulates in the space around the support means between the food and base.

 In a preferred form of the invention, the base includes
15 a plurality of slots formed therethrough that are adapted to allow air to flow from beneath the base to the space around the support means.

 Preferably, the base includes air flow directional means extending downwardly from the base and adapted to be
20 supported on the said turntable, said air flow directional means being adapted to direct air to flow from beneath the base to the space around the support means.

 It is also preferred that the air flow directional means comprises a plurality of spaced apart elongated members
25 that are arranged in such a way that they can impel and direct air to the space around the support means when the turntable is rotating in either a clockwise or anticlockwise direction.

The base is preferably circular in shape and the plurality of spaced apart food support means may have a cylindrical shape.

The present invention may also include vented lid means adapted to be supported concentrically on the base for covering the food.

Preferably, the slots in the base are distributed substantially evenly in the base.

It is further preferred that the food support means are distributed substantially evenly over the base.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the invention may be more readily understood and put into practical effect, reference will be made to the accompanying drawings, in which:-

Fig. 1 is a perspective view of a pastry being heated on a conventional microwave oven turntable plate,

Fig. 2 is an exploded perspective view of an apparatus according to a first preferred embodiment of the invention used to support a pastry being heated in a microwave oven,

Fig. 3 is an exploded perspective view of an apparatus according to a second preferred embodiment of the invention used to support a pastry being heated in a microwave oven,

Fig. 4 is an exploded perspective view of an apparatus according to a third preferred embodiment of the invention used to support a pastry being

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heated in a microwave oven,

Fig. 5 is a perspective side elevational view of an apparatus similar to that of Fig. 4, and

Fig. 6 is a perspective side elevational view of a lid adapted for use with the apparatus of the present invention.

DESCRIPTION OF PREFERRED EMBODIMENTS

A conventional turntable plate 11 of a microwave oven is shown in Fig. 1 supporting a pastry 12. During operation of the microwave oven, a fan 13 blows air in the direction of arrows A towards and above the pastry 12, and the turntable plate 11 rotates in the direction shown by arrow B. Some moisture is evaporated off the pastry 12 as shown by the arrows C. However, the combination of air being blown over the pastry 12 and the pastry being supported flat on the plate 11 creates an area of poor air circulation at the bottom of the pastry, particularly around the bottom centre of the pastry where there is no direct exposure to fanned air. A substantial amount of moisture remains at the bottom of the pastry which becomes moist or soggy and unpalatable as a result.

The use of food support apparatus according to various embodiments of the invention as shown in Figs. 2 to 5 will substantially overcome this problem by providing a pathway for circulation of air beneath the pastry during operation of the microwave oven.

For instance, in Fig. 2, the food support apparatus (shown in an exploded view) comprises a base 14 adapted to be

supported on a rotating turntable of a microwave oven (not shown) and a plurality of spaced apart cylindrical support means 15 extending upwardly from the base 14 for supporting the pastry 16 remotely or in spaced relation therefrom.

5 The support means 15, in this embodiment, are moulded to the base 14, but it is to be understood that the support means used in the apparatus of the invention can be connected to the base by other appropriate means such as with adhesive or screwing to threaded apertures.

10 The effect of having the pastry 16 rest on the cylindrical support means 15 extending from the base 14 is to create a pathway for allowing air blown by the fan 17 to circulate in the space around the support means 15 and around all outer surfaces of the pastry during operation of the
15 microwave oven. In particular, circulating air may flow across the bottom of the pastry (shown by arrows D) and the heightened pastry surface area exposure to fanned air will facilitate increased evaporation of moisture from the pastry, thereby avoiding any concentration of moisture at the pastry
20 bottom and a resultant soggy food product.

 The apparatus shown in Fig. 3 for supporting the pastry 18 comprises a base or slotted tray 19, food support means 20 and air flow directional means 21. The air flow directional means 21, which may also serve as legs to support the slotted
25 tray 19, extend downwardly from the tray 19 and are adapted to be supported on a rotating turntable of a microwave oven (not shown).

The tray 19 has slots 22 formed vertically therethrough that are adapted to allow circulating air to flow from beneath the tray 19 to the space around the food support means 20 (as shown by arrows E). Air is preferentially
5 directed through the slots 22 by the effect of the arrangement of the directional means 21 which, in this instance, consist of a plurality of flat card-like members each located at predetermined sites to facilitate air flow up through the slots 22.

10 The air flow directional means 21, in this embodiment, are moulded to the tray 19, but it is to be understood that the air flow directional means used in the apparatus of the invention can be connected to the base by other appropriate means such as with adhesive.

15 The symmetrical location of the slots 22 in the tray 19, co-operating with the location of the flat card-like shaped food support members 20, is intended to optimize air flow or circulation across the bottom of the pastry 18.

20 During operation of the microwave oven, the fan 23 forces air in the direction of arrows F and the effect of the air flow directional means 21 is to cause circulating air to pass upwardly through the slots 22 of the tray 19 (as shown by arrows E) into the region between the tray 19 and the
25 pastry 18. The food support means 20 also serve to allow circulating air to directly enter this region from its sides and the configuration of the card-like shaped support members facilitates the channelling of air entering both from the

sides and through the slots 22 towards the bottom centre of the pastry.

The resultant circulation of air around the pastry's outer surface enables the pastry to remain relatively dry and free of concentrated areas of moisture.

The apparatus shown in exploded view in Fig. 4 for supporting the pastry 24 comprises a slotted tray 25, cylindrical food support means 26 and air flow directional means 27. The air flow directional means 27 are shown in duplicate so as to illustrate the different air flow pathways when the turntable of the microwave oven is rotating in either a clockwise or anticlockwise direction. In this embodiment, the air flow directional means 27 are curved members that are moulded to the underside of the tray 25 and arranged so as to cause circulating air to be preferentially directed according to the curved profiles of the curved members towards the centre of the arrangement and upwardly through the slots 28 of the tray 25.

The air flow pathway shown by arrows G and the air flow pathway shown by arrows H correspond to opposite rotating directions for the turntable, and both directions of rotation will have substantially identical effect on directing air upwardly through the slots 28 into the region between the tray 25 and pastry 24. Air directed upwardly in this manner will co-operate with air circulating inwardly from the sides of the food support region to allow effective air circulation around the food being heated in the microwave oven.

The apparatus shown in Fig. 5 is identical to the apparatus shown in Fig. 4 if unexploded, except that the food support means 29 are not entirely cylindrical but taper outwardly towards the tray 25 and have a curved region 30 where the support means meets the tray 25.

The invention may include a tray lid 31 as shown in Fig. 6. The lid 31 has vent holes 32 that enable air to flow therethrough in a manner that will not disturb the beneficial air circulation effects arising from the apparatus of the invention. The lid 31 will stop food from splattering onto the sides of the oven whilst maintaining air flow and is adapted to be supported on the outer edges of or concentrically on the base. The lid may be of different sizes to suit differently sized microwave ovens.

Various modifications may be made in details of design and construction without departing from the scope or ambit of the invention.

CLAIMS

1. An apparatus for allowing air to circulate around food being heated in a microwave oven, said apparatus comprising a base adapted to be supported on a rotating turntable of the microwave oven, and a plurality of spaced apart support means extending upwardly from the base for supporting the food in spaced relation to the base, the arrangement being such that during microwave heating, air circulates in the space around the support means between the food and base.
2. The apparatus of claim 1 wherein the base includes a plurality of slots formed therethrough that are adapted to allow air to flow from beneath the base to the space around the support means.
3. The apparatus of claim 2 wherein the base includes air flow directional means extending downwardly from the base and adapted to be supported on the said turntable, said air flow directional means being adapted to direct air to flow from beneath the base to the space around the support means.
4. The apparatus of claim 3 wherein the air flow directional means comprises a plurality of spaced apart elongated members that are arranged in such a way that they can impel and direct air to the space around the support means when the turntable is rotating in either a clockwise or anticlockwise direction.
5. The apparatus of claim 1 wherein the base is circular in shape.
6. The apparatus of claim 1 wherein the base includes legs extending downwardly from the base and adapted to be

supported on the said turntable.

7. The apparatus of claim 1 wherein the plurality of spaced apart food support means have a cylindrical shape.

8. The apparatus of claim 1 and including vented lid means adapted to be supported concentrically on the base for covering the food.

9. The apparatus of claim 2 wherein the slots in the base are distributed substantially evenly in the base.

10. The apparatus of claim 1 wherein the food support means are distributed substantially evenly over the base.

11. The apparatus of claim 3 wherein the air flow directional means comprise curved members that are arranged so as to direct air towards the centre of the base wherefrom the air flows upwardly through the slots to the space around the support means.

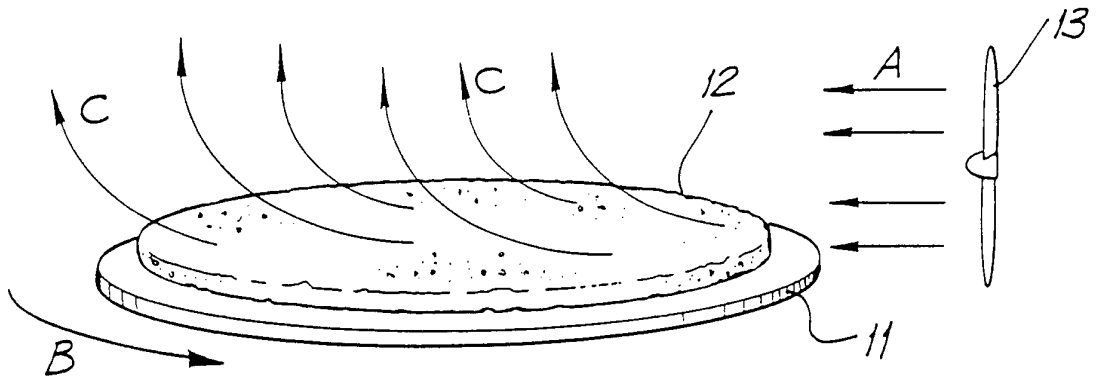


FIG. 1

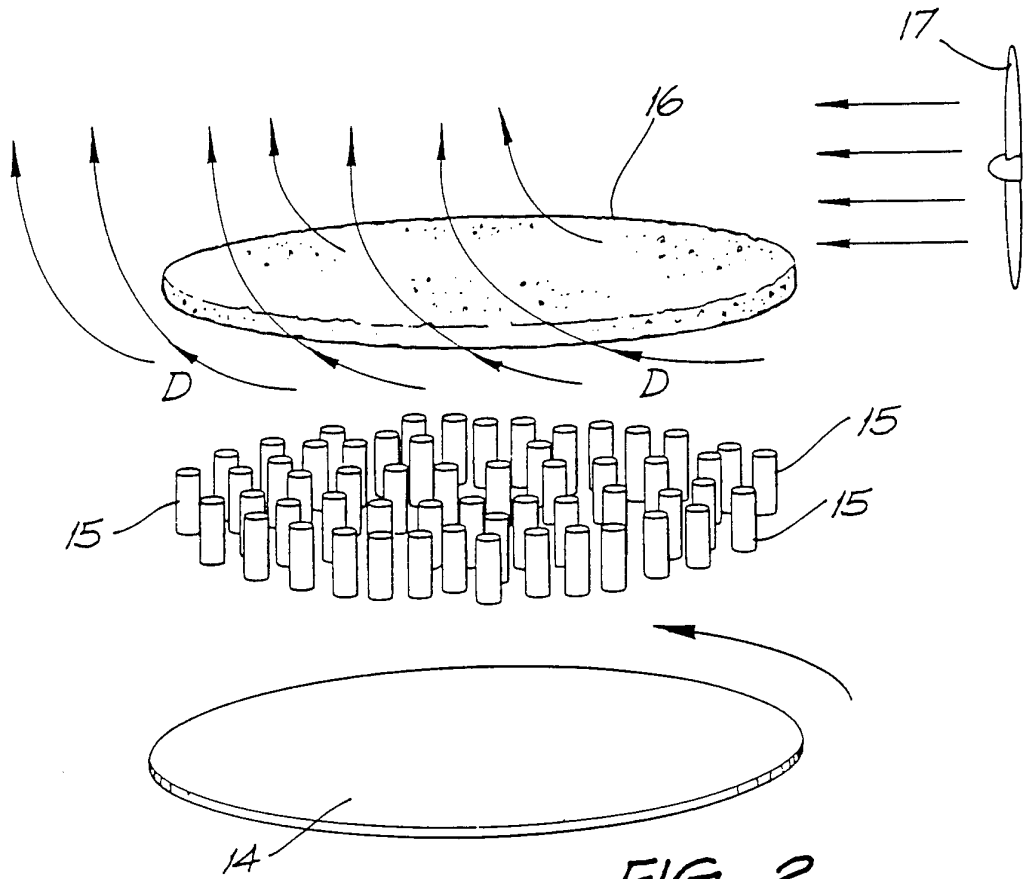


FIG. 2

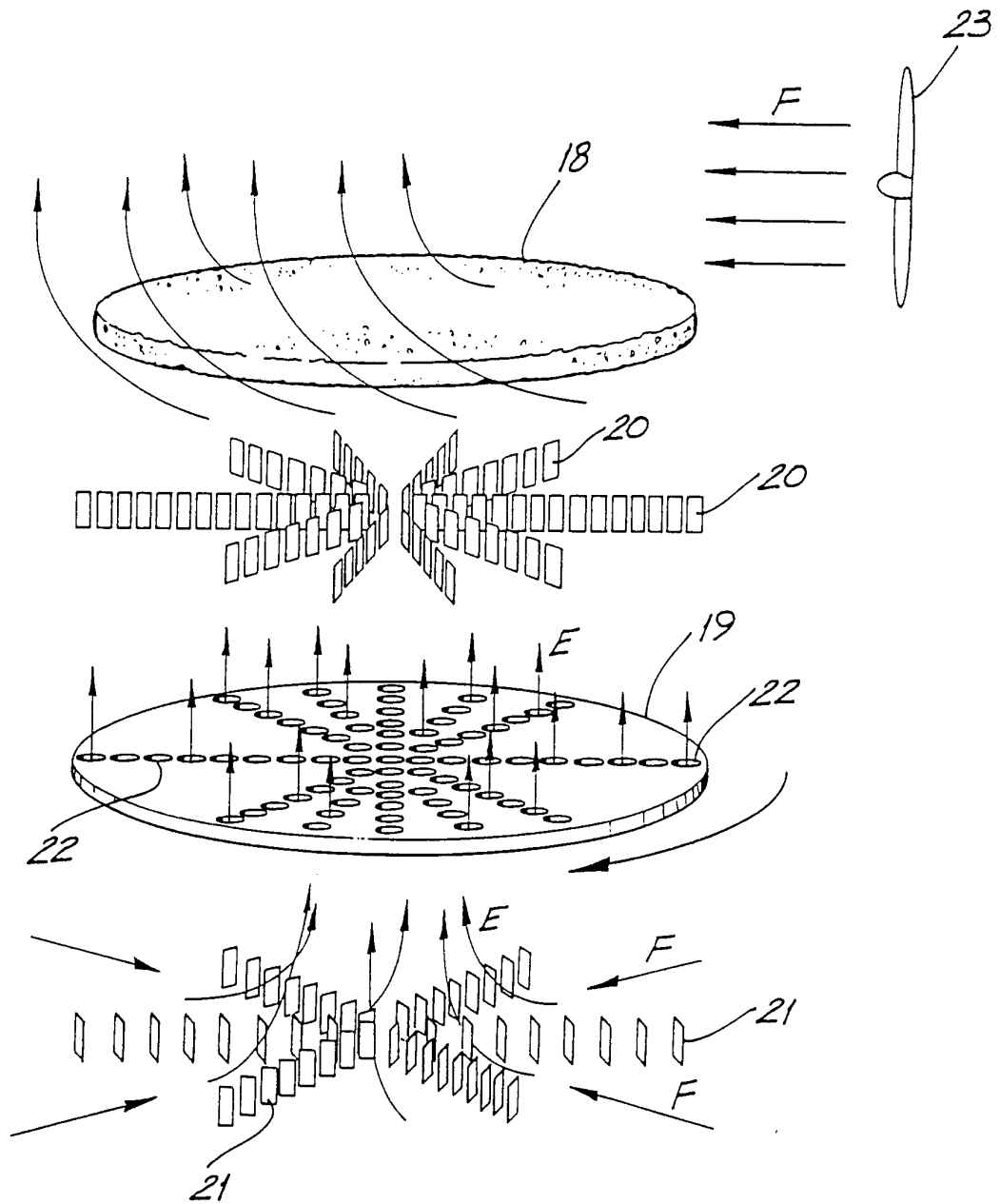


FIG. 3

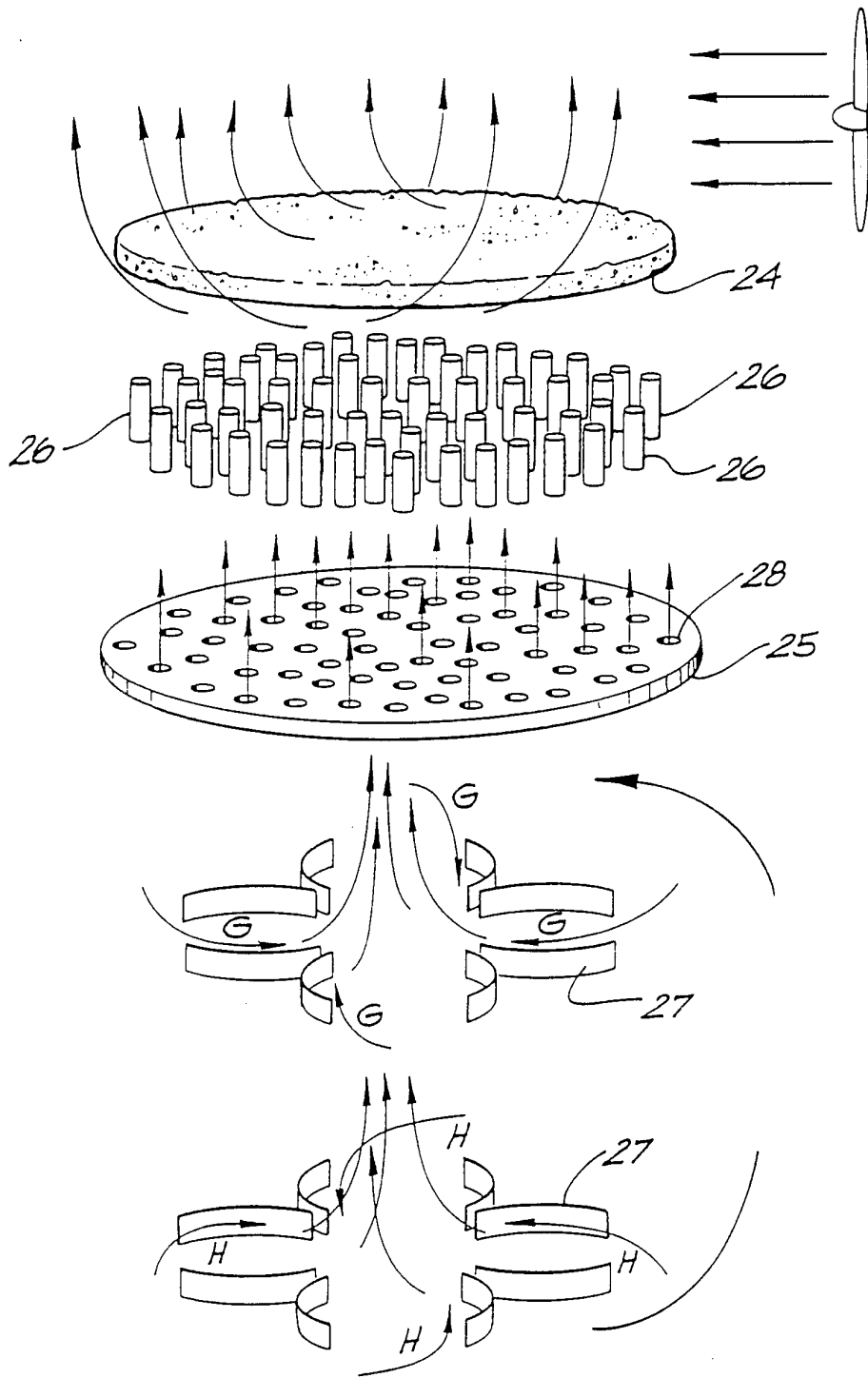


FIG. 4

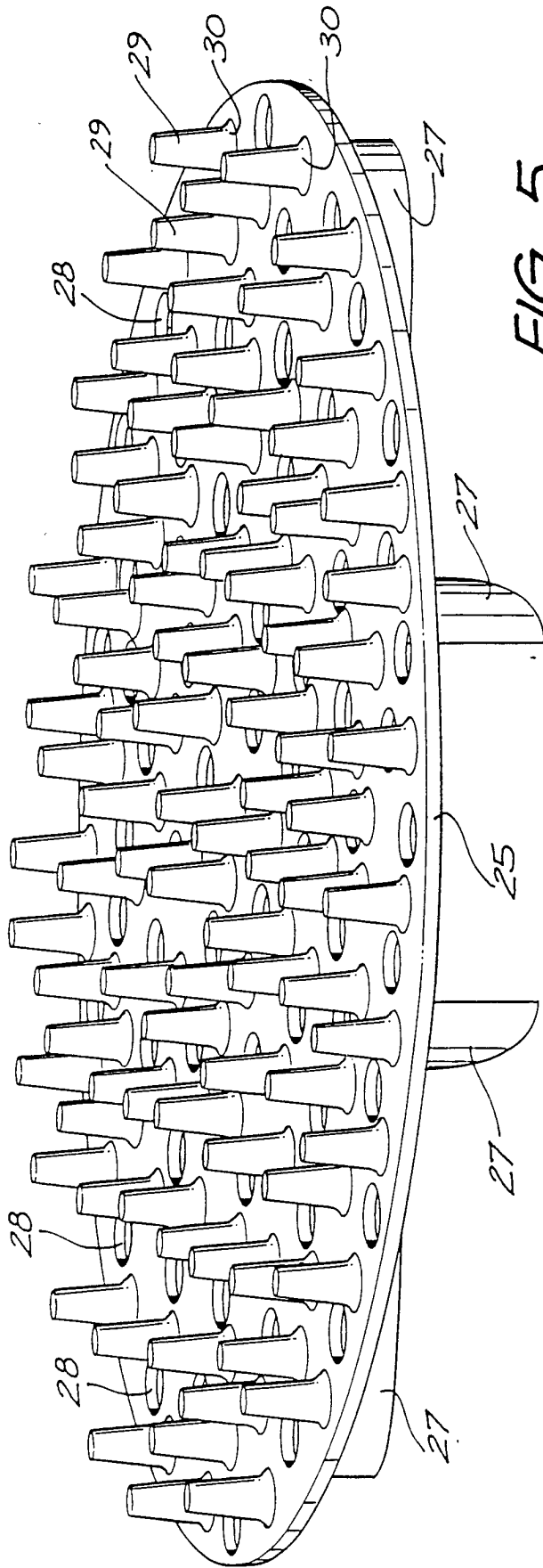


FIG. 5

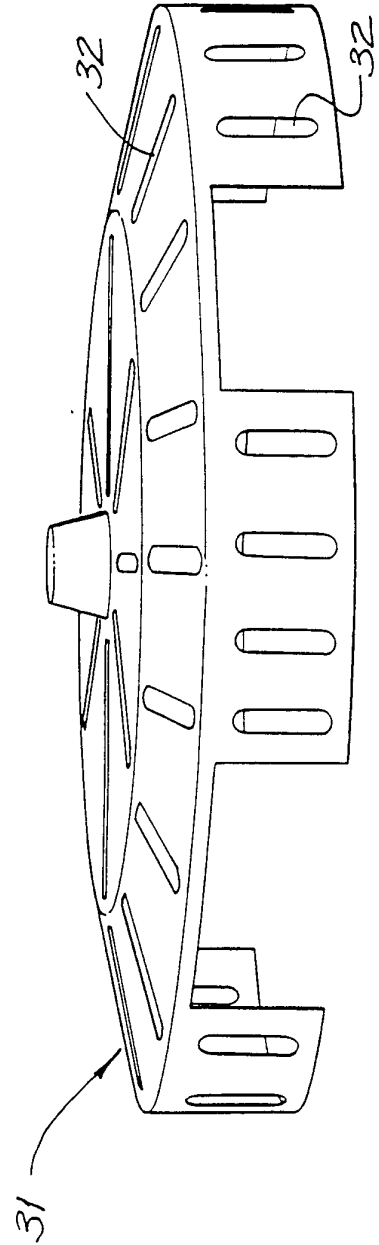
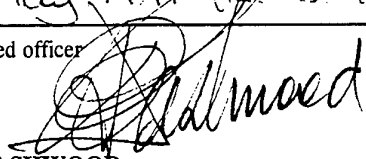


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU 94/00033

A. CLASSIFICATION OF SUBJECT MATTER Int. Cl. ⁵ A47J 36/34, 43/00, 43/18, A21B 3/00, F24C 15/16 According to International Patent Classification (IPC) or to both national classification and IPC																						
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC A47J 36/34, 43/00, 43/18 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU : IPC as above Electronic data base consulted during the international search (name of data base, and where practicable, search terms used)																						
C. DOCUMENTS CONSIDERED TO BE RELEVANT																						
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.																				
X Y	GB,A, 2215187 (GEMCO WARE INC) 20 September 1989 (20.09.89) Page 5 line 23 to page 9 line 4, claim 1 and Figs 1-3	1,2,5,8-10 3,4,6,7,11																				
X Y	US,A, 5008508 (SKERKER et al) 16 April 1991 (16.04.91) Col.1 line 37 to Col.3 line 52, claim 1 and Figure 1	1,5,8-10 2-4,6,7,11																				
X Y	Derwent Abstract Accession No. 86-092276/14, Class Q74 Q79, SE,A, 8401045 (SPANBERG) 28 August 1985 (28.08.85)	1,2,8-10 3-7,11																				
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.																						
* Special categories of cited documents : <table border="0"> <tr> <td>"A"</td> <td>document defining the general state of the art which is not considered to be of particular relevance</td> <td>"T"</td> <td>later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</td> </tr> <tr> <td>"E"</td> <td>earlier document but published on or after the international filing date</td> <td>"X"</td> <td>document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</td> </tr> <tr> <td>"L"</td> <td>document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</td> <td>"Y"</td> <td>document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</td> </tr> <tr> <td>"O"</td> <td>document referring to an oral disclosure, use, exhibition or other means</td> <td>"&"</td> <td>document member of the same patent family</td> </tr> <tr> <td>"P"</td> <td>document published prior to the international filing date but later than the priority date claimed</td> <td></td> <td></td> </tr> </table>			"A"	document defining the general state of the art which is not considered to be of particular relevance	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	"E"	earlier document but published on or after the international filing date	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	"O"	document referring to an oral disclosure, use, exhibition or other means	"&"	document member of the same patent family	"P"	document published prior to the international filing date but later than the priority date claimed		
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Date of the actual completion of the international search 2 May 1994 (02.05.94)		Date of mailing of the international search report 12 May 1994 (12.05.94)																				
Name and mailing address of the ISA/AU AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No. 06 2853929		Authorized officer  B.R. DASHWOOD Telephone No. (06) 2832121																				

INTERNATIONAL SEARCH REPORT

International application No.

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate of the relevant passages	Relevant to Claim No.
X Y	Patent Abstracts of Japan, M-3, Page 44, JP,A, 556138 (MATSUSHITA DENKI SANGYO K.K.) 17 January 1980 (17.01.80)	1,2,5,7-10 3,4,6,11
P,X P,Y	EP,A, 556698 (CONVOTHERM ELEKTROGERATE) 25 August 1993 (25.08.93) Col.3 line 21 to Col.4 line 37	1,2,8-10 3-7,11
Y	GB,A, 2099989 (PIERICK) 15 December 1982 (15.12.82) Page 1 line 41 to page 2 line 5, claims 5,16,21 and Figs 1-12	3,6,7,11
Y	GB,A, 512024 (FEJES) 28 August 1939 (28.08.39) Page 1 line 77 to page 2 line 93, claim 1 and Figs 1-5	6

INTERNATIONAL SEARCH REPORT

Information on patent family membe

International application No.

PCT/AU 94/00033

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
GB	2215187	AU	25781/88	US	4924768		
SE	8401045	NO	850625				
GB	2099989	AU	83477/82	DE	3216835	JP	57208938
		NL	8201886	US	4384513	US	4378729
		US	4464406				
EP	556698	DE	4205361	JP	5344933		
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