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SEÑORES
DIVISION DE NUEVAS CREACIONES
SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
E. S. D.

COD:01

RE.: SOLICITUD DE PATENTE EN COLOMBIA Nº 02046941
TITULO: PLATOS CON MÚLTIPLES PERFORACIONES CON RESERVA DE CALOR PERIMENTAL
SOLICITANTE: AVENTIS PHARMACEUTICALS, INC.
FECHA SOLICITUD: MAYO 31, 2002

ASUNTO: PRESENTACIÓN PRIORIDAD

DILIA RODRIGUEZ D´ALEMAN, en mi condición de apoderada de la sociedad solicitante, en esta oportunidad por el presente escrito me permito presentar:

- Copia certificada de la prioridad reivindicada Nº 09/875,999 DE Junio 7 de 2.002
- Traducción al Español de la mencionada prioridad

Esta prioridad está siendo presentada dentro del término de 16 meses que exige la Decisión 486 de Diciembre 1 de 2.000.

Ruego a usted continuar con el presente trámite.

Señor Jefe,

DILIA RODRIGUEZ D´ALEMAN
CCR/srr
p-442

TRADUCCIÓN OFICIAL No. 02/196 de un documento escrito en inglés, el cual para su identificación se sella con el sello del traductor al tiempo con la presente. Esta traducción ha sido preparada por Juan Pablo Piedrahita Aguilera, Traductor e Intérprete Oficial debidamente reconocido de conformidad con el Certificado de Idoneidad Profesional No. 0045 expedido por la Universidad Nacional de Colombia.

(Se traduce el Certificado de la oficina de Patentes y Marcas de los Estados Unidos de América No. 09/875,999 y el capítulo reivindicatorio correspondiente de la invención, llamada "Plato con Múltiples Perforaciones con Reserva de Calor Perimetral" escritos en inglés.)

PA 848244

ESTADOS UNIDOS DE AMERICA

A TODOS A QUIENES ESTOS PRESENTES LLEGAREN:

DEPARTAMENTO DE COMERCIO DE LOS ESTADOS UNIDOS

OFICINA DE PATENTES Y MARCAS DE LOS ESTADOS UNIDOS

Mayo 31, 2002

POR EL PRESENTE CERTIFICO QUE ADJUNTA SE ENCUENTRA UNA COPIA FIEL DE LOS ARCHIVOS DE LA OFICINA DE PATENTES Y MARCAS DE LOS ESTADOS UNIDOS DE AMÉRICA DE AQUELLOS PAPELES DE LA SOLICITUD DE PATENTE IDENTIFICADA ABAJO Y QUE CUMPLIERON CON LOS REQUISITOS PARA QUE SE LES OTORGARA UNA FECHA DE

TRADUCCION OFICIAL No. 02/196
JUAN PABLO PIEDRAHITA AGUILERA
TRADUCTOR E INTERPRETE OFICIAL
M.C. BOGOTA D.C. COLOMBIA
UNIVERSIDAD NACIONAL DE COLOMBIA

SOLICITUD BAJO EL CÓDIGO DE COMERCIO DE LOS ESTADOS UNIDOS DE AMÉRICA TÍTULO 35 SECCIÓN 111.

NÚMERO DE SOLICITUD: ***09/875,999***

FECHA DE SOLICITUD: ***Junio 07, 2001***

Por autoridad del

COMISARIO DE PATENTES Y MARCAS

(Firmado.) W. MONTGOMERY

Funcionario que Certifica

(SELLO DE OBLEA DE LA OFICINA DE PATENTES Y MARCAS DE LOS ESTADOS UNIDOS DE AMÉRICA)

REIVINDICACIONES

Lo que se reivindica es:

1. Un plato con perforaciones múltiples para contener un compuesto para ensayos, dicho plato que comprende:

un elemento sustancialmente plano limitado por porciones laterales dependientes hacia abajo y con una superficie superior;

una pluralidad de perforaciones colocadas en dicho elemento plano y adaptadas para contener muestras de dicho compuesto, cada una de dichas perforaciones con una abertura localizada en dicha superficie superior, el primer grupo de dichas perforaciones en un arreglo adyacente a una de dichas

porciones laterales y

una primera cámara alongada que se extiende dentro de dicho elemento plano a lo largo de dicha porción lateral y colocado entre dicha porción lateral y dicho primer grupo de perforaciones, dicha primera cámara estando adaptada para contener un fluido con la capacidad de actuar como una reserva de calor y resistir cambios de temperatura de dichas muestras en dicho primer grupo de perforaciones relativo a las muestras en otras dichas perforaciones.

2. Un plato con múltiples perforaciones de acuerdo con la Reivindicación 1, donde dicho elemento plano está hecho de un material transparente para las microondas.

3. Un plato con múltiples perforaciones de acuerdo con la Reivindicación 2, donde dicho material mes politetrafluoretileno.

4. Un plato con múltiples perforaciones de acuerdo con la Reivindicación 1, que además comprende un puerto en dicho elemento plano con comunicación de fluido con dicha primera cámara, dicho puerto estando adaptado para recibir dicho fluido para llenar con él dicha primera cámara.

5. Un plato con múltiples perforaciones de acuerdo con la Reivindicación 4, donde dicho puerto está colocado en dicha superficie superior.

6. Un plato de múltiples perforaciones de acuerdo con la Reivindicación 1, además incluyendo un segundo grupo de perforaciones en un arreglo adyacente a otra de las porciones laterales, y una segunda cámara

alongada que se extiende dentro de dicho plato a lo largo de la otra dicha porción lateral y está colocado entre dicha otra porción lateral y dicho segundo grupo de perforaciones, dicha segunda cámara estando adaptada para contener un fluido con la capacidad de actuar como reserva de calor y resistir cambios de temperatura de dichas muestras en dicho segundo grupo de dichas perforaciones relativos a las muestras en otras dichas perforaciones.

7. Un plato con múltiples perforaciones de acuerdo con la Reivindicación 6, donde dichas primera y segundas cámaras tiene comunicación de fluido entre sí.

8. Un plato con múltiples perforaciones de acuerdo con la Reivindicación 1 donde dicha cámara se extiende continuamente alrededor de dicho elemento plano.

9. Un plato con múltiples perforaciones de acuerdo con la Reivindicación 1, donde dicho fluido es un líquido.

10. Un plato con múltiples perforaciones de acuerdo con la Reivindicación 9, donde dicho líquido tiene una temperatura de ebullición superior a la temperatura a la cual dicho compuesto va a calentarse.

11. Un plato con múltiples perforaciones de acuerdo con la Reivindicación 10, donde dicho líquido tiene una temperatura de ebullición por lo menos cerca de 50°C superior a la temperatura a la cual dicho compuesto va a calentarse.

12. Un plato con múltiples perforaciones para contener un compuesto para ensayos, dicho plato incluyendo:

un elemento sustancialmente plano limitado por una pluralidad de porciones laterales dependientes hacia abajo y con una superficie superior;

una pluralidad de perforaciones colocadas en dicho elemento plano y adaptadas para contener muestras de dicho compuesto, cada una de dichas perforaciones con una abertura localizada en dicha superficie superior, el primer grupo de dichas perforaciones en un arreglo adyacente a una de dichas porciones laterales;

una primera cámara alongada que se extiende dentro de dicho elemento plano a lo largo de dicha porción lateral y colocado entre dicha porción lateral y dicho primer grupo de perforaciones y

un fluido contenido en dicha cámara, dicho fluido con la capacidad de actuar como una reserva de calor y resistir cambios de temperatura de dichas muestras en dicho primer grupo de perforaciones relativo a las muestras en otras dichas perforaciones.

13. Un plato con múltiples perforaciones de acuerdo con la Reivindicación 12, donde dicha cámara se extiende continuamente alrededor de dicho elemento plano.

14. Un plato con múltiples perforaciones de acuerdo con la Reivindicación 13, donde dicha cámara se sella y por eso queda aislada del

ambiente.

15. Un plato con múltiples perforaciones de acuerdo con la Reivindicación 14, donde dicho fluido es un líquido.

16. Un plato con múltiples perforaciones de acuerdo con la Reivindicación 15, donde dicho líquido tiene una temperatura de ebullición superior a la temperatura a la cual dicho compuesto va a calentarse.

17. Un plato con múltiples perforaciones de acuerdo con la Reivindicación 16, donde dicho líquido tiene una temperatura de ebullición por lo menos cerca de 50°C superior a la temperatura a la cual dicho compuesto va a calentarse.

18. Un plato con múltiples perforaciones para contener un compuesto para ensayos, dicho plato incluyendo:

un elemento sustancialmente plano con una superficie superior y una pluralidad de porciones laterales que limitan dicho elemento plano;

pluralidad de perforaciones colocadas en dicho elemento plano y adaptadas para contener muestras de dicho compuesto, cada una de dichas perforaciones con una abertura localizada en dicha superficie superior, el primer grupo de dichas perforaciones en un arreglo adyacente a una de dichas porciones laterales; y

una primer cuerpo alongado que se extiende a lo largo de dicha porción lateral y colocado entre dicha porción lateral adyacente al primer grupo

de dichas perforaciones, dicho cuerpo con la capacidad de actuar como una reserva de calor y resistir cambios de temperatura de dichas muestras en dicho primer grupo de perforaciones relativo a las muestras en otras dichas perforaciones.

19. Un plato con múltiples perforaciones de acuerdo con la Reivindicación 18, donde dicho miembro plano está hecho de un material transparente para las microondas.

20. Un plato con múltiples perforaciones de acuerdo con la Reivindicación 18, donde dicho cuerpo se extiende sustancialmente continuamente alrededor de dicho elemento plano.

21. Un plato con múltiples perforaciones de acuerdo con la Reivindicación 18, donde dicho cuerpo comprende una cámara alongada que se extiende dentro de dicho miembro plano, dicha cámara estando adaptada para contener un fluido con la capacidad de actuar como una reserva de calor.

22. Un plato con múltiples perforaciones de acuerdo con la Reivindicación 21, donde dicho cuerpo comprende una cámara alongada que se extiende dentro de dicho elemento plano, dicha cámara conteniendo un fluido con la capacidad de actuar como una reserva del calor.

23. Un plato con múltiples perforaciones de acuerdo con la Reivindicación 18, donde dicho cuerpo comprende un material sólido que se puede calentar por microondas y con la capacidad de actuar como una reserva

del calor.

ES TRADUCCIÓN FIEL Y COMPLETA de la cual se deja copia en los archivos de esta oficina para su confrontación y a la cual me remito.

Bogotá, Mayo 29, 2002.

TRADUCCION OFICIAL No. 02/196
JUAN PABLO PIEDRAHITA AGUILER/
TRADUCTOR E INTERPRETE OFICIAL
C IDONEIDAD 045
UNIVERSIDAD NACIONAL DE COLOMBIA

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PA 848244

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

May 31, 2002

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE UNDER 35 USC 111.

APPLICATION NUMBER: ***09/875,999***
FILING DATE: ***June 07, 2001***

By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS

02 / W. Montgomery

W. MONTGOMERY
Certifying Officer

TRADUCCION OFICIAL No.
JUAN PABLO PIEDRAHITA AGUILERA
TRADUCTOR E INTERPRETE OFICIAL
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UNIVERSIDAD NACIONAL DE COLOMBIA

Express Mail Label No. EL598706315US 06-08-01 A

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UTILITY PATENT APPLICATION TRANSMITTAL
(Large Entity)
(Only for new nonprovisional applications under 37 CFR 1.53(b))

Docket No. 24664 USA
Total Pages in this Submission

TO THE ASSISTANT COMMISSIONER FOR PATENTS
Box Patent Application
Washington, D.C. 20231

Transmitted herewith for filing under 35 U.S.C. 111(a) and 37 C.F.R. 1.53(b) is a new utility patent application for an invention entitled:

MULTI-WELL PLATE WITH PERIMETERAL HEAT RESERVOIR

and invented by:

Fahad A.D. Al-Obeidi
Richard E. Austin

If a CONTINUATION APPLICATION, *check appropriate box and supply the requisite information:*

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No.: _____

Which is a:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No.: _____

Which is a:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No.: _____

Enclosed are:

Application Elements

1. ☒ Filing fee as calculated and transmitted as described below
2. ☒ Specification having (17) pages and including the following:
   a. ☒ Descriptive Title of the Invention
   b. ☐ Cross References to Related Applications *(if applicable)*
   c. ☐ Statement Regarding Federally-sponsored Research/Development *(if applicable)*
   d. ☐ Reference to Microfiche Appendix *(if applicable)*
   e. ☒ Background of the Invention
   f. ☒ Brief Summary of the Invention
   g. ☒ Brief Description of the Drawings *(if drawings filed)*
   h. ☒ Detailed Description
   i. ☒ Claim(s) as Classified Below
   j. ☒ Abstract of the Disclosure

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UTILITY PATENT APPLICATION TRANSMITTAL
(Large Entity)

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Docket No. 24664 USA
Total Pages in this Submission

Application Elements (Continued)

3. ☒ Drawing(s) *(when necessary as prescribed by 35 USC 113)*
   - a. ☒ Formal — Number of Sheets (6)
   - b. ☐ Informal — Number of Sheets

4. ☒ Oath or Declaration
   - a. ☒ Newly executed *(original or copy)* ☐ Unexecuted
   - b. ☐ Copy from a prior application (37 CFR 1.63(d)) *(for continuation/divisional application only)*
   - c. ☒ With Power of Attorney ☐ Without Power of Attorney
   - d. ☐ *DELETION OF INVENTOR(S)*
     Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. 1.63(d)(2) and 1.33(b).

5. ☐ Incorporation By Reference *(usable if Box 4b is checked)*
   The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

6. ☐ Computer Program in Microfiche *(Appendix)*

7. ☐ Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all must be included)*
   - a. ☐ Paper Copy
   - b. ☐ Computer Readable Copy *(identical to computer copy)*
   - c. ☐ Statement Verifying Identical Paper and Computer Readable Copy

Accompanying Application Parts

8. ☒ Assignment Papers *(cover sheet & document(s))*

9. ☐ 37 CFR 3.73(B) Statement *(when there is an assignee)*

10. ☐ English Translation Document *(if applicable)*

11. ☒ Information Disclosure Statement/PTO-1449 ☒ Copies of IDS Citations

12. ☐ Preliminary Amendment

13. ☒ Acknowledgment postcard

14. ☒ Certificate of Mailing
    ☐ First Class ☒ Express Mail *(Specify Label No.):* EL598786315US

UTILITY PATENT APPLICATION TRANSMITTAL (Large Entity) *(Only for new nonprovisional applications under 37 CFR 1.53(b))*	Docket No. 24664 USA
	Total Pages in this Submission

Accompanying Application Parts (Continued)

15. ☐ Certified Copy of Priority Document(s) *(if foreign priority is claimed)*

16. ☒ Additional Enclosures *(please identify below):*

11 references accompanying IDS
$40 check for Assignment recordal fee

Request That Application Not Be Published Pursuant To 35 U.S.C. 122(b)(2)

17. ☐ Pursuant to 35 U.S.C. 122(b)(2), Applicant hereby requests that this patent application not be published pursuant to 35 U.S.C. 122(b)(1). Applicant hereby certifies that the invention disclosed in this application has not and will not be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication of applications 18 months after filing of the application.

Warning

An applicant who makes a request not to publish, but who subsequently files in a foreign country or under a multilateral international agreement specified in 35 U.S.C. 122(b)(2)(B)(i), must notify the Director of such filing not later than 45 days after the date of the filing of such foreign or international application. A failure of the applicant to provide such notice within the prescribed period shall result in the application being regarded as abandoned, unless it is shown to the satisfaction of the Director that the delay in submitting the notice was unintentional.

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UTILITY PATENT APPLICATION TRANSMITTAL (Large Entity) *(Only for new nonprovisional applications under 37 CFR 1.53(b))*	Docket No. 24664 USA
	Total Pages in this Submission

Fee Calculation and Transmittal

CLAIMS AS FILED

For	#Filed	#Allowed	#Extra		Rate	Fee
Total Claims	23	- 20 =	3	x	$18.00	$54.00
Indep. Claims	3	- 3 =	0	x	$80.00	$0.00
Multiple Dependent Claims (check if applicable) ☐						$0.00
					BASIC FEE	$710.00
OTHER FEE *(specify purpose)*						$0.00
					TOTAL FILING FEE	$764.00

☒ A check in the amount of $764.00 to cover the filing fee is enclosed.

☐ The Commissioner is hereby authorized to charge and credit Deposit Account No. as described below. A duplicate copy of this sheet is enclosed.

- ☐ Charge the amount of as filing fee.
- ☐ Credit any overpayment.
- ☐ Charge any additional filing fees required under 37 C.F.R. 1.16 and 1.17.
- ☐ Charge the issue fee set in 37 C.F.R. 1.18 at the mailing of the Notice of Allowance, pursuant to 37 C.F.R. 1.311(b).

Signature

Dated: June 7, 2001

John A. Chiaschia, Reg. No. 40,954
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Philadelphia, PA 19107-2950

Telephone: 215-923-4466
Facsimile: 215-923-2189

cc:

Attorney Docket 24664 USA

CERTIFICATE OF EXPRESS MAILING

I hereby certify that the documents referred to as enclosed herein are being deposited with the United States Postal Service on this date, June 7, 2001 in an envelope as "Express Mail Post Office to Addressee" Mailing Label Number EL598706315US addressed to the: Commissioner of Patents, Box Patent Application, Washington, D.C. 20231.

Dawn M. Larsen
Signature

Dawn M. Larsen
Print Name

[redacted]

Express Mail #EL59870631 5US
Atty. Docket 24664 USA

MULTI-WELL PLATE WITH PERIMETERAL HEAT RESERVOIR

Field of the Invention

This invention concerns multi-well plates for organic chemical synthesis testing, and especially to multi-well plates useable in a microwave.

Background of the Invention

Organic chemical synthesis concerns the chemistry of the compounds of carbon and is fundamental to a broad range of industrial and research activities, notably pharmaceuticals, but also including polymer chemistry, the chemistry of food additives, flavor chemistry, as well as biochemistry.

Synthesis testing involves the determination of percentage yield of product from starting reagents. Synthesis testing may be performed in either the solid or liquid phases and is conveniently accomplished using a multi-well plate, wherein reagents of various concentrations in each well are permitted to react and form product compounds. The percentage yield for the various starting concentrations is measured and compared to determine the optimum reagent ratios which will yield the largest percentage of product.

When the reaction is endothermic or when heat is a catalyst, it is convenient to heat the reagents in a microwave oven. Microwave heating works by exciting molecules having a dipole moment at or near the resonant frequency of the dipole and, hence, is very selective in what is heated within the oven. For example, the microwaves bombarding a multi-well plate will heat the reagents within the wells but will not heat the plate or the air within the oven. While this is economical, because energy is not wasted heating items other than the constituents, there is a drawback in that temperature differences are present between items within the oven, such as between the reagents and the plate, as well as between the plate and the ambient air. Such temperature differences inevitably cause heat transfer to occur. For example, heat is transferred from the reagents to the plate and from the plate to the ambient air within the microwave chamber. The heat transfer leads to transient and static temperature gradients across the plate. Relatively lower temperatures are found in the wells near the edges of the plate where the heat transfer from the plate to the air is greatest due to the relatively large surface area of the side portions of the plate in contact with the air. Relatively higher temperatures are present in the wells near the center of the plate where the heat transfer is not as great because there is less surface area from which heat is lost.

The temperature gradients cause uneven results to occur, thereby biasing the testing and providing false results since all of the samples are not being tested at the same temperature due to the gradients formed across the plate. There is clearly a need for a multi-

well plate useable in a microwave oven which does not suffer from the disadvantages of temperature gradients and which will yield consistent, uniform results in testing.

Summary and Objects of the Invention

The invention concerns a multi-well plate for holding a compound for testing. The plate is formed from a substantially planar member having an upper surface and a plurality of side portions bounding the planar member. A plurality of wells are positioned in the planar member and are adapted to hold samples of the compound. Each of the wells has an opening located on the upper surface. A first group of the wells are arranged adjacent to one of the side portions. A first elongated body extends lengthwise along the one side portion adjacent to the first group of wells. The body has a capacity to act as a heat reservoir to resist temperature changes of the samples in the first group of wells relative to the samples in others of the wells. Preferably, the body extends substantially continuously around the planar member and serves as a heat reservoir to resist temperature changes of samples in any other adjacent wells.

In its preferred embodiment, the substantially planar member is bounded by downwardly depending side portions. The first group of wells is arranged adjacent to one of the side portions. The elongated body comprises a first elongated chamber which extends within the plate lengthwise along the one side portion and is positioned between the one side portion and the first group of wells. The first chamber is adapted to contain a fluid which has a capacity to act as a heat

reservoir and resist temperature changes of the samples in the first group of wells relative to the samples in others of the wells.

In the preferred embodiment, the first chamber is filled with a liquid and is sealed to isolate it from the ambient. In an alternate embodiment, the chamber is initially air-filled and there is a port in the planar member in fluid communication with the first chamber. The port is adapted to receive the fluid, preferably a liquid which may be poured through the port to fill the first chamber. Preferably, the port is positioned on the upper surface.

The plate preferably has a second group of the wells arranged adjacent to another of the side portions and a second elongated chamber extending within the plate lengthwise along the other side portion. The second chamber is positioned between the other side portion and the second group of wells. Similar to the first chamber, the second chamber is also adapted to contain a fluid having a capacity to act as a heat reservoir and resist temperature changes of the samples in the second group of the wells relative to the samples in others of the wells. Preferably, the first and the second chambers are in fluid communication with each other.

In another embodiment, the elongated body is a solid material which may be heated by the microwaves and preferably extends continuously around the planar member. The solid material may be considered to form the side portions or it may be positioned within the elongated chamber.

It is an object of the invention to provide a multi-well plate suitable for use in a microwave oven.

It is another object of the invention to provide a multi-well plate in which temperature differences between wells is minimized.

It is another object of the invention to reduce or eliminate the presence of temperature gradients across the plate.

These and other objects of the invention will become apparent from consideration of the following drawings and detailed description of preferred embodiments of the invention.

Brief Description of the Drawings

Figure 1 is a perspective view of a multi-well plate according to the invention;

Figure 2 is a plane sectional view of the plate shown in Figure 1 taken along lines 2-2;

Figure 3 is a cross-sectional view of the plate shown in Figure 1 taken along lines 3-3;

Figure 4 is a perspective view of another embodiment of a multi-well plate according to the invention;

Figure 5 is a plane sectional view of the multi-well plate shown in Figure 4 taken along lines 5-5;

Figure 6 is a partial cross-sectional view of the multi-well plate taken along lines 6-6 in Figure 4;

Figure 7 is a partial cross-sectional view of an alternate embodiment of a multi-well plate according to the invention similar to Figure 6;

Figure 8 is a cross-sectional view of another alternate embodiment of a multi-well plate according to the invention similar to Figure 3;

Figure 9 is a cross-sectional view of another alternate embodiment of a multi-well plate according to the invention similar to Figure 3; and

Figure 10 is a perspective view of multi-well plates in use.

Detailed Description of the Preferred Embodiment

Figure 1 shows a multi-well plate 10 according to the invention. Plate 10 is a substantially planar member 12 bounded by downwardly depending side portions 14. The plate has an upper surface 16 and a plurality of wells 18, each well having an opening 20 on the upper surface 16. The wells are preferably arranged in a regular array of rows and columns and are adapted to hold samples of compounds for heating in an experiment, for example, one involving solid phase synthesis.

As best shown in Figures 2 and 3, an elongated chamber 22 extends lengthwise within the planar member 12 between one of the side portions 14 and a row or group of wells 24 proximal to the side portion. In the preferred embodiment, the chamber extends continuously

around the entire planar member 12 between the outermost rows of wells and the proximal side portions 14. Preferably, the chamber is permanently sealed and isolated from the ambient and contains a substance 26, which has a capacity to act as a heat reservoir, i.e., the substance is heatable by microwave radiation and has the ability to store and transfer heat. The preferred substance 26 is a liquid and has a higher boiling point than the temperature at which the experiment is designed to run for reasons described below.

The plate illustrated in Figure 1 is preferably made of polytetrafluoroethylene or another relatively inert substance which is transparent to microwaves (i.e., will not heat up significantly when subjected to microwave radiation), will not react with the compound in the wells and which can withstand relatively high temperatures, at least in excess of the experiment temperature. The plate may be machined from a solid block, the channel filled with the substance 26 and then sealed with the bottom plate 28, attached with adhesives or fasteners or other appropriate means.

Figure 4 shows another embodiment of a multi-well plate 30 wherein one or more chambers 22 are drilled into the planar member 12, each chamber being positioned between a respective row of wells 34 and a side portion 14. As shown in Figure 5, chambers 22 preferably surround the entire planar member 12 and are in fluid communication with one another. One or more plugs 36, as necessary, are used to seal the chambers to prevent the fluid contents from escaping. A fill port 38, in fluid communication with a chamber 22, is

preferably located on the upper surface 16 of the planar member 12 to permit a liquid to be poured into the chambers. It is convenient to use two fill ports 38 as shown in Figure 4, one of the ports allowing air to escape from the chamber or chambers as fluid is poured into the other.

While a single chamber 22 may be used per side of the plate as shown in Figure 6, the invention contemplates using multiple chambers 22 arranged one above the other along one or more sides of a plate as shown in Figure 7. This embodiment will allow more fluid to be positioned between a row of wells and a side portion 14 of the plate, thereby increasing the effectiveness of the chambers as a heat reservoir as described below.

Chambers 22, when filled with an appropriate substance 26, act as heat reservoirs to slow or prevent heat loss from the sides 14 to the cooler ambient air within the microwave oven. The substance acts as a buffer which does not allow significant heat transfer from wells 24 positioned adjacent to the sides, thus, allowing all of the wells to maintain substantially the same temperature and avoid any significant temperature gradient between wells at the center of the plate and wells nearer to the sides 14. By avoiding significant temperature gradients, the integrity of the experimental results will not be compromised and meaningful results will be obtained for all of the reactants in all of the wells of the multi-well plate according to the invention.

To ensure effective operation of the multi-well plate, it is preferred that a liquid within chambers 22 have a boiling point relatively higher than the temperature at which the experiment is to be run. This will ensure that the chambers remain fluid filled and continue to act as a heat reservoir to reduce or eliminate temperature gradients, and also do not form a vapor which may contaminate the atmosphere within the oven, possibly compromising the integrity of the experiment. Safety is also an issue since liquid, heated to its boiling point within a sealed chamber, may achieve significant pressure before the chamber bursts and spews the hot liquid and vapor into the oven.

For example, for an experiment designed to heat the samples within the wells to a constant temperature of about 130°C, the preferred liquid 26 within chambers 22 is N-methylpyrrolidinone, which has a boiling point of 202°C at one atmosphere of pressure. A boiling point for the liquid substance 26 of at least 50°C above the temperature of the experiment provides an adequate safety margin for most applications.

For a standard multi-well plates made of polytetrafluoroethylene having 96 wells and dimensions of 124 X 85 X 27mm, it is found that about 7mL of liquid is sufficient to form an effective heat reservoir around the plate and reduce the temperature gradients to relative insignificance. A greater volume of liquid is preferred however to provide even more effective gradient smoothing.

In another embodiment, shown in Figure 8, a heat reservoir 40 is formed around the planar member 12 by positioning an elongated body 44 of solid material lengthwise along the sides 46 directly adjacent to the wells 18. The elongated body 44 may be considered to form the side portions 14 and preferably extends continuously around the entire planar member. The material comprising body 44 is readily heatable by the microwave to the temperature of the experiment and thereby acts as a heat reservoir to prevent heat loss from the adjacent wells 18 to the cooler atmosphere within the microwave oven. The presence of the solid body surrounding the planar member 10 prevents any significant temperature gradients from forming between the center wells and the wells adjacent to the sides 46. Any gradients which would form would likely be confined to the elongated body 44 itself. The body 44 may be formed of ceramic material, as well as other solid materials. If the body 44 is a gelatinous material, it may be placed within the chamber 22 between the sides 46 and the side portion 14 as shown in Figure 9 before the bottom plate 28 is attached to seal the chamber. This is similar to the embodiment shown in Figure 3.

Figure 9 shows multi-well plates 10 according to the invention being used on a turntable 48 which is positioned within a microwave oven, not shown. Preferably, the plates 10 resides in a tray 50 which is situated on turntable 48, preferably within a recess 52 to ensure proper positioning of the plate. A rotating arm 54 permits a measuring device, such as a thermometer, to be brought to bear on the plates to monitor the temperature of the compound samples in the

wells. The turntable is powered and turns within the oven about vertical axis 56 to ensure even heating to all of the wells within all of the plates by the microwaves.

Experimental results achieved prove the effectiveness of the multi-well plate according to the invention when used in a microwave oven in chemical synthesis testing. For such a plate, 90% to 100% of the reactants in all wells go to product. This contrasts with multi-well plates according to the prior art wherein the reactants in the wells adjacent to the periphery see only 10% to 20% of the reactants going to product.

CLAIMS

What is claimed is:

1. A multi-well plate for holding a compound for testing, said plate comprising:

a substantially planar member bounded by downwardly depending side portions and having an upper surface;

a plurality of wells positioned in said planar member and adapted to hold samples of said compound, each of said wells having an opening located on said upper surface, a first group of said wells being arranged adjacent to one of said side portions; and

a first elongated chamber extending within said planar member lengthwise along said one side portion and positioned between said one side portion and said first group of wells, said first chamber being adapted to contain a fluid having the capacity to act as a heat reservoir and resist temperature changes of said samples in said first group of wells relative to the samples in others of said wells.

2. A multi-well plate according to Claim 1, wherein said planar member is made of a microwave transparent material.

3. A multi-well plate according to Claim 2, wherein said material is polytetrafluoroethylene.

4. A multi-well plate according to Claim 1, further comprising a port in said planar member in fluid communication with said first chamber, said port

being adapted to receive said fluid for filling said first chamber therewith.

5. A multi-well plate according to Claim 4, wherein said port is positioned on said upper surface.

6. A multi-well plate according to Claim 1, further comprising a second group of said wells being arranged adjacent to another of said side portions, and a second elongated chamber extending within said plate lengthwise along said other side portion and positioned between said other side portion and said second group of wells, said second chamber being adapted to contain a fluid having the capacity to act as a heat reservoir and resist temperature changes of said samples in said second group of said wells relative to the samples in others of said wells.

7. A multi-well plate according to Claim 6, wherein said first and said second chambers are in fluid communication with each other.

8. A multi-well plate according to Claim 1, wherein said chamber extends continuously around said planar member.

9. A multi-well plate according to Claim 1, wherein said fluid is a liquid.

10. A multi-well plate according to Claim 9, wherein said liquid has a higher boiling point temperature than the temperature to which said compound will be heated.

11. A multi-well plate according to Claim 10, wherein said liquid has a boiling point temperature at least about 50°C higher than the temperature to which said compound will be heated.

12. A multi-well plate for holding a compound for testing, said plate comprising:

a substantially planar member bounded by a plurality of downwardly depending side portions and having an upper surface;

a plurality of wells positioned in said planar member and adapted to hold said samples of said compound, each of said wells having an opening located on said upper surface, a first group of said wells being arranged adjacent to one of said side portions;

an elongated chamber extending within said plate lengthwise along said one side portion and positioned between said one side portion and said first group of wells; and

a fluid contained in said chamber, said fluid having a capacity to act as a heat reservoir to resist temperature changes of said samples in said first group of wells relative to samples in others of said wells.

13. A multi-well plate according to Claim 12, wherein said chamber extends continuously around said planar member.

14. A multi-well plate according to Claim 13, wherein said chamber is sealed and thereby isolated from the ambient.

15. A multi-well plate according to Claim 14, wherein said fluid is a liquid.

16. A multi-well plate according to Claim 15, wherein said fluid has a higher boiling point temperature than the temperature to which said sample compound is to be heated.

17. A multi-well plate according to Claim 16, wherein said liquid has a boiling point temperature at least about 50°C higher than the temperature to which said compound will be heated.

18. A multi-well plate for holding a compound for testing, said plate comprising:

a substantially planar member having an upper surface and a plurality of side portions bounding said planar member;

a plurality of wells positioned in said planar member and adapted to hold samples of said compound, each of said wells having an opening located on said upper surface, a first group of said wells being arranged adjacent to one of said side portions; and

a first elongated body extending lengthwise along said one side portion adjacent to said first group of said wells, said body having a capacity to act as a heat reservoir to resist temperature changes of said samples in said first group of wells relative to the samples in others of said wells.

19. A multi-well plate according to Claim 18, wherein said planar member is made of a microwave transparent material.

20. A multi-well plate according to Claim 18, wherein said body extends substantially continuously around said planar member.

21. A multi-well plate according to Claim 18, wherein said body comprises an elongated chamber extending within said planar member, said chamber being adapted to contain a fluid having a capacity to act as said heat reservoir.

22. A multi-well plate according to Claim 21, wherein said body comprises an elongated chamber extending within said planar member, said chamber containing a fluid having a capacity to act as said heat reservoir.

23. A multi-well plate according to Claim 18, wherein said body comprises a solid material heatable by microwaves and having a capacity to act as said heat reservoir.

ABSTRACT

A multi-well plate is disclosed for holding chemical compounds for heating in a microwave oven. The plate is a substantially planar member having wells arranged in an array of rows and columns in its upper surface. The plate has heat reservoirs in the form of fluid filled channels or elongated solid bodies positioned lengthwise along the side portions of the plate to reduce temperature gradients among the wells across the length and width of the plate. The heat reservoirs prevent or mitigate heat loss from the wells near the side portions of the plate and ensure that the compounds in all of the wells have a uniform temperature.

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Docket No.
24664 USA

Declaration and Power of Attorney For Patent Application

English Language Declaration

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

MULTI-WELL PLATE WITH PERIMETERAL HEAT RESERVOIR

the specification of which

(check one)

☒ is attached hereto.

☐ was filed on _____ as United States Application No. or PCT International Application Number _____

and was amended on _____

(If applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) or Section 365(b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)			Priority Not Claimed
_____ (Number)	_____ (Country)	_____ (Day/Month/Year Filed)	☐
_____ (Number)	_____ (Country)	_____ (Day/Month/Year Filed)	☐
_____ (Number)	_____ (Country)	_____ (Day/Month/Year Filed)	☐

I hereby claim the benefit under 35 U.S.C. Section 119(e) of any United States provisional application(s) listed below:

(Application Serial No.)	(Filing Date)
(Application Serial No.)	(Filing Date)
(Application Serial No.)	(Filing Date)

I hereby claim the benefit under 35 U. S. C. Section 120 of any United States application(s), or Section 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. Section 112, I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, C. F. R., Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

(Application Serial No.)	(Filing Date)	(Status) (patented, pending, abandoned)
(Application Serial No.)	(Filing Date)	(Status) (patented, pending, abandoned)
(Application Serial No.)	(Filing Date)	(Status) (patented, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(list name and registration number)*

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10/090'665/860

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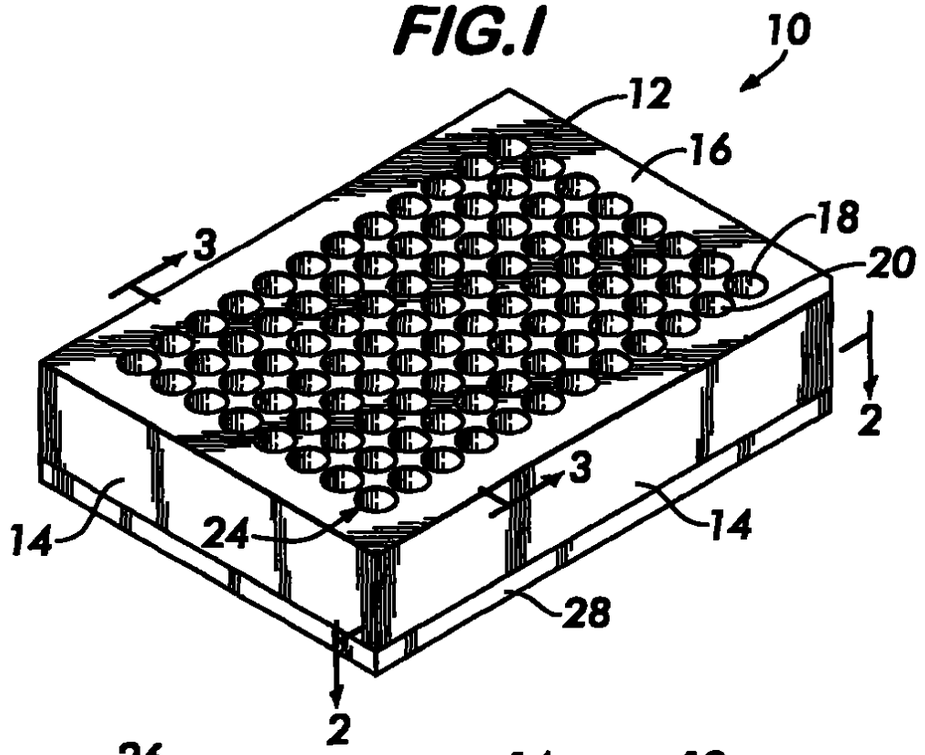
Post Office Address same as residence

FIG.1



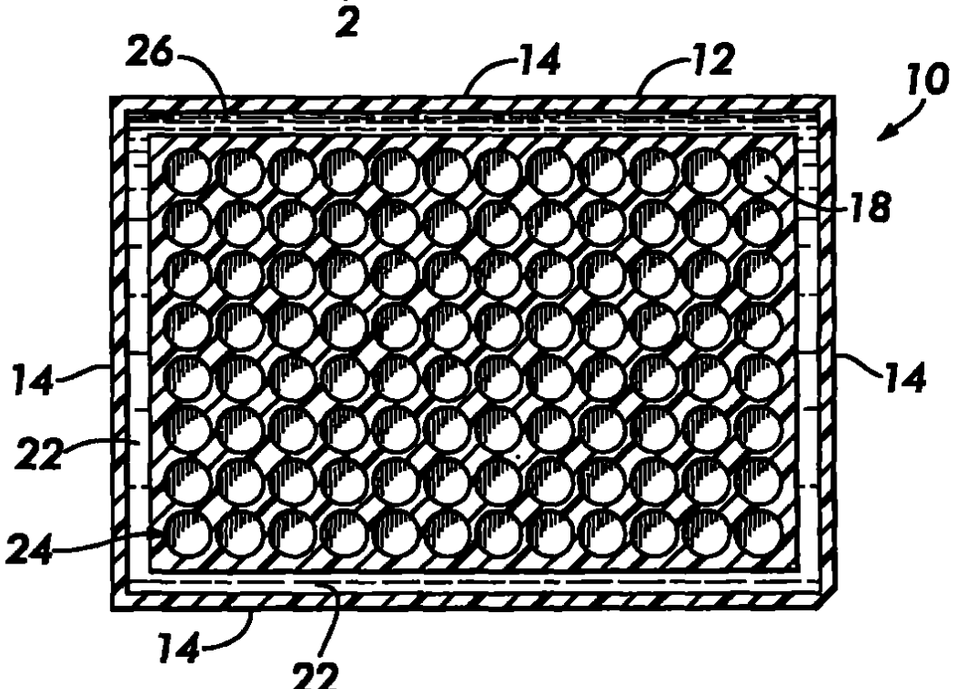


FIG.2

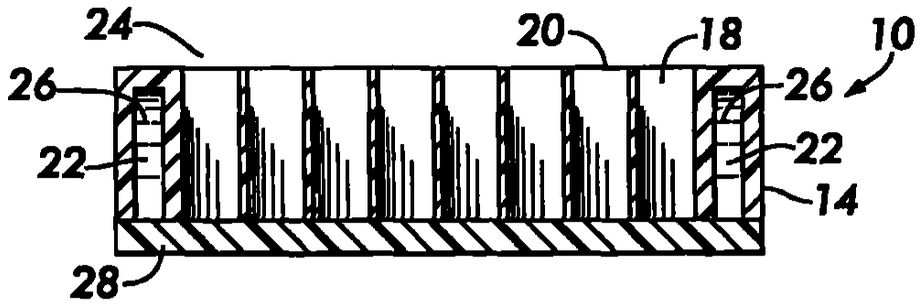

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FIG.3

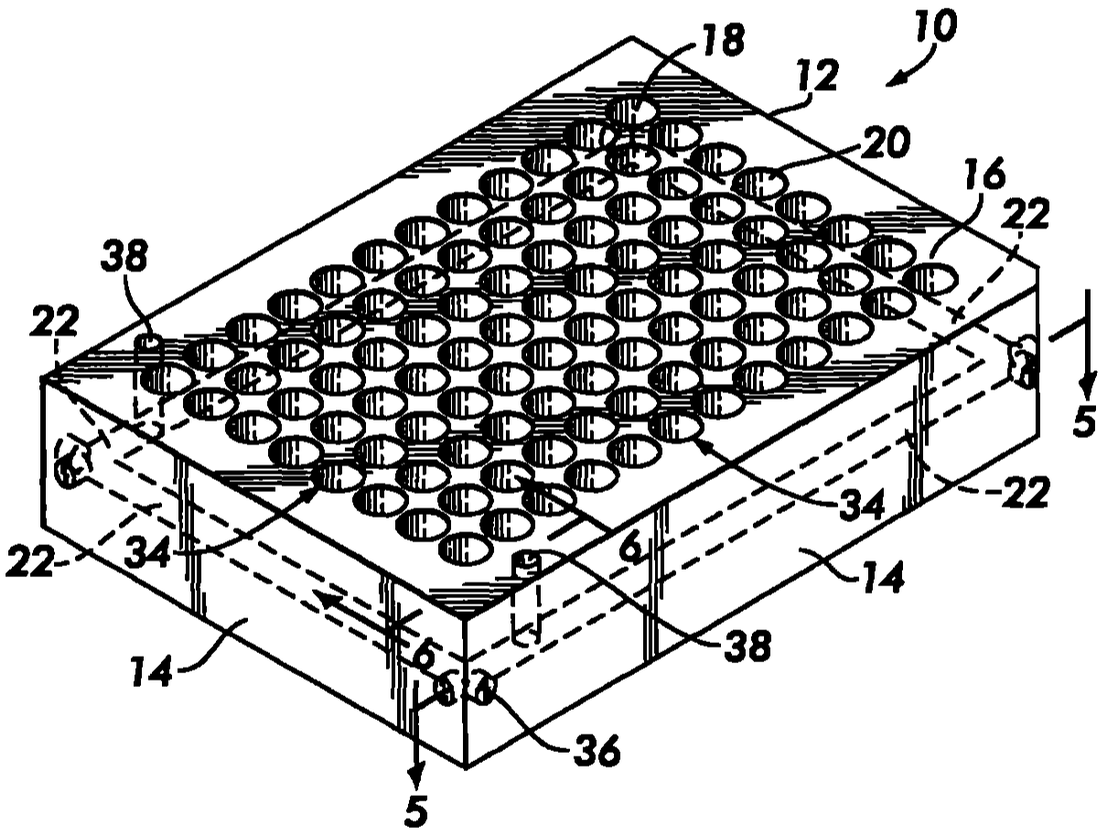
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FIG.4

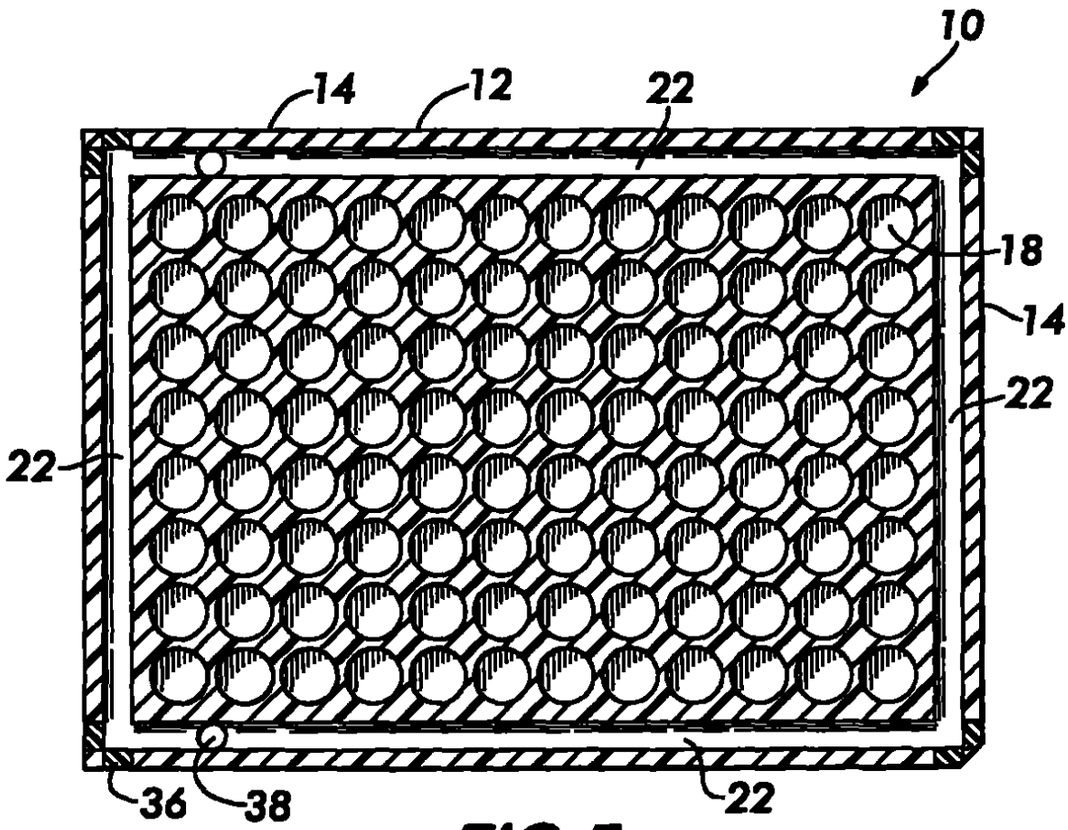

FIG.5

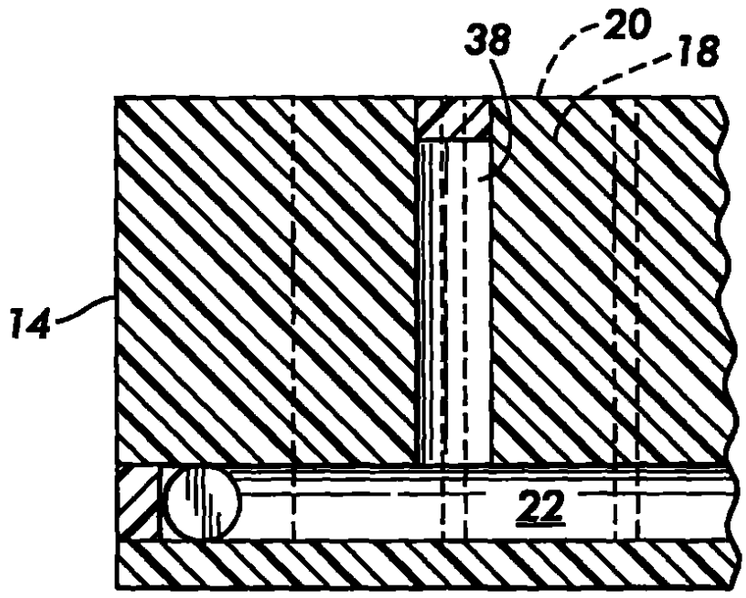

FIG.6

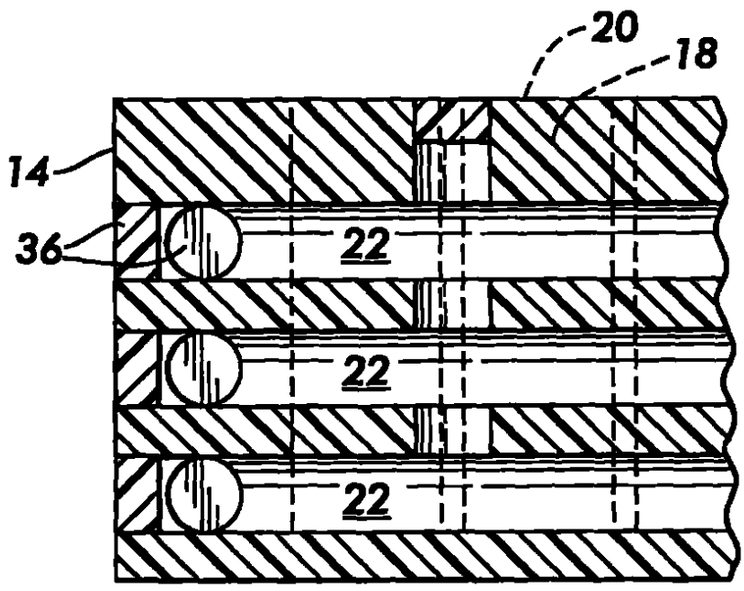

FIG.7

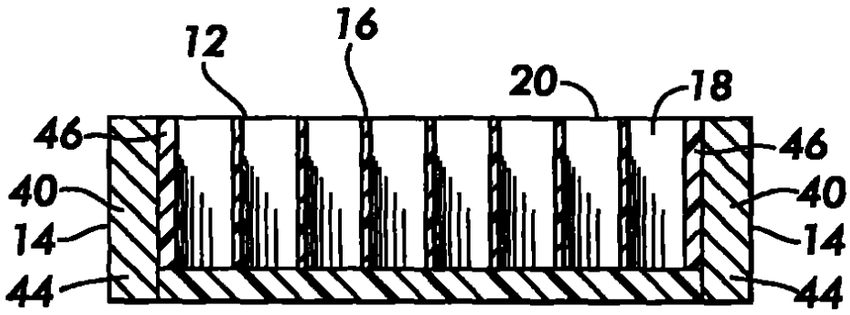

FIG.8

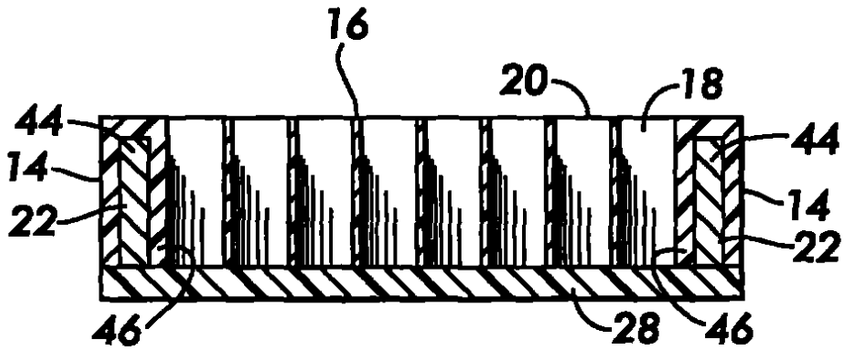

FIG.9

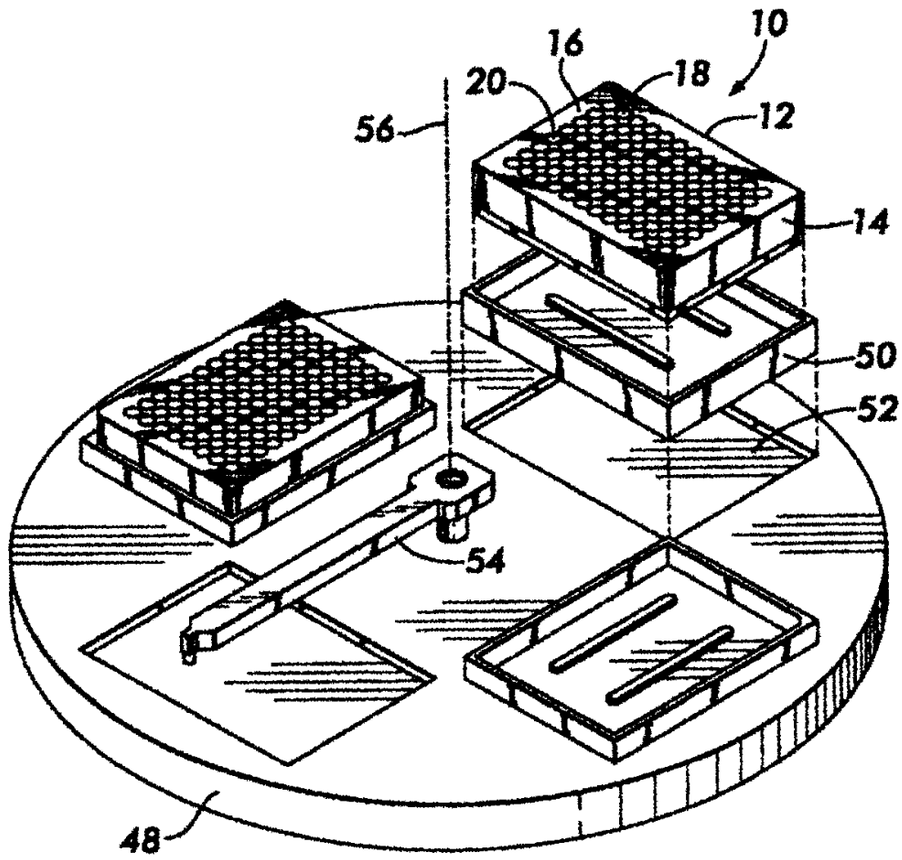

FIG.10