

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 7,320,221 B2
APPLICATION NO. : 10/910613
DATED : January 22, 2008
INVENTOR(S) : Lucien Y. Bronicki

Page 1 of 1

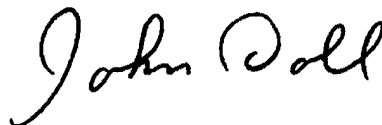
It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the Title Page, Item (73)

Please change the Assignee from "ORAMT TECHNOLOGIES, INC." to
--ORMAT TECHNOLOGIES, INC.--

Signed and Sealed this

Thirtieth Day of June, 2009

A handwritten signature in cursive script that reads "John Doll".

JOHN DOLL

Acting Director of the United States Patent and Trademark Office

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 7,320,221
DATED: January 22, 2008
INVENTOR(S): Lucien Y. BRONICKI

It is certified that an error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Please change the Assignee from "ORAMT TECHNOLOGIES, INC." TO
--ORMAT TECHNOLOGIES, INC.--

Mailing address of sender:

OBLON, SPIVAK MCCLELLAND,
MAIER & NEUSTADT, P.C.
1940 DUKE STREET
ALEXANDRIA, VIRGINIA 22314
Tel. (703) 413-3000
Fax. (703) 413-2220
(OSMMN 03/09)

Patent No. 7,320,221

No. of add'l copies
@ .30 per page



DOCKET NO.: 256868US30

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF: Lucien Y. BRONICKI

PATENT NO.: 7,320,221

GROUP: 3748

ISSUED: January 22, 2008

EXAMINER:

FOR: METHOD AND APPARATUS FOR USING GEOTHERMAL ENERGY FOR THE
PRODUCTION OF POWER

REQUEST FOR CERTIFICATE OF CORRECTION

DIRECTOR OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
ALEXANDRIA, VA 22313-1450

SIR:

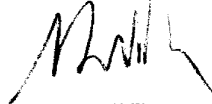
The following is a Request for Certificate of Correction in Serial Number 10/910,613,
now U.S. Patent Number 7,320,221.

In accordance with the provisions of Rule 322 of the Rules of Practice, which
implement 35 USC 254, the U.S. Patent and Trademark Office is respectfully requested to
issue a Certificate of Correction in the above-identified patent.

In light of the fact that the errors were the fault of the U.S. Patent and Trademark
Office, no fees are required. The requested corrections are listed on FORM P.T.O. 1050.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.



Robert T. Pous

Registration No. 29,099

Customer Number

22850

Tel. (703) 413-3000
Fax. (703) 413-2220
(OSMMN 07/08)

Electronic Acknowledgement Receipt

EFS ID:	5358345
Application Number:	10910613
International Application Number:	
Confirmation Number:	6916
Title of Invention:	METHOD AND APPARATUS FOR USING GEOTHERMAL ENERGY FOR THE PRODUCTION OF POWER
First Named Inventor/Applicant Name:	Lucien Y. Bronicki
Customer Number:	22850
Filer:	Marvin Jay Spivak/Cecelia Davis
Filer Authorized By:	Marvin Jay Spivak
Attorney Docket Number:	256868US30
Receipt Date:	19-MAY-2009
Filing Date:	04-AUG-2004
Time Stamp:	11:50:27
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		256868UScoc.PDF	94704 317b33a9e857b0258bad872187a2f1cfe778a633	yes	3

	Multipart Description/PDF files in .zip description		
	Document Description	Start	End
	Miscellaneous Incoming Letter	1	1
	Request for Certificate of Correction	2	3
Warnings:			
Information:			
Total Files Size (in bytes):		94704	
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.			

Docket No.: 256868US30

OBLON
SPIVAK

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

ATTORNEYS AT LAW

ROBERT T. POUS
(703) 413-3000
RPOUS@OBLON.COM

RE: Application Serial No.: 10/910,613
Applicants: Lucien Y. BRONICKI
Filing Date: August 4, 2004
For: METHOD AND APPARATUS FOR USING GEOTHERMAL
ENERGY FOR THE PRODUCTION OF POWER
Group Art Unit: 3748
Examiner: NGUYEN, H.

SIR:

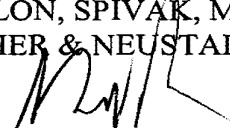
Attached hereto for filing are the following papers:

Request for Certificate of Correction
Certificate of Correction-Form PTO 1050

Credit card payment is being made online (if electronically filed), or is attached hereto (if paper filed), in the amount of **\$0.00** to cover any required fees. In the event any variance exists between the amount enclosed and the Patent Office charges for filing the above-noted documents, including any fees required under 37 C.F.R. 1.136 for any necessary Extension of Time to make the filing of the attached documents timely, please charge or credit the difference to our Deposit Account No. **15-0030**. Further, if these papers are not considered timely filed, then a petition is hereby made under 37 C.F.R. 1.136 for the necessary extension of time.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.


Robert T. Pous

Registration No. 29,099

Customer Number

22850

(703) 413-3000 (phone)
(703) 413-2220 (fax)
(OSMMN 02/09)

OBLON, SPIVAK, McCLELLAND, MAIER & NEUSTADT, P.C.
1940 DUKE STREET ■ ALEXANDRIA, VIRGINIA 22314 ■ U.S.A.
TELEPHONE: 703-413-3000 ■ FACSIMILE: 703-413-2220 ■ WWW.OBLON.COM

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 7,320,221 B2
APPLICATION NO. : 10/910613
DATED : January 22, 2008
INVENTOR(S) : Lucien Y. Bronicki

Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 2, line 17, delete "beat" and insert --heat--;

Column 4, line 46, delete "beat" and insert --heat--;

Column 5, line 50, delete numeral "8" and insert numeral --3--.

Signed and Sealed this

Sixteenth Day of September, 2008

A handwritten signature in black ink, appearing to read "Jon W. Dudas". The signature is stylized with a large, looped initial "J" and a cursive "Dudas".

JON W. DUDAS
Director of the United States Patent and Trademark Office

SPE RESPONSE FOR CERTIFICATE OF CORRECTION

Paper No.:20080507

DATE : May 07, 2008

TO SPE OF : ART UNIT 3748

SUBJECT : Request for Certificate of Correction on Patent No.: 7,320,221

A response is requested with respect to the accompanying request for a certificate of correction.

Please complete this form and return with file, within 7 days to:

Certificates of Correction Branch - ST (South Tower) 9A22

Palm location **7590** - Tel. No. (703) 305-8309

With respect to the change(s) requested, correcting Office and/or Applicant's errors, should the patent read as shown in the certificate of correction? No new matter should be introduced, nor should the scope or meaning of the claims be changed.

Thank You For Your Assistance

Certificates of Correction Branch

The request for issuing the above-identified correction(s) is hereby:

Note your decision on the appropriated box.

☒ **Approved**

All changes apply.

☐ **Approved in Part**

Specify below which changes **do not** apply.

☐ **Denied**

State the reasons for denial below.

Comments:

Thomas Denion
THOMAS DENION
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 3700

SPE: Thomas Denion

Art Unit 3748

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 7,320,221
DATED: January 22, 2008
INVENTOR(S): Lucien Y. BRONICKI

It is certified that an error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Please change the Assignee name on front page from "Oramt" Technologies to "Ormat" Technologies, Inc.;

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Column 4, line 46, delete "beat" and insert --heat--;

Column 5, line 50, delete numeral "8" and insert numeral --3--.

Mailing address of sender:

Patent No. 7,320,221

Customer Number

22850

Tel. (703) 413-3000
Fax. (703) 413-2220
(OSMMN 03/02)

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RECOMMENDED FOR ENTRY

HMN

5/7/08

DOCKET NO.: 256868US30

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF: Lucien Y. BRONICKI

PATENT NO.: 7,320,221

GROUP: 3748

ISSUED: January 22, 2008

EXAMINER:

FOR: METHOD AND APPARATUS FOR USING GEOTHERMAL ENERGY FOR THE
PRODUCTION OF POWER

REQUEST FOR CERTIFICATE OF CORRECTION

DIRECTOR OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
ALEXANDRIA, VA 22313-1450

SIR:

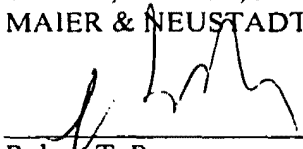
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issue a Certificate of Correction in the above-identified patent.

In light of the fact that the errors were the fault of the U.S. Patent and Trademark
Office, no fees are required. The requested corrections are listed on FORM P.T.O. 1050.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.



Robert T. Pous

Registration No. 29,099

Customer Number

22850

Tel. (703) 413-3000
Fax. (703) 413-2220
(OSMMN 03/06)

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 7,320,221
DATED: January 22, 2008
INVENTOR(S): Lucien Y. BRONICKI

It is certified that an error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

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Mailing address of sender:

Patent No. 7,320,221

Customer Number

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Fax. (703) 413-2220
(OSMMN 03/02)

No. of add'l copies
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SPE RESPONSE FOR CERTIFICATE OF CORRECTION

Paper No.: _____

DATE : 04/07/08

TO SPE OF : ART UNIT 3748

SUBJECT : Request for Certificate of Correction for Appl. No.: **10/910613** Patent No.: **7320221**

Please respond to this request for a certificate of correction within 7 days.

Please review the requested changes/corrections as shown in the **COCIN** document(s) in the IFW application image. No new matter should be introduced, nor should the scope or meaning of the claims be changed.

Please complete the response (see below) and forward the completed response to scanning using document code **COCX**.



Angela Green

Certificates of Correction Branch
703.308.9380 ext. 123

Thank You For Your Assistance

The request for issuing the above-identified correction(s) is hereby:

Note your decision on the appropriate box.

☐ **Approved**

All changes apply.

☐ **Approved in Part**

Specify below which changes **do not** apply.

☐ **Denied**

State the reasons for denial below.

Comments: _____

SPE

Art Unit

DOCKET NO.: 256868US30

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF: Lucien Y. BRONICKI

PATENT NO.: 7,320,221

GROUP: 3748

ISSUED: January 22, 2008

EXAMINER:

FOR: METHOD AND APPARATUS FOR USING GEOTHERMAL ENERGY FOR THE
PRODUCTION OF POWER

REQUEST FOR CERTIFICATE OF CORRECTION

DIRECTOR OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
ALEXANDRIA, VA 22313-1450

SIR:

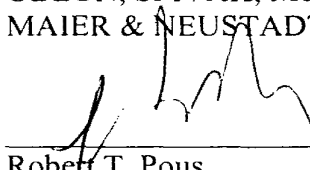
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OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.



Robert T. Pous

Registration No. 29,099

Customer Number

22850

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Fax. (703) 413-2220
(OSMMN 03/06)

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 7,320,221
DATED: January 22, 2008
INVENTOR(S): Lucien Y. BRONICKI

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Mailing address of sender:

Patent No. 7,320,221

Customer Number

22850

Tel. (703) 413-3000
Fax. (703) 413-2220
(OSMMN 03/02)

No. of add'l copies
@ .30 per page



Electronic Acknowledgement Receipt

EFS ID:	2960794
Application Number:	10910613
International Application Number:	
Confirmation Number:	6916
Title of Invention:	METHOD AND APPARATUS FOR USING GEOTHERMAL ENERGY FOR THE PRODUCTION OF POWER
First Named Inventor/Applicant Name:	Lucien Y. Bronicki
Customer Number:	22850
Filer:	Marvin Jay Spivak/Dustin Goodin
Filer Authorized By:	Marvin Jay Spivak
Attorney Docket Number:	256868US30
Receipt Date:	06-MAR-2008
Filing Date:	04-AUG-2004
Time Stamp:	16:31:54
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1		256868USCOC.pdf	87716	yes	3
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	Multipart Description/PDF files in .zip description		
	Document Description	Start	End
	Miscellaneous Incoming Letter	1	1
	Request for Certificate of Correction	2	3
Warnings:			
Information:			
Total Files Size (in bytes):		87716	
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.			



Docket No.: 256868US30



ATTORNEYS AT LAW

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

ROBERT T. POUS
(703) 413-3000
RPOUS@OBLON.COM

RE: Application Serial No.: 10/910,613
Applicants: Lucien Y. BRONICKI
Filing Date: August 4, 2004
For: METHOD AND APPARATUS FOR USING
GEOTHERMAL ENERGY FOR THE PRODUCTION
OF POWER
Group Art Unit: 3748
Examiner: NGUYEN, H.

SIR:

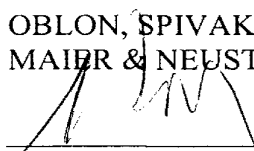
Attached hereto for filing are the following papers:

Request for Certificate of Correction
Certificate of Correction-Form PTO 1050

Our online credit card payment in the amount of **\$0.00** is being made covering any required fees. In the event any variance exists between the amount enclosed and the Patent Office charges for filing the above-noted documents, including any fees required under 37 C.F.R. 1.136 for any necessary Extension of Time to make the filing of the attached documents timely, please charge or credit the difference to our Deposit Account No. 15-0030. Further, if these papers are not considered timely filed, then a petition is hereby made under 37 C.F.R. 1.136 for the necessary extension of time.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.


Robert T. Pous

Registration No. 29,099

Customer Number

22850

(703) 413-3000 (phone)
(703) 413-2220 (fax)



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/910,613	01/22/2008	7320221	256868US30	6916

22850 7590 01/02/2008
OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C.
1940 DUKE STREET
ALEXANDRIA, VA 22314

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment is 279 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

Lucien Y. Bronicki, Yavne, ISRAEL;

Electronic Patent Application Fee Transmittal

Application Number:	10910613			
Filing Date:	04-Aug-2004			
Title of Invention:	METHOD AND APPARATUS FOR USING GEOTHERMAL ENERGY FOR THE PRODUCTION OF POWER			
First Named Inventor/Applicant Name:	Lucien Y. Bronicki			
Filer:	Marvin Jay Spivak/Slobodanka Alic			
Attorney Docket Number:	256868US30			
Filed as Large Entity				
Utility Filing Fees				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Utility Appl issue fee	1501	1	1440	1440
Publ. Fee- early, voluntary, or normal	1504	1	300	300

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1740

Electronic Acknowledgement Receipt

EFS ID:	2506742
Application Number:	10910613
International Application Number:	
Confirmation Number:	6916
Title of Invention:	METHOD AND APPARATUS FOR USING GEOTHERMAL ENERGY FOR THE PRODUCTION OF POWER
First Named Inventor/Applicant Name:	Lucien Y. Bronicki
Customer Number:	22850
Filer:	Marvin Jay Spivak/Slobodanka Alic
Filer Authorized By:	Marvin Jay Spivak
Attorney Docket Number:	256868US30
Receipt Date:	26-NOV-2007
Filing Date:	04-AUG-2004
Time Stamp:	15:05:51
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	\$ 1740
RAM confirmation Number	265
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
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1	Issue Fee Payment (PTO-85B)	256868usissuefee.pdf	98578 2b1cbf38949e591b49455e453ea40a27a29d0817	no	1
Warnings:					
Information:					
2	Fee Worksheet (PTO-06)	fee-info.pdf	8337 913e1b22a1ff3536938cf4a9625d38281febd740	no	2
Warnings:					
Information:					
Total Files Size (in bytes):			106915		
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail** **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the **ISSUE FEE** and **PUBLICATION FEE** (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

22850 7590 08/27/2007

CUSTOMER NUMBER

22850

Certificate of Mailing or Transmission
 I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/910,613	08/04/2004	Lucien Y. Bronicki	25686US30	6916

TITLE OF INVENTION: METHOD AND APPARATUS FOR USING GEOTHERMAL ENERGY FOR THE PRODUCTION OF POWER

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	\$1440	\$300	\$0	\$1740	11/27/2007

EXAMINER	ART UNIT	CLASS-SUBCLASS
NGUYEN, HOANG M	3748	060-641200

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.

2. For printing on the patent front page, list
 (1) the names of up to 3 registered patent attorneys or agents OR, alternatively,
 (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Oblon, Spivak,
 2 McClelland, Maier
 3 & Neustadt, P.C.

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

ORAMT TECHNOLOGIES INC.

Reno, NEVADA

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

☒ Issue Fee
☒ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies - 0 -

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

☐ A check is enclosed.
☒ Payment by credit card. Transmitted via EFS-Web.
☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 15-0030 (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature Fred L. Braun
 Typed or printed name Fred L. Braun

Date NOV 26 2007
 Registration No. Reg. No. 56,123

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/910,613	08/04/2004	Lucien Y. Bronicki	256868US30	6916
22850 7590 11/15/2007 OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			EXAMINER NGUYEN, HOANG M	
			ART UNIT 3748	PAPER NUMBER
			NOTIFICATION DATE 11/15/2007	DELIVERY MODE ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com
oblonpat@oblon.com
jgardner@oblon.com

Response to Rule 312 Communication	Application No. 10/910,613	Applicant(s) BRONICKI, LUCIEN Y.	
	Examiner Hoang M. Nguyen	Art Unit 3748	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

1. ☒ The amendment filed on 31 October 2007 under 37 CFR 1.312 has been considered, and has been:

a) ☐ entered.

b) ☒ entered as directed to matters of form not affecting the scope of the invention.

c) ☐ disapproved because the amendment was filed after the payment of the issue fee.

Any amendment filed after the date the issue fee is paid must be accompanied by a petition under 37 CFR 1.313(c)(1) and the required fee to withdraw the application from issue.

d) ☐ disapproved. See explanation below.

e) ☐ entered in part. See explanation below.

 11/05/07

Hoang M Nguyen
Primary Examiner
Art Unit: 3748

Approved for
enter
4/8/07
DOCKET NO: 256868US30

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :
LUCIEN Y. BRONICKI : EXAMINER: NGUYEN, H. M.
SERIAL NO: 10/910,613 :
FILED: AUGUST 4, 2004 : GROUP ART UNIT: 3748
FOR: METHOD AND APPARATUS FOR :
USING GEOTHERMAL ENERGY FOR
THE PRODUCTION OF POWER

AMENDMENT UNDER 37 C.F.R. §1.132

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

Further to the Notice of Allowability dated August 27, 2007, please amend the above-identified application as follows:

Amendments to the Abstract begin on page 2 of this paper.

Remarks/Arguments begin on page 4 of this paper.

DOCKET NO: 256868US30

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :
LUCIEN Y. BRONICKI : EXAMINER: NGUYEN, H. M.
SERIAL NO: 10/910,613 :
FILED: AUGUST 4, 2004 : GROUP ART UNIT: 3748
FOR: METHOD AND APPARATUS FOR :
USING GEOTHERMAL ENERGY FOR
THE PRODUCTION OF POWER

AMENDMENT UNDER 37 C.F.R. §1.132

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

Further to the Notice of Allowability dated August 27, 2007, please amend the above-identified application as follows:

Amendments to the Abstract begin on page 2 of this paper.

Remarks/Arguments begin on page 4 of this paper.

IN THE ABSTRACT

Please delete the original Abstract at page 29, lines 1-24 in its entirety and insert therefore the following replacement Abstract on a separate sheet as follows:

ABSTRACT OF THE DISCLOSURE

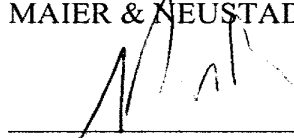
An apparatus and method for enhancing the flow of geothermal fluid ~~comprising from~~ at least one injection well to at least one production well, which comprises a first horizontal geothermal well, which is used as the injection well, and into which water is injected; a second horizontal, geothermal well, which is used s the production well and from which geothermal fluid issues, wherein the second, horizontal, production, geothermal well is substantially horizontally and vertically spaced from the first, horizontal, injection, geothermal well and located at a shallower depth than the first, horizontal, injection, geothermal well; and the apparatus for producing a pressure difference between the first horizontal, injection well and the second horizontal, production well and utilizing the water density difference induced by the temperature difference. Preferably, binary geothermal power plants or combined cycle geothermal power plants can be used to produce power from geothermal fluid recovered from the production well.

REMARKS/ARGUMENTS

The Examiner's amendment introduced a new abstract. The present amendment corrects the abstract, and so its entry is respectfully requested.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.



Robert T. Pous
Attorney of Record
Registration No. 29,099

Customer Number
22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 08/07)

I:\rtp\256868\256868.312Amdt.

Electronic Acknowledgement Receipt

EFS ID:	2405649
Application Number:	10910613
International Application Number:	
Confirmation Number:	6916
Title of Invention:	METHOD AND APPARATUS FOR USING GEOTHERMAL ENERGY FOR THE PRODUCTION OF POWER
First Named Inventor/Applicant Name:	Lucien Y. Bronicki
Customer Number:	22850
Filer:	Marvin Jay Spivak/Cecelia Davis
Filer Authorized By:	Marvin Jay Spivak
Attorney Docket Number:	256868US30
Receipt Date:	31-OCT-2007
Filing Date:	04-AUG-2004
Time Stamp:	16:07:32
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1		256868USAMENDMENT.pdf	101604 fdee36494974e563b19ff8d867c8cba0d029f551	yes	5

	Multipart Description/PDF files in .zip description		
	Document Description	Start	End
	Miscellaneous Incoming Letter	1	1
	Amendment after Notice of Allowance (Rule 312)	2	2
	Abstract	3	4
	Applicant Arguments/Remarks Made in an Amendment	5	5

Warnings:

Information:

Total Files Size (in bytes):	101604
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Docket No.: 256868US30

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313



ATTORNEYS AT LAW

ROBERT T. POUS
(703) 413-3000
RPOUS@OBLON.COM

RE: Application Serial No.: 10/910,613
Applicants: Lucien Y. BRONICKI
Filing Date: August 4, 2004
For: METHOD AND APPARATUS FOR USING
GEOHERMAL ENERGY FOR THE PRODUCTION
OF POWER
Group Art Unit: 3748
Examiner: NGUYEN, H.M.

SIR:

Attached hereto for filing are the following papers:

Amendment Under 37 C.F.R. 1.132

Our online credit card payment in the amount of **\$0.00** is being made covering any required fees. In the event any variance exists between the amount enclosed and the Patent Office charges for filing the above-noted documents, including any fees required under 37 C.F.R. 1.136 for any necessary Extension of Time to make the filing of the attached documents timely, please charge or credit the difference to our Deposit Account No. 15-0030. Further, if these papers are not considered timely filed, then a petition is hereby made under 37 C.F.R. 1.136 for the necessary extension of time.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

Robert T. Pous

Registration No. 29,099

Customer Number

22850

(703) 413-3000 (phone)
(703) 413-2220 (fax)
I:\rtp\256868\256868.cvr



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NOTICE OF ALLOWANCE AND FEE(S) DUE

22850 7590 08/27/2007

OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C.
1940 DUKE STREET
ALEXANDRIA, VA 22314

EXAMINER

NGUYEN, HOANG M

ART UNIT

PAPER NUMBER

3748

DATE MAILED: 08/27/2007

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/910,613	08/04/2004	Lucien Y. Bronicki	256868US30	6916

TITLE OF INVENTION: METHOD AND APPARATUS FOR USING GEOTHERMAL ENERGY FOR THE PRODUCTION OF POWER

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	\$1400	\$300	\$0	\$1700	11/27/2007

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

**Complete and send this form, together with applicable fee(s), to: Mail Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

22850 7590 08/27/2007

OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C.
1940 DUKE STREET
ALEXANDRIA, VA 22314

Certificate of Mailing or Transmission

hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/910,613	08/04/2004	Lucien Y. Bronicki	256868US30	6916

TITLE OF INVENTION: METHOD AND APPARATUS FOR USING GEOTHERMAL ENERGY FOR THE PRODUCTION OF POWER

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nonprovisional	NO	\$1400	\$300	\$0	\$1700	11/27/2007

EXAMINER	ART UNIT	CLASS-SUBCLASS
NGUYEN, HOANG M	3748	060-641200

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,
 (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
 2 _____
 3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

☐ Issue Fee
☐ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

☐ A check is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

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Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/910,613	08/04/2004	Lucien Y. Bronicki	256868US30	6916
22850	7590	08/27/2007	EXAMINER	
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			NGUYEN, HOANG M	
			ART UNIT	PAPER NUMBER
			3748	
DATE MAILED: 08/27/2007				

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 295 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 295 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Notice of Allowability

Application No.

10/910,613

Examiner

Hoang M. Nguyen

Applicant(s)

BRONICKI, LUCIEN Y.

Art Unit

3748

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 07-02-07.
2. ☒ The allowed claim(s) is/are 1-9, 11-39.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material

5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413),
Paper No./Mail Date _____
7. ☒ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____

Hoang M Nguyen
Primary Examiner
Art Unit: 3748

EXAMINER'S AMENDMENT

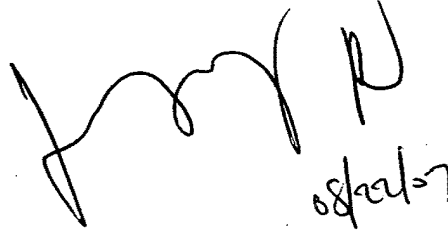
An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

A new abstract has been made on a separate sheet of paper attached herein because the abstract should be less than 250 words.

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Examiner Nguyen whose telephone number is (571) 272-4861. The examiner can normally be reached on Tuesday--Friday from 12:30 AM to 10:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas E. Denion can be reached on 571-272-4859. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to be 'Hoang Nguyen', with a date '8/22/07' written below it.

HOANG NGUYEN
PRIMARY EXAMINER
ART UNIT 3748

Hoang Minh Nguyen
8/22/2007

ABSTRACT OF THE DISCLOSURE

An apparatus and method for enhancing the flow of geothermal fluid comprising at least one injection well to at least one production well, which comprises a first horizontal geothermal well, which is used as the injection well, and into which water is injected; a second horizontal, geothermal well, which is used as the production well and from which geothermal fluid issues, wherein the second, horizontal, production, geothermal well is substantially horizontally and vertically spaced from the first, horizontal, injection, geothermal well and located at a shallower depth than the first, horizontal, injection, geothermal well; and the apparatus for producing a pressure difference between the first horizontal, injection well and the second horizontal, production well and utilizing the water density difference induced by the temperature difference. Preferably, binary geothermal power plants or combined cycle geothermal power plants can be used to produce power from geothermal fluid recovered from the production well.

Issue Classification 	Application/Control No.	Applicant(s)/Patent under Reexamination	
	10/910,613	BRONICKI, LUCIEN Y.	
	Examiner	Art Unit	
	Hoang M. Nguyen	3748	

ISSUE CLASSIFICATION										
ORIGINAL					CROSS REFERENCE(S)					
CLASS		SUBCLASS			CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				
60		641.2			60	641.4				
INTERNATIONAL CLASSIFICATION										
F	0	3	G	7/00						
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(Assistant Examiner) (Date)		HOANG NGUYEN ART UNIT 3748 HOANG NGUYEN 08/18/07 (Primary Examiner) (Date)	Total Claims Allowed: 38	
<i>Dawn Brewer</i> 8/23/07 (Legal Instruments Examiner) (Date)			O.G. Print Claim(s) 1	O.G. Print Fig. 2

☐ Claims renumbered in the same order as presented by applicant				☐ CPA				☐ T.D.				☐ R.1.47			
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	30	31		61		91		121		151		181		
2	2	31	32		62		92		122		152		182		
3	3	32	33		63		93		123		153		183		
4	4	33	34		64		94		124		154		184		
5	5	34	35		65		95		125		155		185		
6	6	35	36		66		96		126		156		186		
7	7	36	37		67		97		127		157		187		
8	8	37	38		68		98		128		158		188		
9	9	38	39		69		99		129		159		189		
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10	11		41		71		101		131		161		191		
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17	18		48		78		108		138		168		198		
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19	20		50		80		110		140		170		200		
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25	26		56		86		116		146		176		206		
26	27		57		87		117		147		177		207		
27	28		58		88		118		148		178		208		
28	29		59		89		119		149		179		209		
29	30		60		90		120		150		180		210		

Index of Claims



Application/Control No.

10/910,613

Examiner

Hoang M. Nguyen

Applicant(s)/Patent under Reexamination

BRONICKI, LUCIEN

Art Unit

3748

✓	Rejected
=	Allowed

-	(Through numeral) Cancelled
+	Restricted

N	Non-Elected
I	Interference

A	Appeal
O	Objected

Claim	Date
Final	Original
1	2
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Claim	Date
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Claim	Date
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UNITED STATES PATENT AND TRADEMARK OFFICE

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 Alexandria, Virginia 22313-1450
 www.uspto.gov



Bib Data Sheet

CONFIRMATION NO. 6916

SERIAL NUMBER 10/910,613	FILING OR 371(c) DATE 08/04/2004 RULE	CLASS 060	GROUP ART UNIT 3748	ATTORNEY DOCKET NO. 256868US30	
APPLICANTS Lucien Y. Bronicki, Yavne, ISRAEL; ** CONTINUING DATA ***** ** FOREIGN APPLICATIONS ***** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 10/01/2004					
Foreign Priority claimed ☐ yes ☒ no 35 USC 119 (a-d) conditions ☐ yes ☒ no ☐ Met after met Allowance Verified and Acknowledged <u> </u> Examiner's Signature <u> </u> Initials		STATE OR COUNTRY ISRAEL	SHEETS DRAWING 11	TOTAL CLAIMS 38	INDEPENDENT CLAIMS 3
ADDRESS 22850					
TITLE Method and apparatus for using geothermal energy for the production of power					
FILING FEE RECEIVED 1370	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:		☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit		

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Hoang M. Nguyen

3748

[illegible]

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner
60	Kell	08/18/07	N
PG-PUB: Sec search in my own privat and detail 08/18/07		08/18/07	N

[illegible]

PATENT APPLICATION FEE DETERMINATION RECORD
Effective October 1, 2003

Application or Docket Number

10 910 613

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	35	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	35 minus 20 =	15
INDEPENDENT CLAIMS	3 minus 3 =	0
MULTIPLE DEPENDENT CLAIM PRESENT ☐		

* If the difference in column 1 is less than zero, enter "0" in column 2

CLAIMS AS AMENDED - PART II

8/23/07

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	38	38	0
Independent	3	3	0
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐			

SMALL ENTITY TYPE ☐

OR OTHER THAN SMALL ENTITY

RATE	FEE		RATE	FEE
BASIC FEE	385.00	OR	BASIC FEE	770.00
XS 9=		OR	XS18=	270
X43=		OR	X86=	0
+145=		OR	+290=	0
TOTAL		OR	TOTAL	1040

SMALL ENTITY

OR OTHER THAN SMALL ENTITY

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
XS 9=		OR	XS18=	
X43=		OR	X86=	
+145=		OR	+290=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total			
Independent			
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐			

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
XS 9=		OR	XS18=	
X43=		OR	X86=	
+145=		OR	+290=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT C	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total			
Independent			
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐			

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
XS 9=		OR	XS18=	
X43=		OR	X86=	
+145=		OR	+290=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

- * If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
- * If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20."
- ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3."

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L12	207	GEOTHERMAL.CLM.	US-PGPUB	OR	OFF	2007/08/18 19:52
L13	173	(INJECTION ADJ WELL).CLM.	US-PGPUB	OR	OFF	2007/08/18 19:52
L14	345	(PRODUCTION ADJ WELL).CLM.	US-PGPUB	OR	OFF	2007/08/18 19:52
L15	6	12 AND 13	US-PGPUB	OR	OFF	2007/08/18 19:52
L16	1	14 AND 15	US-PGPUB	OR	OFF	2007/08/18 19:52



Docket No. 256868US30

IN RE APPLICATION OF: Lucien Y. BRONICKI

SERIAL NO: 10/910,613

FILED: August 4, 2004

FOR: METHOD AND APPARATUS FOR USING GEOTHERMAL ENERGY FOR THE PRODUCTION OF POWER

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

- SIR:
- Transmitted herewith is an amendment in the above-identified application.
- ☐ No additional fee is required
- ☐ Small entity status of this application under 37 C.F.R. §1.9 and §1.27 is claimed.
- ☒ Additional documents filed herewith: Letter Submitting Replacement Drawing Sheet(s); Replacement Sheet (1)

The Fee has been calculated as shown below:

CLAIMS	CLAIMS REMAINING		HIGHEST NUMBER PREVIOUSLY PAID	NO. EXTRA CLAIMS	RATE	CALCULATIONS
TOTAL	38	MINUS	37	1	x \$50 =	\$50.00
INDEPENDENT	3	MINUS	3	0	x \$200 =	\$0.00
APPLICATION SIZE		MINUS	100	0 (each addtl. 50 sheets)	x \$250 =	\$0.00
		☐ MULTIPLE DEPENDENT CLAIMS			+ \$360 =	\$0.00
		TOTAL OF ABOVE CALCULATIONS				\$50.00
		☐ Reduction by 50% for filing by Small Entity				\$0.00
		TOTAL				\$50.00

- / ☐ A check in the amount of \$0.00 is attached.
- ☒ Credit card payment form is attached to cover the fees in the amount of \$50.00
- ☒ Please charge any additional Fees for the papers being filed herewith and for which no check or credit card payment is enclosed herewith, or credit any overpayment to deposit Account No. 15-0030. A duplicate copy of this sheet is enclosed.
- ☒ If these papers are not considered timely filed by the Patent and Trademark Office, then a petition is hereby made under 37 C.F.R. §1.136, and any additional fees required under 37 C.F.R. §1.136 for any necessary extension of time may be charged to Deposit Account No. 15-0030. A duplicate copy of this sheet is enclosed.

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

Robert T. Pous

Registration No. 29,099

Customer Number

22850

Tel. (703) 413-3000
Fax. (703) 413-2220
(OSMMN 05/03)

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DOCKET NO: 256868US30

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :
LUCIEN Y. BRONICKI : EXAMINER: NGUYEN, H.
SERIAL NO: 10/910,613 :
FILED: AUGUST 4, 2004 : GROUP ART UNIT: 3748
FOR: METHOD AND APPARATUS FOR :
USING GEOTHERMAL ENERGY FOR
THE PRODUCTION OF POWER

AMENDMENT

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

In response to the Office Action dated April 5, 2007, please amend the above-identified application as follows:

Amendments to the Drawings are found beginning at page 2 of this paper.

Amendments to the Claims are reflected in the listing of claims which begins on page 3 of this paper.

Remarks/Arguments begin on page 11 of this paper.

07/03/2007 HBELE1E1 00000030 10910613

01 FC:1202

50.00 OP

IN THE CLAIMS

1. (Currently Amended) Method for recovering geothermal heat, which comprises enhancing the flow of geothermal fluid from at least one injection well to at least one production well, by the following steps:

a. Providing a first, horizontal, geothermal well in the ground at a geological layer having an elevated temperature, which is used as said injection well;

b. Injecting water into said injection well, whereby the injected water is heated;

c. Providing a second, horizontal, geothermal well in the ground, which is used as said production well, such that said second, horizontal, production, geothermal well is substantially horizontally and vertically spaced from said first, horizontal, injection, geothermal well by a distance dependent on the elevated temperature and located at a shallower depth than said first, horizontal, injection, geothermal well;

d. Recovering geothermal fluid from said production well;

e. Generating a water density difference and a pressure difference between said first horizontal, injection well and said second horizontal, production well; and

f. Inducing geothermal fluid into said second horizontal geothermal well from the geological layer because of buoyancy of the water and the pressure difference between the horizontal injection and horizontal production wells.

2. (Original) Method according to claim 1, wherein the horizontal wells are provided by drilling along a geological layer.

3. (Currently Amended) Method according to claim 1, comprising increasing the pressure difference by pressurizing the water, injected in the horizontal, deeper injection well,

above the hydrostatic pressure existing at the depth of the horizontal deeper injection geothermal well, and reducing the pressure in the horizontal, shallower production well using a fluid pump connected to said horizontal production well.

4. (Original) Method according to claim 1, further comprising extracting heat from the geothermal fluid recovered from the production well and using said heat for the production of energy.

5. (Original) Method according to claim 1, wherein the water injected into the injection well is the geothermal fluid, recovered from the production well, depleted of heat by heat exchange.

6. (Original) Method according to claim 1, further comprising monitoring the pressure difference.

7. (Original) Method according to claim 1, wherein the first and second horizontal, geothermal wells are formed in a geological layer the suitability of which has been determined.

8. (Previously Presented) Method according to claim 3, wherein the suitability of the geological layer is determined by geophysical surveys and by drilling slim holes in said layer.

9. (Previously Presented) Apparatus for enhancing the flow of geothermal fluid from at least one injection well to at least one production well, which comprises:

a. A first, horizontal geothermal well, which is used as said injection well into which water is injected,

b. A second horizontal, geothermal well, which is used as said production well from which geothermal fluid issues, wherein said second, horizontal, production, geothermal well is substantially horizontally and vertically spaced from said first, horizontal, injection, geothermal well and located at a shallower depth than said first, horizontal, injection, geothermal well; and

c. Means for producing a water density difference and a pressure difference between said first horizontal, injection well and said second horizontal, production well,

wherein the first horizontal, injection geothermal well has an open slotted outlet, from which injected water flows into the geological layer in which the well has been drilled, and the second horizontal, production geothermal well has an open slotted inlet, whereby geothermal fluid flows into it from the geological layer because of buoyancy of the water and the pressure difference between said horizontal injection and horizontal production wells.

10. (Cancelled).

11. (Original) Apparatus according to claim 9, further comprising instrumentation for monitoring the pressure difference.

12. (Original) Apparatus according to claim 9, further comprising an observation well connected to the second horizontal, production geothermal well, and wherein the instrumentation comprising observation instrumentation present in said observation well.

13. (Original) Apparatus according to claim 9, wherein the first horizontal, geothermal well has a length up to 1.25 miles.

14. (Original) Apparatus according to claim 9, wherein the second horizontal, geothermal well has a length up to 1.25 miles.

15. (Original) Apparatus according to claim 9, wherein the horizontal distance between the first horizontal well and the second horizontal well is up to 2000 feet.

16. (Original) Apparatus according to claim 9, wherein the vertical distance between the first horizontal well and the second horizontal well is up to 150 feet.

17. (Original) Apparatus according to claim 9, further comprising a power plant comprising an electricity generator and at least one turbine for driving said generator, conduit means for conveying geothermal fluid to said power plant whereby said geothermal fluid becoming heat-depleted, and conduit means for conveying heat-depleted geothermal fluid from said power plant to the horizontal, injection well.

18. (Original) Apparatus according to claim 9, further comprising a heat exchanger, conduit means for conveying geothermal fluid to a heat exchanger whereby to heat is transferred to a working fluid for producing power in a power plant.

19. (Original) Apparatus according to claim 18 including a binary power plant comprising an organic vapor turbine operating according to an organic Rankine cycle.

20. (Original) Apparatus according to claim 19 wherein said binary power plant includes an air-cooled condenser.

21. (Original) Apparatus according to claim 19 wherein the working fluid of said binary power plant is pentane or isopentane.

22. (Original) Apparatus according to claim 19 wherein the working fluid of said binary power plant is butane or isobutane.

23. (Original) Apparatus according to claim 18 wherein said power plant is a combined cycle geothermal power plant.

24. (Previously Presented) Apparatus according to claim 9, further comprising a water injection pump for injecting heat-depleted geothermal fluid into the horizontal, injection well.

25. (Currently Amended) Apparatus according to claim 9, further comprising a deep well pump connected to the horizontal production well for pumping hot geothermal fluid from the production well.

26. (Previously Presented) Apparatus according to claim 9, wherein the horizontal, injection geothermal well comprises a perforated horizontal pipe.

27. (Previously Presented) Apparatus according to claim 9, wherein the second horizontal, production geothermal well comprises a perforated horizontal pipe,

28. (Original) Apparatus according to claim 26, wherein the perforated horizontal pipe is perforated on its lower surface.

29. (Original) Apparatus according to claim 27, wherein the perforated horizontal pipe is perforated on its lower surface.

30. (Original) Apparatus according to claim 9, wherein the production horizontal geothermal well is generally parallel to the injection horizontal, geothermal well.

31. (Original) Apparatus according to claim 9, comprising a plurality of injection horizontal, geothermal wells for one production horizontal, geothermal well.

32. (Original) Apparatus according to claim 9 comprising a plurality of horizontal injection wells and a plurality of horizontal production wells spaced horizontally and vertically.

33. (Original) Apparatus according to claim 9 wherein all the water and make-up water is supplied from an external source.

34. (Original) Apparatus according to claim 9 wherein part of the water circulating is from the reservoir and only make-up water is from an external source.

35. (Currently Amended) Method for assuring the flow of geothermal fluid from at least an injection well to at least a production well, which comprises the following steps:

I--Providing a first, horizontal, geothermal well, which is connected to said injection well;

II--Injecting water into said injection well;

III--Providing a second, horizontal, geothermal well, which is connected to said production well;

IV--Recovering geothermal fluid from said production well;

V--Generating a water density difference and a pressure difference between said first horizontal well and said second horizontal well by providing a fluid pump connected to said second horizontal well; and

VI . Inducing geothermal fluid into said second horizontal geothermal well from the geological layer because of buoyancy of the water and the pressure difference between the horizontal injection and horizontal production wells.

36. (Previously Presented) Method according to claim 1, wherein the geothermal fluid is one of water, steam and a combination thereof.

37. (Previously Presented) Apparatus according to claim 9, wherein the geothermal fluid is one of water, steam and a combination thereof.

38. (Previously Presented) Method according to claim 35, wherein the geothermal fluid is one of water, steam and a combination thereof.

39. (New) Apparatus according to claim 23 wherein said combined cycle geothermal power plant includes a steam turbine for expanding geothermal steam from said geothermal fluid and producing electricity, a vaporizer to which the expanded steam is supplied to

condense and vaporize the working fluid, which working fluid is supplied to a turbine where it expands thereby driving an electric generator for producing electric power.

REMARKS/ARGUMENTS

Favorable reconsideration of the present application is respectfully requested.

The lead line for element 38 in the attached replacement Fig. 3 has been extended to conform to Fig. 3 as found in the originally filed application.

Claim 1 has been amended to further recite that the vertical distance separating the horizontal injection and production wells is dependent on the elevated temperature at the geological layer of the horizontal injection well. Basis for this is found at page 13, lines 14-15, and will be further explained below. Claims 3, 25 and 35 have been amended to further recite a fluid pump connected to the production well. Basis for this is found in the pump 38 (see sentence bridging pp. 12-13).

New Claim 39 recites that the combined cycle geothermal power plant includes a steam turbine and vaporizer, as well as a working fluid turbine and an electric generator. Basis for this found at 52D in Fig 10.

Fig. 2 of the present application illustrates a known geothermal energy system in which geothermal energy is generated by injecting a fluid such as water into a fractured geothermal layer having an elevated temperature. Specifically, the water is injected via an injection well and recovered via a production well. U.S. patent 4, 223, 729 (Foster) discloses an example of a similar system using HDR (Hot Dry Rock) (col. 2, lines 40 – 41; col. 7, lines 25 – 35) in which two vertically spaced wells are provided for producing a geological fracture (col. 5, line 48 – col. 6, line 13) in which the injection well 2 has a horizontal portion 6 at a depth which is lower than that of the production well 3 by a distance D which is determined by the length of propagation of the fracture in the geothermal layer (col.4, lines 49-51). The wells thus have to be in the same plane in view of the length of propagation of the fractures.

IN THE DRAWINGS

Please replace the sheet of formal drawings including Fig. 3 with the attached replacement sheet in which the lead line for element 36 has been extended to conform to that of the original informal Fig. 3.

The present invention not only uses HDR but also uses geothermal resources containing hot geothermal water already present in the geological structure. According to the present invention, the efficiency of a geothermal system in which geothermal energy is generated by injecting a fluid such as water into a horizontal injection well and recovered via a horizontal production well is improved. This may be done by generating a water density difference and pressure difference between a first horizontal injection well and a second horizontal production well. For example, as is described in the paragraph bridging pages 9-10 of the present specification, water pumped into the deeper, horizontal injection well 32 absorbs geothermal heat from the geological layer and therefore becomes buoyant due to its lower density. This buoyancy and the pressure of the pumped water causes it to preferentially flow upward to the shallower, horizontal production well 34, from which it can be drawn off in order to extract heat energy.

The invention is based in part on the recognition that the buoyancy of water from the injection well which has absorbed geothermal heat provides the density difference that helps drive its upward flow to the production well. Water heated to a higher temperature will have greater buoyancy and will permit a greater vertical separation of the injection and production wells. Thus by determining the vertical spacing of the wells based on the elevated temperature of the geological layer at the injection well, one can tailor this spacing for maximum efficiency and effectiveness.

According to a further feature of the invention, a pump associated with the production well and having an inlet substantially at the depth of the horizontal production well (e.g., pump 38) enhances the pressure difference between the wells, and the efficiency of the system.

Claims 1-9, 13, 26-32 and 35 have been rejected under 35 U.S.C. §102 as being anticipated by Foster. As mentioned above, Foster discloses a geothermal energy system in

which the injection well 2 has a portion 6 which can be oriented horizontally (col. 4, lines 7-9) and is at a depth which is lower than that of the production well 3 by a distance D.

However, Foster explicitly teaches that the vertical spacing D between the injection and production wells is determined by the fracture propagation length (col.4, lines 49-51). There is no description in Foster of providing a production well vertically spaced from an injection well by a distance dependent on the elevated temperature of the geothermal layer.

Additionally, the rejected claims recite that the production well is both horizontally and vertically spaced from the production well (see Fig. 4). This increases the overall spacing for injection and production wells which are vertically spaced by a distance dependent on the elevated temperature of the geothermal layer, which permits the absorption of a greater amount of heat. In contrast, Foster explicitly teaches that plurality of bore holes 2a and 3a are extended through the formation in a relationship such that one lies approximately parallel to *and in approximately the same vertical plane* as the other (col. 4, lines 27 - 30). Thus the claims clearly define over Foster.

Claims 3, 25 and 35 recite a fluid pump connected to the horizontal production well. Additionally, Claim 9 recites “means for producing a water density difference and a pressure difference between said first horizontal, injection well and said second horizontal, production well.” The structure disclosed in the specification as corresponding to this means plus function limitation includes the fluid pump 38 whose inlet is substantially at the vertical depth of the horizontal production well 34. Foster lacks a teaching that the production well 3 has a fluid pump connected to the production well 3, or its equivalent. Thus Claims 3, 9, 13, 26-32 and 35 define over Foster.

Claims 1-9, 13, 26-32 and 35 were also rejected under 35 U.S.C. §102 as being anticipated by U.S. patent 3,863,709 (Fitch). However there is no evidence in Fitch that the injection and production wells are at different vertical depths. For example, any apparent

vertical difference for the wells 31 and 33 in the perspective view of Fig. 3 is due to the horizontal spacing of the wells in this perspective view. In any case, Fitch teaches neither the presently claimed vertical distance separating the horizontal injection and production wells being dependent on the elevated temperature at the geological layer of the horizontal injection well, or the fluid pump connected to the second horizontal well. These claims thus also define over Fitch.

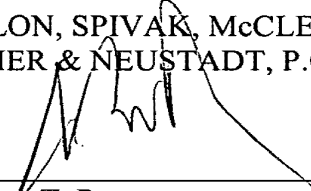
Dependent Claims 11 and 12 were rejected under 35 U.S.C. §103 as being obvious over Foster in view of Lynn et al, which was cited to teach an observation well having a differential pressure sensor. However, regardless of whatever teaching Lynn et al may have in this respect, it would not suggest overcoming the shortcomings of Foster with respect to Claim 9, and so the claims define over any combination of the above references.

New Claim 39 further recites that the combined cycle geothermal power plant includes a steam turbine and vaporizer, as well as a working fluid turbine and an electric generator. For example, separated geothermal steam is supplied to steam turbine 68D while separated geothermal water or brine separated from the geothermal fluid is supplied to pre-heater 72D for pre-heating the liquid organic working fluid. Only thereafter is the heat depleted water or brine supplied to injection well 80D together with steam condensate and non-condensable gases (specification, at page 20, 3rd last line – page 21, line 16). Thus the geothermal fluid itself is used in a power plant. In contrast, according to Foster the heat exchange fluid operates in "the heat exchange operation as a closed earth loop, the heat exchange fluid may be continually cycled through the hot rock oven for heat extraction" (col. 7, lines 7 – 10). Therefore, according to this feature of the present invention the geothermal fluid itself is used in the power plant, and not merely to circulate in the ground for gathering heat and transferring it via heat exchange surface installations as in Foster.

Applicant therefore believes that the present application is in a condition for allowance and respectfully solicits an early notice of allowability.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.



Robert T. Pous
Attorney of Record
Registration No. 29,099

Customer Number
22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 03/06)
RTP/rac



OBLON, SPIVAK, et al.
Docket No: 256868US30
Inventor: Lucien Y. BRONICKI
Serial No: 10/910,613
Reply to OA dated: April 5, 2007
Replacement Sheet

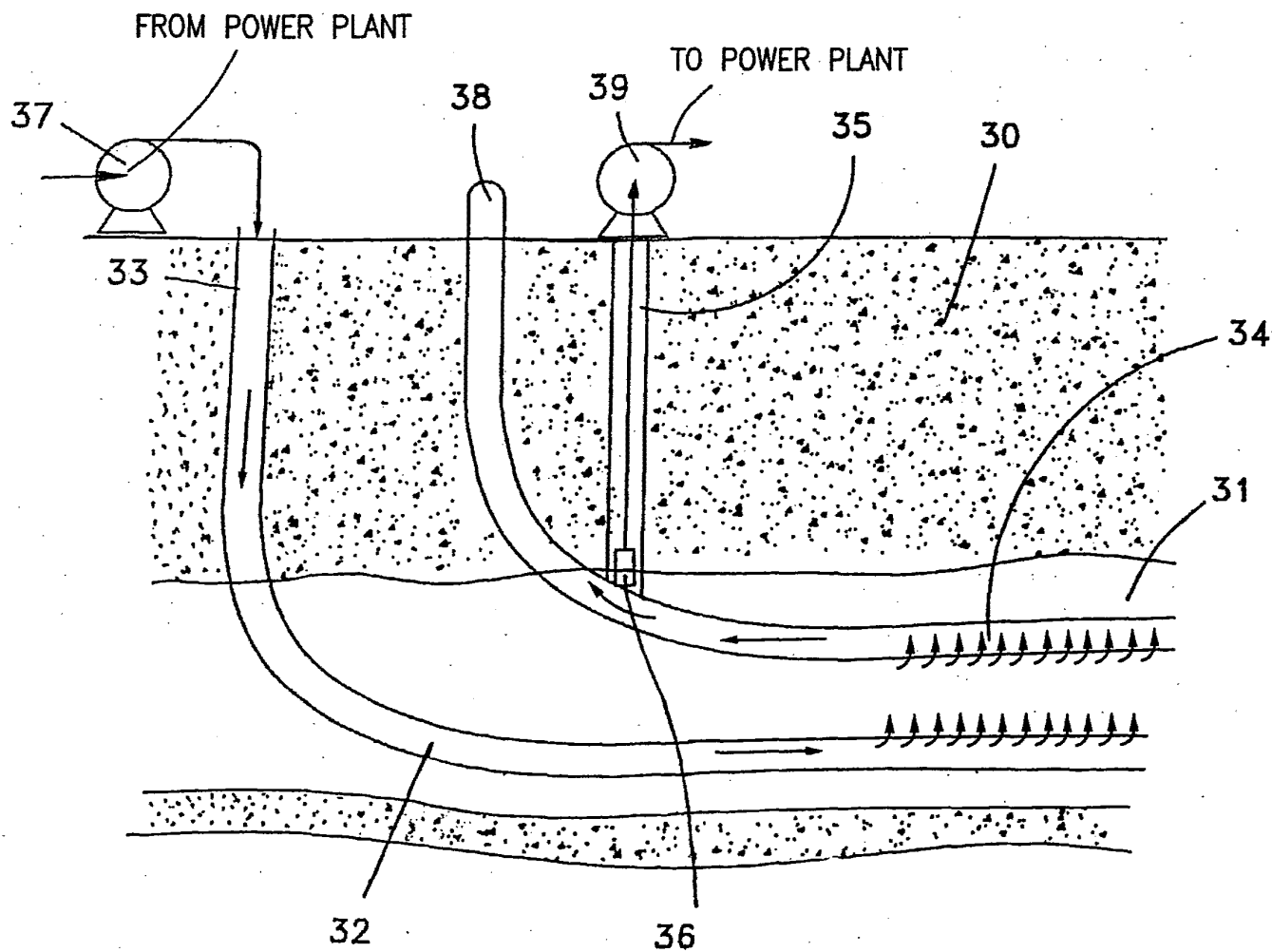


FIG. 3

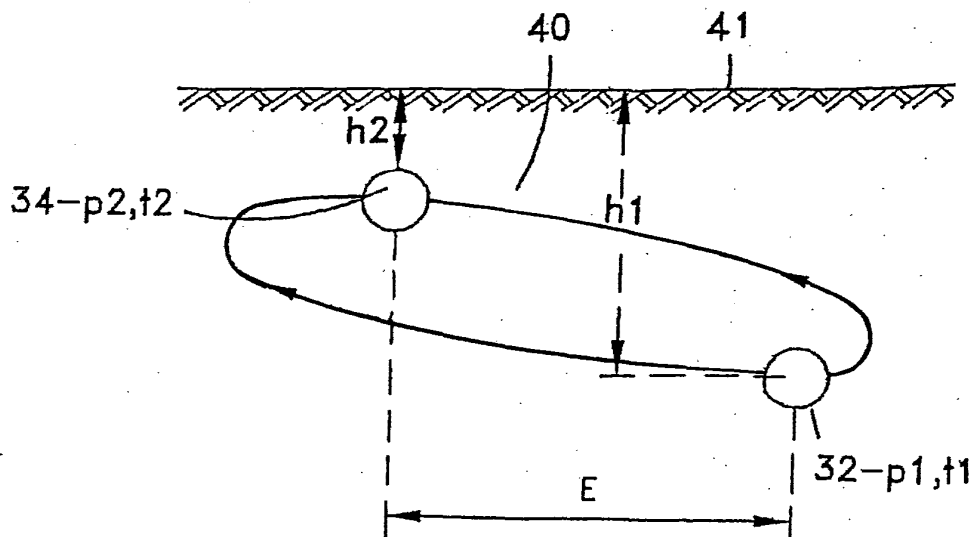


FIG. 4

Docket No.: 256868US30



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION: Lucien Y. BRONICKI

SERIAL NO.: 10/910,613

GAU: 3748

FILED: August 4, 2004

EXAMINER: NGUYEN, H.

FOR: METHOD AND APPARATUS FOR USING GEOTHERMAL ENERGY FOR THE PRODUCTION OF POWER

LETTER SUBMITTING REPLACEMENT DRAWING SHEET(S)

COMMISSIONER FOR PATENTS
Alexandria, VA 22313

SIR:

Responsive to the below indicated communication, the following drawing sheets are submitted herewith:

- ☒ 1 Replacement Drawing Sheets ☐ _____ New Drawing Sheets
- ☒ Official Action dated April 5, 2007.
- ☐ Notice of Allowance/Issue Fee dated _____
- ☐ Other dated _____

The changes and/or modifications made include the following:

Please replace the sheet of formal drawings including Fig. 3 with the attached replacement sheet in which the lead line for element 36 has been extended to conform to that of the original informal Fig. 3.

Respectfully Submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

A handwritten signature in black ink, appearing to read "Robert T. Pous".

Robert T. Pous
Registration No. 29,099

Customer Number

22850

Tel. (703) 413-3000
Fax. (703) 413-2220
(OSMMN 06/04)
I:\cfdav\256868.dwg.

PATENT APPLICATION FEE DETERMINATION RECORD
Effective October 1, 2003

Application or Docket Number

10 910 613

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	35	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	35 minus 20 =	15
INDEPENDENT CLAIMS	3 minus 3 =	0
MULTIPLE DEPENDENT CLAIM PRESENT ☐		

* If the difference in column 1 is less than zero, enter "0" in column 2

CLAIMS AS AMENDED - PART II

10/26/06

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	34	Minus 35	= 0
Independent	3	Minus 3	= 0
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐			

SMALL ENTITY TYPE ☐

OR OTHER THAN SMALL ENTITY

RATE	FEE
BASIC FEE	385.00
XS 9=	
X43=	
+145=	
TOTAL	

RATE	FEE
BASIC FEE	770.00
XS18=	270
X86=	0
+290=	0
TOTAL	1040

SMALL ENTITY

OR OTHER THAN SMALL ENTITY

RATE	ADDITIONAL FEE
XS 9=	
X43=	
+145=	
TOTAL ADDIT. FEE	

RATE	ADDITIONAL FEE
XS18=	
X86=	
+290=	
TOTAL ADDIT. FEE	

2/28/07

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	37	Minus 35	= 2
Independent	3	Minus 3	= 0
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐			

RATE	ADDITIONAL FEE
XS 9=	
X43=	
+145=	
TOTAL ADDIT. FEE	

RATE	ADDITIONAL FEE
XS18=	100
X86=	0
+290=	0
TOTAL ADDIT. FEE	100

7/2/07

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT C	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	38	Minus 37	= 1
Independent	3	Minus 3	= 0
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐			

RATE	ADDITIONAL FEE
XS 9=	
X43=	
+145=	
TOTAL ADDIT. FEE	

RATE	ADDITIONAL FEE
XS18=	50
X86=	0
+290=	0
TOTAL ADDIT. FEE	50

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20."

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3."

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.



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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/910,613	08/04/2004	Lucien Y. Bronicki	256868US30	6916
22850	7590	04/05/2007		
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			EXAMINER NGUYEN, HOANG M	
			ART UNIT	PAPER NUMBER
			3748	

SHORTENED STATUTORY PERIOD OF RESPONSE	NOTIFICATION DATE	DELIVERY MODE
3 MONTHS	04/05/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Notice of this Office communication was sent electronically on the above-indicated "Notification Date" and has a shortened statutory period for reply of 3 MONTHS from 04/05/2007.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com
oblonpat@oblon.com
jgardner@oblon.com

Office Action Summary

Application No.

10/910,613

Applicant(s)

BRONICKI, LUCIEN

Examiner

Hoang M. Nguyen

Art Unit

3748

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 February 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 and 11-38 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9, 11-38 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

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Applicant's amendment dated February 28, 2007, has been fully considered.

Applicant has argued that the applied references do not teach the concept of using vertically and horizontally spaced wells. Even though the Examiner disagrees, a new ground of rejection has been made based on newly discovered references from further searches.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-9, 13, 26-32, 35, are rejected under 35 U.S.C. 102(b) as being anticipated by US 4223729 (Foster).

Foster discloses a geothermal power plant comprising an injection well 2, a production well 3, the production well is above the injection well. The output of the production well is used to generate electricity in a power plant. The water injection well clearly has holes at its horizontal portions 2a going into the ground, note locations 2a, 3a.

Claims 1-9, 13, 26-32, 35, are rejected under 35 U.S.C. 102(b) as being anticipated by US 3863709 (Fitch).

Art Unit: 3748

Fitch discloses a geothermal power plant comprising an injection well 31, a production well 33, the production well is above the injection well. The output of the production well is used to generate electricity in a power plant. The water injection well clearly has holes at its horizontal portions (note areas 41, 43) going into the ground.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 14-25, 33-34, 36-38, are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. 4223729 (Foster). Foster teaches all the claimed subject matter as set forth above, but does not teach the selected fluids, distances, power plants. However, it would have been obvious to a person having ordinary skill in the art to select different types of working fluid, distances, power plants, in Foster for the purpose of achieving appropriate power output based on said selected fluids, distances, power plants.

Claims 11-12, are rejected under 35 U.S.C. § 103(a) as being unpatentable over Foster in view of US 3318145 (Lynn et al). Foster teaches all the claimed subject matter as set forth above in the rejection of claim 1, but still does not teach an observation well with a differential pressure sensor. Lynn et al teaches it's well known to have an observation well having a differential pressure sensor 26. It would have

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been obvious at the time the invention was made to a person having ordinary skill in the art to provide an observation well having a differential pressure sensor in Foster as taught by Lynn et al for the purpose of observing the operations of the well.

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Examiner Nguyen whose telephone number is (571) 272-4861. The examiner can normally be reached on Tuesday--Friday from 12:30 AM to 10:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas E. Denion can be reached on 571-272-4859. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



03/17/07

HOANG NGUYEN
PRIMARY EXAMINER
ART UNIT 3748

Hoang Minh Nguyen
3/17/2007

Notice of References Cited	Application/Control No. 10/910,613	Applicant(s)/Patent Under Reexamination BRONICKI, LUCIEN	
	Examiner Hoang M. Nguyen	Art Unit 3748	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-4,223,729	09-1980	Foster, John W.	166/271
*	B	US-3,863,709	02-1975	Fitch, John L.	165/45
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes



Application/Control No.

10/910,613

Examiner

Hoang M. Nguyen

Applicant(s)/Patent under
Reexamination

BRONICKI, LUCIEN

Art Unit

3748

SEARCHED

Class	Subclass	Date	Examiner
60	641.2, 641.3, 641.4, 641.5	7/15/2006	HMN
To date		11/18/06	<i>[Signature]</i>
To date		03/17/07	<i>[Signature]</i>

INTERFERENCE SEARCHED

Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)

	DATE	EXMR
EAST: SEE SEARCH HISTORY PRINT OUT DATED 7/15/06	7/19/2006	HMN
To date 03/14/07	03/17/07	<i>[Signature]</i>

Index of Claims



Application/Control No.

10/910,613

Examiner

Hoang M. Nguyen

Applicant(s)/Patent under Reexamination

BRONICKI, LUCIEN

Art Unit

3748

✓	Rejected
=	Allowed

-	(Through numeral) Cancelled
+	Restricted

N	Non-Elected
I	Interference

A	Appeal
O	Objected

Claim	Final	Original	Date
1			
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Claim	Final	Original	Date
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EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	8499	geothermal	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2007/03/14 23:10
L2	9614	injection adj well	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2007/03/14 23:11
L3	15752	production adj well	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2007/03/14 23:11
L4	3563	2 and 3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2007/03/14 23:11
L5	308	1 and 4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2007/03/14 23:11
L6	4066	horizontal adj well	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2007/03/14 23:11
L7	107	5 and 6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2007/03/14 23:13

EAST Search History

L8	386	60/641.2-641.4.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2007/03/14 23:13
L9	59	4 and 8	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2007/03/14 23:13
L10	16	("3786858" "3817038" "3863709" "4043386" "4112745" "4201060" "4357802" "4458492" "4712380" "5311741").PN. OR ("5685362").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/03/14 23:22
L11	44	("3223158" "3274769" "3470943" "3500913" "3501201" "3537529" "3682246" "3810510").PN. OR ("3863709").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/03/14 23:24
L12	29	("2788956" "3223158" "3228468" "3270816" "3285335" "3637020" "3835928" "3848674" "3863709" "3878884" "4015663").PN. OR ("4223729").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2007/03/14 23:36

Docket No. 256868US30

IN RE APPLICATION OF: Lucien Y. BRONICKI

SERIAL NO: 10/910,613

FILED: August 4, 2004

FOR: METHOD AND APPARATUS FOR USING GEOTHERMAL ENERGY FOR THE PRODUCTION OF POWER



COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

Transmitted herewith is an amendment in the above-identified application.

- ☐ No additional fee is required
- ☐ Small entity status of this application under 37 C.F.R. §1.9 and §1.27 is claimed.
- ☐ Additional documents filed herewith:

The Fee has been calculated as shown below:

CLAIMS	CLAIMS REMAINING		HIGHEST NUMBER PREVIOUSLY PAID	NO. EXTRA CLAIMS	RATE	CALCULATIONS
TOTAL	37	MINUS	34	3	x \$50 =	\$150.00
INDEPENDENT	3	MINUS	3	0	x \$200 =	\$0.00
APPLICATION SIZE		MINUS	100	0 (each addtl. 50 sheets)	x \$250 =	\$0.00
		☐ MULTIPLE DEPENDENT CLAIMS			+ \$360 =	\$0.00
		TOTAL OF ABOVE CALCULATIONS				\$150.00
		☐ Reduction by 50% for filing by Small Entity				\$0.00
		TOTAL				\$150.00

- ☐ A check in the amount of \$0.00 is attached.
- ☒ Credit card payment form is attached to cover the fees in the amount of \$150.00
- ☒ Please charge any additional Fees for the papers being filed herewith and for which no check or credit card payment is enclosed herewith, or credit any overpayment to deposit Account No. 15-0030. A duplicate copy of this sheet is enclosed.
- ☒ If these papers are not considered timely filed by the Patent and Trademark Office, then a petition is hereby made under 37 C.F.R. §1.136, and any additional fees required under 37 C.F.R. §1.136 for any necessary extension of time may be charged to Deposit Account No. 15-0030. A duplicate copy of this sheet is enclosed.

OBLON, SPIVAK, McCLELLAND,
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DOCKET NO: 256868US30

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :
LUCIEN Y. BRONICKI : EXAMINER: NGUYEN, H.
SERIAL NO: 10/910,613 :
FILED: AUGUST 4, 2004 : GROUP ART UNIT: 3748
FOR: METHOD AND APPARATUS FOR :
USING GEOTHERMAL ENERGY FOR
THE PRODUCTION OF POWER

RCE AMENDMENT

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

In response to the Office Action dated November 28, 2006, please amend the above-identified application as follows:

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks/Arguments begin on page 9 of this paper.

03/01/2007 MARZ11 00000026 10910613
02 FC:1202

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IN THE CLAIMS

1. (Currently Amended) Method for recovering geothermal heat, which comprises enhancing the flow of geothermal fluid from at least one injection well to at least one production well, by the following steps:

- a. Providing a first, horizontal, geothermal well, which is used as said injection well;
- b. Injecting water into said injection well;
- c. Providing a second, horizontal, geothermal well, which is used as said production well, such that said second, horizontal, production, geothermal well is substantially horizontally and vertically spaced from said ~~[[fist]]~~ first, horizontal, injection, geothermal well and located at a shallower depth than said first, horizontal, injection, geothermal well;
- d. Recovering geothermal fluid from said production well;
- e. Generating a water density difference and a pressure difference between said first horizontal, injection well and said second horizontal, production well; and
- f. Inducing geothermal fluid into said second horizontal geothermal well from the geological layer because of buoyancy of the water and the pressure difference between the horizontal injection and horizontal production wells, ~~whereby the first horizontal injection geothermal well has an open slotted outlet from which injected water flows into the geological layer in which the well has been drilled, and the second horizontal injection geothermal well has an open slotted inlet.~~

2. (Original) Method according to claim 1, wherein the horizontal wells are provided by drilling along a geological layer.

3. (Original) Method according to claim 1, comprising increasing the pressure difference by pressurizing the water, injected in the horizontal, deeper injection well, above the hydrostatic pressure existing at the depth of the horizontal deeper injection geothermal well and reducing the pressure in the horizontal, shallower production well.

4. (Original) Method according to claim 1, further comprising extracting heat from the geothermal fluid recovered from the production well and using said heat for the production of energy.

5. (Original) Method according to claim 1, wherein the water injected into the injection well is the geothermal fluid, recovered from the production well, depleted of heat by heat exchange.

6. (Original) Method according to claim 1, further comprising monitoring the pressure difference.

7. (Original) Method according to claim 1, wherein the first and second horizontal, geothermal wells are formed in a geological layer the suitability of which has been determined.

8. (Previously Presented) Method according to claim 3, wherein the suitability of the geological layer is determined by geophysical surveys and by drilling slim holes in said layer.

9. (Previously Presented) Apparatus for enhancing the flow of geothermal fluid from at least one injection well to at least one production well, which comprises:

a. A first, horizontal geothermal well, which is used as said injection well into which water is injected,

b. A second horizontal, geothermal well, which is used as said production well from which geothermal fluid issues, wherein said second, horizontal, production, geothermal well is substantially horizontally and vertically spaced from said first, horizontal, injection, geothermal well and located at a shallower depth than said first, horizontal, injection, geothermal well; and

c. Means for producing a water density difference and a pressure difference between said first horizontal, injection well and said second horizontal, production well,

wherein the first horizontal, injection geothermal well has an open slotted outlet, from which injected water flows into the geological layer in which the well has been drilled, and the second horizontal, production geothermal well has an open slotted inlet, whereby geothermal fluid flows into it from the geological layer because of buoyancy of the water and the pressure difference between said horizontal injection and horizontal production wells.

10. (Cancelled).

11. (Original) Apparatus according to claim 9, further comprising instrumentation for monitoring the pressure difference.

12. (Original) Apparatus according to claim 9, further comprising an observation well connected to the second horizontal, production geothermal well, and wherein the instrumentation comprising observation instrumentation present in said observation well.

13. (Original) Apparatus according to claim 9, wherein the first horizontal, geothermal well has a length up to 1.25 miles.

14. (Original) Apparatus according to claim 9, wherein the second horizontal, geothermal well has a length up to 1.25 miles.

15. (Original) Apparatus according to claim 9, wherein the horizontal distance between the first horizontal well and the second horizontal well is up to 2000 feet.

16. (Original) Apparatus according to claim 9, wherein the vertical distance between the first horizontal well and the second horizontal well is up to 150 feet.

17. (Original) Apparatus according to claim 9, further comprising a power plant comprising an electricity generator and at least one turbine for driving said generator, conduit means for conveying geothermal fluid to said power plant whereby said geothermal fluid becoming heat-depleted, and conduit means for conveying heat-depleted geothermal fluid from said power plant to the horizontal, injection well.

18. (Original) Apparatus according to claim 9, further comprising a heat exchanger, conduit means for conveying geothermal fluid to a heat exchanger whereby to heat is transferred to a working fluid for producing power in a power plant.

19. (Original) Apparatus according to claim 18 including a binary power plant comprising an organic vapor turbine operating according to an organic Rankine cycle.

20. (Original) Apparatus according to claim 19 wherein said binary power plant includes an air-cooled condenser.

21. (Original) Apparatus according to claim 19 wherein the working fluid of said binary power plant is pentane or isopentane.

22. (Original) Apparatus according to claim 19 wherein the working fluid of said binary power plant is butane or isobutane.

23. (Original) Apparatus according to claim 18 wherein said power plant is a combined cycle geothermal power plant.

24. (Previously Presented) Apparatus according to claim 9, further comprising a water injection pump for injecting heat-depleted geothermal fluid into the horizontal, injection well.

25. (Previously Presented) Apparatus according to claim 9, further comprising a deep well pump for pumping hot geothermal fluid from the production well.

26. (Previously Presented) Apparatus according to claim 9, wherein the horizontal, injection geothermal well comprises a perforated horizontal pipe.

27. (Previously Presented) Apparatus according to claim 9, wherein the second horizontal, production geothermal well comprises a perforated horizontal pipe,

28. (Original) Apparatus according to claim 26, wherein the perforated horizontal pipe is perforated on its lower surface.

29. (Original) Apparatus according to claim 27, wherein the perforated horizontal pipe is perforated on its lower surface.

30. (Original) Apparatus according to claim 9, wherein the production horizontal geothermal well is generally parallel to the injection horizontal, geothermal well.

31. (Original) Apparatus according to claim 9, comprising a plurality of injection horizontal, geothermal wells for one production horizontal, geothermal well.

32. (Original) Apparatus according to claim 9 comprising a plurality of horizontal injection wells and a plurality of horizontal production wells spaced horizontally and vertically.

33. (Original) Apparatus according to claim 9 wherein all the water and make-up water is supplied from an external source.

34. (Original) Apparatus according to claim 9 wherein part of the water circulating is from the reservoir and only make-up water is from an external source.

35. (Currently Amended) Method for assuring the flow of geothermal fluid from at least an injection well to at least a production well, which comprises the following steps:

I--Providing a first, horizontal, geothermal well, which is connected to said injection well;

II--Injecting water into said injection well;

III--Providing a second, horizontal, geothermal well, which is connected to said production well;

IV--Recovering geothermal fluid from said production well;

V--Generating a water density difference and a pressure difference between said first horizontal well and said second horizontal well; and

VI . Inducing geothermal fluid into said second horizontal geothermal well from the geological layer because of buoyancy of the water and the pressure difference between the horizontal injection and horizontal production wells, ~~whereby the first horizontal injection geothermal well has an open slotted outlet from which injected water flows into the geological layer in which the well has been drilled, and the second horizontal injection geothermal well has an open slotted inlet.~~

36. (New) Method according to claim 1, wherein the geothermal fluid is one of water, steam and a combination thereof.

37. (New) Apparatus according to claim 9, wherein the geothermal fluid is one of water, steam and a combination thereof.

38. (New) Method according to claim 35, wherein the geothermal fluid is one of water, steam and a combination thereof.

REMARKS/ARGUMENTS

Favorable reconsideration of the present application is respectfully requested.

Method Claims 1 and 35 have been amended to delete an unnecessary structural limitation that was introduced in the last response. New Claims 36-38 further recite that the geothermal fluid is one of water, steam and a combination thereof. Basis for this is found on page 7 of the specification.

Claims 1-9, 17, 18 and 24-35 have again been rejected under 35 U.S.C. §103 as being anticipated by Shnell. Additionally, Claims 1-9 and 13-35 have been rejected under 35 U.S.C. §103 as being obvious over McCabe et al in view of Butler. These rejections are respectfully traversed for the reasons set forth below.

The Applicant would like to stress that the claimed invention is directed to a method or apparatus for recovering or enhancing the flow of geothermal heat from at least one injection well to at least one production well by generating a water density difference and pressure difference between a first horizontal injection well and a second horizontal production well. For example, as is described in the paragraph bridging pages 9-10 of the present specification, water pumped into the deeper, horizontal injection well 32 absorbs geothermal heat and therefore becomes buoyant due to its lower density. This buoyancy and the pressure of the pumped water causes it to preferentially flow upward to the shallower, horizontal production well 34, from which it can be drawn off in order to extract the heat energy. This is not taught or suggested by any of the cited prior art.

For example, Shnell teaches recovering geothermal heat energy by pumping water to a depth where the heat and pressure promote an endothermic reaction, i.e. an endothermic chemical reaction which converts the water into its respective hydrogen and oxygen components. These components are then drawn to a generating plant at the surface for conversion to electricity. Specifically, e.g. water in tank 14 is pumped to the bottom of the

well 12 where it is decomposed into hydrogen and oxygen in the presence of the catalyst 22 located coaxially within the well. In this case, the hydrogen and oxygen components are withdrawn via the conduits 25 and 27 which are also located within the well 12.

It may therefore be appreciated that the claims are distinguishable from Shnell in a number of respects. First, Claim 1 recites a step of providing the second horizontal production well “substantially horizontally and vertically spaced from said first” horizontal injection well and located at a shallower depth than the first injection well. Since the “production well” in Shnell is simply the conduits 25 and 27 which carry the decomposed hydrogen and oxygen components of the injected water, and since these conduits 25 and 27 are positioned *within* the “injection well” 12, it is evident that the “production well” of Shnell cannot be vertically spaced from, or located at a shallower depth than, the “injection well” 12 within which it is located.

Moreover, Claim 1 recites generating a water density difference and a pressure difference between the first and second wells, and inducing geothermal fluid into the second well from the geological layer because of the buoyancy of the water and the pressure difference between the wells. In contrast, to the extent that the hydrogen and oxygen resulting from the decomposition of the water pumped through the well 12 of Shnell can be considered “geothermal fluids,” they are caused to enter the conduits 25 and 27 from the catalytic device 22 by the diffusion of the hydrogen and oxygen through the walls of the catalytic device (column 9, line 60 through column 10, line 58). No water density difference is generated between the well 12 and the conduits 25 and 27 located therein, nor does water buoyancy or a pressure difference between the wells induce a fluid into the conduits 25 and 27. For this reason as well, Claim 1 and its dependent claims define over Shnell.

Concerning conduit 11 of Shnell, this conduit simply provides water to dilate the cracks in the fracture zone (col. 9, lines 4-23). Water discharged from the conduit 11 through

the one way valve 5 is lost and is not induced into a geothermal production well. Thus the conduit 11 does not teach the claimed feature whereby geothermal fluid is induced into the second horizontal geothermal well from the geological layer because of buoyancy of the water and the pressure difference between the horizontal injection and horizontal production wells.

The latter distinctions over Shnell also apply to method Claim 35 which similarly recites generating a water density difference and a pressure difference between first and second horizontal wells, and inducing geothermal fluid into the second horizontal geothermal well from the geological layer because of the buoyancy of the water and pressure difference between the horizontal injection and production wells. Claim 35 therefore also defines over Shnell.

Apparatus Claim 9 recites that the second horizontal production geothermal well is substantially horizontally and vertically spaced from the first well and is located at a shallower depth than the first well, as well as means for producing a water density difference and a pressure difference between the first and second wells. As already explained, neither of these features is present for the well 12 and conduits 25-27 positioned therein in Shnell. Additionally, Claim 9 recites the open slotted outlet of the first well and open slotted inlet of the second well. Applicant has previously explained that these features are not taught by Shnell in which the fluids (and catalyst 22, as well as conduits 25-27) are kept within the well 12 (as explained above, the water released from the conduit 11 is not induced into a production well). The Office Action nonetheless points to elements 5, 7 and 9 of Shnell for this teaching. However, elements 5, 7 and 9 of Shnell are not slots but are respectively a one way valve, a temperature gauge and another undisclosed device. In view of these differences, Claim 9 and its dependent claims therefore also define over this reference.

It is noted that new dependent Claims 36-39 recite that the geothermal fluid is one of water, steam and a combination thereof. This represents a further distinction over Shnell in which the extracted fluid is hydrogen and oxygen.

Concerning McCabe et al, the Office Action has evidently relied upon the embodiment of Figure 2 of this reference. Figure 2 of McCabe et al discloses both a low temperature vertical geothermal well 140 extending to a low temperature formation 146 and a laterally spaced high temperature geothermal vertical well 10a (including casing 20a) extending to a high temperature formation 150 which is below, and fluidically isolated from, the low temperature formation 146. This embodiment is based upon the concern that the high temperature formation 150 may have an insufficient volume of the geothermal fluid (column 20, lines 3-33). Therefore, relatively low temperature geothermal fluid from the formation 146 is pumped through the low temperature geothermal well 140, from which it is introduced into the high temperature geothermal well 10a via the above ground conduit 170 and mixed with the relatively small volume of high temperature fluid coming in from the high temperature formation 150. The resultant mixture is then pumped upwardly through the tail pipe 42a to a heat transfer and generating device for generating electrical power (column 22, lines 34-43). Therefore, not only does McCabe et al fail to disclose horizontal wells, as recognized in the Office Action, it also fails to teach generating a water density difference and pressure difference between the two wells and inducing geothermal fluid into the second well from the geological layer because of the buoyancy of the water and the pressure difference between the wells. Instead, water from the low temperature well 140 is simply pumped to the high temperature well 10a via the aboveground conduit 170.

Butler was cited to suggest providing the wells of McCabe et al with horizontally and vertically spaced apart sections.

As a threshold matter, it is noted that prior art can only be combined to the extent that it is “analogous prior art,” which is limited to that prior art which is reasonably pertinent to the particular problem with which the inventor is involved. MPEP § 2141.01(a)(I). Butler is not analogous prior art and cannot properly be combined with McCabe et al. The problem facing the would be inventor in the present application and in McCabe et al is that of *extracting* geothermal heat. Butler, on the other hand, is concerned with extracting heavy hydrocarbons from the earth by a net *injection of* heat into the earth. The problem of extracting extracting hydrocarbons from the earth is not reasonably pertinent to that of extracting heat. For example, Butler does the opposite of the goal in McCabe et al: net heat is *injected into* the earth. Therefore one skilled in the art would not have even looked to Butler for a teaching for modifying McCabe et al.

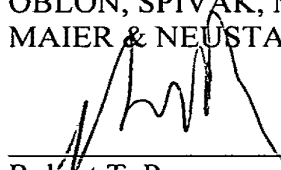
Moreover, in view of the unrelated purpose of the wells in Butler, any structural modification of McCabe et al which would have been suggested by Butler would also be the opposite of the invention. Since Butler is directed to a process for extracting hydrocarbons from the earth, the horizontal section 18 of the injection well 11 in Butler is located horizontally above the horizontal section 16 of the production well 10, which is the *opposite* of the orientation set forth in the present claims. That, is the horizontal section 16 of the production well is located below the horizontal section 18 of the injection well so that the heated heavy oil can drain by gravity to the production well (col. 10, lines 58-64). Therefore, even if one skilled in the art were to draw a suggestion from the oil production well of Butler for incorporation into the geothermal heat extraction well of McCabe et al, Butler would suggest a relative vertical positioning of the wells which is *opposite* to that set forth in the claims. Thus it is evident that the claims define over any combination of McCabe et al. and Butler.

Dependent Claims 11 and 12 were rejected under 35 U.S.C. §103 as being obvious over McCabe et al in view of Butler, and further in view of Lynn et al which was cited to teach an observation well having a differential pressure sensor. However, regardless of whatever teaching Lynn et al may have in this respect, it would not suggest overcoming the shortcomings of McCabe et al and Butler with respect to Claim 9, and so the claims define over any combination of the above references.

Applicant therefore believes that the present application is in a condition for allowance and respectfully solicits an early notice of allowability.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

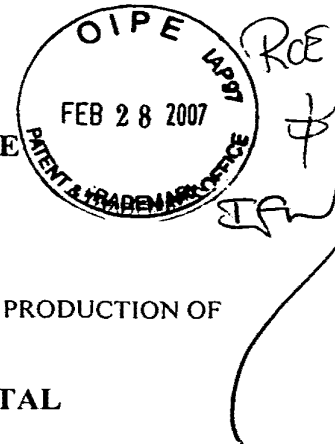


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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF: Lucien Y. BRONICKI

SERIAL NO: 10/910,613

GAU: 3748

FILED: August 4, 2004

EXAMINER: NGUYEN, H.

FOR: METHOD AND APPARATUS FOR USING GEOTHERMAL ENERGY FOR THE PRODUCTION OF POWER

REQUEST FOR CONTINUED EXAMINATION (RCE) TRANSMITTAL

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

This is a request for Continued Examination (RCE) under 37 C.F.R. §1.114 of the above-identified application.

Submission required under 37 C.F.R. §1.114

Previously Submitted:

- ☐ Consider the amendment(s)/reply under 37 C.F.R. §1.116 previously filed on
- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on

Enclosed:

- ☒ RCE Amendment
- ☐ Information Disclosure Statement (IDS)
- ☐ Other:

FEES	RATE	CALCULATIONS
☐ Suspension of action on the above-identified application is requested under 37 C.F.R. §1.103(c) for a period of months.	\$200.00	\$0.00
☒ RCE Fee required under 37 C.F.R. §1.17(e)	\$790.00	\$790.00
☐		\$0.00
☒ Extra Claims		\$150.00
TOTAL OF ABOVE CALCULATIONS:		\$940.00
☐ REDUCTION BY 50% FOR FILING AS SMALL ENTITY		\$0.00
TOTAL:		\$940.00

- ☐ A check in the amount of \$0.00 is enclosed
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- ☒ Please charge any additional Fees for the papers being filed herewith and for which no check or credit card payment is enclosed herewith, or credit any overpayment to Deposit Account No. 15-0030. A duplicate copy of this sheet is enclosed.
- ☒ If these papers are not considered timely filed by the Patent and Trademark Office, then a petition is hereby made under 37 CFR 1.136, and any additional fees required under 37 CFR 1.136 for any necessary extension of time may be charged to Deposit Account No. 15-0030. A duplicate copy of this sheet is enclosed.

Respectfully Submitted,

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MAIER & NEUSTADT, P.C.

Robert T. Pous

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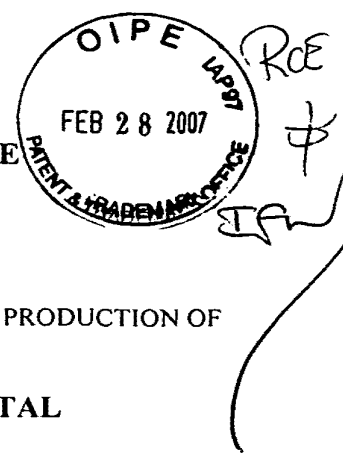
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IN RE APPLICATION OF: Lucien Y. BRONICKI

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/910,613	08/04/2004	Lucien Y. Bronicki	256868US30	6916
22850	7590	11/28/2006	EXAMINER	
C. IRVIN MCCLELLAND OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			NGUYEN, HOANG M	
			ART UNIT	PAPER NUMBER
			3748	

DATE MAILED: 11/28/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/910,613

Applicant(s)

BRONICKI, LUCIEN

Examiner

Hoang M. Nguyen

Art Unit

3748

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 October 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 and 11-35 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9, 11-35 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) ☐ Notice of References Cited (PTO-892) | 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) ☐ Notice of Informal Patent Application |
| 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) ☐ Other: _____ |

Art Unit: 3748

Applicant's amendment dated October 26, 2006, has been fully considered.

Applicant has argued that Shnell does not teach the newly added limitation that recites both horizontal injections thermal wells have drilled holes and slots. The Examiner disagrees. The water injection well 11 clearly has holes at its horizontal portions going into the ground, note locations 5, 7, 9. The ends of both output wells 25, 27, also have open ends to direct fluid back to the ground. The newly added limitations read on those elements.

Regarding the 103 rejection, Applicant argued Mokrys does not disclose geothermal well. The Examiner disagrees because any well going into the ground are subjected to geothermal temperature. Mokrys's wells are underground and therefore must inherently be subjected to geothermal temperature. Furthermore, Mokrys is used to disclose the structures of the wells, not the geothermal power plant. The primary reference, McCabe et al already discloses the geothermal power plant. However, because of the newly added limitations discussed above, a new reference, US 4344485, Butler, is used in place of Mokrys.

Applicant further argued Lynn et al does not disclose a differential pressure sensor. The Examiner disagrees. Lynn et al discloses a differential pressure gauge for wellbore to compare with a reference pressure which can be set by user. Column 2 explains that said gauge can be used to detect pressure at many different wells and of

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course, it would have been obvious to compare the pressures between two wells because the reference pressure can be set.

For the reasons set forth above, this Office Action has been made FINAL.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-9, 17-18, 24-35 is rejected under 35 U.S.C. 102(b) as being anticipated by US 5661977 (Shnell).

Shnell discloses a geothermal power plant comprising an injection well 11, a production well 25, 27, the production well is above the injection well. The output of the production well is used to generate electricity in a power plant 20. The water injection well 11 clearly has holes at its horizontal portions going into the ground, note locations 5, 7, 9. The ends of both output wells 25, 27, also have open ends to direct fluid back to the ground. The newly added limitations read on those elements.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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Claims 1-9, 13-35, are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. 4112745 (McCabe et al) in view of U.S. 4344485 (Butler). McCabe et al discloses a geothermal power plant comprising an injection well 12, a production well 42, the production well is shorter than the injection well, figure 2 discloses two sets of injection well and production well spaced apart from each other, column 12, lines 1-23 disclose that the output fluid from the production port is used to drive an organic fluid using isobutene. McCabe et al does not disclose that the injection well is horizontally and vertically spaced apart, and the drilled holes plus slots for the horizontal sections. Butler is relied upon to disclose it's well known to have an injection well 11 being horizontally and vertically spaced apart from a production well 10, the horizontal sections 16, 18, have holes and/or slots to direct fluid in/out of the wells. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to modify the wells in McCabe et al to be horizontally and vertically spaced apart as taught by Butler for the purpose of achieving appropriate power output. Regarding claims 14-18, 20-21, 23, 30-31, it would have been obvious to a person having ordinary skill in the art to select different types of working fluid, distances, power plants, in McCabe et al for the purpose of achieving appropriate power output based on said selected fluids, distances, power plants.

Claims 11-12, are rejected under 35 U.S.C. § 103(a) as being unpatentable over McCabe et al as modified as applied to claim 1 above, and further in view of US 3318145 (Lynn et al). McCabe et al as modified teaches all the claimed subject matter

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as set forth above in the rejection of claim 1, but still does not teach an observation well with a differential pressure sensor. Lynn et al teaches it's well known to have an observation well having a differential pressure sensor 26. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to provide an observation well having a differential pressure sensor in McCabe et al as taught by Lynn et al for the purpose of observing the operations of the well.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Examiner Nguyen whose telephone number is (571) 272-4861. The examiner can normally be reached on Tuesday--Friday from 12:30 AM to 10:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas E. Denion can be reached on 571-272-4859. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



11/19/06

HOANG NGUYEN
PRIMARY EXAMINER
ART UNIT 3748

Hoang Minh Nguyen
11/19/2006

Hoang M. Nguyen

3748

[illegible]

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

[illegible]

Index of Claims



Application/Control No.

10/910,613

Examiner

Hoang M. Nguyen

Applicant(s)/Patent under Reexamination

BRONICKI, LUCIEN

Art Unit

3748

✓	Rejected
=	Allowed

-	(Through numeral) Cancelled
+	Restricted

N	Non-Elected
I	Interference

A	Appeal
O	Objected

Claim	Date
Final	Original
1	2
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Claim	Date
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EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	384	60/641.2,641.3,641.4.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/19 01:44
L2	25537	horizontal near3 well	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/19 01:44
L3	8	1 and 2	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/19 01:54
L4	116219	pressure adj sensor	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/19 01:54
L5	12	1 and 4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/19 01:58
L6	78796	differential adj pressure	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/19 01:54
L7	0	5 and 6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/19 01:54

EAST Search History

L8	9	1 and 6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/19 01:56
L9	1497115	sensor	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/19 01:54
L10	1	8 and 9	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/11/19 01:55

Docket No.

IN RE APPLICATION OF Lucien Y. BRONICKI

SERIAL NO: 10/910,613

FILED: August 4, 2004

FOR: METHOD AND APPARATUS FOR USING GEOTHERMAL ENERGY FOR THE PRODUCTION OF POWER

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

Transmitted herewith is an amendment in the above-identified application.

- ☒ No additional fee is required
- ☐ Small entity status of this application under 37 C.F.R. §1.9 and §1.27 is claimed.
- ☐ Additional documents filed herewith:

The Fee has been calculated as shown below:

CLAIMS	CLAIMS REMAINING		HIGHEST NUMBER PREVIOUSLY PAID	NO. EXTRA CLAIMS	RATE	CALCULATIONS
TOTAL	34	MINUS	35	0	x \$50 =	\$0.00
INDEPENDENT	3	MINUS	3	0	x \$200 =	\$0.00
APPLICATION SIZE		MINUS	100	0 (each addtl. 50 sheets)	x \$250 =	\$0.00
		☐ MULTIPLE DEPENDENT CLAIMS			+ \$360 =	\$0.00
		TOTAL OF ABOVE CALCULATIONS				\$0.00
		☐ Reduction by 50% for filing by Small Entity				\$0.00
		TOTAL				\$0.00

- ☐ A check in the amount of \$0.00 is attached.
- ☐ Credit card payment form is attached to cover the fees in the amount of \$0.00
- ☒ Please charge any additional Fees for the papers being filed herewith and for which no check or credit card payment is enclosed herewith, or credit any overpayment to deposit Account No. 15-0030. A duplicate copy of this sheet is enclosed.
- ☒ If these papers are not considered timely filed by the Patent and Trademark Office, then a petition is hereby made under 37 C.F.R. §1.136, and any additional fees required under 37 C.F.R. §1.136 for any necessary extension of time may be charged to Deposit Account No. 15-0030. A duplicate copy of this sheet is enclosed.

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

Robert T. Pous
Registration No. 29,099

Customer Number
22850

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(OSMMN 05/03)
I:\rtp\256868\256868.cvr



DOCKET NO. 2004-20868US30

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :
LUCIEN Y. BRONICKI : EXAMINER: NGUYEN, HOANG M.
SERIAL NO: 10/910,613 :
FILED: AUGUST 4, 2004 : GROUP ART UNIT: 3748
FOR: METHOD AND APPARATUS FOR :
USING GEOTHERMAL ENERGY FOR
THE PRODUCTION OF POWER

AMENDMENT

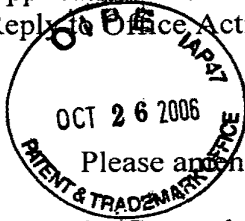
COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

In response to the Office Action dated July 26, 2006, please amend the above-identified application as follows:

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks/Arguments begin on page 9 of this paper.



IN THE CLAIMS

Please amend the claims as follows:

1. (Currently Amended) Method for recovering geothermal heat, which comprises enhancing the flow of geothermal fluid from at least one injection well to at least one production well, by the following steps:
 - a. Providing a first, horizontal, geothermal well, which is used as said injection well;
 - b. Injecting water into said injection well;
 - c. Providing a second, horizontal, geothermal well, which is used as said production well, such that said second, horizontal, production, geothermal well is substantially horizontally and vertically spaced from said first, horizontal, injection, geothermal well and located at a shallower depth than said first, horizontal, injection, geothermal well;
 - d. Recovering geothermal fluid from said production well; ~~and~~
 - e. Generating a water density difference and a pressure difference between said first horizontal, injection well and said second horizontal, production well; and
 - f. Inducing geothermal fluid into said second horizontal geothermal well from the geological layer because of buoyancy of the water and the pressure difference between the horizontal injection and horizontal production wells, whereby the first horizontal injection geothermal well has an open slotted outlet from which injected water flows into the geological layer in which the well has been drilled, and the second horizontal injection geothermal well has an open slotted inlet.

2. (Original) Method according to claim 1, wherein the horizontal wells are provided by drilling along a geological layer.

3. (Original) Method according to claim 1, comprising increasing the pressure difference by pressurizing the water, injected in the horizontal, deeper injection well, above the hydrostatic pressure existing at the depth of the horizontal deeper injection geothermal well and reducing the pressure in the horizontal, shallower production well.

4. (Original) Method according to claim 1, further comprising extracting heat from the geothermal fluid recovered from the production well and using said heat for the production of energy.

5. (Original) Method according to claim 1, wherein the water injected into the injection well is the geothermal fluid, recovered from the production well, depleted of heat by heat exchange.

6. (Original) Method according to claim 1, further comprising monitoring the pressure difference.

7. (Original) Method according to claim 1, wherein the first and second horizontal, geothermal wells are formed in a geological layer the suitability of which has been determined.

8. (Currently Amended) Method according to claim ~~[[8]]~~ 3, wherein the suitability of the geological layer is determined by geophysical surveys and by drilling slim holes in said layer.

9. (Currently Amended) Apparatus for enhancing the flow of geothermal fluid from at least one injection well to at least one production well, which comprises:

a. A first, horizontal geothermal well, which is used as said injection well into which water is injected,

b. A second horizontal, geothermal well, which is used as said production well from which geothermal fluid issues, wherein said second, horizontal, production, geothermal well is substantially horizontally and vertically spaced from said first, horizontal, injection, geothermal well and located at a shallower depth than said first, horizontal, injection, geothermal well; and

c. Means for producing a water density difference and a pressure difference between said first horizontal, injection well and said second horizontal, production well,

wherein the first horizontal, injection geothermal well has an open slotted outlet, from which injected water flows into the geological layer in which the well has been drilled, and the second horizontal, production geothermal well has an open slotted inlet, whereby geothermal fluid flows into it from the geological layer because of buoyancy of the water and the pressure difference between said horizontal injection and horizontal production wells.

10. (Cancelled).

11. (Original) Apparatus according to claim 9, further comprising instrumentation for monitoring the pressure difference.

12. (Original) Apparatus according to claim 9, further comprising an observation well connected to the second horizontal, production geothermal well, and wherein the instrumentation comprising observation instrumentation present in said observation well.

13. (Original) Apparatus according to claim 9, wherein the first horizontal, geothermal well has a length up to 1.25 miles.

14. (Original) Apparatus according to claim 9, wherein the second horizontal, geothermal well has a length up to 1.25 miles.

15. (Original) Apparatus according to claim 9, wherein the horizontal distance between the first horizontal well and the second horizontal well is up to 2000 feet.

16. (Original) Apparatus according to claim 9, wherein the vertical distance between the first horizontal well and the second horizontal well is up to 150 feet.

17. (Original) Apparatus according to claim 9, further comprising a power plant comprising an electricity generator and at least one turbine for driving said generator, conduit means for conveying geothermal fluid to said power plant whereby said geothermal fluid becoming heat-depleted, and conduit means for conveying heat-depleted geothermal fluid from said power plant to the horizontal, injection well.

18. (Original) Apparatus according to claim 9, further comprising a heat exchanger, conduit means for conveying geothermal fluid to a heat exchanger whereby to heat is transferred to a working fluid for producing power in a power plant.

19. (Original) Apparatus according to claim 18 including a binary power plant comprising an organic vapor turbine operating according to an organic Rankine cycle.

20. (Original) Apparatus according to claim 19 wherein said binary power plant includes an air-cooled condenser.

21. (Original) Apparatus according to claim 19 wherein the working fluid of said binary power plant is pentane or isopentane.

22. (Original) Apparatus according to claim 19 wherein the working fluid of said binary power plant is butane or isobutane.

23. (Original) Apparatus according to claim 18 wherein said power plant is a combined cycle geothermal power plant.

24. (Currently Amended) Apparatus according to claim [[10]] 9, further comprising a water injection pump for injecting heat-depleted geothermal fluid into the horizontal, injection well.

25. (Currently Amended) Apparatus according to claim [[10]] 9, further comprising a deep well pump for pumping hot geothermal fluid from the production well.

26. (Currently Amended) Apparatus according to claim [[10]] 9, wherein the horizontal, injection geothermal well comprises a perforated horizontal pipe.

27. (Currently Amended) Apparatus according to claim [[10]] 9, wherein the second horizontal, production geothermal well comprises a perforated horizontal pipe,

28. (Original) Apparatus according to claim 26, wherein the perforated horizontal pipe is perforated on its lower surface.

29. (Original) Apparatus according to claim 27, wherein the perforated horizontal pipe is perforated on its lower surface.

30. (Original) Apparatus according to claim 9, wherein the production horizontal geothermal well is generally parallel to the injection horizontal, geothermal well.

31. (Original) Apparatus according to claim 9, comprising a plurality of injection horizontal, geothermal wells for one production horizontal, geothermal well.

32. (Original) Apparatus according to claim 9 comprising a plurality of horizontal injection wells and a plurality of horizontal production wells spaced horizontally and vertically.

33. (Original) Apparatus according to claim 9 wherein all the water and make-up water is supplied from an external source.

34. (Original) Apparatus according to claim 9 wherein part of the water circulating is from the reservoir and only make-up water is from an external source.

35. (Currently Amended) Method for assuring the flow of geothermal fluid from at least an injection well to at least a production well, which comprises the following steps:

I--Providing a first, horizontal, geothermal well, which is connected to said injection well;

II--Injecting water into said injection well;

III--Providing a second, horizontal, geothermal well, which is connected to said production well;

IV--Recovering geothermal fluid from said production well; ~~and~~

V--Generating a water density difference and a pressure difference between said first horizontal well and said second horizontal well; and

VI . Inducing geothermal fluid into said second horizontal geothermal well from the geological layer because of buoyancy of the water and the pressure difference between the horizontal injection and horizontal production wells, whereby the first horizontal injection geothermal well has an open slotted outlet from which injected water flows into the geological layer in which the well has been drilled, and the second horizontal injection geothermal well has an open slotted inlet.

REMARKS/ARGUMENTS

Favorable reconsideration of the present application is respectfully requested.

Claim 10 has been cancelled and the subject matter thereof has been incorporated into Claims 1, 9 and 35.

Claim 10 was rejected under 35 U.S.C. § 102 as being anticipated by the U.S. patent to Shnell, or under 35 U.S.C. § 103 as being obvious over the U.S. patent to McCabe et al in view of the U.S. patent to Mokrys. However these rejections are respectfully traversed.

The claimed invention is directed to a method or apparatus for recovering or enhancing the flow of geothermal heat from at least one injection well to at least one production well, including generating a water density difference and a pressure difference between a first horizontal injection well and a second horizontal production well. The claims now further recite inducing geothermal fluid into said second horizontal geothermal well from the geological layer because of buoyancy of the water and the pressure difference between the horizontal injection and horizontal production wells, whereby the first horizontal injection geothermal well has an open slotted outlet from which injected water flows into the geological layer in which the well has been drilled, and the second horizontal injection geothermal well has an open slotted inlet. This is not taught in Shnell, which instead discloses the production of endothermic products, gaseous hydrogen and gaseous oxygen in a well and supplying them to a power plant. Thus the amended claims are not anticipated by this reference.

Nor is this feature taught by any combination of McCabe et al and Mokrys. Mokrys is directed to hydrocarbon extraction by vapor extraction, and not geothermal wells. Thus it is not analogous to high temperature geothermal energy production of McCabe et al. That is, the problems presented to the would be inventor in hydrocarbon extraction are not reasonably pertinent to those presented to the would be inventor in high temperature geothermal energy

production (MPEP 2141.01(a)) and so their combination would not have been obvious to one skilled in the art.

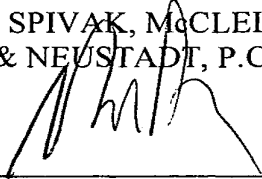
Concerning the rejection of dependent Claims 11 and 12 under 35 U.S.C. § 103 as being obvious over the U.S. patent to McCabe et al in view of the U.S. patent to Mokrys and the U.S. patent to Lynn et al, it is noted that Lynn et al makes no mention of use of measuring pressure differentials of geothermal fluid present in geothermal wells. Lynn et al discloses apparatus which “includes means for balancing a reference pressure against a pressure of the environment wherein differential pressure changes, as a function of time, are to be measured” (col. 2, lines 66-69). In the preferred embodiment in Lynn et al, for measuring downhole pressure changes, the apparatus comprises “an elongated cylindrical housing member adapted for suspension within a wellbore by means of a multi-conductor cable for transmitting the pressure data to surface amplification and recording equipment” (col. 3, lines 9-14). In col. 1, lines 33-36, it is stated “The preferred embodiment of the device is particularly suited for measurement of pressure differentials experienced within deep boreholes, such as oil and gas wells” (emphasis added). Furthermore, it is not clear from either McCabe or Lynn et al that the observation well should be connected to the second horizontal, production well nor, in addition, that the use of observation instrumentation present in the observation well for observing or monitoring the pressure of the geothermal fluid in the geothermal subterranean system is sufficient for a system for enhancing the flow of geothermal fluid from at least one injection well to at least one production well as claimed in claim 12.

Application No. 10/910,613
Reply to Office Action of July 26, 2006

Applicant therefore believes that the present application is in a condition for allowance and respectfully solicits an early Notice of Allowability.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.



Robert T. Pous
Attorney of Record
Registration No. 29,099

Customer Number
22850

Tel: (703) 413-3000
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(OSMMN 06/04)

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/910,613	08/04/2004	Lucien Y. Bronicki	256868US30	6916

22850 7590 07/26/2006

C. IRVIN MCCLELLAND
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C.
1940 DUKE STREET
ALEXANDRIA, VA 22314

EXAMINER

NGUYEN, HOANG M

ART UNIT PAPER NUMBER

3748

DATE MAILED: 07/26/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/910,613

Applicant(s)

BRONICKI, LUCIEN

Examiner

Hoang M. Nguyen

Art Unit

3748

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-35 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-35 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) ☒ Notice of References Cited (PTO-892) | 4) ☐ Interview Summary (PTO-413) |
| 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date: ____ |
| 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) ☐ Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>7/22/05</u> | 6) ☐ Other: ____ |

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Claim 8 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 8 is dependent from itself.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-10, 17-18, 24-35 is rejected under 35 U.S.C. 102(b) as being anticipated by US 5661977 (Shnell).

Shnell discloses a geothermal power plant comprising an injection well 11, a production well 25, 27, the production well is above the injection well. The output of the production well is used to generate electricity in a power plant 20.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-10, 13-35, are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. 4112745 (McCabe et al) in view of U.S. 6318464 (Mokrys). McCabe et al discloses a geothermal power plant comprising an injection well 12, a production well

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42, the production well is shorter than the injection well, figure 2 discloses two sets of injection well and production well spaced apart from each other, column 12, lines 1-23 disclose that the output fluid from the production port is used to drive an organic fluid using isobutene. McCabe et al does not disclose that the injection well is horizontally and vertically spaced apart. MoKrys is relied upon to disclose it's well known to have an injection well 30 being horizontally and vertically spaced apart from a production well 32. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to modify the wells in McCabe et al to be horizontally and vertically spaced apart as taught by Mokrys for the purpose of achieving appropriate power output. Regarding claims 14-18, 20-21, 23, 30-31, it would have been obvious to a person having ordinary skill in the art to select different types of working fluid, distances, power plants, in McCabe et al for the purpose of achieving appropriate power output based on said selected fluids, distances, power plants.

Claims 11-12, are rejected under 35 U.S.C. § 103(a) as being unpatentable over McCabe et al as modified as applied to claim 1 above, and further in view of US 3318145 (Lynn et al). McCabe et al as modified teaches all the claimed subject matter as set forth above in the rejection of claim 1, but still does not teach an observation well with a differential pressure sensor. Lynn et al teaches it's well known to have an observation well having a differential pressure sensor 26. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to provide

Art Unit: 3748

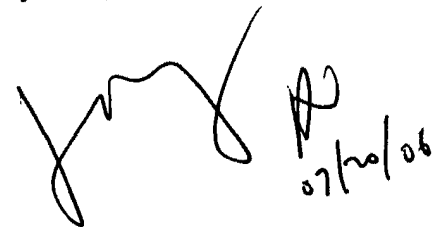
an observation well having a differential pressure sensor in McCabe et al as taught by Lynn et al for the purpose of observing the operations of the well.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Gallup et al, Isaacs et al, Butler, disclose geothermal power plants comprising injection wells and productions wells to drive power plants.

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Examiner Nguyen whose telephone number is (571) 272-4861. The examiner can normally be reached on Tuesday--Friday from 12:30 AM to 10:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas E. Denion can be reached on 571-272-4859. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



HOANG NGUYEN
PRIMARY EXAMINER
ART UNIT 3748

Hoang Minh Nguyen
7/20/2006

Form PTO 1449 (Modified)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTY DOCKET NO. 256868US30		SERIAL NO. 10/910,613	
LIST OF REFERENCES CITED BY APPLICANT				APPLICANT Lucien Y. BRONICKI			
				FILING DATE August 4, 2004		GROUP 3672	
U.S. PATENT DOCUMENTS							
EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB CLASS	FILING DATE IF APPROPRIATE
HN	AA	5,598,706	02/04/1997	Lucien Y. BRONICKI, et al.			
HN	AB	4,578,953	04/01/1986	Zvi KRIEGER, et al.			
HN	AC	4,700,543	10/20/1987	Zvi KRIEGER, et al.			
HN	AD	5,531,073	07/02/1996	Lucien Y. BRONICKI, et al.			
	AE						
FOREIGN PATENT DOCUMENTS							
		DOCUMENT NUMBER	DATE	COUNTRY	TRANSLATION YES NO		
	AF						
	AG						
OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, etc.)							
HN	AH	D. J. RYLEY, et al., "Drilling for geothermal resources", Sourcebook on the production of Electricity from Geothermal Energy, Brown University, USA, DOE, March 1980, pages 136-155					
HN	AI	John H. ALTSEIMER, "Geothermal Well Technology and Potential Applications of Subterrene Devices-A Status Review", pages 1453-1470					
HN	AJ	D. J. RYLEY, "Analysis of the Flow in the Reservoir-Well System", Sourcebook on the production of Electricity from Geothermal Energy, Brown University, USA, DOE, March 1980, pages 172-211					
HN	AK	Emmanuel JACQUOT, "Description of the Geothermal HDR Site of Soultz-Sous-Forêts (BAS-RHIN, France) Based on Data Collected During Previous Stimulation and Circulation Experiments for a Modelling Purpose", DRAFT PROCEEDINGS, 4 TH Int. HDR FORUM, September 28-30, 1998, 10 pages					
HN	AL	K. KATAGIRI, "Effect of Slotted Liner Casing in Geothermal Bores", Geothermics, Special Issue 2, U.N. Symposium on the Development and Utilization of Geothermal Resources, Pisa 1970, vol. 2, part 2, pages 1497-1501					
HN	AM	James N. ALBRIGHT, et al., "Microhole Drilling and Instrumentation", DRAFT PROCEEDINGS, 4 TH Int. HDR FORUM, September 28-30, 1998, 5 pages					
HN	AN	Gregory J. NUNZ, "The Xerolithic Geothermal ("Hot Dry Rock") Energy Resource of the United States: an Update", Los Alamos, National Laboratory, LA-12606-MS, UC-920, July 1993, 3 cover pages and pages 1-31					
HN	AO	"Hot Dry Rock Energy", Hot Dry Rock Geothermal Development Program, LA-12903-PR, Progress Report, UC-1241, March 1995, pages 7-39					
HN	AP	Omar SIGUROSSON, et al., "Reinjection Strategy for Geothermal Systems", 1995, pages 1967-1971					
HN	AQ	A. C. GRINGARTEN, et al., "Applied Pressure Analysis for Fractured Wells", Journal of Petroleum Technology, July 1975, pages 887-892					
HN	AR	D. W. DAREING, "State-of-the-Art of Drilling Thrusters", Category UC-66C, January 1980					
						☐ Additional References sheet(s) attached	
Examiner /Hoang Nguyen/					Date Considered 07/15/2006		
*Examiner: Initial if reference is considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.							

Notice of References Cited	Application/Control No. 10/910,613		Applicant(s)/Patent Under Reexamination BRONICKI, LUCIEN	
	Examiner Hoang M. Nguyen		Art Unit 3748	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-4,112,745	09-1978	McCabe et al.	60/641.2
*	B	US-3,318,145	05-1967	LYNN RALPH D; et. al.	73/152.53
*	C	US-6,318,464	11-2001	Mokrys, Igor J.	166/252.1
*	D	US-5,661,977	09-1997	Shnell, James H.	60/641.2
*	E	US-5,240,687	08-1993	Gallup et al.	423/42
*	F	US-6,186,232	02-2001	Isaacs et al.	166/272.3
*	G	US-4,344,485	08-1982	Butler, Roger M.	166/271
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
 United States Patent and Trademark Office
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 Alexandria, Virginia 22313-1450
 www.uspto.gov



Bib Data Sheet

CONFIRMATION NO. 6916

SERIAL NUMBER 10/910,613	FILING OR 371(c) DATE 08/04/2004 RULE	CLASS 060	GROUP ART UNIT 3748	ATTORNEY DOCKET NO. 256868US30
APPLICANTS Lucien Y. Bronicki, Yavne, ISRAEL;				
** CONTINUING DATA *****				
** FOREIGN APPLICATIONS *****				
IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 10/01/2004				
Foreign Priority claimed ☐ yes ☒ no 35 USC 119 (a-d) conditions met ☐ yes ☒ no ☐ Met after Allowance Verified and Acknowledged <u> </u> Examiner's Signature <u> </u> Initials <u> </u>		STATE OR COUNTRY ISRAEL	SHEETS DRAWING 11	TOTAL CLAIMS 35
			INDEPENDENT CLAIMS 3	
ADDRESS 22850				
TITLE Method and apparatus for using geothermal energy for the production of power				
FILING FEE RECEIVED 1170	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:		☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit	

Search Notes

Application/Control No.

10/910,613

Examiner

Hoang M. Nguyen

Applicant(s)/Patent under
Reexamination

BRONICKI, LUCIEN

Art Unit

3748

SEARCHED

Class	Subclass	Date	Examiner
60	641.2, 641.3, 641.4, 641.5	7/15/2006	HMN

INTERFERENCE SEARCHED

Class	Subclass	Date	Examiner

**SEARCH NOTES
(INCLUDING SEARCH STRATEGY)**

	DATE	EXMR
EAST: SEE SEARCH HISTORY PRINT OUT DATED 7/15/06	7/19/2006	HMN

Index of Claims



Application/Control No.

10/910,613

Examiner

Hoang M. Nguyen

Applicant(s)/Patent under
Reexamination

BRONICKI, LUCIEN

Art Unit

3748

✓	Rejected
=	Allowed

—	(Through numeral) Cancelled
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N	Non-Elected
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A	Appeal
O	Objected

Claim	Date
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Claim	Date
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EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L23	0	"5598706".pn. or "4578953".pn. or "4700543".pn. or "5531073".pn.	US-PGPUB	OR	OFF	2006/07/15 19:31
L24	7	"5598706".pn. or "4578953".pn. or "4700543".pn. or "5531073".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 19:32
L25	14135	inject\$4 adj well	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 20:23
L26	15000	production adj well	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 20:23
L27	3919	25 and 26	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 19:33
L28	1031	geothermal adj power	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 19:33
L29	439	60/641.2-641.5.ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 19:34
L30	1290	28 or 29	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 19:34

EAST Search History

L31	179	27 and 30	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 19:34
L32	704	deeper adj well	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 19:34
L33	0	31 and 32	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 19:34
L34	151	shallower adj well	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 19:35
L35	1	31 and 34	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 19:35
L36	54995	(upper or above or higher) adj well	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 19:35
L37	3	31 and 36	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 19:37
L38	2679	lower adj well	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 19:37

EAST Search History

L39	9	31 and 38	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 20:14
L40	908	observation adj well	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 20:14
L41	301	27 and 40	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 20:14
L42	89	30 and 41	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 20:17
L43	212	41 not 42	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 20:18
L44	6081	(pressure adj (difference or differential)) with sensor	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 20:19
L45	0	43 and 44	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 20:18
L46	1	40 and 44	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 20:18

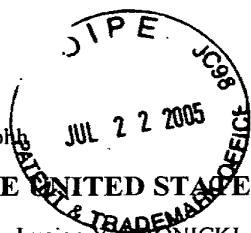
EAST Search History

L47	167154	(pressure adj (difference or differential))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 20:19
L48	179	43 and 47	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 20:20
L49	179	48 not 42	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 20:20
L50	3836	horizontal adj well	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 20:21
L51	89	28 and 41	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 20:21
L52	88	50 and 51	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 20:21
L53	58	horizontal adj inject\$4 adj well	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 20:23
L54	271	horizontal adj production adj well	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 20:23

EAST Search History

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L56	1	40 and 55	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 20:31
L57	8	47 and 55	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 20:33
L58	0	44 and 55	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 20:41
L59	241	bronicki.in.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 20:42
L60	42	30 and 59	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2006/07/15 20:42

Docket No. 256868US30/phh



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF: Lucien Y. BRONICKI

SERIAL NO: 10/910,613

GAU: 3672

FILED: August 4, 2004

EXAMINER:

FOR: METHOD AND APPARATUS FOR USING GEOTHERMAL ENERGY FOR THE PRODUCTION OF POWER

INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR 1.97

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

Applicant(s) wish to disclose the following information.

REFERENCES

- ☒ The applicant(s) wish to make of record the references listed on the attached form PTO-1449. Copies of the listed references are attached, where required, as are either statements of relevancy or any readily available English translations of pertinent portions of any non-English language references.
- ☐ A check or credit card payment form is attached in the amount required under 37 CFR §1.17(p).

RELATED CASES

- ☐ Attached is a list of applicant's pending application(s), published application(s) or issued patent(s) which may be related to the present application. In accordance with the waiver of 37 CFR 1.98 dated September 21, 2004, copies of the cited pending applications are not provided. Cited published and/or issued patents, if any, are listed on the attached PTO form 1449.
- ☐ A check or credit card payment form is attached in the amount required under 37 CFR §1.17(p).

CERTIFICATION

- ☐ Each item of information contained in this information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this statement.
- ☐ No item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application or, to the knowledge of the undersigned, having made reasonable inquiry, was known to any individual designated in 37 CFR §1.56(c) more than three months prior to the filing of this statement.

DEPOSIT ACCOUNT

- ☒ Please charge any additional fees for the papers being filed herewith and for which no check or credit card payment is enclosed herewith, or credit any overpayment to deposit account number 15-0030. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.


Robert T. Pous

Registration No. 29,099

Joseph Scafetta, Jr.
Registration No. 26,803

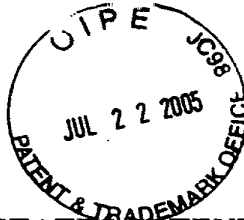
Customer Number

22850

Tel. (703) 413-3000
Fax. (703) 413-2220
(OSMMN 05/03)

DOCKET NO.: 256868US30

Page 1 of 1



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF:

Lucien Y. BRONICKI

SERIAL NO: 10/910,613

GROUP: 3672

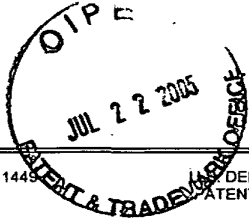
FILED: August 4, 2004

EXAMINER:

FOR: METHOD AND APPARATUS FOR USING GEOTHERMAL ENERGY FOR
THE PRODUCTION OF POWER

STATEMENT OF RELEVANCY

All the references on Form PTO-1449 are discussed in the specification.



Form PTO 1445 (Modified)		DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTY DOCKET NO. 256868US30		SERIAL NO. 10/910,613	
LIST OF REFERENCES CITED BY APPLICANT				APPLICANT Lucien Y. BRONICKI			
				FILING DATE August 4, 2004		GROUP 3672	
U.S. PATENT DOCUMENTS							
EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB CLASS	FILING DATE IF APPROPRIATE
	AA	5,598,706	02/04/1997	Lucien Y. BRONICKI, et al.			
	AB	4,578,953	04/01/1986	Zvi KRIEGER, et al.			
	AC	4,700,543	10/20/1987	Zvi KRIEGER, et al.			
	AD	5,531,073	07/02/1996	Lucien Y. BRONICKI, et al.			
	AE						
FOREIGN PATENT DOCUMENTS							
		DOCUMENT NUMBER	DATE	COUNTRY	TRANSLATION YES NO		
	AF						
	AG						
OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, etc.)							
	AH	D. J. RYLEY, et al., "Drilling for geothermal resources", Sourcebook on the production of Electricity from Geothermal Energy, Brown University, USA, DOE, March 1980, pages 136-155					
	AI	John H. ALTSEIMER, "Geothermal Well Technology and Potential Applications of Subterrene Devices-A Status Review", pages 1453-1470					
	AJ	D. J. RYLEY, "Analysis of the Flow in the Reservoir-Well System", Sourcebook on the production of Electricity from Geothermal Energy, Brown University, USA, DOE, March 1980, pages 172-211					
	AK	Emmanuel JACQUOT, "Description of the Geothermal HDR Site of Soultz-Sous-Forêts (BAS-RHIN, France) Based on Data Collected During Previous Stimulation and Circulation Experiments for a Modelling Purpose", DRAFT PROCEEDINGS, 4 TH Int. HDR FORUM, September 28-30, 1998, 10 pages					
	AL	K. KATAGIRI, "Effect of Slotted Liner Casing in Geothermal Bores", Geothermics, Special Issue 2, U.N. Symposium on the Development and Utilization of Geothermal Resources, Pisa 1970, vol. 2, part 2, pages 1497-1501					
	AM	James N. ALBRIGHT, et al., "Microhole Drilling and Instrumentation", DRAFT PROCEEDINGS, 4 TH Int. HDR FORUM, September 28-30, 1998, 5 pages					
	AN	Gregory J. NUNZ, "The Xerolithic Geothermal ("Hot Dry Rock") Energy Resource of the United States: an Update", Los Alamos, National Laboratory, LA-12606-MS, UC-920, July 1993, 3 cover pages and pages 1-31					
	AO	"Hot Dry Rock Energy", Hot Dry Rock Geothermal Development Program, LA-12903-PR, Progress Report, UC-1241, March 1995, pages 7-39					
	AP	Omar SIGUROSSON, et al., "Reinjection Strategy for Geothermal Systems", 1995, pages 1967-1971					
	AQ	A. C. GRINGARTEN, et al., "Applied Pressure Analysis for Fractured Wells", Journal of Petroleum Technology, July 1975, pages 887-892					
	AR	D. W. DAREING, "State-of-the-Art of Drilling Thrusters", Category UC-66C, January 1980					
					☐ Additional References sheet(s) attached		
Examiner					Date Considered		
*Examiner: Initial if reference is considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.							

ARTIFACT SHEET

Enter artifact number below. Artifact number is application number + artifact type code (see list below) + sequential letter (A, B, C ...). The first artifact folder for an artifact type receives the letter A, the second B, etc..

Examples: 59123456PA, 59123456PB, 59123456ZA, 59123456ZB

10910613 ZA

Indicate quantity of a single type of artifact received but not scanned. Create individual artifact folder/box and artifact number for each Artifact Type.

☐

CD(s) containing:

computer program listing

Doc Code: Computer

pages of specification

and/or sequence listing

and/or table

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content unspecified or combined

Doc Code: Artifact

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Artifact Type Code: P

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Artifact Type Code: S

☐

Artifact Type Code: U

☐

Stapled Set(s) Color Documents or B/W Photographs

Doc Code: Artifact Artifact Type Code: C

☐

Microfilm(s)

Doc Code: Artifact Artifact Type Code: F

☐

Video tape(s)

Doc Code: Artifact Artifact Type Code: V

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☐

Bound Document(s)

Doc Code: Artifact Artifact Type Code: B

☐

Confidential Information Disclosure Statement or Other Documents marked Proprietary, Trade Secrets, Subject to Protective Order, Material Submitted under MPEP 724.02, etc.

Doc Code: Artifact Artifact Type Code X

☐

Other, description:

NPL (reference AN)

Doc Code: Artifact Artifact Type Code: Z

IFW



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
 United States Patent and Trademark Office
 Address: COMMISSIONER FOR PATENTS
 P.O. Box 1450
 Alexandria, Virginia 22313-1450
 www.uspto.gov

APPLICATION NUMBER	FILING OR 371 (c) DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NUMBER
10/910,613	08/04/2004	Lucean Y. Bronichi	256868US30

22850
 OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C.
 1940 DUKE STREET
 ALEXANDRIA, VA 22314

CONFIRMATION NO. 6916

FORMALITIES LETTER



OC000000013979490

Date Mailed: 10/01/2004

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

*Filing Date Granted***Items Required To Avoid Abandonment:**

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The oath or declaration is missing.
A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.

The application is informal since it does not comply with the regulations for the reason(s) indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- Replacement drawings in compliance with 37 CFR 1.84 and 37 CFR 1.121 are required. The drawings submitted are not acceptable because:
 - The drawings must be reasonably free from erasures and must be free from alterations, overwriting, interlineations, folds, and copy marks. See Figure(s) 1 - 3, 3A, 4, 5 - 8, 9A - 9C, 10.
 - The drawings have a line quality that is too light to be reproduced (weight of all lines and letters must be heavy enough to permit adequate reproduction) or text that is illegible (reference characters, sheet numbers, and view numbers must be plain and legible) see 37 CFR 1.84(l) and (p)(1); See Figure(s) 3A.
 - The drawings submitted to the Office are not electronically reproducible. Drawing sheets must be submitted on paper, which is flexible, strong, white, smooth, non-shiny, and durable (see 37 CFR 1.84(e)). See Figure(s) 9A, unreadable.

Replies should be mailed to: Mail Stop Missing Parts

Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

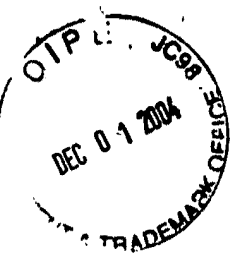
A copy of this notice MUST be returned with the reply.

Tsuyevich

Customer Service Center

Initial Patent Examination Division (703) 308-1202

PART 2 - COPY TO BE RETURNED WITH RESPONSE



ATTN: APPLICATION BRANCH

**THIS IS A RESPONSE TO A
NOTICE TO FILE MISSING
PARTS OF AN APPLICATION**

ATTORNEYS AT LAW

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

Re: Inventor: Lucien Y. BRONICKI
Serial No: 10/910,613
Filed: August 4, 2004
For: METHOD AND APPARATUS FOR USING GEOTHERMAL
ENERGY FOR THE PRODUCTION OF POWER

SIR:

Attached hereto for filing are the following papers:

Notice to File Missing Parts
Filing of Declaration/Declaration
Letter Submitting Replacement Drawing Sheet(s)/Replacement Sheets (11)
Filing of Supplemental Application Data Sheet
Supplemental Application Data Sheet

Our check in the amount of \$0.00 is attached covering any required fees. In the event that any variance exists between the amount enclosed and the Patent Office charges for filing the above-noted documents, including any fees required under 37 CFR 1.136 for any necessary Extension of Time to make the filing of the attached documents timely, please charge or credit the difference to our Deposit Account No. 15-0030. Further, if these papers are not considered timely filed, then a petition is hereby made under 37 CFR 1.136 for the necessary extension of time. A duplicate of this sheet is enclosed.

Respectfully Submitted,

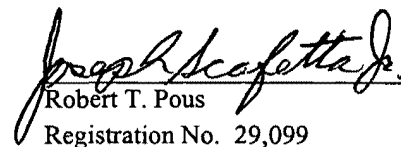
OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

Docket No. 256868US30

Customer Number

22850

Tel. (703) 413-3000
Fax. (703) 413-2220
(OSMMN 05/03)


Robert T. Pous

Registration No. 29,099

Joseph Scafetta, Jr.
Registration No. 26,803

Docket No. 256868US30



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF: Lucien Y. BRONICKI

SERIAL NUMBER: 10/910,613

ATTN: APPLICATION BRANCH

FILING DATE: August 4, 2004

FOR: METHOD AND APPARATUS FOR USING GEOTHERMAL ENERGY FOR THE PRODUCTION OF POWER

FILING OF DECLARATION UNDER 37 CFR 1.53(f)

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

Responsive to the notification dated October 1, 2004, and in accordance with the provisions of 37 CFR 1.53(f), Applicants submit herewith a Rule 63 Declaration.

The required fee was paid at the time of filing the application.

In light of the foregoing, this application is deemed to be in proper condition for examination and such favorable action is earnestly solicited.

Respectfully Submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

A handwritten signature in black ink, appearing to read "Robert T. Pous". The signature is written over a horizontal line.

Robert T. Pous

Registration No. 29,099

Joseph Scafetta, Jr.
Registration No. 26,803

Customer Number

22850

Tel. (703) 413-3000
Fax. (703) 413-2220
(OSMMN 05/03)

Docket No.: 256868US30



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION: Lucien Y. BRONICKI

SERIAL NO.: 10/910,613

GAU: 3672

FILED: August 4, 2004

EXAMINER:

FOR: METHOD AND APPARATUS FOR USING GEOTHERMAL ENERGY FOR THE
PRODUCTION OF POWER

LETTER SUBMITTING REPLACEMENT DRAWING SHEET(S)

COMMISSIONER FOR PATENTS
Alexandria, VA 22313

SIR:

Responsive to the below indicated communication, the following drawing sheets are submitted
herewith:

- ☒ 11 Replacement Drawing Sheets ☐ _____ New Drawing Sheets
- ☐ Official Action dated _____
- ☐ Notice of Allowance/Issue Fee dated _____
- ☒ Other Notice to File Missing Parts dated October 1, 2004

The changes and/or modifications made include the following:

The replacement drawing sheets are submitted to meet the Patent and Trademark Office
requirement.

Respectfully Submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

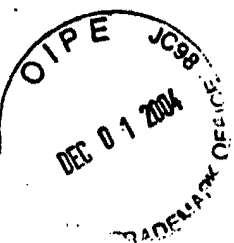
Robert T. Pous
Registration No. 29,099

Joseph Scafetta, Jr.
Registration No. 26,803

Customer Number

22850

Tel. (703) 413-3000
Fax. (703) 413-2220
(OSMMN 06/04)



256868US30

Declaration, Power of Attorney and Petition

WE (I) the undersigned inventor(s), hereby declare(s) that:

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

We (I) believe that we are (I am) the original, first and joint (sole) inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention entitled

METHOD AND APPARATUS FOR USING GEOTHERMAL ENERGY FOR THE PRODUCTION OF POWER

the specification of which

- ☐ is attached hereto.
- ☒ was filed on August 4, 2004 as
Application Serial No. 10/910,613
and amended on _____.
- ☐ was filed as PCT international application
Number _____
on _____,
and was amended under PCT Article 19
on _____ (if applicable).

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

We (I) acknowledge the duty to disclose information known to be material to the patentability of this application as defined in Section 1.56 of Title 37 Code of Federal Regulations.

We (I) hereby claim foreign priority benefits under 35 U.S.C. §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §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)

Application No.	Country	Day/Month/Year	Priority Claimed
_____	_____	_____	☐ Yes ☐ No
_____	_____	_____	☐ Yes ☐ No

We (I) hereby claim the benefit under Title 35, United States Code, §119(c) of any United States provisional application(s) listed below.

(Application Number)

(Filing Date)

(Application Number)

(Filing Date)

We (I) hereby claim the benefit under 35 U.S.C. §120 of any United States application(s), or under §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. §112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR §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 (pending, patented,
abandoned)

And we (I) hereby appoint the following registered practitioner(s):

Customer Number

22850

as our (my) attorneys, with full powers of substitution and revocation, to prosecute this application and to transact all business in the Patent Office connected therewith; and we (I) hereby request that all correspondence regarding this application be sent to

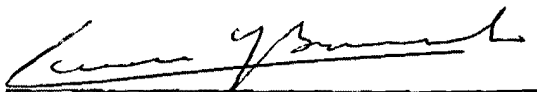
Customer Number

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We (I) declare that all statements made herein of our (my) own knowledge are true and that all statements made on information and belief are believed to be true; and further that those 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 issuing thereon.

Lucien Y. BRONICKI

NAME OF FIRST OR SOLE INVENTOR



Signature of Inventor

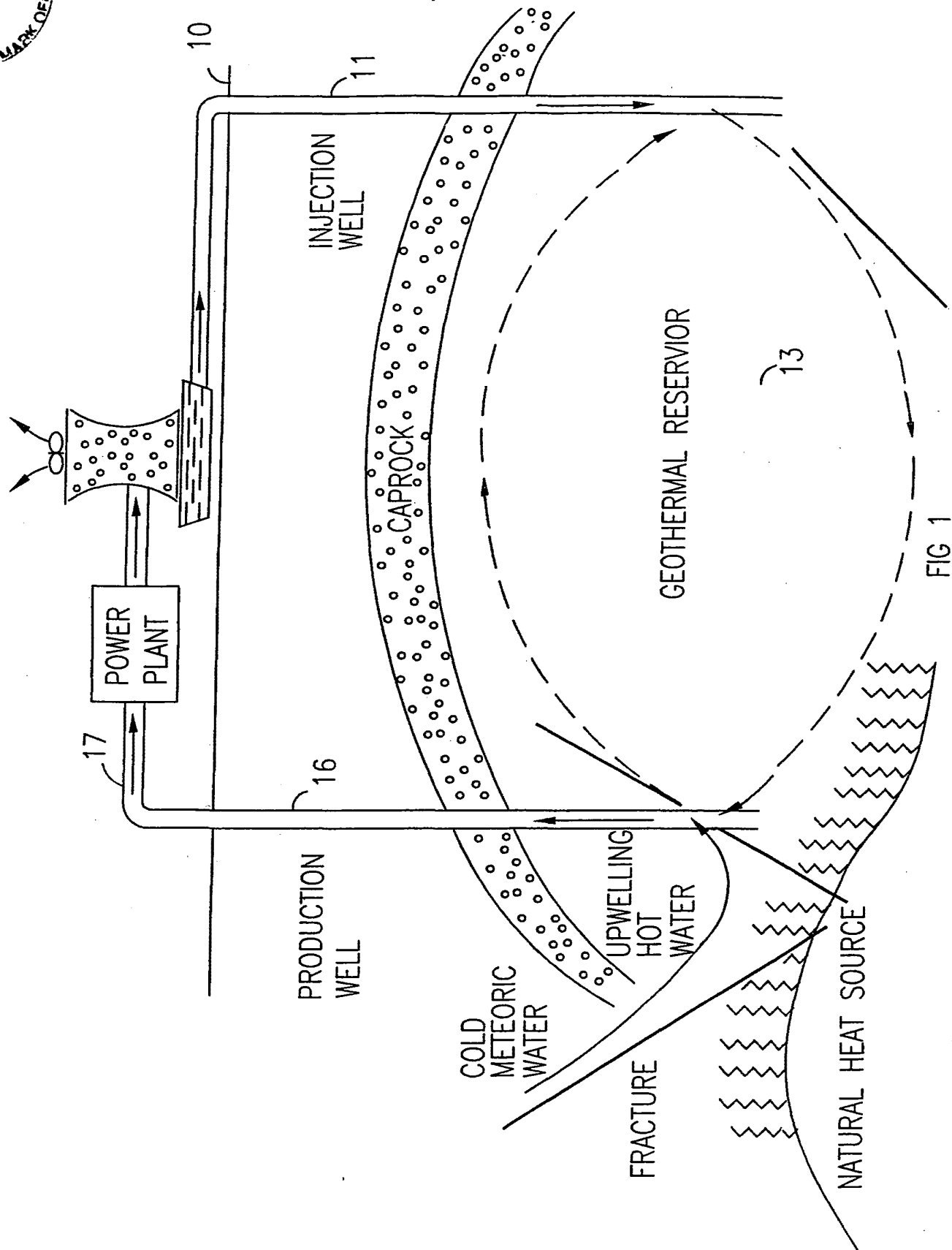
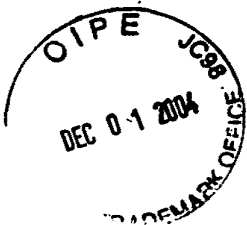
Residence: Yavne, Israel

Citizen of: Israel

Mailing Address: 5 Brosh Street, Yavne, Israel

November 3, 2004

Date



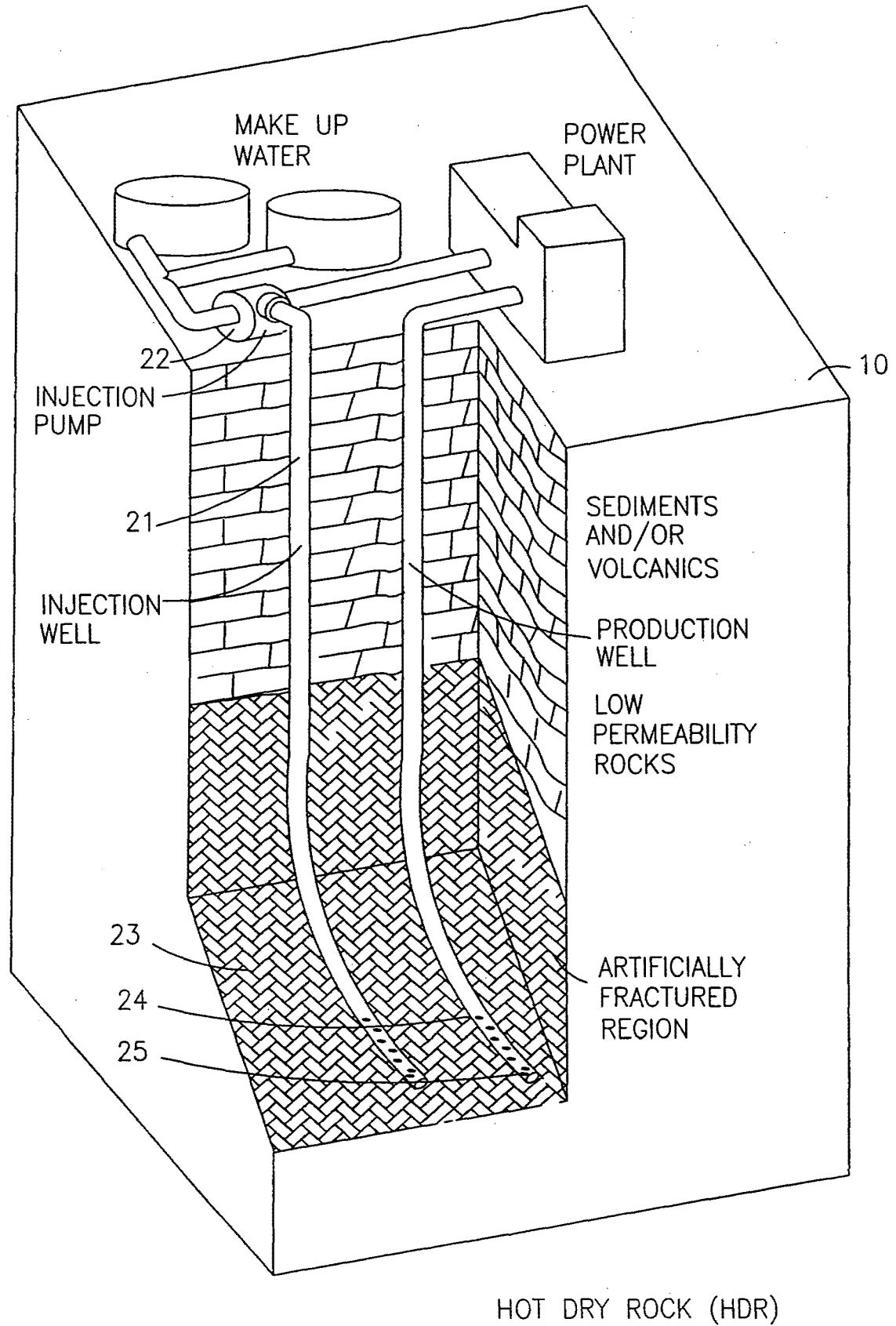


FIG. 2

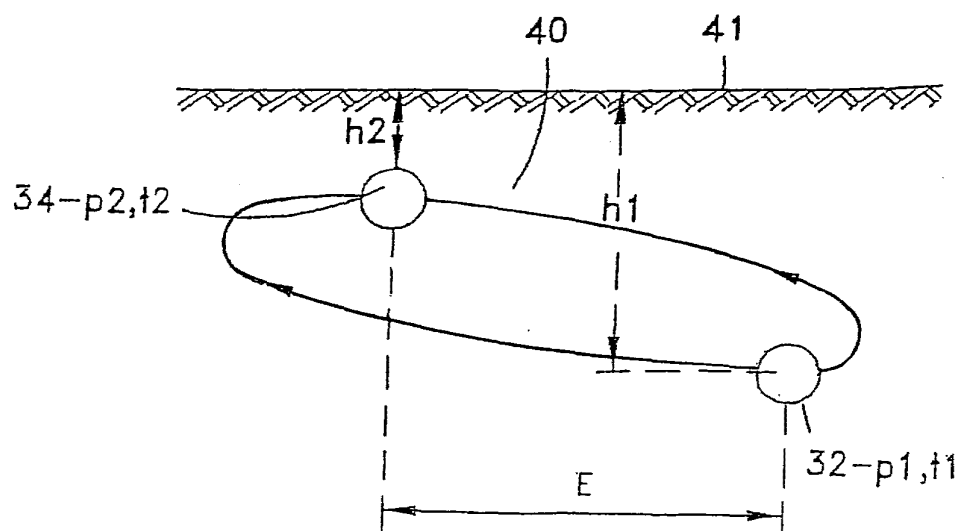
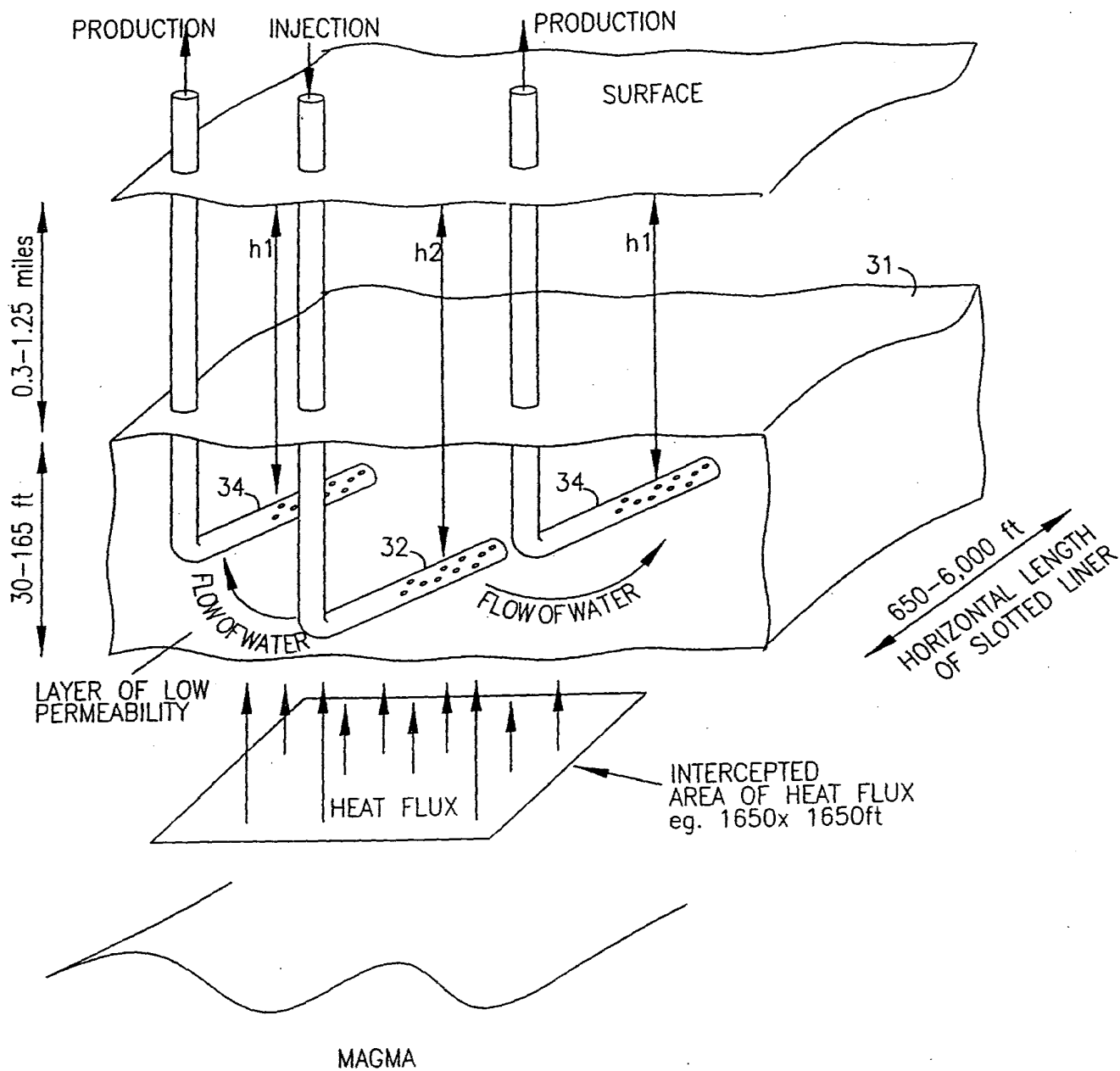


FIG.3A



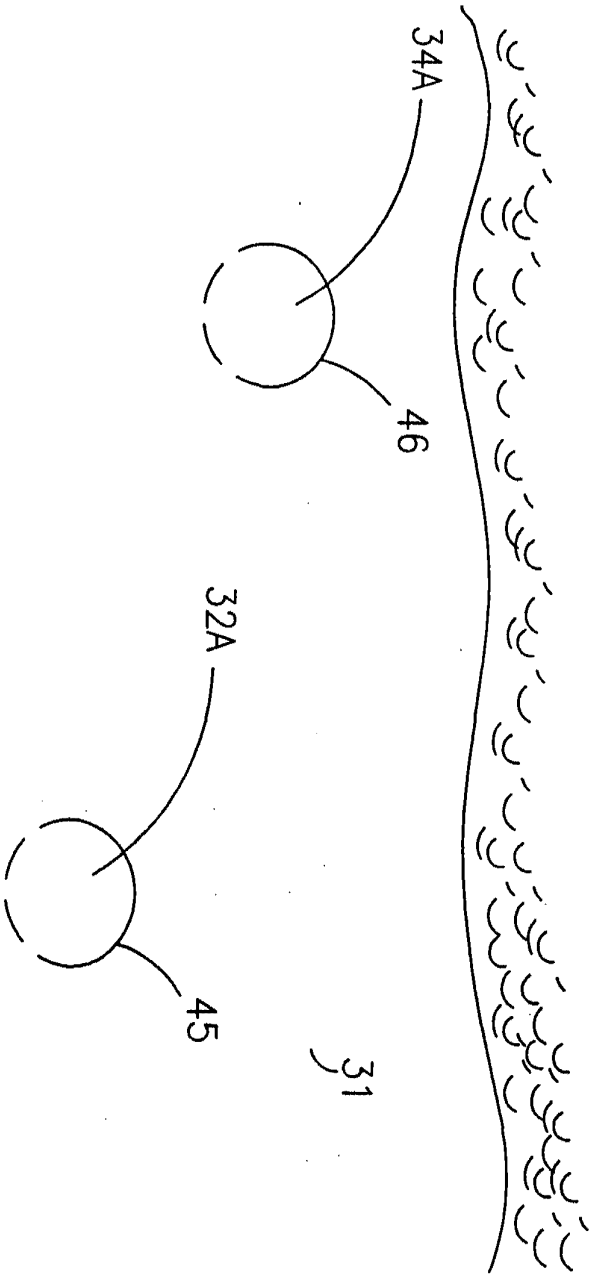


FIG. 5

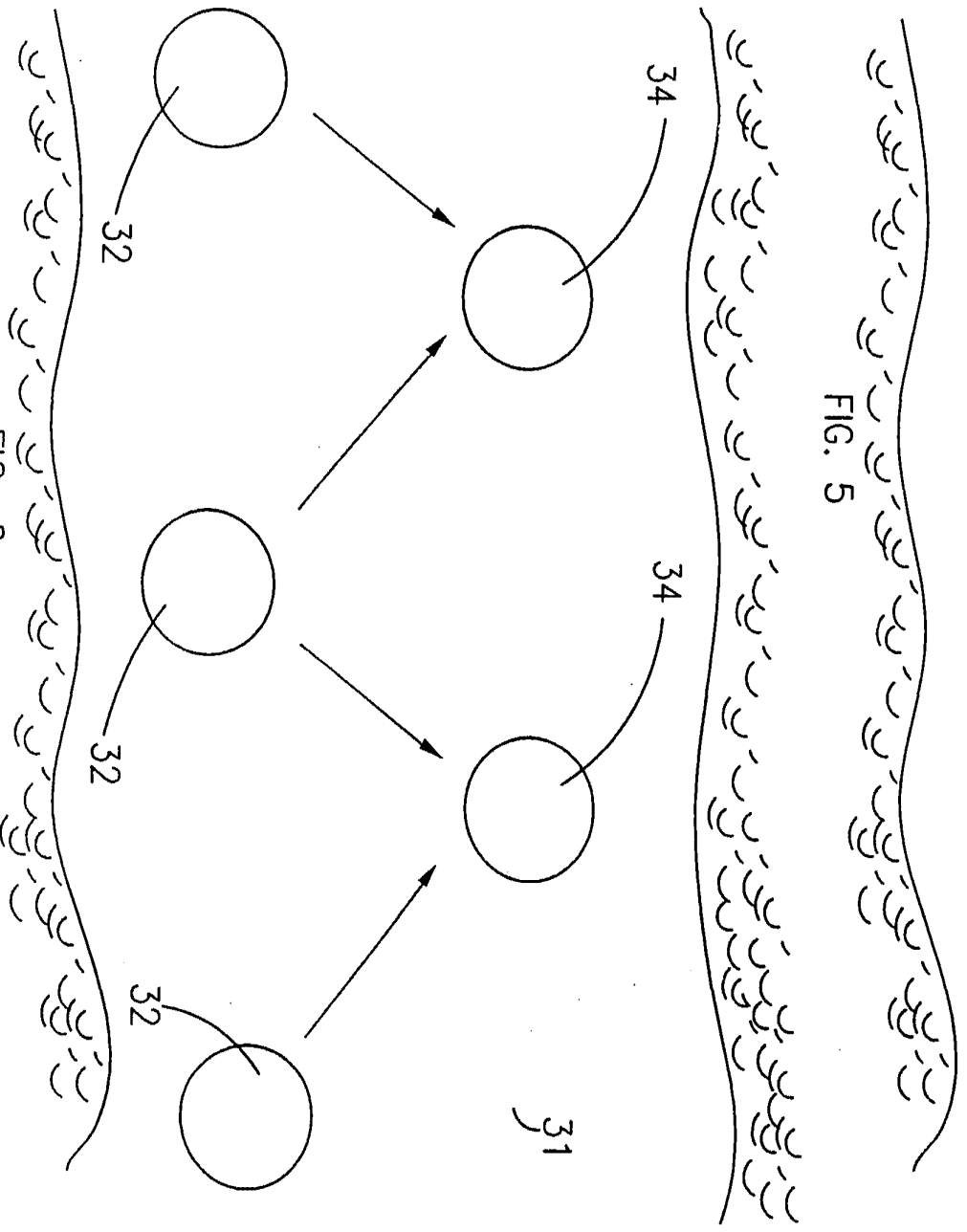


FIG. 6

BEST AVAILABLE COPY

FIG 7
HORIZONTAL WELL, GEOTHERMAL HEAT MINING MODEL
FORECAST PRODUCTION FLOW RATE

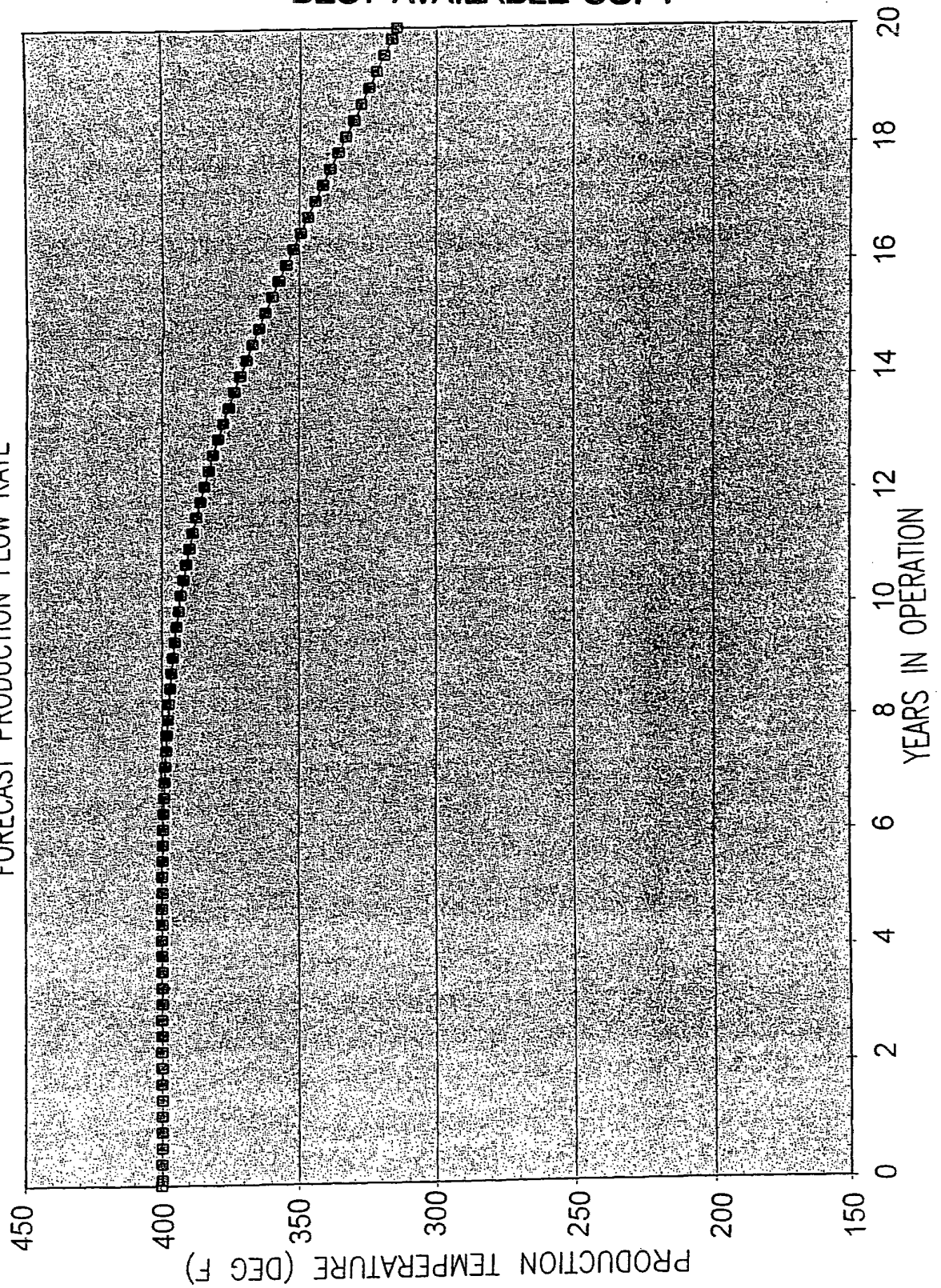
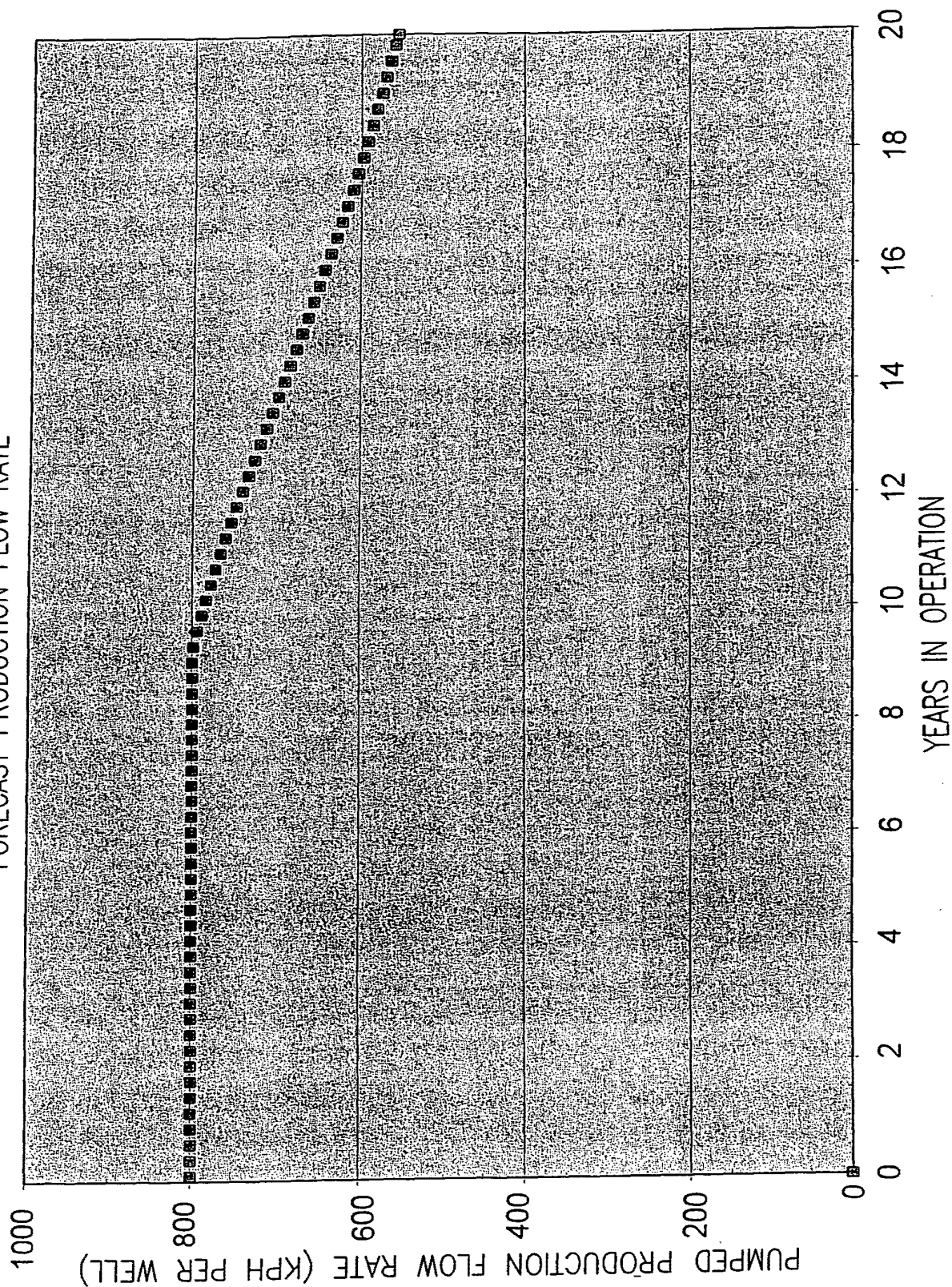


FIG 8
HORIZONTAL WELL, GEOTHERMAL HEAT MINING MODEL
FORECAST PRODUCTION FLOW RATE



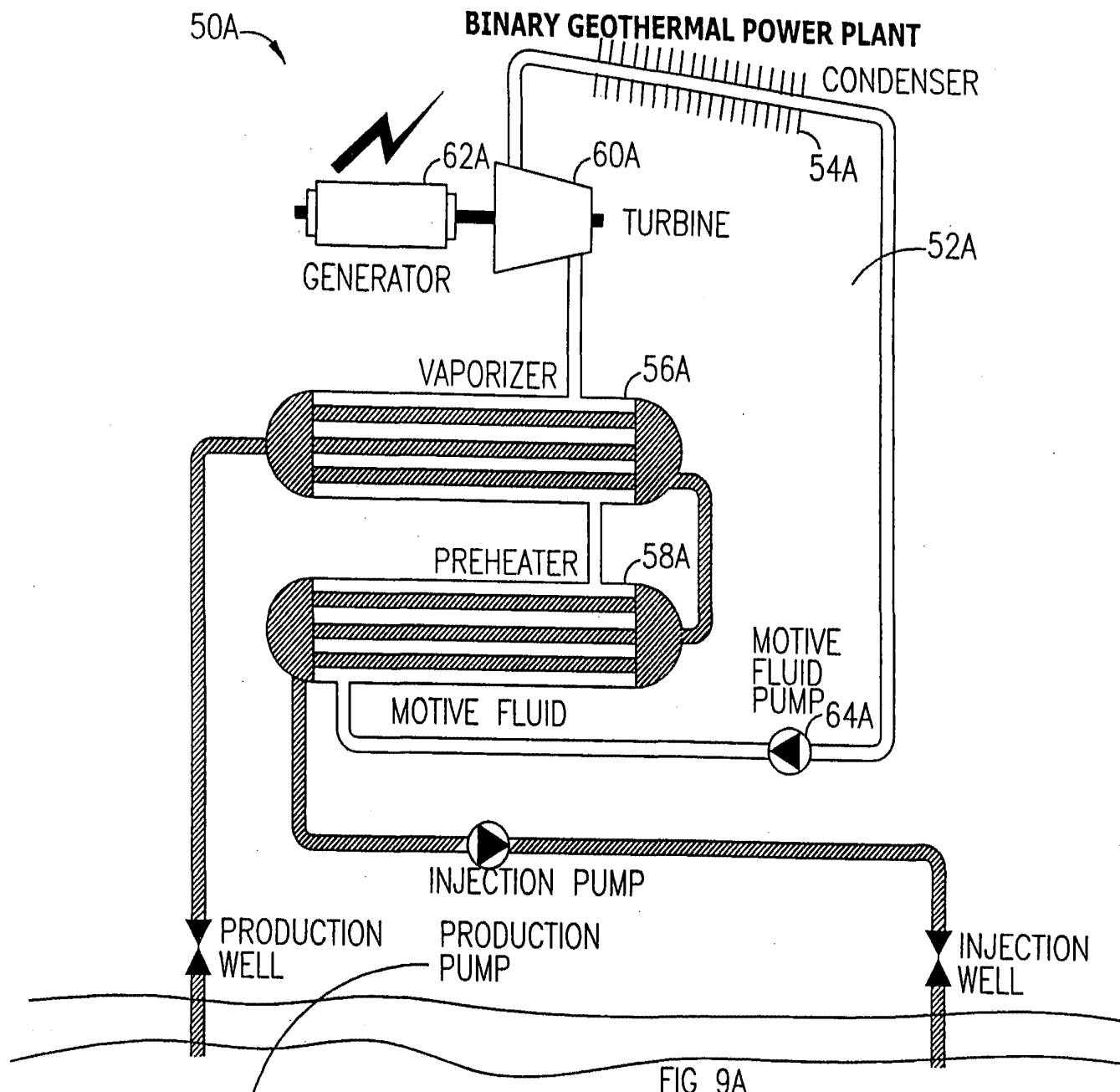


FIG 9A

TWO LEVEL BRINE BINARY GEOTHERMAL POWER PLANT

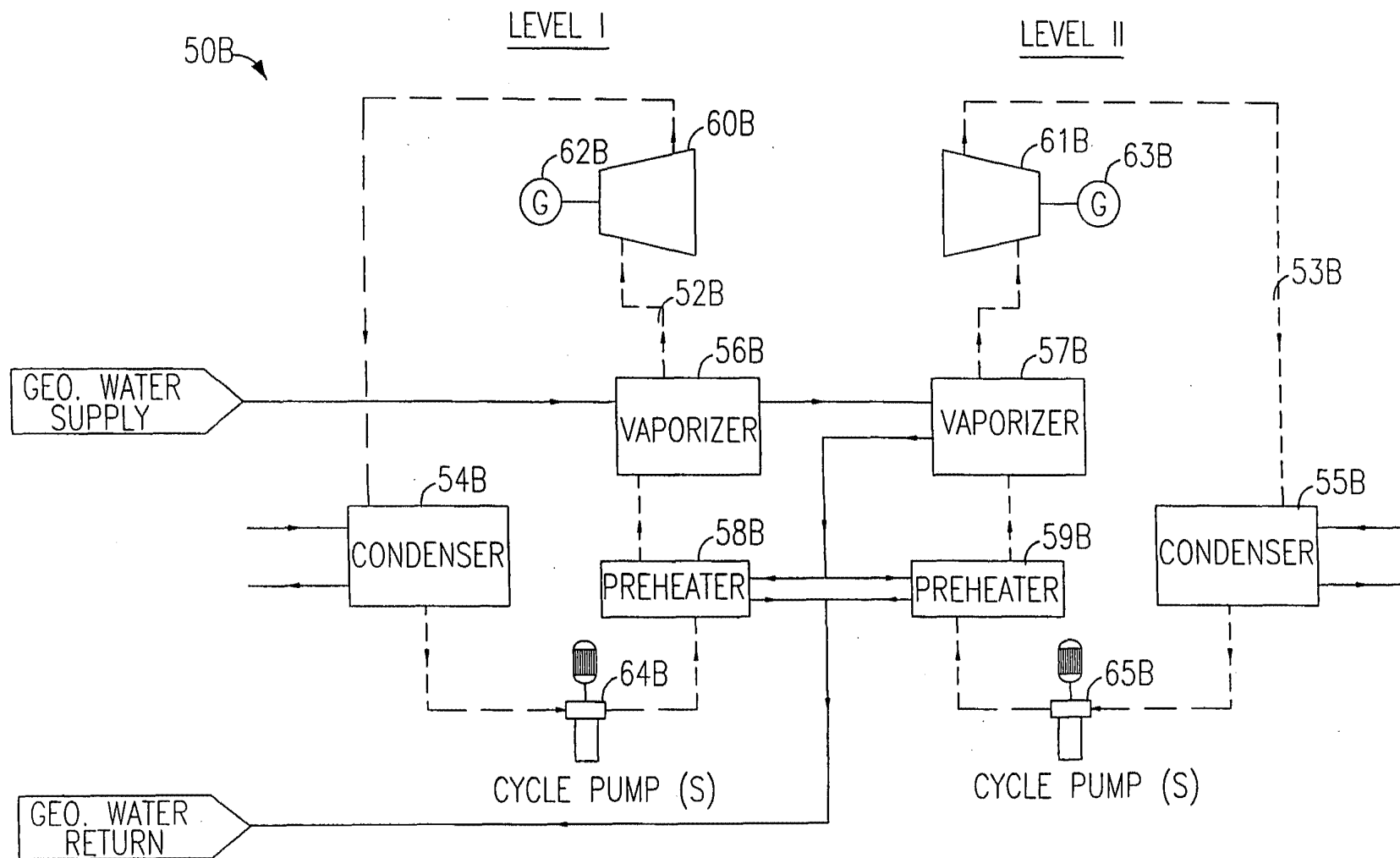


FIG 9B

**TWO LEVEL BRINE BINARY GEOTHERMAL POWER POINT
SPLIT BODY TURBINES
(HIGH PRESSURE AND LOW PRESSURE)**

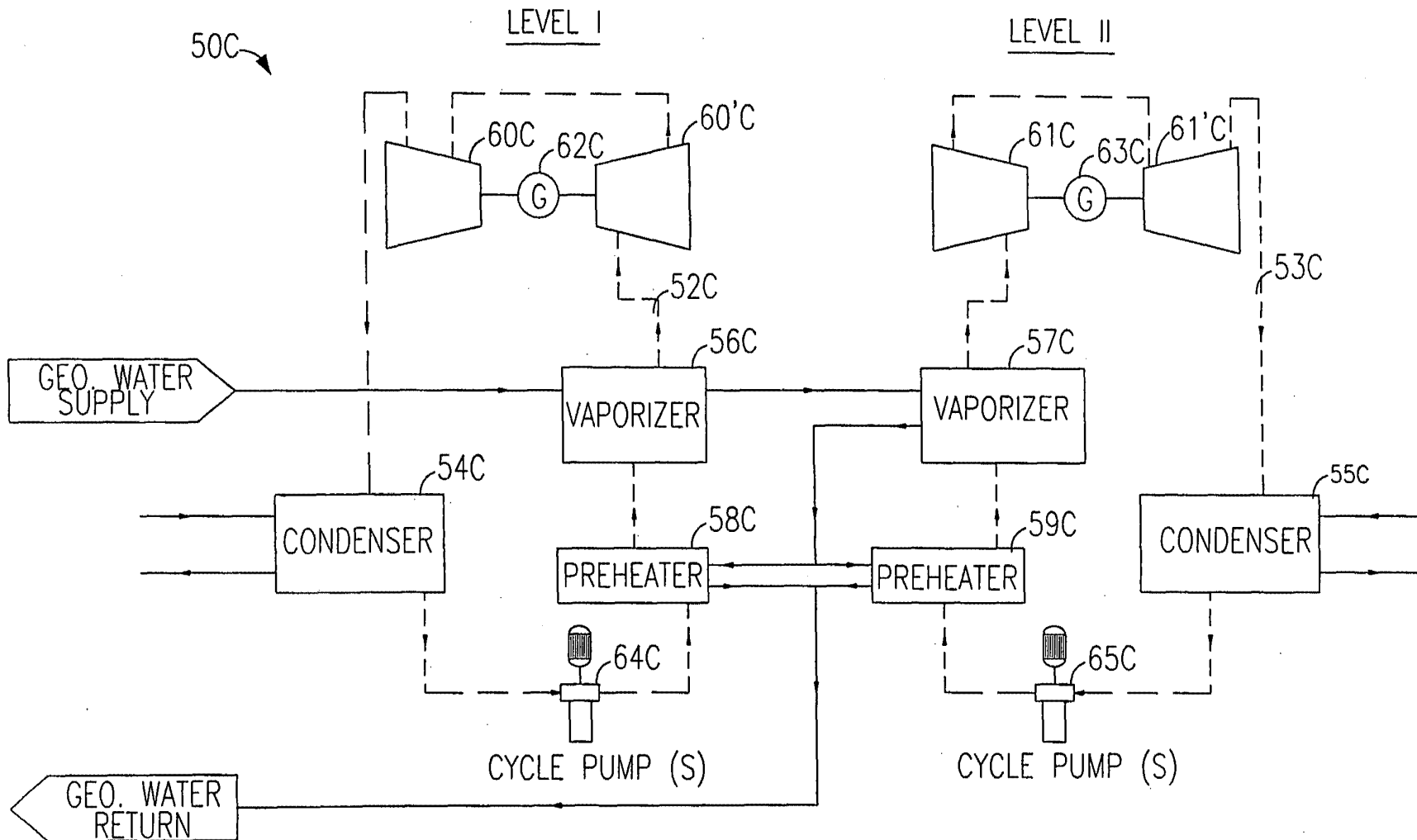
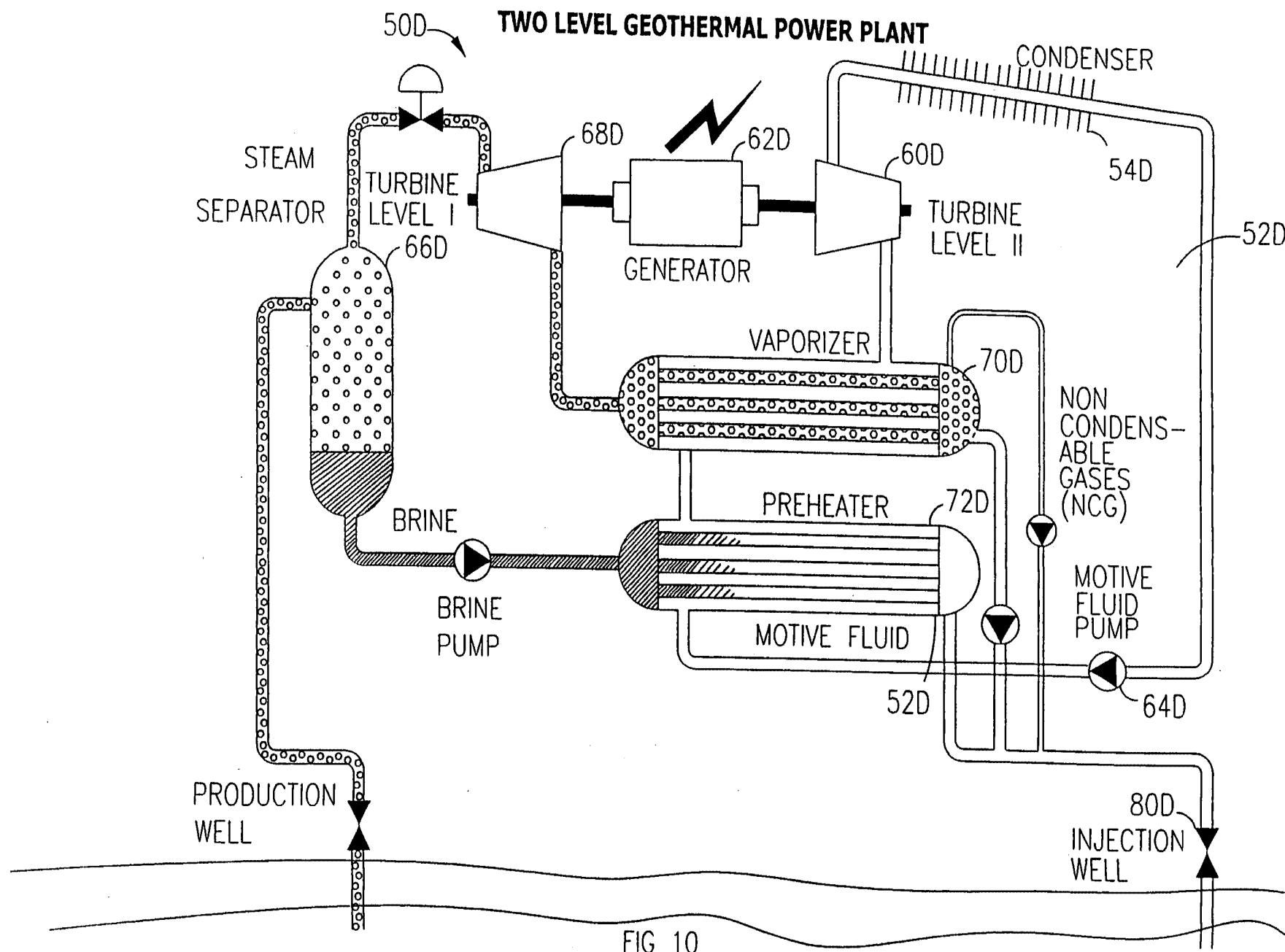


FIG 9C



Docket No. 256868US30



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF: Lucien Y. BRONICKI

SERIAL NUMBER: 10/910,613

ATTN: APPLICATION BRANCH

FILING DATE: August 4, 2004

FOR: METHOD AND APPARATUS FOR USING GEOTHERMAL ENERGY FOR THE
PRODUCTION OF POWER

FILING OF SUPPLEMENTAL APPLICATION DATA SHEET

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

The attached Supplemental Application Data Sheet is submitted herewith to correct the name
and the addresses of the inventor.

Respectfully Submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

Robert T. Pous

Registration No. 29,099

Joseph Scafetta, Jr.

Registration No. 26,803

Customer Number

22850

Tel. (703) 413-3000
Fax. (703) 413-2220
(OSMMN 05/03)



SUPPLEMENTAL APPLICATION DATA SHEET

APPLICATION INFORMATION

Application Number:: 10/910,613
Application Date:: 08/04/04
Application Type:: REGULAR
Subject Matter:: UTILITY
CD-ROM or CD-R?: NONE
Title:: METHOD AND APPARATUS FOR
USING GEOTHERMAL ENERGY FOR
THE PRODUCTION OF POWER

Attorney Docket Number:: 256868US30
Total Drawing Sheets:: 11

INVENTOR INFORMATION

Applicant Authority Type:: INVENTOR
Primary Citizenship Country:: Israel
Status:: FULL CAPACITY
Given Name:: Lucien
Middle Name:: Y.
Family Name:: BRONICKI
City of Residence:: Yavne
Country of Residence:: Israel
Street of Mailing Address:: 5 Brosh Street
City of Mailing Address:: Yavne
Country of Mailing Address:: Israel

CORRESPONDENCE INFORMATION

Correspondence Customer Number:: 22850

REPRESENTATIVE INFORMATION

Representative Customer Number:: 22850

DOMESTIC PRIORITY INFORMATION

FOREIGN PRIORITY INFORMATION

ASSIGNMENT INFORMATION



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
 United States Patent and Trademark Office
 Address: COMMISSIONER FOR PATENTS
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 Alexandria, Virginia 22313-1450
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APPLICATION NUMBER	FILING OR 371 (c) DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NUMBER
10/910,613	08/04/2004	Lucean Y. Bronichi	256868US30

22850
 OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C.
 1940 DUKE STREET
 ALEXANDRIA, VA 22314

CONFIRMATION NO. 6916

FORMALITIES LETTER



OC000000013979490

Date Mailed: 10/01/2004

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

*Filing Date Granted***Items Required To Avoid Abandonment:**

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The oath or declaration is missing.
A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.

The application is informal since it does not comply with the regulations for the reason(s) indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- Replacement drawings in compliance with 37 CFR 1.84 and 37 CFR 1.121 are required. The drawings submitted are not acceptable because:
 - The drawings must be reasonably free from erasures and must be free from alterations, overwriting, interlineations, folds, and copy marks. See Figure(s) 1 - 3, 3A, 4, 5 - 8, 9A - 9C, 10.
 - The drawings have a line quality that is too light to be reproduced (weight of all lines and letters must be heavy enough to permit adequate reproduction) or text that is illegible (reference characters, sheet numbers, and view numbers must be plain and legible) see 37 CFR 1.84(l) and (p)(1)); See Figure(s) 3A.
 - The drawings submitted to the Office are not electronically reproducible. Drawing sheets must be submitted on paper, which is flexible, strong, white, smooth, non-shiny, and durable (see 37 CFR 1.84(e)). See Figure(s) 9A, unreadable.

Replies should be mailed to: Mail Stop Missing Parts

Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

A copy of this notice MUST be returned with the reply.

T. S. Gervin

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Initial Patent Examination Division (703) 308-1202

PART 3 - OFFICE COPY

22581

US PTO

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

Attorney Docket No. 256868US30

First Inventor or Application Identifier Lucean Y. Bronichi

Title METHOD AND APPARATUS FOR USING GEOTHERMAL ENERGY FOR THE PRODUCTION OF POWER

22581 U.S. PTO
10/910613**APPLICATION ELEMENTS***See MPEP chapter 600 concerning utility patent application contents***ADDRESS TO:**Commissioner for Patents
Mail Stop Patent Application
Alexandria, Virginia 22313

- 1.
- ☒
- Fee Transmittal Form (e.g. PTO/SB/17)
-
- (Submit an original and a duplicate for fee processing)

- 2.
- ☒
- Specification Total Sheets
-

- 3.
- ☒
- Formal Drawing(s) (35 U.S.C. 113) Total Sheets
-

- 4.
- ☐
- Oath or Declaration Total Pages
-

a. ☐ Newly executed (original or copy)b. ☐ Copy from a prior application (37 C.F.R. §1.63(d))
(for continuation/divisional with box 18 completed)i. ☐ 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.
- ☐
- CD-ROM or CD-R in duplicate, large table or Computer
-
- Program (Appendix)

- 6.
- ☐
- Nucleotide and/or Amino Acid Sequence Submission
-
- (if applicable, all necessary)

a. ☐ Computer Readable Form (CRF)

b. Specification or Sequence Listing on:

i. ☐ CD-ROM or CD-R (2 copies); orii. ☐ Paperc. ☐ Statements verifying identity of above copies**ACCOMPANYING APPLICATION PARTS**

- 7.
- ☐
- Assignment Papers (cover sheet & document(s))

- 8.
- ☒
- Application Data Sheet. See 37 CFR 1.76

- 9.
- ☐
- 37 C.F.R. §3.73(b) Statement
- ☐
- Power of
-
- (when there is an assignee) Attorney

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

- 11.
- ☐
- Information Disclosure Statement (IDS)/PTO-1449
- ☐
- Copies of IDS
-
- Citations

- 12.
- ☐
- Preliminary Amendment

- 13.
- ☒
- White Advance Serial No. Postcard

- 14.
- ☐
- Certified Copy of Priority Document(s)
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- (if foreign priority is claimed)

- 15.
- ☐
- Applicant claims small entity status.
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- See 37 CFR 1.27

- 16.
- ☐
- Nonpublication Request under
-
- 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form
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- PTO/SB/35 or its equivalent.

- 17.
- ☐
- Other:

18. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below:

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of prior application no.:

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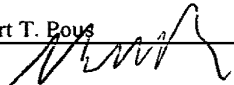
For CONTINUATION OR DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 4b, is considered a part of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.**19. CORRESPONDENCE ADDRESS**

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U.S. 170

Docket No. 256868US30

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

INVENTOR(S) Lucean Y. Bronichi

SERIAL NO: New Application

FILING DATE: Herewith

FOR: METHOD AND APPARATUS FOR USING GEOTHERMAL ENERGY FOR THE PRODUCTION OF POWER

FEE TRANSMITTAL

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

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TOTAL CLAIMS	35 - 20 =	15	x \$18 =	\$270.00
INDEPENDENT CLAIMS	3 - 3 =	0	x \$86 =	\$0.00
☐ MULTIPLE DEPENDENT CLAIMS (If applicable)			+ \$290 =	\$0.00
☒ LATE FILING OF DECLARATION			+ \$130 =	\$130.00
BASIC FEE				\$770.00
TOTAL OF ABOVE CALCULATIONS				\$1,170.00
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Respectfully Submitted,

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METHOD AND APPARATUS FOR USING GEOTHERMAL ENERGY FOR THE PRODUCTION OF POWER

Field of the Invention

The present invention relates to method and apparatus for the use of geothermal energy for the production of power, more specifically to method and apparatus for enhancing the flow of geothermal fluid from an injection well to a production well(or wells), from which it is conveyed to a power plant or to a heat exchanger in order to use its heat to produce power or for other purposes. This applies for both configurations of such a flow: the "classical" water dominated reservoir, the Enhanced Geothermal System (EGS) as well as the Hot Dry Rock (HDR) or Hot Fractured Rock (HFR) artificially stimulated reservoir.

Background of the Invention

Geothermal energy recovery systems, which apply geothermal energy to the production of power, are the object of a considerable amount of attention in the prior art (DiPippo, R. et al., Brown University, U.S.A., DOE, March 1980). While commercial production of geothermal fluids (e.g. for power production) out of a "classical" steam or water dominated reservoirs is pretty well at hand, such production from Hot Dry Rock (HDR) (or Hot Fractured Rock (HFR)) or even from reservoirs with low permeability or insufficient water recharge by Enhanced (or Engineered) Geothermal Systems (EGS) is essentially in the research and development stage, due to many problems in their actual industrial application, including difficulties in sustaining circulation of fluids at a high

enough rate at reasonable pressure and losses to the surroundings. Nevertheless, research and development of such systems are being pursued intensively since a large amount of energy is available in such low permeability, semi-dry or dry geothermal reservoirs (Jacquot, 1998).

In the prior art, geothermal energy recovery systems typically comprise production as well as injection wells, which are connected by a permeable geological layer or fractures. Re-injection of spent geothermal fluids has been stated as beneficial for management of geothermal resources (Sigurosson et al., Florence 1995, pp. 1967). Geothermal wells (production and injection) are built drilled vertically or at an angle slightly deviated from the vertical.

When using a vertical geothermal well for producing, viz. extracting, geothermal fluid from the underground, different geological layers having various levels of permeability are traversed. The production location in said vertical geothermal wells are made at the depth where the temperature is sufficiently high and optimum extraction of the geothermal fluid (water, steam or water and steam mixture) has been established using the slotted liner or open hole [Katagiri, 1970]. The produced fluid is typically a mixture of water and steam, and in the type of plants that is most common in the present art, the so-called "steam" plants, the fluid has a temperature higher than about 360° F. The steam is produced by flashing in the reservoir or in a surface flash tank. The wells may be artesian wells, i.e. self-flowing wells wherein the pressure at the bottom opening exceeds the accompanying hydrostatic pressure of the overlying fluid column in

the well pipe or wherein there is a phase change within the well, and consequently geothermal fluid flows out at the wellhead. In the case of water dominated resources, a pump may be used to promote its flow to the surface in the absence of artesian action, or to increase the flow rate above that due to artesian action, or in order to suppress flashing within the well bore (DiPippo, R. et al., Brown University, U.S.A., DOE, March 1980 pp. 172-210).

On the other hand, re-injection wells are used to do away with spent fluids at the geothermal power plants like separated brine at the well heads (geothermal water being also called "brine" because of its mineral content), or blow-down from a cooling tower associated with a water-cooled condenser of a geothermal power plant. This is in addition to the natural replenishment of the geothermal resource mostly by meteoric water (e.g. from a rain source).

In the case of air-cooled binary power plants, viz. plants in which the extracted geothermal fluid does not directly generate power but transfers most of its heat to a working fluid (generally organic), essentially all of the geothermal liquid is re-injected into re-injection wells thus avoiding the depletion of the aquifer. The heat of the geothermal fluid, or a substantial part of it, is recovered by heat exchange with a working fluid, which is used in the production of energy in ways and by apparatus known in the art (see e.g. US Patent 5,598,706). The depleted geothermal fluid, viz. the geothermal fluid from which heat has been extracted,

and which is still hot or at least warm, is preferably recycled as injection water into an injection well also connected to the permeable layer (see Fig. 1).

A prior art set-up by which geothermal fluid is extracted and re-injected is schematically illustrated in Fig. 1. Numeral 10 designates the ground level. Numeral 11 designates an injection well, vertical in this example, sometimes provided with an injection pump 12 by means of which water is injected into the well. Numeral 18 designates a permeable layer which is crossed by the injection well 11. The injection well is perforated at 14 to discharge the injected water into geothermal reservoir 13. The arrows 15 symbolically indicate the flow of geothermal fluid to a production well 16, from which the geothermal fluid exits as symbolically indicated by arrow 17. Alternatively, the above-mentioned wells can slightly deviate from the vertical, its location and orientation being determined by a natural fault or fractures (Albright and Dreesen, 1998).

Other geothermal energy resources are offered by the Xerolithic systems. (See for instance Nunz, 1993). In such resources the underlying rock does not spontaneously produce fluids at an adequate rate and at a useful temperature and it is necessary to artificially create or increase the permeability of the rock and to introduce therein heat transfer fluids. Such systems are called Hot Dry Rock (HDR) or Hot Fractured Rocks (HFR). Rather than exploiting geothermal resources which contain heat mainly in the rocks or contain relatively small amounts of geothermal fluid, and have low permeability, techniques were developed to induce fractures between the production and injection wells to allow

larger contact area between the hot rocks and the geothermal fluid while reducing the resistance to flow (Salazar and Brown, 1995). Fig. 2 schematically illustrates such a prior art set-up. The ground is indicated once again at 10, an injection well is indicated at 21 and is provided with a pump 22. Artificial fractures 28 have been created in the ground and connect injection well 21 with two production wells 24. The wells are perforated as at 25 in correspondence to fracture 23.

In such prior art Hot Dry Rock (HDR)/Hot Fractured Rocks (HFR) set-ups the production of geothermal fluids is limited by the permeability of the layers and by their thickness, and in case of fractures by the width of the fractures. The injection pumps require energy to be operated and the amount of energy consumed depends on the permeability of the layer between the injection and the production wells, and in some cases becomes a prohibitive fraction of the energy produced. Other problems are created by the large losses of injected fluid and by the difficulty of producing fractures in the desired direction. Mainly for these reasons the results of the prior art Hot Dry Rock (HDR)/HFR have been disappointing, to the extent that no power plant exploiting them has been built so far, and their only use today is for limited experimental heat extraction.

It is apparent, in the inventor's opinion that the critical stage in the exploitation of low permeability/low water content reservoirs is the flow of geothermal fluid from injection wells to production wells. This invention particularly intends to improve said flow while reducing fluid losses and thereby the whole technology of

the use of geothermal fluid for the production of energy in such reservoirs otherwise useless.

It is therefore a purpose of this invention to overcome, at least substantially, the drawbacks of the prior art in the stage of producing hot geothermal fluid from such geological formations.

It is another purpose of this invention to provide a new and improved method and apparatus for permitting to use the heat of geothermal fluids for the production of energy.

It is a further purpose of this invention to enhance the efficient flow of geothermal fluids from injection wells to production wells.

It is a still further purpose of this invention to apply the technology of generating horizontal wells for improving the flow of geothermal fluids from injection wells to production wells.

Other purposes and advantages of the invention will appear as the description proceeds.

Summary of the invention

The method of the invention comprises enhancing the flow of geothermal fluid (water and/or steam and/or mixtures thereof) from at least one injection well to at least one production well, by the following steps:

- a. Providing a first, horizontal, geothermal well, which is used as said injection well;
- b. Injecting water into said injection well;
- c. Providing a second, horizontal, geothermal well, which is used as said production well such that said second, horizontal, production, geothermal well is substantially horizontally and vertically spaced from said first, horizontal, injection, geothermal well and located at a shallower depth than said first, horizontal, injection, geothermal well;
- d. Recovering geothermal fluid from said production well; and
- e. Generating a water density difference and a pressure difference between said first horizontal, injection well and said second horizontal, production well.

Furthermore, the invention comprises an apparatus for enhancing the flow of geothermal fluid (water and/or steam and/or mixtures thereof) from at least one injection well to at least one production well, which comprises:

- I. A first horizontal geothermal well, which is used as said injection well and into which water is injected;
- II. A second horizontal, geothermal well, which is used as said production well and from which geothermal fluid issues, wherein said second,

horizontal, production, geothermal well is substantially horizontally and vertically spaced from said first, horizontal, injection, geothermal well and located at a shallower depth than said first, horizontal, injection, geothermal well; and

- III. Means for producing a pressure difference between said first horizontal, injection well and said second horizontal, production well and utilizing the water density difference induced by the temperature difference.

Preferably, binary geothermal power plants or combined cycle geothermal power plants can be used to produce power from geothermal fluid recovered from the production well.

The said first horizontal well can also be called "horizontal injection well", and the said second horizontal well can also be called "horizontal production well".

Said first horizontal, deeper, injection well has an inlet, into which injected water enters and thereafter flows out into the geological layer in which the well has been drilled and said second horizontal, shallower, production well has an open outlet, whereby the heated geothermal fluid exits because of the aforesaid pressure difference and buoyancy.

An outline of geothermal drilling is presented in DiPippo, R. et al., Brown University, U.S.A., DOE March 1980, Chapter 2 Section 2.4 of, pp. 136-

155.Altseimer, 1975). Many of the techniques are derived from oil and gas industry.

In a technique used today in the heavy oil industry, called Steam Assisted Gravity Drainage (SAGD), two horizontal well are drilled parallel to each other in a bitumen layer found 300-600ft underground. Steam is injected into the bitumen deposit from the upper well where it condenses and heats the oil. The oil then moves gradually into the lower well where it is collected and delivered to the surface under the pressure produced in the reservoir by the injected steam.

"Cluster" drilling (of two or more directional wells originating from a single initial well) has been described as a productivity enhancer for geothermal applications (D.W. Daering, Jan. 1980).

The proposed horizontal wells of the present invention will be drilled by applying a technology which has been developed by the oil and gas industry.

By providing the horizontal production well at a shallower depth level than the horizontal injection well, in accordance with the present invention, the horizontal production well collects water that has flown out of the deeper horizontal injection well. Water flowing out of said horizontal injection well is heated by earth near this well and thus gains heat. This heated water is thus now hotter than water still present in the horizontal injection well and therefore

gains a lower density achieving what may be termed "buoyancy". The pressure has an inherent, static component, due to the said difference of level or depth, and a controllable dynamic component, due to the pressure of the pump that drives the water into said horizontal injection well. Furthermore, a pump associated the horizontal production well maintains a water pressure in the shallower horizontal production well at a value lower than the pressure in the deeper horizontal injection well. Consequently, the heated water will preferably flow upwards in a generally vertical direction towards the horizontal production well rather than in another direction and thereby reducing water losses.

The invention preferably comprises providing the aforesaid horizontal wells by drilling along a geological layer rather than crossing it. This permits to increase the area of heat transfer from the ground to the geothermal fluid and to increase the flow at the cross-section between the horizontal injection and horizontal production wells, both factors leading to an increase of the efficiency of the exploitation of the geothermal energy. In the case of artificial fracturing of the layer, cracks being mostly vertical (Gringarten et al. 1975), will be intersected by the proposed horizontal wells, which further will enhance the productivity at the shallower well upwards.

The pressure and density differences, that are generated according to the invention between the deeper (injection) horizontal, geothermal well and the shallower (production) horizontal, geothermal well, cause the flow of geothermal fluid between them. In such a manner, the water exiting the horizontal injection

well (or wells) while becoming less dense as it crosses the above-mentioned existing or artificially created fractured layer is also heated on its way to the horizontal production well. In the case of a semi-permeable layer, this configuration augments the contact area of the injected fluid with the layer separating the above-mentioned wells, and thus partially compensates for the relatively low permeability.

Brief Description of the drawings

A description of the present inventive subject matter including embodiments thereof is presented and with reference to the accompanying drawings, the description not meaning to be considered limiting in any manner, wherein:

Figs. 1 and 2 schematically illustrate two examples of the prior art.

Fig. 3 is a schematic vertical cross section of the ground, illustrating an embodiment of the apparatus of the invention;

Fig. 3A is a further schematic view of the ground, also illustrating an embodiment of the apparatus of the invention;

Fig. 4 is a schematic illustration of the flow lines of water and geothermal fluid in an embodiment of the invention;

Fig. 5 is a schematic cross section of the injection and production wells, showing the perforations therein according to an embodiment of the invention;

Fig. 6 is a schematic illustration or cross-section of another embodiment of the invention;

Figs. 7 and 8 show predictions of the temperature and production flow rate using a mathematical model of two wells 6.5 MW of Net electrical power; and Figs. 9A, 9B, 9C and 10, show further embodiments of the present invention including different power plant configurations.

Similar reference numerals and designations in the various Figs. refer to like elements.

Detailed Description of Preferred Embodiments

In the embodiment of Fig. 8, considered at present the best mode for carrying out the present invention, numeral 30 indicates the ground. Numeral 31 indicates a geological layer that is suitable for the drilling of horizontal wells. Numeral 32 indicates a first (injection) horizontal, geothermal well connected to an injection connection means 33. Numeral 34 indicates a second (production) horizontal, geothermal well connected to production connection means 35. The said two horizontal wells are located in a suitable geological layer 31, first (injection) horizontal, geothermal well 32 being located at a deeper level than shallower, second (production) horizontal, geothermal well 34. The suitability of geological layer 31 for such operations and the relative position of said horizontal, geothermal wells are determined by carrying out geophysical surveys and drilling e.g. narrow "slim holes" in said geological layer. Actual core samples or geological cuttings produced from said geological layer 31 are used to complement the findings of the geophysical surveys. The apparatus further includes deep water pump 36 located at the bottom of production connection

means 35 adjacent to horizontal production well 34 for extracting hot water from second (production) horizontal, geothermal well 34 and conveying it to a heat consumer. At the heat consumer heat is extracted thereby producing heat-depleted hot water. The heat consumer is particularly a power plant, but other heat consumers are not excluded. Moreover, the apparatus of Fig. 8 also includes water injection pump 37 for supplying the heat-depleted hot water to first (injection) horizontal, geothermal well 32 via injection connection means 33. Furthermore, the apparatus of this embodiment of the invention preferably includes observation and instrumentation well 38 for observing temperatures and pressures of the geothermal water. In a non-limiting example, the length of both horizontal, geothermal wells 32 and 34 is preferably up to 1 mile within geological layer 31. On the other hand, the vertical distance between first (injection) horizontal, geothermal well 32 and second (production) horizontal, geothermal well 34 depends on the structure of the geological layer 31 and on the vertical temperature profile within the geological layer. The two wells are offset horizontally up to 300 ft so that the intersected layer is sufficiently large to enable "harvesting" of a sufficient amount in heat. Usually, however, the vertical distance between the two horizontal wells will be about two orders of magnitude lower than the horizontal length of the geological layer or wells mentioned above. In such a manner, the horizontal extent of geological layer can be exploited wherein the horizontal distance between the injection, deeper horizontal wells and the production, shallower horizontal well can be made large enough even though the vertical distance between the horizontal injection and horizontal production wells is relatively small.

In accordance with the present invention, the water and make-up water used can be supplied from an external source. Alternatively, part of the water circulating comes from the reservoir while only the make-up water is from an external source.

A further view of an embodiment of the present invention is shown in Fig. 3A wherein non-limiting examples of dimensions of the horizontal wells 32 and 34 as well as of the dimensions of geological layer 31 and of the depth of geological layer 31 of the ground surface are given. In addition, a non-limiting example of dimensions of the intercepted area of the geothermal heat flux for the present invention is also shown.

In Fig. 4, to which reference is now made, flow lines 40 are shown to illustrate the general flow path of the geothermal water in the earth of geological layer 31 from first, deeper (injection) horizontal, geothermal well 32 to second, shallower (production) horizontal, geothermal well 34. p_1 designates the hydrostatic pressure of geothermal water present in horizontal (injection), geothermal well 32 at a depth h_1 from ground surface 41, while t_1 designates the temperature of this geothermal water in this injection well. On the other hand, p_2 designates the hydrostatic pressure of geothermal water present in second (production) horizontal, geothermal well 34 at a depth h_2 from ground surface 41, while t_2 designates the temperature of this geothermal water. Water in first (injection) horizontal well 32 is pressurized by injection pump 37 as well as hydrostatic

pressure head p_1 , while deep well pump 86 is used to produce a lower pressure in second (production) horizontal well 34. The heat difference in geothermal geological layer 31, whereby the water flowing out of the first (injection) horizontal well 82 into the hot earth in the vicinity of the injection well present in the existing or artificially created by fracture permeable layer in the geological layer causes this water to be heated and therefore have a lower density than the water flowing in the first (injection) horizontal well 82, assists in raising the water from the first injection horizontal well to the second production horizontal well. Consequently, in Fig. 4 ($p_1 - p_2$) represents the hydrostatic pressure difference between the first (injection) horizontal, geothermal well 82 and the second (production) horizontal, geothermal well 84 over the depth difference ($h_2 - h_1$), while ($t_2 - t_1$) represents the temperature difference between said first (injection) horizontal, geothermal well 32 and said second (production) horizontal, geothermal well 34 over the depth difference ($h_2 - h_1$). The pressure difference is increased by pressurizing the deeper injection well by means of pump 87 (see Fig. 3), above the hydrostatic pressure existing in the layer 81 at the depth of horizontal injection well 32 and reducing the pressure in the production well below the hydrostatic pressure existing in the layer 81 at the depth of shallower horizontal production well 34 by means of pump 36 (see Fig. 3). A density difference favorable for the "buoyancy" is achieved by situating the second (production) horizontal, geothermal well 34 above and the first (injection) horizontal, geothermal well 32.

In Fig. 5 a further embodiment of the present invention is shown, wherein perforated pipes are used in first (injection), deeper horizontal well 82 and second (production), shallower horizontal well 84 in order to increase the flow path from the first of said wells to the second. Preferably, as shown, perforated, first (injection), deeper horizontal pipe 82A has perforations 45 on the lower side only. As far as second (production), perforated, shallower horizontal pipe 34A is concerned, perforations 46 are also present on its lower side. In addition, by positioning the perforations as previously described, clogging of the perforations is reduced or substantially avoided.

In accordance with embodiments of the present invention, and as shown in Fig. 6 a number of horizontal wells 84 (only two are shown in Fig. 6, but this involves no limitation) can be positioned in layer 31. Furthermore, several first (injection) horizontal wells can be used for one second (production) horizontal well. In such a manner, the horizontal extent of geological layer can be further exploited wherein the horizontal distance between the injection, deeper horizontal wells and the production, shallower horizontal well can be made large enough even though the vertical distance between the horizontal injection and horizontal production wells is relatively small. In a non-limiting example, the horizontal distance between the injection, deeper horizontal wells and the production, shallower horizontal well can be approximately 1000 to 2000 ft while the vertical distance between the horizontal injection and horizontal production wells is approximately 50 to 150 ft.

In this description, reference has always been made to the use of the geothermal heat for the production of energy, particularly electrical energy. It will be understood that said heat, or a part of it, may be used for other purposes, particularly may be used directly as such, and that the way in which it is used is not an important condition of the present invention.

An illustrative example is given below using a mathematical model of a low permeability geological layer which would be impossible to exploit by conventional methods. For simplicity only "heat mining" is considered by neglecting the heat flux from the magma.

Here a plot shows the output for the proposed horizontal well heat mining operation assuming a 500 foot thick homogenous reservoir with a transmissivity of 7500 millidarcy-feet (md-ft), initially 400°F, and an initial reservoir pressure of 1000 psia. The permeability in this model (7,500 millidarcy (md)) would yield a productivity index of approximately 0.7 kilopounds per hour/pounds per square inch (kph/psi) for a vertical well, and approximately 2.8 kph/psi for a horizontal well.

Transmissivity which is in essence the ability of a media to transmit a substance (water) from one location to another is calculated as Permeability multiplied by Thickness.

Permeability which is the media (i.e. rock, sand) parameter (similar to thermal conductivity) is noted as k and measured in Darcy.

The thickness h is measured in feet.

The injection temperature is 160 deg. F.

Vertical permeabilities and horizontal permeabilities are assumed equal. The production wells were placed in the upper 1/3 of the reservoir's thickness, and the injection wells were placed in the lower 1/3 of the reservoir's thickness. No "recharge" influx was allowed from any of the boundaries. This is probably similar to what would occur in the interior patterns. Edge wells may interact more with "recharge". No recharge in this modeling was assumed in order to look purely at a heat mining process. The horizontal wells were placed with 2000 foot horizontal sections into this 500 foot thick reservoir.

Injection wells and production wells are spaced 2000 feet apart in the horizontal direction. It was assumed that injection was equal to production. The maximum allowed drawdown for the production wells was set to 400 psi, and the maximum flow rate was set to 800 kph.

The simulation was run as described above. For the first 10 years, there is enough submergence at the production well to allow full pump capacity of 800 kph. However, because the injected fluid is cooler than the produced fluid, volume replacement is less than one (shrinkage), causing a steady decline in

reservoir pressure. After 10 years, the minimum allowable downhole pressure is reached in the production well, and flow rate needs to be gradually curtailed.

This shows that the use of horizontal wells could allow for enhanced well productivities for reservoirs containing low permeability. For a 500 foot thick homogeneous layer with 2000 foot well spacing, there appears to be enough heat in the rock to make such a heat mining operation possible (over a 20 year time frame).

800 kJ/h at 400 deg F will generate 7.5 MW net from the power plant (based exactly on a standard binary plant design) but we should deduct 1 MW for pressure losses, which are 1000 psi in the formation and probably 100 more in the wells and power plant, so 6.5 MW will then conservatively estimated power generated over 10 to 20 years (See Figs. 7 and 8).

Turning to Figs. 9A, 9B, 9C and 10, power plants are shown designated as 50A, 50B, 50C and 50D respectively showing the method of producing power using the apparatus of the present invention. As can be seen from the Figs., binary geothermal power plants in closed cycle power units 52A, 52B, 52C (split turbine: high pressure and low pressure), or in combined cycle power geothermal plants 52D are used in the power plants. In most cases, an organic fluid, such as pentane, or butane, etc., is considered for use as the working fluid in the binary power plants. However, if the temperature is high enough to have steam (flashed in the reservoir or a flash tank), water can be used as the working fluid in the

power plant so that a steam turbine will form the topping part of the power plant cycle while the organic turbine will form the bottoming part of the power plant cycle. Such a plant may be called a combined cycle or hybrid geothermal plant, designated 50D. Condensers 54A, 54B, 55B, 54C, 55C, and 54D are preferably air-cooled. In these binary power units heat is extracted from geothermal fluid in vaporizer 56A and pre-heater 58A so that the working fluid is heated and organic working fluid vapors are produced in the vaporizer that are supplied to organic vapor turbine 60A. Organic vapor turbine 60A is rotated by the expanding vapors and drives electric generator 62A for producing electric power. The expanded vapors exiting vapor turbine 60A are then supplied to condenser 54A where they are condensed and the condensate produced are supplied by cycle pump 64A via pre-heater 58A back to vaporizer 56A thus completing the organic Rankine cycle. Similar operation takes place in two level geothermal water or brine binary geothermal power plants 50B and 50C (see Figs. 9B and 9C) however in these two level geothermal water or brine binary geothermal power plants, hot geothermal fluid in the form of geothermal water or brine is supplied in series to vaporizers 56B, 57B and 56C and 57C, with the heat depleted geothermal fluid in the form of heat depleted geothermal water or brine exiting the vaporizers being supplied in parallel to pre-heaters 58B, 59B and 58C and 59C respectively. In US Patents 4,578,953, 4,700,543 and 5,581,073 similar power plants and methods for producing power are disclosed and the disclosures of these patents are hereby incorporated by reference. In combined cycle geothermal power plant 50D, hot geothermal fluid supplied from the production well is separated into geothermal steam and geothermal liquid, water or brine by separator 66D. The separated

geothermal steam is then supplied from separator 66D to steam turbine 68D where it expands and rotates the steam turbine so that electric generator 62D is driven by steam turbine 68D and produces electricity. The expanded steam exiting steam turbine 68D is supplied to vaporizer 70D where it condenses and vaporizes the organic working fluid. The vaporized organic working fluid is then supplied to organic vapor turbine 60D where it expands and the vapor turbine rotated thereby drives electric generator 62D for producing electric power. Expanded working fluid exiting vapor turbine 60D is supplied to condenser 54D, where it is condensed and the condensate produced is supplied by cycle pump 64D via pre-heater 72D back to vaporizer 70D thus completing the cycle. Heat contained in geothermal water or brine separated from geothermal fluid in separator 66D and supplied from separator 66D to pre-heater 72D pre-heats the liquid organic working fluid in the pre-heater and the pre-heated working fluid is supplied to vaporizer 70D. Thereafter, heat depleted water or brine is supplied from pre-heater 72D to injection well 80D together with steam condensate exiting vaporizer 70D and non-condensable gases also exiting the vaporizer.

The advantages and improved results furnished by the method and apparatus of the present invention are apparent from the foregoing description of preferred embodiments of the invention. Various changes and modifications may be made without departing from the spirit of the invention and without exceeding the scope of the claims.

CLAIMS

1. Method for recovering geothermal heat, which comprises enhancing the flow of geothermal fluid from at least one injection well to at least one production well, by the following steps:
 - a. Providing a first, horizontal, geothermal well, which is used as said injection well;
 - b. Injecting water into said injection well;
 - c. Providing a second, horizontal, geothermal well, which is used as said production well, such that said second, horizontal, production, geothermal well is substantially horizontally and vertically spaced from said first, horizontal, injection, geothermal well and located at a shallower depth than said first, horizontal, injection, geothermal well;
 - d. Recovering geothermal fluid from said production well; and
 - e. Generating a water density difference and a pressure difference between said first horizontal, injection well and said second horizontal, production well.
2. Method according to claim 1, wherein the horizontal wells are provided by drilling along a geological layer.
3. Method according to claim 1, comprising increasing the pressure difference by pressurizing the water, injected in the horizontal, deeper injection

well, above the hydrostatic pressure existing at the depth of the horizontal deeper injection geothermal well and reducing the pressure in the horizontal, shallower production well.

4. Method according to claim 1, further comprising extracting heat from the geothermal fluid recovered from the production well and using said heat for the production of energy.

5. Method according to claim 1, wherein the water injected into the injection well is the geothermal fluid, recovered from the production well, depleted of heat by heat exchange.

6. Method according to claim 1, further comprising monitoring the pressure difference.

7. Method according to claim 1, wherein the first and second horizontal, geothermal wells are formed in a geological layer the suitability of which has been determined.

8. Method according to claim 8, wherein the suitability of the geological layer is determined by geophysical surveys and by drilling slim holes in said layer.

9. Apparatus for enhancing the flow of geothermal fluid from at least one injection well to at least one production well, which comprises:

- a. A first, horizontal geothermal well, which is used as said injection well into which water is injected;
- b. A second horizontal, geothermal well, which is used as said production well from which geothermal fluid issues, wherein said second, horizontal, production, geothermal well is substantially horizontally and vertically spaced from said first, horizontal, injection, geothermal well and located at a shallower depth than said first, horizontal, injection, geothermal well; and
- c. Means for producing a water density difference and a pressure difference between said first horizontal, injection well and said second horizontal, production well.

10. Apparatus according to claim 9, wherein the first horizontal, injection geothermal well has an open slotted outlet, from which injected water flows into the geological layer in which the well has been drilled, and the second horizontal, production geothermal well has an open slotted inlet, whereby geothermal fluid flows into it from the geological layer because of buoyancy of the water and the pressure difference between said horizontal injection and horizontal production wells.

11. Apparatus according to claim 9, further comprising instrumentation for monitoring the pressure difference.

12. Apparatus according to claim 9, further comprising an observation well connected to the second horizontal, production geothermal well, and wherein the instrumentation comprising observation instrumentation present in said observation well.

13. Apparatus according to claim 9, wherein the first horizontal, geothermal well has a length up to 1.25 miles.

14. Apparatus according to claim 9, wherein the second horizontal, geothermal well has a length up to 1.25 miles.

15. Apparatus according to claim 9, wherein the horizontal distance between the first horizontal well and the second horizontal well is up to 2000 feet.

16. Apparatus according to claim 9, wherein the vertical distance between the first horizontal well and the second horizontal well is up to 150 feet.

17. Apparatus according to claim 9, further comprising a power plant comprising an electricity generator and at least one turbine for driving said generator, conduit means for conveying geothermal fluid to said power plant whereby said geothermal fluid becoming heat-depleted, and conduit means for

conveying heat-depleted geothermal fluid from said power plant to the horizontal, injection well.

18. Apparatus according to claim 9, further comprising a heat exchanger, conduit means for conveying geothermal fluid to a heat exchanger whereby to heat is transferred to a working fluid for producing power in a power plant.

19. Apparatus according to claim 18 including a binary power plant comprising an organic vapor turbine operating according to an organic Rankine cycle.

20. Apparatus according to claim 19 wherein said binary power plant includes an air-cooled condenser.

21. Apparatus according to claim 19 wherein the working fluid of said binary power plant is pentane or isopentane.

22. Apparatus according to claim 19 wherein the working fluid of said binary power plant is butane or isobutane.

23. Apparatus according to claim 18 wherein said power plant is a combined cycle geothermal power plant.

24. Apparatus according to claim 10, further comprising a water injection pump for injecting heat-depleted geothermal fluid into the horizontal, injection well.

25. Apparatus according to claim 10, further comprising a deep well pump for pumping hot geothermal fluid from the production well.

26. Apparatus according to claim 10, wherein the horizontal, injection geothermal well comprises a perforated horizontal pipe.

27. Apparatus according to claim 10, wherein the second horizontal, production geothermal well comprises a perforated horizontal pipe.

28. Apparatus according to claim 26, wherein the perforated horizontal pipe is perforated on its lower surface.

29. Apparatus according to claim 27, wherein the perforated horizontal pipe is perforated on its lower surface.

30. Apparatus according to claim 9, wherein the production horizontal, geothermal well is generally parallel to the injection horizontal, geothermal well.

31. Apparatus according to claim 9, comprising a plurality of injection horizontal, geothermal wells for one production horizontal, geothermal well.

32. Apparatus according to claim 9 comprising a plurality of horizontal injection wells and a plurality of horizontal production wells spaced horizontally and vertically.

33. Apparatus according to claim 9 wherein all the water and make-up water is supplied from an external source.

34. Apparatus according to claim 9 wherein part of the water circulating is from the reservoir and only make-up water is from an external source.

35. Method for assuring the flow of geothermal fluid from at least an injection well to at least a production well, which comprises the following steps:

I - Providing a first, horizontal, geothermal well, which is connected to said injection well;

II - Injecting water into said injection well;

III - Providing a second, horizontal, geothermal well, which is connected to said production well;

IV - Recovering geothermal fluid from said production well; and

V - Generating a water density difference and a pressure difference between said first horizontal well and said second horizontal well.

ABSTRACT

The method of the invention comprises enhancing the flow of geothermal fluid (water and/or steam and/or mixtures thereof) from at least one injection well to at least one production well, by the following steps: providing a first, horizontal, geothermal well, which is used as said injection well; injecting water into said injection well; providing a second, horizontal, geothermal well, which is used as said production well such that said second, horizontal, production, geothermal well is substantially horizontally and vertically spaced from said first, horizontal, injection, geothermal well and located at a shallower depth than said first, horizontal, injection, geothermal well; recovering geothermal fluid from said production well; and generating a water density difference and a pressure difference between said first horizontal, injection well and said second horizontal, production well.

Furthermore, the invention comprises an apparatus for enhancing the flow of geothermal fluid from at least one injection well to at least one production well, which comprises a first horizontal geothermal well, which is used as said injection well, and into which water is injected; a second horizontal, geothermal well, which is used as said production well and from which geothermal fluid issues, wherein said second, horizontal, production, geothermal well is substantially horizontally and vertically spaced from said first, horizontal, injection, geothermal well and located at a shallower depth than said first, horizontal, injection, geothermal well; and means for producing a pressure difference between said first horizontal, injection well and said second horizontal, production well and utilizing the water density difference induced by the temperature difference. Preferably, binary geothermal power plants or combined cycle geothermal power plants can be used to produce power from geothermal fluid recovered from the production well.

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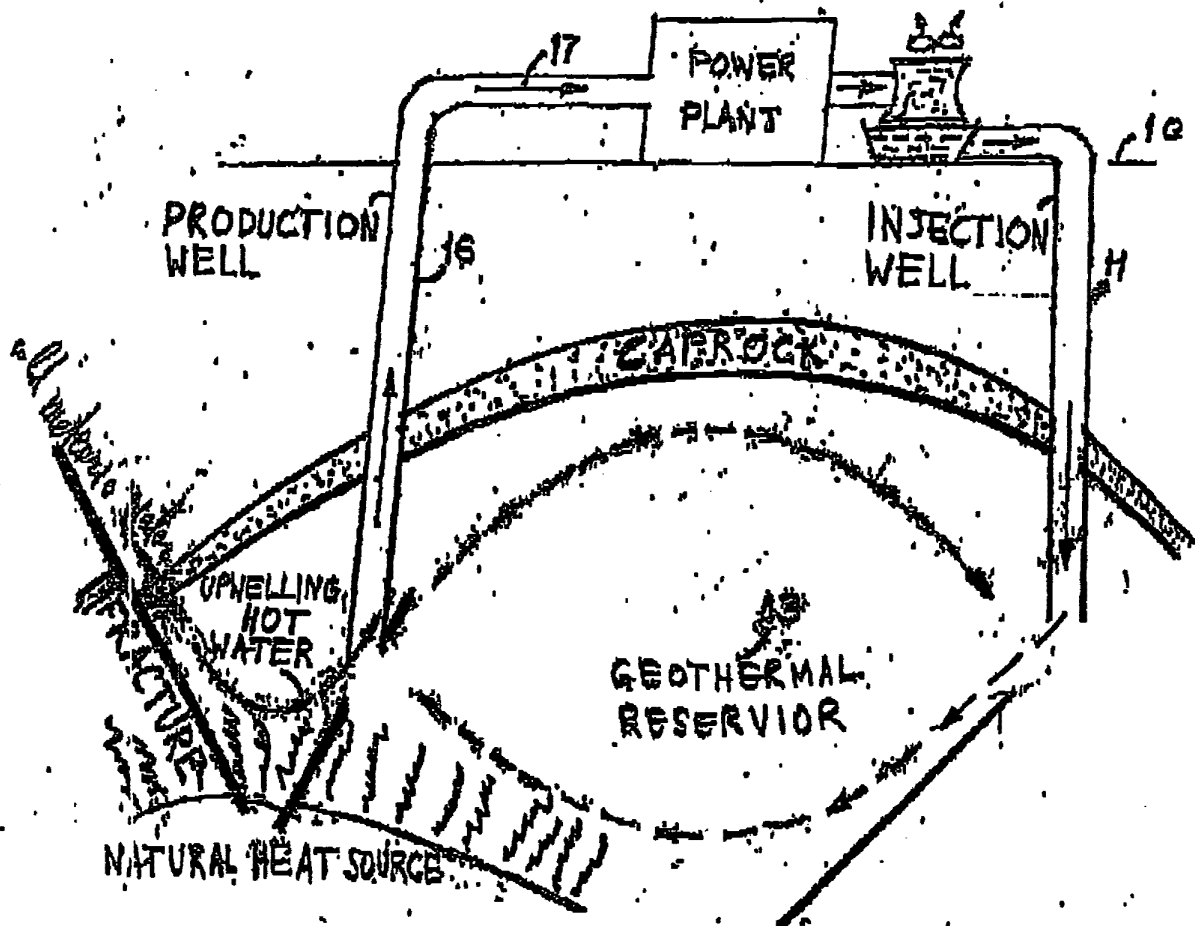


Fig. 1.

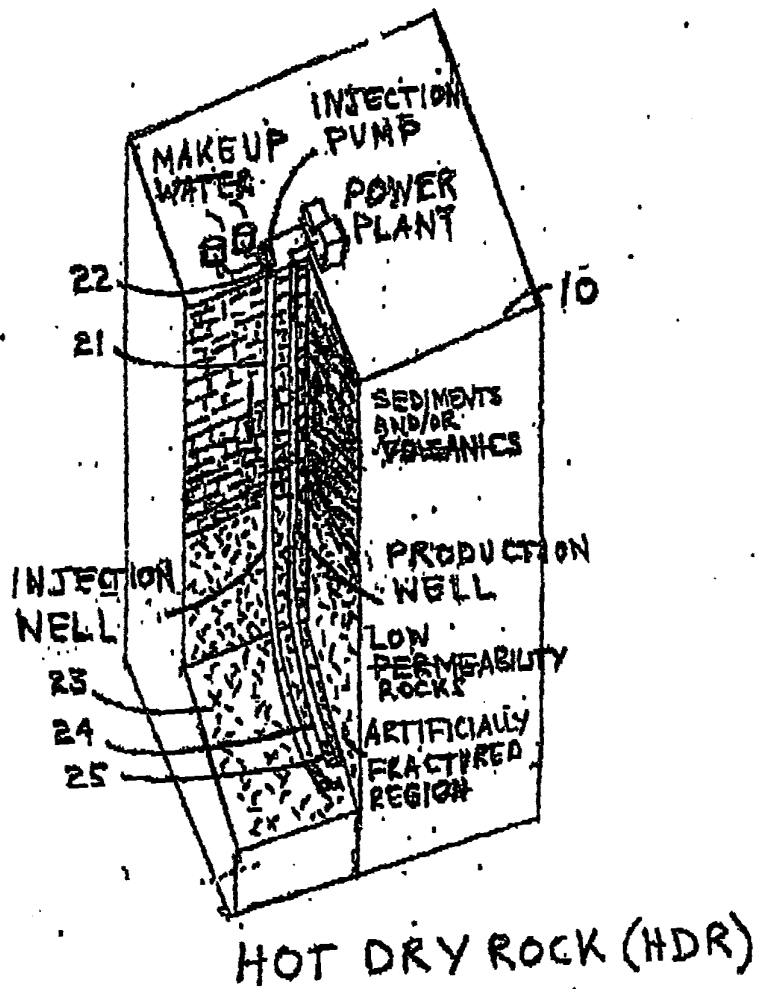


Fig. 2

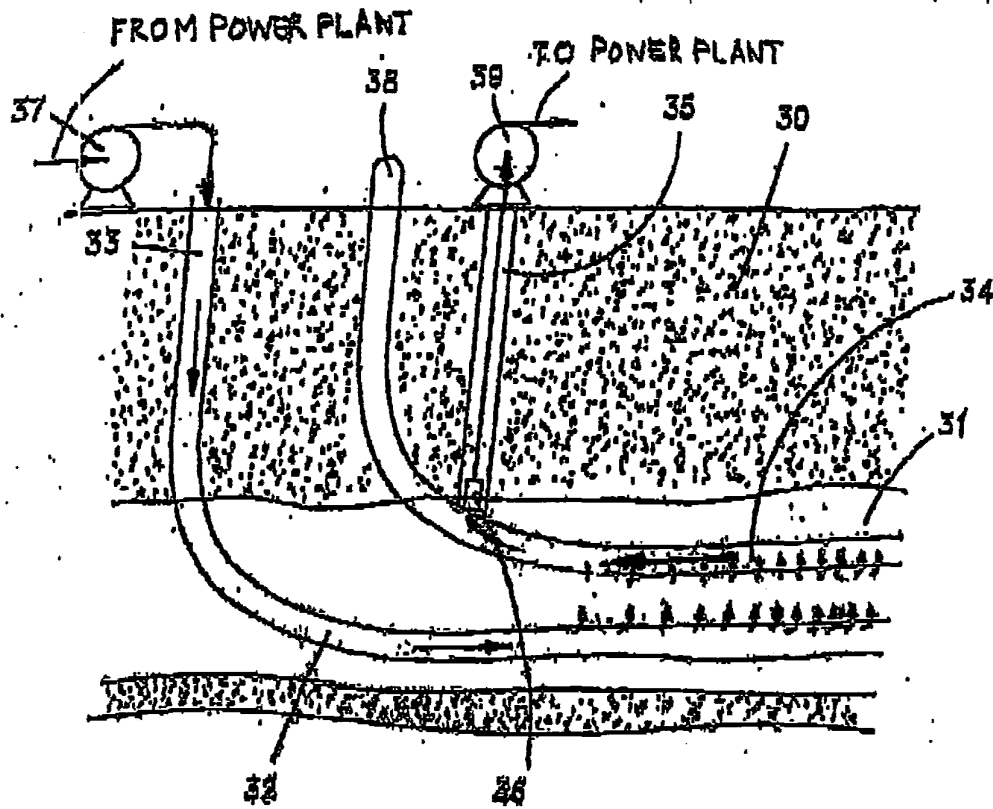


Fig. 3

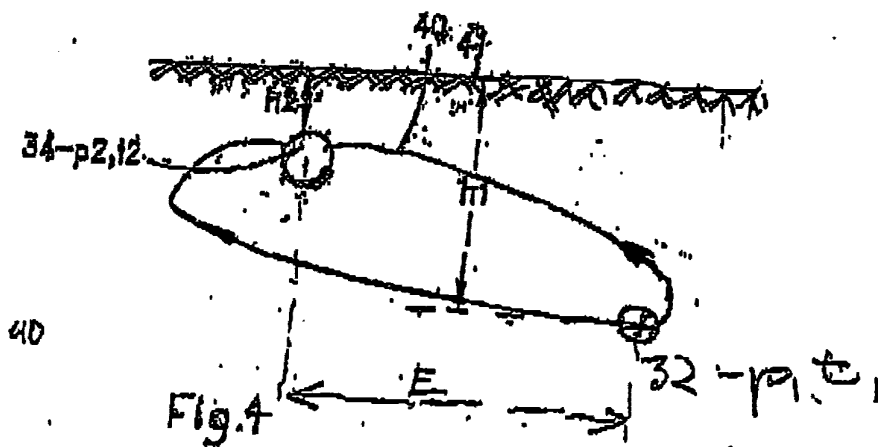
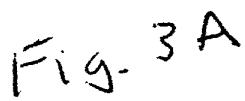


Fig. 4



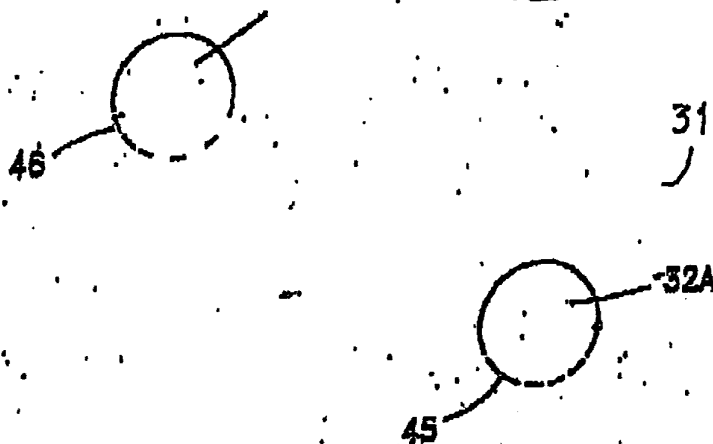


Fig. 5

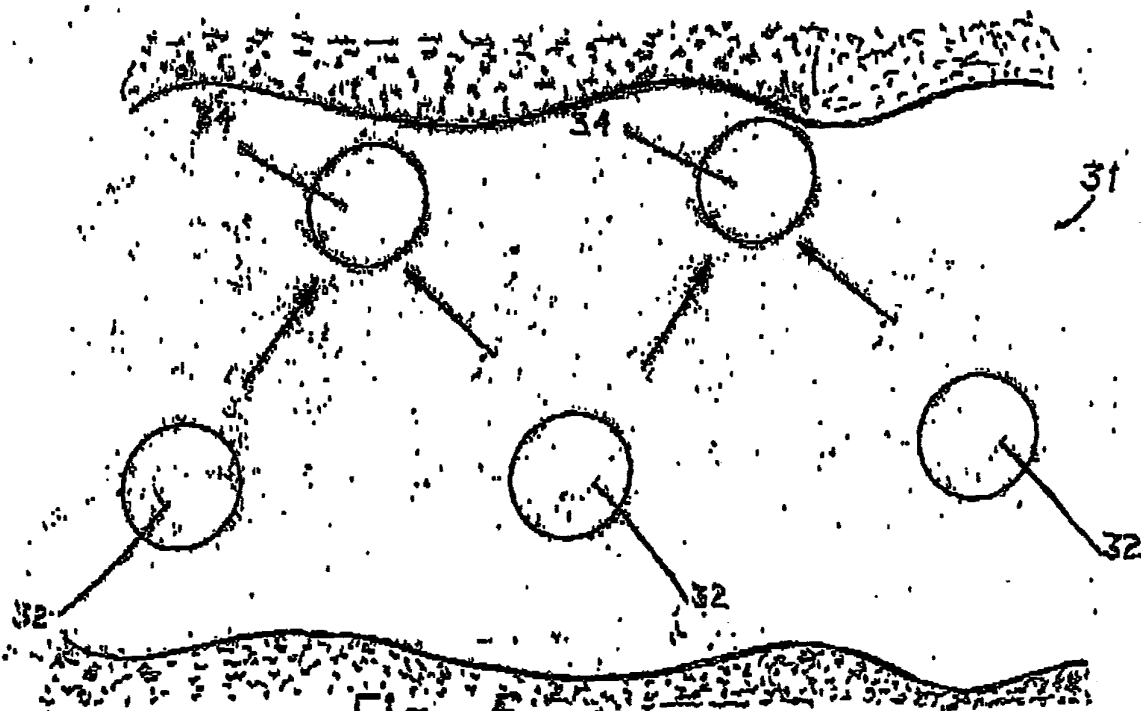


Fig. 6

Fig. 7

Horizontal Well, Geothermal Heat Mixing Model
Forecast Production Temperature

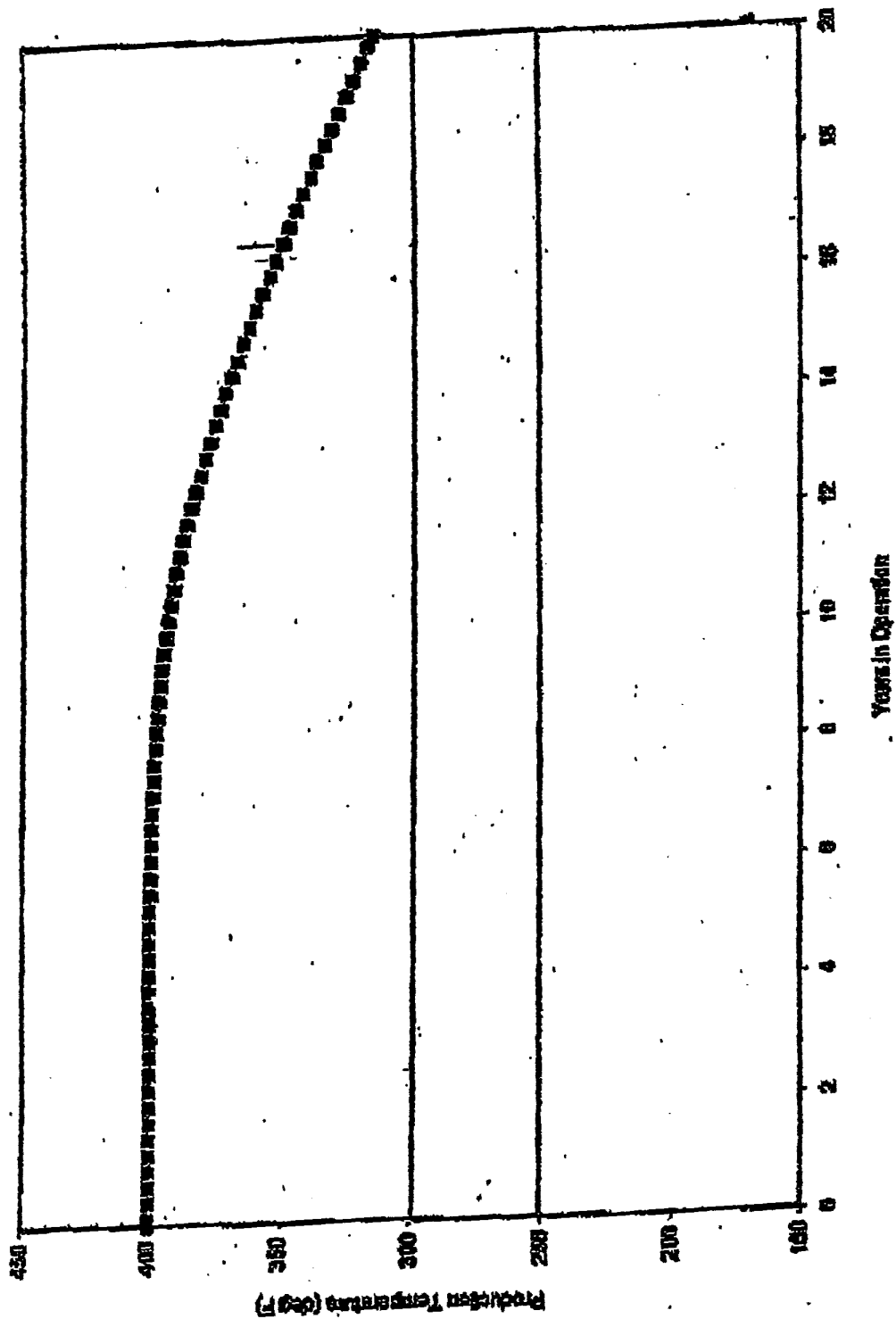
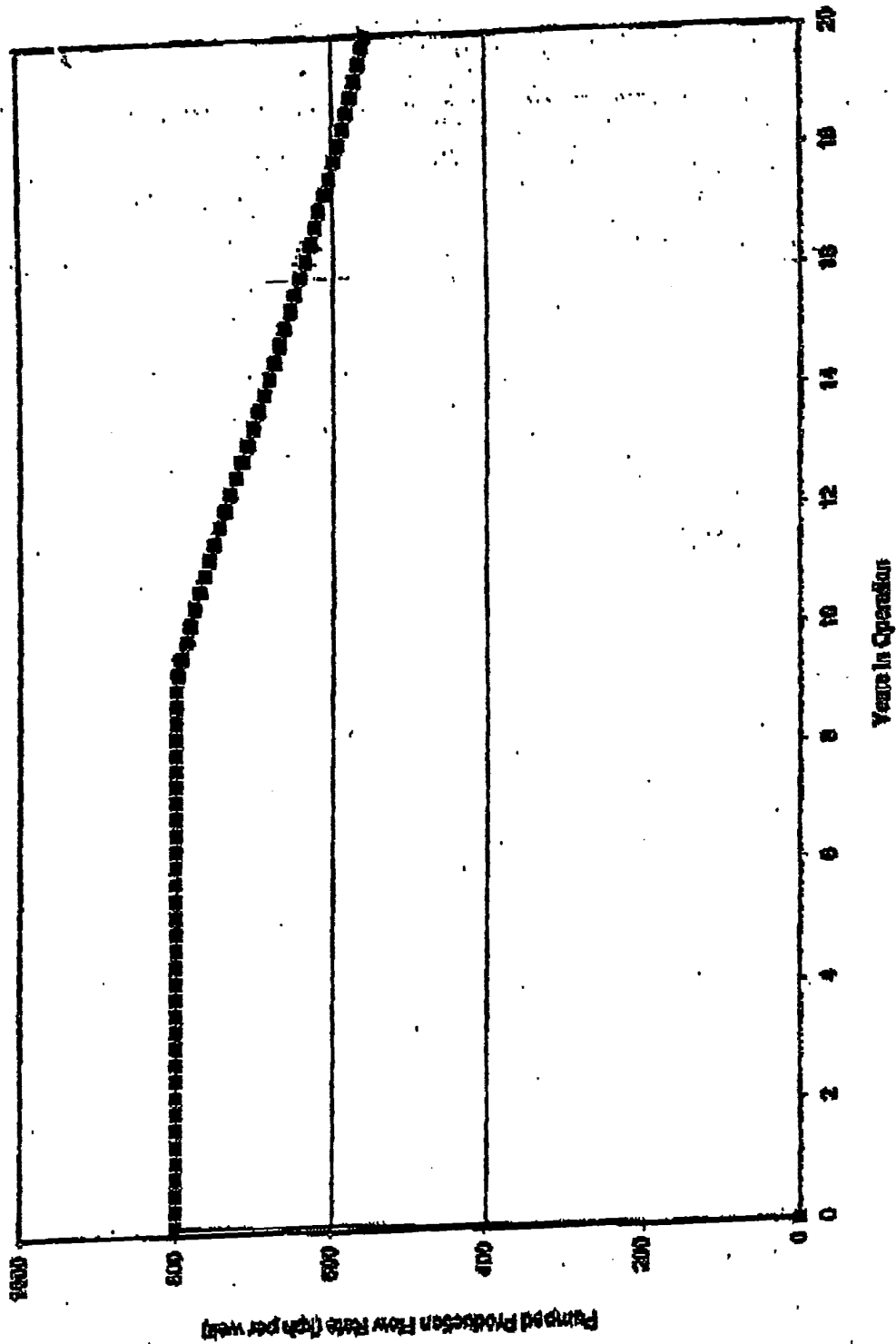


Fig 8
Horizontal axis, Gasflow Rate (gpm) vs. Time (years)
Forecast Production Flow Rate



Binary Geothermal Power Plant

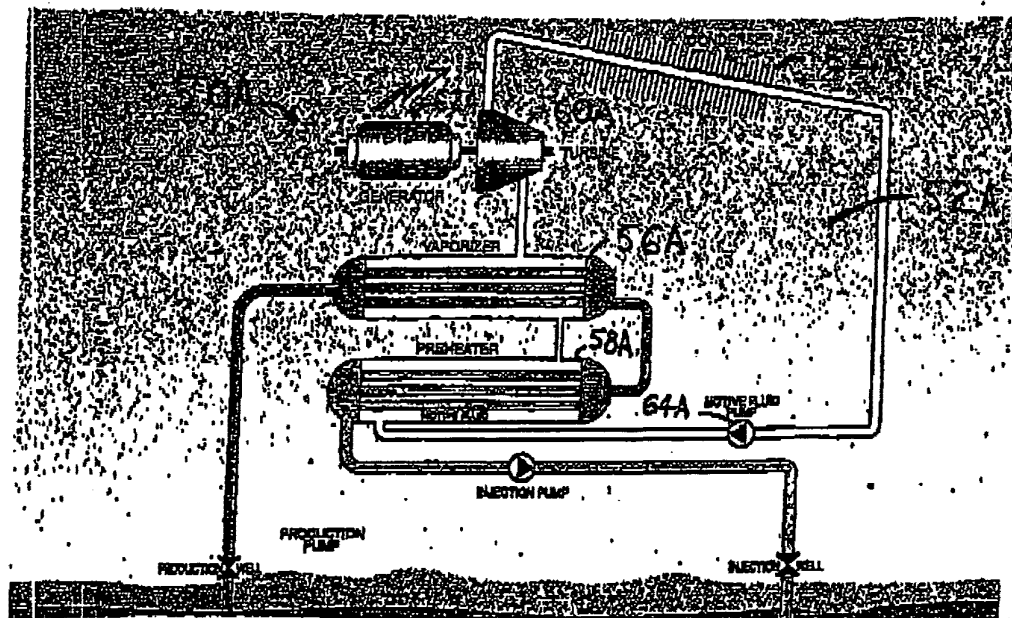


Fig. 9A

Two Level Brine Binary Geothermal Power Plant

LEVEL I

LEVEL II

50B

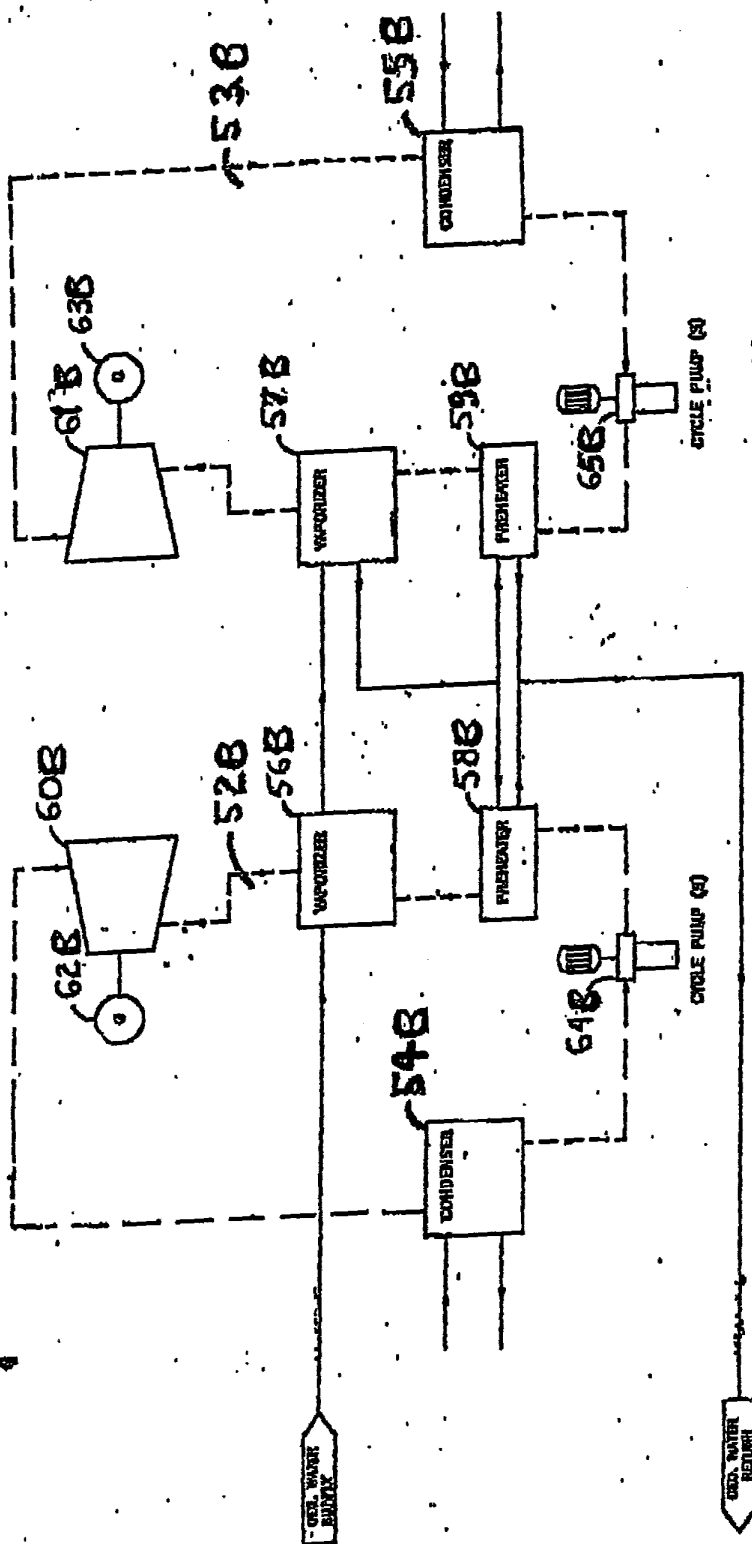
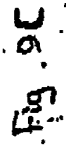


Fig. 9B

505



757

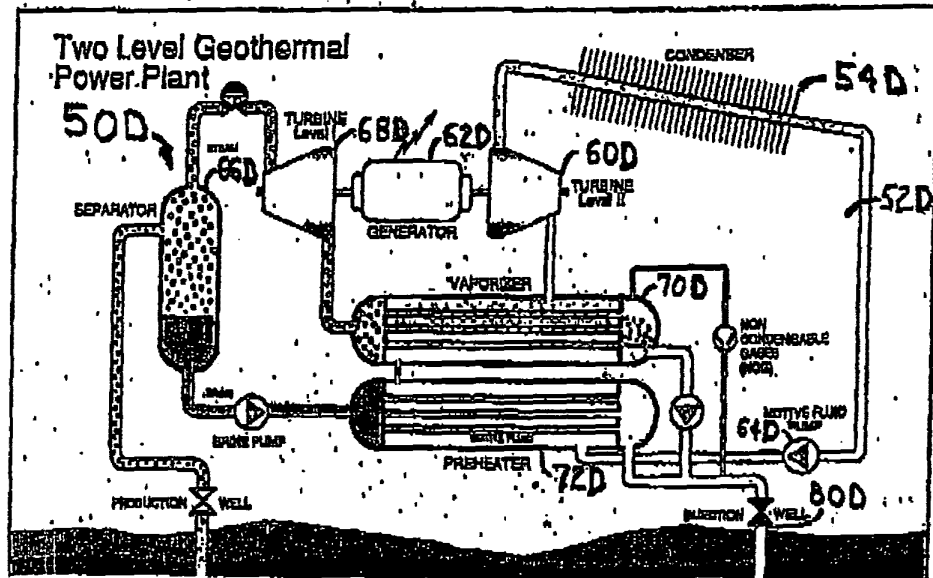


Fig. 10

APPLICATION DATA SHEET

APPLICATION INFORMATION

Application Type::	REGULAR
Subject Matter::	UTILITY
CD-ROM or CD-R?::	NONE
Title::	METHOD AND APPARATUS FOR USING GEOTHERMAL ENERGY FOR THE PRODUCTION OF POWER
Attorney Docket Number::	256868US30
Total Drawing Sheets::	11

INVENTOR INFORMATION

Applicant Authority Type::	INVENTOR
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Country of Mailing Address::	Israel

CORRESPONDENCE INFORMATION

Correspondence Customer Number::	22850
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REPRESENTATIVE INFORMATION

Representative Customer Number::	22850
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PATENT APPLICATION SERIAL NO. _____

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

08/05/2004 HVUONG1 00000063 10910613

01 FC:1001	770.00 DP
02 FC:1202	270.00 DP
03 FC:1051	130.00 DP

PTO-1556
(5/87)

PATENT APPLICATION FEE DETERMINATION RECORD

Effective October 1, 2003

Application or Docket Number

10 910 613

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	35	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	35 minus 20 =	* 15
INDEPENDENT CLAIMS	3 minus 3 =	* -
MULTIPLE DEPENDENT CLAIM PRESENT ☐		

* If the difference in column 1 is less than zero, enter "0" in column 2

SMALL ENTITY
TYPE ☐

OR OTHER THAN
SMALL ENTITY

RATE	FEE
BASIC FEE	385.00
XS 9=	
X43=	
+145=	
TOTAL	

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BASIC FEE	770.00
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CLAIMS AS AMENDED - PART II

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Total	*	Minus **	=
Independent	*	Minus ***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐			

SMALL ENTITY
OR

OTHER THAN
SMALL ENTITY

RATE	ADDITIONAL FEE
XS 9=	
X43=	
+145=	
TOTAL	
ADDIT. FEE	

RATE	ADDITIONAL FEE
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TOTAL	
ADDIT. FEE	

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ADDIT. FEE	

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TOTAL	
ADDIT. FEE	

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AMENDMENT C	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
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FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐			

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+145=	
TOTAL	
ADDIT. FEE	

RATE	ADDITIONAL FEE
XS18=	
X86=	
+290=	
TOTAL	
ADDIT. FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
 ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20."
 *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3."
 The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.