



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

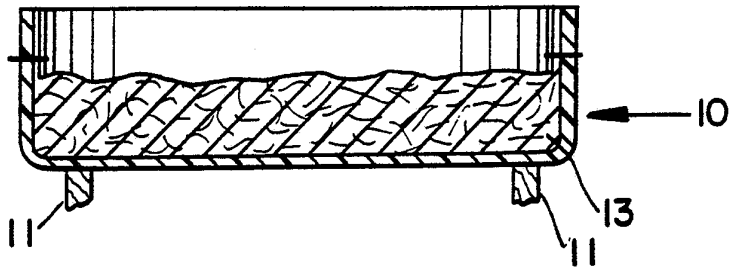
<p>(51) International Patent Classification<sup>4</sup> : <b>H05B 6/80</b></p>	<p><b>A1</b></p>	<p>(11) International Publication Number: <b>WO 89/ 02210</b> (43) International Publication Date: 9 March 1989 (09.03.89)</p>
<p>(21) International Application Number: PCT/US88/02925 (22) International Filing Date: 22 August 1988 (22.08.88) (31) Priority Application Number: 089,508 (32) Priority Date: 26 August 1987 (26.08.87) (33) Priority Country: US (71) Applicant: DEPOSITION TECHNOLOGY, INC. [US/US]; 4540 Viewridge Avenue, San Diego, CA 92123 (US). (72) Inventor: PETCAVICH, Robert, J. ; 4816 Marlborough, San Diego, CA 92116 (US). (74) Agent: VERBECK, Bruno, J.; Juettner Pyle Lloyd &amp; Verbeck, 110 West C Street, Suite 1212, San Diego, CA 92101-3907 (US).</p>		<p>(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), FR (European patent), GB (European patent), IT (European patent), JP, LU (European patent), NL (European patent), SE (European patent). <b>Published</b> <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>

(54) Title: METHOD AND CONTAINER FOR PRODUCING BATTER-BASED BAKED GOODS

## (57) Abstract

A method for producing batter-based baked goods, such as brownies, are produced by subjecting a microwave-transparent pan of batter to microwave energy in a microwave oven. The pan (10), free of sharp corners, is spaced apart from the interior bottom wall of the oven's cavity, and has height, width, and length dimensions such that when

one dimension, in inches is  $N\lambda/4$ , where N is an odd integer from 1 to 15, then one of the other dimensions is  $N\lambda/4$ , wherein  $N\lambda/4$  is an even integer from 2 to 12, and the remaining dimension is  $N\lambda/4$  wherein N is either an odd integer from 1 to 15 or an even integer from 2 to 12, being the wave length of waves emanating from the klystron of the microwave oven.



**UNIQUEMENT A TITRE D'INFORMATION**

Codes utilisés pour identifier les Etats parties au PCT, sur les pages de couverture des brochures publiant des demandes internationales en vertu du PCT.

<b>AT</b> Autriche	<b>FR</b> France	<b>ML</b> Mali
<b>AU</b> Australie	<b>GA</b> Gabon	<b>MR</b> Mauritanie
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<b>FI</b> Finlande		

Method and Container for Producing  
Batter-Based Baked Goods

Technical Field

5       The present invention relates to a method and a container such as a tray or pan for preparing batter-based baked goods, such as Brownies, in a microwave oven.

Background Art

10       Among the myriad of baked goods favored by the American palate are those known, generally, as Brownies. Organoleptically, the ideal Brownie has a chewy, moist texture, a smooth, uniform surface appearance and is free of hard spots, unbaked batter, and a cratered surface. For the homemaker, there are available numerous "Brownie dry  
15 mixes". These, when admixed with, e.g. oil, water, and egg to form a batter, spread in a pan and baked in a gas or electric oven, then cut into rectangles, become the delicious snack cakes known as Brownies.

20       With the advent and increasing popularity and use of microwave ovens, there has been an increase in the availability and variety of prepackaged food products, including cake mixes, which are designed especially for heating and cooking in a microwave oven. While many foods  
25       lend themselves well to heating in a microwave oven to produce a satisfactorily cooked product, this is not true of all foods. Among foods which have presented problems in that regard, are batter-based baked goods, and in particular those known as Brownies.

30       Attempts to produce Brownies, having a desirable taste and eye-appeal by heating a pan of Brownie batter in a microwave oven have, hitherto, not been successful, the resulting baked product frequently having burned edges, having portions which are hard to the "bite", soupy,

uncooked portion therewithin, and cratering or pitting of the surface, all of these affecting the taste appeal or the aesthetics of the product.

The production of satisfactory Brownies by means of heating a batter in a microwave oven has thus far remained an elusive goal.

#### Disclosure of the Invention

It is a primary object of this invention to provide a new and unique method and container for use in producing Brownies and similar baked products, by heating a batter-containing pan in a microwave oven.

Another object is to produce Brownies which are substantially free of burned edges, uncooked, soupy inner portions, uneven surfaces, cratering, and pitting, by subjecting a brownie cake batter in a tray or pan, to microwave energy in a microwave oven.

A still further object is to provide a unique container for use as a tray or pan for holding a batch of cake batter, such as Brownie cake batter, while container and batter are subjected to microwave energy in a microwave oven.

Yet a further object is to provide a means for minimizing or eliminating soft and incompletely baked interior portions of Brownie cake which has been baked in a microwave oven.

These and other more specific objects of the invention will be understood from the following brief description of the drawings, and of the best mode for carrying out the invention.

Brief Description of the Drawings

Figure 1 is a vertical sectional view of one form of a pan designed for use in accordance with the invention.

Figure 2 is a vertical sectional view of a different form of a pan, and different separator means for use therewith in accordance with the invention.

Figure 3 is a plan view of the pan of Figures 1 and 2.

Summary of the Invention

My invention provides a unique method and container, for batter-based production of bakery goods, and in particular Brownies, by heating Brownie batter contained in a unique pan, or tray, in a microwave oven.

In producing Brownies in accordance with my invention, one first forms a batter from any commercially available Brownie dry mix and pours the resulting batter into the specially designed and dimensioned microwave transparent pan, to a predetermined depth. The pan, which may have extenders, or legs, integral therewith to provide a free or open space between the bottom of the pan and the bottom of the oven is placed in a microwave oven, such as one of those conventional ovens operating at 2.45 gigahertz, and subjecting the microwave energy transmission into the batter for a time sufficient to bake the pan contents, as by using a power setting of "high" for about 4 minutes.

In place of a pan having extenders integral therewith, the pan may be wholly flat-bottomed; however in such case it is desirable to insert a microwave-transparent spacer between the bottom of the pan and the bottom of the oven, that is to say the false bottom of the oven. The pan is formed of a microwave transparent polymeric material, such as a polyolefin, including polypropylene, polyesters, polycarbonates, polystyrene, polyamide imides, polyether imides, polyvinyl chlorides, or blends of these.

Desirably, the materials used should be those that provide good release properties, be low in cost, and be able to withstand temperatures in excess of 130 degrees C. The pan is made in any suitable way, as by thermomolding, and  
5 formed so it is rectangular or oval in shape, with generous corner radii and with no angular corners. The walls of the pan are generally less than about 0.060 inches, and preferably about 0.02 to 0.03 inches, in thickness.

The substantially critical dimensions of the pan are  
10 expressible in terms of wavelength  $\lambda$  of the applied microwave radiation. Thus, the depth of the pan in inches should be preferably about  $N\lambda/4$ , where N is an odd integer from 1 to 15. The width of the pan should preferably be about  $N\lambda/4$ , where N is an even integer from  
15 2 to 12. The length of the pan should preferably be about  $N\lambda/4$ , where N is an odd integer from 1 to 15.

More broadly expressed, when one dimension, height(h), width(w) or length(l) of the pan 10, in inches, is  $N\lambda/4$ , N being an odd integer from 1 to 15, then one of the other  
20 dimensions is  $N\lambda/4$ , N being an even integer from 2 to 12, and the remaining dimension is  $N\lambda/4$ , N being either an odd integer from 1 to 15 or an even integer from 2 to 12.

Since the operating frequency for a standard home oven is 2.45 gigahertz, the wavelength is 4.8 inches, and the  
25  $1/4$  wavelength is 1.2 inches. Translating the foregoing into one set of dimension expressed in inches, a convenient pan size, for the practice of my invention, is one with the following dimensions: Depth about 1.2 inches; width, no greater than about 4 inches; length, no greater than about  
30 6 inches.

When used with a batter formed from a commercially available dry mix such as the Fudge Brownie Mix produced by General Mills, Inc. of Minneapolis, Minnesota, and a pan of the aforesaid dimensions, the batter depth, in the pan is  
35 preferably less than about 0.60 inches, and preferably not over about 1.2 inches in thickness.

When a thermal spacer is used to separate the bottom of the pan from the bottom of the oven, it should be from about 0.01 to about 0.50 inches thick. The spacer, on which the pan can be rested, in the oven, is formed of a  
5 microwave transparent material such as foamed polyethylene, foamed polyvinyl chloride, foamed polypropylene, foamed polycarbonate, corrugated cardboard, embossed polymeric film, polymeric filament net, or the like, and should be able to maintain its physical integrity at a temperature  
10 greater than about 130 degrees C. In this connection I have also successfully used mats of the type commonly utilized as scouring pads and which are about 1/8 inch thick and made of nylon threads or filaments. The other dimensions of the spacer are preferably coextensive with  
15 the length and width of the pan.

A release-coated perforated lid of microwave-transparent material, such as paperboard, may be placed on top of the batter-containing pan before it is placed in the oven, to further minimize cratering or pitting of  
20 the resulting cake surface due to release of gases during baking. Typical release-coating materials are vegetable oils, silicones or fluoro compounds.

#### Best Mode for Carrying Out the Invention

25 Referring now to the drawings, wherein like numbers refer to like parts, Figure 1 illustrates one form of a pan embodying, and used in carrying out the method of, the invention. The pan 10 is formed of a microwave transparent polymeric material, such <sup>as</sup> a polyolefin, including poly-  
30 propylene, polyesters, polycarbonates, polystyrene, polyvinyl chlorides, polyether imides, polyamide imides or mixtures thereof, in a shape such as oval or near rectangular, so that there are no sharp, angular corners. Extenders or legs 22, 3 or more in number, which may be  
35 formed integrally with, and of the same material as, the

pan 10, or otherwise suitably joined thereto, are of a length such as to extend from about 0.01 to about 0.50 inches below the bottom of pan 10, and, in use, rest on the false bottom of a conventional microwave oven (not shown),  
5 operating at 2.45 gigahertz.

In place of legs or extenders 11, and as shown in Figure 2, the pan may have suitably joined thereto a spacer 12, formed of microwave transparent material such as the previously described foamed plastics, or the like, of a  
10 thickness such as to effect a separation between the bottom of pan 10 and the false bottom of the microwave oven (not shown) by about 0.10 to 0.50 inches. Of course, the spacer 12 need not necessarily be joined to pan 10, but may be a separate unit on which the pan 10 rests when in the oven.

15 Pan 10, which must be essentially free of sharp corners, may be oval in shape or generally rectangular, as shown in Figure 3, and may vary in overall size. However, the relative dimensions are substantially those described above in terms of the wavelength of the microwave radiation  
20 applied to the pan 10 and contents, in a microwave oven, when heating Brownie mix batter contained in the pan 10.

By way of further illustration, in producing Brownies in accordance with my invention, a batter was prepared by mixing 225 grams of Brownie mix such as the fudge Brownie  
25 mix manufactured by General Mills, Inc. of Minneapolis, Minnesota, with 60 grams of water, i.e., a ratio of grams of mix to grams of water of 3.75. The dry mix was placed in a bowl, and 60 grams of hot tap water added. Using a  
30 fork, the mix was completely wetted, stirred for 1 minute, and then poured into pan 10, thermo-formed of polypropylene, having a thickness of 0.030 inches, a length of 6 inches, as shown by A, a width of 3.6 inches as shown by B, both of Figure 3, and a depth of 1.2 inches as shown in Figure 1. The thickness of the batter 13 in pan 10 was  
35 0.60 inches. The pan 10 and batter 13 contained therein, were then placed in a 750 watt microwave oven operating at



2.45 gigahertz, with the extenders 11 of pan 10 resting on the false bottom of the oven, the power set on "high" for 4 minutes, and the pan and contents then removed from the oven. On cooling, the resulting cake, which was found to be essentially free of burnt edges, cratering or pitting, and was evenly baked throughout with no semi-liquid "soupy" unbaked batter, was cut into rectangles. The resulting Brownies were chewy, moist, and delicious.

While the invention has been described in terms of preferred embodiments, the appended claims are intended to encompass all embodiments which fall within the spirit of the invention. Thus, while my invention is particularly applicable to production of Brownies, it will also lend itself to the production of other batter-based baked goods from, for example, muffin batter, cake batter and cookie batter, including frozen batters.

Claims

1. A method for producing batter-based baked goods which comprises:
  - 5 a) subjecting to microwave energy in a microwave oven having an operating frequency of 2.45 gigahertz, a substantially microwave-transparent pan of cake batter, while the bottom of said tray is spaced apart from the interior bottom wall of the oven's cavity;
  - 10 b) said pan being at least substantially free of sharp corners, and having a height(h), width(w), and length(l) such that when one dimension, in inches, is  $N\lambda/4$ , where N is an odd integer from 1 to 15, then one of the other dimensions is  $N\lambda/4$ , wherein N is an even integer from 2 to 12, and the remaining dimension is  $N\lambda/4$  where N is 15 either an odd integer from 1 to 15 or an even integer from 2 to 12,  $\lambda$  being the wavelength of waves emanating from the klystron of the microwave oven.
  
2. A method for producing batter-based baked goods which comprises:
  - 20 a) subjecting to microwave energy in a microwave oven having an operating frequency of 2.45 gigahertz, a substantially microwave-transparent pan of cake batter, while the bottom of said tray is spaced apart from the interior bottom wall of the oven's cavity;
  - 25 b) said pan being at least substantially free of sharp corners, and having a height in inches of  $N\lambda/4$  where N is an odd integer, and a width and length each greater than  $N\lambda/4$ , where N is an even integer, and  $\lambda$  is the wavelength of waves emanating from the klystron of the microwave oven.

3. The method of Claim 1 wherein the depth of the batter in the tray is about 0.5 to 1.0 inches.
4. The method of Claim 1 wherein the distance between the bottom of said pan and the interior bottom wall of said oven is about 0.01 to 0.50 inches.
5. The method of Claim 1 wherein the said pan has a depth of about 1.2 inches, a width of about 3.6 inches, and length of about 6.0 inches.
6. A container for use in baking batter-based goods in a microwave oven having an operating frequency of 2.45 gigahertz comprising a microwave-transparent pan or tray substantially free of sharp corners and having a height(h), width(w), and length(l), in inches, such that when one dimension is  $N\lambda/4$ , wherein N is an odd integer from 1 to 15, then one of the other dimensions is  $N\lambda/4$  wherein N is an even interger from 2 to 12, and the remaining dimension is  $N\lambda/4$  wherein N is either an odd integer from 1 to 15 or an even integer from 2 to 12,  $\lambda$  being the wavelength of waves emanating from the klystron of the microwave.
7. A container for use in baking batter-based goods in a microwave oven comprising, a microwave-transparent pan or tray substantially free of angular corners, having in terms of the wavelength  $\lambda$  of the microwave radiation of the said oven,
- a) a depth of  $N\lambda/4$  wherein N is an odd integer;
  - b) a width of  $N\lambda/4$  where N is preferably an even integer;
- and
- c) a length of  $N\lambda/4$  wherein N is preferably an odd integer.

8. A container for use in baking batter-based goods in a microwave oven having an operating frequency of 2.45 gigahertz comprising a microwave-transparent pan or tray substantially free of angular corners, having a depth of about 1.2 inches, a width of about 3.6 inches, and a length of about 6.0 inches.

FIG. 1

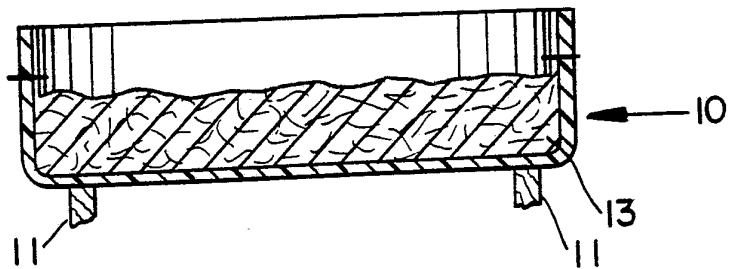


FIG. 2

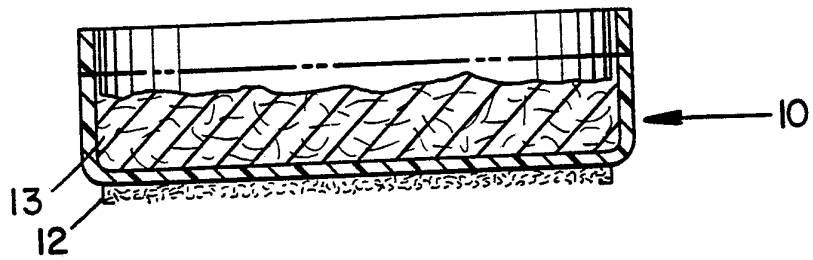
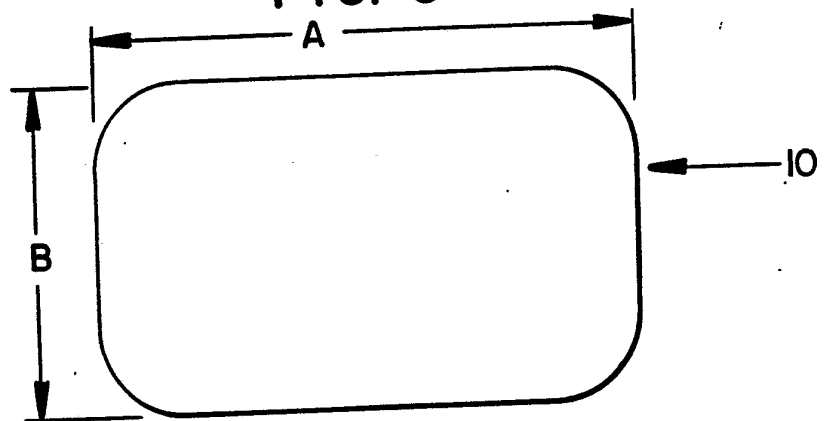


FIG. 3



# INTERNATIONAL SEARCH REPORT

International Application No. PCT/US88/02925

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>6</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC(4): H05B 6/80		
U.S.CL.: 426/243		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>7</sup>		
Classification System	Classification Symbols	
U.S.	426/107, 113, 242, 243 219/10.55E, 10.55M	
Documentation Searched other than Minimum Documentation to the extent that such Documents are included in the Fields Searched <sup>8</sup>		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT</b> <sup>9</sup>		
Category <sup>*</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
Y	US, A, 4,689,458 (LEVENDUSKY) 25 AUGUST 1987 SEE THE ENTIRE DOCUMENT.	1-8
Y, P	US, A, 4,698,472 (COX) 06 OCTOBER 1987 SEE THE ENTIRE DOCUMENT.	1-8
Y	US, A, 2,612,596 (GROSS) 30 SEPTEMBER 1952 SEE THE ENTIRE DOCUMENT.	1-8
Y	D. COPSON 'MICROWAVE HEATING' PUBLISHED 1962 BY AVI PUBLISHING COMPANY, WESTPOINT, CONNECTICUT, SEE PAGES 261-272-273 AND 277-278.	1-8
A	US, A, 4,266,108 (ANDERSON) 05 MAY 1981	1-8
A	US, A, 4,556,771 (THOMAS) 03 DECEMBER 1985	1-8
A	US, A, 4,560,850 (LEVENDUSKY) 24 DECEMBER 1985	1-8
A	US, A, 4,469,258 (WRIGHT) 04 SEPTEMBER 1984	1-8
A	US, A, 4,456,164 (FOSTER) 26 JUNE 1984	1-8
<p><sup>*</sup> Special categories of cited documents: <sup>10</sup></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"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</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"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.</p> <p>"Δ" document member of the same patent family</p>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
16 November 1988	04 JAN 1989	
International Searching Authority	Signature of Authorized Officer	
ISA/US	R.B. Penland R.B. Penland	

## FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

A	US, A, 4,013,798 (GOLTSOS) 22 MARCH 1977	1-8
A	US, A, 3,854,023 (LEVINSON) 10 DECEMBER 1974	1-8

V.  OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE <sup>1</sup>

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1.  Claim numbers \_\_\_\_\_, because they relate to subject matter <sup>12</sup> not required to be searched by this Authority, namely:

2.  Claim numbers \_\_\_\_\_, because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out <sup>13</sup>, specifically:

3.  Claim numbers \_\_\_\_\_, because they are dependent claims not drafted in accordance with the second and third sentences of PCT Rule 6.4(a).

VI.  OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING <sup>2</sup>

This International Searching Authority found multiple inventions in this international application as follows:

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

4.  As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

## Remark on Protest

The additional search fees were accompanied by applicant's protest.

No protest accompanied the payment of additional search fees.