Doc Code: **TR.PROV**
Document Description: Provisional Cover Sheet (SB16)

PTO/SB/16 (11-08)
Approved for use through 05/31/2015. OMB 0651-0032
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number

Provisional Application for Patent Cover Sheet

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c)

Inventor(s)

Inventor 1 — Remove

Given Name	Middle Name	Family Name	City	State	Country i
Andrea		Rossi	Maddalena		IT

All Inventors Must Be Listed – Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. [Add]

Title of Invention	NOVEL METHODS AND DEVICES FOR USE IN GENERATING USEFUL HEAT
Attorney Docket Number (if applicable)	364/4 PROV

Correspondence Address

Direct all correspondence to (select one):

◉ The address corresponding to Customer Number	○ Firm or Individual Name
Customer Number	76934

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

◉ No.

○ Yes, the invention was made by an agency of the United States Government. The U.S. Government agency name is:

○ Yes, the invention was under a contract with an agency of the United States Government. The name of the U.S. Government agency and Government contract number are:

Entity Status
Applicant asserts small entity status under 37 CFR 1.27 or applicant certifies micro entity status under 37 CFR 1.29

- ◯ Applicant asserts small entity status under 37 CFR 1.27
- ◯ Applicant certifies micro entity status under 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.
- ◉ No

Warning

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

Signature

Please see 37 CFR 1.4(d) for the form of the signature.

Signature	/Justin R. Nifong/			Date (YYYY-MM-DD)	2013-05-10
First Name	Justin	Last Name	Nifong	Registration Number (If appropriate)	59389

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or paten. Accordingly, pursuant to the requirements of the Act, please be advised that : (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, t o a n other federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

DIAGRAM TEST FACILITY

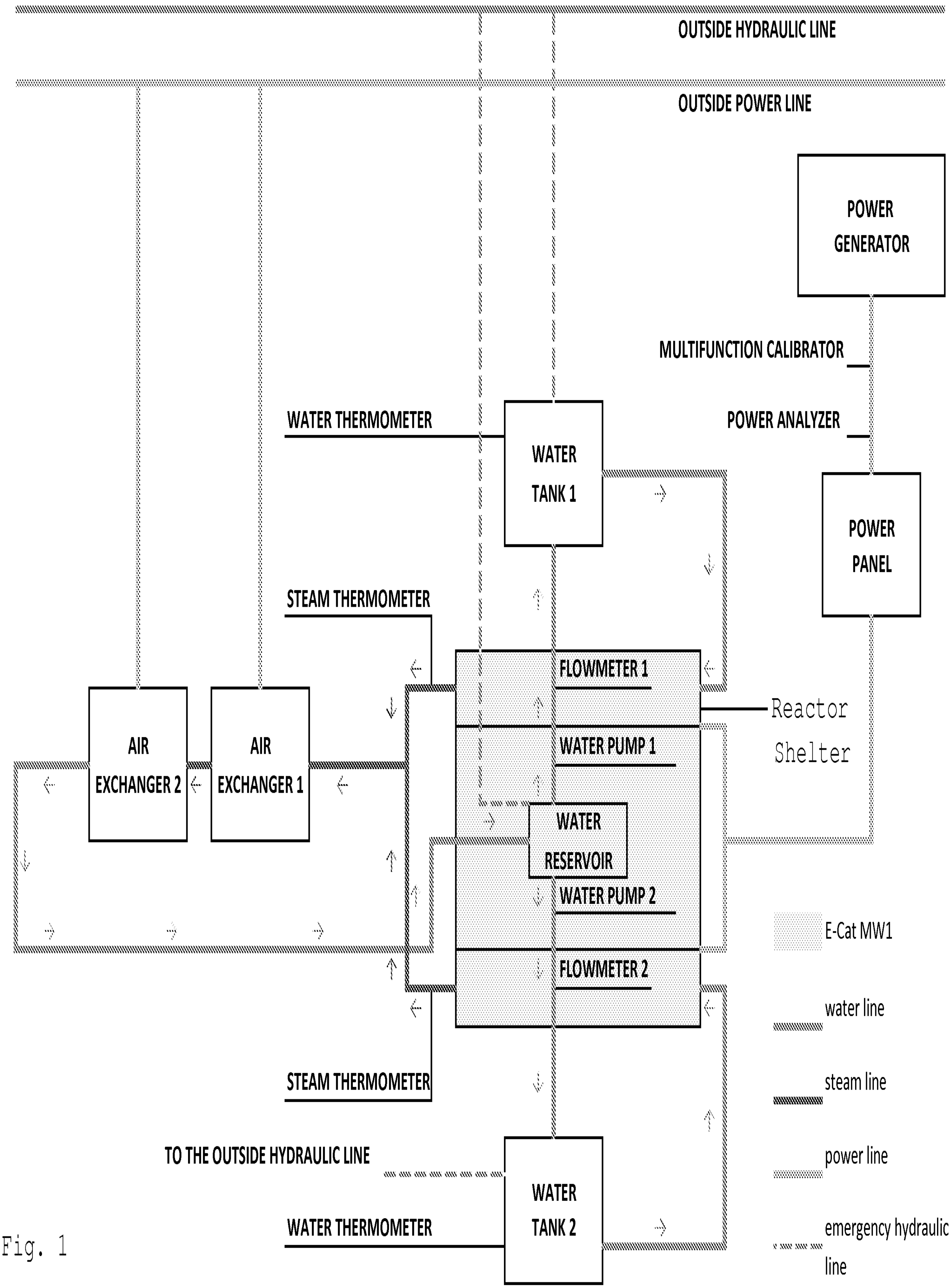

Fig. 1

DESCRIPTION

NOVEL METHODS AND DEVICES FOR USE IN GENERATING USEFUL HEAT

TECHNICAL FIELD

[0001] This disclosure is related to novel methods and devices for use in generating useful heat. The generated heat may be used, for example, in an energy generating setting, industrial, commercial setting, or any other setting in which heat may be advantageously employed.

BACKGROUND

[0002] Heat may be advantageously used for generating energy, heating an area, powering an industrial process, or in many other situations. Methods and devices useful in generating heat will be beneficial for addressing energy storage and supply issues faced by the developed world, however, current methods suffer from a variety of shortcomings. For example, some methods and devices for generating heat are costly, requiring significant capital infrastructure and investment. Other methods and devices are not efficient in producing heat in a cost effective manner.

[0003] A need therefore exists for a method or solution that addresses these disadvantages.

SUMMARY

[0004] This Summary is provided to introduce a selection of concepts in a simplified

form that are further described below in the Detailed Description of Illustrative Embodiments. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used to limit the scope of the claimed subject matter.

[0005] Disclosed herein is a system for capturing generated heat. The system includes a heat generator according to the one or more devices disclosed herein and a liquid exchanger configured for passing fluid into heat transfer arrangement with the heat generator and configured for condensing heated liquid.

[0006] According to one or more embodiments, a method for generating energy is provided. The method includes generating heat with a heat generator according to the one or more devices disclosed herein and passing cooling fluids into heat transfer arrangement with the heat generator and condensing the heated fluids.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The foregoing summary, as well as the following detailed description of preferred embodiments, is better understood when read in conjunction with the appended drawings. For the purposes of illustration, there is shown in the drawings exemplary embodiments; however, the presently disclosed invention is not limited to the specific methods and instrumentalities disclosed. In the drawings:

[0008] FIG. 1 illustrates a schematic diagram of a system for use in generating heat and capturing heat therefrom. A related method of using the system in generating heat is also provided.

DETAILED DESCRIPTION

[0009] The presently disclosed invention is described with specificity to meet statutory requirements. However, the description itself is not intended to limit the scope of this patent. Rather, the inventors have contemplated that the claimed invention might also be embodied in other ways, to include different steps or elements similar to the ones described in this document, in conjunction with other present or future technologies.

Device

[0010] A system is illustrated in Fig. 1 for producing heat. According to one or more embodiments and in one or more experiments, the system may include 107 individual reactors. In one or more embodiments and in one or more experiments, each of the reactors may absorb a power of about 1.1 kW.

[0011] Each unit may include a reaction chamber. According to one or more embodiments, nickel powder may react with hydrogen in the presence of a catalyst within the reaction chamber. Electric heaters may be provided and are fed by the current generator. The power of the electric heaters may be regulated by a power panel. The power panel may include computer control code in which an automated process of monitoring is carried out by the power panel. Alternatively, the power panel may include operator responsive buttons such that a human operator can monitor the heat generation process and control an output thereof.

[0012] The electric heaters may be positioned within the reactor shelter and heat each reactor. This may trigger a reaction between nickel and hydrogen, if those are the elements provided within the reaction chamber, which may have heat as a byproduct.

[0013] The energy and/or heat produced by the generator may removed by a heat transfer method such as liquid cooling. For example, a cooling fluid, such as water, may be sent to inside of the module from the pump. Any liquid capable of acting as a heat transfer medium may be employed.

[0014] The control of the heat generation by reaction of the nickel powder, hydrogen, and catalyst may be performed by a computing device that measures one or more factors such as, for example, temperature measured by temperature probes. The temperature probes may detect the temperature of water in any portion of the system, including entry into the reactor shelter. These measurements may be useful for determining steam to output. The flow rate of the cooling fluid may be manually set to start of operations, or it may vary according to operator controls or according to one or more computing systems.

[0015] In one or more experiments, the system included the following components:

One (1) Generator (300 Kw);
Two (2) Water pumps, which in the experiment were model EEM, Tellarini pompe, 0.37 Kw;
107 Reactors;

24 Water pumps, which in the experiment were model Prominent Gamma, 23 w;

56 Water pumps, which in the experiment were model Prominent Concept plus, 15w;

Two (2) Heat sinks;

Two (2) Water tanks, which in the experiment were 1 cubic meter capacity each;

Two (2) Flowmeters;

One (1) Manometer;

Four (4) Instruments with a probe and/or sensor for temperature measurement by immersion;

One (1) Multifunction Calibrator; and

One (1) Power analyzer.

EXPERIMENTAL PROCESS

[0016] The water contained in the two tanks, placed at the sides of the reactor shelter, is conveyed by pumps in the reactor shelter. The water is then heated by heat produced by the reactors to vaporize into steam. The steam is collected in the two tubes of the steam line. The steam is then conveyed to the outside of the reactor shelter housing the water pump and flowmeter. The two tubes are then combined into a single tube.

[0017] The vapor is then passed through an air exchanger 1 and an air exchanger 2 until the steam condenses. The condensed water is then conveyed into the water reservoir which is placed inside of the reactor shelter in the experiment. The water is then conveyed to water tank 1 and water tank 2, where the temperature of the water is measured.

[0018] The generator powers the heating elements of the reactor chambers in this experiment. The pumps for the water, the internal services to the reactor shelter and the control panel are powered by the generator. The heat sinks, which are fans in this experiment are connected to the public electric grid.

EXPERIMENTAL RESULTS

[0019] In an experiment, the generator was activated. Exit temperatures of steam and water in tank 1 were measured. Exit temperatures of steam were automatically recorded, as well as temperature in tank 1. The process was then shutdown and temperature recording was ceased.

Calculation of COP

$$\text{COP} = \frac{\text{energy produced } (E_P)}{\text{energy absorbed } (E_A)}$$

Calculation of the energy produced (EP)

[0020] The energy produced by 18 reactors is given by the sum of the heat of heating of water, heat of vaporization of water and heat of superheating the steam.

Ep = ER + EV + ES

ER (energy of heating of water up to100 °C) = MW1 x Csw x (Tev – Tiw1) + MW2 x Csw x (Tev – Tiw2)

MW1 = mass of water vaporized during the whole test, coming from tank 1

TiW1 = inlet temperature of the water, coming from tank 2

MW2 = mass of water vaporized during the whole test, coming from tank 2

TW2 = inlet temperature of the water, coming from tank 2

Csw= specific heat of water = 1.14 Wh/(kg°K)

Tvw = vaporization temperature of the water = 100 °C

EV = (energy of vaporization of water) = λ x (MW1 +MW2)

λ = (latent energy of vaporization) = 627.5 Wh/kg

ES (heating energy of steam) = Ms x Cps x (Tos – Tvw)

Ms = mass of steam produced during the whole test

Cps =specific heat of steam at constant pressure = 0.542 Wh/kg

Tos = outlet temperature of the steam

Tvw = vaporization temperature of the water

**** Note: Throughout the test the temperatures of steam measured by the two probes have always been the same or very similar to each other.

[0021] Throughout the test the pressure of the steam was always equal to atmospheric pressure

[0022] In order to be conservative:

- it has not been taken into account the heating energy of steam
- the temperature of the inlet water has always been considered equal to the maximum value of the same measured during the whole test
- the uncertainty of measurement of the mass of water heated all were considered against. Consequently, the total mass of water transited during the trial period has been reduced by 10%.

Calculation of the energy absorbed (Ea)

[0023] The absorbed energy is generated by the generator set.

[0024] In order to be conservative:

- all the energy, produced by the generator, is supposed to be absorbed by the 18 reactors

In reality a part of this energy feeds the pumps, which convey the water from the internal reservoir to the two external tanks and pumps, which convey the water from the tanks external to the reactors. This energy then would not have gone to feed the reactors

- all the energy produced by the generator since its activation has been taken into account in the context of the test.

Calculation of the COP

[0025] The COP has been considered only during the period, in which the reactors were operating, namely when the temperature of the steam at ambient pressure was higher than 101 ° C.

The COP has not been considered during the phases of activation and de-activation

[0026] At the beginning of the test, the following values were measured:

MW1b = 1050 kg

MW2b = 2100 kg

TiW1 = 21.6 °C

TiW2 = 22.4 °C

Tos = 121.3 °C

Energy produced by generator set = 8.98 KWh

[0027] At the end of the operational period, the following values were measured:

MW1e = 1750 kg

MW2e = 3900 kg

TiW1 = 54.4 °C

TiW2 = 46.8 °C

Tos = 139.7 °C

[0028] Energy produced by generator set = 140.7 KWh

ER = MW1 x Csw x (Tev – Tiw1) + MW2 x Csw x (Tev – Tiw2)

MW1 = (MW1e - MW1b) = 1750 – 1050 = 700 kg

MW2 = (MW2e – MW2b) = 3900 – 2050 = 1850 kg

and reducing by 10%

MW1 = 630 kg

MW2 = 1665 kg

[0029] During the test the highest value of TiW1 is equal to 54.9 °C, the highest value of TiW2 is equal to 55.2 °C

[0030] Substituting the values results in:

ER = 630 x 1.14 x (100–54.9) + 1665 x 1.14 x (100–55.2) = 32391 + 85035 = 117426 wh

EV = λ x (MW1 +MW2) = 627.5 x (630 + 1665) = 627.5 x 2295 = 1440113 wh

ES = Ms x Cps x (Tos – Tvw) = not taken into account

Ea = 140.70 – 8.98 = 131.72 Kwh

[0031] The following was taken into account

$$E_a = 140.70 \text{ kwh} = 140700 \text{ wh}$$

$$COP = \frac{(117426 + 1440113)}{140700} = \frac{1557539}{140700} = 11.07$$

[0032] Throughout the test the temperature of the outlet steam was always significantly higher than 100 ° C.

[0033] While the embodiments have been described in connection with the preferred embodiments of the various figures, it is to be understood that other similar embodiments may be used or modifications and additions may be made to the described embodiment for performing the same function without deviating therefrom. Therefore, the disclosed embodiments should not be limited to any single embodiment, but rather should be construed in breadth and scope in accordance with the appended claims.

Electronic Acknowledgement Receipt

EFS ID:	15746054
Application Number:	61821914
International Application Number:	
Confirmation Number:	3833
Title of Invention:	NOVEL METHODS AND DEVICES FOR USE IN GENERATING USEFUL HEAT
First Named Inventor/Applicant Name:	Andrea Rossi
Customer Number:	76934
Filer:	Justin Robert Nifong
Filer Authorized By:	
Attorney Docket Number:	364/4 PROV
Receipt Date:	10-MAY-2013
Filing Date:	
Time Stamp:	15:00:05
Application Type:	Provisional

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$260
RAM confirmation Number	1382
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1	Provisional Cover Sheet (SB16)	364-4PROVcover.pdf	1477321 c47861ab32b152e40e4a9aed9df22c13c3fc bbc9	no	3
Warnings:					
Information:					
2	Drawings-only black and white line drawings	364-4prov-dwgs.pdf	38411 c41c049339bf4e516bd9733ac9533c3d54a 8f7ce	no	1
Warnings:					
Information:					
3	Specification	364-4PROV.pdf	226969 4be00a789728b5e51515b1c884a9b2d1a2 b0c52f	no	13
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	29590 8bd094aa5b3f6d5dbf870fefa3c40f19ebfc6 aa1	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1772291		

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.