

Dirección de Nuevas Creaciones
Superintendencia de Industria y Comercio
E. S. D.

Referencia: Solicitud de Privilegio para Patente de invención
Título: Sistema de recinto subterráneo
Solicitante: BOBSBOX, LLC.
Exp. No.: NC2022/0005857
Asunto: Respuesta a requerimiento No. 7.244 de 2022.

JESÚS M. MÉNDEZ BERMÚDEZ, identificado con cédula de ciudadanía No. 13.491.525 y con Tarjeta Profesional de Abogado No. 99.678 expedida por el Consejo Superior de la Judicatura, actuando como apoderado de la sociedad BOBSBOX, LLC., por medio del presente escrito me permito dar respuesta al requerimiento de la referencia de la siguiente forma:

1. Documento de poder

Con el objetivo de atender el requerimiento proyectado por su Despacho, allego al expediente documento de poder debidamente diligenciado.

2. Documento de cesión de derechos

Con el objetivo de atender el requerimiento proyectado por su Despacho, allego al expediente documento de cesión de derechos debidamente diligenciado.

Por favor tener en cuenta que, aunque el Sr. Walter Pierce figura como inventor en la solicitud de EE. UU. n.º 16/599,671, a la que la solicitud PCT '981 reclama prioridad, ese tema no se reivindicó en la solicitud PCT '981. Más bien, la Solicitud PCT '981 se centró más en el tema de la Solicitud de EE. UU. No. 16/841,120. Entonces, aunque el Sr. Pierce contribuyó a un reclamo dependiente de US 16/599,671, no contribuyó a ninguno de los reclamos de la Solicitud PCT '981. Por lo tanto, según la ley de los EE. UU., el Sr. Pierce no es un inventor adecuado para la solicitud PCT '981.

Publication Number
WO/2021/072191

Publication Date
15.04.2021

International Application No.
[PCT/US2020/054981](#)

International Filing Date
09.10.2020

IPC

H02B 1/56 2006.1

H02B 1/36 2006.1

H02G 3/08 2006.1

CPC

H02B 1/505

H02B 1/56

H02G 3/22

H02G 9/10

Applicants
BOBSBOX, LLC [US]/[US]
7209 Reserve Creek Dr. Port St. Lucie, FL
34986, US

Inventors

AYCOCK, Kevin, T.
GRAHAM, Matthew
GOLDSTEIN, Kevin
TORRES, Marcela

Agents
LEFKOWITZ, Gregory M.
LANDOLFI, Steven, M.

Title
[EN] IN-GROUND ENCLOSURE SYSTEM
[FR] SYSTÈME D'ENCEINTE SOUTERRAINE

Abstract
[EN] An in-ground enclosure for housing electrical components is provided. The in-ground enclosure can include an outer shell defining an internal compartment housing a lift system, an equipment rack structure connected to the lift system, an upper panel comprising a compartment opening for accessing the internal compartment, an enclosure cover adapted to cover the compartment opening and for removably sealing the compartment opening. In certain uses, a telecommunications base station may also be provided. The telecommunications base station can include the in-ground enclosure and a cellular base station, with the cellular base station including an antenna coupled to signal processing equipment and a power supply.
[FR] L'invention concerne une enceinte souterraine servant à loger des composants électriques. L'enceinte souterraine peut comprendre une enveloppe externe formant un compartiment interne logeant un système de levage, une structure de bâti d'équipement reliée au système de levage, un panneau supérieur comprenant une ouverture de compartiment pour accéder au compartiment interne, un couvercle d'enceinte conçu pour recouvrir l'ouverture de compartiment et sceller de manière amovible l'ouverture de compartiment. Selon certains modes de réalisation, l'invention concerne également une station de base de télécommunications. La station de base de télécommunications peut comprendre l'enceinte souterraine et une station de base cellulaire, la station de base cellulaire comprenant une antenne couplée à un équipement de traitement de signal et une alimentation électrique.

Related patent documents

Resuelta la objeción presentada, amablemente solicito se continué con el trámite y se autorice la publicación de la solicitud en la gaceta de propiedad industrial.

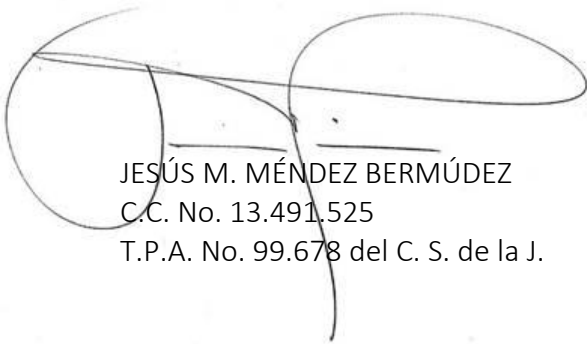
ANEXOS

1. Documento de poder.
2. Documento de cesión de derechos.

NOTIFICACIONES

Recibiré notificaciones en la secretaria de este Despacho y en mi oficina, ubicada en la Calle 83ª No. 23-90 de esta ciudad.

De la Señora Directora,



JESÚS M. MÉNDEZ BERMÚDEZ
C.C. No. 13.491.525
T.P.A. No. 99.678 del C. S. de la J.

FOR INTELLECTUAL PROPERTY

Yo, Kevin Goldstein actuando en nombre y representación de **BOBSBOX, LLC** con domicilio en **4600 Georgia Avenue, West Palm Beach, Florida 33405 (US)** por el presente nombra a la Dra. Mónica Wolf Wasserman, identificada con C. C. No. 51.711.267 y/o al Dr. Jesús M. Méndez Bermúdez, identificado con C. C. No. 13.491.525, miembros de la firma **WOLF • MENDEZ • ABOGADOS ASOCIADOS**, con domicilio en la Diagonal 83A No. 23 - 90, de Bogotá D.C. - Colombia, como sus representantes legales, para que actúen conjunta o separadamente al propósito de recibir notificaciones y nombrar apoderados judiciales o extrajudiciales. En desarrollo de dicha calidad los representantes, o los apoderados que ellos designen, podrán recabar de las autoridades administrativas, trámites de solicitudes de patente, en especial de la patente No. PCT/US2020/054981 en Colombia a cuyo efecto les faculta para dar ante dichas autoridades todos los pasos necesarios al objeto indicado y en fin tomar todas las medidas que creyeren conducentes al resguardo de nuestros intereses con todas las demás facultades legales necesarias. Este poder comprende además las facultades de recibir, desistir, transigir, conciliar, comprometer, sustituir en todo o en parte, revocar sustituciones y ratificar actuaciones anteriores hechas en calidad de Agentes Oficiosos.

Dado y firmado en Estados Unidos de América, el 6
de junio de 2022.

(Firma)

The undersigned, Kevin Goldstein acting on behalf of **BOBSBOX, LLC** with domicile in **4600 Georgia Avenue, West Palm Beach, Florida 33405 (US)** hereby appoints Dr. Mónica Wolf Wasserman, identified with Citizenship Card No. 51.711.267 and/or Dr. Jesús M. Méndez Bermúdez, identified with Citizenship Card No. 13.491.525, attorneys at law of the firm **WOLF • MENDEZ • ABOGADOS ASOCIADOS** domiciled in Diagonal 83A No. 23 - 90, of Bogotá - Colombia, as our legal representatives, so that either or both said attorneys may act for the purpose of receiving notifications and to appoint attorneys to act in and out of court. In such capacity the representatives, or the attorneys by them appointed, may request from the administrative authorities filing patent applications in particular patent application No. PCT/US2020/054981 in Colombia for which they are empowered to take before said authorities all the necessary steps for the purposes indicated, and to take any other measures that may be deemed conducive to the safeguard of our interests, with all necessary legal faculties to receive, withdrawal, compromise, transact, conciliate, substitute in all or in part, to revoke substitutions and ratify acts done as attorney de facto.

Given and signed in United States of America on June
6, 2022.

(Signature)

CORPORATE SEAL
TO BE AFFIXED

ASSIGNMENT

WHEREAS, we, **Kevin T. Aycock, Matthew Graham, Marcela Torres, Kevin W. Goldstein**, and **Walter Pierce**, have invented certain new and useful improvements in and to the invention entitled:

IN-GROUND ENCLOSURE SYSTEM

described in an application for Letters Patent filed on October 11, 2019, and accorded U.S. Patent Application No. 16/599,671, which is a continuation-in-part of U.S. Non-Provisional Application 16/164,036, filed October 18, 2018, which is a continuation of U.S. Non-Provisional Application No. 15/694,186, filed September 1, 2017, now granted as U.S. Patent No. 10,141,730, which claims priority to U.S. Provisional Patent Application No. 62/483,005, filed April 7, 2017 (hereinafter collectively the "Invention").

AND, WHEREAS, **BOBSBOX, LLC.**, a Florida company, whose address is 7209 Reserve Creek Dr., Port St. Lucie, Florida 34986, (hereinafter "ASSIGNEE"), is desirous of acquiring certain rights in the Invention including all patents and patent applications thereto;

NOW, THEREFORE, in view of good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, we do hereby sell, assign and transfer unto said ASSIGNEE, its successors, assigns and legal representatives, our entire right, title and interest in and throughout the United States of America (including its territories and dependencies) and all countries foreign thereto in and to said Invention including said United States patent application(s), any other United States patent application(s), including provisional, divisional, renewal, substitute, continuation, continuation-in-part, reexamination and reissue applications, and extensions thereof based in whole or in part on said United States patent application or in whole or in part on said Invention, any foreign applications, including international and regional applications, based in whole or in part on any of the aforesaid United States applications or in whole or in part on said Invention, in and to any and all letters patent, including extensions thereof, of any country which have been or may be granted on any of the aforesaid applications or on said Invention or any part(s) thereof, and in and to any right to claim priority to any of the aforesaid patents and/or patent applications;

AND we hereby authorize and request, Duane Morris LLP, whose address is 1875 NW Corporate Blvd., Suite 300, Boca Raton, Florida 33431-8561, to insert hereon any identification necessary or desirable for recordation of this document, including the filing date and application number of said application when known.

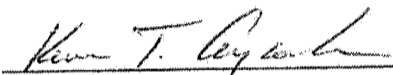
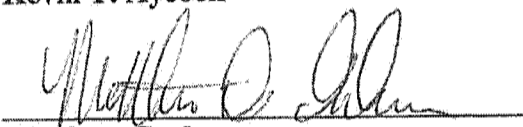
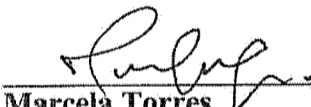
AND we hereby agree for ourselves and our heirs, executors and administrators to execute without further consideration any further documents and instruments which may be necessary, lawful and proper in the prosecution of said above-referenced application or in the preparation or prosecution of any continuing, substitute, divisional, renewal, reexamination or reissue application or in any amendments, extensions or interference proceedings, or other applications for patents of any region or country, that may be necessary to secure to ASSIGNEE its interest and title in and to said Invention or any part(s) thereof, and in and to said several patents or any of them;

AND we hereby covenant for ourselves and our legal representatives, and agree with said ASSIGNEE, its successors and assigns, that we have granted no right or license to make, use, sell or offer to sell said Invention, to anyone except said ASSIGNEE, that prior to the execution of this deed, our right, title and interest in said Invention had not been otherwise encumbered, and that we have not and will not execute any instrument in conflict therewith;

AND we do hereby authorize and request the United States Commissioner for Patents to issue any and all letters patent which may be granted upon said United States applications, or upon said Invention or any part(s) thereof when granted, to said ASSIGNEE;

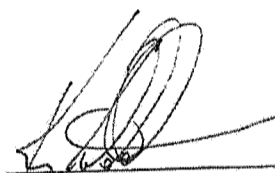
IN WITNESS WHEREOF, we have hereunto set our hand and seal.

FOR ASSIGNOR: The Named Inventors

Date <u>10/26/19</u>	Inventor <u></u> Kevin T. Aycock
Date <u>10/28/19</u>	Inventor <u></u> Matthew Graham
Date <u>10/28/2019.</u>	Inventor <u></u> Marcela Torres

Date 10.15.2019

Inventor



Kevin W. Goldstein

Date 10/29/2019

Inventor



Walter Pierce

DOCUMENT MADE AVAILABLE UNDER THE PATENT COOPERATION TREATY (PCT)

International application number:	PCT/US2020/054981
International filing date:	09 October 2020 (09.10.2020)
Document type:	Certified copy of priority document
Document details:	Country/Office: US
	Number: 16/841,120
	Filing date: 06 April 2020 (06.04.2020)
Date of receipt at the International Bureau:	26 October 2020 (26.10.2020)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a),(b) or (b-bis)

1100539

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

October 25, 2020

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

APPLICATION NUMBER: *16/841,120*

FILING DATE: *April 06, 2020*

RELATED PCT APPLICATION NUMBER: *PCT/US20/54981*

THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS CONVENTION, IS *US16/841,120*



Certified by

Andres Ibarra

Under Secretary of Commerce
for Intellectual Property
and Director of the United States
Patent and Trademark Office

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.

UTILITY PATENT APPLICATION TRANSMITTAL <i>(Only for new nonprovisional applications under 37 CFR 1.53(b))</i>	Attorney Docket No.	G3743-00205
	First Named Inventor	Kevin T. AYCOCK
	Title	IN-GROUND ENCLOSURE SYSTEM
	Priority Mail Express® Label No.	

APPLICATION ELEMENTS <i>See MPEP chapter 600 concerning utility patent application contents.</i>	Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450
1. ☐ Fee Transmittal Form (PTO/SB/17 or equivalent) 2. ☒ Applicant asserts small entity status. See 37 CFR 1.27 3. ☐ Applicant certifies micro entity status. See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent. 4. ☒ Specification [Total Pages <u>38</u>] Both the claims and abstract must start on a new page. (See MPEP § 608.01(a) for information on the preferred arrangement) 5. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets <u>32</u>] 6. Inventor's Oath or Declaration [Total Pages _____] (including substitute statements under 37 CFR 1.64 and assignments serving as an oath or declaration under 37 CFR 1.63(e)) a. ☐ Newly executed (original or copy) b. ☐ A copy from a prior application (37 CFR 1.63(d)) 7. ☒ Application Data Sheet * See note below. See 37 CFR 1.76 (PTO/AIA/14 or equivalent) 8. CD-ROM or CD-R in duplicate, large table, or Computer Program (Appendix) ☐ Landscape Table on CD 9. Nucleotide and/or Amino Acid Sequence Submission (if applicable, items a. – c. are required) a. ☐ Computer Readable Form (CRF) b. ☐ Specification Sequence Listing on: i. ☐ CD-ROM or CD-R (2 copies); or ii. ☐ Paper c. ☐ Statements verifying identity of above copies	ACCOMPANYING APPLICATION PAPERS 10. ☐ Assignment Papers (cover sheet & document(s)) Name of Assignee _____ 11. ☐ 37 CFR 3.73(c) Statement ☐ Power of Attorney (when there is an assignee) 12. ☐ English Translation Document (if applicable) 13. ☒ Information Disclosure Statement (PTO/SB/08 or PTO-1449) ☒ Copies of citations attached 14. ☐ Preliminary Amendment 15. ☐ Return Receipt Postcard (MPEP § 503) (Should be specifically itemized) 16. ☐ Certified Copy of Priority Document(s) (if foreign priority is claimed) 17. ☐ Nonpublication Request Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent. 18. ☐ Other: _____ _____ _____ _____ _____

***Note:** (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 **must** be included in an Application Data Sheet (ADS).
(2) For applications filed under 35 U.S.C. 111, the application must contain an ADS specifying the applicant if the applicant is an assignee, person to whom the inventor is under an obligation to assign, or person who otherwise shows sufficient proprietary interest in the matter. See 37 CFR 1.46(b).

19. CORRESPONDENCE ADDRESS					
☒ The address associated with Customer Number: <u>11753</u> OR ☐ Correspondence address below					
Name					
Address					
City	State	Zip Code			
Country	Telephone	Email			
Signature	/ Gregory M. Lefkowitz /			Date	April 6, 2020
Name (Print/Type)	Gregory M. Lefkowitz			Registration No. (Attorney/Agent)	56216

This collection of information is required by 37 CFR 1.53(b). 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 1.11 and 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, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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 patent. 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, to another 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.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	G3743-00205
		Application Number	
Title of Invention	IN-GROUND ENCLOSURE SYSTEM		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2:

☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
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Inventor Information:

Inventor	1				Remove	
Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
	Kevin	T.	Aycock			
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service						
City	Port St. Lucie	State/Province	FL	Country of Residence	US	
Mailing Address of Inventor:						
Address 1	7209 Reserve Creek Dr.					
Address 2						
City	Port St. Lucie	State/Province	FL			
Postal Code	34986	Country i	US			
Inventor	2				Remove	
Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
	Matthew		Graham			
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service						
City	West Palm Beach	State/Province	FL	Country of Residence	US	
Mailing Address of Inventor:						
Address 1	7209 Reserve Creek Dr.					
Address 2						
City	Port St. Lucie	State/Province	FL			
Postal Code	34986	Country i	US			
Inventor	3				Remove	
Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
	Kevin		Goldstein			
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service						

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	G3743-00205
		Application Number	
Title of Invention	IN-GROUND ENCLOSURE SYSTEM		

City	Berwyn	State/Province	FL	Country of Residence ⁱ	US
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Mailing Address of Inventor:

Address 1	7209 Reserve Creek Dr.				
Address 2					
City	Port St. Lucie	State/Province	FL		
Postal Code	34986	Country ⁱ	US		
Inventor	4				Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Marcela		Torres	

Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service

City	Hollywood	State/Province	PA	Country of Residence ⁱ	US
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Mailing Address of Inventor:

Address 1	7209 Reserve Creek Dr.				
Address 2					
City	Port St. Lucie	State/Province	FL		
Postal Code	34986	Country ⁱ	US		

 All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button.
Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).			
☐ An Address is being provided for the correspondence Information of this application.			
Customer Number	11753		
Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	IN-GROUND ENCLOSURE SYSTEM		
Attorney Docket Number	G3743-00205	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	32	Suggested Figure for Publication (if any)	1

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	G3743-00205
		Application Number	
Title of Invention	IN-GROUND ENCLOSURE SYSTEM		

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not be** the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	11753		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation in part of	16599671	2019-10-11

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number		G3743-00205	
		Application Number			
Title of Invention		IN-GROUND ENCLOSURE SYSTEM			
Prior Application Status		Pending		Remove	
Application Number		Continuity Type		Filing or 371(c) Date (YYYY-MM-DD)	
16599671		Continuation in part of		16164036 2018-10-18	
Prior Application Status		Patented		Remove	
Application Number		Continuity Type		Filing Date (YYYY-MM-DD)	
16164036		Continuation of		15694186 2017-09-01	
Prior Application Status		Expired		Remove	
Application Number		Continuity Type		Filing or 371(c) Date (YYYY-MM-DD)	
15694186		Claims benefit of provisional		62483005 2017-04-07	
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This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)ⁱ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Number			Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ⁱ (if applicable)	Remove
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Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

☐ NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	G3743-00205
		Application Number	
Title of Invention	IN-GROUND ENCLOSURE SYSTEM		

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	G3743-00205
		Application Number	
Title of Invention	IN-GROUND ENCLOSURE SYSTEM		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant	1	Remove
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If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

[Clear](#)

☒ Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.		Person who shows sufficient proprietary interest

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	BOBSBOX, LLC.		
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Email Address			

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	G3743-00205
		Application Number	
Title of Invention	IN-GROUND ENCLOSURE SYSTEM		

Assignee	1		
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.			
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This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/ Gregory M. Lefkowitz /		Date (YYYY-MM-DD)	2020-04-06	
First Name	Gregory	Last Name	Lefkowitz	Registration Number	56216
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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	G3743-00205
		Application Number	
Title of Invention	IN-GROUND ENCLOSURE SYSTEM		

This collection of information is required by 37 CFR 1.76. 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 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet 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, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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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 the Freedom of Information Act requires disclosure of these records.
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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.
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6. A record in this system of records may be disclosed, as a routine use, to another 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 inspections 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.

ABSTRACT

An in-ground enclosure for housing electrical components is provided. The in-ground enclosure can include an outer shell defining an internal compartment housing a lift system, an equipment rack structure connected to the lift system, an upper panel comprising a compartment opening for accessing the internal compartment, an enclosure cover adapted to cover the compartment opening and for removably sealing the compartment opening. In certain uses, a telecommunications base station may also be provided. The telecommunications base station can include the in-ground enclosure and a cellular base station, with the cellular base station including an antenna coupled to signal processing equipment and a power supply.

CLAIMS

What is claimed is:

1. An enclosure for housing electrical components, comprising:
a shell defining an interior compartment;
an upper panel comprising an interior compartment opening for accessing the interior compartment;
a compartment cover adapted for removably sealing the interior compartment opening;
an equipment rack comprising an equipment lift system that is coupled to both the compartment cover and a base in the interior compartment; and
an air handling system to control environmental conditions within said interior compartment;
wherein the equipment lift system is adapted to move between a retracted position, where the compartment cover seals the interior compartment opening, and an extended position where the equipment rack extends through the compartment opening to provide above ground access to the equipment rack, and
wherein said enclosure is adapted for in-ground installation.
2. The enclosure of claim 1, wherein said air handling system comprises a split air conditioner comprising an air handler and a condenser, wherein said air handler is located within said interior compartment, and said condenser is located above ground outside the interior compartment.
3. The enclosure of claim 2, further comprising an above ground, vertical element that houses said condenser.
4. The enclosure of claim 3, wherein said above ground vertical element is selected from the group consisting of a light pole, kiosk, solar panel pole, or advertising signage.
5. The enclosure of claim 1, wherein said air handling system is a geo-thermal heat pump.

6. The enclosure of claim 5, wherein said geo-thermal heat pump uses a closed-loop working fluid circulation system.

7. The enclosure of claim 5, wherein said geo-thermal heat pump uses an open-loop working fluid circulation system.

8. The enclosure of claim 1, wherein said air handling system incorporates a passive heat pipe working fluid phase change system.

9. The enclosure of claim 8, further comprising an above ground, vertical element, and a condenser of said passive heat pipe working fluid phase change system is located within said above ground, vertical element.

10. The enclosure of claim 1, further comprising at least one thermoelectric generator coupled to the shell of said enclosure, and at least one battery, wherein electricity generated by said at least one thermoelectric generator is stored in said at least one battery.

11. The enclosure of claim 10, further comprising cooling fins thermally coupled to an exterior surface of the thermoelectric generator.

12. The enclosure of claim 10, wherein an interior surface of each of the at least one thermoelectric generators is positioned to thermally contact air within the shell and an exterior surface of each of the at least one thermoelectric generators is positioned to thermally contact material in which the enclosure is buried.

13. A telecommunications base station, comprising:
an enclosure for housing electrical components, comprising:
an outer shell defining an interior compartment;
an upper panel comprising a compartment opening for accessing the interior compartment;

a compartment cover adapted for removably sealing the compartment opening;

an equipment rack comprising an equipment lift system that is coupled to both the compartment cover and a base in the interior compartment;

an air handling system to control environmental conditions within said interior compartment; and

a cellular base station, comprising an antenna coupled to signal processing equipment and a power supply, comprising a battery, a connection to an external power source, or both,

wherein the signal processing equipment and the battery are coupled to the equipment rack,

wherein, in a storage position, the signal processing equipment and the battery are housed within the interior compartment, and wherein, in an extended position, the equipment rack extends through the compartment opening, and

wherein said enclosure for housing electrical components is adapted for in-ground installation.

14. The telecommunications base station of claim 13, further comprising an above-ground, vertical element to which the antenna is connected.

15. The telecommunications base station of claim 14, wherein the vertical above ground element is one of a light pole, kiosk, solar panel pole, totem pole, or advertising signage.

16. The telecommunications base station of claim 13, wherein said air handling system comprises a split air conditioner comprising an air handler and a condenser, wherein said air handler is located within said interior compartment, and said condenser is located above ground outside the interior compartment.

17. The telecommunications base station of claim 13, further comprising an above ground, vertical element that houses said condenser.

18. The telecommunications base station of claim 13, wherein said air handling system is a geo-thermal heat pump.

19. The telecommunications base station of claim 13, wherein said air handling system incorporates a passive heat pipe working fluid phase change system.

IN-GROUND ENCLOSURE SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

[1] The present application is a continuation-in-part of U.S. Non-Provisional Application No. 16/599,671 filed October 11, 2019, which is a continuation-in-part of U.S. Non-Provisional Application No. 16/164,036, filed October 18, 2018, which is a continuation of U.S. Non-Provisional Application No. 15/694,186, filed September 1, 2017, now granted as U.S. Patent No. 10,141,730, which claims priority to U.S. Provisional Patent Application No. 62/483,005, filed April 7, 2017, the entireties of which are each incorporated herein by reference for all purposes.

FIELD OF THE DISCLOSURE

[2] The present disclosure relates generally to an enclosure, and more specifically to an underground enclosure for various electronic equipment, including without limitation, telecommunications equipment.

BACKGROUND OF THE INVENTION

[3] A cell tower (also known as a “cell site”) is a cellular telephone site where antennae and electronic communications equipment are positioned. The working range of a cell tower can depend on several factors, including, for example, the height of the tower relative to the surrounding terrain, the presence of buildings or vegetation that may reflect or absorb the electromagnetic energy, the spectrum of frequency used for the wireless transmission, cell phone traffic in the area, and weather conditions. In terms of real estate size and needs, cell towers can be sprawling structures, including the tower or pole, one or more equipment structures or sheds, and fencing, requiring up to 10,000 square feet of land, or about ¼ acre. Because of the demands for cellular coverage, cell towers are needed proximate to areas of high population density so that the most potential users can utilize the towers. However, each cell site can only handle a finite number of calls or data traffic.

SUMMARY OF THE INVENTION

[1] In some embodiments, an in-ground enclosure for housing electrical components is provided. The in-ground enclosure for housing electrical components can include a shell defining an interior compartment, an upper panel comprising a compartment opening for accessing the interior compartment, a compartment cover adapted for removably sealing the compartment opening, an equipment rack comprising an equipment lift system that is coupled to the compartment cover, and further is coupled to a base in the interior compartment, and wherein the equipment lift system is adapted to move between a retracted position, where the compartment cover seals the interior compartment opening, and an extended position where the equipment rack extends through the compartment opening to provide above ground access to the equipment rack. The upper panel can be attached to and/or integrally formed with the shell.

[2] In some embodiments, an in-ground enclosure for housing electrical components is provided. The in-ground enclosure for housing electrical components can include a shell defining an interior compartment, wherein the outer shell comprises a plurality of panels interconnected to form a shell (which can be a sealed shell), an upper panel comprising an opening for accessing the interior compartment, a compartment cover adapted for removably sealing the interior compartment opening, an equipment rack comprising an equipment lift system that is coupled to the compartment cover, and further is coupled to a base in the interior compartment, and wherein the equipment lift system is adapted to move between a retracted position, where the compartment cover seals the interior compartment opening, and an extended position where the equipment rack extends through the compartment opening to provide above ground access to the equipment rack. The upper panel can be attached to and/or integrally formed with the shell.

[3] In some embodiments, an in-ground enclosure for housing electrical components is provided. The in-ground enclosure for housing electrical components can include a cylindrical shell defining an interior compartment and having a compartment opening for accessing the interior compartment, a compartment cover adapted for removably sealing the compartment opening, an equipment rack comprising an equipment lift system that is coupled to the compartment cover, and further is coupled to a base in the interior compartment, and wherein the equipment lift system is adapted to move between a retracted position, where the compartment

cover seals the interior compartment opening and the cylindrical shell, and an extended position where the equipment rack extends through the upper opening to provide above ground access to the equipment rack.

[4] In some embodiments, a telecommunications base station is provided. The telecommunications base station can include an in-ground enclosure for housing electrical components, comprising an outer shell defining an interior compartment, an upper panel comprising a compartment opening for accessing the interior compartment, a compartment cover adapted for removably sealing the compartment opening, an equipment rack comprising an equipment lift system that is coupled to the compartment cover, and further is coupled to a base in the interior compartment, and can include a cellular base station, comprising an antenna coupled to signal processing equipment and a power supply, comprising a battery, a connection to an external power source, or both, wherein, in a storage position, the signal processing equipment and the battery are housed within the interior compartment. The upper panel can be attached to and/or integrally formed with the shell.

BRIEF DESCRIPTION OF THE DRAWINGS

[5] The features and advantages of the present invention will be more fully disclosed in, or rendered obvious by the following detailed description of the embodiments, which are to be considered together with the accompanying drawings wherein like numbers refer to like parts and further wherein:

[6] FIG. 1 illustrates an environmental view of an in-ground enclosure that is incorporated as part of a telecommunications base station as described herein.

[7] FIG. 2 is a control schematic of an in-ground enclosure, including the gas handling system as described herein.

[8] FIG. 3 is a top, perspective view of the first and second compartment openings of the in-ground enclosure as described herein.

[9] FIG. 4 is a side, perspective view of the in-ground enclosure showing the external conduits as described herein.

[10] FIG. 5 is a top, perspective view of the second compartment showing the external and internal conduits extending into the second compartment as described herein.

[11] FIG. 6 is a cross-sectional view of a sidewall of the enclosure showing the sidewall gap, as well as, external conduits plugged with conduits and conduit couplers as described herein.

[12] FIG. 7 is a partially exploded view of the first compartment prior to being inserted into the outer shell as described herein.

[13] FIG. 8 is a partially exploded view of the second compartment prior to being inserted into the outer shell as described herein.

[14] FIG. 9 is a partially exploded view showing the first and second compartments located adjacent one another in preparation for placing the outer shell over them as described herein.

[15] FIG. 10 is a bottom view of FIG. 9 once the first and second compartments have been inserted into the outer shell and spacers have been attached to the bases of the first and second compartments as described herein.

[16] FIG. 11 is a partially exploded view showing the first and second compartments located adjacent one another in preparation for placing the outer shell over them and sealing them in the outer shell with the outer base as described herein.

[17] FIG. 12 is a perspective view of a double-walled in-ground enclosure.

[18] FIG. 13 is a partial, cross-sectional view of FIG. 12 taken along cut line 13–13.

[19] FIG. 14A and FIG. 14B are perspective views of an equipment rack and equipment lift system as described herein, as well as, the battery rack and battery lift system as described herein.

[20] FIG. 15 is a perspective view of a rack and lift system showing a lock-out system as described herein.

[21] FIG. 16A and FIG. 16B are front and end views of a diffuser that can be used in connection with the equipment racks and battery racks as described herein.

[22] FIG. 17 is a bottom view of a first compartment cover showing the locking arms in the open position as described herein.

[23] FIG. 18 is a bottom view of a first compartment cover showing the locking arms in the locked position as described herein.

[24] FIG. 19 is a bottom view of a second compartment cover showing the locking arms in the open position as described herein.

[25] FIG. 20 is a bottom view of a second compartment cover showing the locking arms in the locked position as described herein.

[26] FIG. 21 is a semi-transparent view of a cover lock disposed in the cover lock recess as described herein.

[27] FIG. 22 is a cross-sectional view of the interface between a compartment opening and a compartment cover in the locked position (without a cover lock for clarity) as described herein.

[28] FIG. 23 illustrates an environmental view of an in-ground enclosure that is incorporated as part of a telecommunications base station, including an underground ground ring as described herein.

[29] FIG. 24 is a side view of an exemplary embodiment of an antenna pole having telescoping sections as described herein.

[30] FIG. 25 is a side cross-sectional view of an in-ground enclosure showing placement of heat transfer particles around an exterior of an in-ground enclosure.

[31] FIG. 26 is a perspective view of a single walled, multi-panel in-ground enclosure as described herein.

[32] FIG. 27 is a partial, cross-sectional view of FIG. 26 taken along cut line 27–27.

[33] FIG. 28 is a perspective view of a cylindrical in-ground enclosure as described herein.

[34] FIG. 29 illustrates an environmental view of an in-ground enclosure that is incorporated as part of a telecommunications base station, including an air conditioning system with a condenser located in an above ground vertical element as described herein.

[35] FIG. 30 illustrates an environmental view of an in-ground enclosure that is incorporated as part of a telecommunications base station, including one or more above ground vertical elements as described herein.

[36] FIG. 31 is a side cross-sectional view of an embodiment of an in-ground enclosure that incorporates a geo-thermal heat pump environmental control system as described herein.

[37] FIG. 32 is a side cross-sectional view of an embodiment of an in-ground enclosure that incorporates a working fluid phase change heat pipe environmental control system as described herein.

[38] FIG. 33 is a side cross-sectional view of an embodiment of an in-ground enclosure showing the enclosure shell side and base panels with an exemplary configuration layout for thermoelectric generators as described herein.

[39] FIG. 34 is a partial, side cross-sectional view of an embodiment of an in-ground enclosure showing an example configuration of cooling fins incorporated with thermoelectric generators as described herein.

DETAILED DESCRIPTION

[40] The description of the preferred embodiments is intended to be read in connection with the accompanying drawings, which are to be considered part of the entire written description of this invention. The drawing figures are not necessarily to scale and certain features of the invention may be shown exaggerated in scale or in somewhat schematic form in

the interest of clarity and conciseness. In this description, relative terms such as “horizontal,” “vertical,” “up,” “down,” “top,” “bottom,” as well as derivatives thereof (e.g., “horizontally,” “downwardly,” “upwardly,” etc.) should be construed to refer to the orientation as then described or as shown in the drawing figure under discussion. These relative terms are for convenience of description and normally are not intended to require a particular orientation. Terms including “inwardly” versus “outwardly,” “longitudinal” versus “lateral” and the like are to be interpreted relative to one another or relative to an axis of elongation, or an axis or center of rotation, as appropriate. Terms concerning attachments, coupling and the like, such as “connected” and “interconnected,” refer to a relationship wherein structures are secured or attached to one another either directly or indirectly through intervening structures, as well as both moveable or rigid attachments or relationships, unless expressly described otherwise, and includes terms such as “directly” coupled, secured, etc. The term “operatively coupled” is such an attachment, coupling, or connection that allows the pertinent structures to operate as intended by virtue of that relationship.

[41] As shown in FIGS. 1–28, in various embodiments, an in-ground enclosure 10 for housing electrical components is disclosed. The in-ground enclosure can include an outer shell 12, a first compartment 14 located within the outer shell 12; a second compartment 16 located within the outer shell 12; and an upper panel 18 comprising a first compartment opening 20 for accessing the first compartment 14 and a second compartment opening 22 for accessing the second compartment 16. The in-ground enclosure 10 can include a dividing wall 24 separating the first compartment 14 from the second compartment 16. The in-ground enclosure can also include a first compartment cover 26 adapted for removably sealing the first compartment opening 14, a second compartment cover 28 adapted for removably sealing the second compartment opening 16, or both 26, 28.

[42] In some embodiments, as shown in FIGS. 3–6, one or more external conduits 30 extend from the exterior of the in-ground enclosure 10 to the interior of the first compartment 14 or the second compartment 16. In such embodiments, the external conduits 30 allow a line to pass from outside the in-ground enclosure 10 to the first compartment 14 or the second compartment. Examples of lines that may pass through an external conduit 30 include, but are not limited to, an electrical supply, a communication line (e.g., fiber optics, coaxial cables), an

air hose, and wires (*e.g.*, for connecting an external control panel to internal electronics). In some embodiments, the external conduits 30 can be corrosion resistant pipes.

[43] In some embodiments, a first external conduit 30a can be used for a communication line (*e.g.*, a fiber optic cable), a second external conduit 30b can be used for an electrical supply, and a third external conduit 30c can be used for an air hose. The lines passing through the external conduits 30 can be secured with a conduit coupler 32 to form a water-tight and air-tight seal with the external conduit 30. For example, the conduit coupler 32 can be a plug-type sealing system such as that made by Roxsystems and marketed under the ROXTEC[®] trademark. A conduit coupler 32 can be positioned on the outside end 34 of the external conduit 30, the inside end 36 of the external conduit 30, or both 34, 36.

[44] In some embodiments, one or more internal conduits 38 extend through the dividing wall 24 to allow a line to pass from the first compartment 14 to the second compartment 16. In some embodiments, a first internal conduit 38a can be used for a communication line (*e.g.*, a fiber optic cable), a second internal conduit 38b can be used for an electrical supply, and a third internal conduit 38c can be used for an air hose. The lines passing through the internal conduits 38 can be secured with a conduit coupler 32 to form a water-tight and air-tight seal with the internal conduit 38. For example, as shown in FIGS. 4 and 6, the conduit coupler 32 can be a plug-type sealing system such as that made by Roxsystems and marketed under the ROXTEC[®] trademark. A conduit coupler 32 can be positioned on the first compartment side 40 of the internal conduit 38, the second compartment side 42 of the internal conduit 38, or both 40, 42.

[45] In some embodiments, the first compartment 14 and the second compartment 16 can be, controllably or permanently, hermetically isolated from one another when the first compartment cover 26 seals the first compartment opening 20 and the second compartment cover 28 seals the second compartment opening 22. As will be discussed in more detail below, when the first and second compartments 14, 16 are controllably hermetically sealed, the exchange of gas can be controlled so that no gas is exchanged when the applicable valves of the gas handling system 78 are closed and gas can be exchanged when the applicable valves of the gas handling system 78 are opened.

[46] In some embodiments, as shown in FIGS. 2, 6, and 13, the sidewalls 46 of the in-ground enclosure 10 comprise an inner sidewall 48 and an outer sidewall 50 separated by a sidewall gap 52, and the sidewall gap 52 is filled with heat transfer particles 54. In some embodiments, a portion of the inner sidewall 48 comprises exterior sidewalls of the first compartment 14 and exterior sidewalls of the second compartment 16, while the outer sidewall 50 is an exterior sidewall of the outer shell 12.

[47] In some embodiments, as shown in FIGS. 2 and 13, there is a dividing wall gap 56 between the first side 58 and the second side 60 of the dividing wall 24. In some embodiments, the dividing wall gap 56 is filled with heat transfer particles 54. In some embodiments, the first side 58 of the dividing wall 24 comprises an exterior sidewall of the first compartment 14 and the second side 60 of the dividing wall 24 comprises an exterior sidewall of the second compartment 16.

[48] In some embodiments, as best shown in FIG. 13, a base 62 of the in-ground enclosure 10 comprises an inner base 64 and an outer base 66 separated by a base gap 68, wherein the base gap 68 is filled with heat transfer particles 54, wherein a bulk density of the heat transfer particle in the sidewall gap is at least 75% of a density of the heat transfer particle. In some embodiments, a portion of the inner base 64 comprises a base of the first compartment 14 and a base of the second compartment 16, while the outer base 66 is a base of the outer shell 12.

[49] In some embodiments, each of the gaps 52, 56, 68 independently range from 0.5 to 5 inches. In some embodiments, each of the gaps 52, 56, 68 independently range from 0.75 to 4 inches, or from 1 to 3.5 inches. In some embodiments, each of the gaps 52, 56, 68 independently range from 1.25 to 2.5 inches (e.g., 1.5 inches, 1.75 inches, 2.0 inches, 2.25 inches). In some embodiments, the sidewall gap 52 can be 1 to 3 inches, while the dividing wall gap 56 can be 2 to 5 inches, and the base gap 68 can be 0.5 to 3 inches.

[50] In some embodiments, as shown in FIGS. 7–13, the in-ground enclosure 10 can be formed from a first compartment 14 and a second compartment 16 inserted into the outer shell 12. The gaps 52, 56 can be maintained by spacers 15, which may also function as reinforcing elements. In some embodiments, the spacers 15 can be welded to an exterior of the

first compartment 14, the second compartment 16, or both 14, 16. In some embodiments, the first compartment 14 and the second compartment 16 can be sealed within the outer shell 12 by the outer base 66, which can be secured to lower edges of the outer shell 12. Like the sides, the gap between the bases 64 of the first compartment 14 and second compartment 16 and the outer base 66 can be maintained by spacers 15. The upper portions of the first compartment 14 and the second compartment 16 should be sealed in an airtight fashion to the upper panel 18 or portions of the outer shell 12 so that a positive pressure can be maintained in each of the first compartment 14 and the second compartment 16. Similarly, in order to keep the heat transfer particles 54 in their optimal state the outer base 66 should be sealed in a waterproof fashion to the outer shell 12.

[51] As shown in Figures 7–13, the sides 50 of the outer shell 12 are angled so that the outer shell 12 is wider and longer at the base 66 than proximate the upper panel 18. This design is intended to maintain the in-ground enclosure 10 within the ground and prevent it from “floating,” particularly when the surrounding soils are saturated with water. In some embodiments, the sides of the first compartment 14 and the second compartment 16 are also angled so that they remain parallel with the adjacent outer sidewall 50 of the outer shell 12. In some embodiments, the outer sidewalls 50 and, optionally, the inner sidewalls 48 are maintained at an angle (θ) of 2.5 to 30 degrees, or 5 to 20 degrees, or 5 to 15 degrees relative to vertical.

[52] The outer shell 12, first compartment 14, and the second compartment 16 can be formed from corrosion resistant materials. For example, the outer shell 12, first compartment 14, and the second compartment 16 can be formed of a metal alloy that is corrosion resistant and/or can be coated with additional materials to prevent corrosion. In addition, or in the alternative, corrosion of the outer shell 12, first compartment 14, and the second compartment 16 can be reduced or prevented by cathodic protection. In some embodiments, the outer shell 12, first compartment 14, and the second compartment 16 can be formed from a weathering steel, such as that sold by United States Steel Corporation under the trademark COR-TEN[®], which can undergo additional protection. For example, the steel can undergo washing, zinc phosphatizing, coating with a primer, coating with a cationic epoxy electrocoat, coating with a polyester paint, curing, etc.

[53] In some embodiments, the bulk density of the heat transfer particles 54 in one or more of the sidewall gap 52, the dividing wall gap 56, and the base gap 68 is at least 75% of a density of the heat transfer particles 54. In some embodiments, the bulk density of the heat transfer particles 54 in one or more of the sidewall gap 52, the dividing wall gap 56, and the base gap 68 is at least 77.5%, or at least 80%, or at least 82.5%, or at least 85%, or at least 87.5%, or at least 90% of the density of the heat transfer particles 54. In some embodiments, the heat transfer particles 54 can be made of a material having a thermal conductivity of at least 70 W/mK (~ 40 BTU-ft/hr/ft² °F), or at least 100 W/mK (~ 58 BTU-ft/hr/ft² °F), or at least 200 W/mK (~ 115.6 BTU-ft/hr/ft² °F), or at least 300 W/mK (~ 173.3 BTU-ft/hr/ft² °F), or at least 400 W/mK (~ 231.1 BTU-ft/hr/ft² °F), or at least 450 W/mK (~ 260 BTU-ft/hr/ft² °F), or at least 500 W/mK (~ 288.9 BTU-ft/hr/ft² °F). In some embodiments, the heat transfer particles 54 can be made of a material having an electrical resistivity of at least 300 $\mu\Omega$ -in, or at least 400 $\mu\Omega$ -in, or at least 425 $\mu\Omega$ -in. In some embodiments, the heat transfer particles 54 can be made of a material having a density in the range of 1.25 g/cm³ to 2.00 g/cm³ or from 1.30 g/cm³ to 1.88 g/cm³.

[54] In some embodiments, the heat transfer particles have maximum dimensions of 50 to 1,000 microns, or from 75 to 750 microns, or from 100 to 500 microns, or from 125 to 400 microns. In some embodiments, the minimum size of the maximum dimension is at least 10 microns. In some embodiments, the median (D50) particle size is between 75 microns and 180 microns. In some embodiments, a maximum of 30 wt.% of the particles, or 25 wt.% of the particles, or 20 wt.% of the particles, do not pass through an 80 mesh (180 micron) screen. In some embodiments, a maximum of 50 wt.% of the particles, or 45 wt.% of the particles, or 40 wt.% of the particles, do not pass through a 100 mesh (150 micron) screen. In some embodiments, a maximum of 30 wt.% of the particles, or 25 wt.% of the particles, or 20 wt.% of the particles, do pass through a 325 mesh (44 micron) screen. This prevents dusting problems and provides a light-weight, high performance heat transfer material.

[55] In some embodiments, the heat transfer particles 54 are flakes. In some embodiments, the heat transfer particle comprises graphite particles (*e.g.*, flakes). In some embodiments, the heat transfer particles comprise expanded graphite particles (*e.g.*, flakes). Examples of expanded graphite particles include those sold by Entegris, Inc. under the

trademark POCO[®] graphites, and those sold by Carbon Graphite Materials, Inc. In some embodiments, the heat transfer particles comprise natural or synthetic graphite flakes. In some embodiments, the heat transfer particles comprise crystalline graphite flakes. In some embodiments, the heat transfer particles comprise graphite flakes having at least 90% carbon, or at least 94% carbon, or at least 96% carbon, or at least 99% carbon. In some embodiments, the heat transfer particles comprise less than 5% moisture, or less than 2% moisture, or less than 1% moisture, or less than 0.5% moisture.

[56] In some embodiments, the desired bulk density levels of the heat transfer particles 54 can be obtained by filling the sidewall gap 52 and, optionally, the dividing wall gap 56 and base gap 68 with heat transfer particles 54 while the outer shell 12 is on a shaker. The shaking action facilitates tight packing of the heat transfer particles 54. In some embodiments, the outer shell 12 can be filled from the base-side and, once the desired packing level has been reached, the base 13 on the outer shell can be secured to the lower portion of the outer shell 12.

[57] In some embodiments, the desired density levels the desired bulk density levels of the heat transfer particles 54 can be obtained by filling the sidewall gap 52 and, optionally, the dividing wall gap 56 and base gap 68 with a slurry containing heat transfer particles 54 suspended in a solvent, which is subsequently heated off. In some embodiments, the heat transfer particles 54 can partially or completely fill the sidewall gap 52 and, optionally, the dividing wall gap 56 and base gap 68, then be sprayed with a volatile liquid to facilitate tight packing. In some instances, this can be an iterative process where a portion of the gap 52, 56, and/or 68 is filled with heat transfer particles 54, which are then sprayed with the volatile liquid and this process is repeated until the applicable gap 52, 56 and/or 68 is filled with heat transfer particles 54. This process generally results in a well-packed bed of heat transfer particles 54 that is in intimate contact with the opposing surfaces defining the applicable gaps 52, 56, 68. Examples of solvents that can be used in this process include, but are not limited to, ethylene glycol, propylene glycol, water, and/or a mixture thereof. In some embodiments, such as crystalline graphite, the particles do not absorb water and the solvent can be water.

[58] In some embodiments, for example, the slurry can be prepared in a mixer (e.g., cement mixer), whereby the heat transfer particles 54 are mixed with a solvent. The heat transfer particles 54 and solvent can be selected based on the desired viscosity or other properties of the slurry. For example, a plurality of graphite particles can be mixed with water in a cement mixer for 5–60 minutes before being filling gaps 52, 56, and/or 68. After filling the gaps 52, 56, and/or 68, the outer shell can be subjected to packing step to facilitate tight packing of the heat transfer particles. Any suitable means of packing can be used, such as shaking, pounding, vibrating, sonicating, etc. Once the desired packing has been achieved, the solvent can be allowed to evaporate or otherwise removed (e.g., heated in an oven), leaving behind the packed heat transfer particles. Additional particles and/or powder coatings may be added after solvent removal.

[59] In some embodiments, as shown in FIGS. 1, 2, 14, and 15, the in-ground enclosure 10 includes an equipment rack 70, including an equipment lift system 72 coupled to a base 65a in the first compartment 14. The equipment lift system 72 is adapted to move the equipment rack 70 between a retracted position where the equipment rack 70 is completely contained within the first compartment 14 and an extended position where the equipment rack 70 extends through the first compartment opening 20 and is accessible to a user standing outside the in-ground enclosure 10. For example, the equipment rack 70 and be arranged so that a user standing along one side of the in-ground enclosure 10 can access the equipment rack 70.

[60] In some embodiments, as best shown in FIGS. 1 and 22, the first compartment cover 26 is coupled to a top of the equipment rack 70 and the equipment lift system 72 is adapted to move between a retracted position where the first compartment cover 26 seals the first compartment opening 20 and an extended position where a majority of or the entirety of the equipment rack 70 extends through the first compartment opening 20 above the top surface 19 of the upper panel 18.

[61] In some embodiments, the in-ground enclosure 10 includes a battery rack 74, including a battery lift system 76 coupled to a base 65b in the second compartment 16. The battery lift system 76 is adapted to move the battery rack 74 between a retracted position where the battery rack 74 is completely contained within the second compartment 16 and an extended position where the battery rack 74 extends through the second compartment opening 22 and is

accessible to a user standing outside the in-ground enclosure 10. For example, the battery 74 and be arranged so that a user standing at one end of the in-ground enclosure 10 can access the battery rack 74.

[62] In some embodiments, as best shown in FIGS. 1, 14, 15, and 22, the second compartment cover 28 is coupled to a top of the battery rack 74 and the battery lift system 76 is adapted to move between a retracted position where the second compartment cover 28 seals the second compartment opening 22 and an extended position where a majority of or the entirety of the battery rack 74 extends through the second compartment opening 22 above the top surface 19 of the upper panel 18.

[63] In some embodiments, the equipment lift system 72, the battery lift system 76, or both 72, 76, can independently be operated pneumatically, hydraulically, electrically, mechanically, or a combination thereof. In some embodiments, the equipment lift system 72, the battery lift system 76, or both 72, 76 are controlled by a gas handling system 78 within the in-ground enclosure 10.

[64] In some embodiments, as shown in FIGS. 2 and 17–21, the first compartment cover 26 includes a plurality of cover locks 80. For example, in some embodiments, the first compartment cover 26 includes at least four cover locks 80 or at least six cover locks 80. In some embodiments, the second compartment cover 28 includes a plurality of cover locks 80. For example, in some embodiments, the second compartment cover 28 includes at least four cover locks 80.

[65] In some embodiments, each cover lock 80 includes a locking arm 82 and a sealing hub 84. In some embodiments the locking arm 82 is adapted for rotating between a locked position where a portion of the locking arm 82 extends underneath an edge 86a, 86b of the first or second compartment opening 20, 22 to prevent the compartment cover 26, 28 from being removed from the applicable compartment opening 20, 22, and an open position that allows the compartment cover 26, 28 to be removed from the applicable compartment opening 20, 22.

[66] In some embodiments, such as that shown in FIGS. 17–21, the sealing hub 84 is coupled to the locking arm 82, and the sealing hub 84 is adapted for adjusting a distance between

the locking arm 82 and a bottom surface 27, 29 of the applicable compartment cover 26, 28. Thus, once the compartment cover 26, 28 is covering the applicable compartment opening 20, 22, the locking arm 82 can rotate into the locked position and the sealing hub 84 can reduce the distance between the locking arm 82 and the bottom surface 27, 29 of the applicable compartment cover 26, 28. Eventually the locking arm 82 will contact the edge 86a, 86b of the applicable compartment opening 20, 22, which will lock the applicable compartment cover 26, 28 in place.

[67] In some embodiments, as shown in FIGS. 17–21, each sealing hub 84 is disposed, in part, within a respective cover lock recess 88 in a bottom surface 27, 29 of the applicable compartment cover 26, 28. In some embodiments, the in-ground enclosure 10 includes a gas handling system 78 adapted for controllably supplying pressurized air to rotate each sealing hub 84 in a first direction to reduce the distance between the bottom surface 27, 29 of the applicable compartment cover 26, 28 and the locking arm 82, and supplying pressurized air to rotate the sealing hub 84 in a second direction, opposite the first direction, to increase the distance between the bottom surface 27, 29 of the applicable compartment cover 26, 28 and the locking arm 82. For example, the gas handling system 78 can have a first line coupled to a first lock recess inlet 90 and a second line coupled to a second lock recess inlet 92, where the sealing hub 84 rotates the first direction when pressurized gas is supplied to the first lock recess inlet 90 (but not the second lock recess inlet 92) and the sealing hub 84 rotates the second direction when pressurized gas is supplied to the second lock recess inlet 92 (but not the first lock recess inlet 90).

[68] In some embodiments, the pressurized gas is supplied to the first lock recess inlet 90 of each cover lock 80 to rotate the locking arm 82 and the sealing hub 84 to the locked position. In the event of a malfunction, each cover lock 80 can be accessed from outside the in-ground enclosure by removing the respective access panel 81, which allows the operator to manually turn the sealing hub 84 to move the cover lock 80 to the unlocked position. In some embodiments, the pressurized gas will remain in or be continuously supplied to the sealing hub 84 to maintain the cover lock 80 in the locked position and resist manual rotation of the sealing hub 84. In such instances, it may be possible to manually release the pressurized gas from the locking hub 84 using the control panel 154, which will then allow the operator to manually turn the sealing hub 84 to move the cover lock 80 to the unlocked position. In some

embodiments, the sealing hub 84 can require a special coupling (*e.g.*, a double D socket wrench) in order to turn the locking hub 84 when accessed via the access panel 81.

[69] In some embodiments, as shown in FIGS. 21 and 22, the edge 86a of the first compartment opening 20 includes a first compartment inset shelf 94a and, when the first compartment cover 26 is in the locked position, the outer lip 96a of the first compartment cover 26 rests on the first compartment inset shelf 94a and an upper surface 98a of the first compartment cover 26 is approximately level with an upper surface 19 of the upper panel 18. In some embodiments, a sealing material 95a can be coupled to the first compartment inset shelf 94a, the outer lip 96a, or both 94a, 96a so that, when the first compartment cover 26 is in the locked position, the outer lip 96a rests on the sealing material 95a. In some embodiments, the first compartment inset shelf 94a includes a vertical thickness with an edge defining a first abutment 100a. In some embodiments, the first compartment cover 26 comprises a first vertical surface 102a extending from the first compartment outer lip 96a to the bottom surface 27 thereof. In some embodiments, a first inflatable seal 104a extends outwardly from the first vertical surface 102a, and the first inflatable seal 104a exerts force against the first abutment 100a when the first compartment cover 26 is in the locked position and the first inflatable seal 104a is inflated by the gas handling system 78. As will be understood, the first inflatable seal 104a can be deflated by opening a first inflatable seal valve 106a of the first inflatable seal 104a. The first inflatable seal valve 106a can be electronically operated (*e.g.*, a solenoid valve).

[70] In some embodiments, the edge 86b of the second compartment opening 22 includes a second compartment inset shelf 94b and, when the second compartment cover 28 is in the locked position, the outer lip 96b of the second compartment cover 28 rests on the second compartment inset shelf 94b and an upper surface 98b of the second compartment cover 28 is approximately level with an upper surface 19 of the upper panel 18. In some embodiments, a sealing material 95b can be coupled to the first compartment inset shelf 94b, the outer lip 96b, or both 94b, 96b so that, when the second compartment cover 28 is in the locked position, the outer lip 96b rests on the sealing material 95b. In some embodiments, the second compartment inset shelf 94b includes a vertical thickness with an edge defining a second abutment 100b. In some embodiments, the second compartment cover 28 comprises a second vertical surface 102b extending from the second compartment outer lip 96b to the bottom surface 29 thereof. In some

embodiments, a second inflatable seal 104b extends outwardly from the second vertical surface 102b, and the second inflatable seal 104b exerts force against the second abutment 100b when the first compartment cover 28 is in the locked position and the second inflatable seal 104b is inflated by the gas handling system 78. As will be understood, the second inflatable seal 104b can be deflated by opening a second inflatable seal valve 106b of the second inflatable seal 104b. The second inflatable seal valve 106b can be electronically operated (*e.g.*, a solenoid valve).

[71] In some embodiments, the first compartment cover 26, the second compartment cover 28, or both 26, 28, include at least one reinforcing sheet embedded in a continuous phase. In some embodiments, the first compartment cover 26, the second compartment cover 28, or both 26, 28, include rebar embedded in a continuous phase. In some embodiments, the first compartment cover 26, the second compartment cover 28, or both 26, 28, include rebar and at least one reinforcing sheet embedded in a continuous phase. In some embodiments, the continuous phase can be an impermeable concrete, polymer, or ceramic capable of forming an impermeable structure. For example, the continuous phase can be a polymeric concrete material. In some embodiments, the first compartment cover 26, second compartment cover 28, or both can be capable of supporting a car, truck, or van parked on the first or second compartment cover 26, 28 resting on the applicable compartment opening 20, 22. For example, in some embodiments, the first compartment cover 26, second compartment cover 28, or both can be capable of supporting at least 20,000 pounds, at least 30,000 pounds, or at least 40,000 pounds when the first or second compartment cover 26, 28 is locked over the applicable compartment opening 20, 22.

[72] In some embodiments, the first compartment cover 26, the second compartment cover 28, or both 26, 28, include at least two reinforcing sheets embedded in a continuous phase. In some embodiments, major fibers in two of the reinforcing sheets are at an angle of 10 to 80 degrees, or 15 to 75 degrees, or 20 to 70 degrees, or 30 to 60 degrees relative to one another. Examples of reinforcing sheets that can be used herein include brass and galvanized steel tapes/fabrics such as those sold by Hardwire, LLC under the trademark HARDWIRE®. In some embodiments, the one or more of the reinforcing sheets can provide electromagnetic (EM) radiation blocking. In some embodiments, the one or more of the reinforcing sheets embedded

in the compartment cover 26, 28 can prevent a drill bit from penetrating the applicable compartment cover 26, 28.

[73] In some embodiments, a Faraday shield (also known as a cage) can be embedded into compartment covers 26, 28 to block certain electromagnetic fields from penetrating the covers. In some embodiments, the Faraday shield can block electromagnetic (EMI) or radio frequency interference (RFI), such as radio waves from a nearby radio transmitter, from interfering with the equipment inside the in-ground enclosure. In some embodiments, the Faraday shield can block electric currents, such as lightning strikes and electrostatic discharges, from interfering with and/or damaging the equipment inside the in-ground enclosure. By shielding EMI/RFI, the Faraday shield can prevent eavesdropping or monitoring of telephone calls connected through the in-ground enclosure. The Faraday shield can comprise any suitable material. In some embodiments, the Faraday shield can comprise a metal or metallic material. In some embodiments, the Faraday shield can comprise a metal hardwire grid or mesh, or a plurality of grids and/or meshes. When two or more grids or meshes are used, a first can be placed in a north-south direction and a second can be placed on top of the first and oriented in the same or a different direction. In some embodiments, the second grid or mesh can be secured at an angle, with respect to the first, in order to provide a difference in harmonics for the Faraday shield. In some embodiments, the second grid or mesh can be placed at an angle between 10–80 degrees, 25–70°, 20–60°, 25–50°, 25–45°, 25–35°, or 30–35°. In some embodiments, the grid or mesh can comprise stranded flex ground wires cad-welded per bonding and grounding specifications known and utilized in the telecommunications industry. In some embodiments, the Faraday shield can comprise a flexible metallic fabric, a fine metal mesh, or any other suitable material.

[74] In some embodiments, as shown schematically in FIG. 2, the in-ground enclosure 10 includes a gas handling system 78, comprising a dehumidifier 110, an air compressor 112 located within the outer shell 12 (*e.g.*, within the first compartment 14 or the second compartment 16). In some embodiments, an ambient air intake line 114 having an air intake line inlet 116 in fluid communication with ambient air outside the outer shell 12 and an air intake line outlet 118 in fluid communication with a compressor inlet 120. In some embodiments, a filter 121 may be located between the air intake line outlet 118 and the

compressor inlet 120, but this still reads on fluid communication between the air intake line outlet 118 and the compressor inlet 120. In some embodiments, a filter 121 can be located prior to the compressor 112 and another filter 123 can be located following the dehumidifier 110. The gas handling system 78 can be adapted to provide air at an elevated pressure to an interior of the first compartment 14, an interior of the second compartment 16, or both 14, 16. As used herein, “elevated pressure” refers to a pressure of at least 1 pound per square inch gauge. As used herein, “dehumidified air” is used to refer to a gas (*e.g.*, air) that has passed through the dehumidifier 110.

[75] In some embodiments, the gas handling system 78 includes a water trap 122 adapted to collect water removed by the dehumidifier or otherwise condensed by the gas handling system 78. In some embodiments, the gas handling system 78 includes a water purge line 124 for purging the water from the in-ground enclosure 10.

[76] In some embodiments, the gas handling system 78 is adapted to provide dehumidified air at an elevated pressure to the interiors of both the first compartment 14 and the second compartment 16. Thus, when the compartment covers 26, 28 are in the locked position the first compartment 14, the second compartment 16, or both 14, 16 can be maintained with a pressure greater than atmospheric pressure. This is another precaution to prevent both water vapor and water from seeping into the applicable compartment 14, 16, whether through the compartment openings 20, 22 or some other location of potential intrusion. In some embodiments, when the compartment covers 26, 28 are in the locked position, the first compartment 14, the second compartment 16, or both 14, 16 are maintained at a positive pressure of at least 1 psig, or at least 2 psig, or at least 3 psig.

[77] The gas handling system 78 can include a processor 108 for processing information from the numerous sensors 138, 144, 146, switches 136, valves 140, 142, and electronic devices 112, controlling the gas handling system 78, and communicating with connected devices, such as the control panel 154 of the power pedestal 150 or remotely located devices (*e.g.*, a mobile device using a secured app or a desktop or laptop computer). Although the processor 108 is not shown connected to any particular electromechanical devices, it will be understood that that processor 108 can be in communication with any or all electromechanical

devices necessary to operate the in-ground enclosure 10 or telecommunications base station 300 via any techniques known in the art (examples include, but are not limited to, hard wire, wifi, blue tooth, RF, etc.).

[78] In some embodiments, the air compressor 112 pressurizes intake air before passing the intake air through the dehumidifier 110 and providing the pressurized, dehumidified air to pressurized storage tanks 126. In some embodiments, the storage tanks 126 are in fluid communication with a plurality of regulators 128 for providing dehumidified air at a variety of pressures.

[79] For example, in some embodiments, the at least one storage tank 126 can store dehumidified air at a pressure of at least 100 psig, the at least one of the storage tanks 126 can be coupled to at least three of the following:

a first regulator 128a that provides air at a first pressure to pressurize interiors of the first compartment 14, the second compartment 16, or both 14, 16;

a second regulator 128b that provides air at a second pressure to the sealing hubs 84 of the cover locks 80 disposed in the first compartment cover 26, the second compartment cover 28, or both 26, 28; and

a third regulator 128c that provides air at a third pressure to the equipment lift system 72, the battery lift system 76, or both 72, 76,

a fourth regulator 128d that provides air at a fourth pressure to the first inflatable seal 104a, the second inflatable seal 104b, or both 104a, 104b,

a fifth regulator 128e that provides air at a fifth pressure to the equipment cooling diffuser(s) 73, the battery cooling diffuser(s) 77, or both.

[80] In some embodiments, the first pressure, the second pressure and the third pressure are different. In some embodiments, the first pressure and the second pressure are different. In some embodiments, the first and third pressures are different. In some embodiments, the second and third pressures can be the same and can be supplied by the same regulator. In some embodiments, the fourth and fifth pressures can be the same and can be

supplied by the same regulator. In some embodiments, the first pressure, the second pressure, the third pressure, the fourth pressure, and the fifth pressure are different.

[81] In some embodiments, there is a master lock air line 130 that is split into a locking air line 132 and an unlocking air line 134. The flow of pressurized air between the locking air line 132 and the unlocking air line 134 is controlled by a lock control switch 136. The locking air line 132 can be coupled to the first lock recess inlet 90 of each cover lock 80, while the unlocking air line 134 can be coupled to the second lock recess inlet 92 of each cover lock 80.

[82] In some embodiments, the first pressure can range from 1 to 9 psig, or from 1.5 psig to 7 psig, or from 2 to 5 psig. In some embodiments, the second pressure can range from 40 to 150 psig, or from 60 to 135 psig, or from 70 to 120 psig. In some embodiments, the third pressure can range from 50 to 300 psig, or from 75 to 250 psig or from 100 to 200 psig. In some embodiments, the fourth pressure can range from 10 to 80 psig, or from 12.5 to 70 psig, or from 15 to 60 psig, or from 17.5 to 50 psig. In some embodiments, the fifth pressure can range from 2 to 25 psig, or from 3 to 22.5 psig, or from 5 to 20 psig. In some embodiments, the dehumidified gas can be stored in the pressurized storage tanks 126 can be stored at a pressure of at least 125 psig. In some embodiments, the first pressure can be 3 psig, the second pressure 100 psig, the third pressure can be 125 psig, the fourth pressure can be 25 psig, and the fifth pressure can be 10 psig. As will be understood, in any case, each of the second pressure through fifth pressure will be greater than the first pressure, which is the effective ambient pressure when the first and second compartments are locked.

[83] In some embodiments, as shown in FIGS. 2, 14, and 16, the gas handling system 78 is adapted to provide air at a fourth pressure to at least one equipment cooling diffuser 73, at least one battery cooling diffuser 77, or both 73, 77 adapted for blowing air over equipment stored in the equipment rack 70 and at least one battery stored in the battery rack 74, respectively. The cooling diffusers 73, 77 blow air over the equipment and/or batteries and toward the inner sidewalls 48, which are in contact with the heat transfer particles. Thus, the cooling diffusers 73, 77 facilitate heat dissipation and help maintain the first and second compartments 14, 16 at desirable operating temperatures for the equipment and batteries. In

some embodiments, the cooling diffusers 73, 77 can have the form of a pipe with a plurality of cooling orifices 75 therein for distributing the pressurized air exiting the cooling orifices 75 and an end cap 79.

[84] In some embodiments, the gas handling system 78 also includes a first humidity sensor 138 in the first compartment 14. The gas handling system 78 can be adapted so that, when the first humidity sensor 138 detects that a humidity in the first compartment exceeds a predetermined level, air in the first compartment 14 is vented to an outside atmosphere and replaced with dehumidified air at an elevated pressure. In some embodiments, opening a purge vent 140 in the second compartment 16 and venting air from the first compartment 14 to the second compartment 16 through a compartment transfer vent 142. As this process will lower the pressure in both the first compartment 14 and the second compartment 16, once the purge vent 140 is closed, the gas handling system 78 can provide pressurized, dehumidifier air to both the first compartment 14 and the second compartment 16. The compartment transfer vent 142 can be closed either before or after the first compartment 14 and second compartment 16 are re-pressurized (*e.g.*, at the first pressure).

[85] In some embodiments, the gas handling system 78 includes a second humidity sensor 144 in the second compartment 16. The gas handling system 78 can be adapted so that, when the second humidity sensor 144 detects that a humidity in the second compartment 16 exceeds a predetermined level, air in the second compartment 16 is vented to an outside atmosphere and replaced with dehumidified air at an elevated pressure. For example, the air in the second compartment can be vented through the purge vent 140, which can then be closed before the second compartment 16 is re-pressurize (*e.g.*, at the first pressure).

[86] In some embodiments, in order to dissipate hydrogen, the purge vent 140 can be opened at a regular interval regardless of the readings of the humidity sensors 138, 144 of the hydrogen sensor 146. In some embodiments, the regular interval for opening the purge vent 140 can be 1 to 60 seconds every 15 to 120 minutes in order to maintain safe conditions. In some embodiments, the purge vent 140 can be opened for 2 to 45 seconds or 3 to 30 seconds, or 4 to 20 seconds, or 5 to 15 seconds. In some embodiments, the purge vent 140 can be opened every 20 to 90 minutes, or every 25 to 60 minutes, or every 30 to 45 minutes.

[87] In some embodiments, the gas handling system 78 includes a hydrogen sensor 146 in the second compartment 16. The gas handling system 78 can be adapted so that, when the hydrogen sensor 146 detects that a hydrogen concentration in the second compartment 16 exceeds a predetermined level, air in the second compartment 16 is vented to an outside atmosphere and replaced with dehumidified air at an elevated pressure. For example, the air in the second compartment can be vented through the purge vent 140, which can then be closed before the second compartment 16 is re-pressurize (*e.g.*, at the first pressure). In some embodiments, the in-ground enclosure 10 can be operated so that, absent an elevated hydrogen reading, the purge vent 140 is opened for 10 seconds every 30 minutes to vent the hydrogen.

[88] In some embodiments, the in-ground enclosure 10 also includes a power pedestal 150. The power pedestal 150 can include a lockbox 152, which provides an operator access to an external control panel 154 for operating the in-ground enclosure 10 and monitoring the status of the in-ground enclosure 10. For example, an operator can use the external control panel to unlock the compartment cover(s) 26, 28, and actuate the equipment lift system 72, the battery lift system 76, or both 72, 76 in order to access the equipment rack 70, the battery rack 74, or both 70, 74. Each of the lift systems 72, 76 can include a lock-out system 156 to maintain the respective lift system 72, 76 in the extended position so that an operator can access the interior of the first compartment 14 and/or the second compartment 16 without the risk on being crushed by the lift system 72, 76 returning to the retracted position.

[89] An example of such a lock system 156 is shown in FIG. 15, where a hole at the top of the base plate aligns with a hole at the bottom of the intermediate plate, so that a pin 156 can pass through the holes and maintain the lift system 72, 76 in an extended position even if there is a loss of air pressure. In some embodiments, each side of the lift system 72, 76 can include a lock-out system 156. This arrangement allows an operator to confidently enter the first compartment 14 or the second compartment 16 feeling confident that the racks 70, 74 will not retract to the closed position and injure the operator.

[90] In some embodiments, as shown in FIGS. 1 and 2, the control panel 154 can provide an interface where the user can monitor the performance of the in-ground enclosure 10 and the equipment contained therein. For example, in some embodiments, the control panel 154

can display the current and/or historical temperature, humidity, pressure, and hydrogen levels within the first and second compartments 14, 16. In some embodiments, the control panel 154 can also display the current status of each of the components attached to the gas handling system 76 (*e.g.*, the cover locks 80, the inflatable seals 104a, 104b, the diffusers 73, 77, and the pressurized storage tanks 126). In some embodiments, the control panel 154 can also display current and historical performance data for the equipment housed in the in-ground enclosure (*e.g.*, data demand, calls dropped, communication errors, communication outages).

[91] In some embodiments, as shown in FIGS. 1 and 2, the air intake line inlet 116 can be part of the power pedestal 150. In some embodiments, the purge vent 140 can exhaust to the power pedestal 150. Of course, the air intake line inlet 116 and the purge vent exhaust can be located in other, protected positions.

[92] In another embodiment, as shown in FIGS. 1 and 23, a telecommunications base station 300 is described. The telecommunications base station 300 can include an in-ground enclosure 10 as described herein, an antenna 302 coupled to signal processing equipment 304 and a power supply 306, comprising a battery 308, wherein, in a retracted position, the signal processing equipment 304 is positioned within the first compartment 14 and the battery 308 is positioned within the second compartment 16. As shown in FIG. 23, the antenna 302 may be attached to a vertical element or pole 320 to elevate the antenna 302 to a desired or required height for efficient signal transmission. While shown in FIG. 23 with the antenna 302 attached to a single vertical pole 320, the antenna 302 may be alternatively attached to a light pole, solar panel pole, totem pole, kiosk, various free-standing advertising signage, or most any other type of vertical element 320 that allows for the proper placement of the antenna 302.

[93] With respect to the proper vertical placement of the antenna 302, in another embodiment as shown in FIG. 24, the vertical pole 320 may be constructed of a plurality of interconnected, telescoping sections 320a, 320b, 320c. With such a construction, the vertical pole 320, with the antenna 302 attached, may be raised by extending one or more telescoping sections, and similarly, may be lowered by retracting one or more of the telescoping sections.

[94] As also shown in FIG. 23, to ensure electrical grounding of the in-ground enclosure 10, and proper grounding of any signal processing equipment 304 housed in the in-

ground enclosure 10, a conductive ground element 330 which would include at least one electrical or metal ground element that is electrically coupled to the in-ground enclosure 10 in direct contact with the earth (soil, sand, etc.). In some embodiments, the conductive ground element 330 is a conductive ring, having multiple redundant ground portions. By way of example, two portions of such conductive ground element 330 are shown in FIG. 23. In some embodiments, the conductive ground element 330 can be positioned below the in-ground enclosure 10. In some embodiments, the conductive ground element 330 is a bare copper element and is buried in the earth at least three (3) feet below grade.

[95] The signal processing equipment 304 can be connected to a telecommunications cable 310 for connecting into a terrestrial telecommunications network. The antenna 302 can be adapted for sending data to and receiving data from a wireless device, including, but not limited to, a smart phone, a tablet computer, a car, or a laptop computer.

[96] In operation, the in-ground enclosure 10 described herein allows cellular providers to locate telecommunications base stations 300 in locations that were previously unavailable due to space constraints. The in-ground enclosures 10 described herein can be installed in conventional easements, such as those adjacent to roads and railroad tracks. In addition, the in-ground enclosures 10 can be installed in a parking lot and be used as a parking spot when the in-ground enclosure is in the locked position. With this development, telecommunications antennae can be located in densely populated areas or in areas where above-ground installations are not practicable for one reason or another. This greatly enhances the ability of cellular providers to enhance coverage in an unobtrusive manner wherever additional bandwidth is necessary.

[97] In some embodiments, the in-ground enclosure 10 can be used in a variety of other applications. For example, in some embodiments, the in-ground enclosure 10 can enclose a plurality of batteries in the first and/or second compartments 14, 16, where the batteries are adapted to be charged by a solar array and supply energy to a structure having an energy requirement (*e.g.*, a house, an office building, a retail building, a warehouse, a drilling site, etc.). In other embodiments, the in-ground enclosure 10 can enclose a fuel cell in the first compartment 14 and fuel (hydrogen tanks) in the second compartment 16. The fuel cell can be

adapted to supply energy to a structure having an energy requirement (*e.g.*, a house, an office building, a retail building, a warehouse, a drilling site, etc.). In other embodiments, the in-ground enclosure 10 can house signaling equipment, including data signaling equipment. By way of example, such signaling equipment may include traffic signaling equipment and/or railroad signaling equipment. As will be understood, the in-ground enclosure 10, including the lift systems 72, 76, cover locks 80, and gas handling system 78, can operate as described herein in order to protect the equipment located in the in-round enclosure 10. In some embodiments, such as those described for the solar array and fuel cell, the in-ground enclosure 10 can include a single compartment.

[98] In some further embodiments, as shown in FIGS. 25-27, the in-ground enclosure 10 can be constructed with a single shell 12 that defines a single interior compartment 14, and does not include a dividing wall 24. Such a single shell configuration has a single interior compartment 14. With such a configuration, there will be more interior space within an in-ground enclosure 10 with the same dimensions. Thus, a single shell 12 enclosure facilitates the storage of more equipment with a smaller footprint relative to a two-compartment embodiment.

[99] In some embodiments, the in-ground enclosure shell 12 may be manufactured from a plurality of panels 12a, 12b, etc. that are interconnected to form the in-ground enclosure shell 12. By using a plurality of panels to form the in-ground enclosure shell, the manufacturing process is simplified, in addition to making shipping of a disassembled in-ground enclosure shell 12 easier and less expensive. In such a configuration, the assembly or fabrication of the in-ground enclosure shell 12 may be accomplished at the site where the in-ground enclosure is to be installed and deployed. For example, the panels 12a, 12b, etc. can be welded together, bolted together, or otherwise fastened together in a manner that allows them to form a shell 12 that is water-tight, air-tight, or both. During such assembly, to ensure a water-tight and/or air-tight configuration, an adhesive or sealant material (not shown) may be used.

[100] While shown with a recti-linear or trapezoidal vertical cross-section (*e.g.*, in FIG. 13), the in-ground enclosure shell 12 may be manufactured with other vertical cross-sectional shapes, including a square or rectangle. Moreover, as shown in FIG. 28, for certain efficiencies in manufacturing and installation, the in-ground enclosure shell 12 may be manufactured as a

cylinder (rectangular vertical cross-section and a circular horizontal cross-section). Such a shape allows for relatively easy installation by drilling a bore within the ground to the depth of the cylinder and then placing the cylindrical-shaped in-ground shell 12 within the bore. As noted above, the cylindrical in-ground enclosure shell 12 may be manufactured using a plurality of panels that interconnect to form the in-ground enclosure shell. Such panels could be curved in shape to ensure the in-ground enclosure shell 12 shape is maintained and is structurally stable.

[101] In some embodiments, as shown in FIGS. 26 and 27, the in-ground enclosure 10 can be formed with a single shell 12 and a single interior compartment 14. The in-ground enclosure 10 can include an interior compartment opening 20 and a compartment cover 26. In some embodiments, as evident from FIG. 26, the shell 12 can be formed of a number of shell panels 12a, 12b, etc., that are interconnected. The interior compartment 14 can include any and all of the equipment and features discussed herein, including but not limited to, an equipment rack, an equipment lift system, an air handling system, a sensor array, and a plurality of external conduits 30, which can be sealed with conduit couplers 32.

[102] To assist with heat transfer for the embodiments with the in-ground enclosure 10 having a single shell, as shown in FIG. 25, the bed of heat transfer particles 54 may be formed by placing or packing the heat transfer particles in direct contact with the outside of the shell and surrounding all exterior surfaces of the in-ground enclosure shell 12 that is subgrade. In some embodiments, the bed of heat transfer particles 54 may be deposited as a foundation on which the base 66 of the in-ground enclosure shell 12 rests. In some embodiments, the bed of heat transfer particles may be formed around the sides 50 of the in-ground enclosure shell by depositing the dry particles or pouring them as a slurry around the sides of the in-ground enclosure shell 12. As described above, once the heat transfer particles 54 are poured or placed around the in-ground enclosure shell 12, the bed of heat transfer particles 54 may be densified to ensure uniform contact with the sides of the in-ground enclosure exterior and the surrounding earth (soil, sand, rock, etc.). The properties and techniques described for the plurality of heat transfer particles 54 described with respect to the two compartment embodiments above are equally applicable to embodiments where the bed of heat transfer particles is located under and/or around the in-ground enclosure shell 12.

[103] Analysis shows that surrounding the in-ground shell 12 with at least 10 to 12 inches of heat transfer particles 54 assists in drawing heat out of the in-ground enclosure 10. In some embodiments, the thickness of the bed of heat transfer particles 54 surrounding the sides 50 of the in-ground shell 12 can be in the range of approximately 1 inch to at least 18 inches. In some embodiments, the thickness of the bed of heat transfer particles 54 below the outer base 66 of the in-ground shell 12 can be at least 9 inches, or at least 12 inches, or at least 15 inches, or at least 18 inches.

[104] As described above, the equipment lift system 72, the battery lift system 76, or both 72, 76, may be operated hydraulically, mechanically, or a combination of both. By way of example, the equipment lift system 72 or the battery lift system 76 may be operated using a hydraulically driven scissor lift system. In some embodiments, the equipment lift system 72 or the battery lift system 76 may be operated using a mechanical spring system. Through use of such a spring system, including a torsional spring system, the operation of the equipment lift system 72 or battery lift system 76 may be accomplished without external pneumatic, hydraulic, or electrical forces. Such a system allows for essentially passive operation of the equipment lift system 72 and/or the battery lift system 76. Further, such a passive control of the lift systems 72, 76, may be augmented with external input and control through one or more of a pneumatic, hydraulic, or electric drive system.

[105] In some embodiments, as shown and described above relating to FIG. 2, the in-ground enclosure 10 may include a gas handling system 78, comprising a dehumidifier 110, and an air compressor 112 located within the outer shell 12. In some embodiments the dehumidifier 110 may be configured as a heat pump or air conditioner. In such an embodiment, the gas handling system 78 could also be accurately described as an air handling system 78 to dehumidify and condition the air within the interior of the in-ground enclosure 10. Moreover, as an air handling system 78, the operation of the system could include an ambient air intake line 114 having an air intake line inlet 116 in fluid communication with ambient air outside the outer shell 12 and an air intake line outlet 118 in fluid communication with a compressor inlet 120.

[106] As described above, the gas handling system 78 can include or be connected to a processor 108 for processing information from various sensors 138, 144, 146, switches 136,

valves 140, 142, and electronic devices 112, and for controlling the gas handling system 78, and communicating with connected devices, including remotely located devices such as a hand-held device, a tablet, or a laptop computer. By way of further description, the sensors may include one or more temperature, humidity, pressure, hydrogen, acoustic, vibration, or other environmental condition sensors.

[107] Although the processor 108 is not shown connected to any particular electromechanical devices, it will be understood that that processor 108 can be in communication with any or all electromechanical devices necessary to operate the in-ground enclosure 10 or telecommunications base station 300 via any techniques known in the art (examples include, but are not limited to, hard wire, wifi, blue tooth, RF, etc.). Further the processor 108 may operate one or more valves 140, 142, and one or more electronic devices 112, to vent the interior of the in-ground enclosure 10 should the conditions detected within the in-ground enclosure 10 warrant venting. By way of example, should the humidity sensor within the in-ground enclosure detect humidity levels exceeding a predetermined level, then the air within the in-ground enclosure may be vented to outside atmosphere and replaced with dehumidified or air conditioned air.

[108] Similarly, should the temperature sensor within the in-ground enclosure detect temperature levels exceeding a predetermined level, then the processor 108 may lower or set the temperature level of the air conditioner 110 to reduce the temperature of the air within the in-ground enclosure.

[109] Upon receiving data from one or more of the various sensors 138, 144, 146, the processor 108 can transmit an alert notification to one or more remote devices 370, including a hand-held device (such as a smart phone), a tablet, or a laptop. The alert notification provided by the processor 108 would be based upon sensor data received by the processor 108 showing that one or more of the sensor data exceeds a predetermined level, or is approaching an abnormal condition.

[110] In some embodiments, the in-ground enclosure 10 is designed to house various electrical components and equipment, which in turn generate heat within the in-ground enclosure 10. In some embodiments, the in-ground enclosure 10 is adapted to include at least one of active and passive means to dissipate or remove excess heat from within the in-ground enclosure 10.

As described above, one active means of controlling such internal temperatures of the in-ground enclosure 10 is through use of an air-conditioner system 110, such as a mini-split system. As shown in FIG. 29, an air-conditioning system may be implemented with an air-handler 111 located within the in-ground enclosure 10 and a condenser 115 located outside of the in-ground enclosure 10 and above ground.

[111] In one embodiment, the condenser 115 may be discretely housed within an above ground element 321, such as a storage housing, street furniture, a bench, planter, or a light pole base as shown in Fig. 30. In a further embodiment, where the in-ground enclosure 10 is electronically coupled with an above ground element 321 such as a kiosk with a digital display, the condenser 115 may be discretely located within the kiosk 321. Where the condenser 115 is located within the above ground element 321 at an elevation sufficiently above grade, the condenser 115 and air-conditioner system 110 are both protected from flood or water damage. Current testing has shown that air-conditioner units with capacity of approximately 12,000 BTU/hour to 36,000 BTU/hour have condensers 115 that can be configured to be housed discretely within a kiosk 321.

[112] In another embodiment, as shown in FIG. 31, a geo-thermal heat pump 190 may be incorporated into and coupled with the in-ground enclosure to control the interior temperature of the in-ground enclosure 10. Geo-thermal heat pump systems 190 typically include a heat pump compressor unit 191, a heat pump circulating fan 192, one or more refrigerant loops 193, and a loop pump 194. The refrigerant loops are located, at least in part, outside the in-ground enclosure 10 so that they can exchange heat with the surrounding ground. A typical installation of a geo-thermal system 190 with the in-ground enclosure 10 would have the heat pump compressor unit 191, the heat pump circulating fan 192, and the loop pump 194 located within the in-ground enclosure 10, with the underground refrigerant loops 193 deployed beneath the in-ground enclosure 10 or otherwise adjacent to the in-ground enclosure 10 (*e.g.*, within 10 to 100 feet of the in-ground enclosure 10). One advantage of a geo-thermal system 190 over a typical air-conditioner 110 is that the geo-thermal system 190 does not require an above ground element. In certain equipment deployments and installations, such as telecommunications embodiments, where there are restrictions in having above ground elements other than an antenna, the geo-thermal system 190 may be particularly advantageous.

[113] Either closed-loop or open-loop geo-thermal systems may be used and coupled with the in-ground enclosure. While shown in Fig. 31 as having a single underground bore, in alternative embodiments, the system may use a plurality of bores. Use of such multiple bores or loops allows the same length of loop for heat exchange using multiple shallower bores instead of one extremely deep bore. For example, four 150 foot deep loops could replace a single 600 foot deep loop. Depending upon geographic location, and the geology and structure and consistency of the ground proximate to the in-ground enclosure, the geo-thermal bores may need to be at least 200 feet below grade, or at least 300 feet below grade, or at least 400 feet below grade, or at least 500 feet below grade, or at least 600 feet below grade.

[114] A further means of controlling temperature within the in-ground enclosure 10 uses passive heat pipe technology, such as that shown in FIG. 32. A heat pipe system 210 uses the phase change characteristics of a working fluid to transfer heat from a hot surface to a cooler area such as a condenser. In the configuration shown in FIG. 32, the lower end of the heat pipe system 210 is located within the in-ground enclosure 10 where the interior temperature is elevated due to operation of the electrical equipment. The working fluid 211 within the heat pipe system 210 changes phase from a liquid to a gas and rises through the heat pipe system 210 to a vertical element or pole 320 where the working fluid 211 releases absorbed heat from the in-ground enclosure 10 and then changes phase back to a liquid. The working fluid 211 then travels back to the in-ground enclosure by gravity and repeats the heat transfer and phase change cycle. As shown in FIG. 32, the top section or lower temperature section of the heat pipe could be located within a light pole or other vertical element 320.

[115] One advantage of using heat pipe technology for heat transfer is the passive nature of the system. Separate pumps or power systems are not needed for operation of the system. One disadvantage of heat pipe technology and systems is that such a system would only be capable of reducing the in-ground enclosure 10 interior temperature to the outside air temperature. Accordingly, in locations with elevated outside air temperatures, a heat pipe system would have limited applicability. However, in moderate or cooler locations, a heat pipe system can be very effective for cooling the in-ground enclosure 10.

[116] In a further embodiment and design of the in-ground enclosure 10, as shown in FIGS. 33-34, a plurality of thermo-electric generators (“TEGs”) or Seebeck generators 240 may be incorporated into the enclosure shell 12 walls and enclosure bottom panel. The use of TEGs takes advantage of the fact that the interior surface of the enclosure shell 12 typically will have a higher temperature than the outer surface of the enclosure shell 12. A TEG is a solid-state semiconductor device that is capable of generating electrical voltage that may be stored or used as a direct current power source based on a temperature gradient. As shown in FIG. 33, a plurality of TEGs may be embedded or formed within the enclosure shell 12, including the walls and base 66 sections of the shell 12. To further enhance the heat transfer from the interior of the in-ground enclosure 10 to the exterior of the enclosure, as shown in FIG. 34, a series of cooling fins 241 may extend from the exterior surface of the TEGs into the surrounding ground. The use of such cooler fins 241 increases the heat transfer through the TEG 240 and thereby also increases the power generation.

[117] For heat transfer and energy efficiency considerations, the TEGs would be embedded within the shell 12 where the largest temperature differential (inside of the enclosure 10 as compared to outside of the enclosure 10) is expected. In moderate or warmer geographies where the bottom of the in-ground enclosure 10 may have the lowest temperature, then the TEGs would be incorporated into the base 66. Similarly, in colder geographies, where ground surface temperatures may be lower than ground temperatures further below grade, the TEGs could be incorporated into the sides of the shell 12. In some instances, the TEGs may be in the sides of the shell 12, the base of the shell 66, or both.

[118] As shown in Fig. 33, the plurality of TEGs, may be electrically connected in parallel to a battery 74 or set of batteries 74. The fact that there is a perpetual temperature differential between the interior of the in-ground enclosure 10 and the surrounding earth can provide significant levels of “free” power that can be stored in the system batteries 74. Such power may then be used as back-up power or for equipment needs.

[119] Although the subject matter has been described in terms of exemplary embodiments, it is not limited thereto. It should be noted that the figures are not necessarily drawn to scale and any particular dimensions in the Figures are not intended to be limiting.

Rather, the appended claims should be construed broadly, to include other variants and embodiments, which may be made by those skilled in the art.

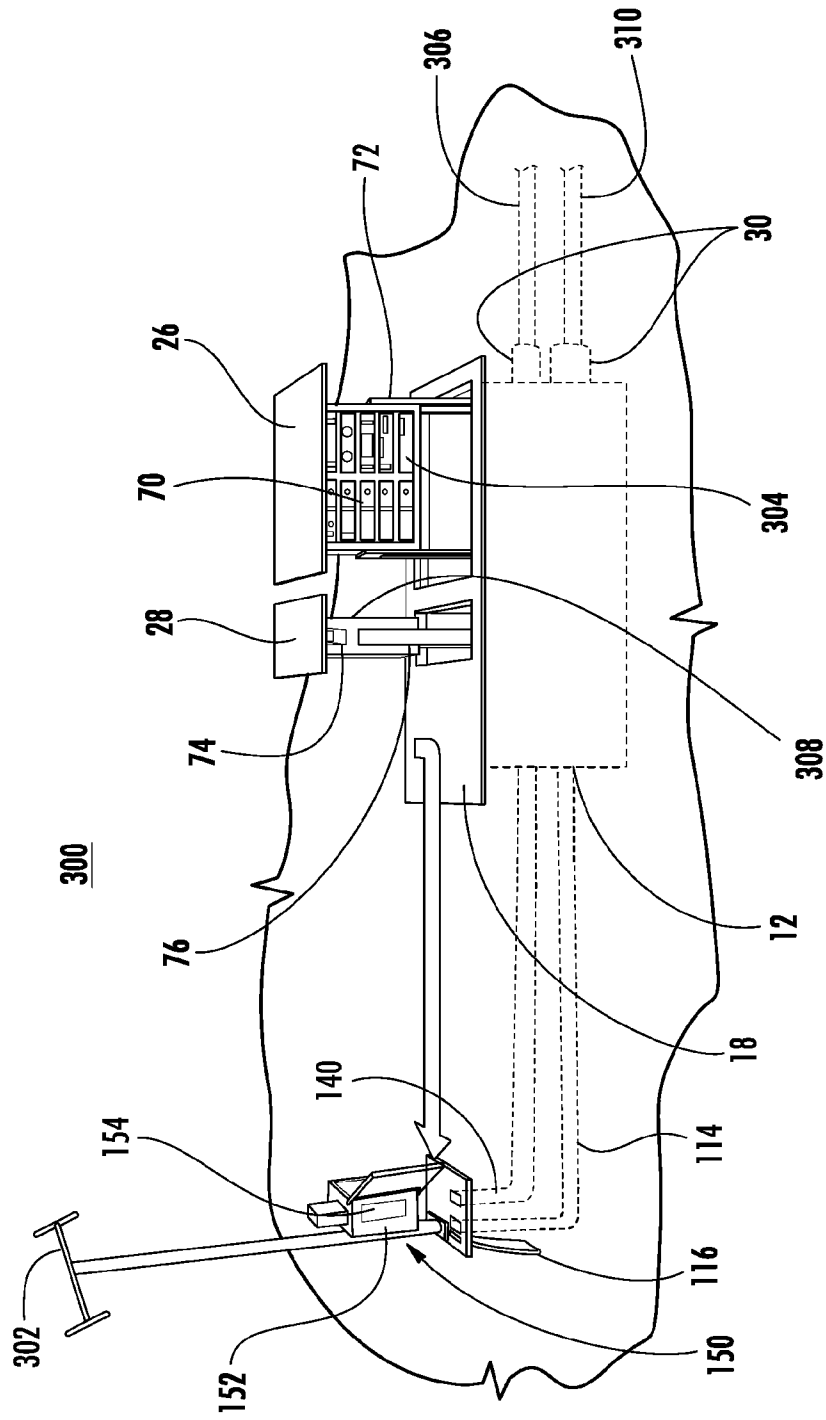
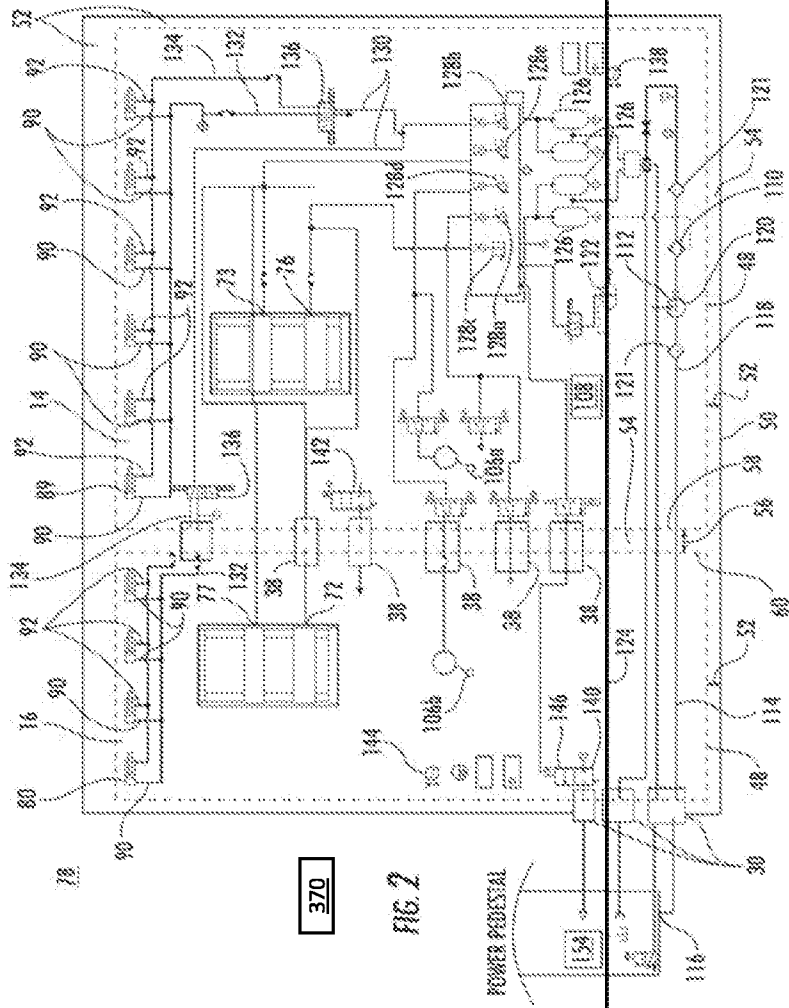


FIG. 1



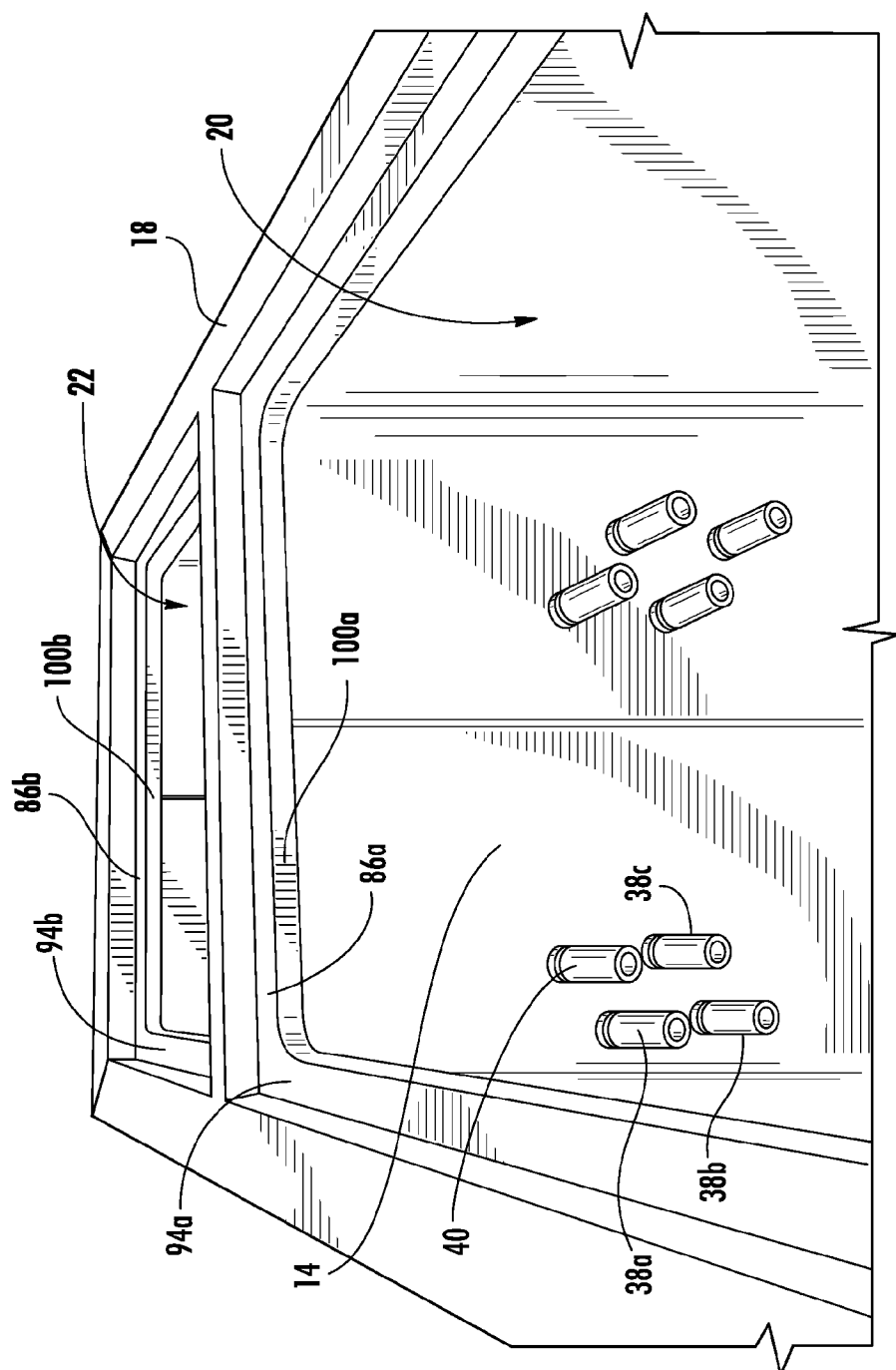


FIG. 3

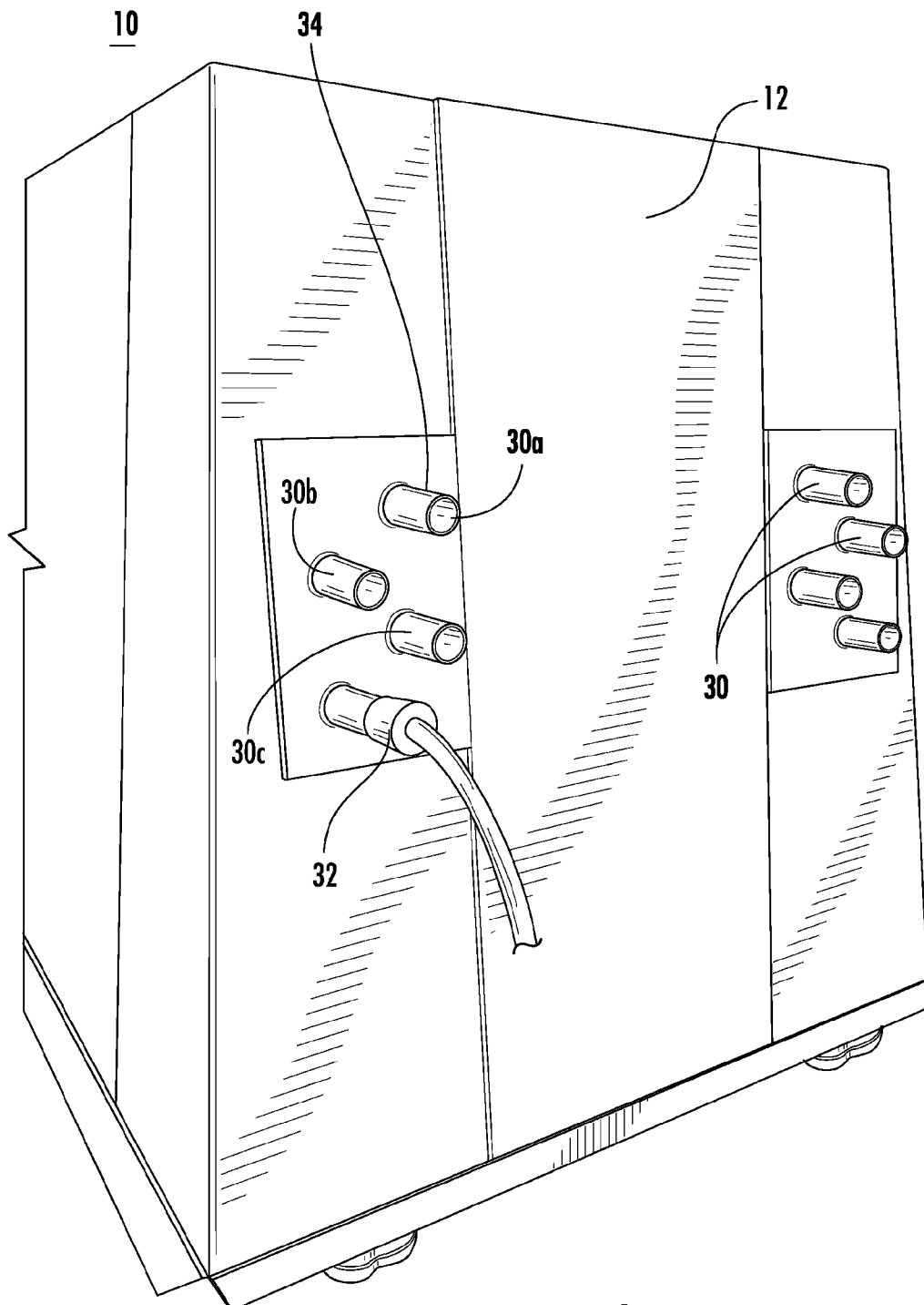


FIG. 4

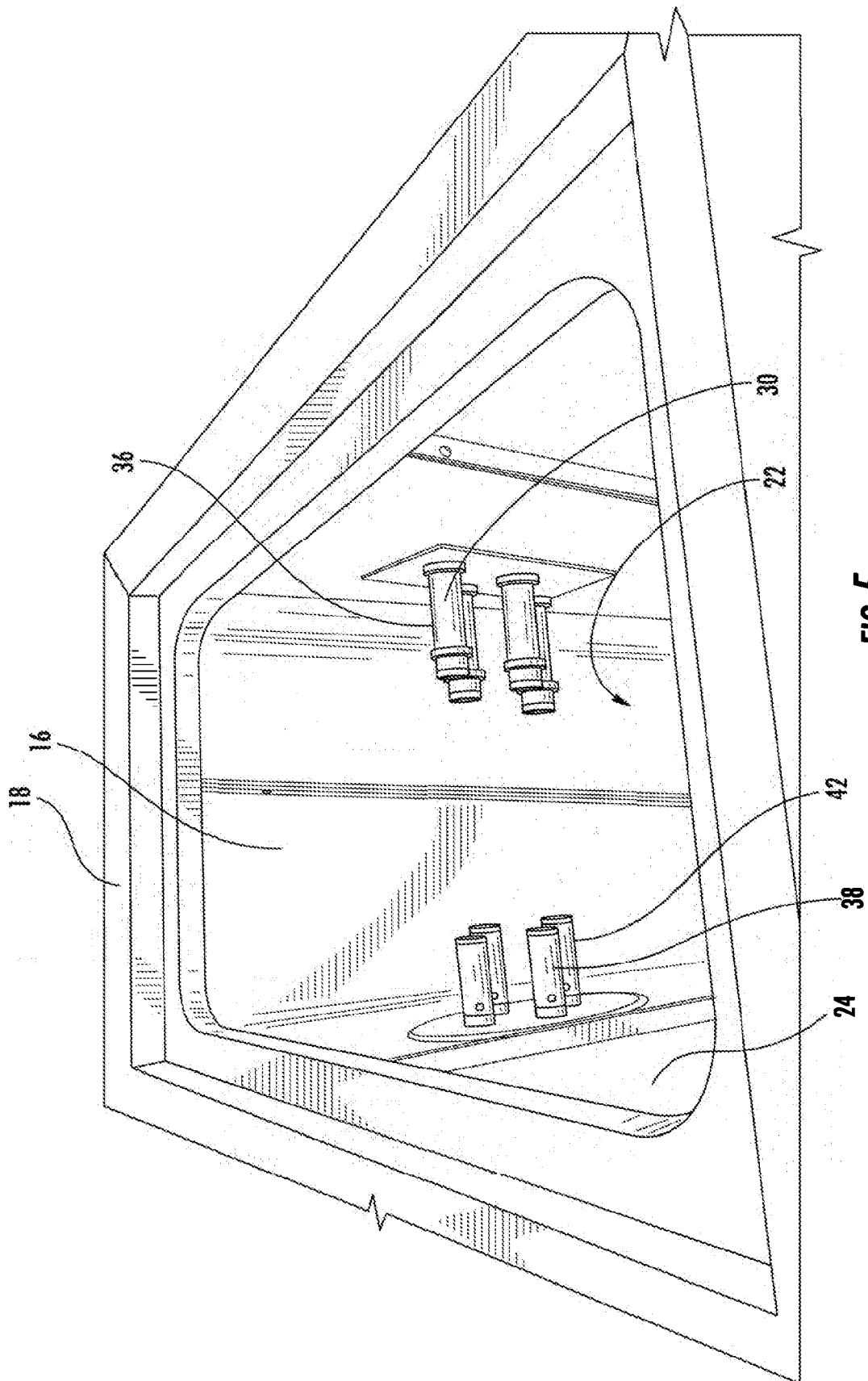
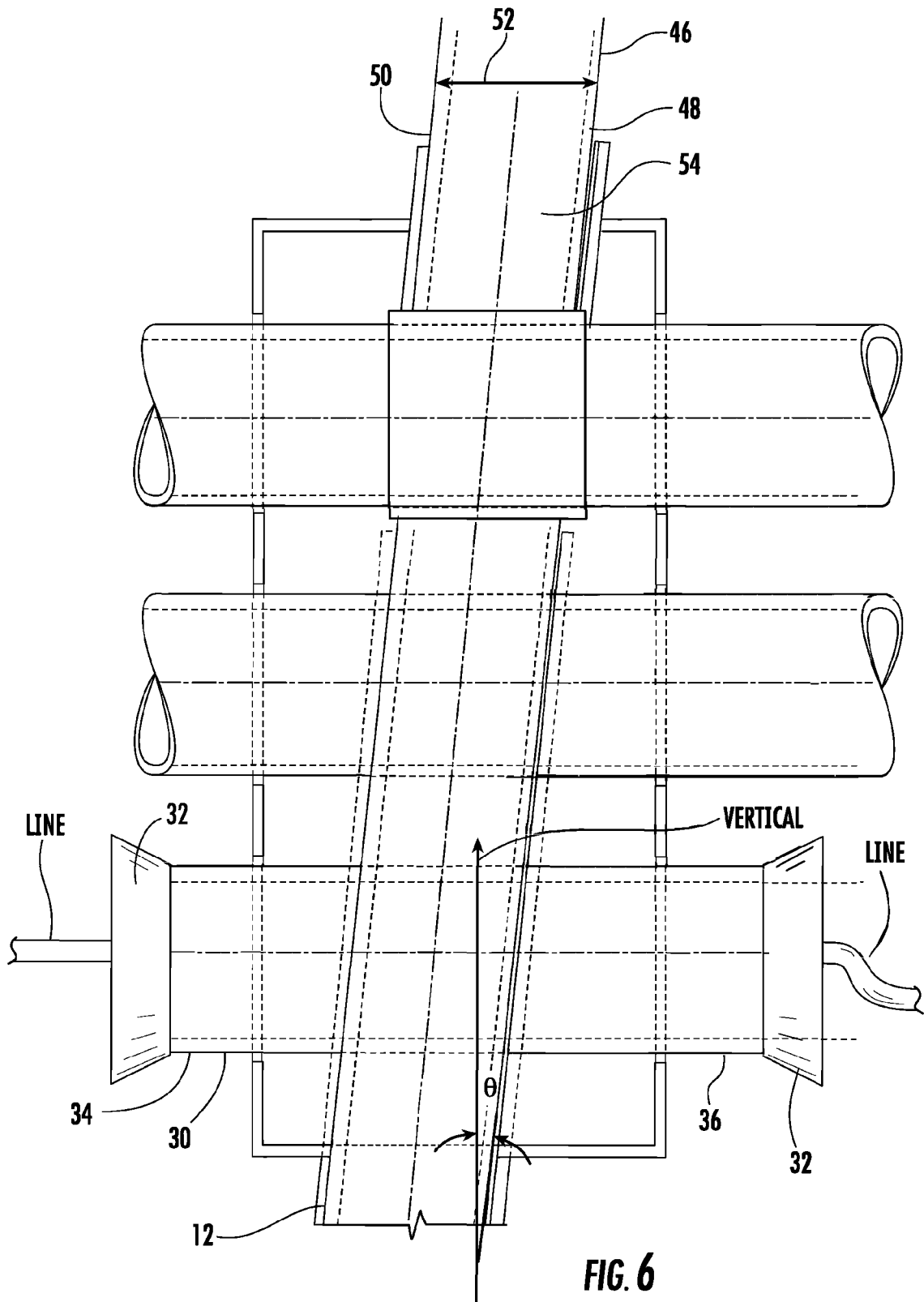
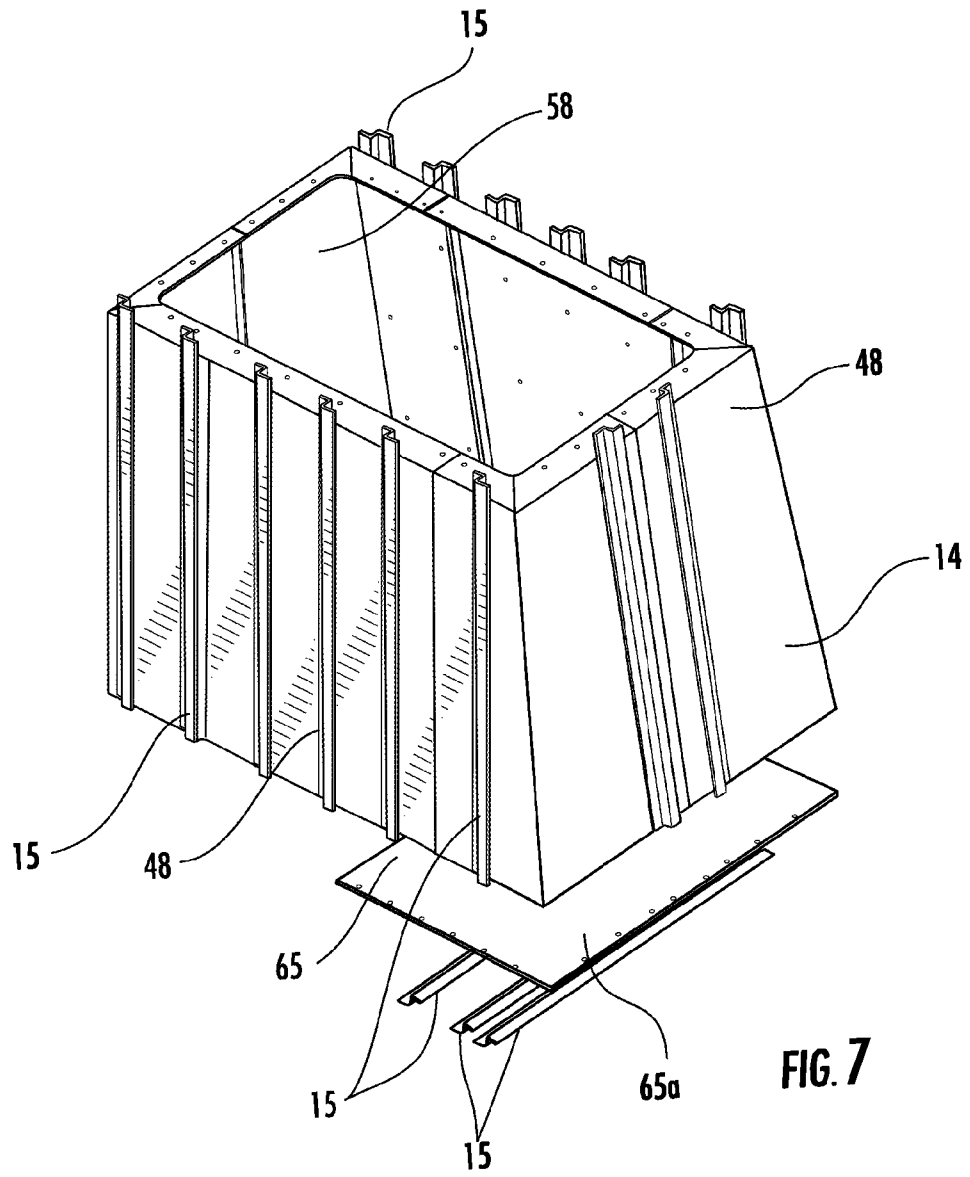


FIG. 5





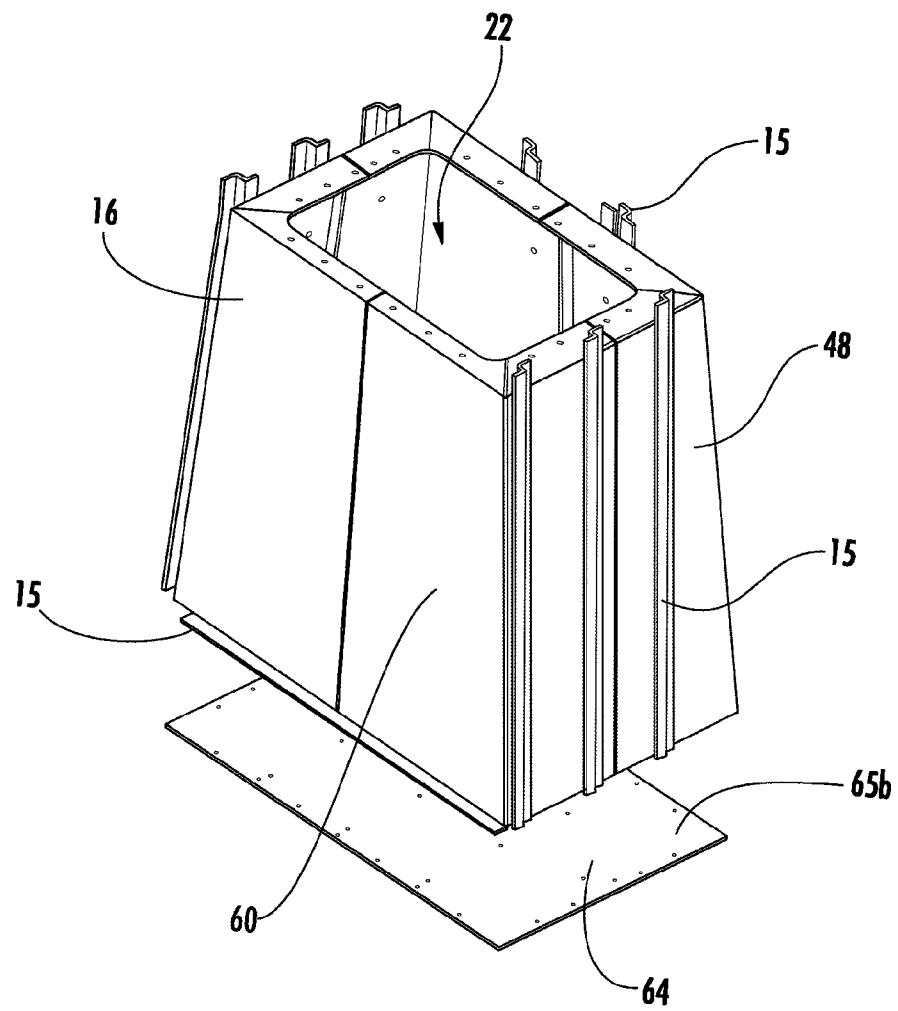


FIG. 8

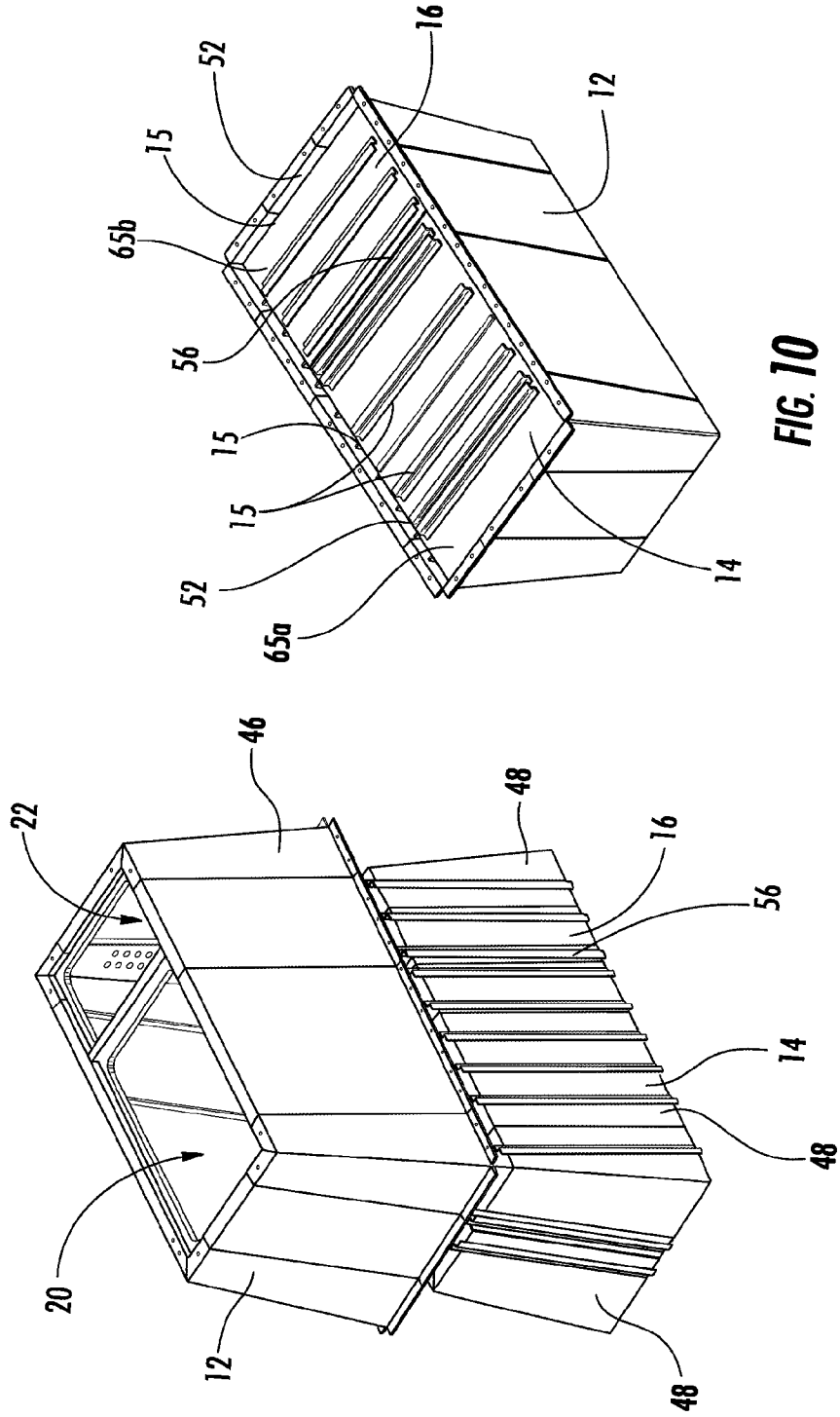


FIG. 9

FIG. 10

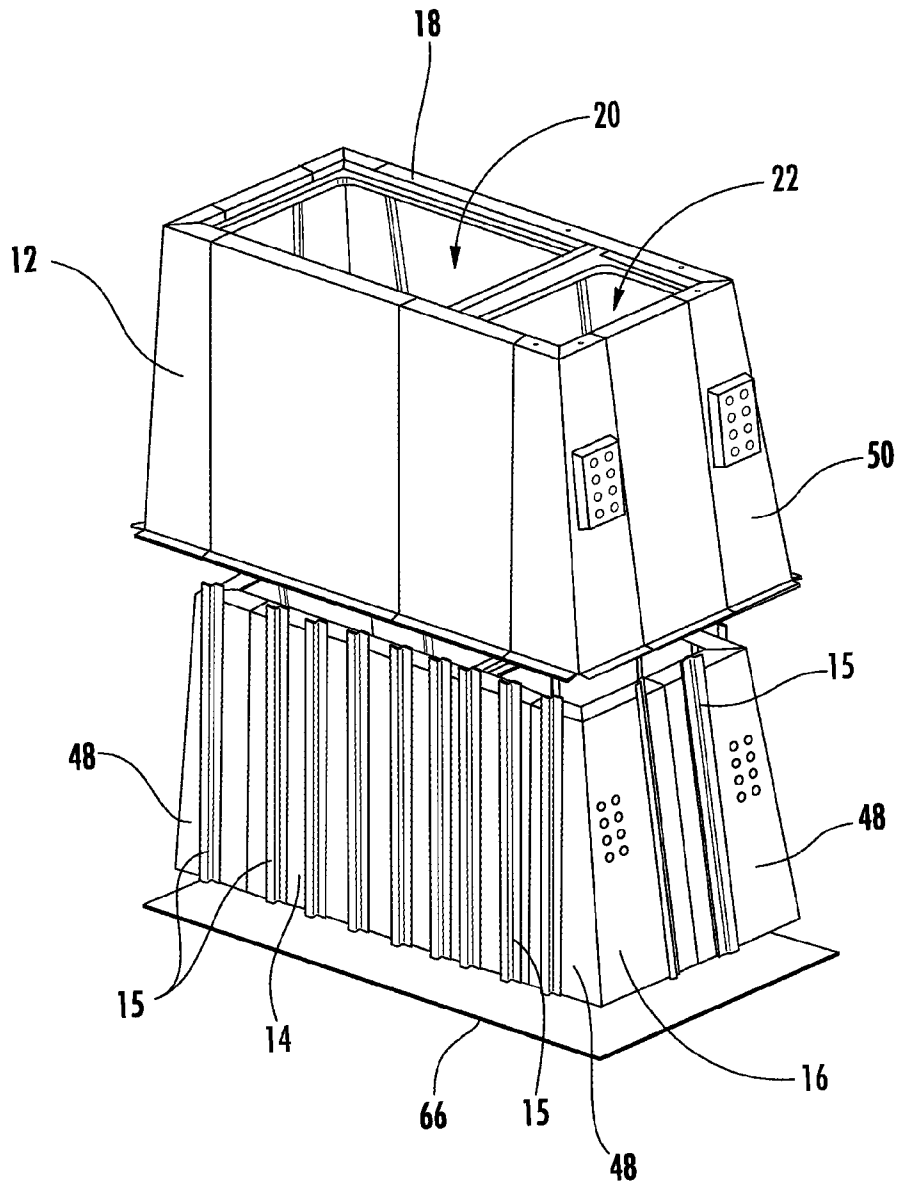


FIG. 11

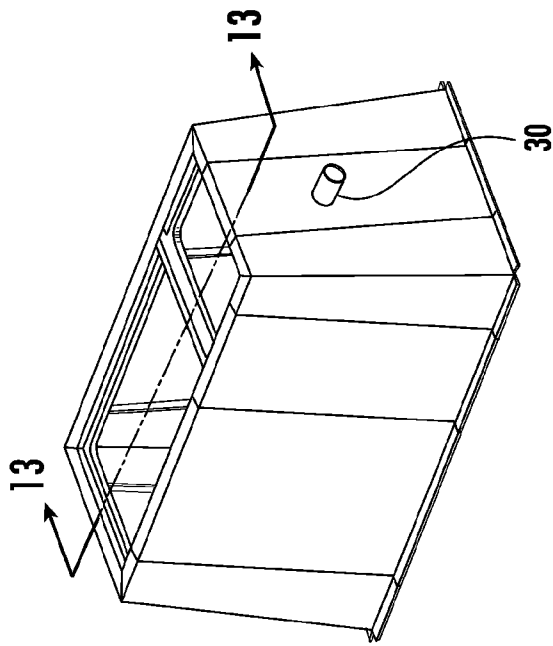


FIG. 12

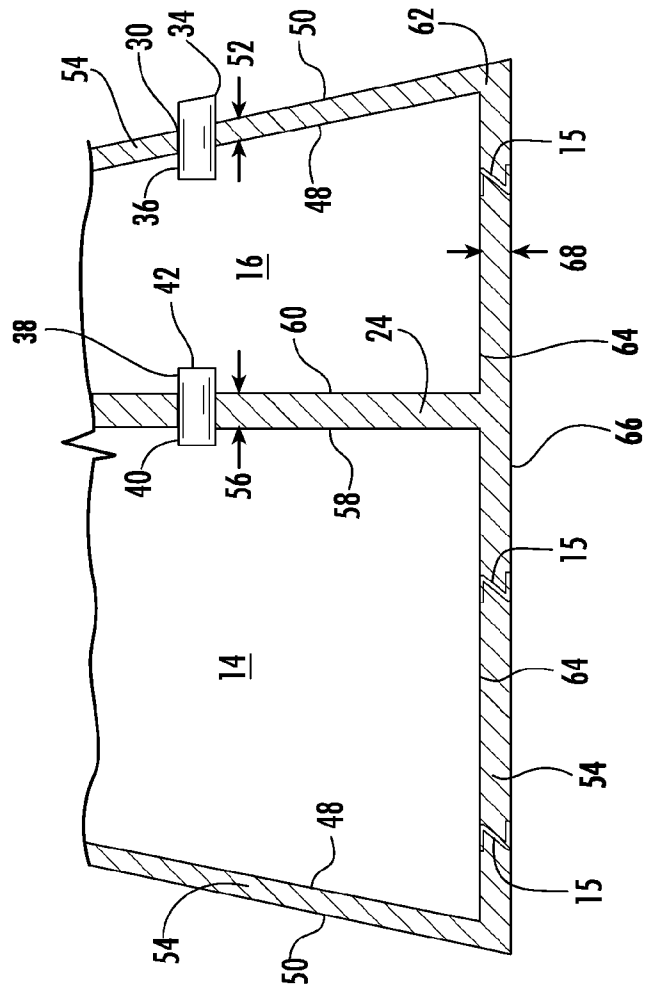


FIG. 13

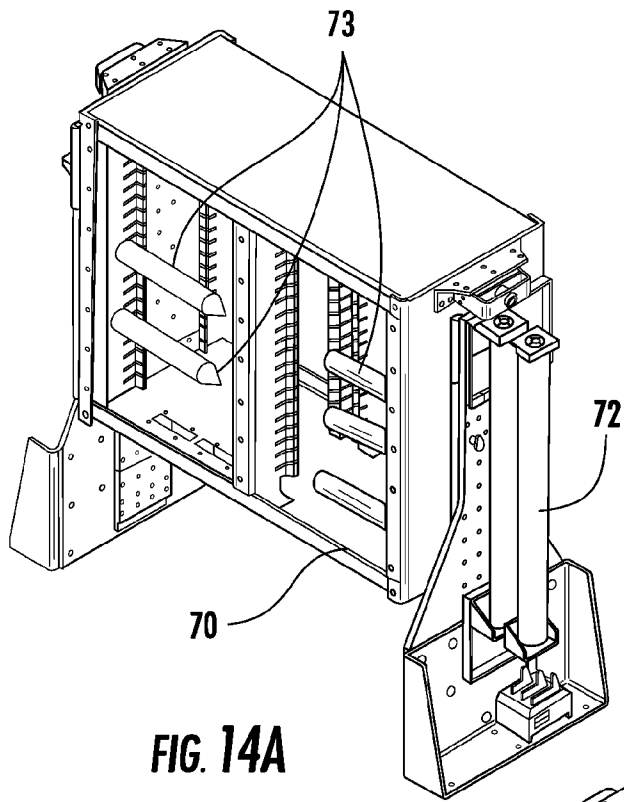


FIG. 14A

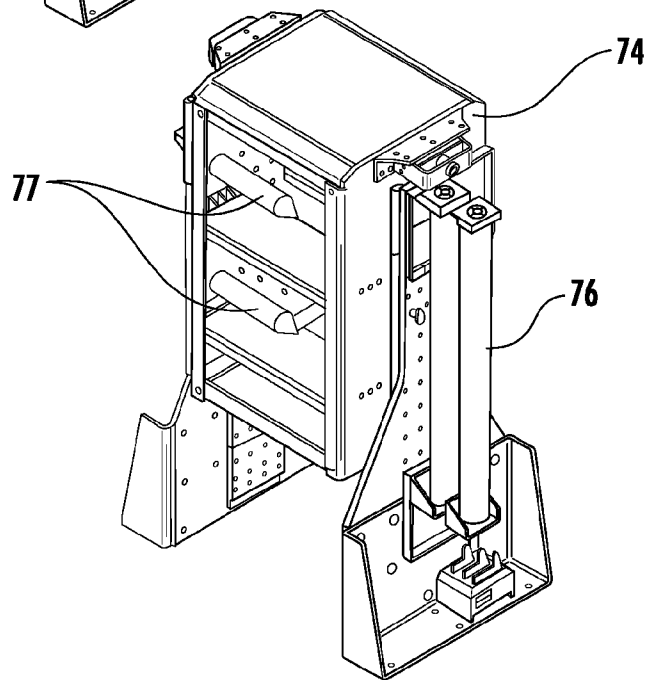


FIG. 14B

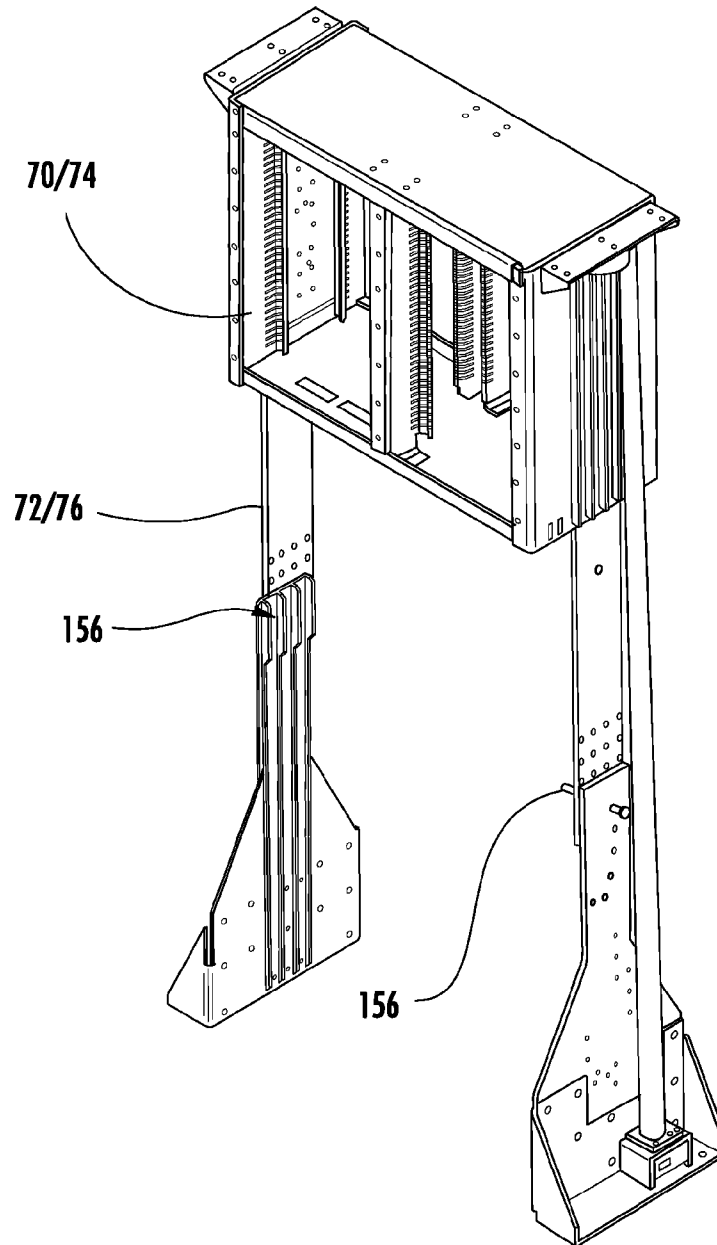
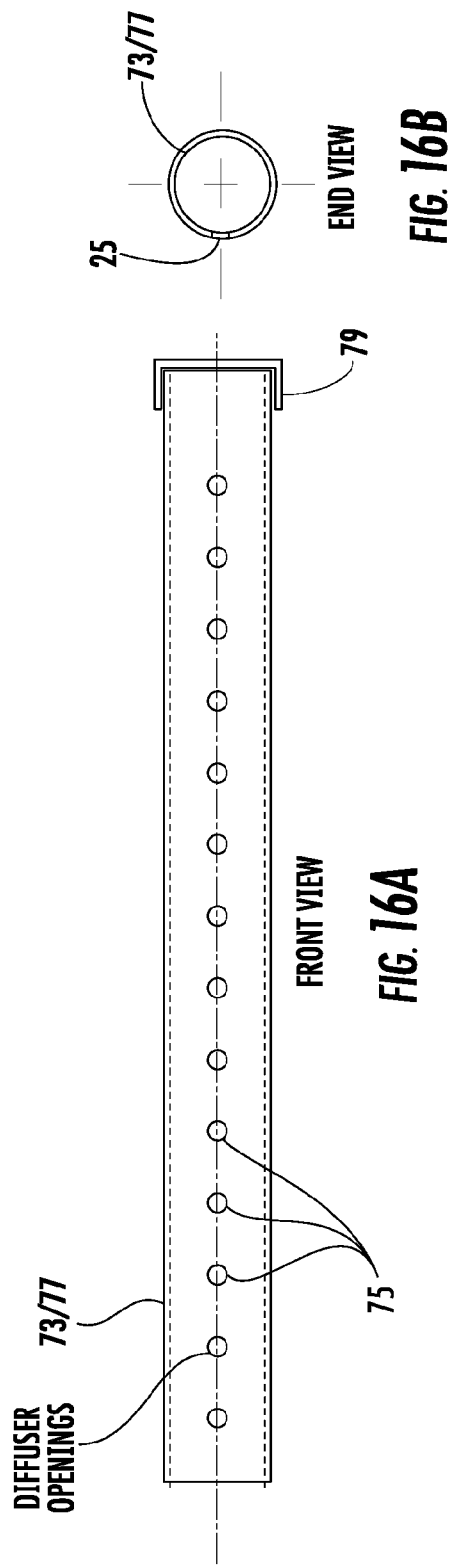


FIG. 15



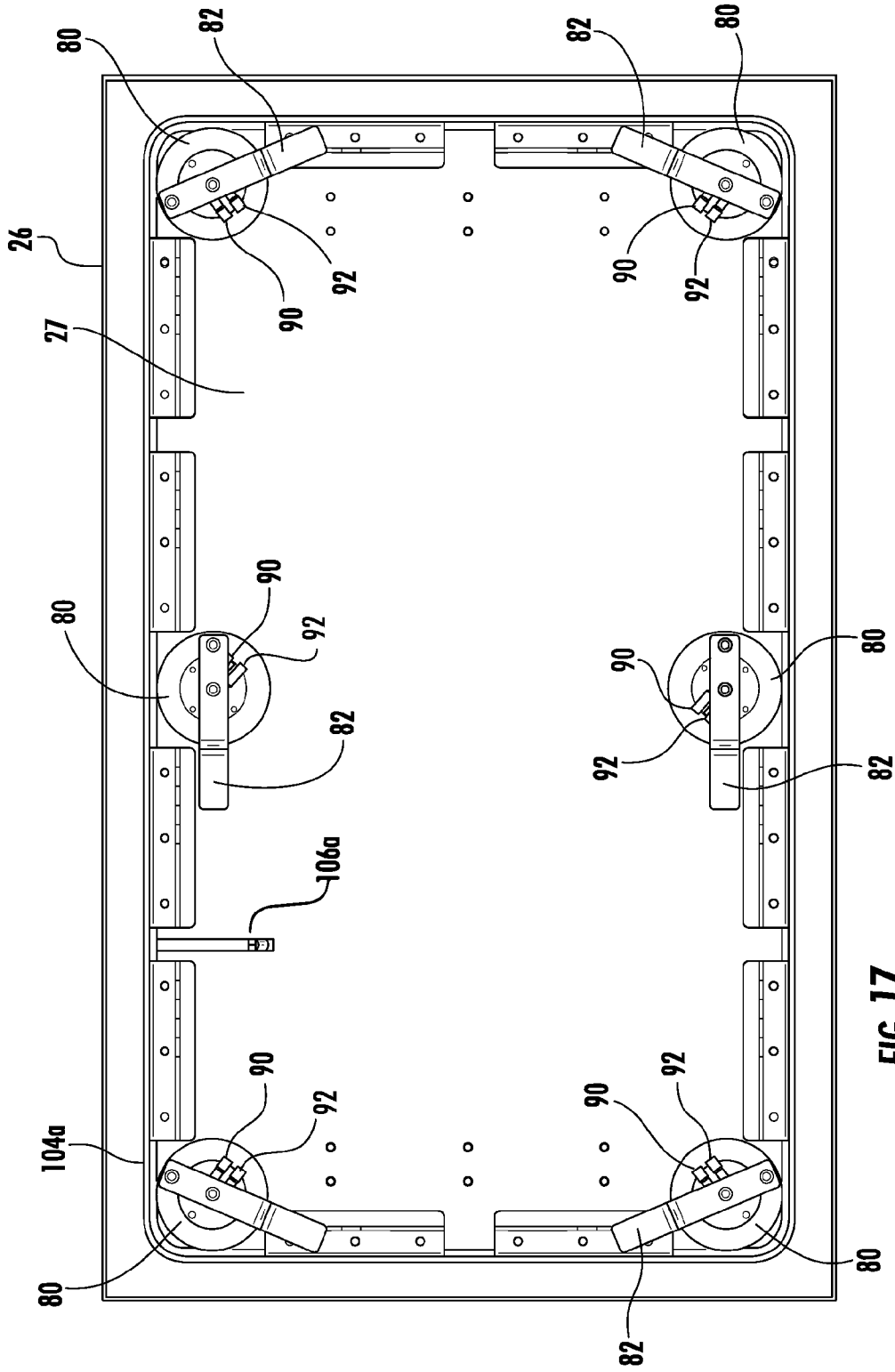


FIG. 17

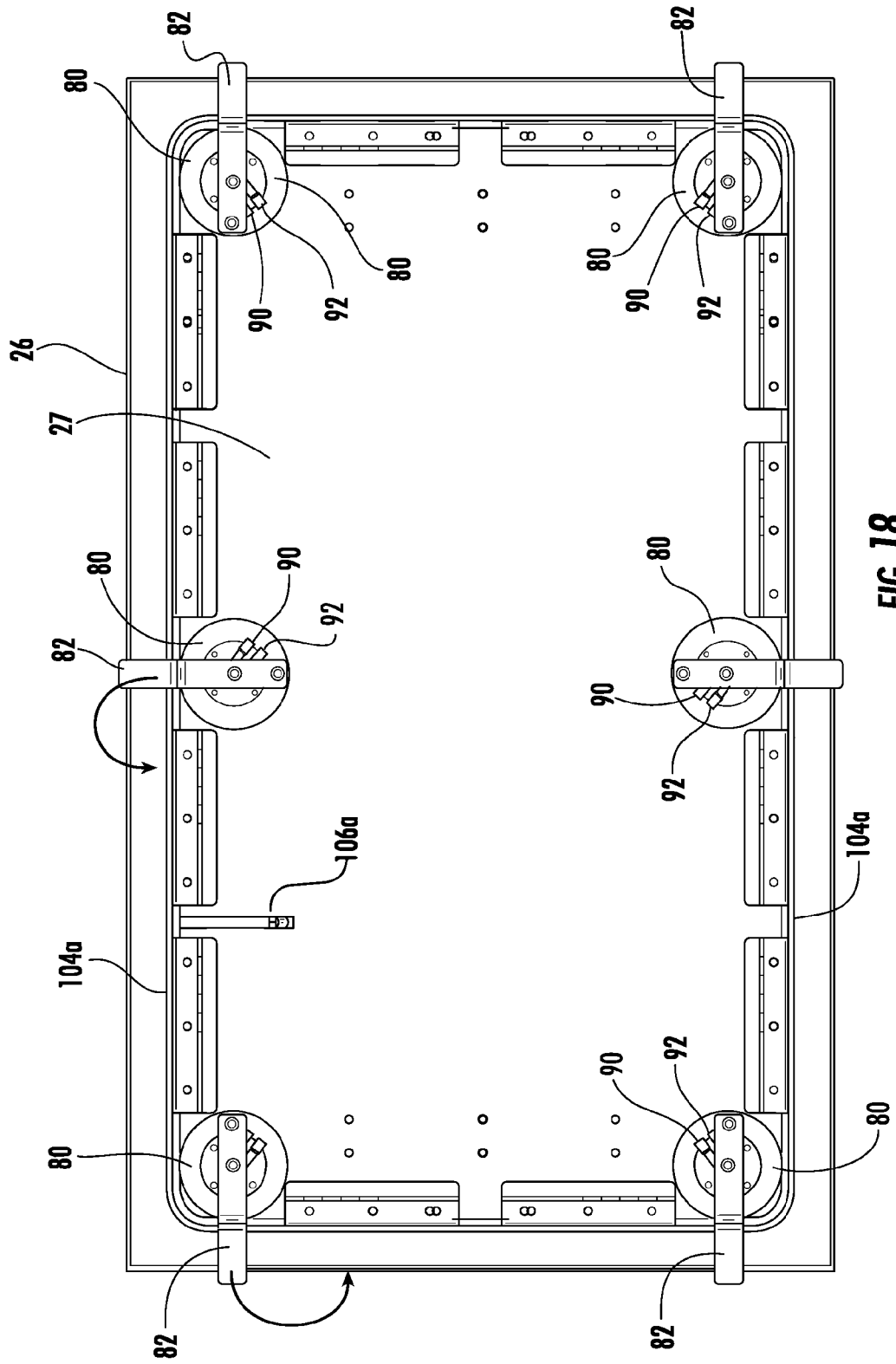


FIG. 18

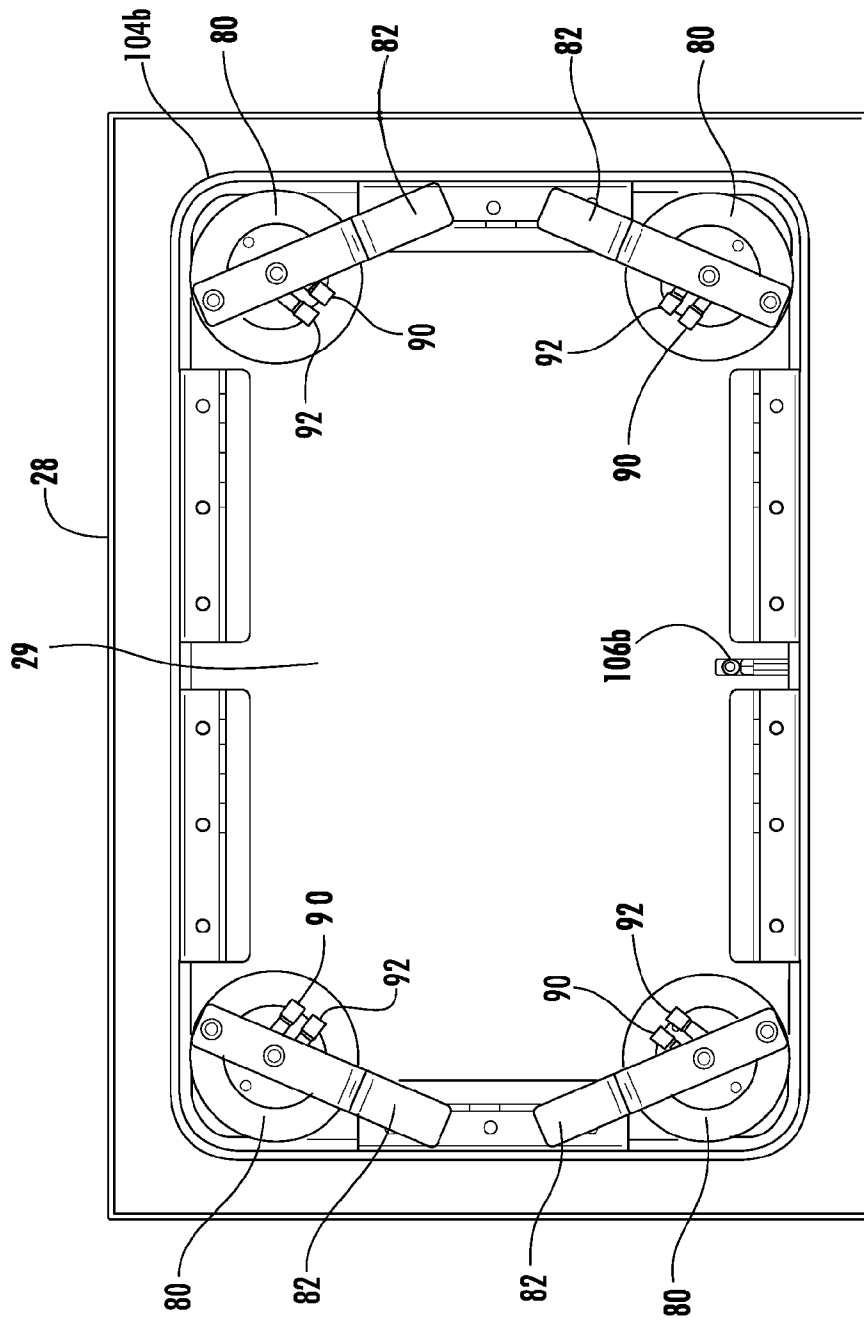


FIG. 19

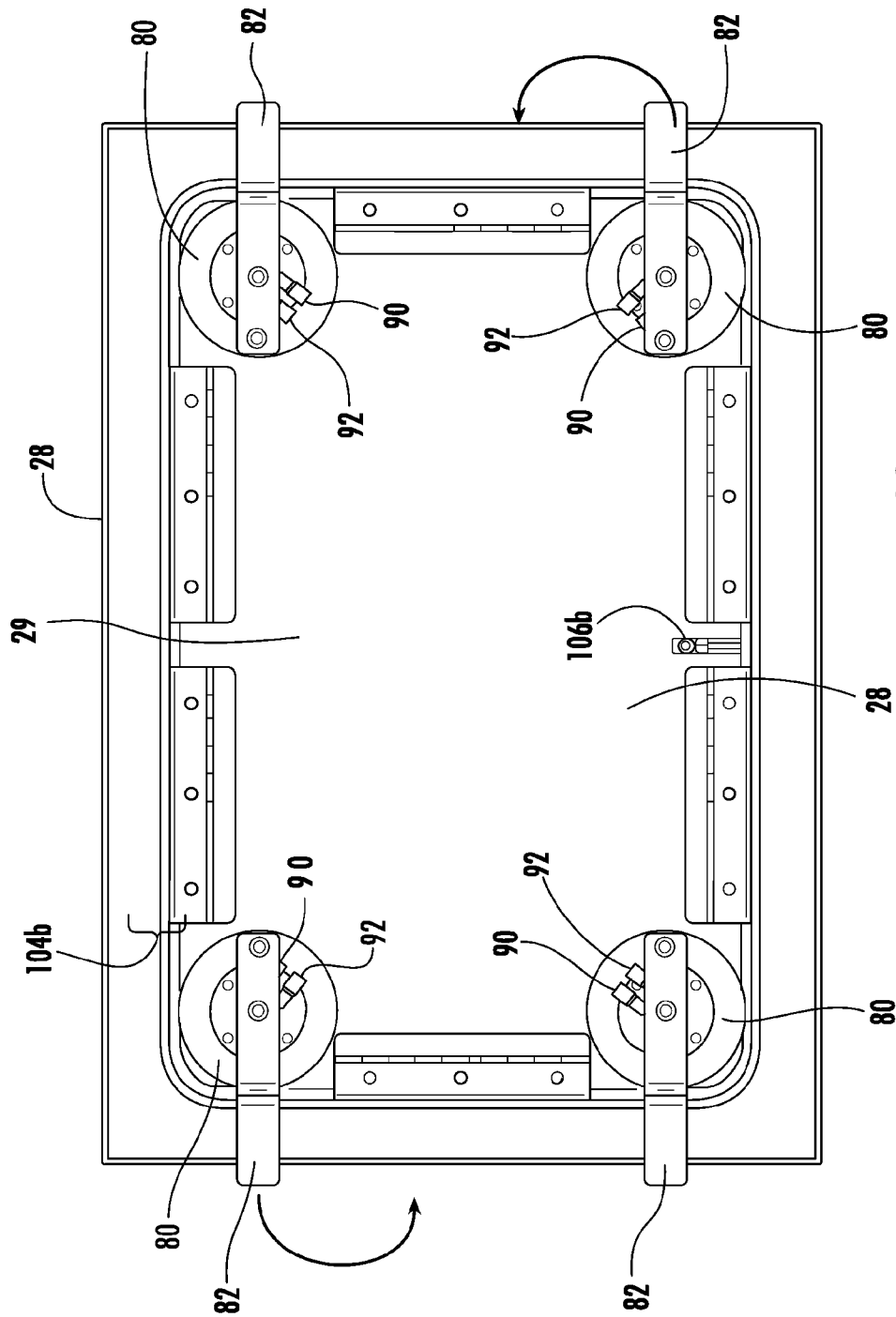


FIG. 20

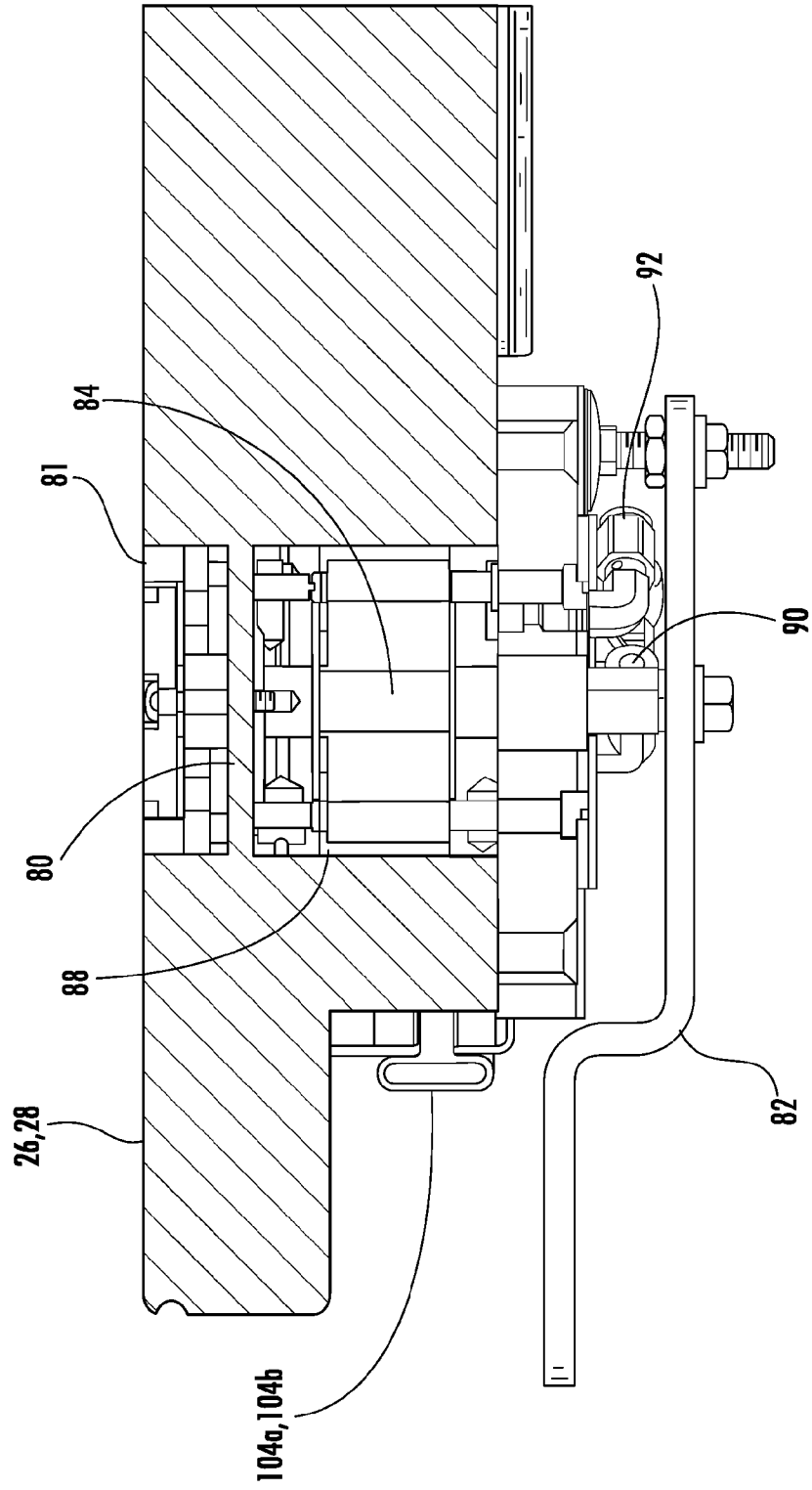


FIG. 21

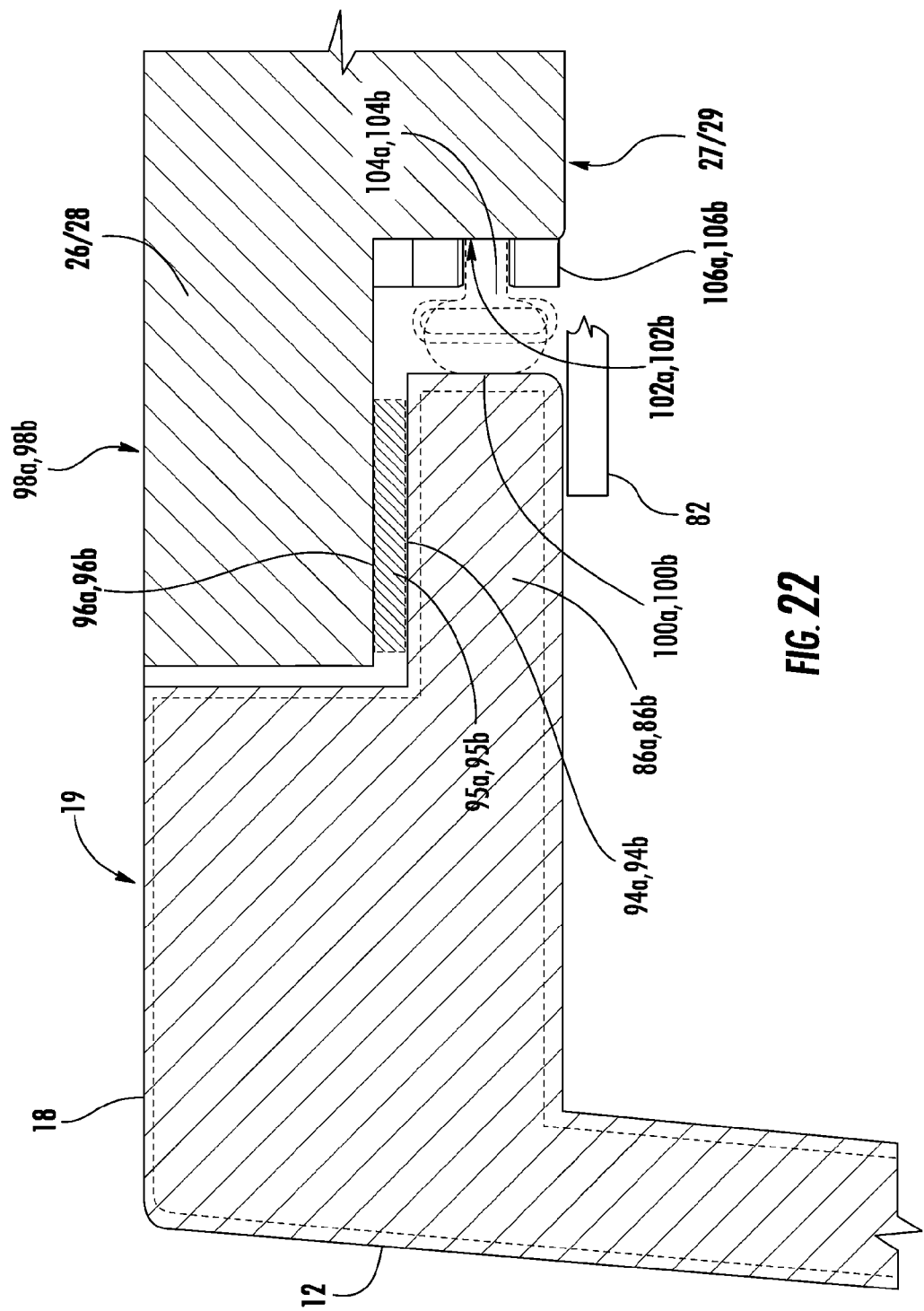


FIG. 22

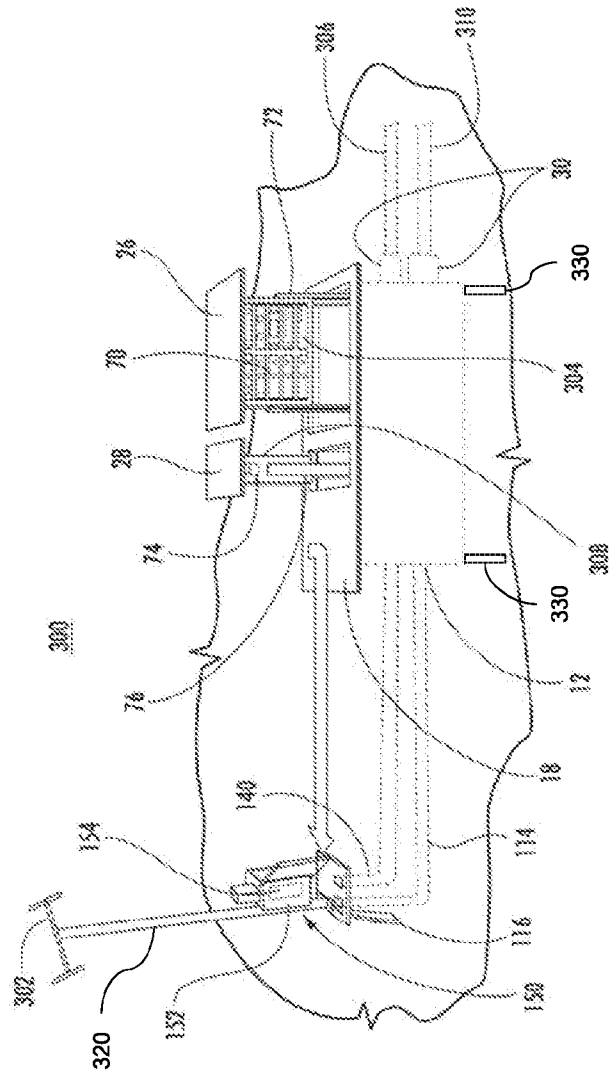


FIG. 23

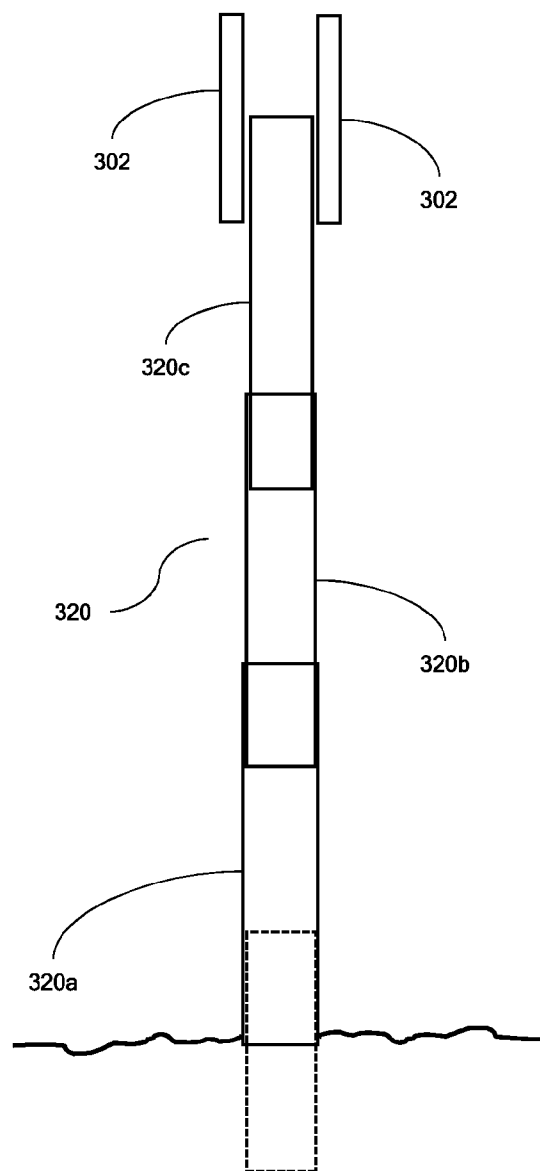


FIG. 24

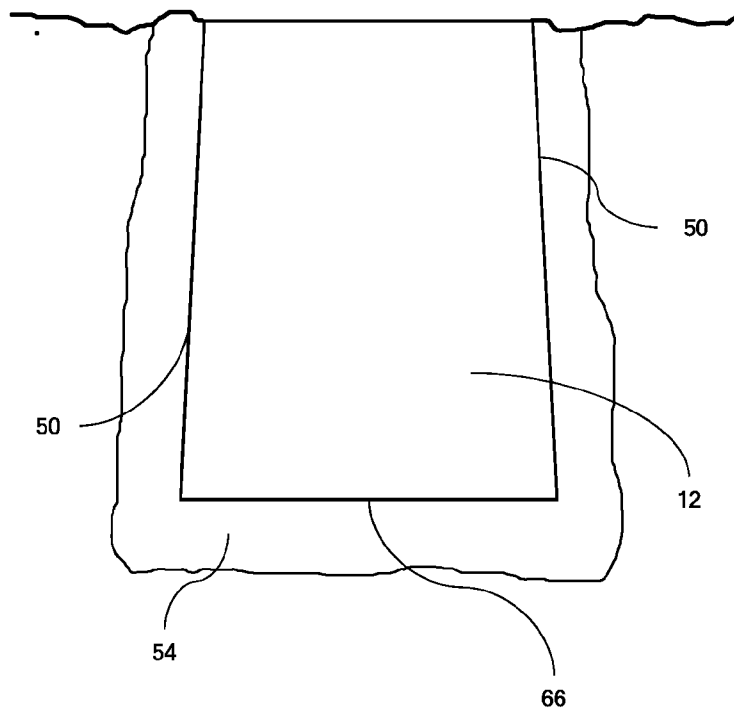


FIG. 25

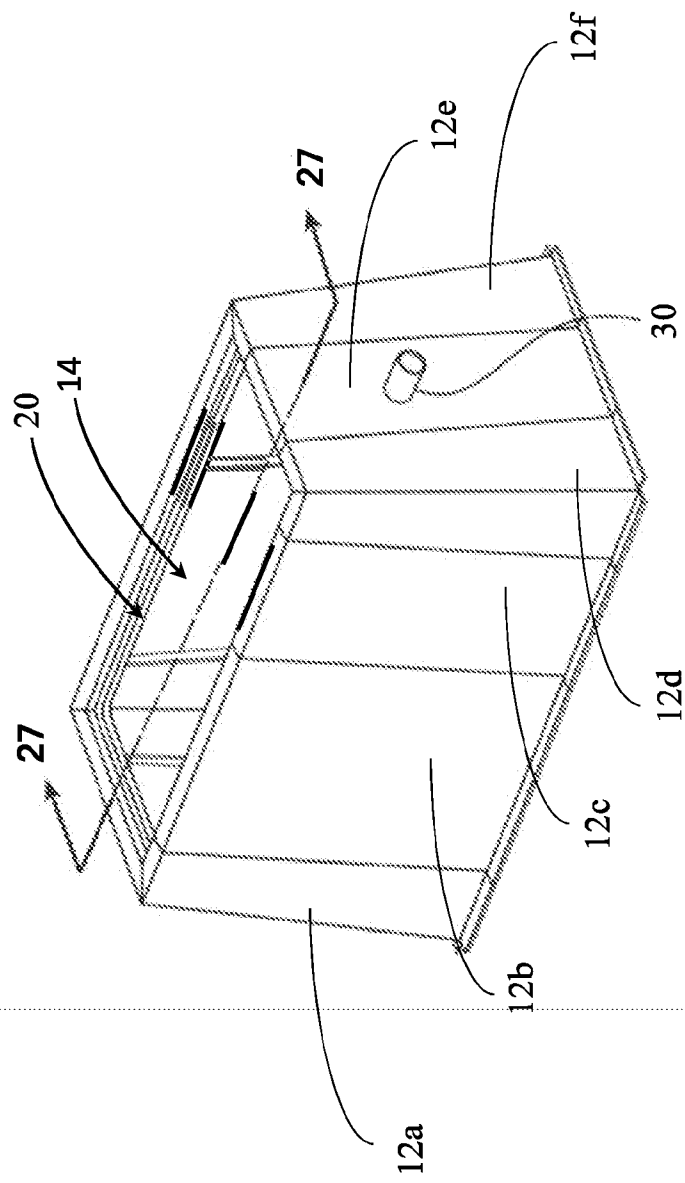
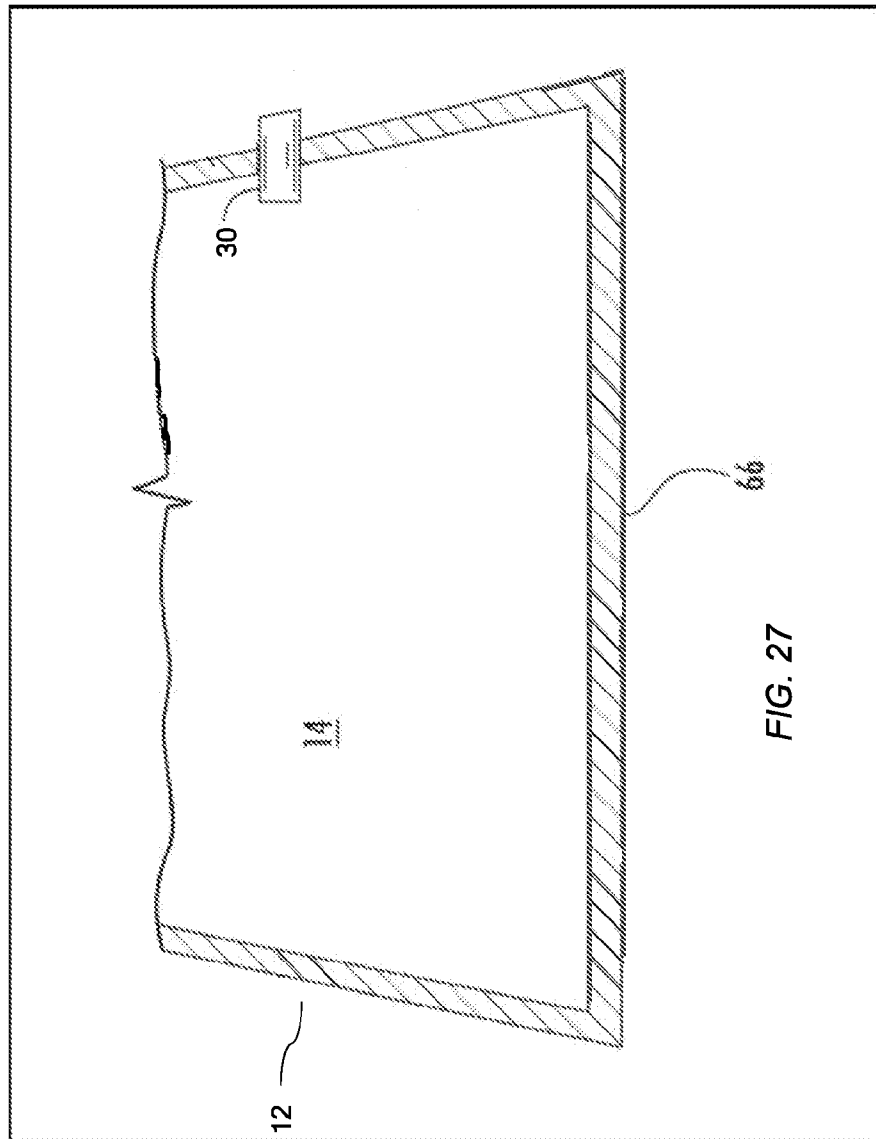


FIG. 26



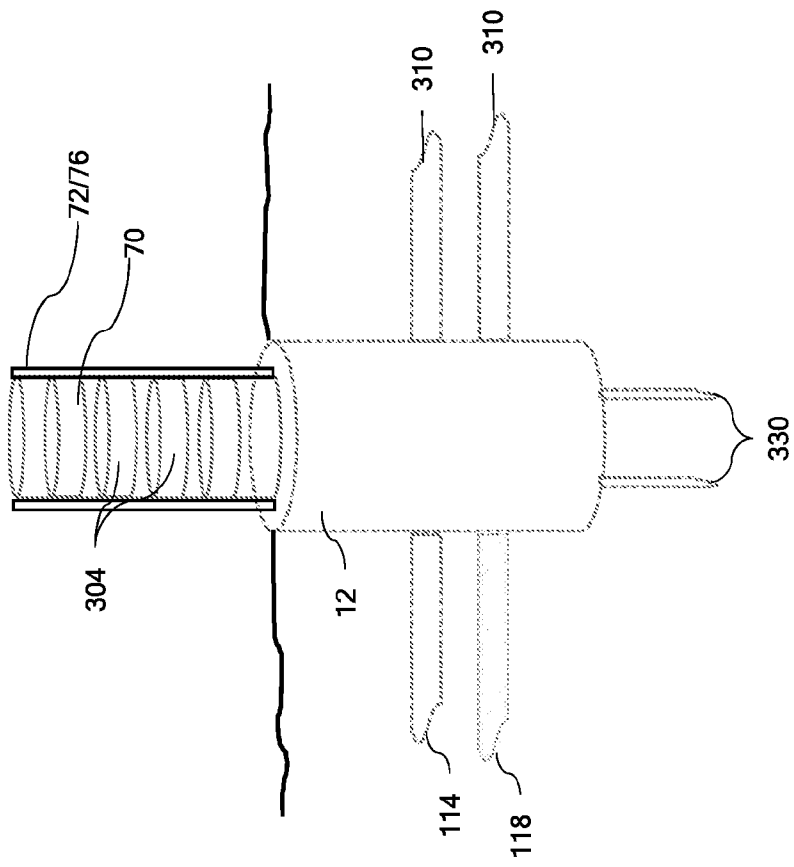


FIG. 28

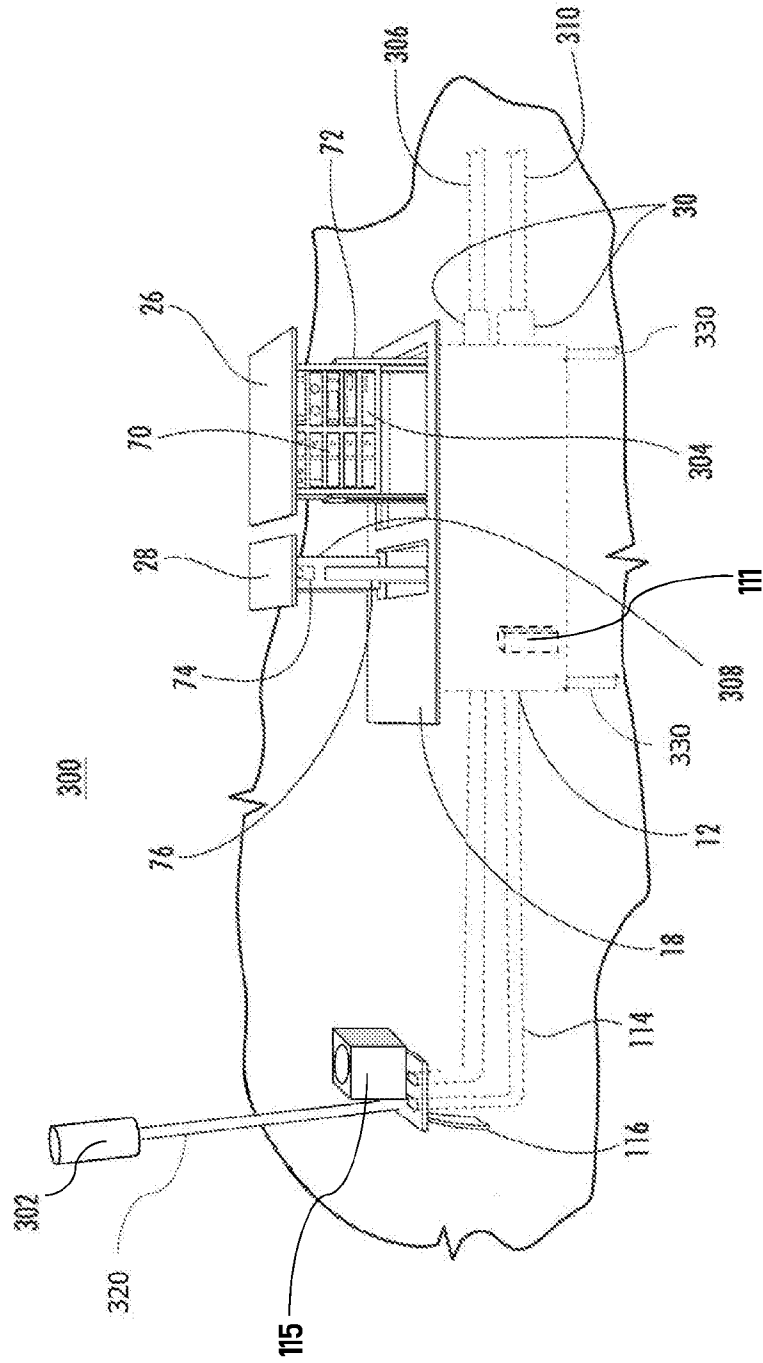


FIG. 29

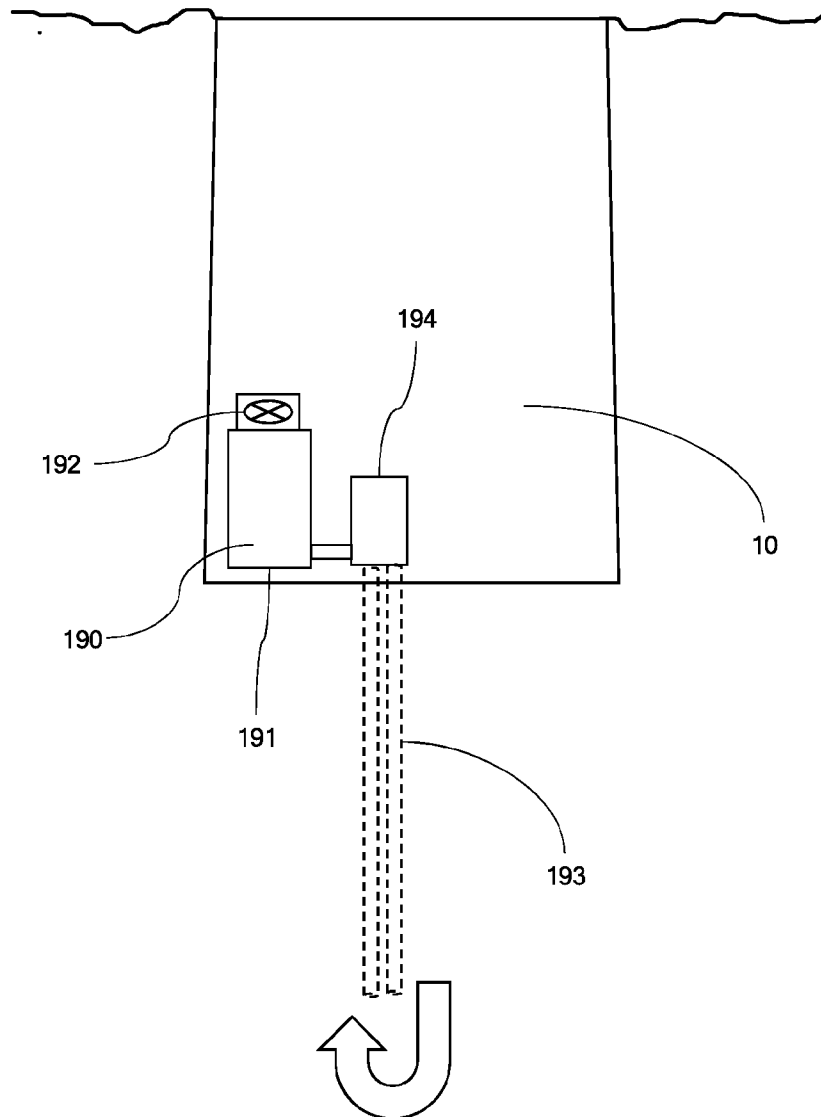


FIG. 31

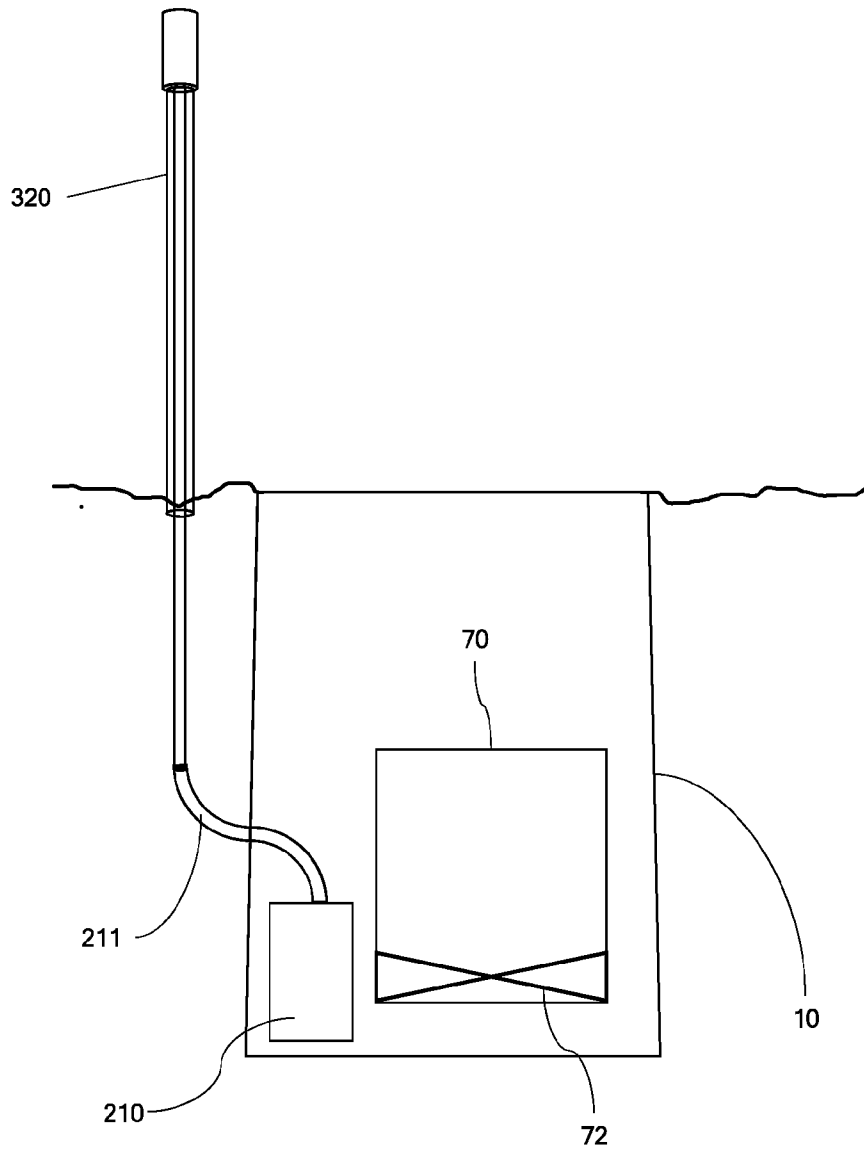


FIG. 32

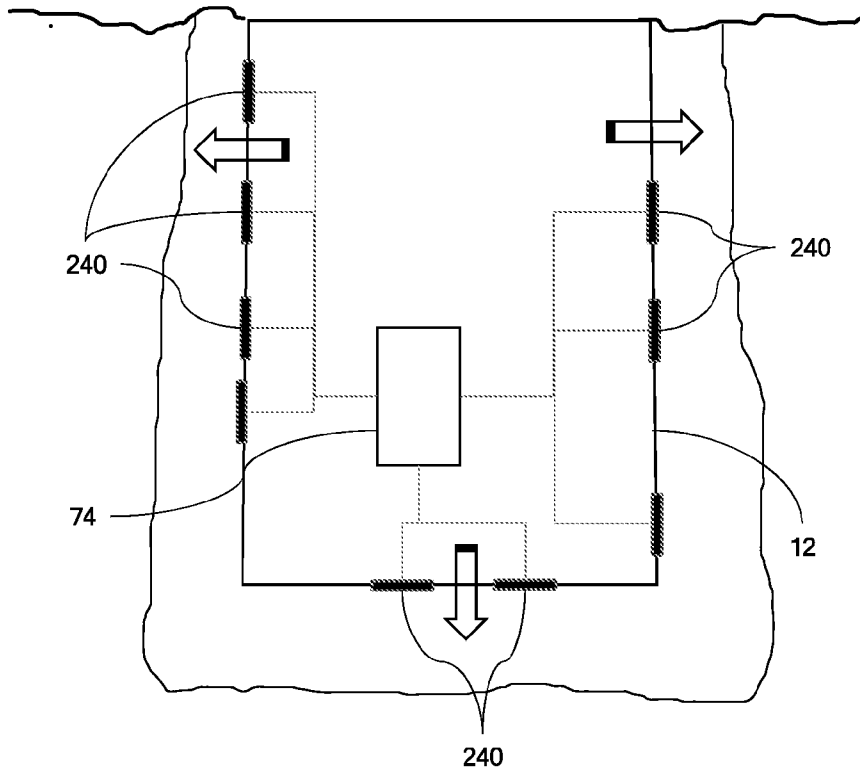


FIG. 33

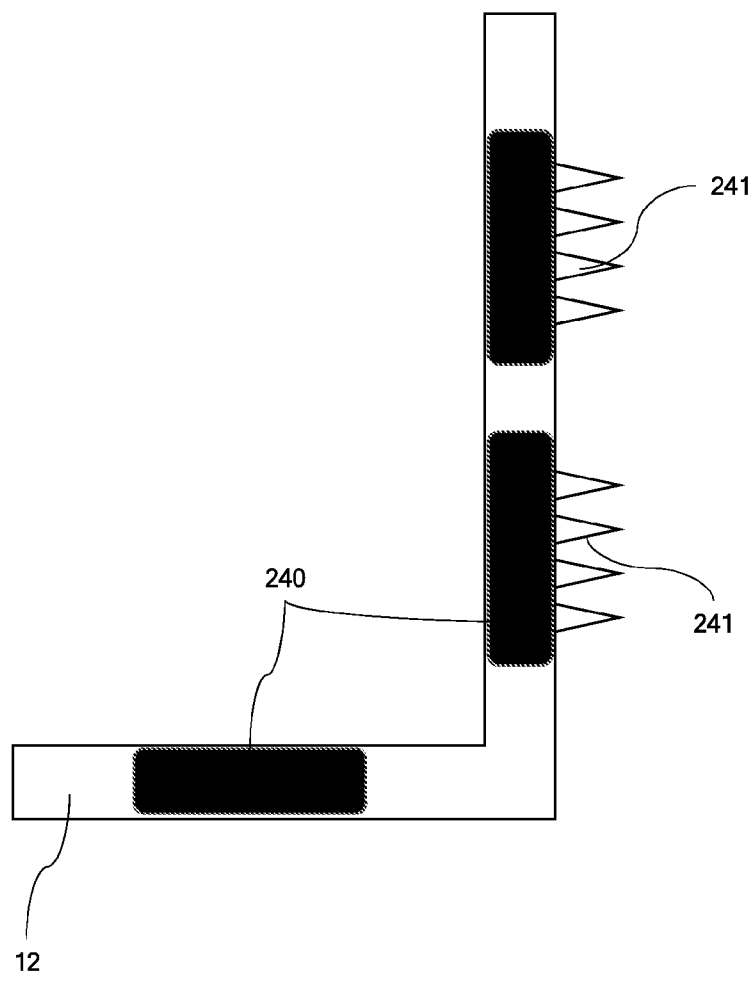


FIG. 34

Electronic Acknowledgement Receipt

EFS ID:	39073056
Application Number:	16841120
International Application Number:	
Confirmation Number:	3990
Title of Invention:	IN-GROUND ENCLOSURE SYSTEM
First Named Inventor/Applicant Name:	Kevin T. Aycock
Customer Number:	11753
Filer:	Gregory Marc Lefkowitz/Angela Zontelli
Filer Authorized By:	Gregory Marc Lefkowitz
Attorney Docket Number:	G3743-00205
Receipt Date:	06-APR-2020
Filing Date:	
Time Stamp:	16:24:52
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$ 865
RAM confirmation Number	E202046G25092109
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal of New Application	G3743-00205_Transmittal.pdf	255466	no	2
			81944db4a5df8e03b0b9d9a507061261cd89a4a5		
Warnings:					
Information:					
2	Application Data Sheet	G3743-00205_ADS.pdf	1793952	no	9
			b7055a791a5a6aa4c84fdef2a3cc6a0394ac669f		
Warnings:					
Information:					
3		G3743-00205_Specification.pdf	209450	yes	38
			46d536bb548bd1863240edf8d6fd3972b92dbc31		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Abstract		38	38	
	Claims		34	37	
	Specification		1	33	
Warnings:					
Information:					
4	Information Disclosure Statement (IDS) Form (SB08)	G3743-00205_IDS.pdf	67587	no	5
			8b8c70f1bd0279456a10e7b0b99912950cffe067		
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5	Foreign Reference	G3743-00205_ForeignRefs.pdf	2701466	no	29
			63717d198d6bc0f9a5277dad90a422821f4d2c8d		
Warnings:					
Information:					
6	Drawings-only black and white line drawings	G3743-00205_2PDFDrawings.pdf	1781591	no	32
			4be10060479e98cb99c0c56bee63df7aee01da42		
Warnings:					
Information:					
7	Fee Worksheet (SB06)	fee-info.pdf	36832	no	2
			41dfc6c894436427657dc0da905ed7a9fd31de0a		
Warnings:					
Information:					
Total Files Size (in bytes):			6846344		
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