UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/571,527	01/26/2021	10900626	120257-5001 US02	1021

9629 7590 01/06/2021

Morgan, Lewis & Bockius LLP (WA)
1111 Pennsylvania Avenue, N.W.
Washington, DC 20004

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

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

The Patent Term Adjustment is 9 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

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

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

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

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

C&M OILFIELD RENTALS, LLC, CODY, WY;
JOSHUA C. ALLISON, CODY, WY;
JOSH HAALAND, CODY, WY;
JESSICA IVANOFF, CODY, WY;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

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

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

9629 7590 12/15/2020
Morgan, Lewis & Bockius LLP (WA)
1111 Pennsylvania Avenue, N.W.
Washington, DC 20004

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

Certificate of Mailing or Transmission

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

Deborah A. Rypacek	(Typed or printed name)
/Deborah A. Rypacek/	(Signature)
December 17, 2020	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/571,527	09/16/2019	JOSHUA C. ALLISON	120257-5001 US02	1021

TITLE OF INVENTION: ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$600	$0.00	$0.00	$600	03/15/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
HINES, ANNE M	2879	362-249010

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

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

1 Morgan, Lewis & Bockius LLP
2
3

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

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: C&M Oilfield Rentals, LLC

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Cody, Wyoming

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

4a. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

☐ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 500310

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

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /C. ERIK HAWES/ Date December 17, 2020

Typed or printed name C. ERIK HAWES Registration No. 63328

PTOL-85 Part B (08-18) Approved for use through 01/31/2020 OMB 0651-0033 U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

Petitioner Ensign
Exhibit 1002 - 2 of 336

Electronic Patent Application Fee Transmittal

Application Number:	16571527
Filing Date:	16-Sep-2019
Title of Invention:	ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM
First Named Inventor/Applicant Name:	JOSHUA C. ALLISON
Filer:	Clay Erik Hawes
Attorney Docket Number:	120257-5001 US02

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	2501	1	600	600

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**600**

Electronic Acknowledgement Receipt

EFS ID:	41422481
Application Number:	16571527
International Application Number:	
Confirmation Number:	1021
Title of Invention:	ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM
First Named Inventor/Applicant Name:	JOSHUA C. ALLISON
Customer Number:	9629
Filer:	Clay Erik Hawes
Filer Authorized By:	
Attorney Docket Number:	120257-5001 US02
Receipt Date:	17-DEC-2020
Filing Date:	16-SEP-2019
Time Stamp:	17:28:28
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$600
RAM confirmation Number	E2020BGH29065496
Deposit Account	500310
Authorized User	Clay Hawes
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.17 (Patent application and reexamination processing fees) 37 CFR 1.21 (Miscellaneous fees and charges)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	CM_5001-US02_PAY_ISSUE_FFES.pdf	64910 d3aad2e5bbf53dafb406aa85d95878ac620b8c91	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30023 f6ae57f8a0c98151fea559ede7a932bb7e71e9b8	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	94933		

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

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

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

NOTICE OF ALLOWANCE AND FEE(S) DUE

9629 7590 12/15/2020

Morgan, Lewis & Bockius LLP (WA)
1111 Pennsylvania Avenue, N.W.
Washington, DC 20004

EXAMINER
HINES, ANNE M

ART UNIT	PAPER NUMBER
2879	

DATE MAILED: 12/15/2020

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/571,527	09/16/2019	JOSHUA C. ALLISON	120257-5001 US02	1021

TITLE OF INVENTION: ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$600	$0.00	$0.00	$600	03/15/2021

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

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

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

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

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

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

Petitioner Ensign
Exhibit 1002 - 7 of 336

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

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

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

9629 7590 12/15/2020
Morgan, Lewis & Bockius LLP (WA)
1111 Pennsylvania Avenue, N.W.
Washington, DC 20004

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

Certificate of Mailing or Transmission

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

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/571,527	09/16/2019	JOSHUA C. ALLISON	120257-5001 US02	1021

TITLE OF INVENTION: ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$600	$0.00	$0.00	$600	03/15/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
HINES, ANNE M	2879	362-249010

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

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

1_____
2_____
3_____

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

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

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

4a. Fees submitted: ❑Issue Fee ❑Publication Fee (if required) ❑Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

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

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

Petitioner Ensign
Exhibit 1002 - 8 of 336

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/571,527	09/16/2019	JOSHUA C. ALLISON	120257-5001 US02	1021

9629 7590 12/15/2020

Morgan, Lewis & Bockius LLP (WA)
1111 Pennsylvania Avenue, N.W.
Washington, DC 20004

EXAMINER	
HINES, ANNE M	
ART UNIT	PAPER NUMBER
2879	

DATE MAILED: 12/15/2020

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

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

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

PTOL-85 (Rev. 02/11)

Petitioner Ensign
Exhibit 1002 - 9 of 336

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. 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.

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.

Notice of Allowability	Application No. 16/571,527	Applicant(s) ALLISON et al.	
	Examiner ANNE M HINES	Art Unit 2879	AIA (FITF) Status Yes

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

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

1. ☑ This communication is responsive to Amendment filed 12/1/2020.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 13-33 and 35-39 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information , please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

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

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/ANNE M HINES/
Primary Examiner, Art Unit 2879

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Response to Amendment

The amendment filed on December 1, 2020, has been entered and acknowledged by the Examiner.

Claims 13-33, 35-39 are pending in the instant application.

Allowable Subject Matter

Claims 13-33 and 35-39 are allowed.

The following is an examiner's statement of reasons for allowance:

The amendments to independent claim 13 overcome the previous grounds of rejection and render the claim allowable over the prior art; claims 14-20 are allowable based on their dependence from independent claim 13.

Claims 21-33 and 35-39 stand as allowable as indicated in the office action of November 25, 2020 and will not be reiterated here.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANNE M HINES whose telephone number is (571)272-2285. The examiner can normally be reached on M-F: 8:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Epps can be reached on 571-272-2328. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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

/Anne M Hines/
Primary Examiner
Art Unit 2879

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/571,527	ALLISON et al.
	Examiner	Art Unit
	ANNE M HINES	2879

CPC - Searched*		
Symbol	**Date**	**Examiner**
F21S8/088	11/20/2020	AMH
F21V21/116; 33/00	11/20/2020	AMH
F21B41/00	11/20/2020	AMH

CPC Combination Sets - Searched*		
Symbol	**Date**	**Examiner**

US Classification - Searched*			
Class	**Subclass**	**Date**	**Examiner**

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	**Date**	**Examiner**
searched East; see East search history	11/20/2020	AMH
inventor search in DAV	11/20/2020	AMH
reviewed prosecution history for parent and sibling cases	11/20/2020	AMH
updated previous searches	12/04/2020	AMH

Interference Search			
US Class/CPC Symbol	**US Subclass/CPC Group**	**Date**	**Examiner**
same	as above	12/04/2020	AMH

Petitioner Ensign
Exhibit 1002 - 14 of 336

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/571,527	ALLISON et al.
	Examiner	**Art Unit**
	ANNE M HINES	2879

CPC						
Symbol					**Type**	**Version**
F21S	/	8	/	088	F	2013-01-01
F21V	/	21	/	116	I	2013-01-01
F21V	/	33	/	00	I	2013-01-01
E21B	/	41	/	00	I	2013-01-01
F21W	/	2131	/	403	A	2013-01-01
F21W	/	2131	/	1005	A	2013-01-01
F21W	/	2131	/	402	A	2013-01-01

CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	26	
/ANNE M HINES/ Primary Examiner, Art Unit 2879	04 December 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	13	1

U.S. Patent and Trademark Office — Part of Paper No.: 20201204

Petitioner Ensign
Exhibit 1002 - 15 of 336

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/571,527	ALLISON et al.
	Examiner	**Art Unit**
	ANNE M HINES	2879

INTERNATIONAL CLASSIFICATION				
CLAIMED				
F21S	/	8	/	08

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 26	
/ANNE M HINES/ Primary Examiner, Art Unit 2879 (Primary Examiner)	04 December 2020 (Date)	O.G. Print Claim(s) 13	O.G. Print Figure 1

U.S. Patent and Trademark Office — Part of Paper No.: 20201204

Petitioner Ensign
Exhibit 1002 - 16 of 336

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/571,527	ALLISON et al.
	Examiner	**Art Unit**
	ANNE M HINES	2879

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	13	10	22	19	31										
2	14	11	23	20	32										
3	15	12	24	21	33										
4	16	13	25		34										
5	17	14	26	22	35										
6	18	15	27	24	36										
7	19	16	28	25	37										
8	20	17	29	26	38										
9	21	18	30	23	39										

NONE (Assistant Examiner) (Date)	**Total Claims Allowed:** 26	
/ANNE M HINES/ Primary Examiner, Art Unit 2879 (Primary Examiner) (Date) 04 December 2020	O.G. Print Claim(s) 13	O.G. Print Figure 1

U.S. Patent and Trademark Office Part of Paper No.: 20201204

Petitioner Ensign
Exhibit 1002 - 17 of 336

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	2	(("20120217897") or ("5272611")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	OFF	2019/03/26 11:47 AM
L2	6	("3725695" | "4780799" | "4937717").PN. OR ("5272611").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/03/26 11:48 AM
L3	3	("5272611").URPN.	USPAT	OR	ON	ON	2019/03/26 12:20 PM
L4	19	("20080129543" | "3264465" | "4181929" | "5272611" | "5550333" | "5806963" | "6517225" | "6805462" | "7988343" | "8025428" | "8172438" | "8342714" | "8734163" | "8931932" | "9103495" | "D399595" | "D573286" | "D646840").PN. OR ("9567899").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/03/26 12:20 PM
L5	8	("4220981" | "6517225" | "6805462" | "RE30000").PN. OR ("8172438").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/03/26 12:24 PM
L6	21	(drilling with rig with lighting with system)	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/03/26 12:26 PM
L7	9	("20050083690" | "20080266859" | "3827197" | "4450507" | "5272609" | "5432691" | "5551199" | "6607285" | "7988343").PN.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/03/26 12:42 PM
L8	5	("20050083690" | "5432691" | "5551199" | "6607285" | "7988343").PN.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/03/26 12:43 PM
L9	2	(("20150184840") or ("5272611")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	OFF	2019/03/26 01:03 PM
L10	591	F21S8/088.cpc.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/03/26 01:08 PM
L11	7	("10125935"|"10145544"|"20180010748"|"20180163956"|"20180187873"|"9316390"|"D757343").PN.	US-PGPUB; USPAT	OR	ON	ON	2019/03/26 01:10 PM

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Exhibit 1002 - 18 of 336

L12	3	(drilling with rig).ab. and (safety with net) and (light)	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/08/09 01:01 PM
L13	2	(("20160109079") or ("20190242218")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	OFF	2019/08/09 02:28 PM
L14	982	F21V21/116.cpc.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/09/06 02:00 PM
L15	2073	F21V33/00.cpc.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/09/06 02:01 PM
L16	563	(drilling with rig) and (light)	FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	ON	2019/09/06 02:29 PM
L17	2	("2018/0187873").urpn. AND (PGPB | USPT | USOC).dbnm.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2020/11/13 03:42 PM
L18	8	(oil WITH crown WITH light$3) AND (rail handrail$3)	US-PGPUB; USPAT	OR	ON	ON	2020/11/13 03:47 PM
L19	40	(oil SAME light$3).ab. AND ((rail handrail$3) SAME (light$3))	US-PGPUB; USPAT	OR	ON	ON	2020/11/13 03:52 PM
L20	53	(railing WITH light$3 WITH bracket)	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 10:29 AM
L21	5	(oil WITH rig) SAME ((walk$3 catwalk) WITH (rail$3 handrail$3))	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 02:13 PM
L22	0	(oil WITH crown) SAME ((walk$3 catwalk) WITH (rail$3 handrail$3))	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 02:14 PM
L23	7	(oil WITH crown) SAME ((walk$3 catwalk))	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 02:36 PM
L24	516	F21S8/088.cpc.	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 02:37 PM
L25	28	L24 AND oil	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 02:39 PM
L26	13368	((oil drill$3) WITH (platform crown rig$3 structure frame)) AND (walk$3)	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 03:22 PM
L27	1237	((oil drill$3) WITH (platform crown rig$3 structure frame)) SAME (walk$3)	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 03:22 PM
L28	579	(((oil drill$3) WITH (platform crown rig$3	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 03:23 PM

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Exhibit 1002 - 19 of 336

		structure frame)) SAME (walk$3)) AND (light$3 lamp$3)					

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

Bibliographic Data

Application No: 16/571,527

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☑ No ☐ Met After Allowance

Verified and Acknowledged: /ANNE M HINES/ Examiner's Signature | Initials

Title: ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
09/16/2019	362	2879	120257-5001 US02
RULE			

APPLICANTS

C&M OILFIELD RENTALS, LLC, CODY, WY,

INVENTORS

JOSHUA C. ALLISON, CODY, WY, UNITED STATES

JOSH HAALAND, CODY, WY, UNITED STATES

JESSICA IVANOFF, CODY, WY, UNITED STATES

CONTINUING DATA

This application is a CON of 16138723 09/21/2018 PAT 10473282

16138723 is a CIP of 16009032 06/14/2018 PAT 10711961

16009032 has PRO of 62643663 03/15/2018

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

09/26/2019

** SMALL ENTITY **

STATE OR COUNTRY

UNITED STATES

ADDRESS

Morgan, Lewis & Bockius LLP (WA)

1111 Pennsylvania Avenue, N.W.

Washington, DC 20004

UNITED STATES

FILING FEE RECEIVED

$785

Electronic Acknowledgement Receipt

EFS ID:	41257862
Application Number:	16571527
International Application Number:	
Confirmation Number:	1021
Title of Invention:	ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM
First Named Inventor/Applicant Name:	JOSHUA C. ALLISON
Customer Number:	9629
Filer:	Clay Erik Hawes
Filer Authorized By:	
Attorney Docket Number:	120257-5001 US02
Receipt Date:	01-DEC-2020
Filing Date:	16-SEP-2019
Time Stamp:	11:58:42
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment/Req. Reconsideration-After Non-Final Reject	CM_5001US02_ROA_11_25_20x.pdf	129476 2e9e54813ac97ad1dda7e89f282af095842e0f27	no	7

Warnings:

Information:	
Total Files Size (in bytes):	129476

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

ELECTRONICALLY FILED IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.:	16/571,527	Confirmation No.:	1021
Applicant:	C&M Oilfield Rentals, LLC		
Filed:	September 16, 2019		
TC/A.U.:	2879		
Examiner:	Hines, Anne M.		
Docket No.:	120257-5001 US02		
Customer No.:	9629		
Title:	ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM		

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

RESPONSE TO OFFICE ACTION MAILED NOVEMBER 25, 2020

Dear Examiner:

In response to the Office Action mailed November 25, 2020, Applicant offers the following:

Amendments to the claims; and

Remarks.

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

1-12. (Cancelled)

13. (Currently Amended) A lighting system mounted on a rig; the lighting system comprising:

a plurality of light units, each light unit comprising:

a mounting pole comprising a continuous structure, wherein each light unit comprises a separate mounting pole, such that the system comprises a plurality of mounting poles;

a bracket configured to connect the mounting pole to [[the]] a handrail of the rig; and

a light fixture comprising one or more lights, the light fixture coupled to the mounting pole, wherein the light fixture may be coupled to the mounting pole in a first position or a second position; and

wherein the light fixture is proximate to the handrail of the rig in both the first position and the second position.

14. (Currently Amended) The lighting system of claim [[1]] 13, further comprising safety nets connected to the rig.

15. (Currently Amended) The lighting system of claim [[1]] 13, wherein the light fixture is secondarily coupled to the rig using a cable.

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16. (Currently Amended) The lighting system of claim [[1]] 13, wherein, when the light fixture is in the first position, the one or more lights of the light fixture are oriented away from the rig.

17. (Previously Presented) The lighting system of claim 16, wherein, when the light fixture is in the second position, the one or more lights of the light fixture are oriented towards the rig.

18. (Currently Amended) The lighting system of claim [[1]] 13, wherein the bracket is welded to the rig.

19. (Currently Amended) The lighting system of claim [[1]] 13, wherein the mounting pole and bracket are connected to the rig using U-shaped bolts.

20. (Previously Presented) The lighting system of claim 13, wherein the rig is a drilling rig.

21. (Previously Presented) A rig comprising:

a derrick;

a crown deck at the top of the derrick, the crown deck comprising a handrail; and

a plurality of light units attached to the handrail, each light unit comprising:

a mounting pole, wherein each light unit comprises a separate mounting pole, such that the system comprises a plurality of mounting poles; and

a light fixture comprising one or more lights, the light fixture coupled to the mounting pole.

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22. (Previously Presented) The rig of claim 21, further comprising safety nets connected to the rig.

23. (Previously Presented) The rig of claim 21, wherein the light fixture is coupled to the rig using a cable.

24. (Previously Presented) The rig of claim 21, wherein the light fixture may be coupled to the mounting pole in a first position or a second position and, when the light fixture is in the first position, the one or more lights of the light fixture are oriented away from the rig.

25. (Previously Presented) The rig of claim 24, wherein, when the light fixture is in the second position, the one or more lights of the light fixture are oriented towards the rig.

26. (Previously Presented) The rig of claim 21, further comprising a bracket configured to connect the mounting pole to the handrail.

27. (Previously Presented) The rig of claim 26, wherein the mounting pole and bracket are connected to the rig using U-shaped bolts.

28. (Previously Presented) The rig of claim 21, wherein the rig is a drilling rig.

29. (Previously Presented) The rig of claim 21, wherein one or more of the plurality of mounting poles comprises a continuous structure.

30. (Previously Presented) The rig of claim 21, wherein the light fixture is proximate to the handrail in both the first position and the second position.

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31. (Previously Presented) A method for illuminating a wellsite, comprising:

mounting a plurality of mounting poles on a crown deck of a rig, wherein each of the plurality of mounting poles is attached to a handrail of the crown deck;

mounting a plurality of lights to the plurality of mounting poles, wherein each of the plurality of mounting poles supports at least one of the plurality of lights, and each of the plurality of lights is mounted to only one of the plurality of mounting poles; and

illuminating the wellsite using the plurality of lights.

32. (Previously Presented) The method of claim 31, further comprising individually adjusting each of the plurality of lights.

33. (Previously Presented) The method of claim 31, wherein mounting a plurality of mounting poles on a crown deck of a rig comprises:

attaching a removable bracket to one or more of the mounting poles on the rig; and

using the removable bracket the attach one or more of the mounting poles to the rig.

34. (Cancelled)

35. (Previously Presented) The method of claim 31, wherein each of the plurality of lights mounted at the one or more of the plurality of mounting poles attached to the handrail of the crown deck of the rig is proximate to the handrail.

36. (Previously Presented) The method of claim 31, further comprising:

coupling each light of the plurality of lights to one or more cables; and

coupling the one or more cables to the rig.

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37. (Previously Presented) The method of claim 31, further comprising installing a safety net below one of the plurality of lights.

38. (Previously Presented) The method of claim 31, wherein one or more of the plurality of mounting poles comprises a continuous structure.

39. (Previously Presented) The method of claim 35, wherein one or more of the plurality of mounting poles comprises a continuous structure.

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REMARKS

Applicant appreciates Examiner's indication of allowable subject matter for claims 21-33 and 35-39. In this response, claims 13-16 and 18-19 are amended. Claims 1-12 and 34 were previously cancelled. Accordingly, claims 13-33 and 35-39 are currently pending.

The office action included rejections for claims 13-20 under 35 U.S.C. § 112 based on antecedent basis or claim dependency issues, or for depending from a claim with those issues. Claim 13 has been amended to correct an antecedent basis issue for "handrail." Claims 14-16 and 18-19 have been amended to depend from claim 13, and claim 17 ultimately depends from claim 13 through its dependency on claim 16. Applicant submits that each of claims 13-20 are in condition to be allowed and respectfully requests a notice of allowance be issued for all pending claims.

It is believed that no unpaid fees are due. If there are any fees due in connection with this filing, please charge the fee to Deposit Account No. 50-0310, referencing 120257-5001 US02. If, while considering this reply, the Examiner believes that a telephone conference would be beneficial towards furthering prosecution of this case, the Examiner is strongly encouraged to contact the undersigned attorney at the number listed.

Dated: December 1, 2020

Respectfully submitted,

Customer Number: 09629

/C. Erik Hawes /
C. Erik Hawes
Registration No.: 63328
MORGAN, LEWIS & BOCKIUS LLP
713-890-5000 x 5165
Attorney for Applicant

DB1/ 117437989.1

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/571,527	Filing Date 09/16/2019	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	12/01/2020	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 26	Minus	** 26	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x $480 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/VICTORIA JOHNSON/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, 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.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/571,527	09/16/2019	JOSHUA C. ALLISON	120257-5001 US02	1021

9629 7590 11/25/2020

Morgan, Lewis & Bockius LLP (WA)
1111 Pennsylvania Avenue, N.W.
Washington, DC 20004

EXAMINER	
HINES, ANNE M	

ART UNIT	PAPER NUMBER
2879	

NOTIFICATION DATE	DELIVERY MODE
11/25/2020	ELECTRONIC

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

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

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

karen.catalano@morganlewis.com
patents@morganlewis.com

Office Action Summary	Application No. 16/571,527	Applicant(s) ALLISON et al.	
	Examiner ANNE M HINES	Art Unit 2879	AIA (FITF) Status Yes

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

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

Status

1)☑ Responsive to communication(s) filed on 10/22/2020.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 13-33 and 35-39 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☑ Claim(s) 21-33 and 35-39 is/are allowed.

7) ☑ Claim(s) 13-20 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☑ The drawing(s) filed on 9/16/2019 is/are: a)☑ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

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

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

Petitioner Ensign
Exhibit 1002 - 33 of 336

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Claim Rejections - 35 USC § 112

The following is a quotation of 35 U.S.C. 112(b):
(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 13-20 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor (or for applications subject to pre-AIA 35 U.S.C. 112, the applicant), regards as the invention.

In independent claim 13, at line 6, the phrase "the handrail" lacks antecedent basis in the claims; claim 20 is rejected based on its dependence from claim 13.

Claims 14-19 lack antecedent basis because they each depend from cancelled claim 1.

Allowable Subject Matter

Claims 21-33, and 35-39 are allowed.

The following is an examiner's statement of reasons for allowance:

Regarding independent claim 21, the references of the Prior Art of record fail to teach or suggest the combination of the limitations as set forth in claim 21, and specifically comprising the

limitation wherein a rig comprising: a derrick; a crown deck at the top of the derrick, the crown deck comprising a handrail; and a plurality of light units attached to the handrail each light unit comprising: a mounting pole, wherein each light unit comprises a separate mounting pole, such that the system comprises a plurality of mounting poles; and a light fixture comprising one or more lights, the light fixture coupled to the mounting pole.

Regarding claims 22-30, claims 22-30 are allowable for the reasons given in claim 21 because of their dependency status from claim 21.

Regarding independent claim 31, the references of the Prior Art of record fail to teach or suggest the combination of the limitations as set forth in claim 31, and specifically comprising the limitation wherein a method for illuminating a wellsite, comprising: mounting a plurality of mounting poles on a crown deck of a rig, wherein each of the plurality of mounting poles is attached to a handrail of the crown deck: mounting a plurality of lights to the plurality of mounting poles, wherein each of the plurality of mounting poles supports at least one of the plurality of lights, and each of the plurality of lights is mounted to only one of the plurality of mounting poles; and illuminating the wellsite using the plurality of lights.

Regarding claims 32-33, 35-39, claims 32-33, 35-39 are allowable for the reasons given in claim 31 because of their dependency status from claim 31.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANNE M HINES whose telephone number is (571)272-2285. The examiner can normally be reached on M-F: 8:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Epps can be reached on 571-272-2328. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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

/Anne M Hines/
Primary Examiner
Art Unit 2879

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/571,527	ALLISON et al.
	Examiner	Art Unit
	ANNE M HINES	2879

CPC - Searched*		
Symbol	Date	Examiner
F21S8/088	11/20/2020	AMH
F21V21/116; 33/00	11/20/2020	AMH
F21B41/00	11/20/2020	AMH

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
searched East; see East search history	11/20/2020	AMH
inventor search in DAV	11/20/2020	AMH
reviewed prosecution history for parent and sibling cases	11/20/2020	AMH

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

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Exhibit 1002 - 37 of 336

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	16571527
Filing Date	2019-09-16
First Named Inventor	Joshua C. Allison
Art Unit	2879
Examiner Name	
Attorney Docket Number	120257-5001 US02

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	D757343		2016-05-24	Dupuis et al.; Apollo Energy Services Corp.	
	2	5272611		1993-12-21	Lai	
	3	8814221		2014-08-26	Grant; Swivelpole Patent Pty Ltd.	
	4	9316390		2016-04-19	Gowanlock et al.; Apollo Energy Services Corp.	
	5	9534626		2017-01-03	Walton et al.; Swivelpole Patent Pty Ltd.	
	6	9945143		2018-04-17	Pannekoek et al.; Swivelpole Patent Pty Ltd.	
	7	10125935		2018-11-13	Gowanlock et al.; Apollo Energy Services Corp.	
	8	10145544		2018-12-04	Gowanlock et al.; Apollo Energy Services Corp.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.M.H/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16571527
	Filing Date	2019-09-16
	First Named Inventor	Joshua C. Allison
	Art Unit	2879
	Examiner Name	
	Attorney Docket Number	120257-5001 US02

	9	10392826		2019-08-27	Pannekoek et al.; Swivelpole Patent Pty Ltd.	
	10	10473282		2019-11-12	Allison et al.; JCA Rentals, LLC	
	11	10598359		2020-03-24	Pannekoek et al.; Swivelpole Patent Pty Ltd.	

If you wish to add additional U.S. Patent citation information please click the Add button. Add

U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20050184207		2005-08-25	Bertram, III	
	2	20120217897		2012-08-30	Gordin et al.; Musco Corporation	
	3	20130135848		2013-05-30	Chrysanthous	
	4	20180010748		2018-01-11	Gowanlock; Apollo Energy Services Corp.	
	5	20180163956		2018-06-14	Gowanlock; Apollo Energy Services Corp.	
	6	20180187873		2018-07-05	Carroll; Location Illuminator Technologies	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16571527
	Filing Date	2019-09-16
	First Named Inventor	Joshua C. Allison
	Art Unit	2879
	Examiner Name	
	Attorney Docket Number	120257-5001 US02

FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	108240588	CN		2018-07-01	Liu Chunxin		

If you wish to add additional Foreign Patent Document citation information please click the Add button Add

NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	SWIVELPOLE Brochure; Swivelpole Product Catalogue NEC V2-4. Printed March 2014, pp. 5-9	

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature	/ANNE M HINES/	Date Considered	11/20/2020

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.M.H/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16571527
	Filing Date	2019-09-16
	First Named Inventor	Joshua C. Allison
	Art Unit	2879
	Examiner Name	
	Attorney Docket Number	120257-5001 US02

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/C. ERIK HAWES/	Date (YYYY-MM-DD)	2020-09-11
Name/Print	C. ERIK HAWES	Registration Number	63328

This collection of information is required by 37 CFR 1.97 and 1.98. 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 1 hour 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.**

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.M.H/

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 the Freedom of Information Act requires disclosure of these record s.

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 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.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.M.H/

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	2	(("20120217897") or ("5272611")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	OFF	2019/03/26 11:47 AM
L2	6	("3725695" | "4780799" | "4937717").PN. OR ("5272611").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/03/26 11:48 AM
L3	3	("5272611").URPN.	USPAT	OR	ON	ON	2019/03/26 12:20 PM
L4	19	("20080129543" | "3264465" | "4181929" | "5272611" | "5550333" | "5806963" | "6517225" | "6805462" | "7988343" | "8025428" | "8172438" | "8342714" | "8734163" | "8931932" | "9103495" | "D399595" | "D573286" | "D646840").PN. OR ("9567899").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/03/26 12:20 PM
L5	8	("4220981" | "6517225" | "6805462" | "RE30000").PN. OR ("8172438").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/03/26 12:24 PM
L6	21	(drilling with rig with lighting with system)	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/03/26 12:26 PM
L7	9	("20050083690" | "20080266859" | "3827197" | "4450507" | "5272609" | "5432691" | "5551199" | "6607285" | "7988343").PN.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/03/26 12:42 PM
L8	5	("20050083690" | "5432691" | "5551199" | "6607285" | "7988343").PN.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/03/26 12:43 PM
L9	2	(("20150184840") or ("5272611")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	OFF	2019/03/26 01:03 PM
L10	591	F21S8/088.cpc.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/03/26 01:08 PM
L11	7	("10125935"|"10145544"|"20180010748"|"20180163956"|"20180187873"|"9316390"|"D757343").PN.	US-PGPUB; USPAT	OR	ON	ON	2019/03/26 01:10 PM

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Exhibit 1002 - 43 of 336

L12	3	(drilling with rig).ab. and (safety with net) and (light)	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/08/09 01:01 PM
L13	2	(("20160109079") or ("20190242218")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	OFF	2019/08/09 02:28 PM
L14	982	F21V21/116.cpc.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/09/06 02:00 PM
L15	2073	F21V33/00.cpc.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/09/06 02:01 PM
L16	563	(drilling with rig) and (light)	FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	ON	2019/09/06 02:29 PM
L17	2	("2018/0187873").urpn. AND (PGPB | USPT | USOC).dbnm.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2020/11/13 03:42 PM
L18	8	(oil WITH crown WITH light$3) AND (rail handrail$3)	US-PGPUB; USPAT	OR	ON	ON	2020/11/13 03:47 PM
L19	40	(oil SAME light$3).ab. AND ((rail handrail$3) SAME (light$3))	US-PGPUB; USPAT	OR	ON	ON	2020/11/13 03:52 PM
L20	53	(railing WITH light$3 WITH bracket)	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 10:29 AM
L21	5	(oil WITH rig) SAME ((walk$3 catwalk) WITH (rail$3 handrail$3))	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 02:13 PM
L22	0	(oil WITH crown) SAME ((walk$3 catwalk) WITH (rail$3 handrail$3))	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 02:14 PM
L23	7	(oil WITH crown) SAME ((walk$3 catwalk))	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 02:36 PM
L24	516	F21S8/088.cpc.	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 02:37 PM
L25	28	L24 AND oil	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 02:39 PM
L26	13368	((oil drill$3) WITH (platform crown rig$3 structure frame)) AND (walk$3)	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 03:22 PM
L27	1237	((oil drill$3) WITH (platform crown rig$3 structure frame)) SAME (walk$3)	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 03:22 PM
L28	579	(((oil drill$3) WITH (platform crown rig$3	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 03:23 PM

Petitioner Ensign
Exhibit 1002 - 44 of 336

		structure frame)) SAME (walk$3)) AND (light$3 lamp$3)					

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

Bibliographic Data

Application No: 16/571,527

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☑ No ☐ Met After Allowance

Verified and Acknowledged: /ANNE M HINES/ Examiner's Signature | Initials

Title: ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
09/16/2019	362	2879	120257-5001 US02
RULE			

APPLICANTS

C&M OILFIELD RENTALS, LLC, CODY, WY,

INVENTORS

JOSHUA C. ALLISON, CODY, WY, UNITED STATES

JOSH HAALAND, CODY, WY, UNITED STATES

JESSICA IVANOFF, CODY, WY, UNITED STATES

CONTINUING DATA

This application is a CON of 16138723 09/21/2018 PAT 10473282

16138723 is a CIP of 16009032 06/14/2018 PAT 10711961

16009032 has PRO of 62643663 03/15/2018

FOREIGN APPLICATIONS

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1111 Pennsylvania Avenue, N.W.
Washington, DC 20004
UNITED STATES

FILING FEE RECEIVED

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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	16571527
Filing Date	2019-09-16
First Named Inventor	Joshua C. Allison
Art Unit	2879
Examiner Name	
Attorney Docket Number	120257-5001 US02

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	1	03096128	CA		2020-10-05	Curlett et al; Cleantek Industries Inc.		
	2	2019191843	WO		2019-10-10	Curlett et al; Cleantek Industries Inc.		

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
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See attached certification statement.

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Signature	/C. ERIK HAWES/	Date (YYYY-MM-DD)	2020-11-12
Name/Print	C. ERIK HAWES	Registration Number	63328

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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.

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	1	20160109079		2016-04-21	McKinley et al.; McKinley Service Equipment, Inc.	
	2	20170023195		2017-01-26	Gowanlock et al; Apollo Energy Services Corp	
	3	20190242218		2019-08-08	Gowanlock; Apollo Energy Services Corp.	

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PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	2	(("20120217897") or ("5272611")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	OFF	2019/03/26 11:47 AM
L2	6	("3725695" | "4780799" | "4937717").PN. OR ("5272611").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/03/26 11:48 AM
L3	3	("5272611").URPN.	USPAT	OR	ON	ON	2019/03/26 12:20 PM
L4	19	("20080129543" | "3264465" | "4181929" | "5272611" | "5550333" | "5806963" | "6517225" | "6805462" | "7988343" | "8025428" | "8172438" | "8342714" | "8734163" | "8931932" | "9103495" | "D399595" | "D573286" | "D646840").PN. OR ("9567899").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/03/26 12:20 PM
L5	8	("4220981" | "6517225" | "6805462" | "RE30000").PN. OR ("8172438").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/03/26 12:24 PM
L6	21	(drilling with rig with lighting with system)	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/03/26 12:26 PM
L7	9	("20050083690" | "20080266859" | "3827197" | "4450507" | "5272609" | "5432691" | "5551199" | "6607285" | "7988343").PN.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/03/26 12:42 PM
L8	5	("20050083690" | "5432691" | "5551199" | "6607285" | "7988343").PN.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/03/26 12:43 PM
L9	2	(("20150184840") or ("5272611")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	OFF	2019/03/26 01:03 PM
L10	591	F21S8/088.cpc.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/03/26 01:08 PM
L11	7	("10125935"|"10145544"|"20180010748"|"20180163956"|"20180187873"|"9316390"|"D757343").PN.	US-PGPUB; USPAT	OR	ON	ON	2019/03/26 01:10 PM

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Exhibit 1002 - 55 of 336

L12	3	(drilling with rig).ab. and (safety with net) and (light)	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/08/09 01:01 PM
L13	2	(("20160109079") or ("20190242218")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	OFF	2019/08/09 02:28 PM
L14	982	F21V21/116.cpc.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/09/06 02:00 PM
L15	2073	F21V33/00.cpc.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2019/09/06 02:01 PM
L16	563	(drilling with rig) and (light)	FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	ON	2019/09/06 02:29 PM
L17	2	("2018/0187873").urpn. AND (PGPB | USPT | USOC).dbnm.	US-PGPUB; USPAT; USOCR	OR	ON	ON	2020/11/13 03:42 PM
L18	8	(oil WITH crown WITH light$3) AND (rail handrail$3)	US-PGPUB; USPAT	OR	ON	ON	2020/11/13 03:47 PM
L19	40	(oil SAME light$3).ab. AND ((rail handrail$3) SAME (light$3))	US-PGPUB; USPAT	OR	ON	ON	2020/11/13 03:52 PM
L20	53	(railing WITH light$3 WITH bracket)	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 10:29 AM
L21	5	(oil WITH rig) SAME ((walk$3 catwalk) WITH (rail$3 handrail$3))	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 02:13 PM
L22	0	(oil WITH crown) SAME ((walk$3 catwalk) WITH (rail$3 handrail$3))	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 02:14 PM
L23	7	(oil WITH crown) SAME ((walk$3 catwalk))	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 02:36 PM
L24	516	F21S8/088.cpc.	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 02:37 PM
L25	28	L24 AND oil	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 02:39 PM
L26	13368	((oil drill$3) WITH (platform crown rig$3 structure frame)) AND (walk$3)	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 03:22 PM
L27	1237	((oil drill$3) WITH (platform crown rig$3 structure frame)) SAME (walk$3)	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 03:22 PM
L28	579	(((oil drill$3) WITH (platform crown rig$3	US-PGPUB; USPAT	OR	ON	ON	2020/11/17 03:23 PM

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Exhibit 1002 - 56 of 336

		structure frame)) SAME (walk$3)) AND (light$3 lamp$3)					

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

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Exhibit 1002 - 57 of 336

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

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SIGNATURE

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Name/Print	C. ERIK HAWES	Registration Number	63328

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LIGHTWEIGHT LED LIGHTING SYSTEMS FOR PERMANENT AND SEMI- PERMANENT MOUNTING ON ELEVATED STRUCTURES HAVING INTEGRATED SUPPORT AND THERMAL TRANSFER FEATURES

FIELD OF THE INVENTION

[0001] The invention relates to lightweight LED lighting systems for permanent and semi-permanent mounting on elevated structures, the lighting systems having integrated support and thermal transfer features. The systems are particularly suited for elevated mast systems and specifically for mast systems that are repeatedly lifted and lowered such as drilling and service rig masts. Specifically, the invention improves a) the weight/lumen ratios of LED lamp assemblies and LED lighting systems, b) the net added weight of LED lighting systems, c) the footprint of LED light systems and/or d) obviates the need for removing LED lighting systems or their sub-assemblies when transporting mast systems.

BACKGROUND OF THE INVENTION

[0002] LED lighting systems are well known and have a large number of applications. They are advantaged over past incandescent, fluorescent and metal halide systems in many applications for their energy consumption, robustness and durability.

[0003] In industrial applications, LED lighting systems continue to be used extensively and are becoming more common place for both portable and permanent applications and their associated markets. In the portable market, and in particular, the construction and energy industries, there are certain areas where LED lighting systems are not widespread due to various technical problems and/or limitations in certain applications. Although LED technology can supply lighting needs at a fraction of the energy consumption of metal halide technology, a drawback is the amount of metal required to dissipate and draw heat away from high-power LED lamps. As such, in many cases the cost and weight of LED lighting systems can make them a challenging option for retrofit structures that were

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originally built for metal halide lighting systems and/or mounting LED lighting systems to structures that were not designed to support the weight of LED lighting systems.

[0004] Specifically, the combined weight of an LEDs, lamp housings and heat sinks (collectively referred to herein as an LED lamp assembly) together with mounting brackets and all support frames required for configuring a plurality of LED lamp assemblies to an existing structure can limit or prevent a retrofit or a new build thus preventing lower energy LED technology to be deployed in some applications.

[0005] One example of a system that has had limited application of LED technology is oil industry drilling and service rigs and specifically mounting lighting on the crown or upper mast region of a drilling rig or service rig mast. As is known, drilling and service rigs and their masts are sophisticated and costly pieces of equipment designed for the complex task of drilling wells and servicing wells. Given the nature and location of drilling and service operations, drilling and service sites are operated around the clock and at all times of the year. As such, there is a need for effective lighting solutions on and around these rigs that meet the high demands and tough working environment of a rig including long term exposure to heat, cold and precipitation.

[0006] Importantly, while rigs are generally very well engineered structures, designed for their primary task of drilling or servicing wells, they must also be designed to be transported between well sites, and as such are often not designed to accommodate secondary tasks such as supporting lighting systems on their masts or crowns despite the desirability of having effective lighting at a central and high location of the site. As a result, lighting systems are often separate from the rig and mast and, as such, are operated as separate and independent pieces of equipment such as trailer mounted portable light tower systems. Separate and independent lighting sources can be effective in providing light to the site but they must be independently set up and directed to ensure that their light is effective at the site. This can increase the costs of lighting the rig as both additional equipment and personnel may be required. In addition, pieces of equipment such as fuel powered light towers are often not tall enough to provide a lighting source above the working surfaces of a rig.

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[0007] As low watt per lumen LED technology has developed, new applications have arisen. Various prior art systems have configured high lumen lighting systems (for example, 0.5 million (MM) to 1.5 million (MM) systems) to the crown or upper section of a drilling rig or service rig mast and have shown that light can be provided to the entire drilling lease surface to provide a safer work area to the workers. For example, an LED lighting system mounted 165 feet (53m) off the ground level where the workers need light, a 0.5MM lumen LED system may not provide enough light on target; however, if that same 0.5MM lumen system was added to an 80-foot (26m) mast it would likely provide enough light on target. However, in the latter case, a smaller rig can generally support less weight than the taller bigger rigs and so, designers of LED lighting systems will consider both the height of the mast in determining the required light output as well as the ability of the mast to support a given weight. Importantly, and as discussed below, a key drawback of LED lamps assemblies and LED lighting systems that mount to a rig crown or upper mast is the overall weight or weight to lumen ratio requirements of such systems to provide a specific light output.

[0008] Primarily, the problem of weight at the crown or upper mast of a rig is that during the process of raising and lowering the mast at a job site (after moving the rig between drilling locations), the extra weight of an LED lighting system acting at the end of the mast can subject the mast to enough force that the mast will bend and/or break and/or put additional stresses on lifting equipment. In other words, because rigs are mobile systems, their overall weight and footprint are engineered such that both are usually minimized and are not "over engineered" to accommodate additional loads being placed on the rig. As noted previously, the smaller the rig the less weight it can support, but then due to a lower height of a smaller rig, fewer lumens are required to displace other means of site surface lighting.

[0009] For example, it is desirable to keep the overall weight of a rig low due to road weight restrictions and challenges of delivering heavy rigs down roads that are not paved, particularly when the roads are wet that can cause ruts and road damage. Accordingly, drilling rigs are designed with upper weights limits to enable their movement.

[0010] As such, current prior art lighting systems that provide for example 1MM-1.5MM lumens can weigh in the range of 2,000-2,500 lbs and, as a result, are limited from being

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installed on many drilling rigs due to the stresses that such systems impose on a drilling rig as it is being raised and lowered. While some rigs may be strong enough to allow this extra weight to be lifted, as noted above in some cases, it is the size and capabilities of the hydraulic ram lifting systems that limit the ability to use higher weight systems. While larger hydraulic lifting systems may be utilized, this can also represent a significant additional cost to an operator. For service rigs the same issues apply, but as this style of rig is generally smaller, they may only need 0.25MM – 0.75MM lumens and may weigh 400-1,000 lbs. Thus, while the net added weight is lower for a service rig, as with the heavier drilling rigs, the weight to lumen ratio needs to be within a range to mitigate the above issues.

[0011] Another consideration is the time and equipment required to install a lighting system on a mast and the current requirement of having to remove the LED lighting system for transport due to the positioning the lighting systems and the extent to which they will project outwardly from the sides of the mast. Moreover, with the high weights of these systems, manpower and equipment is required. In other words, the installation and removal of LED lighting systems requires the use and cost of a crane and loader for rigging in and rigging out, plus the extra time it takes to remove and reattach the LED lighting system after each move. Since the rig companies often are compensated by their customer on time efficiency, this has created a barrier to market for many retrofit LED lighting systems and from gaining traction in the market. Accordingly, there is a need for LED lighting systems that can be permanently and/or semi-permanently configured to a rig such that during transport the LED lighting system can remain attached or substantially attached to the rig, thereby reducing time for transport between well sites and minimizing the need and cost associated with loaders, cranes and additional deck space on transport trucks.

[0012] Furthermore, to provide access to a higher percentage of existing drilling rigs, there is a need for lighting systems that reduce weight while providing sufficient light for rigs which typically have mast heights of 20-45m for service type rigs and 30-50+m for drilling rigs. While weight can be reduced by decreasing the lumen output of the system, lower lumen systems may not provide sufficient light.

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[0013] While newer systems have been developed that continue to reduce the weight of lighting systems greater than 1.0MM lumens to around 550kg, there remain many rigs where this amount of added weight is still too high.

[0014] For the purposes of discussion, if it is assumed that a low weight LED lighting system or a standard prior art LED lighting system for configuration to the crown of drilling rigs and that provides 1MM+ lumens will generally weigh 1,200 lbs (500kgs) to 2,400 lbs (1,100kgs). These figures represent a ratio of 0.55 grams or 1.10 grams, respectively, of added weight / 1.0 lumen (0.55:1.0 or 1.10:1.0 g/lumen respectively).

[0015] As the total mass of such systems cannot be used on many rigs, it is desirable to decrease the ratio of added weight/lumen below these numbers. In addition, it is desirable to decrease the total mass of lighting systems to reduce or obviate the time and equipment required to prepare a rig for installation or transport.

[0016] Specifically, for configuration to larger drilling rigs with mast heights in the range of 30-50+ meters wherein the overall lumens are preferably near or greater than 1MM lumens, there is a need for the net added weight to be less than 1,100lbs (500kg), preferably less than 880lbs (400kg) and more preferably to around 600lbs (275kgs). Thus, for an LED lighting system of approximately 600 lbs (275 kg) and a 1MM lumen LED lighting system, this is a ratio of 0.27 grams/lumen. For a high lumen output LED system for the same drilling rig providing 1.5 MM lumens a ratio of less than 0.2 and preferably less than 0.18 grams/lumen is desirable.

[0017] To achieve these levels of lighting with current LED lamps assemblies, a typical lighting system may include an array of 10-50 LED lamp assemblies, again depending on the applicable height of the LED lighting system while in use, each typically weighing in the range of 17.5-33lbs (8-15kg) based on typical designs as shown in Figures 1A and 1B. The weights of lamps described in the preceding sentence are for illustration and are not meant to be limiting.

[0018] Specifically, Figures 1A and 1B show the various components of a typical prior art LED lamp assembly 10 as including an LED housing 12, LED solid state light board 14 having LEDs (i.e. high power LEDs) 14a, reflectors 16, heat sink 18, housing cover 20,

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associated mounting brackets 22, optional cooling fans (not shown) and power cables 24. As noted above, due to the need for each LED lamp assembly to be robust and durable, a typical LED lamp assembly will have a separate housing, heat sink and brackets that are connected to one another during assembly. However, each of these components is generally heavy when assembled and when incorporated into an array of lamp assemblies can represent a significant weight. As noted, various prior art systems may also utilize a cooling fan to direct cooling air over one or more LEDs. As such, as the total weight of the LED lighting system includes the lamp assemblies as well as all the supporting frames, electrical cables, connectors, etc., the end result is that the desired ratios of grams/lumen as described above cannot be achieved with current designs.

[0019] As indicated, each LED lamp assembly 10 includes a heat sink 18 to ensure that heat generated by the LEDs is properly dissipated to ensure the LEDs are operated within the required temperature ranges and do not exceed recommended operating temperatures as set by a LED manufacturer. Moreover, it is generally desirable to manage power consumption for a given light output in lumens to ensure both efficiency and the longevity of the LEDs. Accordingly, an LED manufacturer will generally recommend that the temperature at the semi-conductor junction of each LED be maintained within a preferred temperature range to maintain power efficiency but also LED longevity. While a LED may be operated at a higher junction temperature (up to a maximum temperature before burning out), the power efficiency will drop off (i.e. higher watts being consumed per lumen of light intensity) and the longevity of the LED will drop. Hence, for practical purposes, high power LEDs are rarely operated at temperatures higher than the recommended temperatures.

[0020] Table 1 shows typical specifications of a high performance LED.

[0021] Table 1- Typical Specifications of a High Performance LED (Cree XHP 70, Cree Canada Corp, Mississauga, Ontario)

Property	Parameter
Size	7 by 7 mm
Voltage	6V or 12V
Max Drive Current	4.8A (6V) 2.4A (12V)

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Max Power	28.8 W
Max Light Output	4022 lm
Max Efficiency at Binning Conditions	150 lm/W
Typical Forward Voltage	5.8 V White @ 2100 mA (6 V) 11.6 V White @ 1050 mA (12 V)
Maximum Reverse Voltage	-5 V
Viewing Angle	120 °
Maximum Junction Temperature	150 °C

[0022] As can be seen in this example, the maximum junction temperature is 150 °C. However, in a typical operating scenario, it would be recommended to not operate the lamp at temperatures greater than about 80°C.

[0023] For an LED described in Table 1, an array of 16 LEDs within a housing 12 would have a maximum power requirement of about 460 W but would normally be operating at about 50-60% of maximum power thus consistently utilizing about 230-276 W of power. With the radiant efficiency of the LEDs typically being between 20% and 45%, this means that approximately 55-80% of the input power will be lost as heat. Assuming a 75% heat loss, this means 180-206 W of power is continuously being lost as heat which to prevent junction temperatures from rising must be efficiently removed.

[0024] In view of the foregoing and in summary, there has been a need for lightweight LED lighting systems that provide desired light on target (e.g. suitable, desired and usable light volume delivered to the area where workers require the light to complete tasks) and that can be effectively configured to tall structures at different and/or various heights from the surface of a work site (whether smaller service rigs or larger drilling rigs). In addition, there has been a need for LED lamp assemblies and LED lighting systems with lower ratios of grams/lumens than current LED lighting systems whilst enabling effective heat dissipation to maintain recommended junction temperatures.

[0025] Further still, there has been a need for LED lighting systems that integrate, partially-integrate and/or are otherwise configured with or to functional features of a rig's upper mast and/or crown with an LED lighting system such that the net added weight of

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adding lighting to a drilling mast is reduced. In addition, there has been a need for LED lighting systems that integrate or partially-integrate with, or act as a substitute and/or partial substitute for, components and/or sub-components of a rig mast, crown, structure, or other such item, without limitation, that exists as part of the rig assembly prior to the addition and/or configuration of an LED lamp assemblies and/or an LED lighting system. Further, there has been a need for LED lighting systems that reduce the effective net added weight and/or minimize the weight/lumen ratio when compared to prior art.

[0026] Further still, there remains a need for LED lighting systems that can be configured to a rig as a permanent and/or semi-permanent system thereby minimizing or eliminating the need to remove and/or partially remove the LED lamp assemblies and/or LED lighting system during transportation activities.

[0027] In addition, there has also been a need for portable lighting systems for other applications including temporary lighting applications such as interior construction applications that provide desired lighting but that reduce both the size and the weight of the lighting systems.

[0028] Further still, it is desirable in certain applications, including the operation of drilling rigs, that the light cast from a high mast does not create excessive light pollution to areas adjacent the work site. As such, the design of a lamp assembly should provide relatively precise light paths that illuminate the desired areas but do not allow excessive light to escape. The design of reflectors can be adjusted to enable sharper boundaries between illuminated and non-illuminated areas from a particular light source. However, as light towers become taller, the precision of these boundaries becomes lower for a given reflector. Tighter boundaries can be achieved by deeper and narrower reflectors; however, this must also be balanced against the proximity of a hot LED near the reflector.

SUMMARY OF THE INVENTION

[0029] In accordance with the invention, there is provided an LED lighting system for configuration to a supporting structure, the LED lighting system comprising: a plurality of LED lamps and reflectors within at least one LED lamp assembly; an air flow system having at least one air flow conduit (AFC) for directing air flow against each LED lamp

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assembly to effect cooling of the LED lamps and to provide structural support to each LED lamp assembly for connection to the supporting structure; and wherein the LED lighting system has a weight/lumen ratio of less than 0.55g/lumen.

[0030] In various embodiments, the LED lighting system has a weight/lumen ratio of less than 0.35g/lumen and/or less than 0.25g/lumen.

[0031] In various embodiments, the LED lighting system provides greater than 500,000 lumens and/or greater than 1.0 MM lumens.

[0032] In further embodiments, each LED lamp assembly includes a lamp assembly housing having a plurality of surfaces for effecting heat transfer of heat from the LED lamps away from the LED lamps.

[0033] In other embodiments, each AFC is operatively connected to a lamp assembly housing, the AFC having an air channel for moving cooling air through the AFC and for conveying heat from each LED lamp assembly away from each LED lamp assembly to effect cooling of each LED lamp assembly and to maintain an operating temperature of the LED lamp assembly at or below a threshold temperature during use.

[0034] In yet further embodiments, the mass/lumen ratio is realized by a balance of a collective weight and thermal mass of each LED lamp assembly and AFC to provide sufficient structural strength to support the LED lighting system and an adequate thermal mass of each LED lamp assembly housing to effect sufficient cooling when each lamp assembly is operating at ambient temperature and air flow is flowing over each LED lamp assembly.

[0035] The system may include a fan system operatively connected to the AFC for actively moving air through the AFC.

[0036] In various embodiments, the AFC includes a vertically oriented conduit having a lower air entry and upper air exit and wherein cool air enters the lower air entry and warm heated air exits the upper air exit. The vertically oriented conduit may also include at least one substantially horizontal branch conduit extending laterally from the vertically oriented conduit and wherein each branch conduit operatively and structurally supports at least

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one lamp assembly housing and/or a heat transfer fin system operatively connected to the AFC.

[0037] In other embodiments, the system will include a controller for managing LED lamp assembly temperature, wherein the controller monitors the temperature within an LED lamp assembly and adjusts air flow speed to increase or decrease air flow through the AFC to maintain LED lamp assembly temperature below a pre-determined threshold temperature. The controller may also monitor the temperature within an LED lamp assembly and adjust power to the LED lamp assembly to maintain LED lamp assembly temperature below a pre-determined threshold temperature.

[0038] In other embodiments, the system may also include a duct collar operatively connected to a lamp assembly for directing cooling air against a lamp assembly housing at substantially 90 degrees to the lamp assembly.

[0039] In various embodiments, each lamp assembly housing has one or more outer edges and includes cooling fins extending radially from a central position on a lamp assembly housing towards each outer edge of the lamp assembly housing for providing an even air flow across the lamp assembly housing.

[0040] In other embodiments, the lamp assembly housing has a thermal mass sufficient to effect cooling of the LED lamp assembly and to maintain an operating temperature of the LED lamp assembly at a recommended temperature during use at ambient conditions only when air is flow against the LED lamp assembly housing from the AFC.

[0041] In another aspect, the invention provides an integrated lighting and railing system for attachment to a crown of a rig mast comprising: at least one LED lamp assembly, each LED lamp assembly having at least one LED lamp operatively contained within a lamp assembly housing and thermally connected thereto; a combined air flow conduit (AFC) and railing, the combined AFC and railing including at least one substantially vertical and at least one substantially horizontal AFC members, the AFC members arranged as a railing structure and configured for attachment to an upper region of a rig mast, the AFC members supporting the at least one LED lamp assembly and defining an air flow path through the AFC members to each LED lamp assembly to effect cooling of each LED lamp

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assembly, and wherein the integrated lighting and railing system has railing dimensions substantially corresponding to an existing mast-top steel railing.

[0042] In other embodiments, the integrated lighting and railing system includes a forced air system operatively connected to the AFC to move air through the AFC and towards each lamp assembly.

[0043] The integrated lighting and railing system may include a controller operatively connected to the forced air system, the controller for controlling a flow rate of air through the AFC, the controller responsive to a measured temperature at one or more LED lamp assemblies to increase or decrease the flow rate of air based on a measured temperature.

[0044] In various embodiments of the integrated lighting and railing system, the lamp assembly housing has a thermal mass sufficient to effect cooling of the LED lamp assembly and to maintain an operating temperature of the LED lamp assembly at a recommended temperature during use at ambient conditions only when air is flow against the LED lamp assembly housing from the AFC.

[0045] The integrated lighting and railing system may be configurable to a drilling rig mast, provides greater than 0.5 MM lumens and has a net added weight /lumen ratio of less than 0.55g/lumen and/or provides greater than 0.5 MM lumens and has a net added weight/lumen ratio of less than 0.35g/lumen and/or provides greater than 0.5 MM lumens and has a net added weight /lumen ratio of less than 0.25g/lumen and/or provides greater than 1.0 MM lumens and has a net added weight /lumen ratio of less than 0.55g/lumen and/or provides greater than 1.0 MM lumens and has a net added weight /lumen ratio of less than 0.35g/lumen and/or provides greater than 1.0 MM lumens and has a net added weight /lumen ratio of less than 0.25g/lumen and/or provides greater than 1.0 MM lumens and has a net added weight /lumen ratio of less than 0.20g/lumen.

[0046] In various embodiments, the LED lamp assemblies are retractable with respect to a central axis of the rig mast to enable transportation of the rig mast with the LED lighting system attached.

[0047] In another aspect, the invention provides method for retrofitting an LED lighting system to a rig mast to reduce a net added weight of the LED lighting system to the rig

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mast, the method comprising the steps of: a) removing existing mast-top steel railings from a rig mast; and, b) attaching an integrated lighting and railing system to the mast top, the integrated lighting and railing system having at least one LED lamp assembly, each LED lamp assembly having at least one LED lamp operatively contained within a lamp assembly housing and thermally connected thereto; and a combined air flow conduit (AFC) and railing, the combined AFC and railing including at least one substantially vertical and at least one substantially horizontal AFC members, the AFC members arranged as a railing structure and configured for attachment to an upper region of a rig mast, the AFC members supporting the at least one LED lamp assembly and defining an air flow path through the AFC members to each LED lamp assembly to effect cooling of each LED lamp assembly and wherein the integrated lighting and railing system has railing dimensions substantially corresponding to the existing mast-top steel dimensions.

[0048] In another aspect, the invention provides an LED lighting system comprising: an LED circuit board having a support matrix supporting at least one LED lamp and power conducting trace; a reflector operatively configured over each LED lamp and to the LED board, the reflector having a reflector base for operative positioning over the LED lamp and a reflector body for directing LED light away from the reflector; a heat sink in thermal contact with an outside surface of the reflector adjacent the reflector base and the LED board, the heat sink for conveying LED lamp heat away from inside surfaces of the reflector; and, an LED housing operatively configured to the LED board, the LED housing having a thermally conductive body for conveying heat away from the LED housing.

[0049] In a further aspect, the invention provides a control system for an LED light system having at least one LED lamp assembly, each LED lamp assembly having a plurality of LED lamps operatively contained within an LED housing, an air flow conduit (AFC) operative configured with a fan system to deliver cooling air to each LED lamp assembly, the control system for controlling power to the LED lamps and to maintain an operating temperature within a desired range, the control system comprising: a power driver operatively connected to a power supply and to the LED lamps of an LED lamp assembly; a temperature sensor and controller operatively connected to each LED housing for monitoring the temperature of the LED housing, the temperature sensor and controller for reporting the temperature of the LED housing to the power driver; and wherein the power

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driver increases or decreases power to the LED lamps in response to the temperature of the LED housing and wherein if the temperature of the LED housing is above a threshold, power is reduced to the LED lamps, and wherein if the temperature is below a threshold, power is increased to the LED lamps up to a pre-determined power threshold.

[0050] In one embodiment, the system further includes a fan driver operatively connected to the power supply and wherein the fan driver activates the fan above a temperature threshold and deactivates the fan below a temperature threshold.

BRIEF DESCRIPTION OF THE DRAWINGS

[0051] Various objects, features and advantages of the invention will be apparent from the following description of particular embodiments of the invention, as illustrated in the accompanying drawings. The drawings are not necessarily to scale, emphasis instead being placed upon illustrating the principles of various embodiments of the invention. Similar reference numerals indicate similar components.

Figures 1A and 1B are schematic cross sectional (Figure 1A) and top (Figure 1B) views of a typical prior art LED lamp assembly having LEDs within a housing.

Figures 2, 2A, 2B, 2C, 2D, 2E, 2F and 2G are various perspective views (Figures 2-2F) and a cross-sectional view (Figure 2G) of a lighting system having a heat transfer conduit (HTC) in accordance with one embodiment of the invention.

Figures 3, 3A, 3B, 3C and 3D are various perspective views (Figures 3-3C) and a cross-sectional view (Figure 3D) of an LED lighting system having a branched heat transfer conduit (HTC) in accordance with one embodiment of the invention.

Figures 4 and 4A are a cross-sectional view (Figure 4) and perspective view (Figure 4A) of a ducted cooling system in accordance with one embodiment of the invention and **Figure 4B** is perspective view of a ducted cooling system having radial fins on a lamp assembly in accordance with one embodiment of the invention.

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Figures 4C and 4D are schematic cross-section and perspective views of an LED lamp assembly having a ducted collar to provide even air flow to an LED lamp assembly in accordance with one embodiment of the invention.

Figure 5 is a perspective view of an integrated LED lighting and railing system in accordance with one embodiment of the invention.

Figures 6 and 6A are schematic top (Figure 6) and cross-sectional (Figure 6A) views of an LED light panel array having a telescopic arm that functions as a heat sink in accordance with one embodiment of the invention.

Figure 7 is a diagram of an integrated light assembly (IA) configured to one corner of a drilling mast in accordance with one embodiment of the invention.

Figure 7A is a diagram of eight integrated light assemblies (IAs) configured to four corners of a drilling mast in accordance with one embodiment of the invention.

Figure 7B is a bottom view of an IA in accordance with one embodiment of the invention.

Figure 7C is an isometric view of an IA with portions of the heat transfer conduit removed in accordance with one embodiment of the invention.

Figure 7D is a cross-sectional view through a lamp assembly showing a typical beam path from a reflector in accordance with one embodiment of the invention.

Figure 7E is a cross-sectional and isometric view of a lamp assembly and reflector heat sinks in accordance with one embodiment of the invention.

Figures 7F-7I are isometric and cross-sectional views of a reflector pair in accordance with one embodiment of the invention.

Figure 7J is an isometric view of an LED reflector heat sink in accordance with one embodiment of the invention.

Figure 7K is an isometric view of a LED printed circuit board in accordance with one embodiment of the invention.

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Figure 8 is a schematic diagram of a control system in accordance with one embodiment of the invention.

Figures 9 and 9A are sketches of the light projection pattern of a lighting system in accordance with one embodiment of the invention.

DETAILED DESCRIPTION

[0052] With reference to the Figures, LED lamp assemblies and LED lighting systems are described that combine structural and heat dissipation properties in combined systems that significantly reduces the weight of LED lamp assemblies and LED lighting systems.

[0053] Although many of the Figures illustrate and/or describe configuration to drilling rigs with higher lumen outputs, these are not meant to be limiting and it is understood that the systems described can be modified for configurations with applicability to smaller service rigs, other rigs of various heights, weights, geometry, etc. and are within the scope and spirit of the present invention. The systems described herein may also be integrated with other support systems. Various embodiments and aspects of the current invention are described that achieve one or more of the following:

a. provide a desired level of lighting;

b. reduce the overall net weight of an LED lighting system when compared to prior art systems;

c. reduce the mass/lumen ratio of a LED lamp assembly and/or the mass/lumen ratio of an LED lighting system

d. provide sufficient heat dissipation capabilities for the desired lighting;

e. provide robust structural support to enable deployment in a variety of applications and particularly elevated structure applications;

f. for drilling and service rig mast LED lighting systems, reduce the "net added weight" at the upper section of the mast by integrating and/or at least partially replacing, displacing and/or subsidizing functional uses and

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weights of other structural features of the rig mast at least partially with at least some aspects or components of the LED lighting system;

g. provide a controller that manages the power delivery to LED lighting systems to align with the sunrise and sunset of any particular location;

h. provide a power backup system to ensure uninterrupted LED lighting when the main site power fails.

i. provide reflector optics enabling effective light projection over a defined area while reducing light pollution outside a projection area as well as defined blind spots when desired.

j. provide a control system that enables effective interconnection of a number of lamp assembly modules depending on lighting needs.

[0054] To achieve these objectives, the LED lighting systems and LED lamp assemblies described herein utilize combinations of separate and integrated LED housings, heat transfer/air flow conduits and support systems that enable effective heat dissipation through the support system or cooling air through the heat transfer conduits and/or support system. Generally, the LED lighting systems are operated to maintain an operating temperature of individual LEDs at or around a recommended operating temperature.

[0055] Figure 2 shows a typical drilling mast system 30 having a representative lighting system 32 in accordance with one embodiment of the invention mounted to upper corners of a drilling mast. For the purposes of illustration, as is known a typical drilling rig mast includes a number of substantially vertical members 30a, horizontal members 30b and various cross members 30c. The typical mast will include an upper deck platform 30d having a railing 30f and potentially other top mounted structures 30e such as a cage railing. Figure 2A shows a lighting system 32 mounted to the upper railings of the drilling mast.

[0056] In a first embodiment, and as shown in greater detail in Figures 2B-2G, an LED lighting system 32 includes separate corner-mounted LED lighting assemblies 40 each having a plurality of LED lamp assemblies 40a. The LED lamp assemblies 40a are

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connected to and supported by an air flow conduit (AFC) 40b that has a generally hollow interior enabling air to be drafted upwardly through the AFC. The AFC provides structural support to the LED lamp assemblies 40a and enables effective heat dissipation from the LED lamp assemblies to maintain desired operating temperatures within each LED lamp assembly and LED. The AFC is attached to the drilling mast via appropriate connectors and will generally be installed in a substantially vertical orientation. Within the AFC, a system of cooling fins 40c (see Figure 2G in particular) is preferably configured to increase the surface area of the AFC and otherwise improve heat transfer from the system.

[0057] As shown, each of the LED lamp assemblies 40a is pivotally connected to the AFC allowing individual manipulation of an LED lamp assembly for directing light where it may be required. Power for the LED lamp assemblies is provided by a power controller 42 mounted to each AFC.

[0058] In the embodiment shown in Figures 2B and 2C, air may passively draft upwardly through the AFC from a lower entry position 40d to an upper exit position 40e. In this example, heated air within the AFC and derived from the LED lamp assemblies will rise within the AFC to create an air draft such that colder air is drawn in at the entry position 40d and warmer air is expelled through the exit 40e. The upper exit position may include a cap 40f to prevent precipitation from entering the AFC.

[0059] As shown in Figures 2D-2G, in one embodiment, a forced air convention system may be provided to actively move air through the AFC via a fan system 44. In this case, a fan having fan blades and a motor is configured to the AFC at the lower entry 40d and operates to pull cold air into the AFC and move it upwardly towards the exit 40e.

[0060] In another embodiment, as shown in Figures 3-3D, a branched AFC lighting system 50 is described. In this embodiment, a branched AFC conduit 52 has a vertical conduit 52a and two or more horizontal conduits 52 b,c (or substantially vertical and substantially horizontal). Figure 3 shows a branched system 50 configured to the upper railings of a drilling mast and Figure 3A shows a branched lighting system 50 configured to the upper corners of a drilling mast. As with the other embodiments, air can be moved through the system from a lower entry position 50c by fan 53, upwardly and then outwardly from two or more branches exits 50d, 50e. As shown, LED lamp assemblies 40a may be mounted

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to the vertical 52a and horizontal conduits 52 b,c. Each branch may be coplanar (e.g. 50b, 50c) with one another and may also include additional non-coplanar branches (e.g 50f, 50c).

[0061] As shown in Figure 3D, the branched AFC will preferably include internal fins 54 to increase the surface area for heat dissipation.

[0062] Importantly, for each of the above described embodiments, the AFC provides a combination of heat sink capabilities and structural support for a plurality of LED lamp assemblies. In contrast, prior art systems provide only provide heat sink capabilities through non-structural members.

[0063] Figures 4 and 4A show another embodiment similar to the branched AFC above but where cooling air is actively pushed against an LED lamp assembly 60. In this embodiment, a fan system 62 drafts air through additional AFC 64 having an LED lamp assembly 60 adjacent a conduit exit 64a. In this case, a combination of vertical 64b and horizontal 64c and angled 64d conduits collectively provide air movement from the fan system to the exits 64a. As shown, each LED lamp assembly 60 has a bracket connection system 66 and system of cooling fins 68. Importantly, in this embodiment, the cooling fins 68 may be substantially smaller and lighter than the cooling fins on a prior art lamp assembly as sufficient heat transfer from the LED lamp assembly is enabled due to the active air flow over the cooling fins. In one embodiment (Figure 4B), the cooling fins may be arranged in a generally radial pattern (or spiral pattern (not shown)) from the center of the back of the lamp assembly to provide radial channels to the outside edges of the lamp assembly to the flow of air from the conduits. A generally radial or spiral pattern of cooling fins helps promote an even flow of air over the entire surface of the lamp assembly thus providing even cooling to all lamps within the lamp assembly as well as continuous air cleaning of the cooling fins. Importantly, the cooling fins in these embodiments would generally not be sufficient to enable the LED lamp assembly to operate at the desired light output as a standalone lamp assembly. That is, sufficient cooling is normally only achieved by the movement of cooling air over the LED lamp assembly, particularly when operating at ambient temperatures at, around or above 20 °C.

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[0064] In various embodiments, the cooling fins 68 may be partially enclosed via additional ducting to manage air flow over the cooling fins.

[0065] Figures 4C and 4D show one embodiment having a duct collar 64e to promote an even flow of air over the cooling fins. In this case, a duct collar is pivotally connected to angled conduit 64d to direct air flow against cooling fins 68 in a substantially perpendicular direction to the cooling fins and/or in a direction that promotes passage of the cooling air through the cooling fins. That is, by providing a short channel that directs cooling air through the cooling fins, air will be directed more evenly across the back of the LED lamp assembly. In one embodiment, a small gap 69 is provided between the duct collar and angled conduit to enable an increased air flow against the cooling fins through the duct collar. That is, the movement of air through the duct collar will draw additional air in through the gap 69 thus increasing air flow.

Weight Reduction

[0066] By moving the heat sink capabilities and/or air flow to the structural members, the weight of each LED lamp assembly can be reduced by reducing the size of or eliminating heat sink fins from the housing.

[0067] Potential weight reductions are illustrated by way of example and as shown in Table 2 for various sub-assemblies of an LED lighting system. In this representative example, for 16 LEDs contained within a lamp housing 210 (Figure 7A for example), the total weight of a LED lamp assembly including 16 LED lamps, an aluminum housing, cabling and housing covering can be reduced to approximately 2-3 kg as compared to current systems having passively cooling fins mounted to the housing and which typically weigh 12kg each.

[0068] Table 2-Representative Weights of Lighting System Sub-Assemblies for a 1.2MM total lumen LED Lighting System and Mass/Lumen

Sub-Assembly /Parameter	Weight (lbs) [kgs]	Number	Total Weight (lbs) [kgs]
LED Lamp Assembly	6 [2.7]	6 per corner	36 [16.3]

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Air Flow Conduit and Electrical Assembly	46 [30.4]	2 per corner	92 [41.8]
Support Frame	20 [9.1]	1 per corner	20 [9.1]
Total Weight			148 [67.2]
Total Weight for 4 corners of mast			592 [268.8]
Mass/Lumen (g/lumen)			0.224

[0069] Thus, as shown in Figure 7A and Table 2, a total of 6 LED lamp assemblies for one corner of a drilling mast may weight approximately 16.3 kgs. Two aluminum AFCs 212 including their electrical assemblies and for mounting a total of 6 LED lamp assemblies may weigh approximately 41.8 kg. A support frame may weigh approximately 9.1 kgs. Accordingly, the entire weight of 6 LED lamp assemblies and the support system would be approximately 67.2 kg and be capable of 300,000 lumens.

[0070] Thus, for a drilling mast having 4 LED lighting systems and 1.2 MM lumens as shown in Figure 7A, the total weight of the LED lighting system would be approximately 268 kg which is significantly lower than current systems weighing upwards of 500kg for the same light capabilities of approximately 1.2 million lumens (assuming both systems are operated to maintain recommended junction temperatures and utilize similar LEDs). As such, the subject system can dramatically reduce the total mass of an LED lighting system and significantly decrease the added weight/lumen.

Net Weight Reduction

[0071] As shown in Figure 5, in one embodiment, the LED lighting system is integrated to upper regions of a drilling mast where an existing steel railing system 30f is replaced with an LED lighting system where the AFCs of the LED lighting system form the railings of the upper mast thus further reducing the net weight addition of the LED lighting system.

[0072] By way of example, and as shown in Figure 2, a typical mast has a steel handrail assembly that weighs approximately 45-90kg (100-200lbs). As shown in Figure 5, by removing the steel handrail and replacing the steel system with an LED lighting system 70 where the AFC of the LED lighting system provides railing structures, a significant reduction in overall weight can be achieved. In this example, for a square or rectangular

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mast head, the vertical corner posts and horizontal rails of the steel handrail assembly are replaced with a combination of vertical 70a and horizontal 70h AFCs that support a plurality of LED lamp assemblies 70b supported on conduits 70c. The interior channels with the AFCs enable cooling air to be directed to each LED lamp assembly as described above. The AFCs may completely replace existing railings. In some embodiments, non-AFC aluminum railing may be utilized to fill in any gaps as may be required.

[0073] As such, by removing 90kg (200lbs) of steel handrails and adding a 300kg (650lbs) (representative example weight) integrated lighting and railing system 70 the "net added weight" to the rig is only 210kg (460lbs).

[0074] In addition, as shown in Figure 5, a steel cage railing 30e may also be replaced with a lighter metal structure such as aluminum, to further reduce the net added weight. Accordingly, in these embodiments, the net added weight/lumen is further reduced as shown in Table 3.

Table 3- Representative Net Added Weight/lumen for Integrated LED Lighting and Railing System.

Parameter	Value
Lumens	1.2 MM/1.5MM
LED Lighting System Weight	300kg
g/lumen	0.25 g/lumen@1.2MM lumen 0.2 g/lumen @1.5 MM lumen
Steel Railing Removed	-90kg
Net Added Weight/Lumen	0.175 g/lumen 0.14 g/lumen @1.5 MM lumen

[0075] Accordingly, as can be seen from Table 3, substantially lower effective weight/lumen ratios can be achieved by and integrated LED lighting and railings system.

[0076] In one embodiment, the integrated lighting and railing system is a single, modular unit that can be configured to the drilling rig mast at site whilst the drilling rig mast is in a horizontal position. The integrated lighting and railing system may be transported independently from the drilling rig mast or connected to it during transportation. If

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transportable in a connected position, the integrated lighting and railing system may include pivoting arms that can be moved towards a central axis of the mast.

[0077] Other features and embodiments of the lighting system are described below.

AFC Design

[0078] AFCs are designed to provide a) sufficient heat transfer or air flow capabilities and b) structural strength to mount the desired number of LED lamp assemblies. From a mass and heat conductivity perspective, aluminum will generally provide the best properties for both heat conductivity and reducing weight. Rectangular or square AFCs can be assembled from aluminum panels with additional fin systems mounted to the interior (or exterior) of the conduit. Similarly, for round AFCs, extruded aluminum tubes can be readily assembled to form a branched or straight structure again with a fin system configured to the interior of the conduit. Both systems, rectangular or round or other profiles, will have sufficient void spaces to allow sufficient air flow through each AFC.

Fan System

[0079] In those LED lighting systems having a fan, the fan may be operated at one or more fixed speeds or may dynamically adjust air flow through each AFC depending on cooling requirements and as may be determined by a control scheme. In one embodiment, for example, a representative LED lighting system having 12 LED lamp assemblies having 16 LEDs, a fixed air flow of 500 cfm may be effective to continuously circulate air to effect cooling in which case power consumption of each fan system will be in range of 100 Watts.

Lamp Housing

[0080] Each LED lamp assembly, of either configuration in Figures 2 and 3 or Figure 4 as the specific case may be, will include a lamp housing supporting LEDs, reflectors and a transparent cover. A housing can be manufactured or assembled from an extruded aluminum profile or flat aluminum panels or a combination thereof.

[0081] For example, for the embodiment as shown in Figure 4 where cooling air is directed against the back of an LED housing, the LED lamp housing may include a relatively low

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surface area of cooling fins and a hence non-traditional appearance when compared to the surface area of cooling fins of a traditional standalone LED lamp assembly and that would typically be required for a specified lumen output.

[0082] For the embodiment as shown in Figure 3, where heat is conducted through an AFC away from the LED lamp assembly, the back of the LED housing may also have a non-traditional appearance of heat sink fins and have even less surface area when compared to the surface area of cooling fins of a traditional standalone LED lamp assembly.

Mounting Brackets

[0083] Each LED lamp assembly or LED lamp housing is attached to an AFC through a mounting bracket, which is preferably adjustable. In the case of the embodiments of Figures 2 and 3, the brackets provide effective heat transfer from the LED lamp housing to the AFC. In the case of the embodiment of Figure 4, the brackets may at least partially assist in directing air over the back of the LED lamp housing. Aluminum brackets and/or strapping can provide effective heat transfer while reducing weight.

Operation

[0084] In a typical operating scenario with average ambient conditions, for example lower night temperatures, some air movement, precipitation, and/or cooler seasonal temperatures, the operating temperature of each LED lamp assembly may remain below a recommended operating temperature. However, under various conditions, for example warm summer nights, no wind and/or no precipitation, the operating temperature may rise towards or above a recommended operating temperature. Similarly, the operator may temporarily require more light and increase the power to the LED lighting system.

[0085] Generally, the system controller can actively monitor junction temperature and

a. reduce power to the LEDs if the temperature rises or increase power to the LEDs as temperature drops or

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b. increase or decrease the air flow rate through each AFC as the temperature rises or drops.

[0086] In other situations, an operator may selectively choose to increase the light output of the system in which case, the system may allow a temporary increase in power and temperature for a time period and/or increase the air flow rate through the AFC to maintain temperature at the recommended level.

[0087] In other situations, the system is designed so that the forced air flow and other design features described herein are fixed and not variable such that there is a contingency of heat dissipation capacity for the environmental changes between summer and winter and wherein the LED lighting system provides a reliable and predictable amount of light on target.

[0088] The control system in one embodiment of the present invention incorporates logic that turns the LED lighting system on and off based on the sunrise and sunset time for that location, the controller logic updating itself daily and automatically from satellites thereby minimizing the need for attention by and tasks required by humans.

[0089] In another embodiment, the LED lighting system includes a battery or energy storage system configured to the LED lighting system whereby the lights can remain powered in the event of a blackout condition whereby the rig generators may fault and be off-line for a period of time. The backup system may be any one of Lithium batteries, capacitors, generators with control system that auto-starts the generator when needed, or other means of power backup reliability of common means.

[0090] Figures 6 and 6A show another embodiment where LEDs are configured to a telescopic pole where heat sink capabilities are provided by the telescopic pole 100. In this case, the telescopic pole includes both an inner pole and an outer pole 100b fixed to the housing 36. The inner pole is frictionally engaged with the outer pole allowing the lighting array to be selectively positioned along the inner pole. Importantly, the outer pole 100b is in heat transfer contact with the housing 36 through a contact system such as a weld bead 102 allowing heat to transfer through the housing to the outer pole. During operation, and under conditions as described above, the inner pole may also act as a heat

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sink. These embodiments may be particularly suited for portable construction applications where lighting systems are being regularly moved, positioned and oriented by workers.

Other Embodiments

[0091] With reference to Figures 7-7F, further embodiments are described having additional features that provide light weight and high output light.

[0092] Figure 7 shows an integrated assembly (IA) 200 having 4 lamp assemblies 202, air flow conduits (AFC) 210 and a main conduit 212. The integrated assembly 200 is configured to the upper deck of a drilling mast via a support pole 204, support arm 206 and hinge connector 208 to position the IA outside the upper deck railing of the drilling mast and allows individual lamp assemblies 202 to project their output light in a generally downward and outward direction.

[0093] Figure 7A shows each corner of a drilling mast supporting two IAs 200 vertically and horizontally separated from one another. In this case, the support system includes additional support members 206a, 206b, 206b' that provide horizontal support for each IA as well as vertical separation. Upper and lower support members 206b, 206b' may be of different lengths to enable horizontal separation between the two IAs. In addition, connector 206c allows pivoting of the support member 206a about a vertical axis. Vertical support member 206a may also be horizontally positioned on support member 206 to enable horizontal extension or retraction of the IAs relative to the drilling mast. Connector 208 also enables inward pivoting of the entire assembly in order to locate the IAs inside the outer perimeter of the drilling mast which is particularly useful during raising and lowering of the mast and/or during transportation of the drilling mast.

[0094] As shown in Figures 7, 7A, 7B and 7C, the main conduit 212 is generally a square or rectangular aluminum conduit that supports the lamp assemblies 202 through the AFCs 210. The main conduit may include handles 212a. The main conduit 212 shown has sections (a, b, c, d) each supporting one lamp assembly and angled (angle A) with respect to one another as shown in Figure 7B such that each lamp assembly has a different projection direction.

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[0095] Each main conduit includes end caps 212e at each end of the main conduit that provide an inlet cover duct to the main conduit and weather protection to the drivers and cooling fans (explained below).

[0096] Generally, in operation, cooling air is actively drawn in through the end caps 212e, through the main conduit and downwardly and against each lamp assembly 202 through AFCs 210.

[0097] Referring to Figure 7C, additional details of an IA are shown and specifically the location of power drivers 214 that control power to one or more lamp assemblies as described below.

[0098] Individual lamp assemblies may also be individually adjusted to provide a desired light direction.

Lamp Assembly and LED Reflector Design

[0099] As shown in Figures 7D-7J, the design of individual lamp assemblies 202, LEDs 220 and reflectors 222 is described for mast applications. For context, in a typical drilling mast application, the lighting system may be mounted at the top of a drilling mast 30-60m above the ground. As it is desirable to have relatively sharp boundaries between lighted and non-lighted areas at the work location, to create a precise projection/throw from each reflector, the design of the lamp assemblies, LEDs and reflectors includes a number of features that enables a precise light projection/throw. Importantly, this feature also contributes to providing light weight for high light output.

[00100] Figure 7D shows a cross section of a lamp assembly 202. As in other embodiments, the lamp assembly includes a housing 202a having cooling fins 202b and transparent cover 202c. A plurality of LEDs 220 and reflectors 222 (typically 16) are mounted at the base of the housing 202a.

[00101] As shown in Figure 7D, each LED 220 is positioned within a reflector such that light emanating from an LED will diverge from the outer edges of the reflector within a relatively tight beam path (BP). The beam path is determined by the depth (D) of the reflector relative to the width (W) of the base and the proximity of the LED to the inner

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walls of the reflector. Generally, a tighter beam path is enabled by positioning the LED closer to the base of the reflector and by the depth D of the reflector. However, this also causes heat from an operating LED to directly heat the base of the reflector.

[00102] As noted, in addition to minimizing the weight, it is also desired to reduce the cost of each reflector; hence, it is desirable that the LED reflectors 222 are plastic such as a metalized polycarbonate. Metalized polycarbonate has a number of optical advantages over metal surfaces as well as manufacturing advantages insomuch that it can be injection molded and hence is relatively inexpensive to produce as compared to cast metal reflectors.

[00103] Accordingly, to minimize effects of heat immediately adjacent the LED, the outer surfaces of the base of the reflector are configured with a metallic heat sink 224 (having a conductive thermal mass) (see Figures 7H and 7J for example) that is in heat exchange contact with the lower outer walls of the reflector, an LED printed circuit board 230 (Figure 7K) and indirectly the lamp assembly housing 202a. As such, direct heat from the LED can be conveyed away from the reflector as a result of the thermal mass of the heat sink and its surface area contact with the LED printed circuit board 230 and the lamp housing. Importantly, the heat sink can prevent the temperature of a metalized plastic reflector from overheating in that the heat sink enables a more efficient transfer of heat away from the base of the reflector.

[00104] In one specific embodiment, the LED 220 has approximate outer dimensions of 7x7 mm, the base of the reflector has an inner dimension of 7.5x7.5 mm and a depth of 26 mm. The top dimensions of the reflector are 20x29mm with wall angles approximately 30° in the short dimension and 50° in the long dimension. It is to be appreciated that the inner walls 222c of the reflector may also be slightly parabolic in shape to further minimize reflection that would diffuse light leaving the reflector.

[00105] In one embodiment, the heat sink 224 (Figure 7J) has lower outer dimensions of approximately 19x25mm and upper outer dimensions of 21x28 mm and a total height of 12mm. The heat sink 224 is shown schematically in Figure 7H before (left side) and after assembly (right side) when it is configured to the outer base of a reflector.

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[00106] Furthermore, and as shown in Figures 7F-7I, in order to minimize weight and for convenience of assembly, two or more reflectors 222 are interconnected by a connection member 222a. The connection member 222a includes a connection bore 222b that can be used to seat an assembly screw 225 and thus provides consistent spacing and alignment of reflectors within a lamp assembly and allows connection to the lamp assembly by a single screw or other suitable connector. As understood, arrays of 2 or more reflectors may utilize similar connection members.

[00107] Figure 7K shows one embodiment of an LED printed circuit board 230 for use within a lamp assembly. In this embodiment, the board 230 is aluminum with 4 LEDs 220. The board includes internal power conducting traces (not shown) and is suitably insulated from the main board. The board includes a power connector 230a for interconnecting an array of LEDs and reflectors on separate LED printed circuit boards as well as connection holes 230b for aligning with the screw connector described above which in turn align two LEDs within the base of a reflector pair as shown in Figures 7F-7I.

[00108] Suitable heat conductive pastes may be utilized between mating surfaces to enhance heat transfer from surfaces exposed to LED heat.

Power and Control System

[00109] The control system is designed to efficiently provide power to a number of IAs, provide effective temperature monitoring and power control to minimize the risk of overheating and hence damage to the light system while also minimizing the weight of the cabling required to power a number of IAs that may be configured to a drilling mast.

[00110] A control system is shown in Figure 8. Power is routed up the mast via a connecting cable 250 to a control box 252. The control box includes cable connectors for connecting the power cable to the top-of-mast power and control system. The control box may include other functionality including for example GPS location and/or Bluetooth communication systems for reporting information such as location and/or system parameters to rig/service operators. In one embodiment, power is delivered at ~208V, 3 phase, 30A (max) and power rating of 7-8 kW.

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[00111] As noted above, the drilling mast may be configured with up to 8 IAs (although this may be greater with some embodiments). Each IA will generally be daisy-chained together to minimize the length (and hence weight) of power cables at the top of the mast. As shown in Figure 8, the control box is connected to a first junction box 254 within an IA 212. The junction box 254 directs power within the IA to one or more lamp assembly drivers 254a, 254b and 254c.

[00112] In addition, power is directed to a fan circuit 254d, which in turn delivers power to one or more fans 254e, 254f. The fan circuit is provided with a thermosensitive switch to deactivate the fan circuit if the ambient air temperature is below a threshold such as below -5C. If the temperature is above the threshold, the fans will be activated.

[00113] Each driver 254a, 254b, 254c is connected to a lamp assembly 202 via power cable 254g to a power/thermo board 203. The power/thermo board delivers power to each LED assembly 203a, 203b, 203c within the lamp assembly. As described above, each LED assembly may include one or more LEDs 220 operatively connected to a printed circuit board 230 and each LED assembly may be daisy-chained together.

[00114] The power/thermo board 203 monitors temperature within the lamp assembly and includes logic to monitor and report threshold temperatures to a specific lamp assembly driver. If the power/thermo board determines the temperature is rising (for example through a temperature range of 67-77°C), the drivers 203a, 203b, 203c will progressively and individually reduce the current to each lamp assembly to limit the temperature rise of a lamp assembly using an open loop control within the control unit. Thus, as each lamp assembly has its own power/thermo board and driver, each lamp assembly is independently controlled in terms of maintaining an operating temperature within a desired range.

[00115] Each junction box 254 may be connected to adjacent IAs, either on the same corner or another location of a drilling mast in a daisy-chain manner and ultimately back to the control box.

Light Projection

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[00116] As shown in Figures 9 and 9A, light from a plurality of IAs each having a number of lamp assemblies will downwardly and outwardly project light to the surface and intersecting the surface as a series of generally trapezoidal-shaped light patterns. As shown in Figure 9, the light pattern of each lamp assembly will preferably be directed so as to overlap with one or more adjacent lamp assemblies so as to fully illuminate a desired area.

[00117] Importantly, the outer edges of the light projection will be reasonably sharp so as to minimize light pollution outside the desired area but also to minimize light in an area immediately adjacent the mast which may be a working area and where it may be desired to prevent extremely bright lights from "blinding" workers in a specific working area.

Transportation

[00118] In other embodiments, where the crown or upper regions of a mast are retrofit to receive a LED lighting system that is a stand alone add-on, or partially or fully replaces components such as a railing, the LED lighting system may no longer project laterally or more specifically downward from the mast when the mast is laid in its horizontal position for transport and/or may be withdrawn towards the central axis of the mast. In this case, the LED lighting system may be permanently (or semi-permanently) retained on the mast thereby reducing or obviating the need for manpower and equipment to install/uninstall the LED lighting system prior to and after transportation.

[00119] Although the present invention has been described and illustrated with respect to preferred embodiments and preferred uses thereof, it is not to be so limited since modifications and changes can be made therein which are within the full, intended scope of the invention as understood by those skilled in the art.

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CLAIMS

1. An LED lighting system for configuration to a supporting structure, the LED lighting system comprising:

a plurality of LED lamps and reflectors within at least one LED lamp assembly,

an air flow system having at least one air flow conduit (AFC) for directing air flow against each LED lamp assembly to effect cooling of the LED lamps and to provide structural support to each LED lamp assembly for connection to the supporting structure;

and wherein the LED lighting system has a weight/lumen ratio of less than 0.55g/lumen.

2. The LED lighting system as in claim 1 wherein the LED lighting system has a weight/lumen ratio of less than 0.35g/lumen.

3. The LED lighting system as in claim 1 wherein the LED lighting system has a weight/lumen ratio of less than 0.25g/lumen.

4. The LED lighting system as in any one of claims 1-3 wherein the LED lighting system provides greater than 500,000 lumens.

5. The LED lighting system as in any one of claims 1-3 wherein the lighting system provides greater than 1.0 MM lumens.

6. The LED lighting system as in any one of claims 1-5 wherein each LED lamp assembly includes a lamp assembly housing having a plurality of surfaces for effecting heat transfer of heat from the LED lamps away from the LED lamps.

7. The LED lighting system as in any one of claims 1-6 wherein each AFC is operatively connected to a lamp assembly housing, the AFC having an air channel for moving cooling air through the AFC and for conveying heat from each LED lamp assembly away from each LED lamp assembly to effect cooling of each LED lamp assembly and to maintain

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an operating temperature of the LED lamp assembly at or below a threshold temperature during use.

8. The LED lighting system as in any one of claims 1-7 wherein the mass/lumen ratio is realized by a balance of a collective weight and thermal mass of each LED lamp assembly and AFC to provide sufficient structural strength to support the LED lighting system and an adequate thermal mass of each LED lamp assembly housing to effect sufficient cooling when each lamp assembly is operating at ambient temperature and air flow is flowing over each LED lamp assembly.

9. The LED lighting system as in any one of claims 1-8 further comprising a fan system operatively connected to the AFC for actively moving air through the AFC.

10. The LED lighting system as in any one of claims 1-9 wherein the AFC includes a vertically oriented conduit having a lower air entry and upper air exit and wherein cool air enters the lower air entry and warm heated air exits the upper air exit.

11. The LED lighting system as in claim 10 wherein the vertically oriented conduit includes at least one substantially horizontal branch conduit extending laterally from the vertically oriented conduit and wherein each branch conduit operatively and structurally supports at least one lamp assembly housing.

12. The LED lighting system as in any one of claims 1-11 further comprising a heat transfer fin system operatively connected to the AFC.

13. The LED lighting system as in any one of claims 1-12 further comprising a controller for managing LED lamp assembly temperature, wherein the controller monitors the temperature within an LED lamp assembly and adjusts air flow speed to increase or decrease air flow through the AFC to maintain LED lamp assembly temperature below a pre-determined threshold temperature.

14. The LED lighting system as in any one of claims 1-12 further comprising a controller for managing LED lamp assembly temperature, wherein the controller monitors the temperature within an LED lamp assembly and adjusts power to the LED lamp assembly

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to maintain LED lamp assembly temperature below a pre-determined threshold temperature.

15. The LED lighting system as in any one of claims 1-14 further comprising a duct collar operatively connected to a lamp assembly for directing cooling air against a lamp assembly housing at substantially 90 degrees to the lamp assembly.

16. The LED lighting system as in any one of claims 1-15 wherein each lamp assembly housing has one or more outer edges and includes cooling fins extending radially from a central position on a lamp assembly housing towards each outer edge of the lamp assembly housing for providing an even air flow across the lamp assembly housing.

17. The LED lighting system as in any one of clams 1-16 wherein the lamp assembly housing has a thermal mass sufficient to effect cooling of the LED lamp assembly and to maintain an operating temperature of the LED lamp assembly at a recommended temperature during use at ambient conditions only when air is flow against the LED lamp assembly housing from the AFC.

18. An integrated lighting and railing system for attachment to a crown of a rig mast comprising:

at least one LED lamp assembly, each LED lamp assembly having at least one LED lamp operatively contained within a lamp assembly housing and thermally connected thereto;
a combined air flow conduit (AFC) and railing, the combined AFC and railing including at least one substantially vertical and at least one substantially horizontal AFC members, the AFC members arranged as a railing structure and configured for attachment to an upper region of a rig mast, the AFC members supporting the at least one LED lamp assembly and defining an air flow path through the AFC members to each LED lamp assembly to effect cooling of each LED lamp assembly,
and wherein the integrated lighting and railing system has railing dimensions substantially corresponding to an existing mast-top steel railing.

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19. The integrated lighting and railing system as in claim 19 wherein the AFC members are aluminum.

20. The integrated lighting and railing system as in claim 18 or 19 further comprising a forced air system operatively connected to the AFC to move air through the AFC and towards each lamp assembly.

21. The integrated lighting and railing system as in claim 20 further comprising a controller operatively connected to the forced air system, the controller for controlling a flow rate of air through the AFC, the controller responsive to a measured temperature at one or more LED lamp assemblies to increase or decrease the flow rate of air based on a measured temperature.

22. The integrated lighting and railing system as in any one of claims 18-21 wherein the lamp assembly housing has a thermal mass sufficient to effect cooling of the LED lamp assembly and to maintain an operating temperature of the LED lamp assembly at a recommended temperature during use at ambient conditions only when air is flow against the LED lamp assembly housing from the AFC.

23. The integrated lighting and railing system as in any one of claims 18-22 wherein the lighting system is configurable to a drilling rig mast, provides greater than 0.5 MM lumens and has a net added weight /lumen ratio of less than 0.55g/lumen.

24. The integrated lighting and railing system as in any one of claims 18-22 wherein the lighting system is configurable to a drilling rig mast, provides greater than 0.5 MM lumens and has a net added weight /lumen ratio of less than 0.35g/lumen.

25. The integrated lighting and railing system as in any one of claims 18-22 wherein the lighting system is configurable to a drilling rig mast, provides greater than 0.5 MM lumens and has a net added weight /lumen ratio of less than 0.25g/lumen.

26. The integrated lighting and railing system as in any one of claims 18-22 wherein the lighting system is configurable to a drilling rig mast, provides greater than 1.0 MM lumens and has a net added weight /lumen ratio of less than 0.55g/lumen.

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27. The integrated lighting and railing system as in any one of claims 18-22 wherein the lighting system is configurable to a drilling rig mast, provides greater than 1.0 MM lumens and has a net added weight /lumen ratio of less than 0.35g/lumen.

28. The LED lighting system as in any one of claims 18-22 wherein the lighting system is configurable to a drilling rig mast, provides greater than 1.0 MM lumens and has a net added weight /lumen ratio of less than 0.25g/lumen.

29. The LED lighting system as in any one of claims 18-22 wherein the lighting system is configurable to a drilling rig mast, provides greater than 1.0 MM lumens and has a net added weight /lumen ratio of less than 0.20g/lumen.

30. The LED lighting system as in any one of claims 18-28 where the LED lamp assemblies are retractable with respect to a central axis of the rig mast to enable transportation of the rig mast with the LED lighting system attached.

31. A method for retrofitting an LED lighting system to a rig mast to reduce a net added weight of the LED lighting system to the rig mast, the method comprising the steps of:

a) removing existing mast-top steel railings from a rig mast; and,

b) attaching an integrated lighting and railing system to the mast top, the integrated lighting and railing system having at least one LED lamp assembly, each LED lamp assembly having at least one LED lamp operatively contained within a lamp assembly housing and thermally connected thereto; and a combined air flow conduit (AFC) and railing, the combined AFC and railing including at least one substantially vertical and at least one substantially horizontal AFC members, the AFC members arranged as a railing structure and configured for attachment to an upper region of a rig mast, the AFC members supporting the at least one LED lamp assembly and defining an air flow path through the AFC members to each LED lamp assembly to effect cooling of each LED lamp assembly and wherein the integrated lighting and railing system has railing dimensions substantially corresponding to the existing mast-top steel dimensions.

32. An LED lighting system comprising:

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an LED circuit board having a support matrix supporting at least one LED lamp and power conducting trace;

a reflector operatively configured over each LED lamp and to the LED board, the reflector having a reflector base for operative positioning over the LED lamp and a reflector body for directing LED light away from the reflector;

a heat sink in thermal contact with an outside surface of the reflector adjacent the reflector base and the LED board, the heat sink for conveying LED lamp heat away from inside surfaces of the reflector; and,

an LED housing operatively configured to the LED board, the LED housing having a thermally conductive body for conveying heat away from the LED housing.

33. An LED lighting system as in claim 32 wherein the LED housing includes a plurality of radially aligned heat transfer fins.

34. An LED lighting system as in claim 32 wherein the support matrix is aluminum.

35. An LED lighting system as in any one of claims 32-34 where the heat sink is aluminum and the reflector is metalized plastic.

36. A control system for an LED light system having at least one LED lamp assembly, each LED lamp assembly having a plurality of LED lamps operatively contained within an LED housing, an air flow conduit (AFC) operative configured with a fan system to deliver cooling air to each LED lamp assembly, the control system for controlling power to the LED lamps and to maintain an operating temperature within a desired range, the control system comprising:

a power driver operatively connected to a power supply and to the LED lamps of an LED lamp assembly;

a temperature sensor and controller operatively connected to each LED housing for monitoring the temperature of the LED housing, the temperature sensor and controller for reporting the temperature of the LED housing to the power driver;

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wherein the power driver increases or decreases power to the LED lamps in response to the temperature of the LED housing and wherein if the temperature of the LED housing is above a threshold, power is reduced to the LED lamps, and wherein if the temperature is below a threshold, power is increased to the LED lamps up to a pre-determined power threshold.

37. The control system as in claims 36 further comprising a fan driver operatively connected to the power supply and wherein the fan driver activates the fan above a temperature threshold and deactivates the fan below a temperature threshold.

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(54) Title: LIGHTWEIGHT LED LIGHTING SYSTEMS FOR PERMANENT AND SEMI-PERMANENT MOUNTING ON ELEVATED STRUCTURES HAVING INTEGRATED SUPPORT AND THERMAL TRANSFER FEATURES

(57) Abstract: The invention relates to lightweight LED lighting systems for permanent and semi-permanent mounting on elevated structures, the lighting systems having integrated support and thermal transfer features. The systems are particularly suited for elevated mast systems and specifically for mast systems that are repeatedly lifted and lowered such as drilling and service rig masts. Specifically, the invention improves a) the weight/lumen ratios of LED lamp assemblies and LED lighting systems, b) the net added weight of LED lighting systems, c) the footprint of LED light systems and/or d) obviates the need for removing LED lighting systems or their sub-assemblies when transporting mast systems.

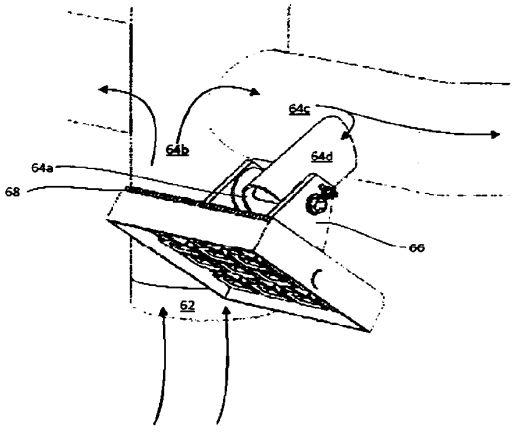


FIGURE 4A

[Continued on next page]

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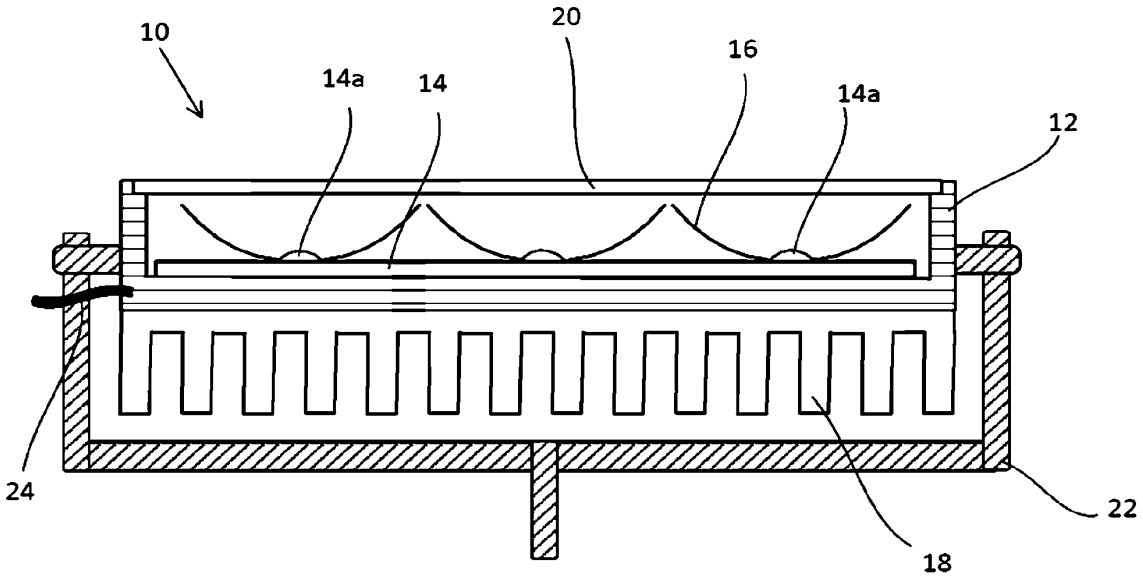


FIGURE 1A
PRIOR ART

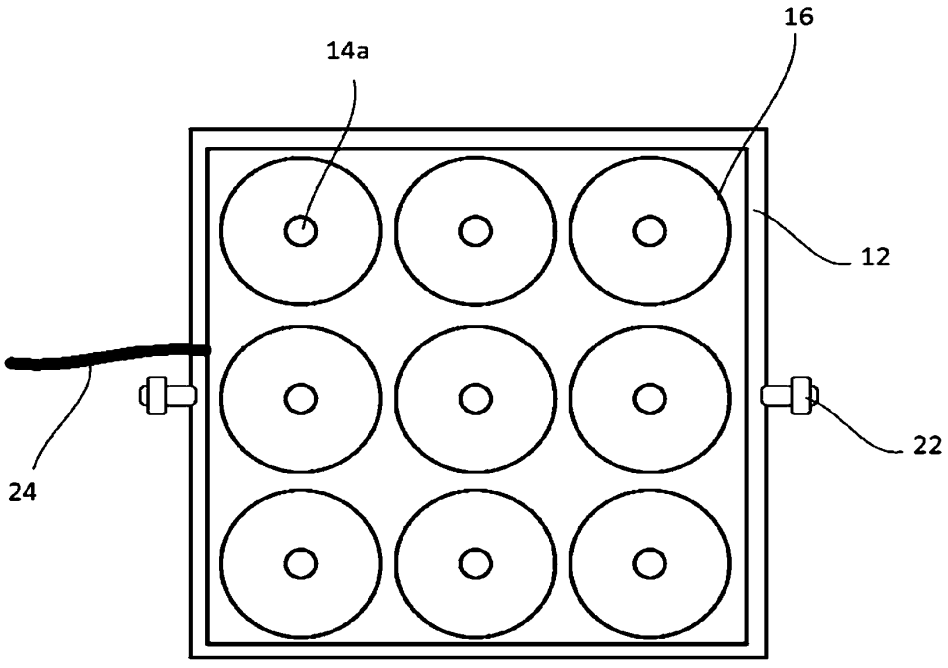


FIGURE 1B
PRIOR ART

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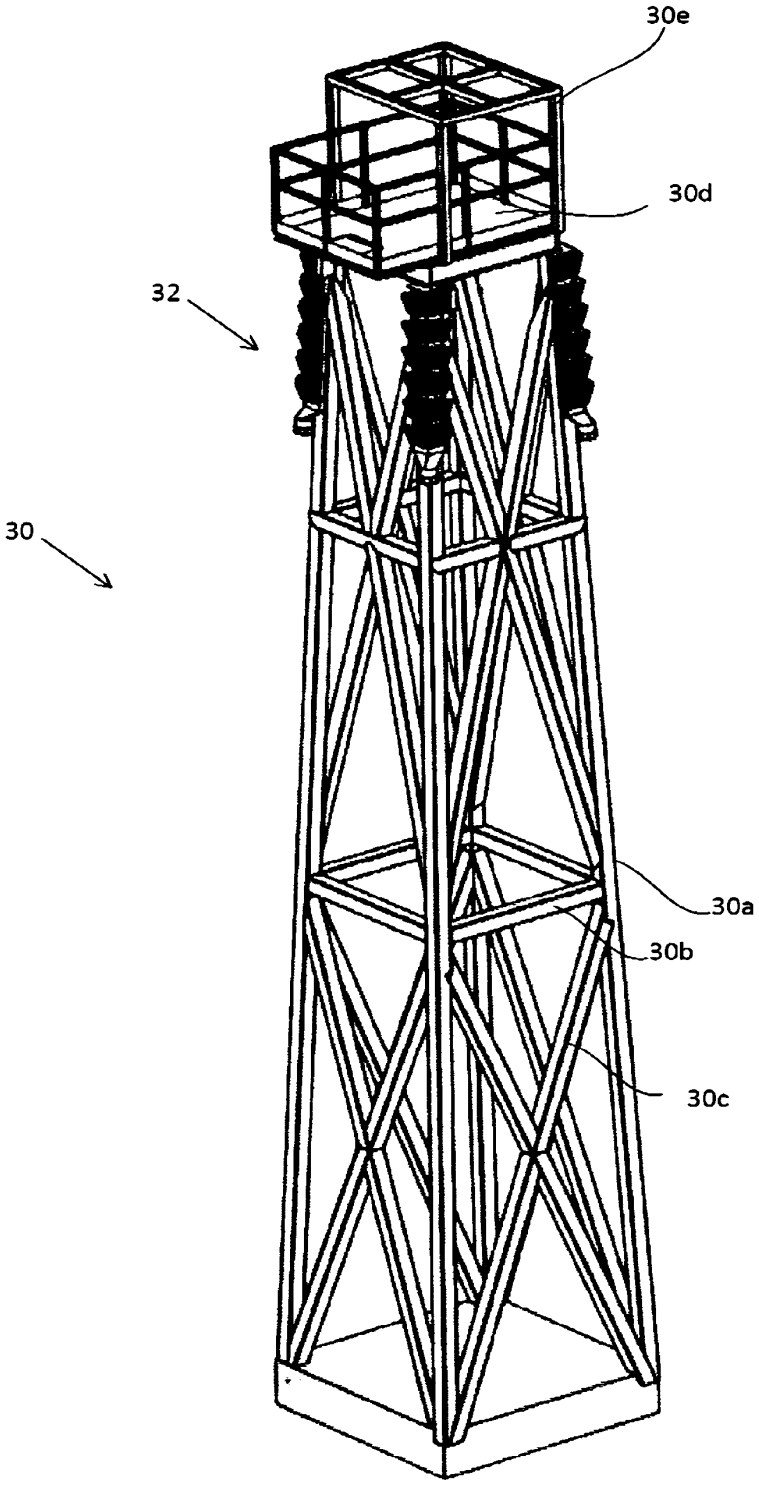


FIGURE 2
2/32

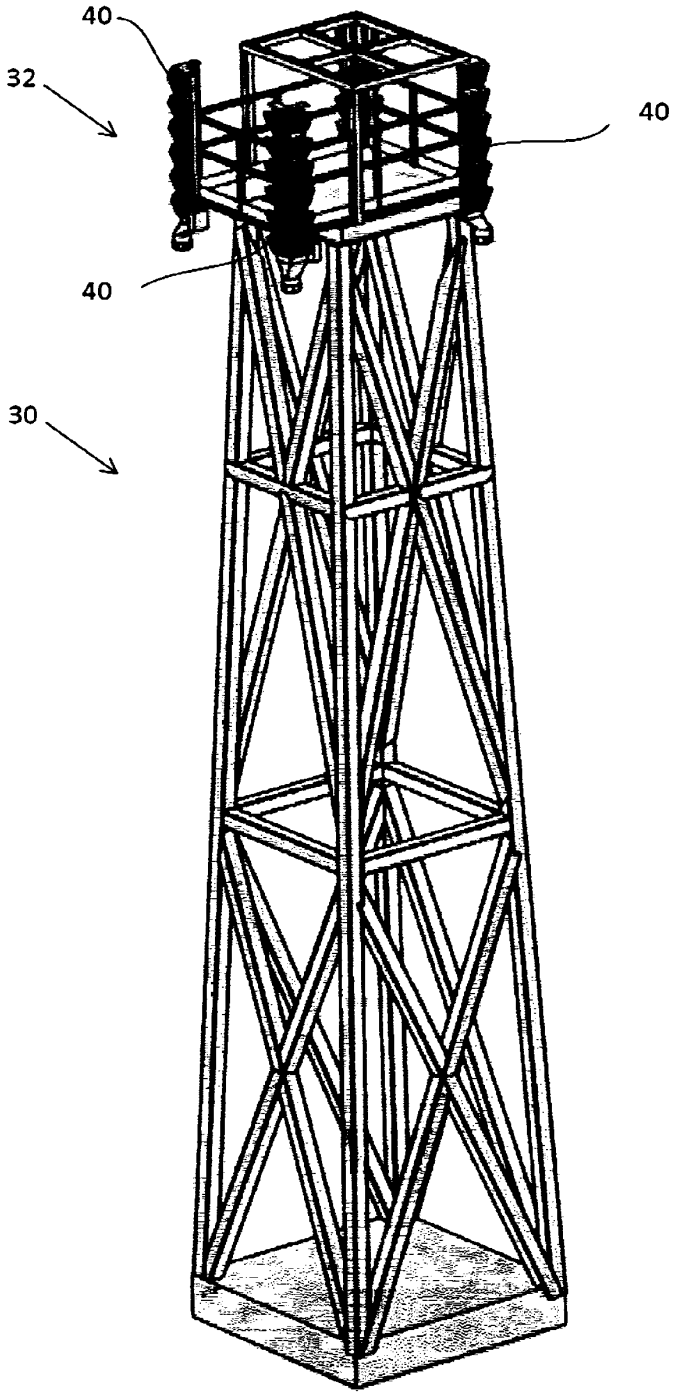


FIGURE 2A

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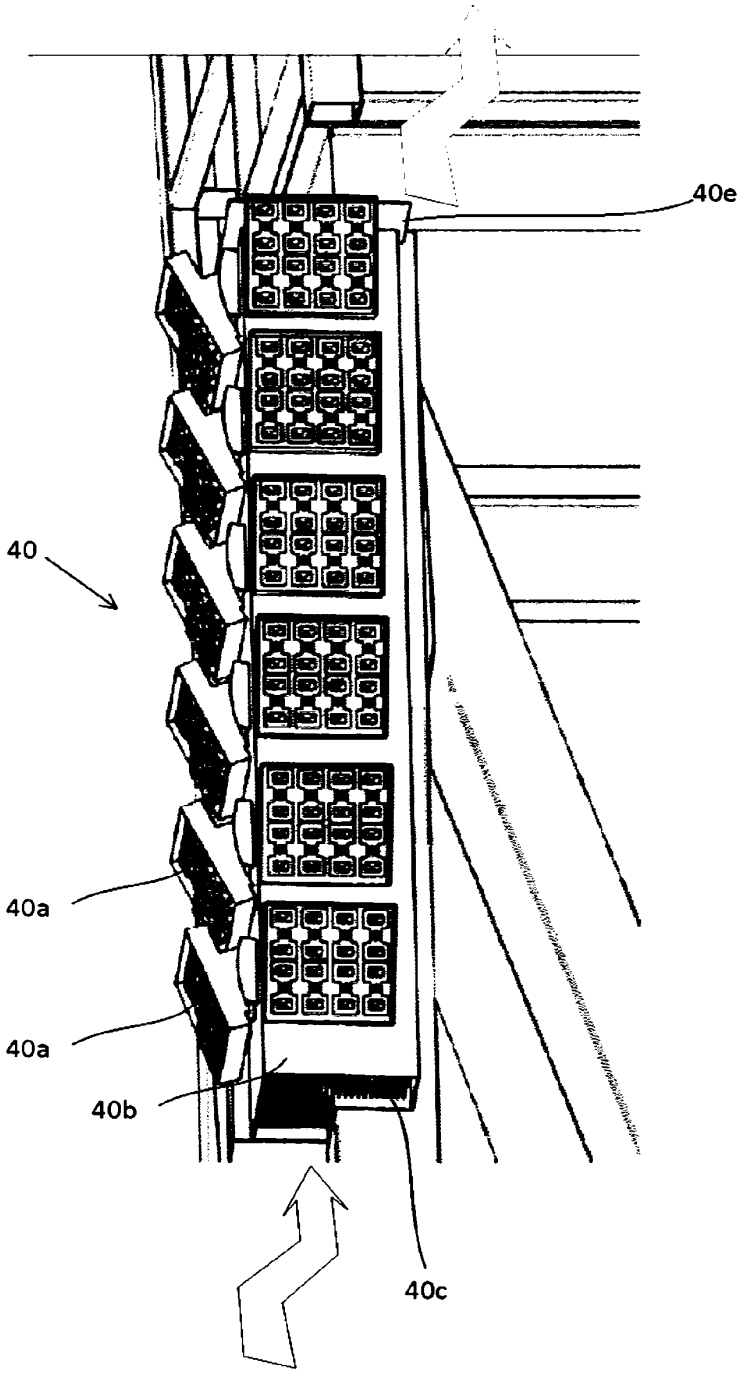


FIGURE 2B

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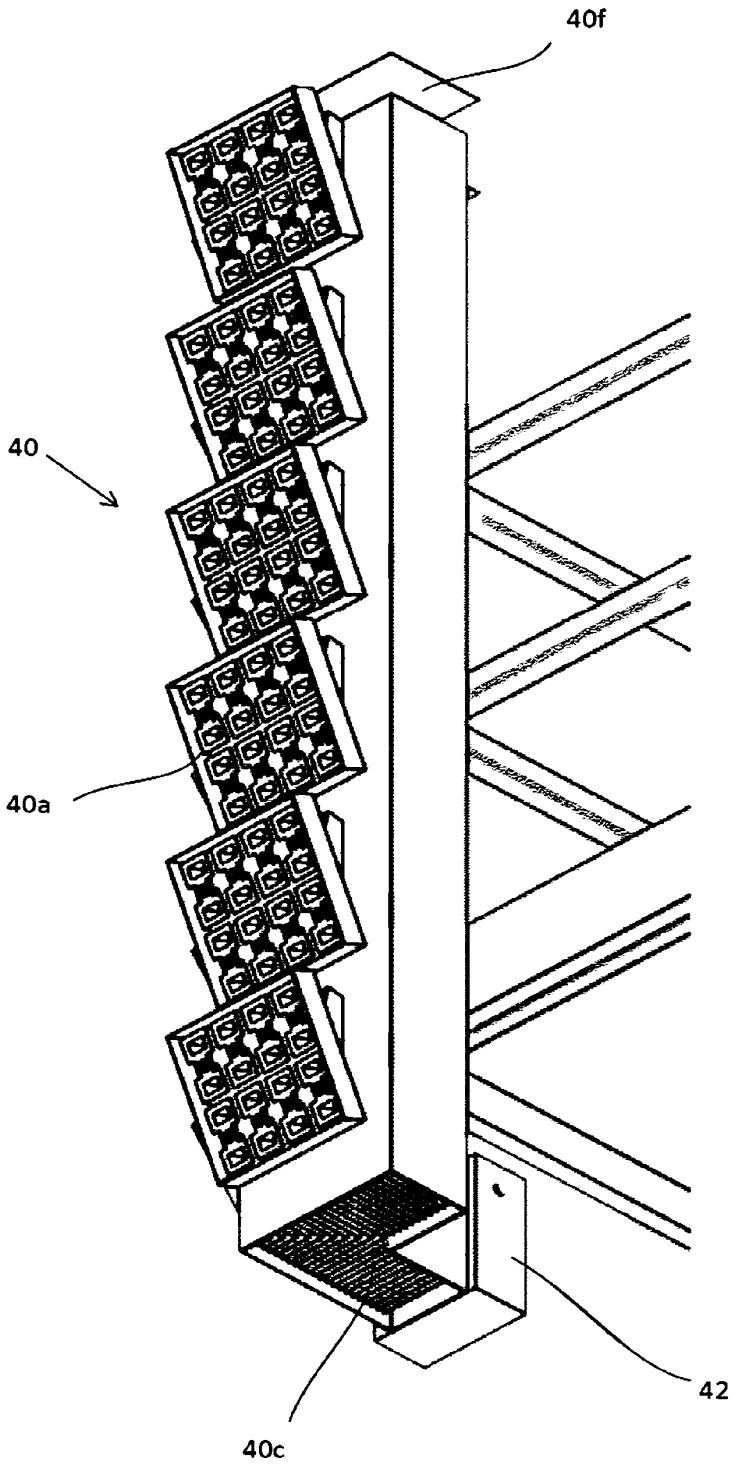


FIGURE 2C

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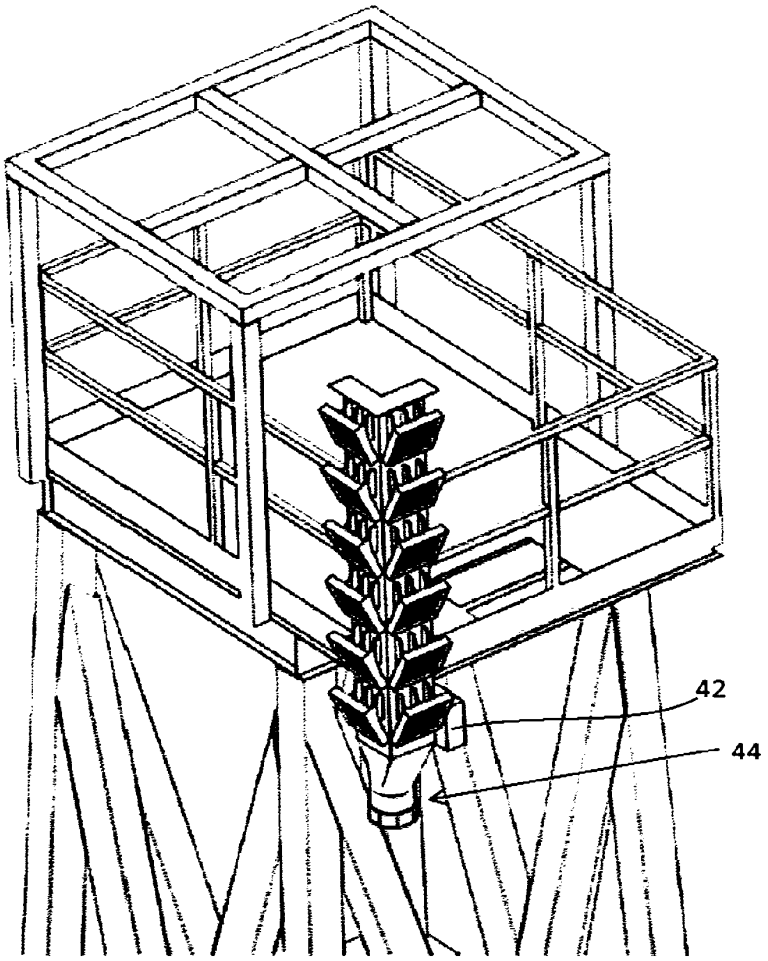


FIGURE 2D

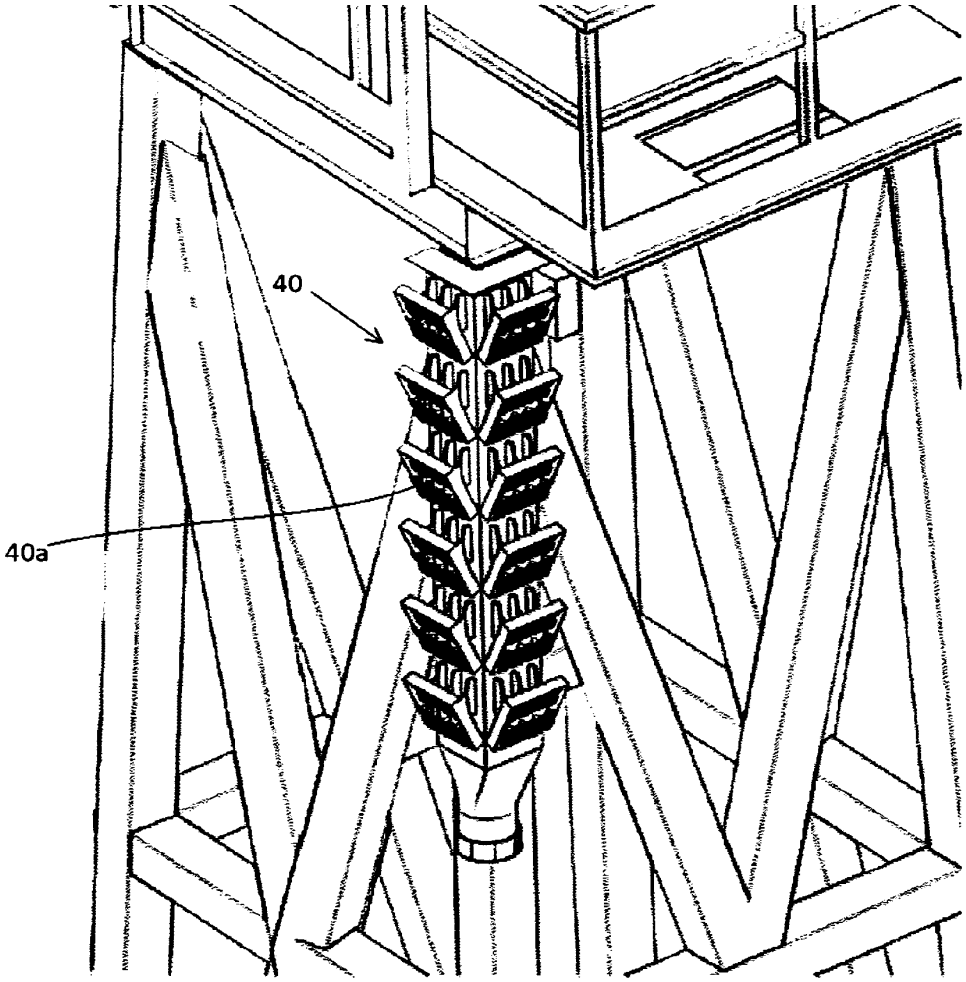


FIGURE 2E

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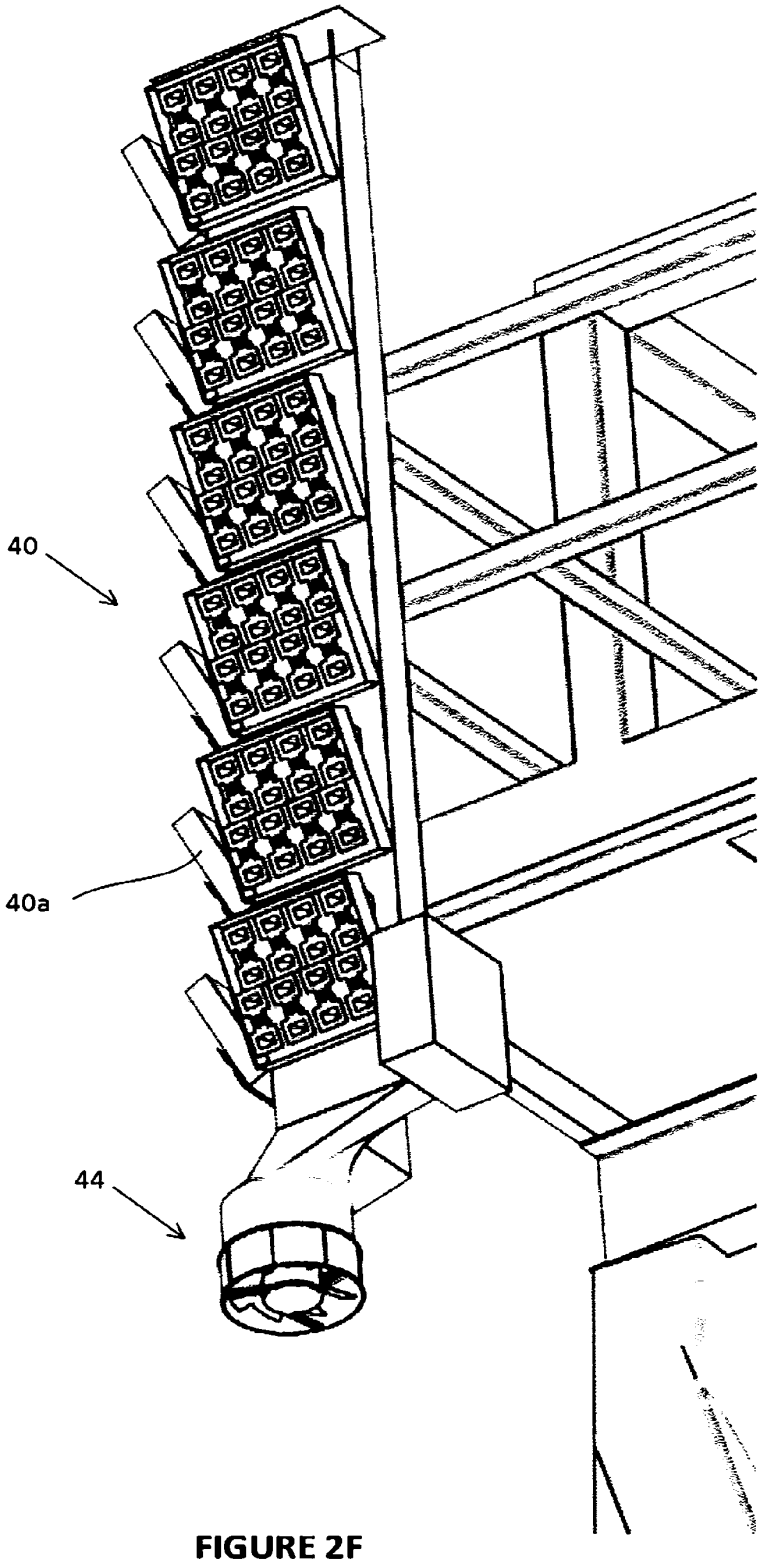


FIGURE 2F

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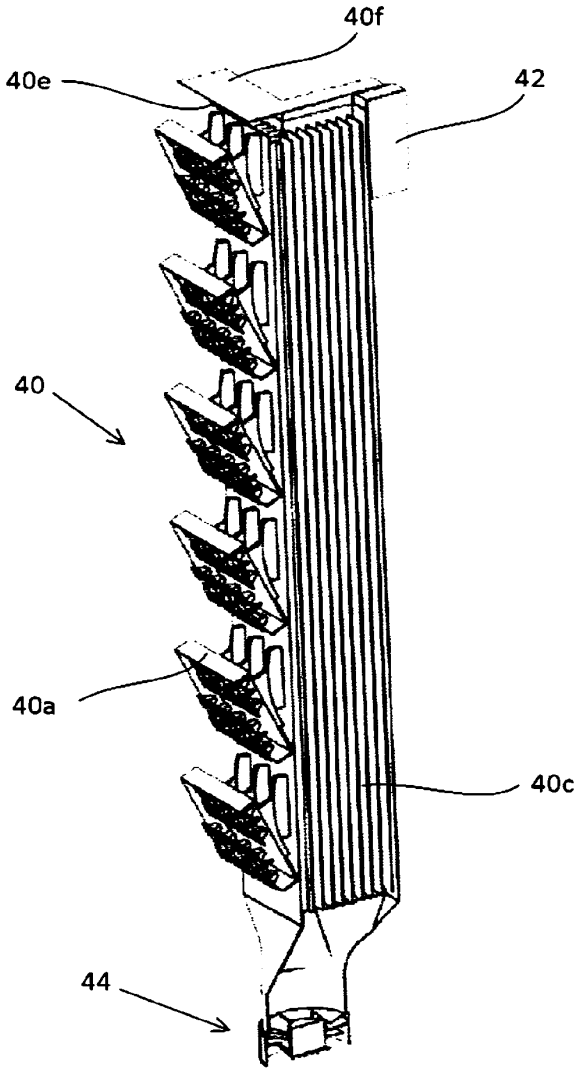


FIGURE 2G

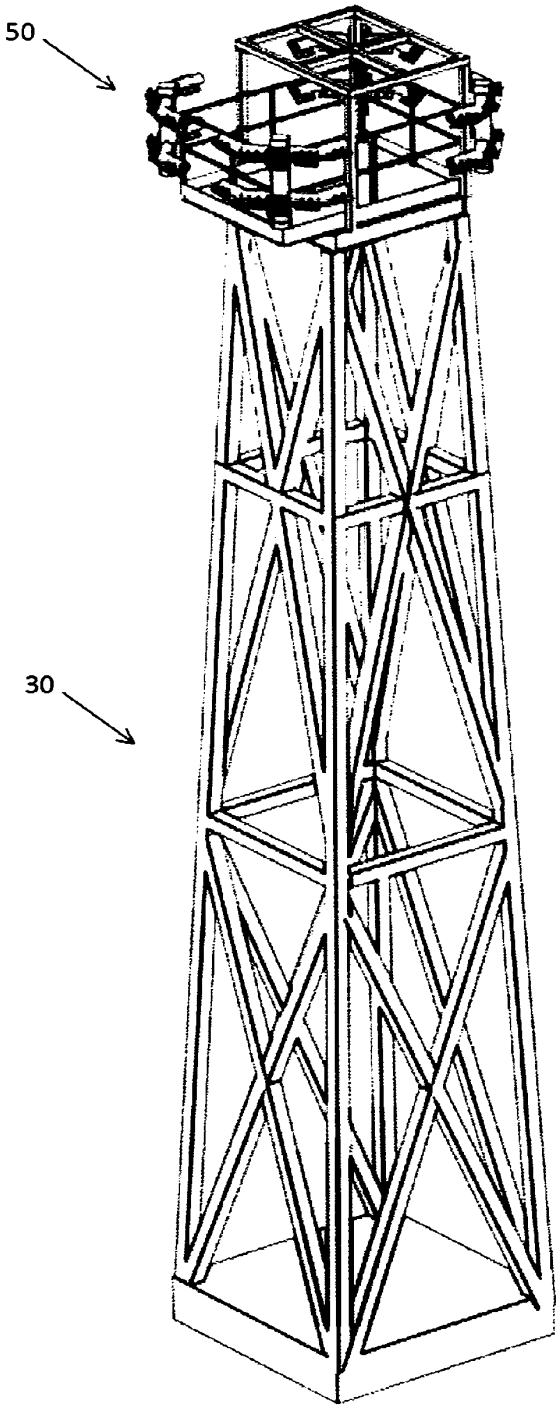


FIGURE 3

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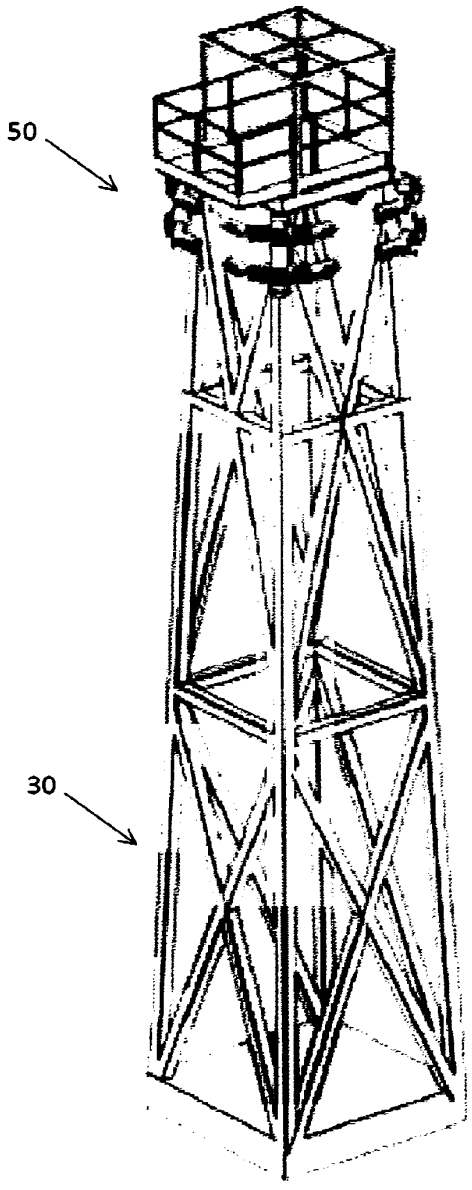


FIGURE 3A

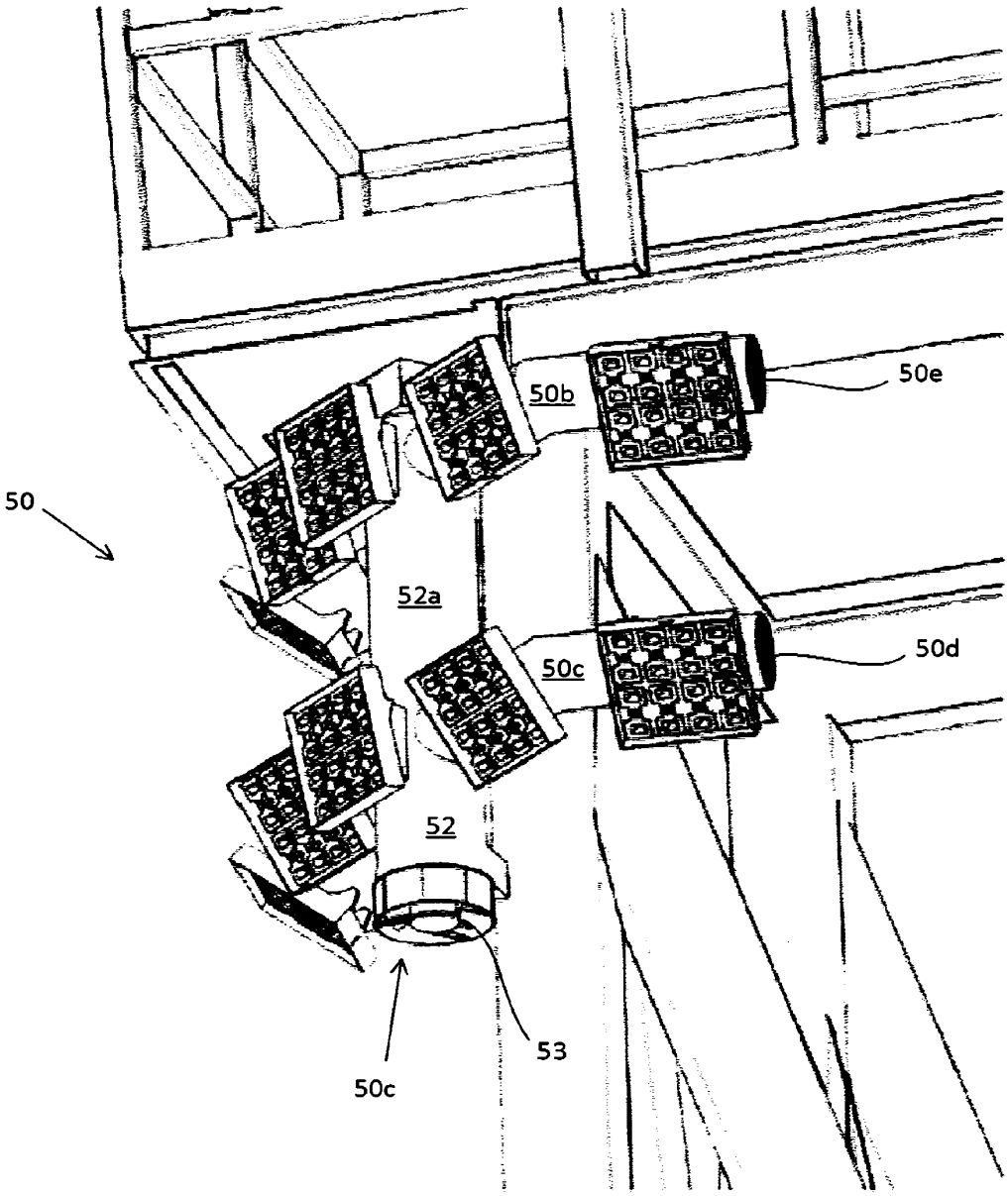


FIGURE 3B

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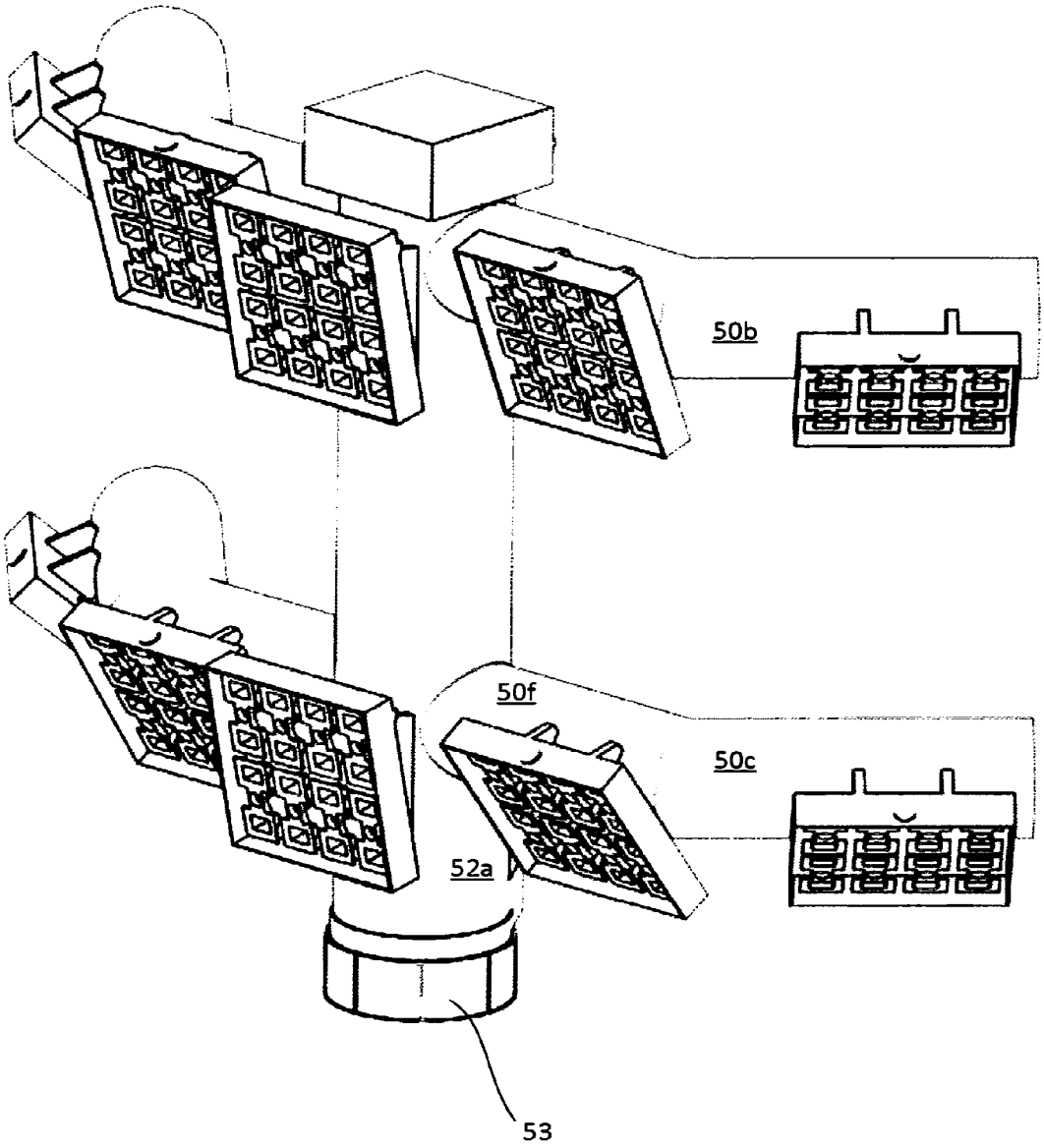


FIGURE 3C

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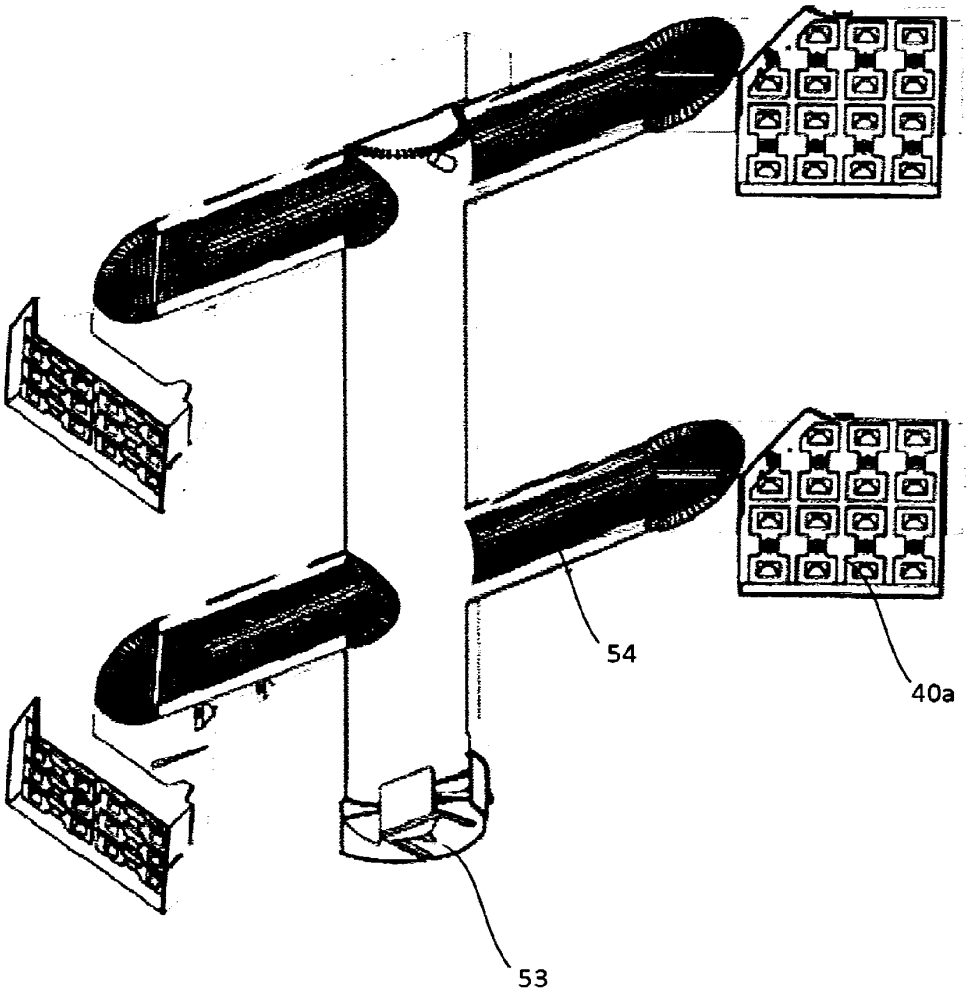


FIGURE 3D

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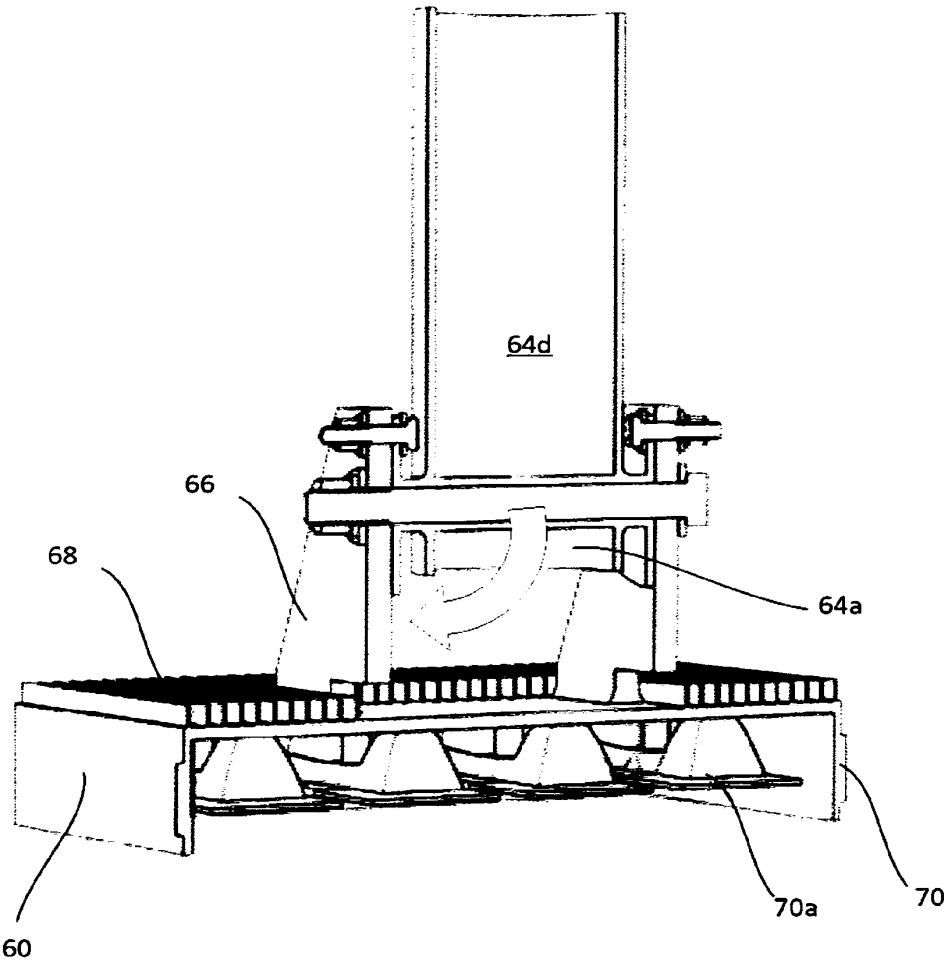


FIGURE 4

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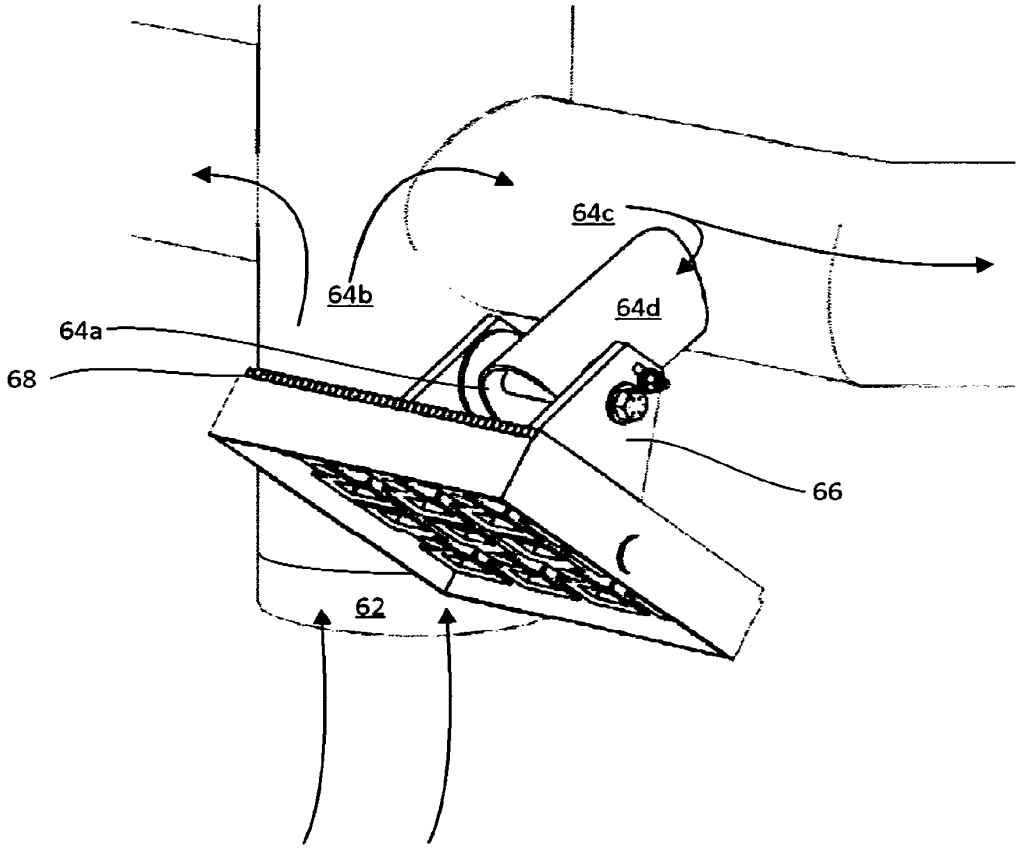


FIGURE 4A

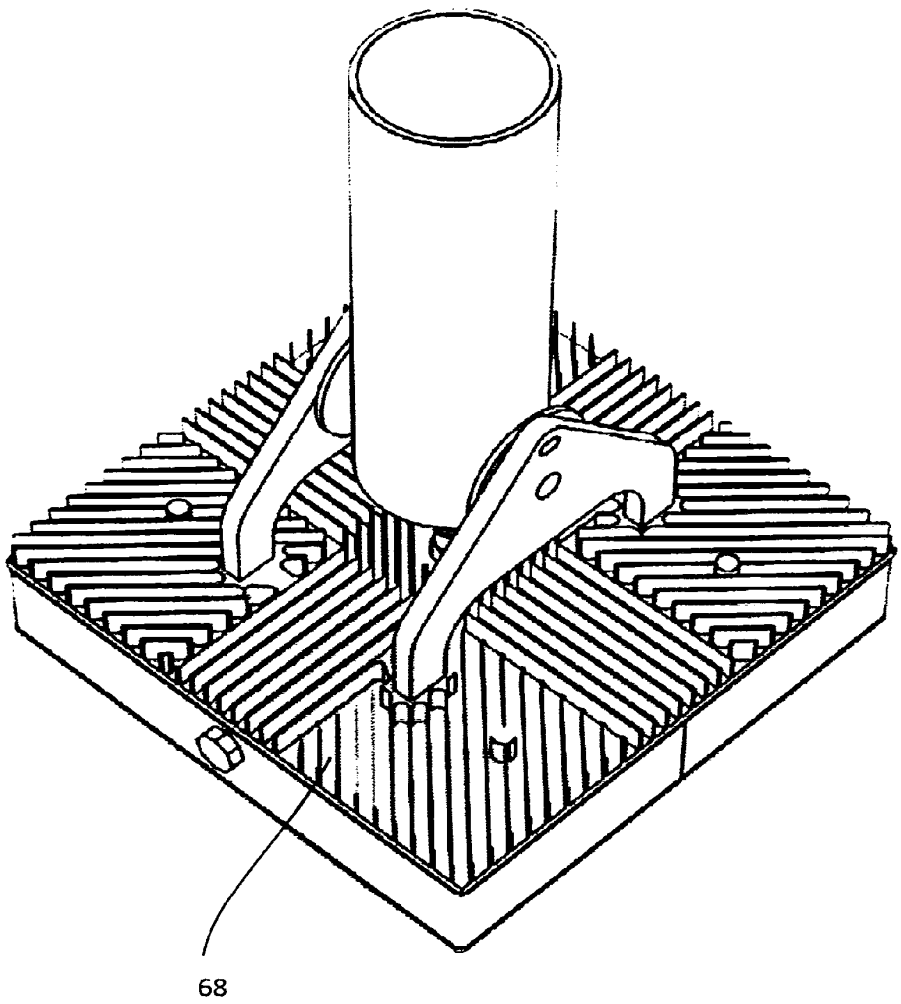


FIGURE 4B

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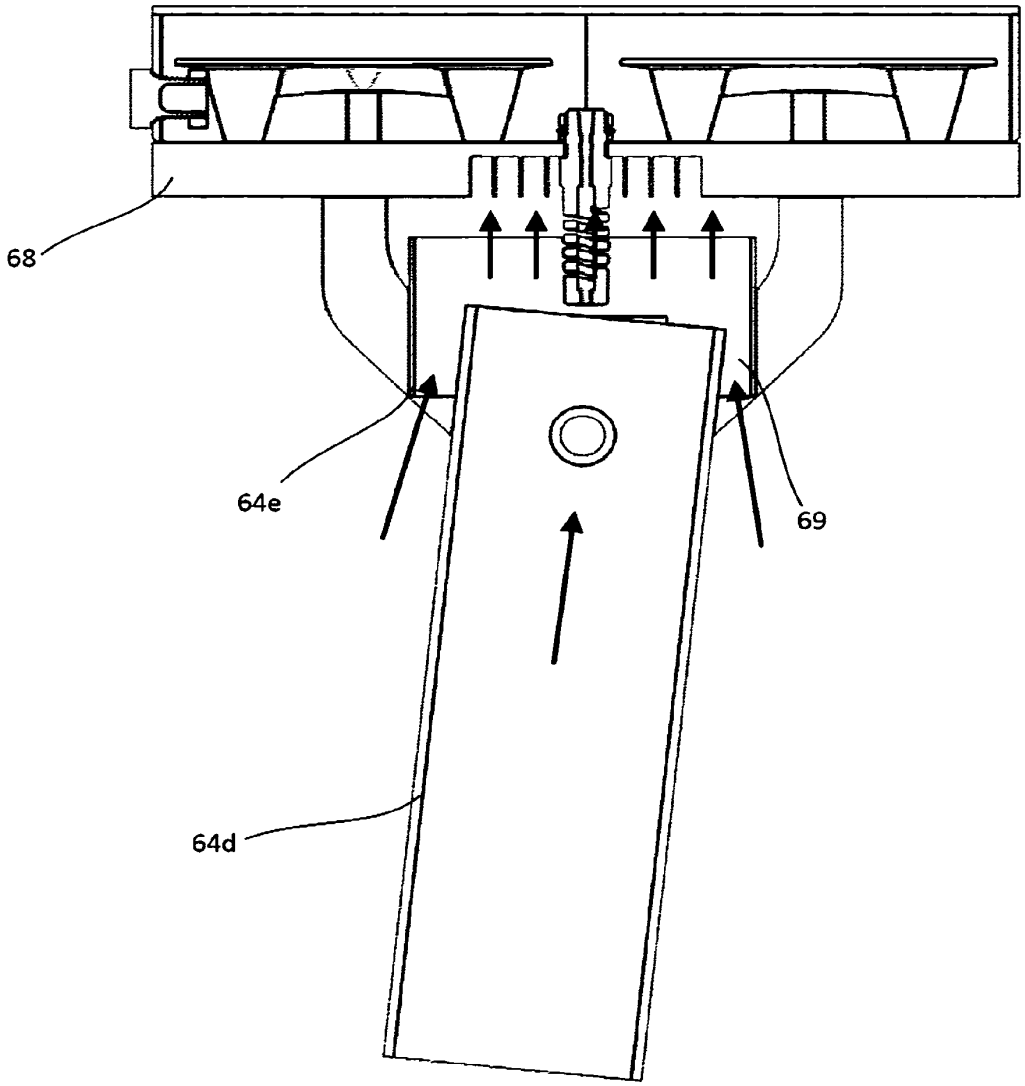


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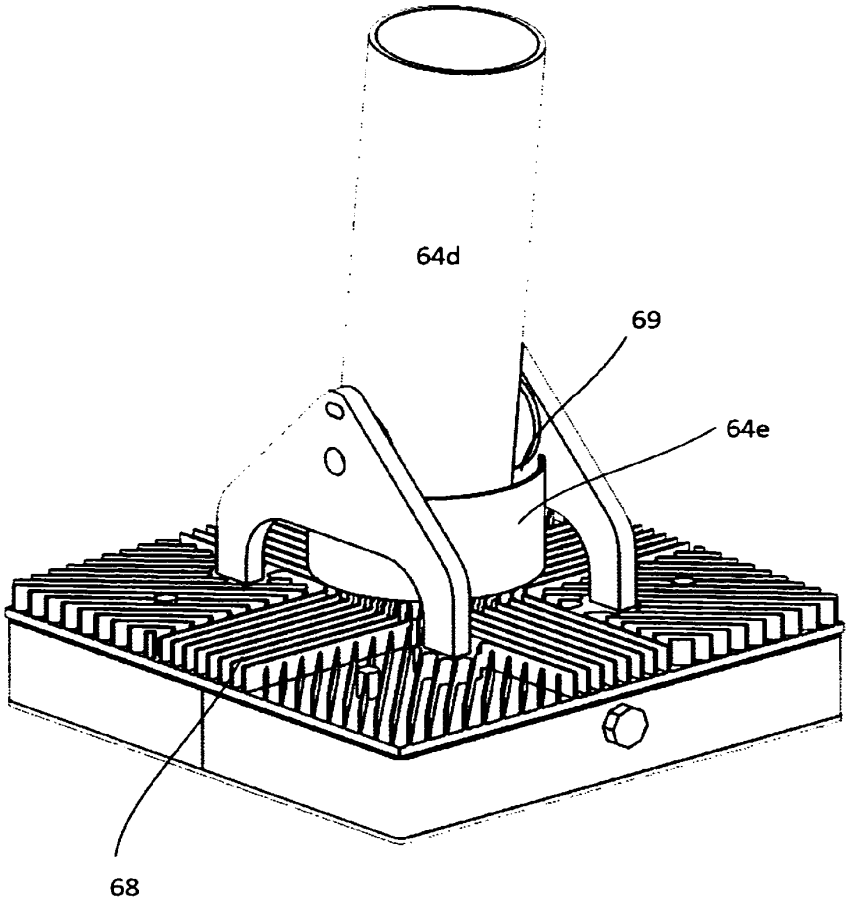


FIGURE 4D

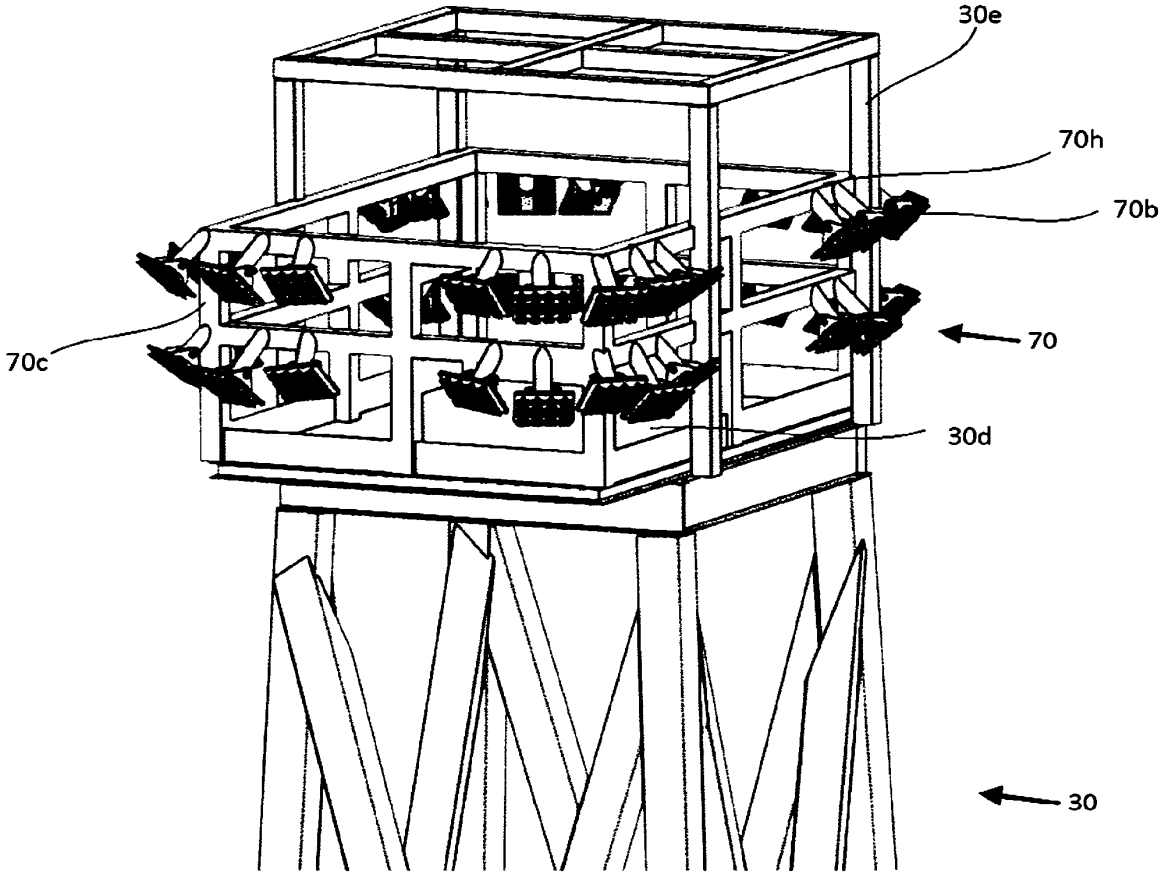


FIGURE 5

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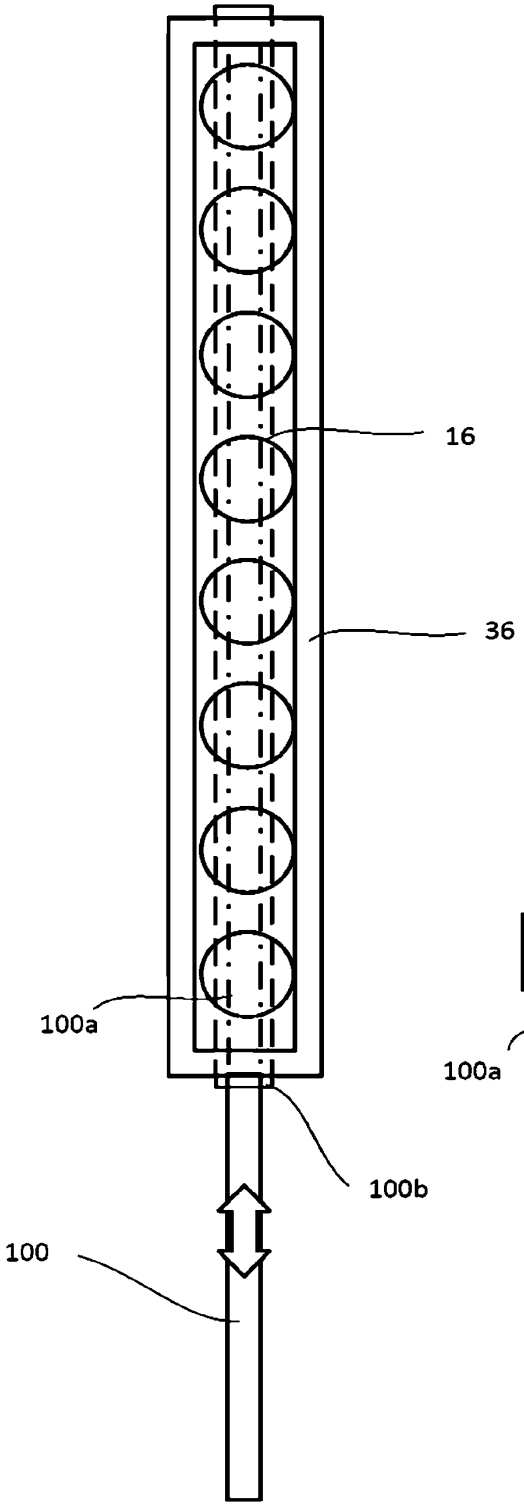


FIGURE 6

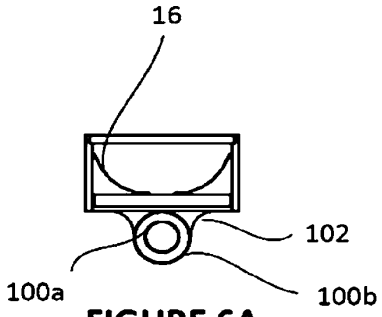


FIGURE 6A

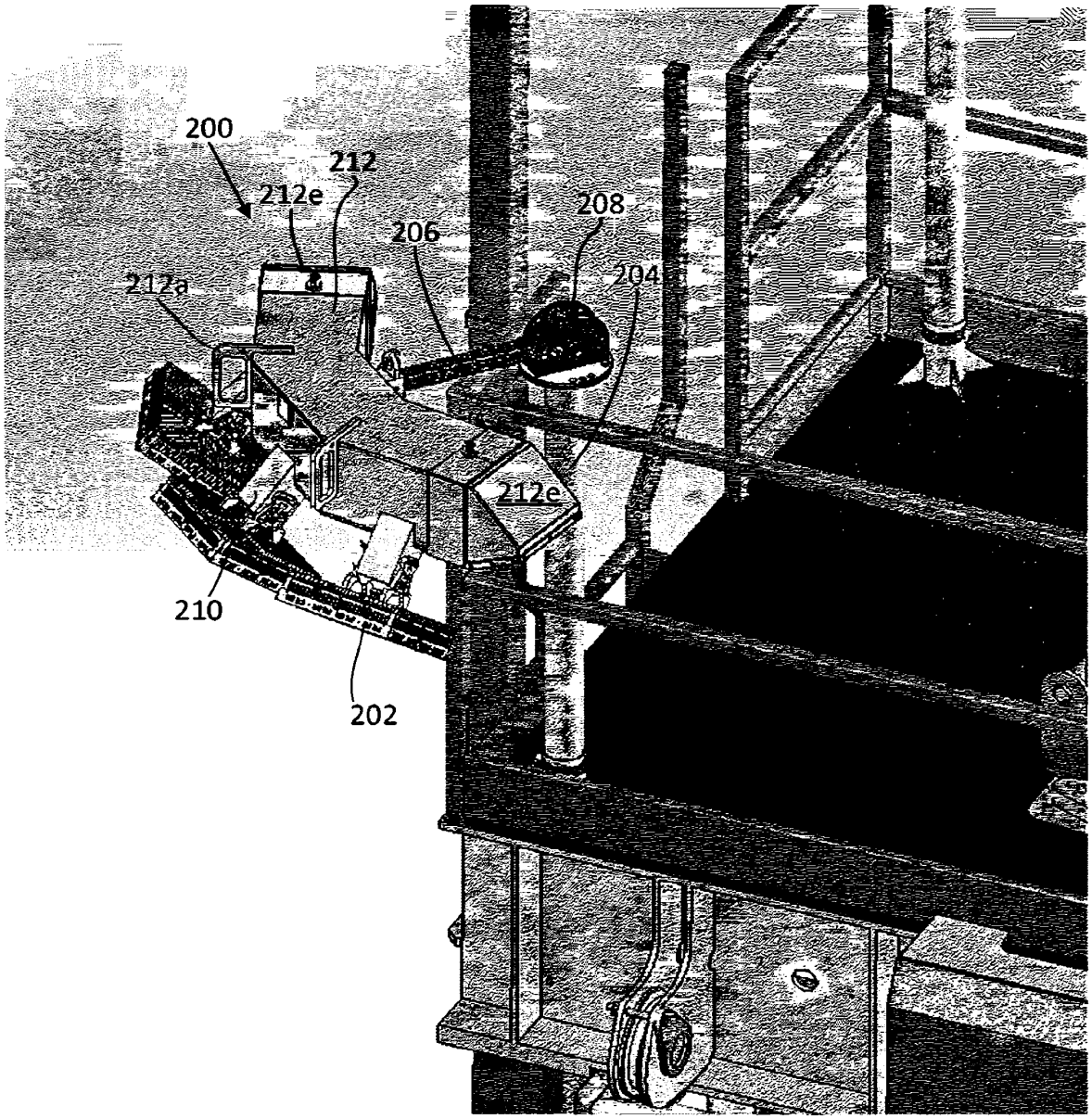


FIGURE 7

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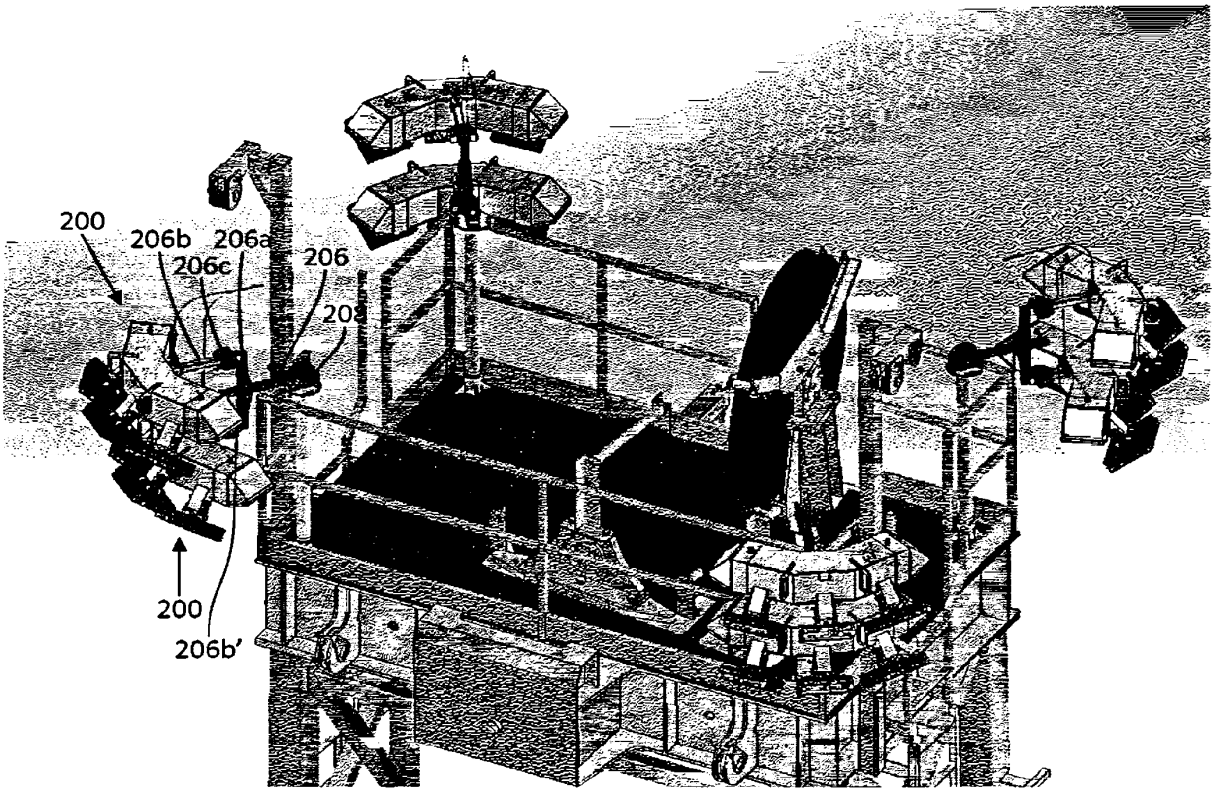


FIGURE 7A

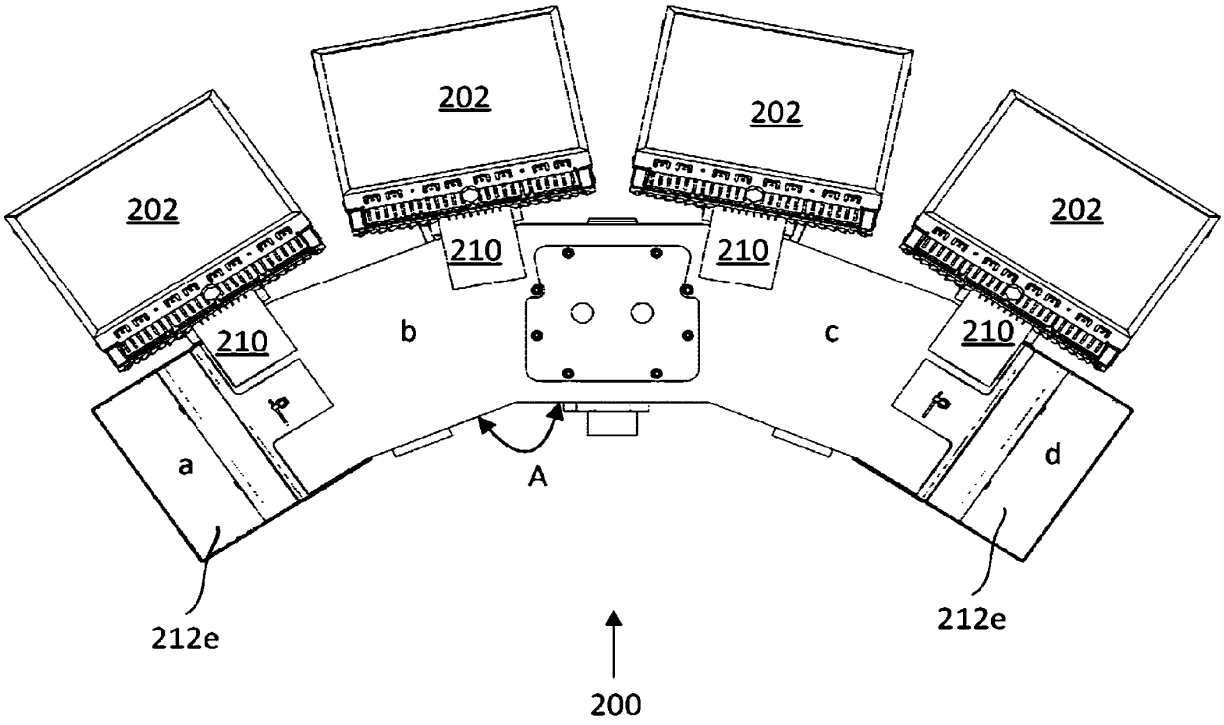


FIGURE 7B

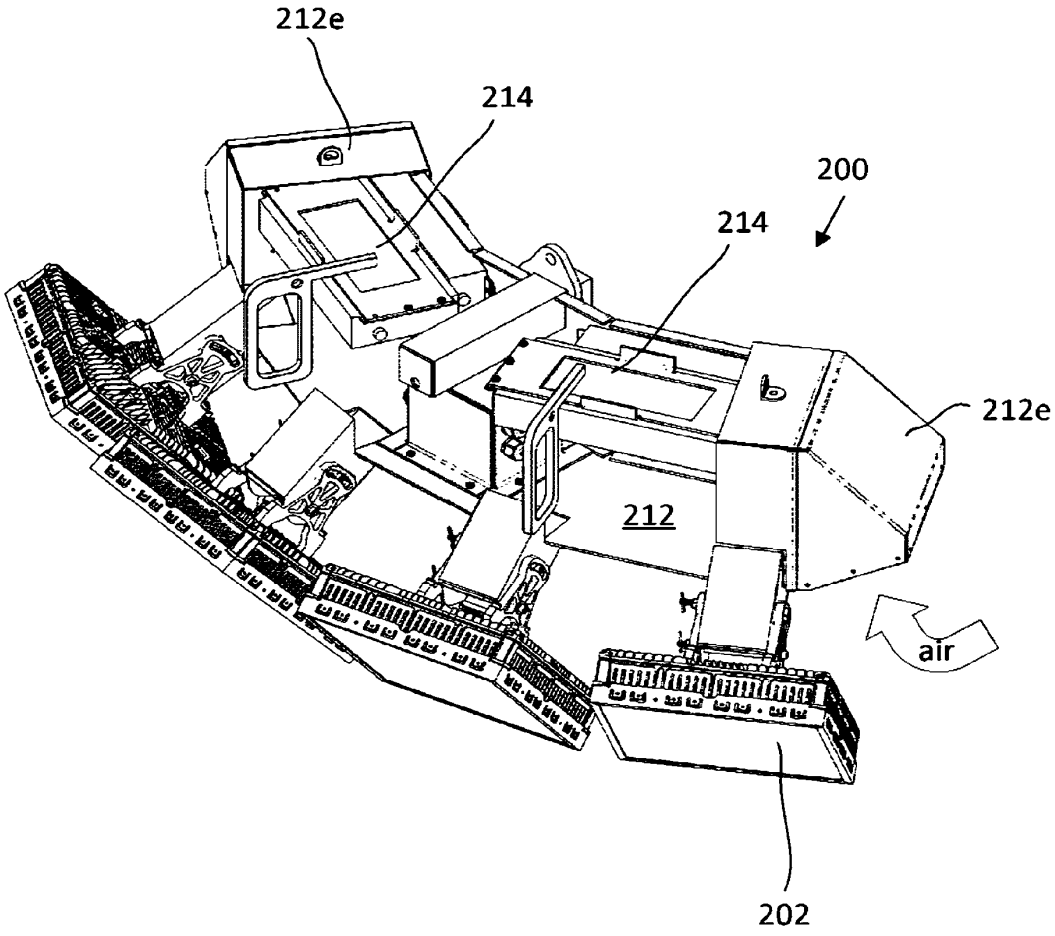


FIGURE 7C

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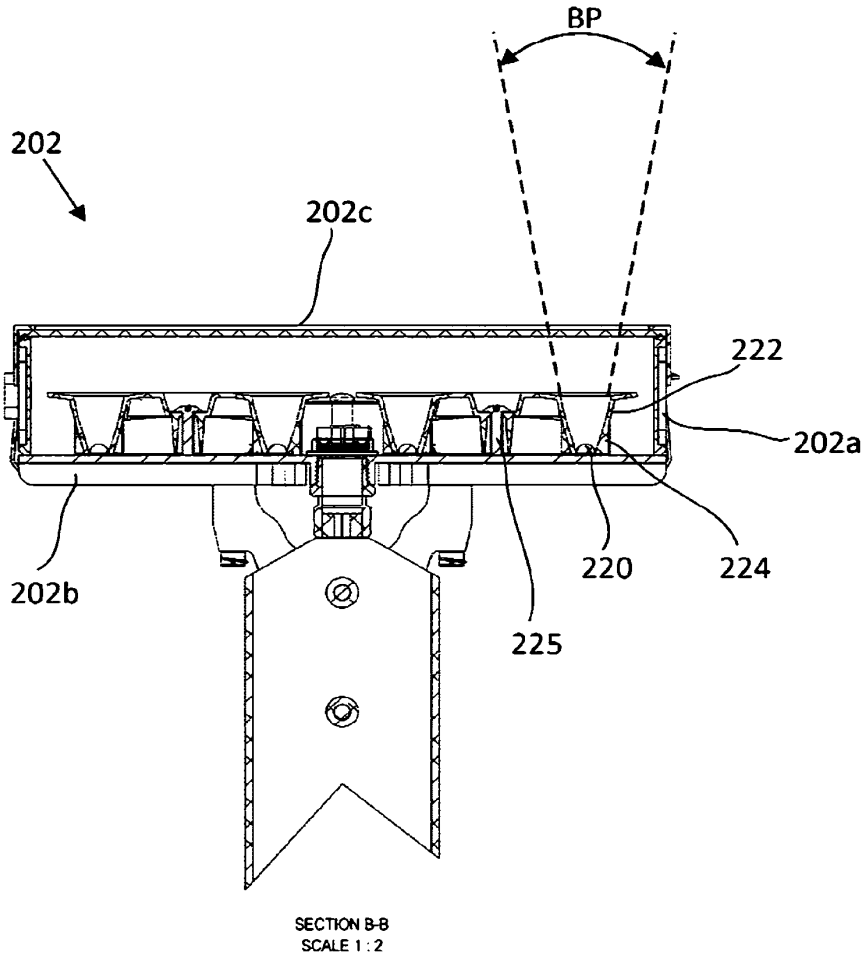


FIGURE 7D

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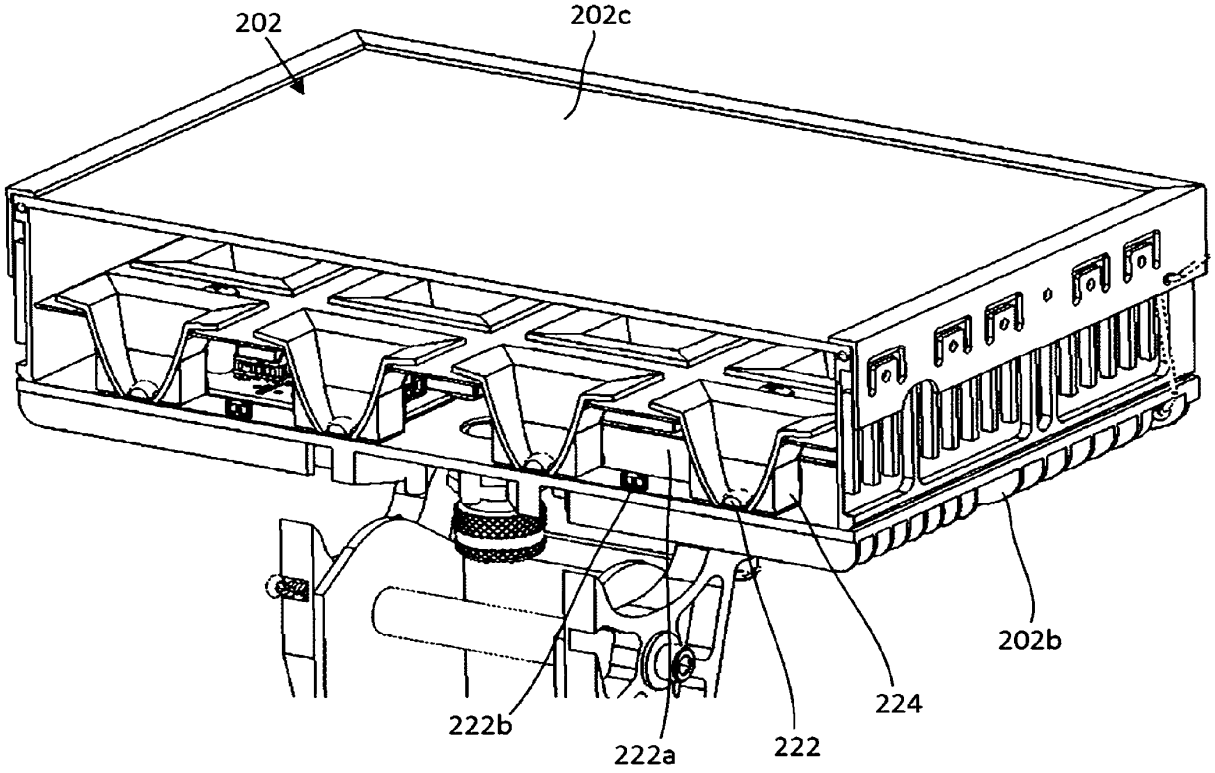


FIGURE 7E

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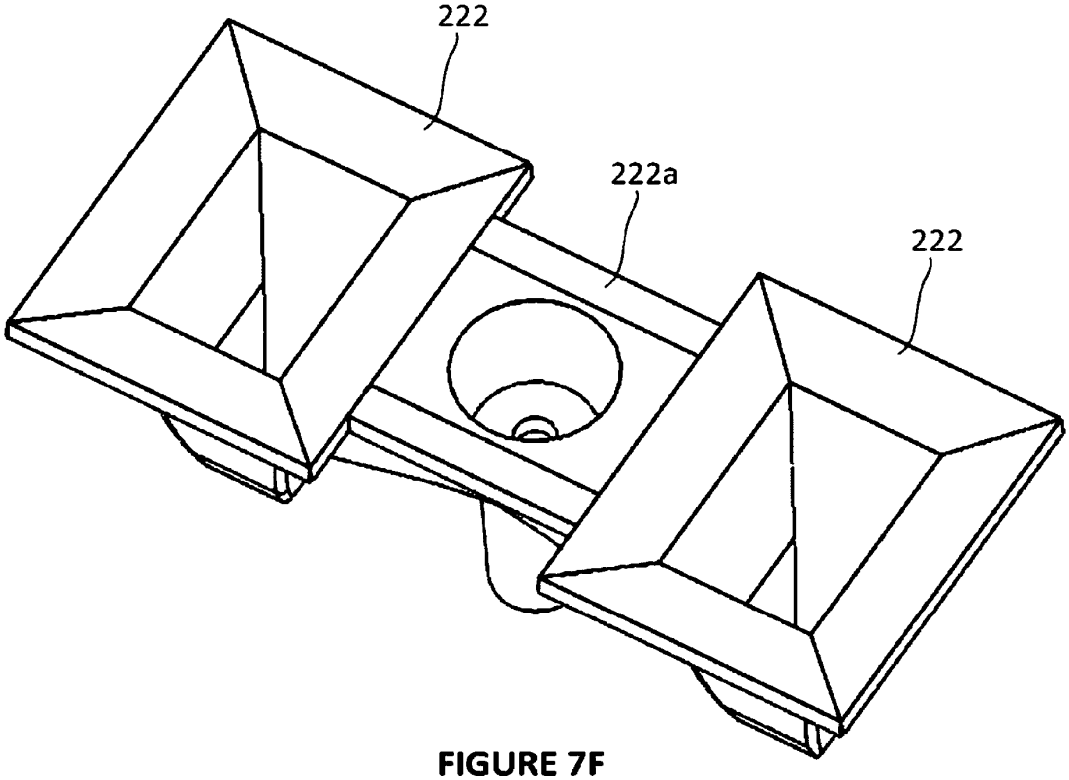


FIGURE 7F

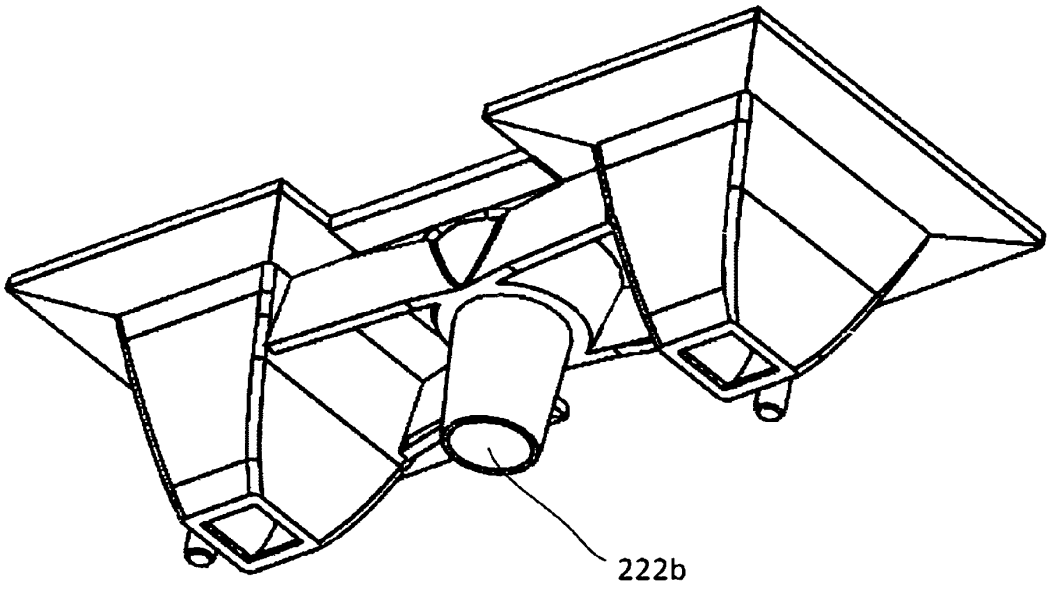


FIGURE 7G

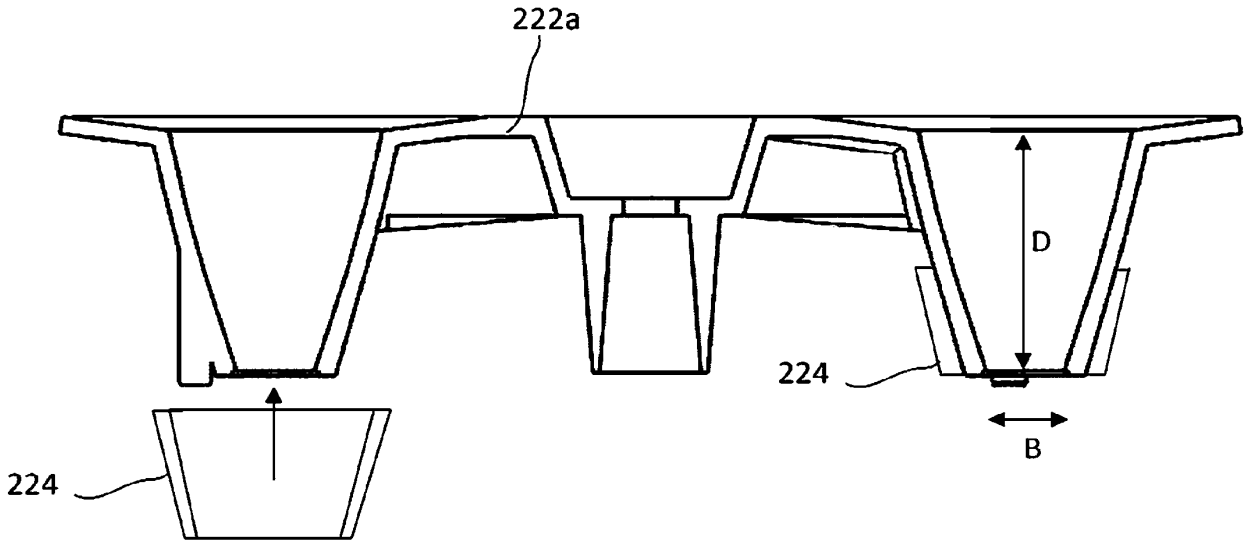


FIGURE 7H

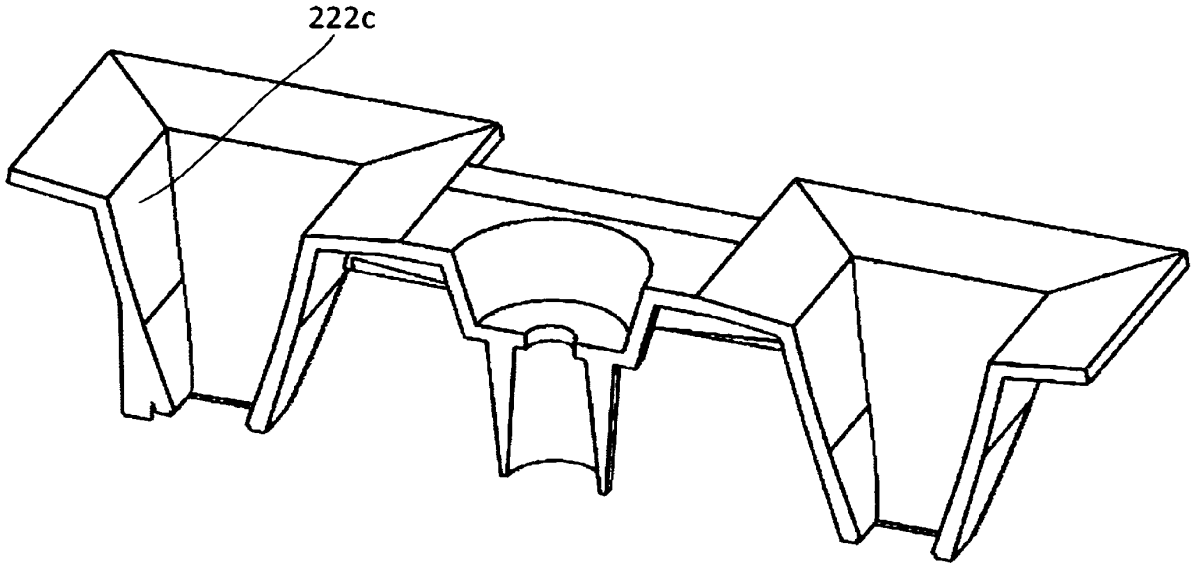


FIGURE 7I

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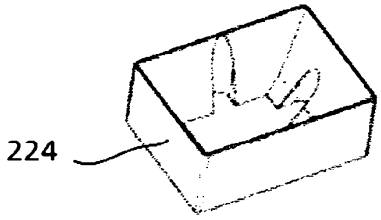


FIGURE 7J

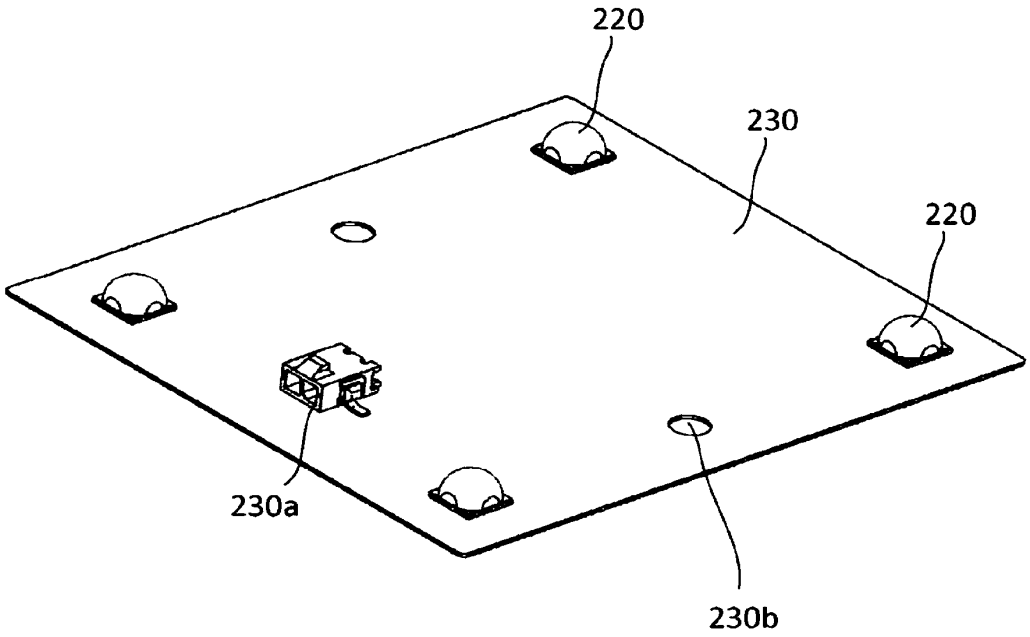


FIGURE 7K

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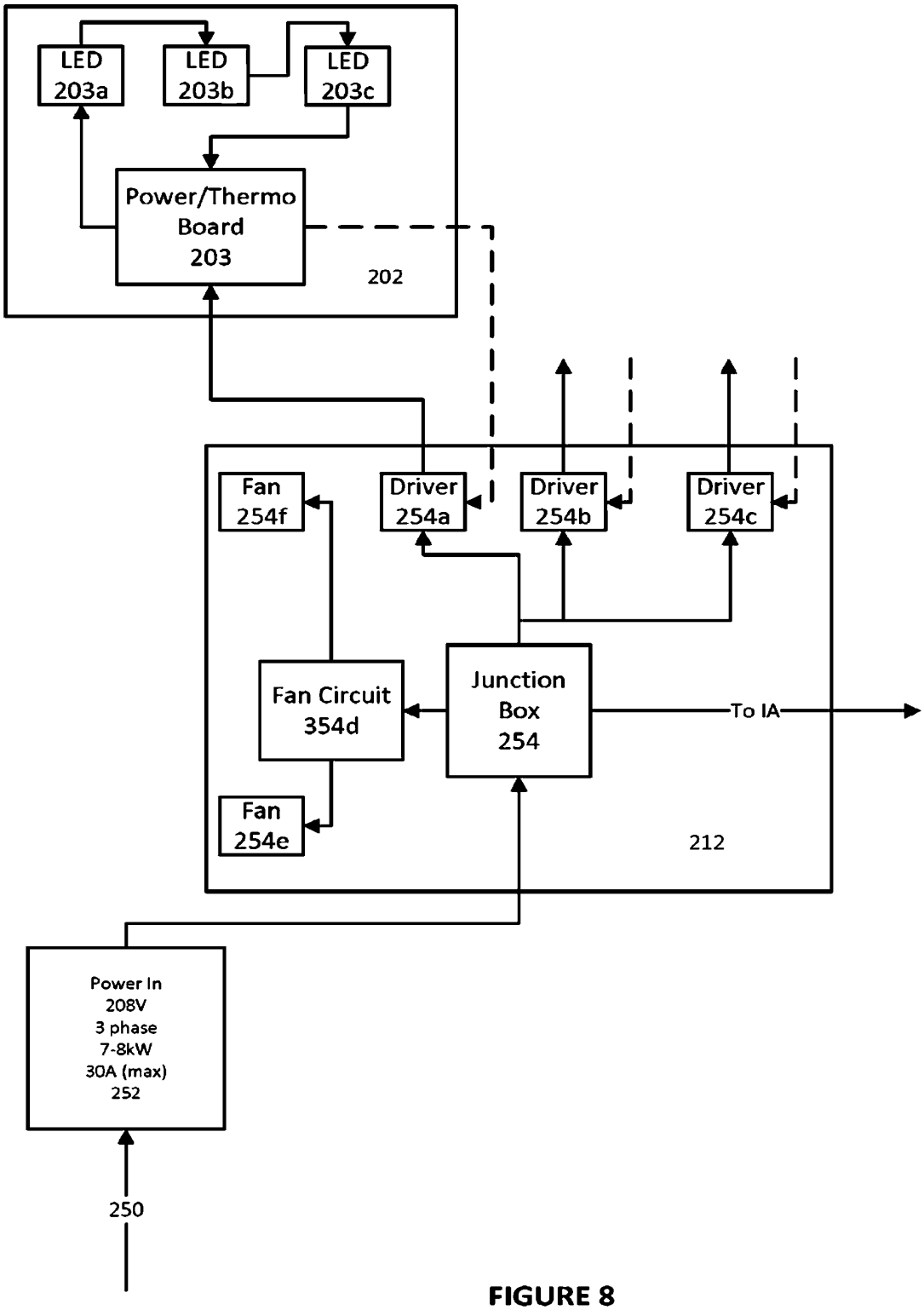


FIGURE 8

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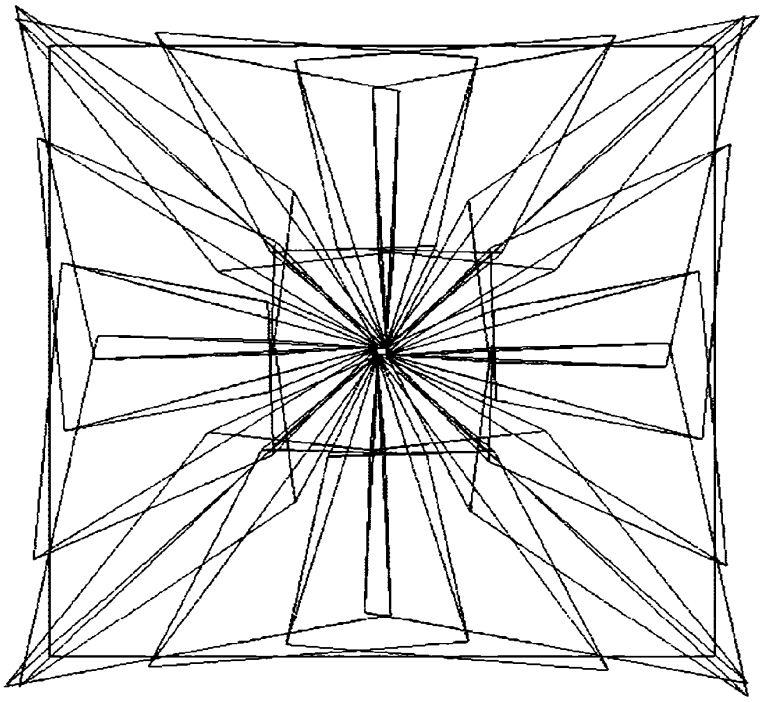


FIGURE 9

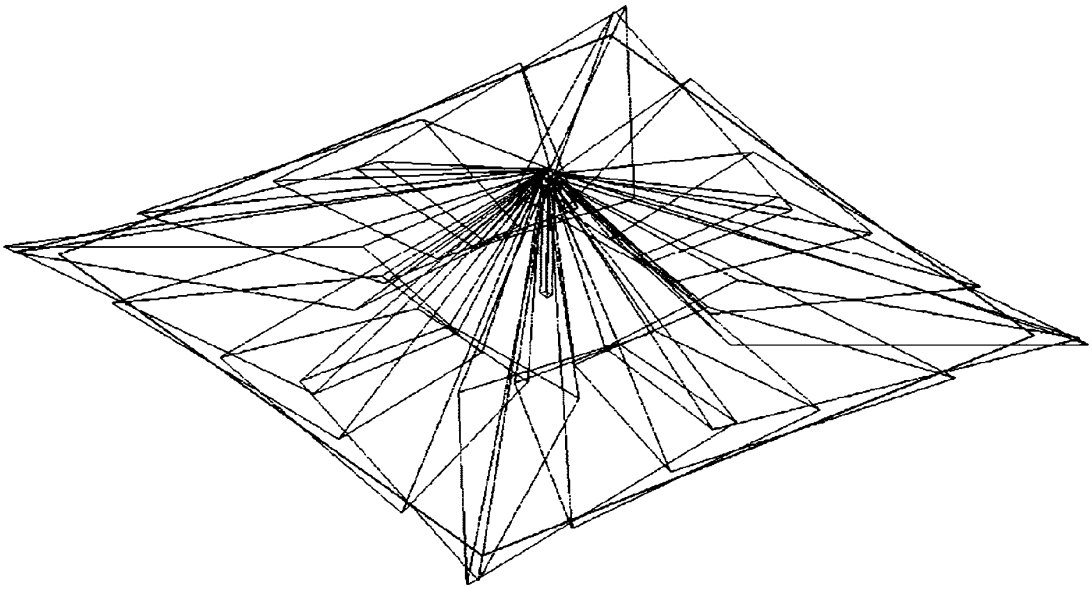


FIGURE 9A

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(54) **Title:** LIGHTWEIGHT LED LIGHTING SYSTEMS FOR PERMANENT AND SEMI-PERMANENT MOUNTING ON ELEVATED STRUCTURES HAVING INTEGRATED SUPPORT AND THERMAL TRANSFER FEATURES

(57) **Abstract:** The invention relates to lightweight LED lighting systems for permanent and semi-permanent mounting on elevated structures, the lighting systems having integrated support and thermal transfer features. The systems are particularly suited for elevated mast systems and specifically for mast systems that are repeatedly lifted and lowered such as drilling and service rig masts. Specifically, the invention improves a) the weight/lumen ratios of LED lamp assemblies and LED lighting systems, b) the net added weight of LED lighting systems, c) the footprint of LED light systems and/or d) obviates the need for removing LED lighting systems or their sub-assemblies when transporting mast systems.

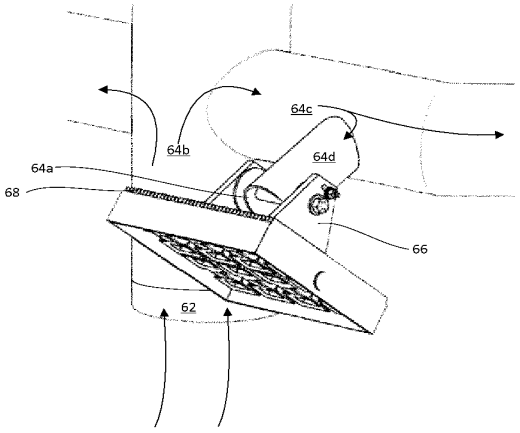


FIGURE 4A

[Continued on next page]

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LIGHTWEIGHT LED LIGHTING SYSTEMS FOR PERMANENT AND SEMI- PERMANENT MOUNTING ON ELEVATED STRUCTURES HAVING INTEGRATED SUPPORT AND THERMAL TRANSFER FEATURES

FIELD OF THE INVENTION

[0001] The invention relates to lightweight LED lighting systems for permanent and semi-permanent mounting on elevated structures, the lighting systems having integrated support and thermal transfer features. The systems are particularly suited for elevated mast systems and specifically for mast systems that are repeatedly lifted and lowered such as drilling and service rig masts. Specifically, the invention improves a) the weight/lumen ratios of LED lamp assemblies and LED lighting systems, b) the net added weight of LED lighting systems, c) the footprint of LED light systems and/or d) obviates the need for removing LED lighting systems or their sub-assemblies when transporting mast systems.

BACKGROUND OF THE INVENTION

[0002] LED lighting systems are well known and have a large number of applications. They are advantaged over past incandescent, fluorescent and metal halide systems in many applications for their energy consumption, robustness and durability.

[0003] In industrial applications, LED lighting systems continue to be used extensively and are becoming more common place for both portable and permanent applications and their associated markets. In the portable market, and in particular, the construction and energy industries, there are certain areas where LED lighting systems are not widespread due to various technical problems and/or limitations in certain applications. Although LED technology can supply lighting needs at a fraction of the energy consumption of metal halide technology, a drawback is the amount of metal required to dissipate and draw heat away from high-power LED lamps. As such, in many cases the cost and weight of LED lighting systems can make them a challenging option for retrofit structures that were

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originally built for metal halide lighting systems and/or mounting LED lighting systems to structures that were not designed to support the weight of LED lighting systems.

[0004] Specifically, the combined weight of an LEDs, lamp housings and heat sinks (collectively referred to herein as an LED lamp assembly) together with mounting brackets and all support frames required for configuring a plurality of LED lamp assemblies to an existing structure can limit or prevent a retrofit or a new build thus preventing lower energy LED technology to be deployed in some applications.

[0005] One example of a system that has had limited application of LED technology is oil industry drilling and service rigs and specifically mounting lighting on the crown or upper mast region of a drilling rig or service rig mast. As is known, drilling and service rigs and their masts are sophisticated and costly pieces of equipment designed for the complex task of drilling wells and servicing wells. Given the nature and location of drilling and service operations, drilling and service sites are operated around the clock and at all times of the year. As such, there is a need for effective lighting solutions on and around these rigs that meet the high demands and tough working environment of a rig including long term exposure to heat, cold and precipitation.

[0006] Importantly, while rigs are generally very well engineered structures, designed for their primary task of drilling or servicing wells, they must also be designed to be transported between well sites, and as such are often not designed to accommodate secondary tasks such as supporting lighting systems on their masts or crowns despite the desirability of having effective lighting at a central and high location of the site. As a result, lighting systems are often separate from the rig and mast and, as such, are operated as separate and independent pieces of equipment such as trailer mounted portable light tower systems. Separate and independent lighting sources can be effective in providing light to the site but they must be independently set up and directed to ensure that their light is effective at the site. This can increase the costs of lighting the rig as both additional equipment and personnel may be required. In addition, pieces of equipment such as fuel powered light towers are often not tall enough to provide a lighting source above the working surfaces of a rig.

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[0007] As low watt per lumen LED technology has developed, new applications have arisen. Various prior art systems have configured high lumen lighting systems (for example, 0.5 million (MM) to 1.5 million (MM) systems) to the crown or upper section of a drilling rig or service rig mast and have shown that light can be provided to the entire drilling lease surface to provide a safer work area to the workers. For example, an LED lighting system mounted 165 feet (53m) off the ground level where the workers need light, a 0.5MM lumen LED system may not provide enough light on target; however, if that same 0.5MM lumen system was added to an 80-foot (26m) mast it would likely provide enough light on target. However, in the latter case, a smaller rig can generally support less weight than the taller bigger rigs and so, designers of LED lighting systems will consider both the height of the mast in determining the required light output as well as the ability of the mast to support a given weight. Importantly, and as discussed below, a key drawback of LED lamps assemblies and LED lighting systems that mount to a rig crown or upper mast is the overall weight or weight to lumen ratio requirements of such systems to provide a specific light output.

[0008] Primarily, the problem of weight at the crown or upper mast of a rig is that during the process of raising and lowering the mast at a job site (after moving the rig between drilling locations), the extra weight of an LED lighting system acting at the end of the mast can subject the mast to enough force that the mast will bend and/or break and/or put additional stresses on lifting equipment. In other words, because rigs are mobile systems, their overall weight and footprint are engineered such that both are usually minimized and are not "over engineered" to accommodate additional loads being placed on the rig. As noted previously, the smaller the rig the less weight it can support, but then due to a lower height of a smaller rig, fewer lumens are required to displace other means of site surface lighting.

[0009] For example, it is desirable to keep the overall weight of a rig low due to road weight restrictions and challenges of delivering heavy rigs down roads that are not paved, particularly when the roads are wet that can cause ruts and road damage. Accordingly, drilling rigs are designed with upper weights limits to enable their movement.

[0010] As such, current prior art lighting systems that provide for example 1MM-1.5MM lumens can weigh in the range of 2,000-2,500 lbs and, as a result, are limited from being

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installed on many drilling rigs due to the stresses that such systems impose on a drilling rig as it is being raised and lowered. While some rigs may be strong enough to allow this extra weight to be lifted, as noted above in some cases, it is the size and capabilities of the hydraulic ram lifting systems that limit the ability to use higher weight systems. While larger hydraulic lifting systems may be utilized, this can also represent a significant additional cost to an operator. For service rigs the same issues apply, but as this style of rig is generally smaller, they may only need 0.25MM - 0.75MM lumens and may weigh 400-1,000 lbs. Thus, while the net added weight is lower for a service rig, as with the heavier drilling rigs, the weight to lumen ratio needs to be within a range to mitigate the above issues.

[001 1] Another consideration is the time and equipment required to install a lighting system on a mast and the current requirement of having to remove the LED lighting system for transport due to the positioning the lighting systems and the extent to which they will project outwardly from the sides of the mast. Moreover, with the high weights of these systems, manpower and equipment is required. In other words, the installation and removal of LED lighting systems requires the use and cost of a crane and loader for rigging in and rigging out, plus the extra time it takes to remove and reattach the LED lighting system after each move. Since the rig companies often are compensated by their customer on time efficiency, this has created a barrier to market for many retrofit LED lighting systems and from gaining traction in the market. Accordingly, there is a need for LED lighting systems that can be permanently and/or semi-permanently configured to a rig such that during transport the LED lighting system can remain attached or substantially attached to the rig, thereby reducing time for transport between well sites and minimizing the need and cost associated with loaders, cranes and additional deck space on transport trucks.

[001 2] Furthermore, to provide access to a higher percentage of existing drilling rigs, there is a need for lighting systems that reduce weight while providing sufficient light for rigs which typically have mast heights of 20-45m for service type rigs and 30-50+m for drilling rigs. While weight can be reduced by decreasing the lumen output of the system, lower lumen systems may not provide sufficient light.

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[0013] While newer systems have been developed that continue to reduce the weight of lighting systems greater than 1.0MM lumens to around 550kg, there remain many rigs where this amount of added weight is still too high.

[0014] For the purposes of discussion, if it is assumed that a low weight LED lighting system or a standard prior art LED lighting system for configuration to the crown of drilling rigs and that provides 1MM+ lumens will generally weigh 1,200 lbs (500kgs) to 2,400 lbs (1,100kgs). These figures represent a ratio of 0.55 grams or 1.10 grams, respectively, of added weight / 1.0 lumen (0.55:1.0 or 1.10:1.0 g/lumen respectively).

[0015] As the total mass of such systems cannot be used on many rigs, it is desirable to decrease the ratio of added weight/lumen below these numbers. In addition, it is desirable to decrease the total mass of lighting systems to reduce or obviate the time and equipment required to prepare a rig for installation or transport.

[0016] Specifically, for configuration to larger drilling rigs with mast heights in the range of 30-50+ meters wherein the overall lumens are preferably near or greater than 1MM lumens, there is a need for the net added weight to be less than 1,10Olbs (500kg), preferably less than 880lbs (400kg) and more preferably to around 600lbs (275kgs). Thus, for an LED lighting system of approximately 600 lbs (275 kg) and a 1MM lumen LED lighting system, this is a ratio of 0.27 grams/lumen. For a high lumen output LED system for the same drilling rig providing 1.5 MM lumens a ratio of less than 0.2 and preferably less than 0.18 grams/lumen is desirable.

[0017] To achieve these levels of lighting with current LED lamps assemblies, a typical lighting system may include an array of 10-50 LED lamp assemblies, again depending on the applicable height of the LED lighting system while in use, each typically weighing in the range of 17.5-33lbs (8-15kg) based on typical designs as shown in Figures 1A and 1B. The weights of lamps described in the preceding sentence are for illustration and are not meant to be limiting.

[0018] Specifically, Figures 1A and 1B show the various components of a typical prior art LED lamp assembly 10 as including an LED housing 12, LED solid state light board 14 having LEDs (i.e. high power LEDs) 14a, reflectors 16, heat sink 18, housing cover 20,

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associated mounting brackets 22, optional cooling fans (not shown) and power cables 24. As noted above, due to the need for each LED lamp assembly to be robust and durable, a typical LED lamp assembly will have a separate housing, heat sink and brackets that are connected to one another during assembly. However, each of these components is generally heavy when assembled and when incorporated into an array of lamp assemblies can represent a significant weight. As noted, various prior art systems may also utilize a cooling fan to direct cooling air over one or more LEDs. As such, as the total weight of the LED lighting system includes the lamp assemblies as well as all the supporting frames, electrical cables, connectors, etc., the end result is that the desired ratios of grams/lumen as described above cannot be achieved with current designs.

[0019] As indicated, each LED lamp assembly 10 includes a heat sink 18 to ensure that heat generated by the LEDs is properly dissipated to ensure the LEDs are operated within the required temperature ranges and do not exceed recommended operating temperatures as set by a LED manufacturer. Moreover, it is generally desirable to manage power consumption for a given light output in lumens to ensure both efficiency and the longevity of the LEDs. Accordingly, an LED manufacturer will generally recommend that the temperature at the semi-conductor junction of each LED be maintained within a preferred temperature range to maintain power efficiency but also LED longevity. While a LED may be operated at a higher junction temperature (up to a maximum temperature before burning out), the power efficiency will drop off (i.e. higher watts being consumed per lumen of light intensity) and the longevity of the LED will drop. Hence, for practical purposes, high power LEDs are rarely operated at temperatures higher than the recommended temperatures.

[0020] Table 1 shows typical specifications of a high performance LED.

[0021] Table 1- Typical Specifications of a High Performance LED (Cree XHP 70, Cree Canada Corp, Mississauga, Ontario)

Property	Parameter
Size	7 by 7 mm
Voltage	6V or 12V
Max Drive Current	4.8A (6V) 2.4A (12V)

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Max Power	28.8 W
Max Light Output	4022 lm
Max Efficiency at Binning Conditions	150 lm/W
Typical Forward Voltage	5.8 V White @ 2100 mA (6 V) 11.6 V White @ 1050 mA (12 V)
Maximum Reverse Voltage	-5 V
Viewing Angle	120 °
Maximum Junction Temperature	150 °C

[0022] As can be seen in this example, the maximum junction temperature is 150 °C. However, in a typical operating scenario, it would be recommended to not operate the lamp at temperatures greater than about 80°C.

[0023] For an LED described in Table 1, an array of 16 LEDs within a housing 12 would have a maximum power requirement of about 460 W but would normally be operating at about 50-60% of maximum power thus consistently utilizing about 230-276 W of power. With the radiant efficiency of the LEDs typically being between 20% and 45%, this means that approximately 55-80% of the input power will be lost as heat. Assuming a 75% heat loss, this means 180-206 W of power is continuously being lost as heat which to prevent junction temperatures from rising must be efficiently removed.

[0024] In view of the foregoing and in summary, there has been a need for lightweight LED lighting systems that provide desired light on target (e.g. suitable, desired and usable light volume delivered to the area where workers require the light to complete tasks) and that can be effectively configured to tall structures at different and/or various heights from the surface of a work site (whether smaller service rigs or larger drilling rigs). In addition, there has been a need for LED lamp assemblies and LED lighting systems with lower ratios of grams/lumens than current LED lighting systems whilst enabling effective heat dissipation to maintain recommended junction temperatures.

[0025] Further still, there has been a need for LED lighting systems that integrate, partially-integrate and/or are otherwise configured with or to functional features of a rig's upper mast and/or crown with an LED lighting system such that the net added weight of

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adding lighting to a drilling mast is reduced. In addition, there has been a need for LED lighting systems that integrate or partially-integrate with, or act as a substitute and/or partial substitute for, components and/or sub-components of a rig mast, crown, structure, or other such item, without limitation, that exists as part of the rig assembly prior to the addition and/or configuration of an LED lamp assemblies and/or an LED lighting system. Further, there has been a need for LED lighting systems that reduce the effective net added weight and/or minimize the weight/lumen ratio when compared to prior art.

[0026] Further still, there remains a need for LED lighting systems that can be configured to a rig as a permanent and/or semi-permanent system thereby minimizing or eliminating the need to remove and/or partially remove the LED lamp assemblies and/or LED lighting system during transportation activities.

[0027] In addition, there has also been a need for portable lighting systems for other applications including temporary lighting applications such as interior construction applications that provide desired lighting but that reduce both the size and the weight of the lighting systems.

[0028] Further still, it is desirable in certain applications, including the operation of drilling rigs, that the light cast from a high mast does not create excessive light pollution to areas adjacent the work site. As such, the design of a lamp assembly should provide relatively precise light paths that illuminate the desired areas but do not allow excessive light to escape. The design of reflectors can be adjusted to enable sharper boundaries between illuminated and non-illuminated areas from a particular light source. However, as light towers become taller, the precision of these boundaries becomes lower for a given reflector. Tighter boundaries can be achieved by deeper and narrower reflectors; however, this must also be balanced against the proximity of a hot LED near the reflector.

SUMMARY OF THE INVENTION

[0029] In accordance with the invention, there is provided an LED lighting system for configuration to a supporting structure, the LED lighting system comprising: a plurality of LED lamps and reflectors within at least one LED lamp assembly; an air flow system having at least one air flow conduit (AFC) for directing air flow against each LED lamp

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assembly to effect cooling of the LED lamps and to provide structural support to each LED lamp assembly for connection to the supporting structure; and wherein the LED lighting system has a weight/lumen ratio of less than 0.55g/lumen.

[0030] In various embodiments, the LED lighting system has a weight/lumen ratio of less than 0.35g/lumen and/or less than 0.25g/lumen.

[0031] In various embodiments, the LED lighting system provides greater than 500,000 lumens and/or greater than 1.0 MM lumens.

[0032] In further embodiments, each LED lamp assembly includes a lamp assembly housing having a plurality of surfaces for effecting heat transfer of heat from the LED lamps away from the LED lamps.

[0033] In other embodiments, each AFC is operatively connected to a lamp assembly housing, the AFC having an air channel for moving cooling air through the AFC and for conveying heat from each LED lamp assembly away from each LED lamp assembly to effect cooling of each LED lamp assembly and to maintain an operating temperature of the LED lamp assembly at or below a threshold temperature during use.

[0034] In yet further embodiments, the mass/lumen ratio is realized by a balance of a collective weight and thermal mass of each LED lamp assembly and AFC to provide sufficient structural strength to support the LED lighting system and an adequate thermal mass of each LED lamp assembly housing to effect sufficient cooling when each lamp assembly is operating at ambient temperature and air flow is flowing over each LED lamp assembly.

[0035] The system may include a fan system operatively connected to the AFC for actively moving air through the AFC.

[0036] In various embodiments, the AFC includes a vertically oriented conduit having a lower air entry and upper air exit and wherein cool air enters the lower air entry and warm heated air exits the upper air exit. The vertically oriented conduit may also include at least one substantially horizontal branch conduit extending laterally from the vertically oriented conduit and wherein each branch conduit operatively and structurally supports at least

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one lamp assembly housing and/or a heat transfer fin system operatively connected to the AFC.

[0037] In other embodiments, the system will include a controller for managing LED lamp assembly temperature, wherein the controller monitors the temperature within an LED lamp assembly and adjusts air flow speed to increase or decrease air flow through the AFC to maintain LED lamp assembly temperature below a pre-determined threshold temperature. The controller may also monitor the temperature within an LED lamp assembly and adjust power to the LED lamp assembly to maintain LED lamp assembly temperature below a pre-determined threshold temperature.

[0038] In other embodiments, the system may also include a duct collar operatively connected to a lamp assembly for directing cooling air against a lamp assembly housing at substantially 90 degrees to the lamp assembly.

[0039] In various embodiments, each lamp assembly housing has one or more outer edges and includes cooling fins extending radially from a central position on a lamp assembly housing towards each outer edge of the lamp assembly housing for providing an even air flow across the lamp assembly housing.

[0040] In other embodiments, the lamp assembly housing has a thermal mass sufficient to effect cooling of the LED lamp assembly and to maintain an operating temperature of the LED lamp assembly at a recommended temperature during use at ambient conditions only when air is flow against the LED lamp assembly housing from the AFC.

[0041] In another aspect, the invention provides an integrated lighting and railing system for attachment to a crown of a rig mast comprising: at least one LED lamp assembly, each LED lamp assembly having at least one LED lamp operatively contained within a lamp assembly housing and thermally connected thereto; a combined air flow conduit (AFC) and railing, the combined AFC and railing including at least one substantially vertical and at least one substantially horizontal AFC members, the AFC members arranged as a railing structure and configured for attachment to an upper region of a rig mast, the AFC members supporting the at least one LED lamp assembly and defining an air flow path through the AFC members to each LED lamp assembly to effect cooling of each LED lamp

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assembly, and wherein the integrated lighting and railing system has railing dimensions substantially corresponding to an existing mast-top steel railing.

[0042] In other embodiments, the integrated lighting and railing system includes a forced air system operatively connected to the AFC to move air through the AFC and towards each lamp assembly.

[0043] The integrated lighting and railing system may include a controller operatively connected to the forced air system, the controller for controlling a flow rate of air through the AFC, the controller responsive to a measured temperature at one or more LED lamp assemblies to increase or decrease the flow rate of air based on a measured temperature.

[0044] In various embodiments of the integrated lighting and railing system, the lamp assembly housing has a thermal mass sufficient to effect cooling of the LED lamp assembly and to maintain an operating temperature of the LED lamp assembly at a recommended temperature during use at ambient conditions only when air is flow against the LED lamp assembly housing from the AFC.

[0045] The integrated lighting and railing system may be configurable to a drilling rig mast, provides greater than 0.5 MM lumens and has a net added weight /lumen ratio of less than 0.55g/lumen and/or provides greater than 0.5 MM lumens and has a net added weight/lumen ratio of less than 0.35g/lumen and/or provides greater than 0.5 MM lumens and has a net added weight /lumen ratio of less than 0.25g/lumen and/or provides greater than 1.0 MM lumens and has a net added weight /lumen ratio of less than 0.55g/lumen and/or provides greater than 1.0 MM lumens and has a net added weight /lumen ratio of less than 0.35g/lumen and/or provides greater than 1.0 MM lumens and has a net added weight /lumen ratio of less than 0.25g/lumen and/or provides greater than 1.0 MM lumens and has a net added weight /lumen ratio of less than 0.20g/lumen.

[0046] In various embodiments, the LED lamp assemblies are retractable with respect to a central axis of the rig mast to enable transportation of the rig mast with the LED lighting system attached.

[0047] In another aspect, the invention provides method for retrofitting an LED lighting system to a rig mast to reduce a net added weight of the LED lighting system to the rig

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mast, the method comprising the steps of: a) removing existing mast-top steel railings from a rig mast; and, b) attaching an integrated lighting and railing system to the mast top, the integrated lighting and railing system having at least one LED lamp assembly, each LED lamp assembly having at least one LED lamp operatively contained within a lamp assembly housing and thermally connected thereto; and a combined air flow conduit (AFC) and railing, the combined AFC and railing including at least one substantially vertical and at least one substantially horizontal AFC members, the AFC members arranged as a railing structure and configured for attachment to an upper region of a rig mast, the AFC members supporting the at least one LED lamp assembly and defining an air flow path through the AFC members to each LED lamp assembly to effect cooling of each LED lamp assembly and wherein the integrated lighting and railing system has railing dimensions substantially corresponding to the existing mast-top steel dimensions.

[0048] In another aspect, the invention provides an LED lighting system comprising: an LED circuit board having a support matrix supporting at least one LED lamp and power conducting trace; a reflector operatively configured over each LED lamp and to the LED board, the reflector having a reflector base for operative positioning over the LED lamp and a reflector body for directing LED light away from the reflector; a heat sink in thermal contact with an outside surface of the reflector adjacent the reflector base and the LED board, the heat sink for conveying LED lamp heat away from inside surfaces of the reflector; and, an LED housing operatively configured to the LED board, the LED housing having a thermally conductive body for conveying heat away from the LED housing.

[0049] In a further aspect, the invention provides a control system for an LED light system having at least one LED lamp assembly, each LED lamp assembly having a plurality of LED lamps operatively contained within an LED housing, an air flow conduit (AFC) operative configured with a fan system to deliver cooling air to each LED lamp assembly, the control system for controlling power to the LED lamps and to maintain an operating temperature within a desired range, the control system comprising: a power driver operatively connected to a power supply and to the LED lamps of an LED lamp assembly; a temperature sensor and controller operatively connected to each LED housing for monitoring the temperature of the LED housing, the temperature sensor and controller for reporting the temperature of the LED housing to the power driver; and wherein the power

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driver increases or decreases power to the LED lamps in response to the temperature of the LED housing and wherein if the temperature of the LED housing is above a threshold, power is reduced to the LED lamps, and wherein if the temperature is below a threshold, power is increased to the LED lamps up to a pre-determined power threshold.

[0050] In one embodiment, the system further includes a fan driver operatively connected to the power supply and wherein the fan driver activates the fan above a temperature threshold and deactivates the fan below a temperature threshold.

BRIEF DESCRIPTION OF THE DRAWINGS

[0051] Various objects, features and advantages of the invention will be apparent from the following description of particular embodiments of the invention, as illustrated in the accompanying drawings. The drawings are not necessarily to scale, emphasis instead being placed upon illustrating the principles of various embodiments of the invention. Similar reference numerals indicate similar components.

Figures 1A and 1B are schematic cross sectional (Figure **1A)** and top (Figure **1B)** views of a typical prior art LED lamp assembly having LEDs within a housing.

Figures 2, 2A, 2B, 2C, 2D, 2E, 2F and 2G are various perspective views (Figures 2-2F) and a cross-sectional view (Figure 2G) of a lighting system having a heat transfer conduit (HTC) in accordance with one embodiment of the invention.

Figures 3, 3A, 3B, 3C and 3D are various perspective views (Figures 3-3C) and a cross-sectional view (Figure 3D) of an LED lighting system having a branched heat transfer conduit (HTC) in accordance with one embodiment of the invention.

Figures 4 and 4A are a cross-sectional view (Figure 4) and perspective view (Figure 4A) of a ducted cooling system in accordance with one embodiment of the invention and **Figure 4B** is perspective view of a ducted cooling system having radial fins on a lamp assembly in accordance with one embodiment of the invention.

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Figures 4C and 4D are schematic cross-section and perspective views of an LED lamp assembly having a ducted collar to provide even air flow to an LED lamp assembly in accordance with one embodiment of the invention.

Figure 5 is a perspective view of an integrated LED lighting and railing system in accordance with one embodiment of the invention.

Figures 6 and 6A are schematic top (Figure 6) and cross-sectional (Figure 6A) views of an LED light panel array having a telescopic arm that functions as a heat sink in accordance with one embodiment of the invention.

Figure 7 is a diagram of an integrated light assembly (IA) configured to one corner of a drilling mast in accordance with one embodiment of the invention.

Figure 7A is a diagram of eight integrated light assemblies (IAs) configured to four corners of a drilling mast in accordance with one embodiment of the invention.

Figure 7B is a bottom view of an IA in accordance with one embodiment of the invention.

Figure 7C is an isometric view of an IA with portions of the heat transfer conduit removed in accordance with one embodiment of the invention.

Figure 7D is a cross-sectional view through a lamp assembly showing a typical beam path from a reflector in accordance with one embodiment of the invention.

Figure 7E is a cross-sectional and isometric view of a lamp assembly and reflector heat sinks in accordance with one embodiment of the invention.

Figures 7F-7I are isometric and cross-sectional views of a reflector pair in accordance with one embodiment of the invention.

Figure 7J is an isometric view of an LED reflector heat sink in accordance with one embodiment of the invention.

Figure 7K is an isometric view of a LED printed circuit board in accordance with one embodiment of the invention.

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Figure 8 is a schematic diagram of a control system in accordance with one embodiment of the invention.

Figures 9 and 9A are sketches of the light projection pattern of a lighting system in accordance with one embodiment of the invention.

DETAILED DESCRIPTION

[0052] With reference to the Figures, LED lamp assemblies and LED lighting systems are described that combine structural and heat dissipation properties in combined systems that significantly reduces the weight of LED lamp assemblies and LED lighting systems.

[0053] Although many of the Figures illustrate and/or describe configuration to drilling rigs with higher lumen outputs, these are not meant to be limiting and it is understood that the systems described can be modified for configurations with applicability to smaller service rigs, other rigs of various heights, weights, geometry, etc. and are within the scope and spirit of the present invention. The systems described herein may also be integrated with other support systems. Various embodiments and aspects of the current invention are described that achieve one or more of the following:

a. provide a desired level of lighting;

b. reduce the overall net weight of an LED lighting system when compared to prior art systems;

c. reduce the mass/lumen ratio of a LED lamp assembly and/or the mass/lumen ratio of an LED lighting system

d. provide sufficient heat dissipation capabilities for the desired lighting;

e. provide robust structural support to enable deployment in a variety of applications and particularly elevated structure applications;

f. for drilling and service rig mast LED lighting systems, reduce the "net added weight" at the upper section of the mast by integrating and/or at least partially replacing, displacing and/or subsidizing functional uses and

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weights of other structural features of the rig mast at least partially with at least some aspects or components of the LED lighting system;

g. provide a controller that manages the power delivery to LED lighting systems to align with the sunrise and sunset of any particular location;

h. provide a power backup system to ensure uninterrupted LED lighting when the main site power fails.

i. provide reflector optics enabling effective light projection over a defined area while reducing light pollution outside a projection area as well as defined blind spots when desired.

j. provide a control system that enables effective interconnection of a number of lamp assembly modules depending on lighting needs.

[0054] To achieve these objectives, the LED lighting systems and LED lamp assemblies described herein utilize combinations of separate and integrated LED housings, heat transfer/air flow conduits and support systems that enable effective heat dissipation through the support system or cooling air through the heat transfer conduits and/or support system. Generally, the LED lighting systems are operated to maintain an operating temperature of individual LEDs at or around a recommended operating temperature.

[0055] Figure 2 shows a typical drilling mast system 30 having a representative lighting system 32 in accordance with one embodiment of the invention mounted to upper corners of a drilling mast. For the purposes of illustration, as is known a typical drilling rig mast includes a number of substantially vertical members 30a, horizontal members 30b and various cross members 30c. The typical mast will include an upper deck platform 30d having a railing 30f and potentially other top mounted structures 30e such as a cage railing. Figure 2A shows a lighting system 32 mounted to the upper railings of the drilling mast.

[0056] In a first embodiment, and as shown in greater detail in Figures 2B-2G, an LED lighting system 32 includes separate corner-mounted LED lighting assemblies 40 each having a plurality of LED lamp assemblies 40a. The LED lamp assemblies 40a are

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connected to and supported by an air flow conduit (AFC) 40b that has a generally hollow interior enabling air to be drafted upwardly through the AFC. The AFC provides structural support to the LED lamp assemblies 40a and enables effective heat dissipation from the LED lamp assemblies to maintain desired operating temperatures within each LED lamp assembly and LED. The AFC is attached to the drilling mast via appropriate connectors and will generally be installed in a substantially vertical orientation. Within the AFC, a system of cooling fins 40c (see Figure 2G in particular) is preferably configured to increase the surface area of the AFC and otherwise improve heat transfer from the system.

[0057] As shown, each of the LED lamp assemblies 40a is pivotally connected to the AFC allowing individual manipulation of an LED lamp assembly for directing light where it may be required. Power for the LED lamp assemblies is provided by a power controller 42 mounted to each AFC.

[0058] In the embodiment shown in Figures 2B and 2C, air may passively draft upwardly through the AFC from a lower entry position 40d to an upper exit position 40e. In this example, heated air within the AFC and derived from the LED lamp assemblies will rise within the AFC to create an air draft such that colder air is drawn in at the entry position 40d and warmer air is expelled through the exit 40e. The upper exit position may include a cap 40f to prevent precipitation from entering the AFC.

[0059] As shown in Figures 2D-2G, in one embodiment, a forced air convention system may be provided to actively move air through the AFC via a fan system 44. In this case, a fan having fan blades and a motor is configured to the AFC at the lower entry 40d and operates to pull cold air into the AFC and move it upwardly towards the exit 40e.

[0060] In another embodiment, as shown in Figures 3-3D, a branched AFC lighting system 50 is described. In this embodiment, a branched AFC conduit 52 has a vertical conduit 52a and two or more horizontal conduits 52 b,c (or substantially vertical and substantially horizontal). Figure 3 shows a branched system 50 configured to the upper railings of a drilling mast and Figure 3A shows a branched lighting system 50 configured to the upper corners of a drilling mast. As with the other embodiments, air can be moved through the system from a lower entry position 50c by fan 53, upwardly and then outwardly from two or more branches exits 50d, 50e. As shown, LED lamp assemblies 40a may be mounted

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to the vertical 52a and horizontal conduits 52 b,c. Each branch may be coplanar (e.g. 50b, 50c) with one another and may also include additional non-coplanar branches (e.g 50f, 50c).

[0061] As shown in Figure 3D, the branched AFC will preferably include internal fins 54 to increase the surface area for heat dissipation.

[0062] Importantly, for each of the above described embodiments, the AFC provides a combination of heat sink capabilities and structural support for a plurality of LED lamp assemblies. In contrast, prior art systems provide only provide heat sink capabilities through non-structural members.

[0063] Figures 4 and 4A show another embodiment similar to the branched AFC above but where cooling air is actively pushed against an LED lamp assembly 60. In this embodiment, a fan system 62 drafts air through additional AFC 64 having an LED lamp assembly 60 adjacent a conduit exit 64a. In this case, a combination of vertical 64b and horizontal 64c and angled 64d conduits collectively provide air movement from the fan system to the exits 64a. As shown, each LED lamp assembly 60 has a bracket connection system 66 and system of cooling fins 68. Importantly, in this embodiment, the cooling fins 68 may be substantially smaller and lighter than the cooling fins on a prior art lamp assembly as sufficient heat transfer from the LED lamp assembly is enabled due to the active air flow over the cooling fins. In one embodiment (Figure 4B), the cooling fins may be arranged in a generally radial pattern (or spiral pattern (not shown)) from the center of the back of the lamp assembly to provide radial channels to the outside edges of the lamp assembly to the flow of air from the conduits. A generally radial or spiral pattern of cooling fins helps promote an even flow of air over the entire surface of the lamp assembly thus providing even cooling to all lamps within the lamp assembly as well as continuous air cleaning of the cooling fins. Importantly, the cooling fins in these embodiments would generally not be sufficient to enable the LED lamp assembly to operate at the desired light output as a standalone lamp assembly. That is, sufficient cooling is normally only achieved by the movement of cooling air over the LED lamp assembly, particularly when operating at ambient temperatures at, around or above 20 °C.

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[0064] In various embodiments, the cooling fins 68 may be partially enclosed via additional ducting to manage air flow over the cooling fins.

[0065] Figures 4C and 4D show one embodiment having a duct collar 64e to promote an even flow of air over the cooling fins. In this case, a duct collar is pivotally connected to angled conduit 64d to direct air flow against cooling fins 68 in a substantially perpendicular direction to the cooling fins and/or in a direction that promotes passage of the cooling air through the cooling fins. That is, by providing a short channel that directs cooling air through the cooling fins, air will be directed more evenly across the back of the LED lamp assembly. In one embodiment, a small gap 69 is provided between the duct collar and angled conduit to enable an increased air flow against the cooling fins through the duct collar. That is, the movement of air through the duct collar will draw additional air in through the gap 69 thus increasing air flow.

Weight Reduction

[0066] By moving the heat sink capabilities and/or air flow to the structural members, the weight of each LED lamp assembly can be reduced by reducing the size of or eliminating heat sink fins from the housing.

[0067] Potential weight reductions are illustrated by way of example and as shown in Table 2 for various sub-assemblies of an LED lighting system. In this representative example, for 16 LEDs contained within a lamp housing 210 (Figure 7A for example), the total weight of a LED lamp assembly including 16 LED lamps, an aluminum housing, cabling and housing covering can be reduced to approximately 2-3 kg as compared to current systems having passively cooling fins mounted to the housing and which typically weigh 12kg each.

[0068] Table 2-Representative Weights of Lighting System Sub-Assemblies for a 1.2MM total lumen LED Lighting System and Mass/Lumen

Sub-Assembly /Parameter	Weight (lbs) [kgs]	Number	Total Weight (lbs) [kgs]
LED Lamp Assembly	6 [2.7]	6 per corner	36 [16.3]

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Air Flow Conduit and Electrical Assembly	46 [30.4]	2 per corner	92 [41.8]
Support Frame	20 [9.1]	1 per corner	20 [9.1]
Total Weight			148 [67.2]
Total Weight for 4 corners of mast			592 [268.8]
Mass/Lumen (g/lumen)			0.224

[0069] Thus, as shown in Figure 7A and Table 2, a total of 6 LED lamp assemblies for one corner of a drilling mast may weight approximately 16.3 kgs. Two aluminum AFCs 212 including their electrical assemblies and for mounting a total of 6 LED lamp assemblies may weigh approximately 41.8 kg. A support frame may weigh approximately 9.1 kgs. Accordingly, the entire weight of 6 LED lamp assemblies and the support system would be approximately 67.2 kg and be capable of 300,000 lumens.

[0070] Thus, for a drilling mast having 4 LED lighting systems and 1.2 MM lumens as shown in Figure 7A, the total weight of the LED lighting system would be approximately 268 kg which is significantly lower than current systems weighing upwards of 500kg for the same light capabilities of approximately 1.2 million lumens (assuming both systems are operated to maintain recommended junction temperatures and utilize similar LEDs). As such, the subject system can dramatically reduce the total mass of an LED lighting system and significantly decrease the added weight/lumen.

Net Weight Reduction

[0071] As shown in Figure 5, in one embodiment, the LED lighting system is integrated to upper regions of a drilling mast where an existing steel railing system 30f is replaced with an LED lighting system where the AFCs of the LED lighting system form the railings of the upper mast thus further reducing the net weight addition of the LED lighting system.

[0072] By way of example, and as shown in Figure 2, a typical mast has a steel handrail assembly that weighs approximately 45-90kg (100-200lbs). As shown in Figure 5, by removing the steel handrail and replacing the steel system with an LED lighting system 70 where the AFC of the LED lighting system provides railing structures, a significant reduction in overall weight can be achieved. In this example, for a square or rectangular

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mast head, the vertical corner posts and horizontal rails of the steel handrail assembly are replaced with a combination of vertical 70a and horizontal 70h AFCs that support a plurality of LED lamp assemblies 70b supported on conduits 70c. The interior channels with the AFCs enable cooling air to be directed to each LED lamp assembly as described above. The AFCs may completely replace existing railings. In some embodiments, non-AFC aluminum railing may be utilized to fill in any gaps as may be required.

[0073] As such, by removing 90kg (200lbs) of steel handrails and adding a 300kg (650lbs) (representative example weight) integrated lighting and railing system 70 the "net added weight" to the rig is only 210kg (460lbs).

[0074] In addition, as shown in Figure 5, a steel cage railing 30e may also be replaced with a lighter metal structure such as aluminum, to further reduce the net added weight. Accordingly, in these embodiments, the net added weight/lumen is further reduced as shown in Table 3.

Table 3- Representative Net Added Weight/lumen for Integrated LED Lighting and Railing System.

Parameter	Value
Lumens	1.2 MM/1.5MM
LED Lighting System Weight	300kg
g/lumen	0.25 g/lumen@1.2MM lumen 0.2 g/lumen @1.5 MM lumen
Steel Railing Removed	-90kg
Net Added Weight/Lumen	0.175 g/lumen 0.14 g/lumen @1.5 MM lumen

[0075] Accordingly, as can be seen from Table 3, substantially lower effective weight/lumen ratios can be achieved by and integrated LED lighting and railings system.

[0076] In one embodiment, the integrated lighting and railing system is a single, modular unit that can be configured to the drilling rig mast at site whilst the drilling rig mast is in a horizontal position. The integrated lighting and railing system may be transported independently from the drilling rig mast or connected to it during transportation. If

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transportable in a connected position, the integrated lighting and railing system may include pivoting arms that can be moved towards a central axis of the mast.

[0077] Other features and embodiments of the lighting system are described below.

AFC Design

[0078] AFCs are designed to provide a) sufficient heat transfer or air flow capabilities and b) structural strength to mount the desired number of LED lamp assemblies. From a mass and heat conductivity perspective, aluminum will generally provide the best properties for both heat conductivity and reducing weight. Rectangular or square AFCs can be assembled from aluminum panels with additional fin systems mounted to the interior (or exterior) of the conduit. Similarly, for round AFCs, extruded aluminum tubes can be readily assembled to form a branched or straight structure again with a fin system configured to the interior of the conduit. Both systems, rectangular or round or other profiles, will have sufficient void spaces to allow sufficient air flow through each AFC.

Fan System

[0079] In those LED lighting systems having a fan, the fan may be operated at one or more fixed speeds or may dynamically adjust air flow through each AFC depending on cooling requirements and as may be determined by a control scheme. In one embodiment, for example, a representative LED lighting system having 12 LED lamp assemblies having 16 LEDs, a fixed air flow of 500 cfm may be effective to continuously circulate air to effect cooling in which case power consumption of each fan system will be in range of 100 Watts.

Lamp Housing

[0080] Each LED lamp assembly, of either configuration in Figures 2 and 3 or Figure 4 as the specific case may be, will include a lamp housing supporting LEDs, reflectors and a transparent cover. A housing can be manufactured or assembled from an extruded aluminum profile or flat aluminum panels or a combination thereof.

[0081] For example, for the embodiment as shown in Figure 4 where cooling air is directed against the back of an LED housing, the LED lamp housing may include a relatively low

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surface area of cooling fins and a hence non-traditional appearance when compared to the surface area of cooling fins of a traditional standalone LED lamp assembly and that would typically be required for a specified lumen output.

[0082] For the embodiment as shown in Figure 3, where heat is conducted through an AFC away from the LED lamp assembly, the back of the LED housing may also have a non-traditional appearance of heat sink fins and have even less surface area when compared to the surface area of cooling fins of a traditional standalone LED lamp assembly.

Mounting Brackets

[0083] Each LED lamp assembly or LED lamp housing is attached to an AFC through a mounting bracket, which is preferably adjustable. In the case of the embodiments of Figures 2 and 3, the brackets provide effective heat transfer from the LED lamp housing to the AFC. In the case of the embodiment of Figure 4, the brackets may at least partially assist in directing air over the back of the LED lamp housing. Aluminum brackets and/or strapping can provide effective heat transfer while reducing weight.

Operation

[0084] In a typical operating scenario with average ambient conditions, for example lower night temperatures, some air movement, precipitation, and/or cooler seasonal temperatures, the operating temperature of each LED lamp assembly may remain below a recommended operating temperature. However, under various conditions, for example warm summer nights, no wind and/or no precipitation, the operating temperature may rise towards or above a recommended operating temperature. Similarly, the operator may temporarily require more light and increase the power to the LED lighting system.

[0085] Generally, the system controller can actively monitor junction temperature and

a. reduce power to the LEDs if the temperature rises or increase power to the LEDs as temperature drops or

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b. increase or decrease the air flow rate through each AFC as the temperature rises or drops.

[0086] In other situations, an operator may selectively choose to increase the light output of the system in which case, the system may allow a temporary increase in power and temperature for a time period and/or increase the air flow rate through the AFC to maintain temperature at the recommended level.

[0087] In other situations, the system is designed so that the forced air flow and other design features described herein are fixed and not variable such that there is a contingency of heat dissipation capacity for the environmental changes between summer and winter and wherein the LED lighting system provides a reliable and predictable amount of light on target.

[0088] The control system in one embodiment of the present invention incorporates logic that turns the LED lighting system on and off based on the sunrise and sunset time for that location, the controller logic updating itself daily and automatically from satellites thereby minimizing the need for attention by and tasks required by humans.

[0089] In another embodiment, the LED lighting system includes a battery or energy storage system configured to the LED lighting system whereby the lights can remain powered in the event of a blackout condition whereby the rig generators may fault and be off-line for a period of time. The backup system may be any one of Lithium batteries, capacitors, generators with control system that auto-starts the generator when needed, or other means of power backup reliability of common means.

[0090] Figures 6 and 6A show another embodiment where LEDs are configured to a telescopic pole where heat sink capabilities are provided by the telescopic pole 100. In this case, the telescopic pole includes both an inner pole and an outer pole 100b fixed to the housing 36. The inner pole is frictionally engaged with the outer pole allowing the lighting array to be selectively positioned along the inner pole. Importantly, the outer pole 100b is in heat transfer contact with the housing 36 through a contact system such as a weld bead 102 allowing heat to transfer through the housing to the outer pole. During operation, and under conditions as described above, the inner pole may also act as a heat

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sink. These embodiments may be particularly suited for portable construction applications where lighting systems are being regularly moved, positioned and oriented by workers.

Other Embodiments

[0091] With reference to Figures 7-7F, further embodiments are described having additional features that provide light weight and high output light.

[0092] Figure 7 shows an integrated assembly (IA) 200 having 4 lamp assemblies 202, air flow conduits (AFC) 210 and a main conduit 212. The integrated assembly 200 is configured to the upper deck of a drilling mast via a support pole 204, support arm 206 and hinge connector 208 to position the IA outside the upper deck railing of the drilling mast and allows individual lamp assemblies 202 to project their output light in a generally downward and outward direction.

[0093] Figure 7A shows each corner of a drilling mast supporting two IAs 200 vertically and horizontally separated from one another. In this case, the support system includes additional support members 206a, 206b, 206b' that provide horizontal support for each IA as well as vertical separation. Upper and lower support members 206b, 206b' may be of different lengths to enable horizontal separation between the two IAs. In addition, connector 206c allows pivoting of the support member 206a about a vertical axis. Vertical support member 206a may also be horizontally positioned on support member 206 to enable horizontal extension or retraction of the IAs relative to the drilling mast. Connector 208 also enables inward pivoting of the entire assembly in order to locate the IAs inside the outer perimeter of the drilling mast which is particularly useful during raising and lowering of the mast and/or during transportation of the drilling mast.

[0094] As shown in Figures 7, 7A, 7B and 7C, the main conduit 212 is generally a square or rectangular aluminum conduit that supports the lamp assemblies 202 through the AFCs 210. The main conduit may include handles 212a. The main conduit 212 shown has sections (a, b, c, d) each supporting one lamp assembly and angled (angle A) with respect to one another as shown in Figure 7B such that each lamp assembly has a different projection direction.

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[0095] Each main conduit includes end caps 212e at each end of the main conduit that provide an inlet cover duct to the main conduit and weather protection to the drivers and cooling fans (explained below).

[0096] Generally, in operation, cooling air is actively drawn in through the end caps 212e, through the main conduit and downwardly and against each lamp assembly 202 through AFCs 210.

[0097] Referring to Figure 7C, additional details of an IA are shown and specifically the location of power drivers 214 that control power to one or more lamp assemblies as described below.

[0098] Individual lamp assemblies may also be individually adjusted to provide a desired light direction.

Lamp Assembly and LED Reflector Design

[0099] As shown in Figures 7D-7J, the design of individual lamp assemblies 202, LEDs 220 and reflectors 222 is described for mast applications. For context, in a typical drilling mast application, the lighting system may be mounted at the top of a drilling mast 30-60m above the ground. As it is desirable to have relatively sharp boundaries between lighted and non-lighted areas at the work location, to create a precise projection/throw from each reflector, the design of the lamp assemblies, LEDs and reflectors includes a number of features that enables a precise light projection/throw. Importantly, this feature also contributes to providing light weight for high light output.

[00100] Figure 7D shows a cross section of a lamp assembly 202. As in other embodiments, the lamp assembly includes a housing 202a having cooling fins 202b and transparent cover 202c. A plurality of LEDs 220 and reflectors 222 (typically 16) are mounted at the base of the housing 202a.

[00101] As shown in Figure 7D, each LED 220 is positioned within a reflector such that light emanating from an LED will diverge from the outer edges of the reflector within a relatively tight beam path (BP). The beam path is determined by the depth (D) of the reflector relative to the width (W) of the base and the proximity of the LED to the inner

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walls of the reflector. Generally, a tighter beam path is enabled by positioning the LED closer to the base of the reflector and by the depth D of the reflector. However, this also causes heat from an operating LED to directly heat the base of the reflector.

[00102] As noted, in addition to minimizing the weight, it is also desired to reduce the cost of each reflector; hence, it is desirable that the LED reflectors 222 are plastic such as a metalized polycarbonate. Metalized polycarbonate has a number of optical advantages over metal surfaces as well as manufacturing advantages insomuch that it can be injection molded and hence is relatively inexpensive to produce as compared to cast metal reflectors.

[00103] Accordingly, to minimize effects of heat immediately adjacent the LED, the outer surfaces of the base of the reflector are configured with a metallic heat sink 224 (having a conductive thermal mass) (see Figures 7H and 7J for example) that is in heat exchange contact with the lower outer walls of the reflector, an LED printed circuit board 230 (Figure 7K) and indirectly the lamp assembly housing 202a. As such, direct heat from the LED can be conveyed away from the reflector as a result of the thermal mass of the heat sink and its surface area contact with the LED printed circuit board 230 and the lamp housing. Importantly, the heat sink can prevent the temperature of a metalized plastic reflector from overheating in that the heat sink enables a more efficient transfer of heat away from the base of the reflector.

[00104] In one specific embodiment, the LED 220 has approximate outer dimensions of 7x7 mm, the base of the reflector has an inner dimension of 7.5x7.5 mm and a depth of 26 mm. The top dimensions of the reflector are 20x29mm with wall angles approximately 30° in the short dimension and 50° in the long dimension. It is to be appreciated that the inner walls 222c of the reflector may also be slightly parabolic in shape to further minimize reflection that would diffuse light leaving the reflector.

[00105] In one embodiment, the heat sink 224 (Figure 7J) has lower outer dimensions of approximately 19x25mm and upper outer dimensions of 21x28 mm and a total height of 12mm. The heat sink 224 is shown schematically in Figure 7H before (left side) and after assembly (right side) when it is configured to the outer base of a reflector.

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[00106] Furthermore, and as shown in Figures 7F-7I, in order to minimize weight and for convenience of assembly, two or more reflectors 222 are interconnected by a connection member 222a. The connection member 222a includes a connection bore 222b that can be used to seat an assembly screw 225 and thus provides consistent spacing and alignment of reflectors within a lamp assembly and allows connection to the lamp assembly by a single screw or other suitable connector. As understood, arrays of 2 or more reflectors may utilize similar connection members.

[00107] Figure 7K shows one embodiment of an LED printed circuit board 230 for use within a lamp assembly. In this embodiment, the board 230 is aluminum with 4 LEDs 220. The board includes internal power conducting traces (not shown) and is suitably insulated from the main board. The board includes a power connector 230a for interconnecting an array of LEDs and reflectors on separate LED printed circuit boards as well as connection holes 230b for aligning with the screw connector described above which in turn align two LEDs within the base of a reflector pair as shown in Figures 7F-7I.

[00108] Suitable heat conductive pastes may be utilized between mating surfaces to enhance heat transfer from surfaces exposed to LED heat.

Power and Control System

[00109] The control system is designed to efficiently provide power to a number of IAs, provide effective temperature monitoring and power control to minimize the risk of overheating and hence damage to the light system while also minimizing the weight of the cabling required to power a number of IAs that may be configured to a drilling mast.

[001 10] A control system is shown in Figure 8. Power is routed up the mast via a connecting cable 250 to a control box 252. The control box includes cable connectors for connecting the power cable to the top-of-mast power and control system. The control box may include other functionality including for example GPS location and/or Bluetooth communication systems for reporting information such as location and/or system parameters to rig/service operators. In one embodiment, power is delivered at -208V, 3 phase, 30A (max) and power rating of 7-8 kW.

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[001 11] As noted above, the drilling mast may be configured with up to 8 IAs (although this may be greater with some embodiments). Each IA will generally be daisy-chained together to minimize the length (and hence weight) of power cables at the top of the mast. As shown in Figure 8, the control box is connected to a first junction box 254 within an IA 212. The junction box 254 directs power within the IA to one or more lamp assembly drivers 254a, 254b and 254c.

[001 12] In addition, power is directed to a fan circuit 254d, which in turn delivers power to one or more fans 254e, 254f. The fan circuit is provided with a thermosensitive switch to deactivate the fan circuit if the ambient air temperature is below a threshold such as below -5C. If the temperature is above the threshold, the fans will be activated.

[001 13] Each driver 254a, 254b, 254c is connected to a lamp assembly 202 via power cable 254g to a power/thermo board 203. The power/thermo board delivers power to each LED assembly 203a, 203b, 203c within the lamp assembly. As described above, each LED assembly may include one or more LEDs 220 operatively connected to a printed circuit board 230 and each LED assembly may be daisy-chained together.

[001 14] The power/thermo board 203 monitors temperature within the lamp assembly and includes logic to monitor and report threshold temperatures to a specific lamp assembly driver. If the power/thermo board determines the temperature is rising (for example through a temperature range of 67-77°C), the drivers 203a, 203b, 203c will progressively and individually reduce the current to each lamp assembly to limit the temperature rise of a lamp assembly using an open loop control within the control unit. Thus, as each lamp assembly has its own power/thermo board and driver, each lamp assembly is independently controlled in terms of maintaining an operating temperature within a desired range.

[001 15] Each junction box 254 may be connected to adjacent IAs, either on the same corner or another location of a drilling mast in a daisy-chain manner and ultimately back to the control box.

Light Projection

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[001 16] As shown in Figures 9 and 9A, light from a plurality of IAs each having a number of lamp assemblies will downwardly and outwardly project light to the surface and intersecting the surface as a series of generally trapezoidal-shaped light patterns. As shown in Figure 9, the light pattern of each lamp assembly will preferably be directed so as to overlap with one or more adjacent lamp assemblies so as to fully illuminate a desired area.

[001 17] Importantly, the outer edges of the light projection will be reasonably sharp so as to minimize light pollution outside the desired area but also to minimize light in an area immediately adjacent the mast which may be a working area and where it may be desired to prevent extremely bright lights from "blinding" workers in a specific working area.

Transportation

[001 18] In other embodiments, where the crown or upper regions of a mast are retrofit to receive a LED lighting system that is a stand alone add-on, or partially or fully replaces components such as a railing, the LED lighting system may no longer project laterally or more specifically downward from the mast when the mast is laid in its horizontal position for transport and/or may be withdrawn towards the central axis of the mast. In this case, the LED lighting system may be permanently (or semi-permanently) retained on the mast thereby reducing or obviating the need for manpower and equipment to install/uninstall the LED lighting system prior to and after transportation.

[001 19] Although the present invention has been described and illustrated with respect to preferred embodiments and preferred uses thereof, it is not to be so limited since modifications and changes can be made therein which are within the full, intended scope of the invention as understood by those skilled in the art.

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CLAIMS

1. An LED lighting system for configuration to a supporting structure, the LED lighting system comprising:

a plurality of LED lamps and reflectors within at least one LED lamp assembly,

an air flow system having at least one air flow conduit (AFC) for directing air flow against each LED lamp assembly to effect cooling of the LED lamps and to provide structural support to each LED lamp assembly for connection to the supporting structure;

and wherein the LED lighting system has a weight/lumen ratio of less than 0.55g/lumen.

2. The LED lighting system as in claim 1 wherein the LED lighting system has a weight/lumen ratio of less than 0.35g/lumen.

3. The LED lighting system as in claim 1 wherein the LED lighting system has a weight/lumen ratio of less than 0.25g/lumen.

4. The LED lighting system as in any one of claims 1-3 wherein the LED lighting system provides greater than 500,000 lumens.

5. The LED lighting system as in any one of claims 1-3 wherein the lighting system provides greater than 1.0 MM lumens.

6. The LED lighting system as in any one of claims 1-5 wherein each LED lamp assembly includes a lamp assembly housing having a plurality of surfaces for effecting heat transfer of heat from the LED lamps away from the LED lamps.

7. The LED lighting system as in any one of claims 1-6 wherein each AFC is operatively connected to a lamp assembly housing, the AFC having an air channel for moving cooling air through the AFC and for conveying heat from each LED lamp assembly away from each LED lamp assembly to effect cooling of each LED lamp assembly and to maintain

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an operating temperature of the LED lamp assembly at or below a threshold temperature during use.

8. The LED lighting system as in any one of claims 1-7 wherein the mass/lumen ratio is realized by a balance of a collective weight and thermal mass of each LED lamp assembly and AFC to provide sufficient structural strength to support the LED lighting system and an adequate thermal mass of each LED lamp assembly housing to effect sufficient cooling when each lamp assembly is operating at ambient temperature and air flow is flowing over each LED lamp assembly.

9. The LED lighting system as in any one of claims 1-8 further comprising a fan system operatively connected to the AFC for actively moving air through the AFC.

10. The LED lighting system as in any one of claims 1-9 wherein the AFC includes a vertically oriented conduit having a lower air entry and upper air exit and wherein cool air enters the lower air entry and warm heated air exits the upper air exit.

11. The LED lighting system as in claim 10 wherein the vertically oriented conduit includes at least one substantially horizontal branch conduit extending laterally from the vertically oriented conduit and wherein each branch conduit operatively and structurally supports at least one lamp assembly housing.

12. The LED lighting system as in any one of claims 1-11 further comprising a heat transfer fin system operatively connected to the AFC.

13. The LED lighting system as in any one of claims 1-12 further comprising a controller for managing LED lamp assembly temperature, wherein the controller monitors the temperature within an LED lamp assembly and adjusts air flow speed to increase or decrease air flow through the AFC to maintain LED lamp assembly temperature below a pre-determined threshold temperature.

14. The LED lighting system as in any one of claims 1-12 further comprising a controller for managing LED lamp assembly temperature, wherein the controller monitors the temperature within an LED lamp assembly and adjusts power to the LED lamp assembly

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to maintain LED lamp assembly temperature below a pre-determined threshold temperature.

15. The LED lighting system as in any one of claims 1-14 further comprising a duct collar operatively connected to a lamp assembly for directing cooling air against a lamp assembly housing at substantially 90 degrees to the lamp assembly.

16. The LED lighting system as in any one of claims 1-15 wherein each lamp assembly housing has one or more outer edges and includes cooling fins extending radially from a central position on a lamp assembly housing towards each outer edge of the lamp assembly housing for providing an even air flow across the lamp assembly housing.

17. The LED lighting system as in any one of clams 1-16 wherein the lamp assembly housing has a thermal mass sufficient to effect cooling of the LED lamp assembly and to maintain an operating temperature of the LED lamp assembly at a recommended temperature during use at ambient conditions only when air is flow against the LED lamp assembly housing from the AFC.

18. An integrated lighting and railing system for attachment to a crown of a rig mast comprising:

at least one LED lamp assembly, each LED lamp assembly having at least one LED lamp operatively contained within a lamp assembly housing and thermally connected thereto;

a combined air flow conduit (AFC) and railing, the combined AFC and railing including at least one substantially vertical and at least one substantially horizontal AFC members, the AFC members arranged as a railing structure and configured for attachment to an upper region of a rig mast, the AFC members supporting the at least one LED lamp assembly and defining an air flow path through the AFC members to each LED lamp assembly to effect cooling of each LED lamp assembly,

and wherein the integrated lighting and railing system has railing dimensions substantially corresponding to an existing mast-top steel railing.

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19. The integrated lighting and railing system as in claim 19 wherein the AFC members are aluminum.

20. The integrated lighting and railing system as in claim 18 or 19 further comprising a forced air system operatively connected to the AFC to move air through the AFC and towards each lamp assembly.

21. The integrated lighting and railing system as in claim 20 further comprising a controller operatively connected to the forced air system, the controller for controlling a flow rate of air through the AFC, the controller responsive to a measured temperature at one or more LED lamp assemblies to increase or decrease the flow rate of air based on a measured temperature.

22. The integrated lighting and railing system as in any one of claims 18-21 wherein the lamp assembly housing has a thermal mass sufficient to effect cooling of the LED lamp assembly and to maintain an operating temperature of the LED lamp assembly at a recommended temperature during use at ambient conditions only when air is flow against the LED lamp assembly housing from the AFC.

23. The integrated lighting and railing system as in any one of claims 18-22 wherein the lighting system is configurable to a drilling rig mast, provides greater than 0.5 MM lumens and has a net added weight /lumen ratio of less than 0.55g/lumen.

24. The integrated lighting and railing system as in any one of claims 18-22 wherein the lighting system is configurable to a drilling rig mast, provides greater than 0.5 MM lumens and has a net added weight /lumen ratio of less than 0.35g/lumen.

25. The integrated lighting and railing system as in any one of claims 18-22 wherein the lighting system is configurable to a drilling rig mast, provides greater than 0.5 MM lumens and has a net added weight /lumen ratio of less than 0.25g/lumen.

26. The integrated lighting and railing system as in any one of claims 18-22 wherein the lighting system is configurable to a drilling rig mast, provides greater than 1.0 MM lumens and has a net added weight /lumen ratio of less than 0.55g/lumen.

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27. The integrated lighting and railing system as in any one of claims 18-22 wherein the lighting system is configurable to a drilling rig mast, provides greater than 1.0 MM lumens and has a net added weight /lumen ratio of less than 0.35g/lumen.

28. The LED lighting system as in any one of claims 18-22 wherein the lighting system is configurable to a drilling rig mast, provides greater than 1.0 MM lumens and has a net added weight /lumen ratio of less than 0.25g/lumen.

29. The LED lighting system as in any one of claims 18-22 wherein the lighting system is configurable to a drilling rig mast, provides greater than 1.0 MM lumens and has a net added weight /lumen ratio of less than 0.20g/lumen.

30. The LED lighting system as in any one of claims 18-28 where the LED lamp assemblies are retractable with respect to a central axis of the rig mast to enable transportation of the rig mast with the LED lighting system attached.

31. A method for retrofitting an LED lighting system to a rig mast to reduce a net added weight of the LED lighting system to the rig mast, the method comprising the steps of:

a) removing existing mast-top steel railings from a rig mast; and,

b) attaching an integrated lighting and railing system to the mast top, the integrated lighting and railing system having at least one LED lamp assembly, each LED lamp assembly having at least one LED lamp operatively contained within a lamp assembly housing and thermally connected thereto; and a combined air flow conduit (AFC) and railing, the combined AFC and railing including at least one substantially vertical and at least one substantially horizontal AFC members, the AFC members arranged as a railing structure and configured for attachment to an upper region of a rig mast, the AFC members supporting the at least one LED lamp assembly and defining an air flow path through the AFC members to each LED lamp assembly to effect cooling of each LED lamp assembly and wherein the integrated lighting and railing system has railing dimensions substantially corresponding to the existing mast-top steel dimensions.

32. An LED lighting system comprising:

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an LED circuit board having a support matrix supporting at least one LED lamp and power conducting trace;

a reflector operatively configured over each LED lamp and to the LED board, the reflector having a reflector base for operative positioning over the LED lamp and a reflector body for directing LED light away from the reflector;

a heat sink in thermal contact with an outside surface of the reflector adjacent the reflector base and the LED board, the heat sink for conveying LED lamp heat away from inside surfaces of the reflector; and,

an LED housing operatively configured to the LED board, the LED housing having a thermally conductive body for conveying heat away from the LED housing.

33. An LED lighting system as in claim 32 wherein the LED housing includes a plurality of radially aligned heat transfer fins.

34. An LED lighting system as in claim 32 wherein the support matrix is aluminum.

35. An LED lighting system as in any one of claims 32-34 where the heat sink is aluminum and the reflector is metalized plastic.

36. A control system for an LED light system having at least one LED lamp assembly, each LED lamp assembly having a plurality of LED lamps operatively contained within an LED housing, an air flow conduit (AFC) operative configured with a fan system to deliver cooling air to each LED lamp assembly, the control system for controlling power to the LED lamps and to maintain an operating temperature within a desired range, the control system comprising:

a power driver operatively connected to a power supply and to the LED lamps of an LED lamp assembly;

a temperature sensor and controller operatively connected to each LED housing for monitoring the temperature of the LED housing, the temperature sensor and controller for reporting the temperature of the LED housing to the power driver;

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wherein the power driver increases or decreases power to the LED lamps in response to the temperature of the LED housing and wherein if the temperature of the LED housing is above a threshold, power is reduced to the LED lamps, and wherein if the temperature is below a threshold, power is increased to the LED lamps up to a pre-determined power threshold.

37. The control system as in claims 36 further comprising a fan driver operatively connected to the power supply and wherein the fan driver activates the fan above a temperature threshold and deactivates the fan below a temperature threshold.

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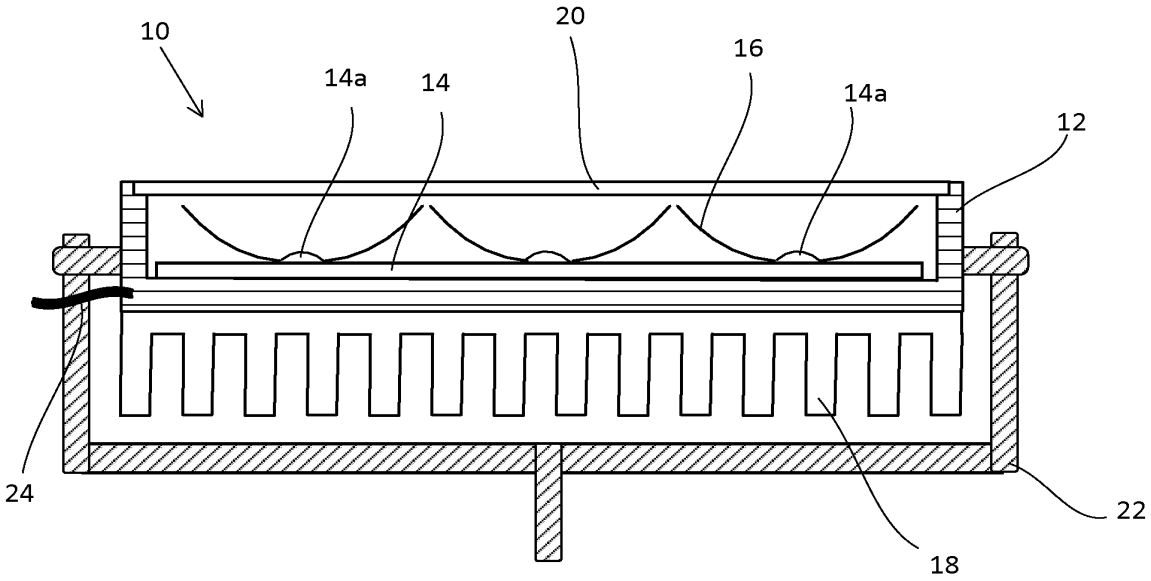


FIGURE 1A
PRIOR ART

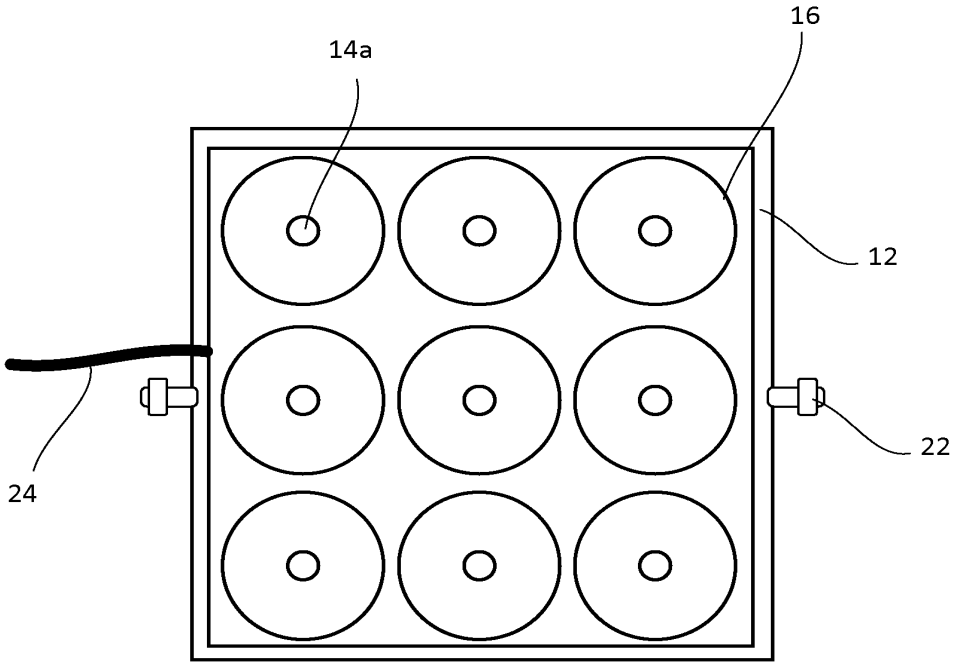


FIGURE 1B
PRIOR ART

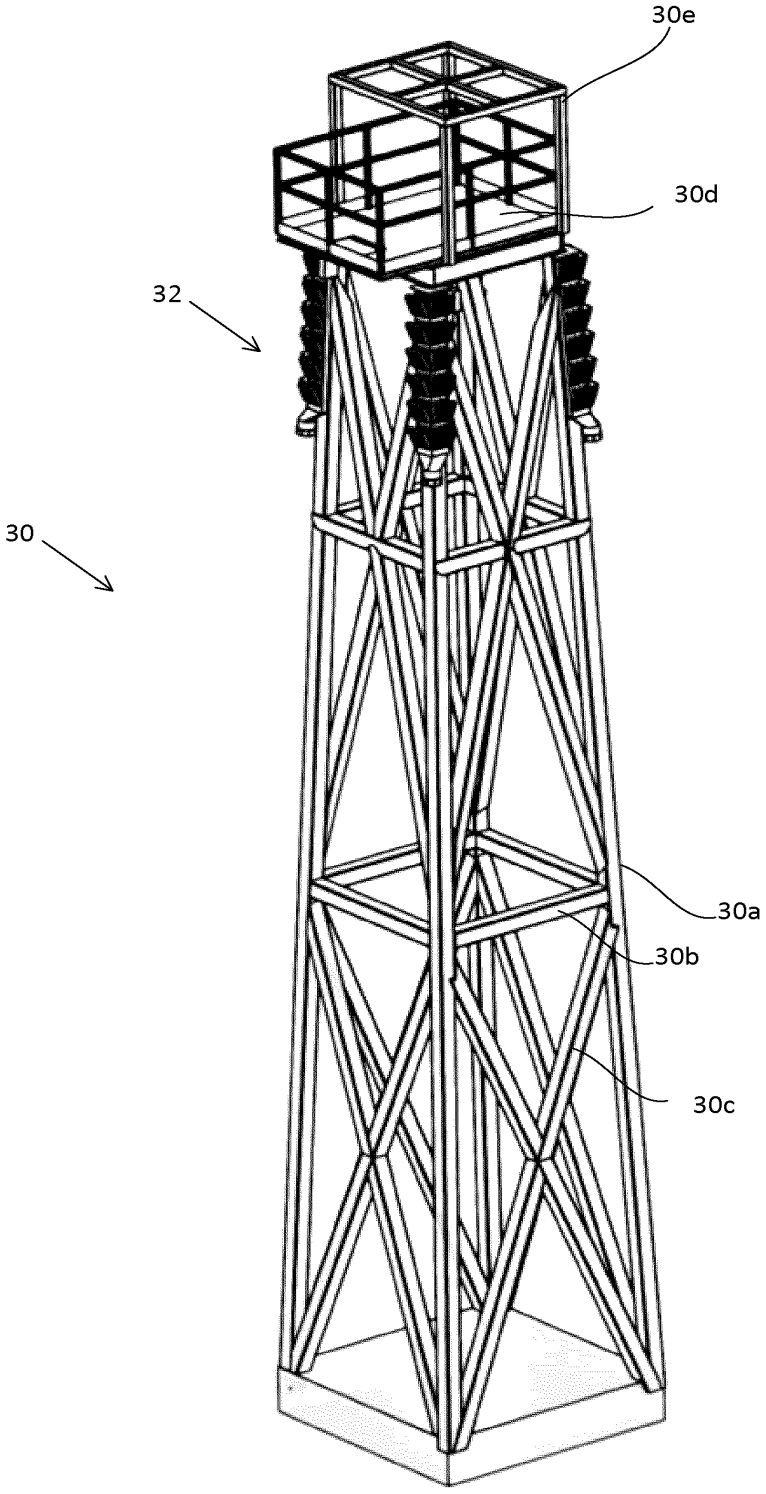


FIGURE 2

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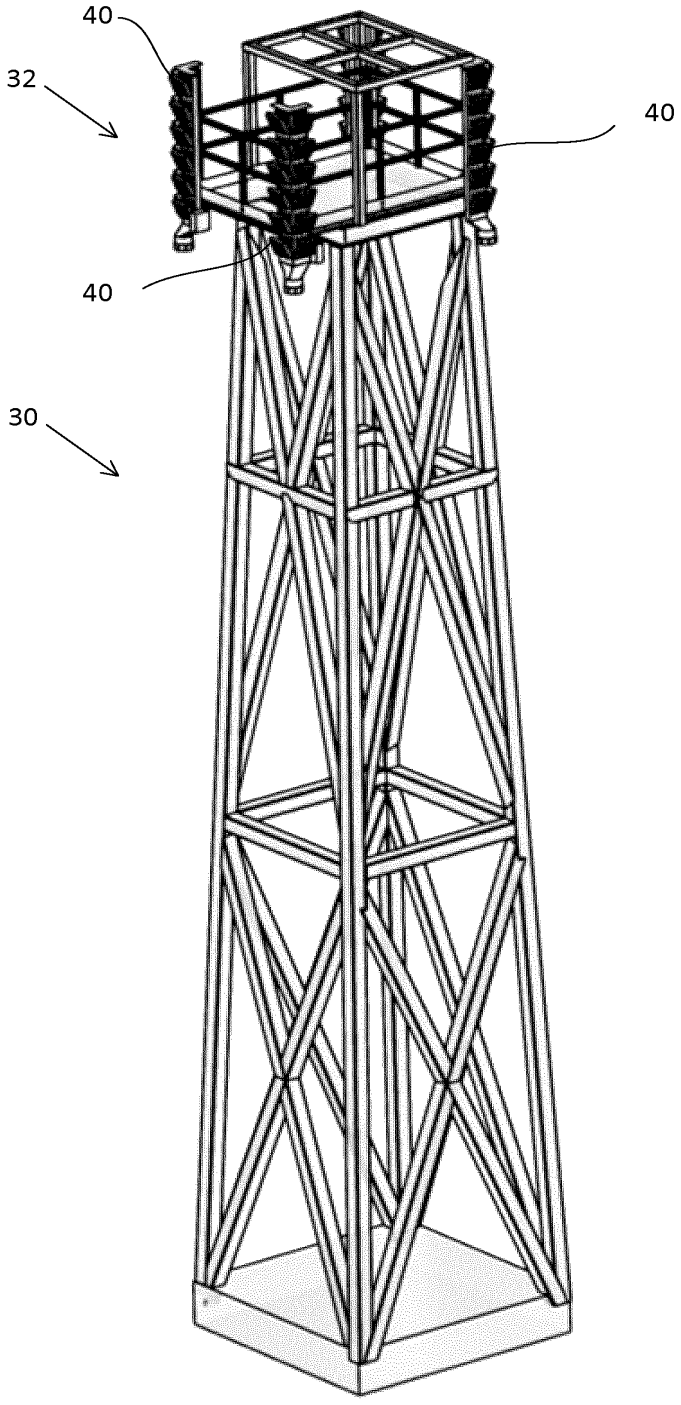


FIGURE 2A

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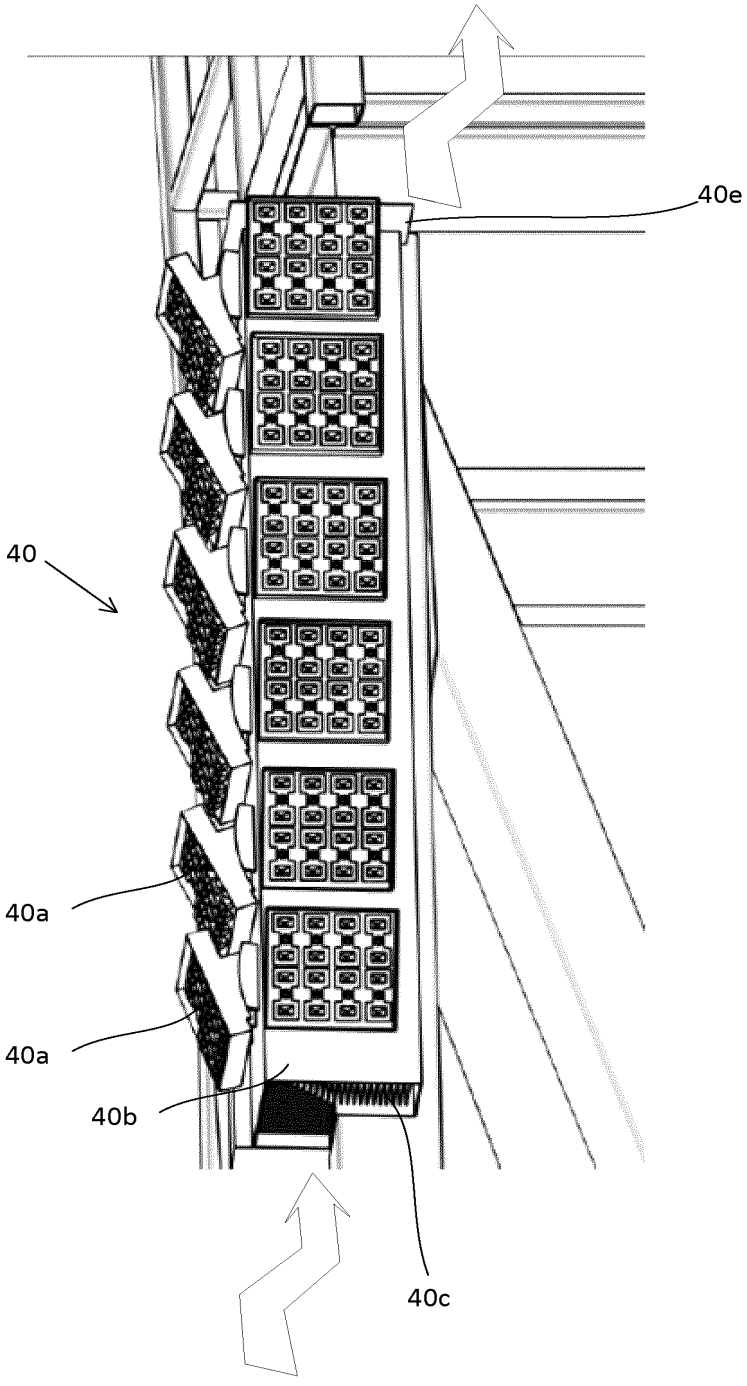


FIGURE 2B

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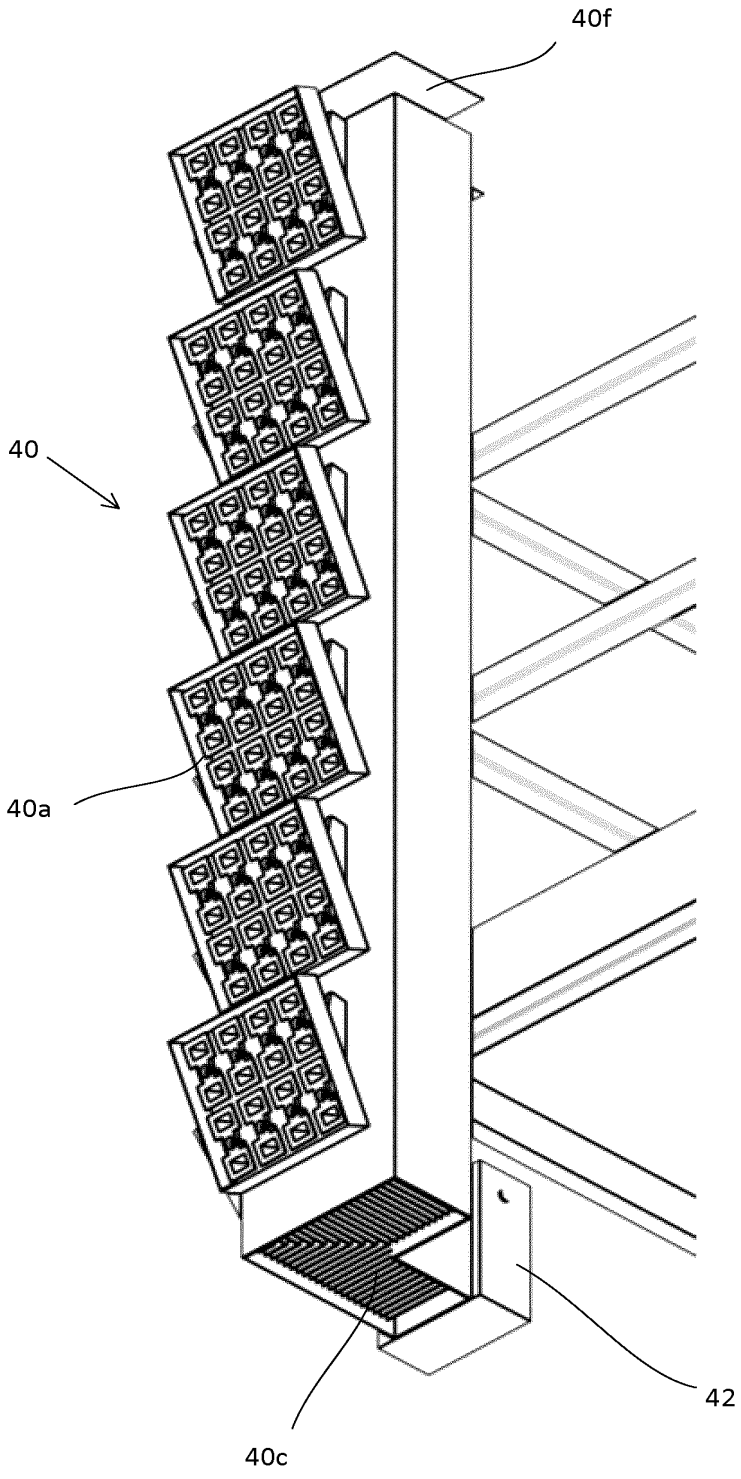


FIGURE 2C

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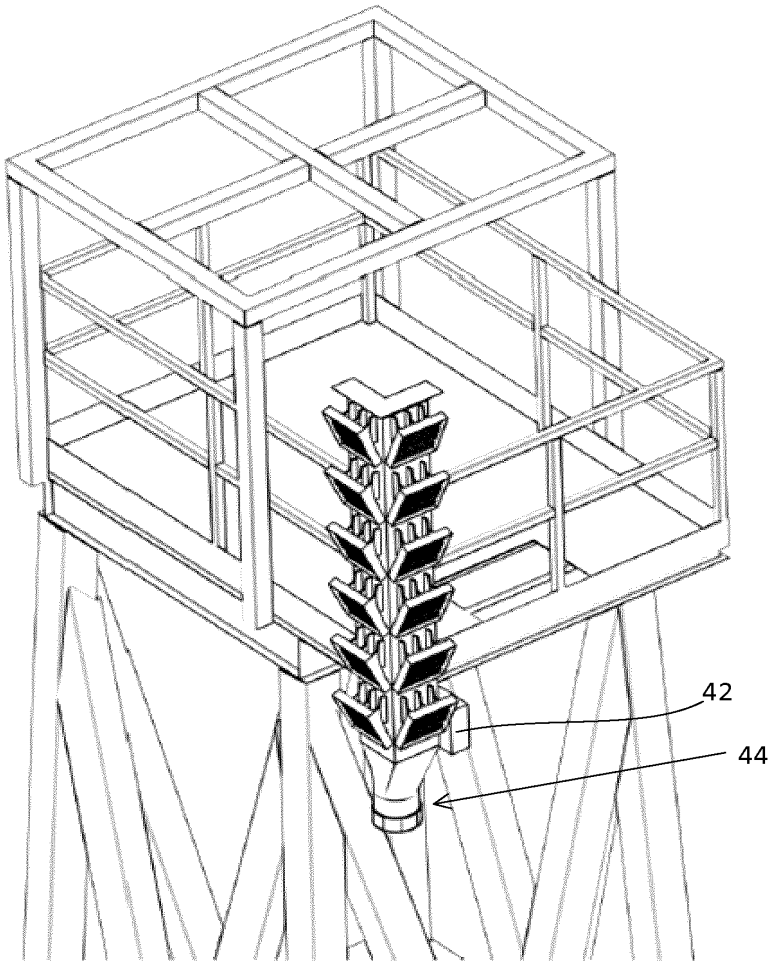


FIGURE 2D

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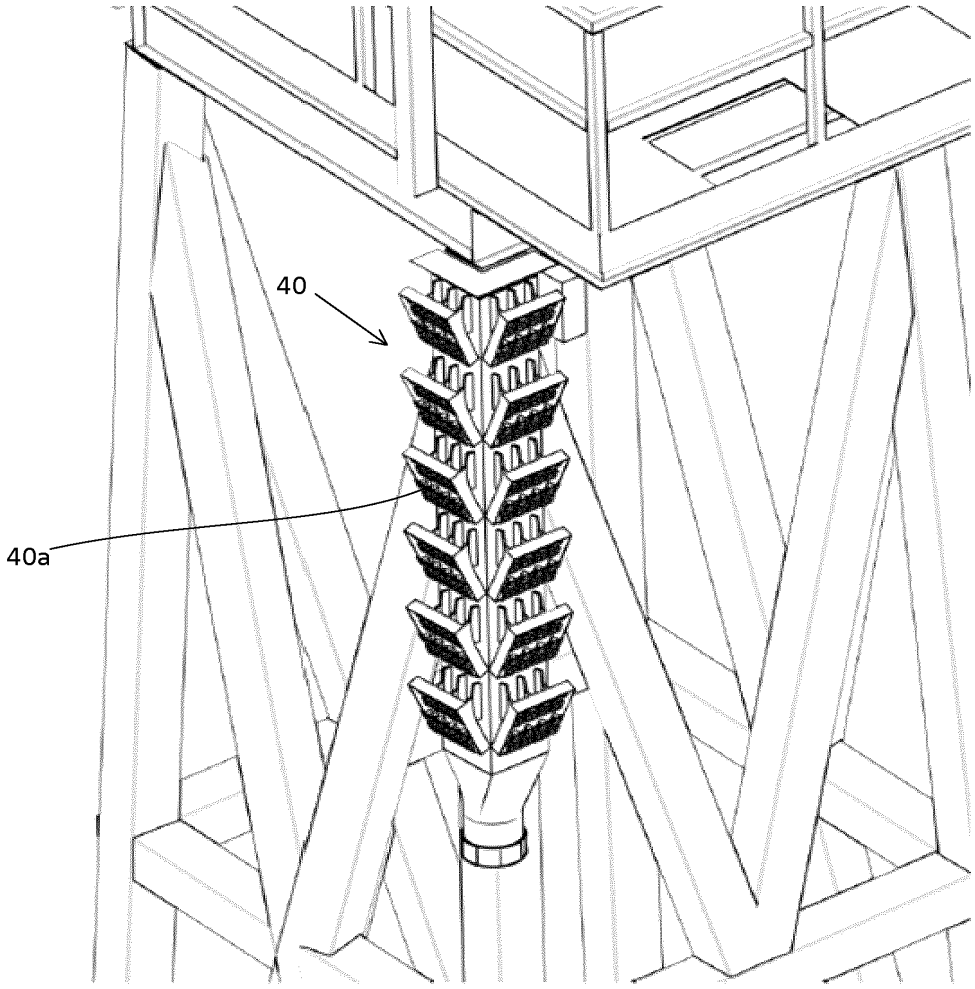


FIGURE 2E

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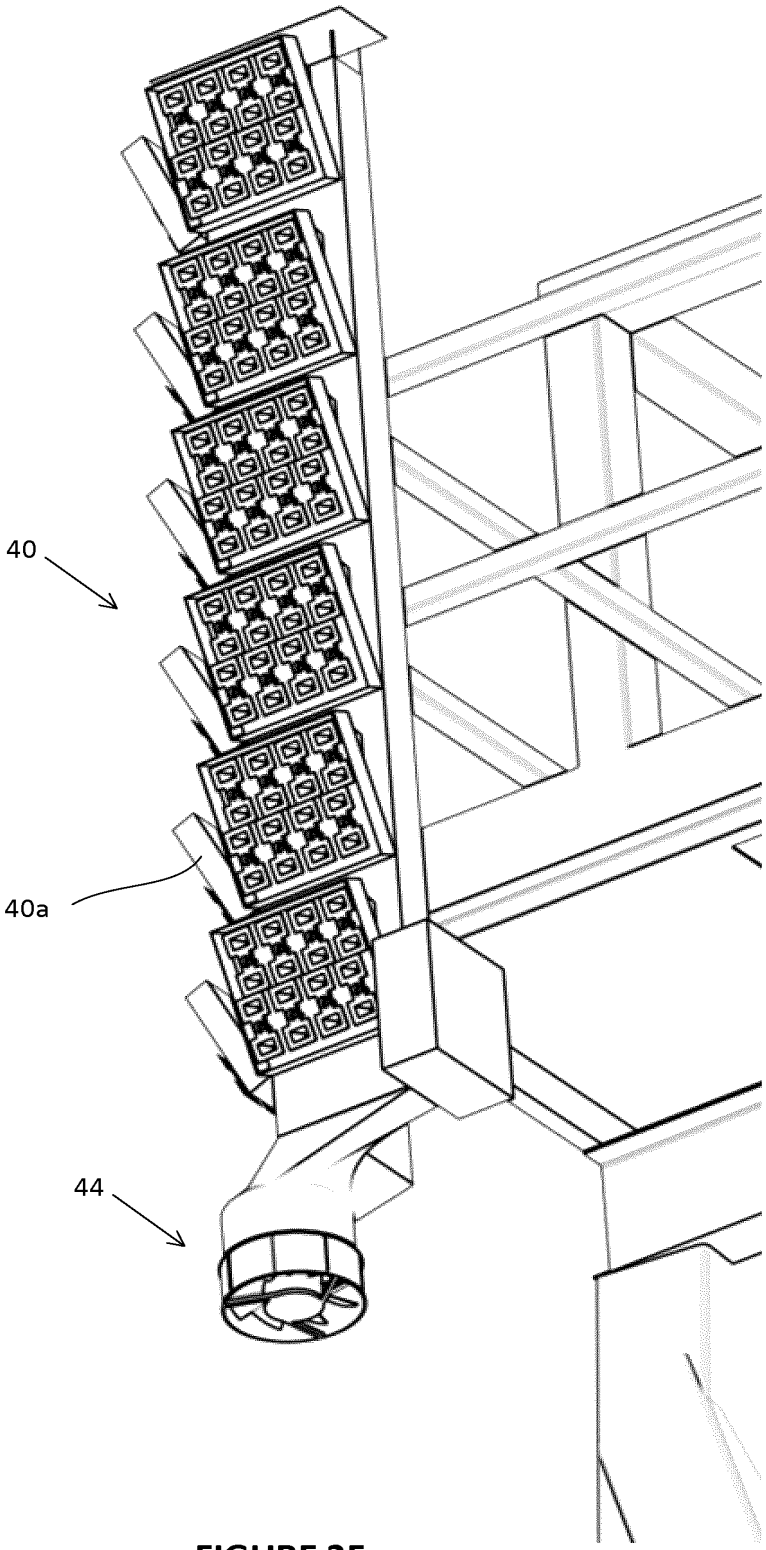


FIGURE 2F

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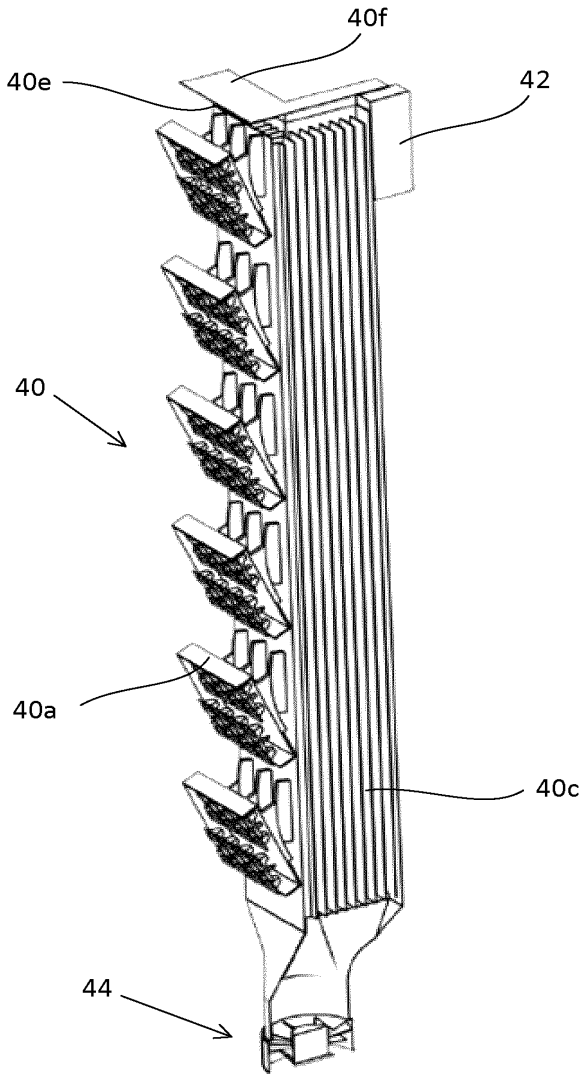


FIGURE 2G

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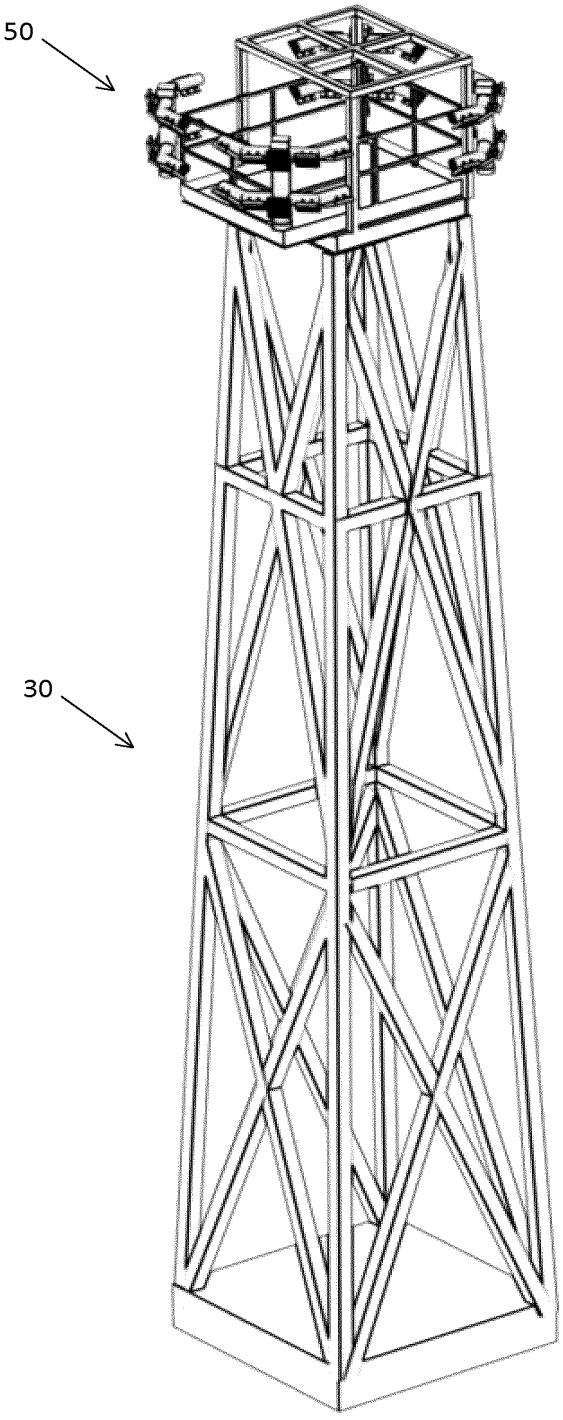


FIGURE 3

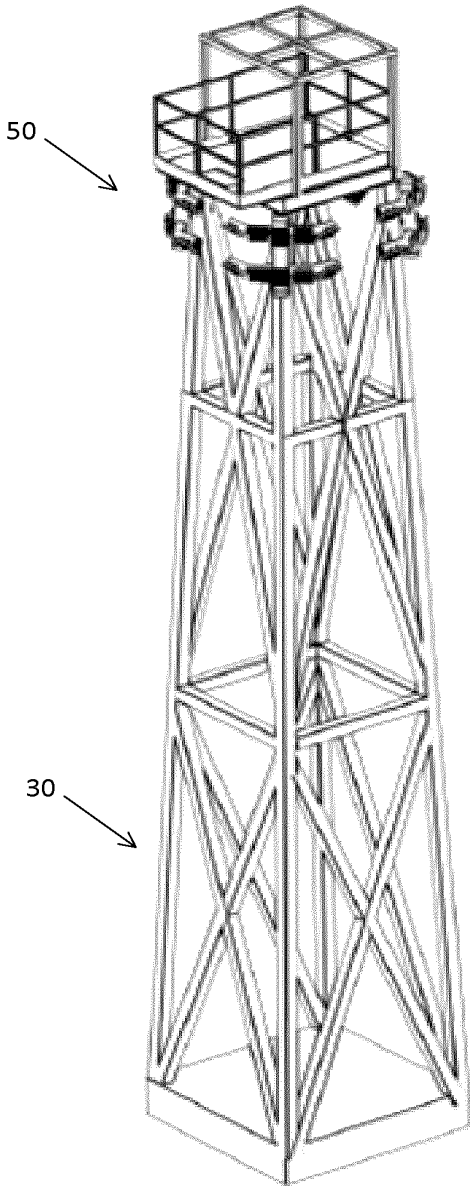


FIGURE 3A

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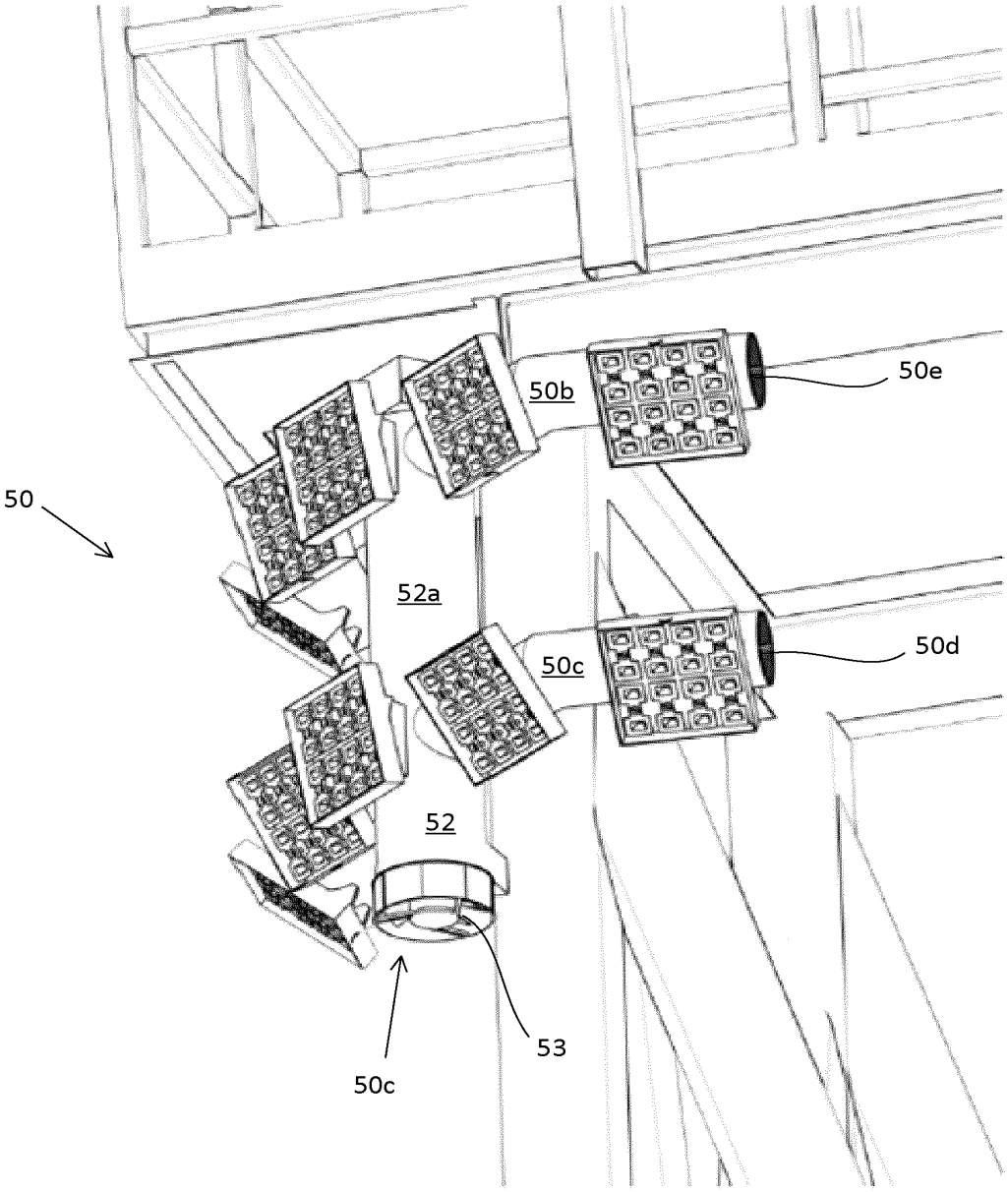


FIGURE 3B

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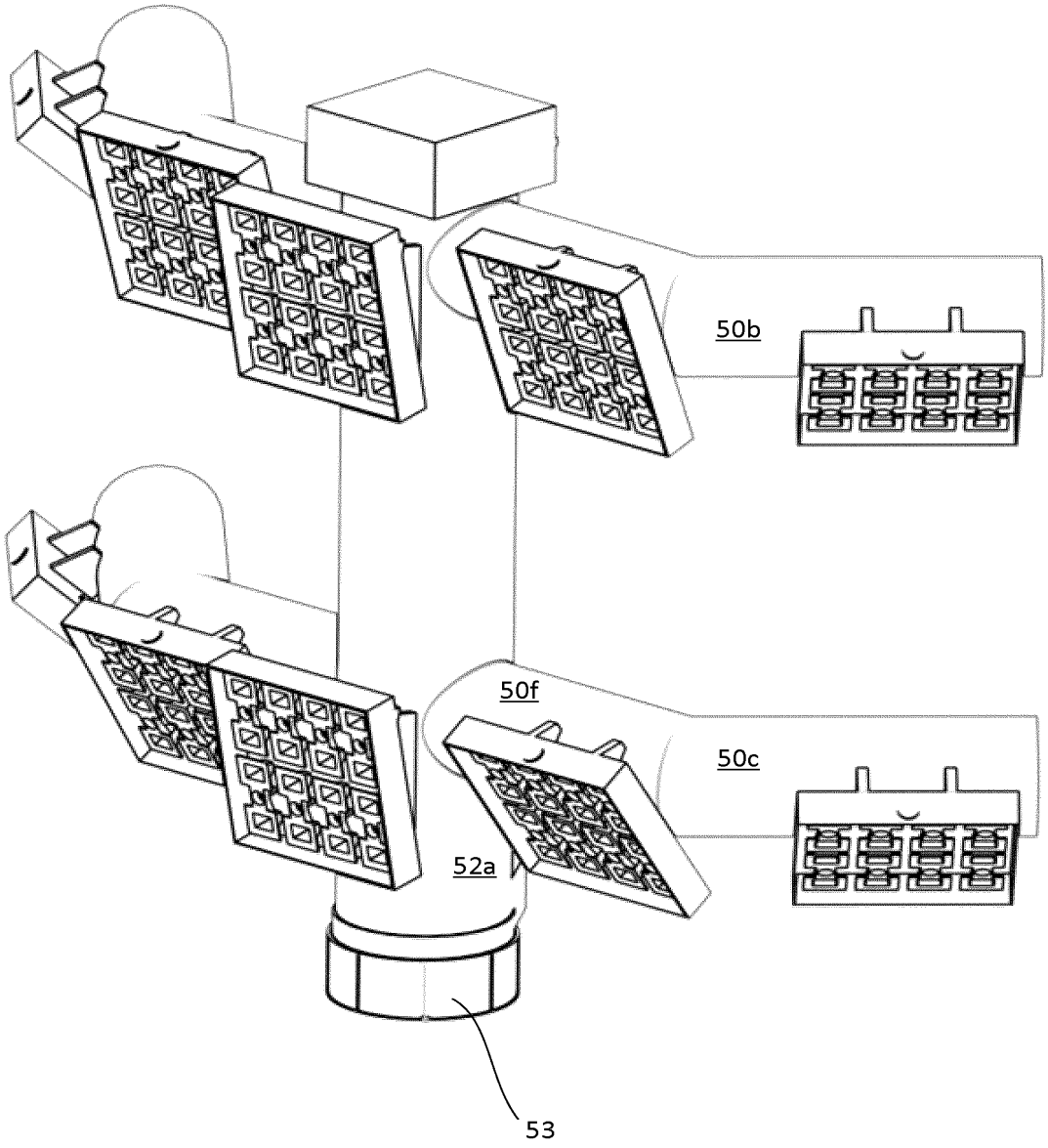


FIGURE 3C

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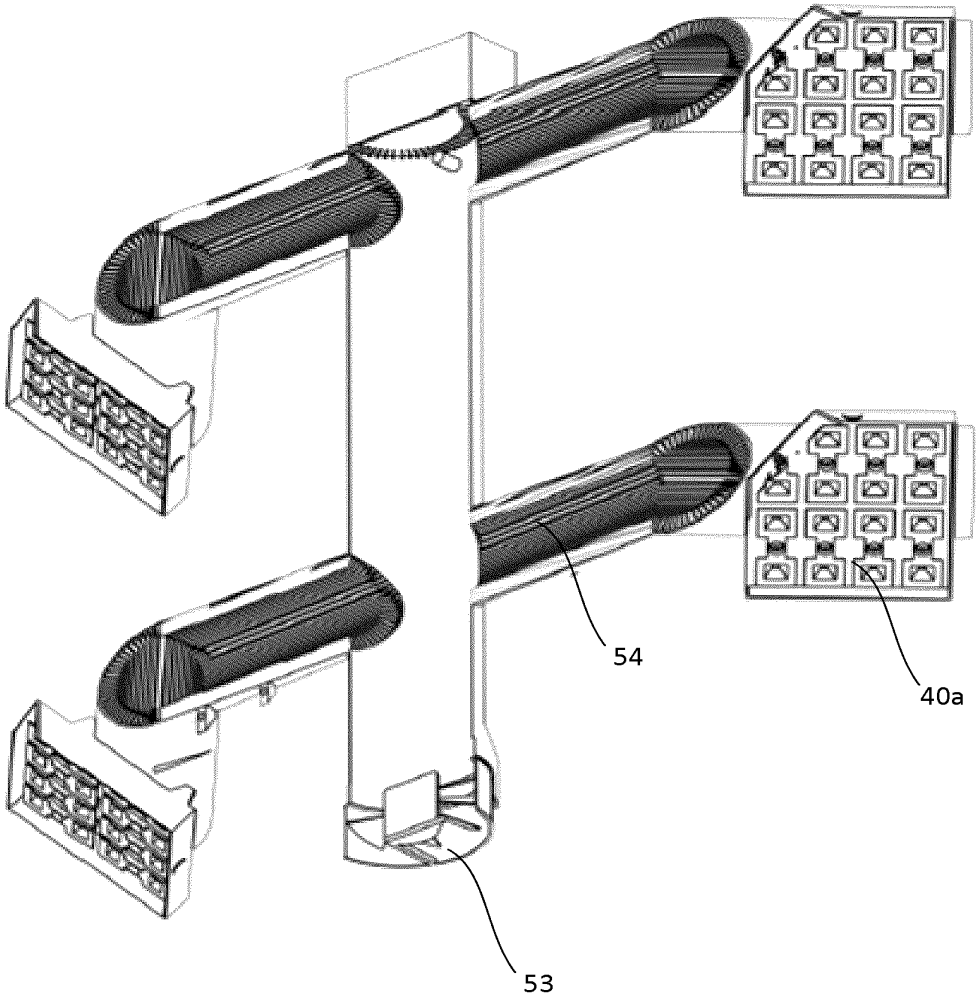


FIGURE 3D

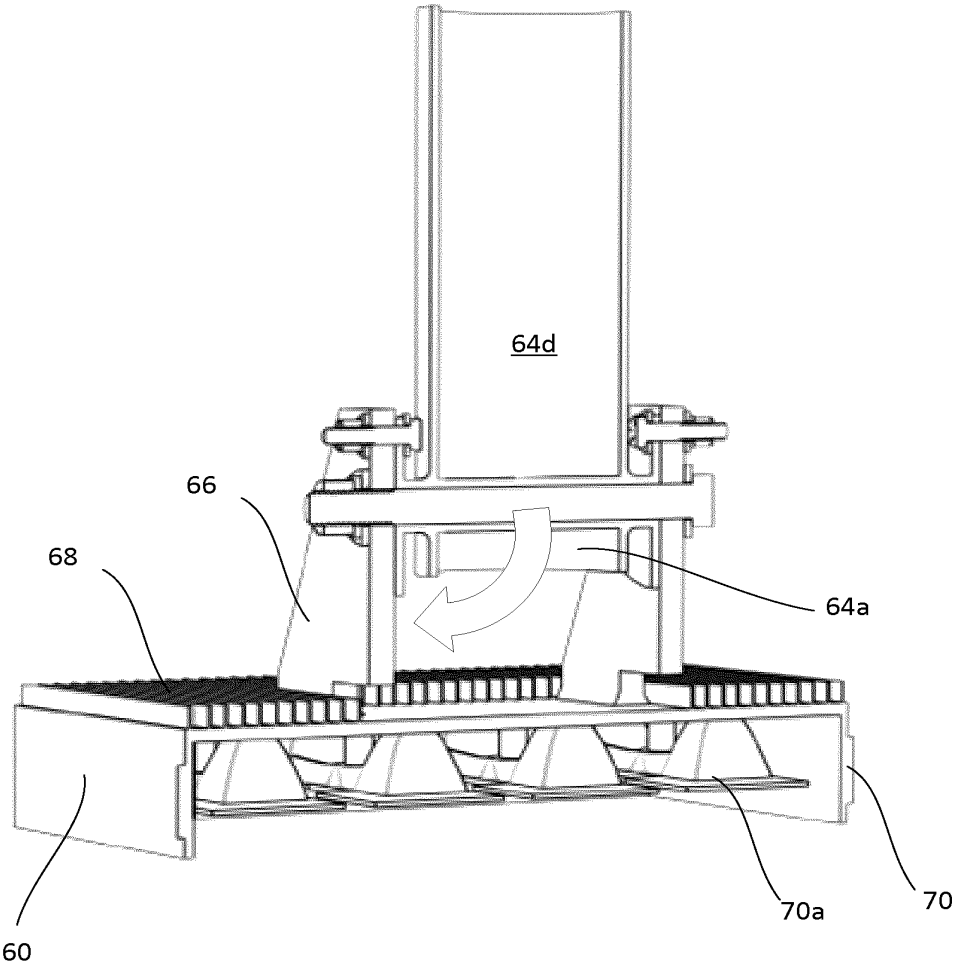


FIGURE 4

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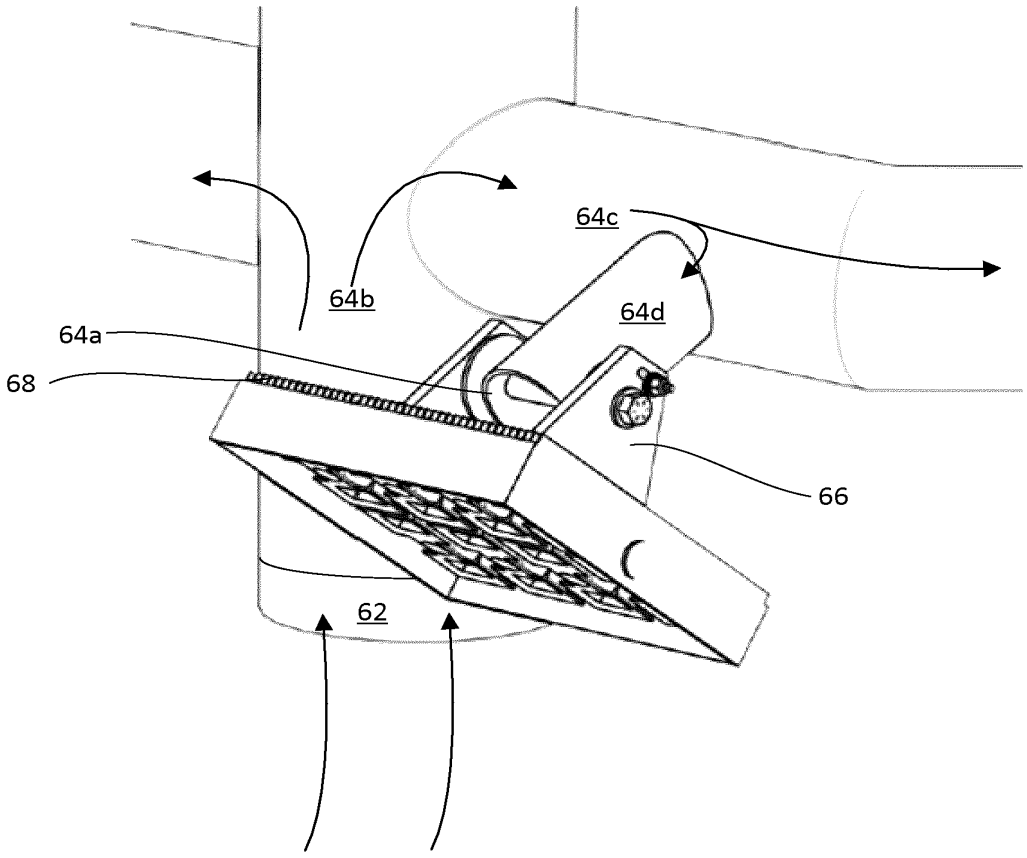


FIGURE 4A

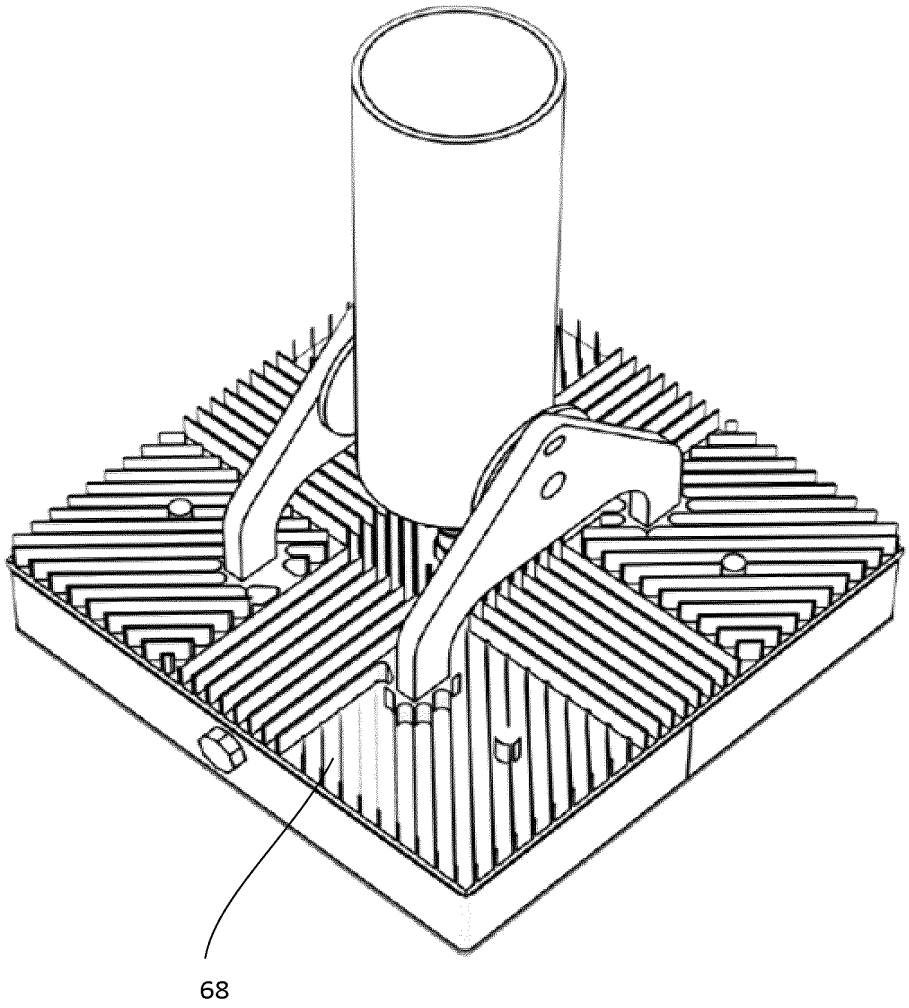


FIGURE 4B

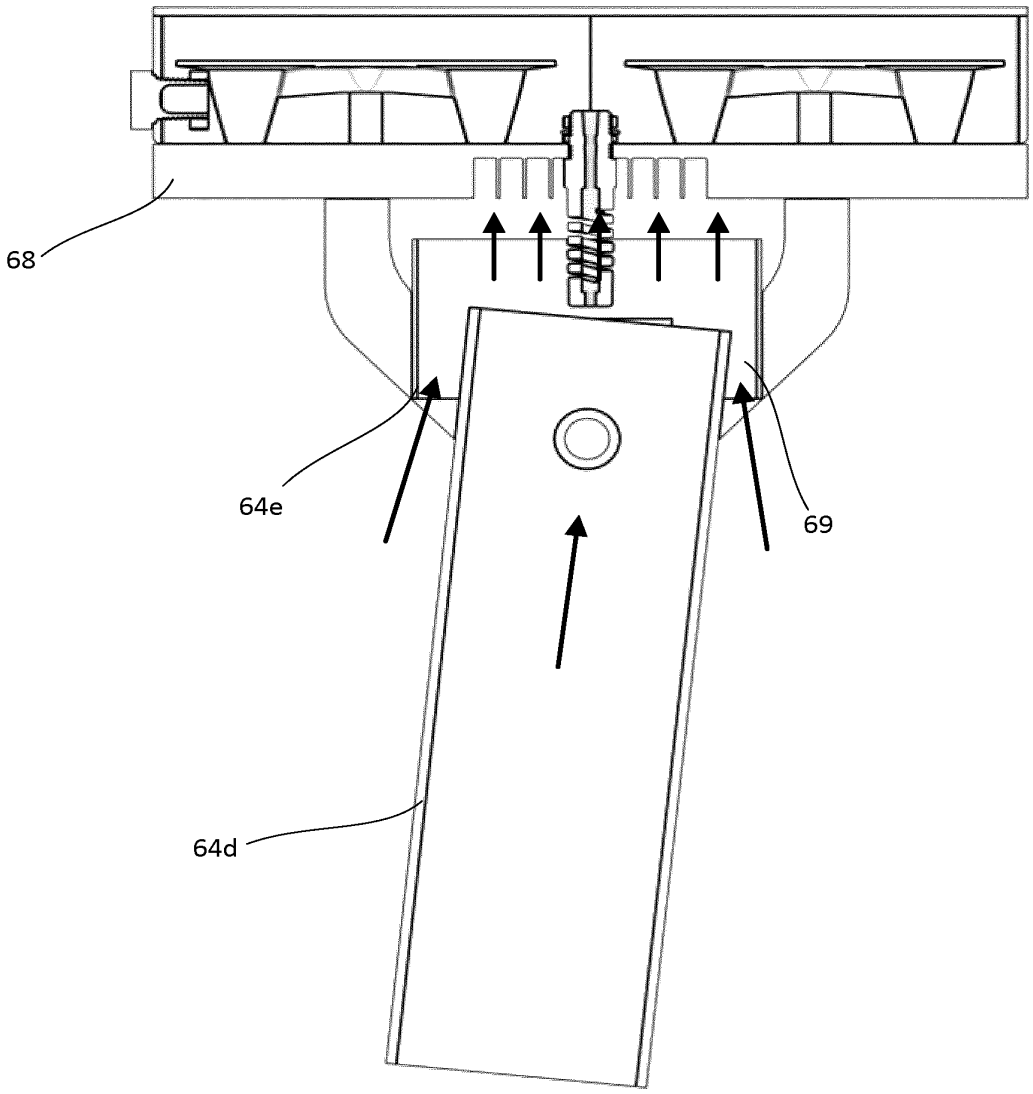


FIGURE 4C

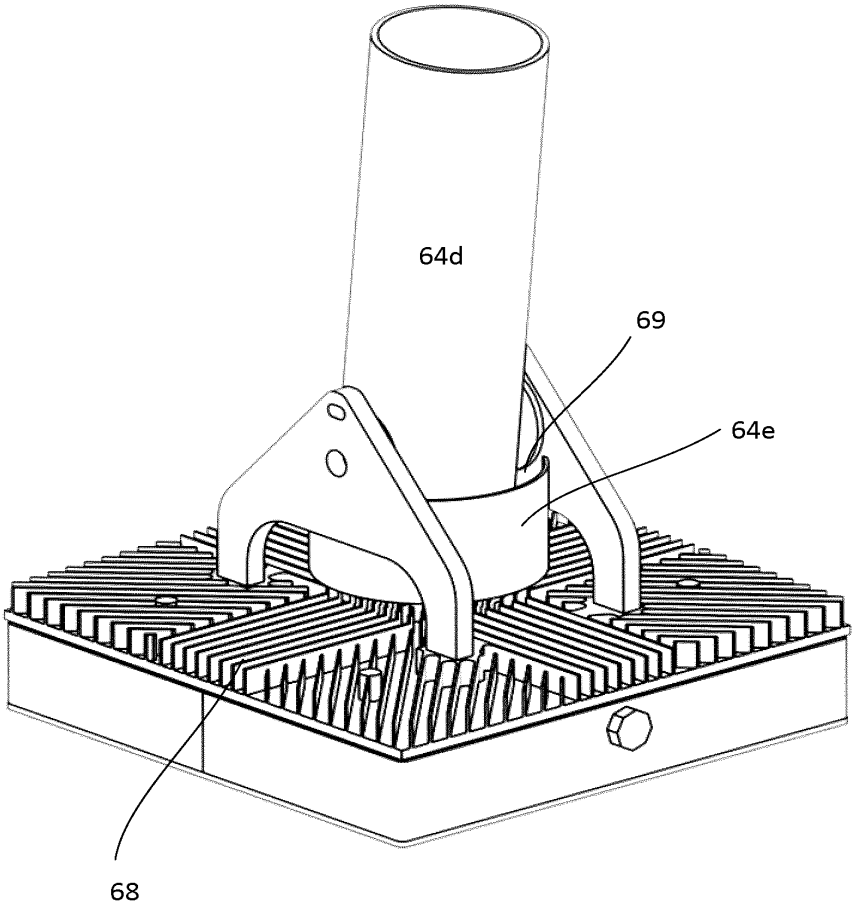


FIGURE 4D

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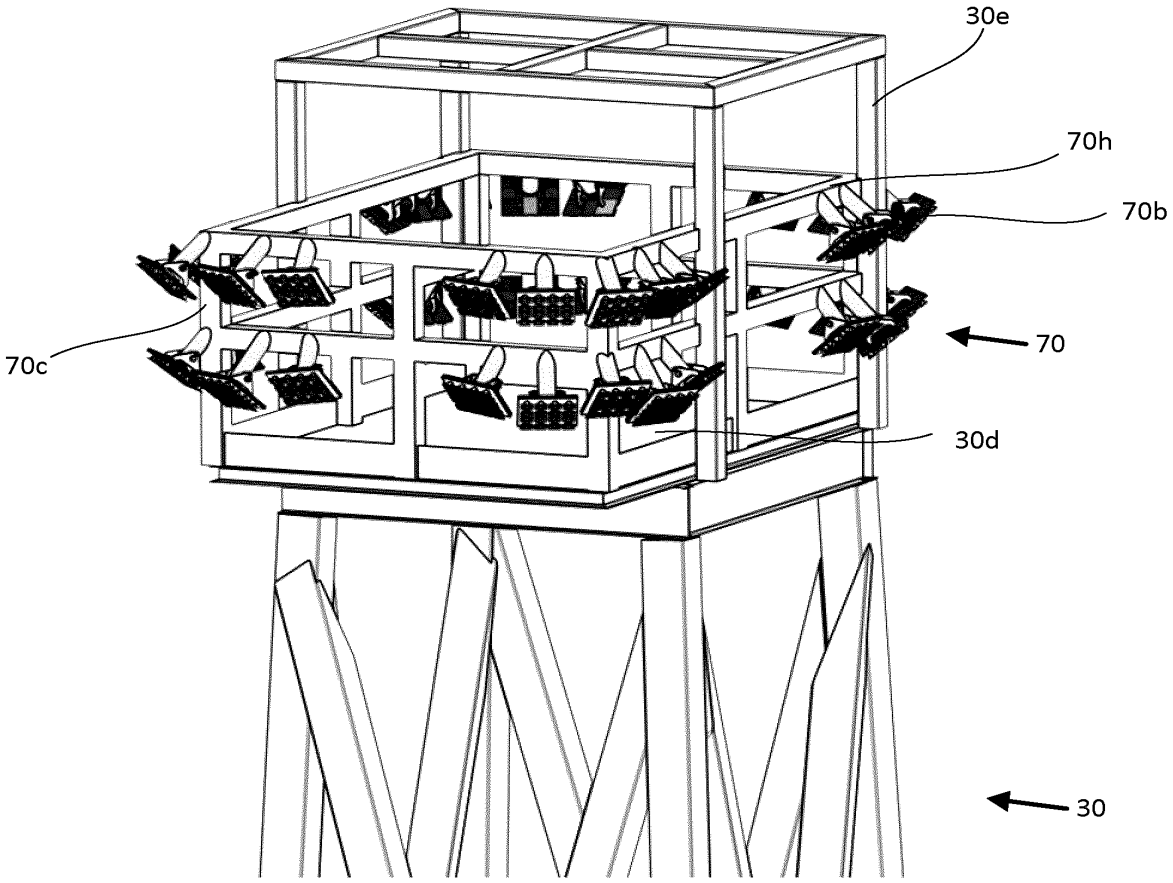


FIGURE 5

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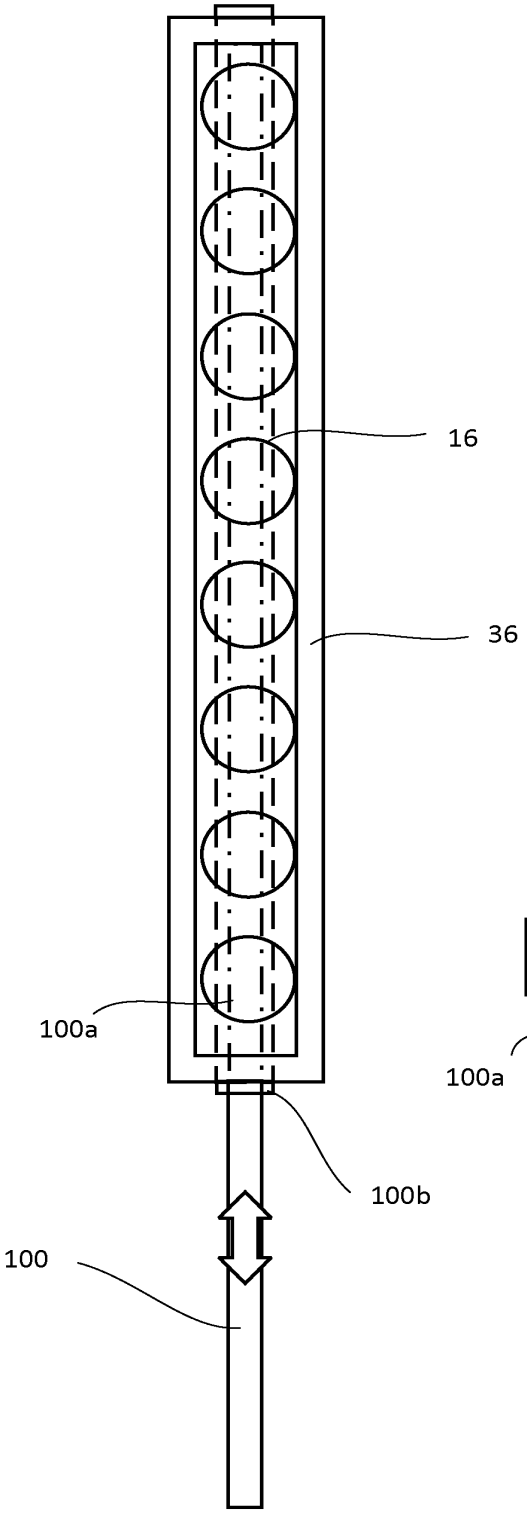


FIGURE 6

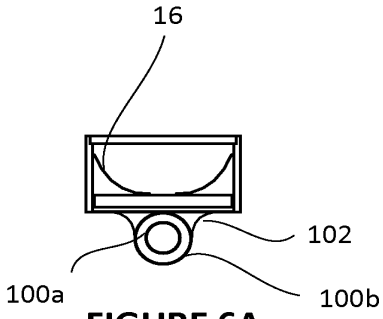


FIGURE 6A

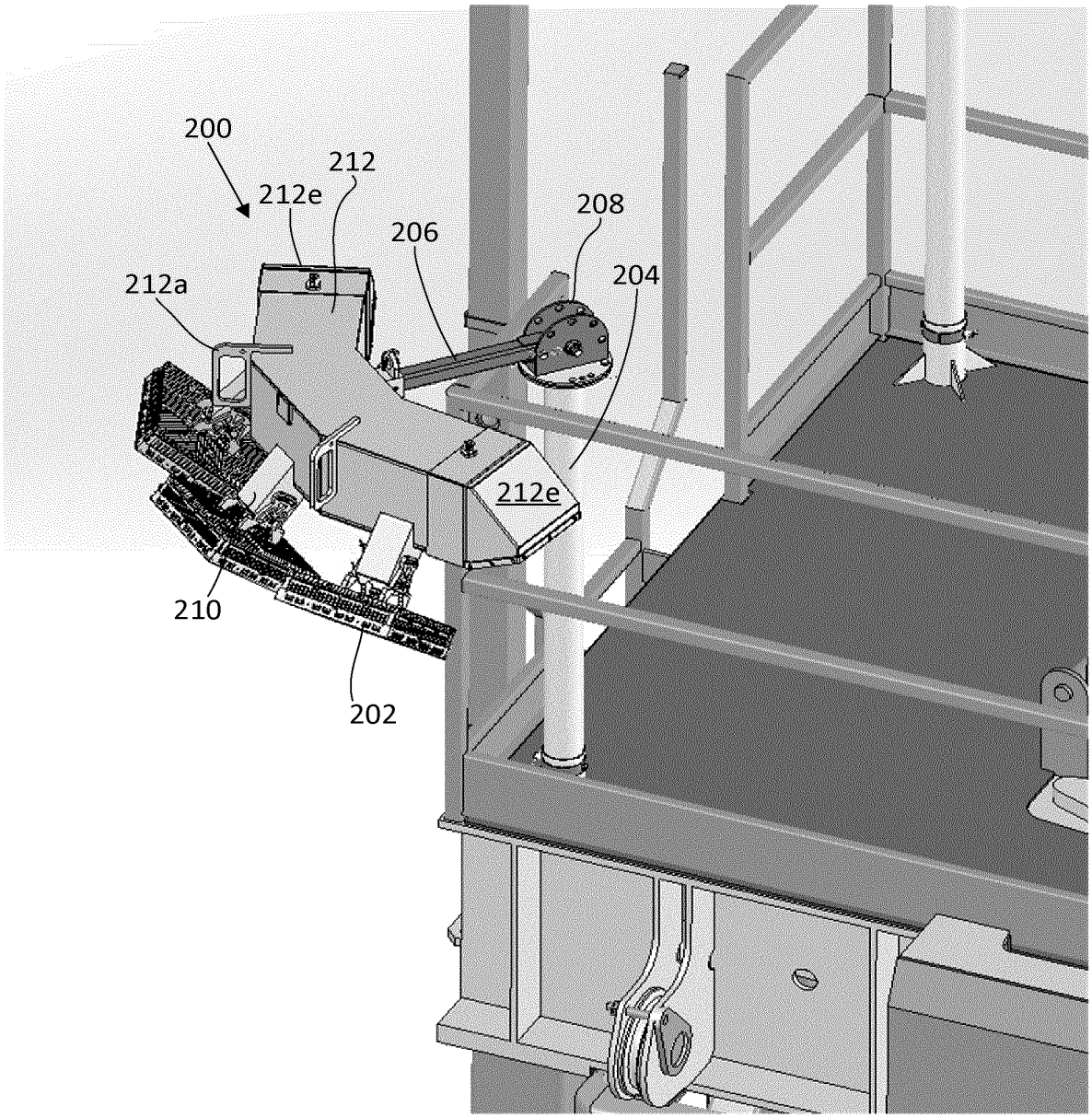


FIGURE 7

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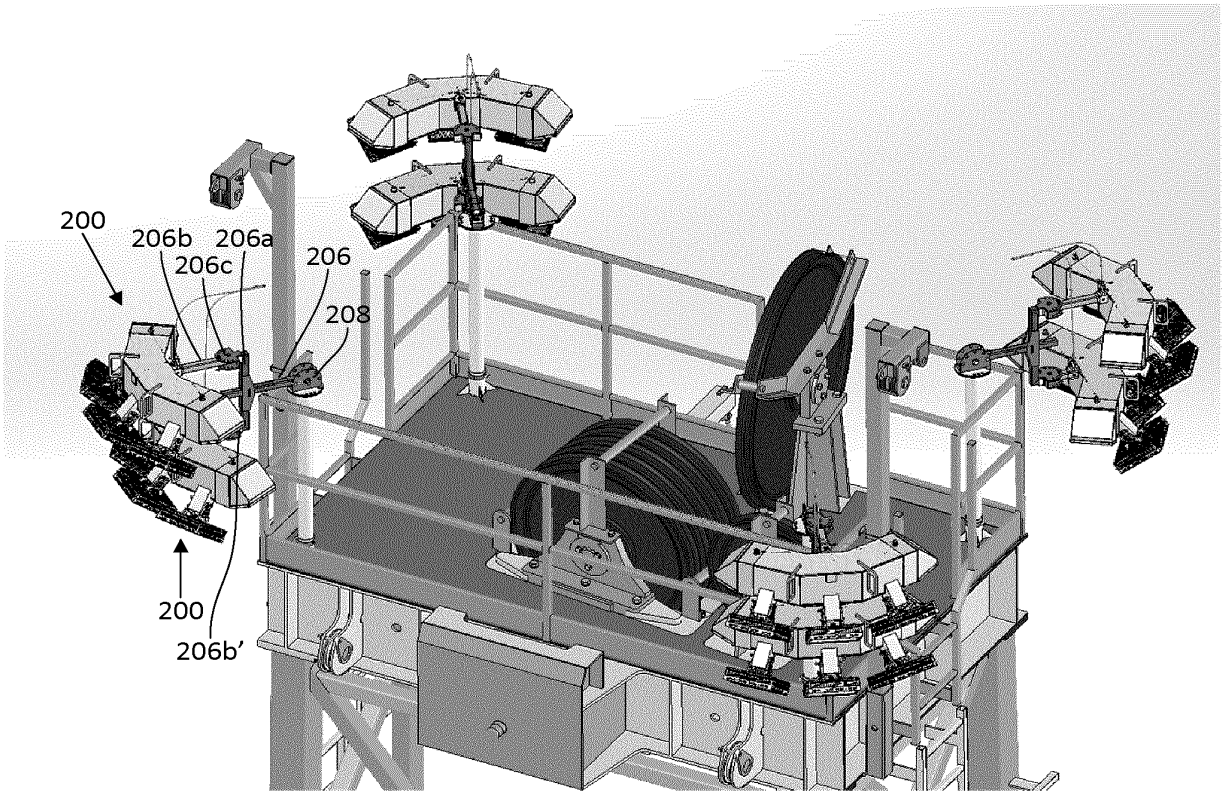


FIGURE 7A

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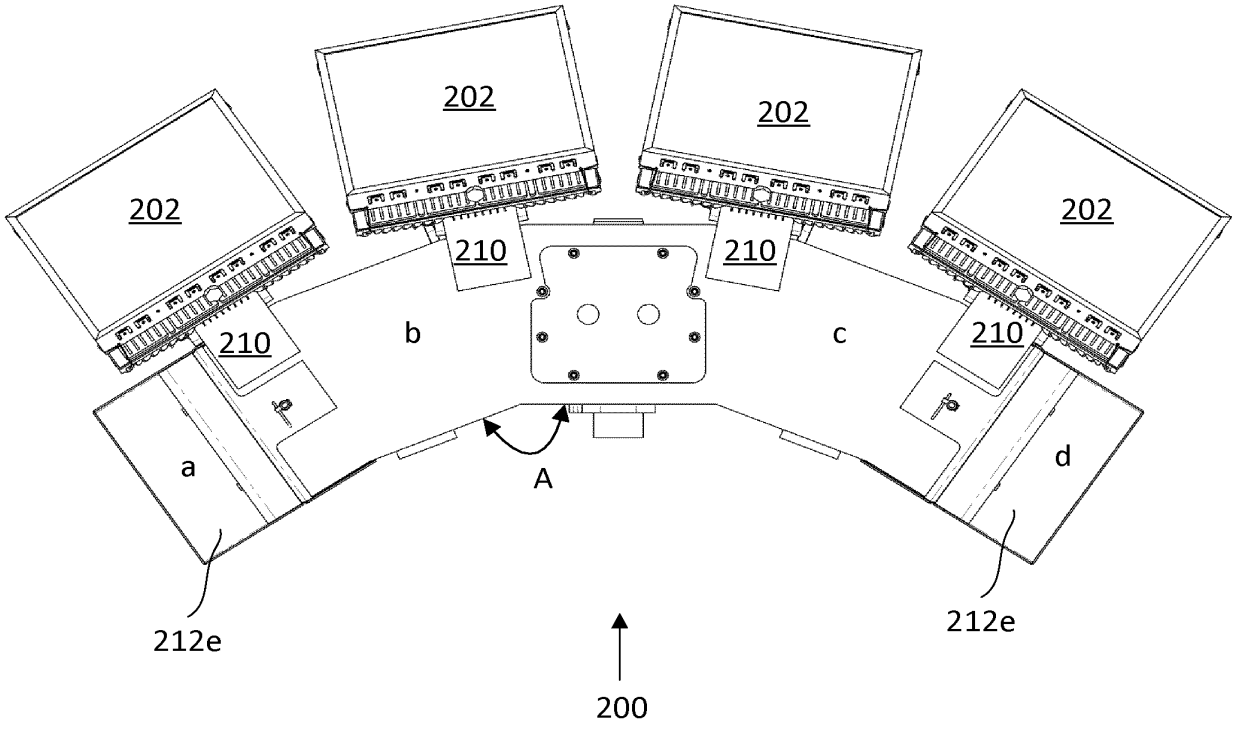


FIGURE 7B

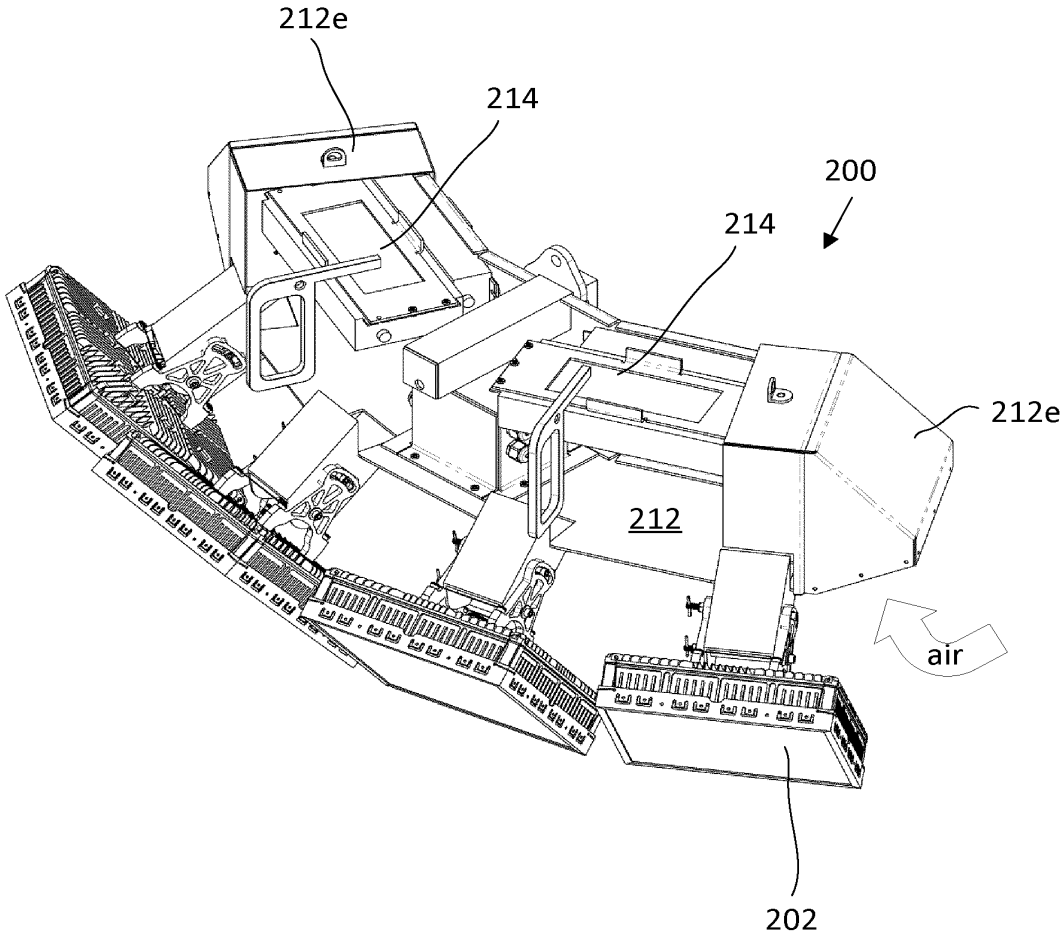


FIGURE 7C

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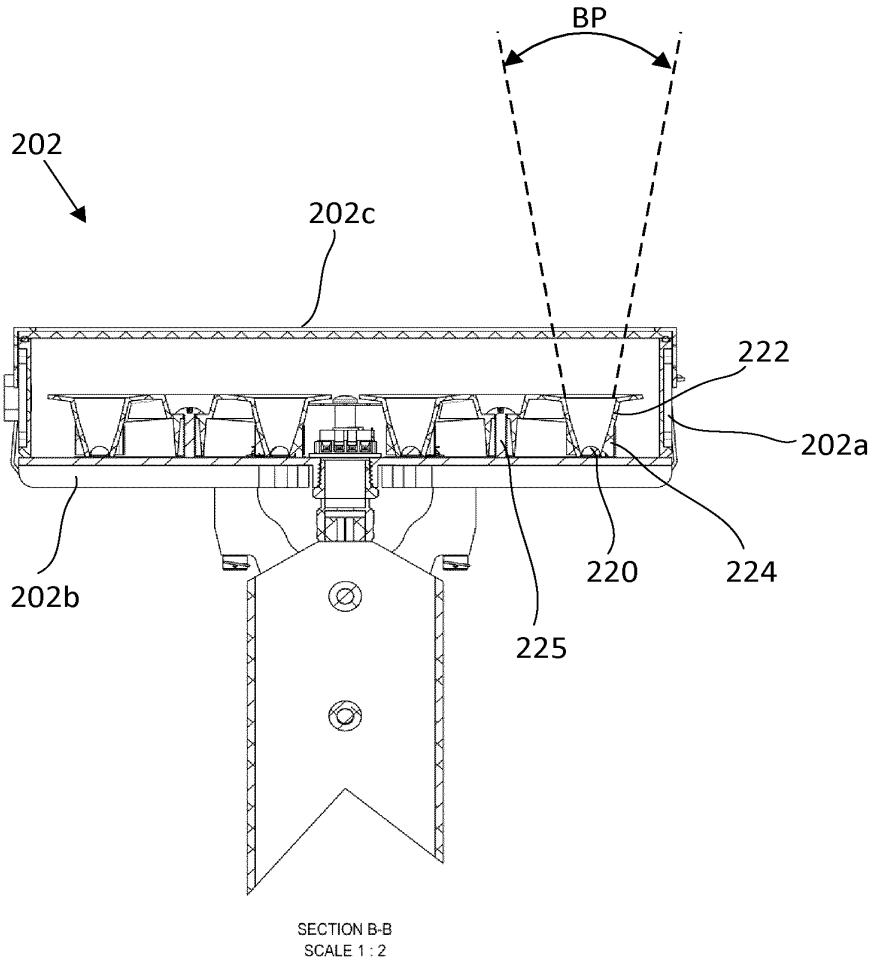


FIGURE 7D

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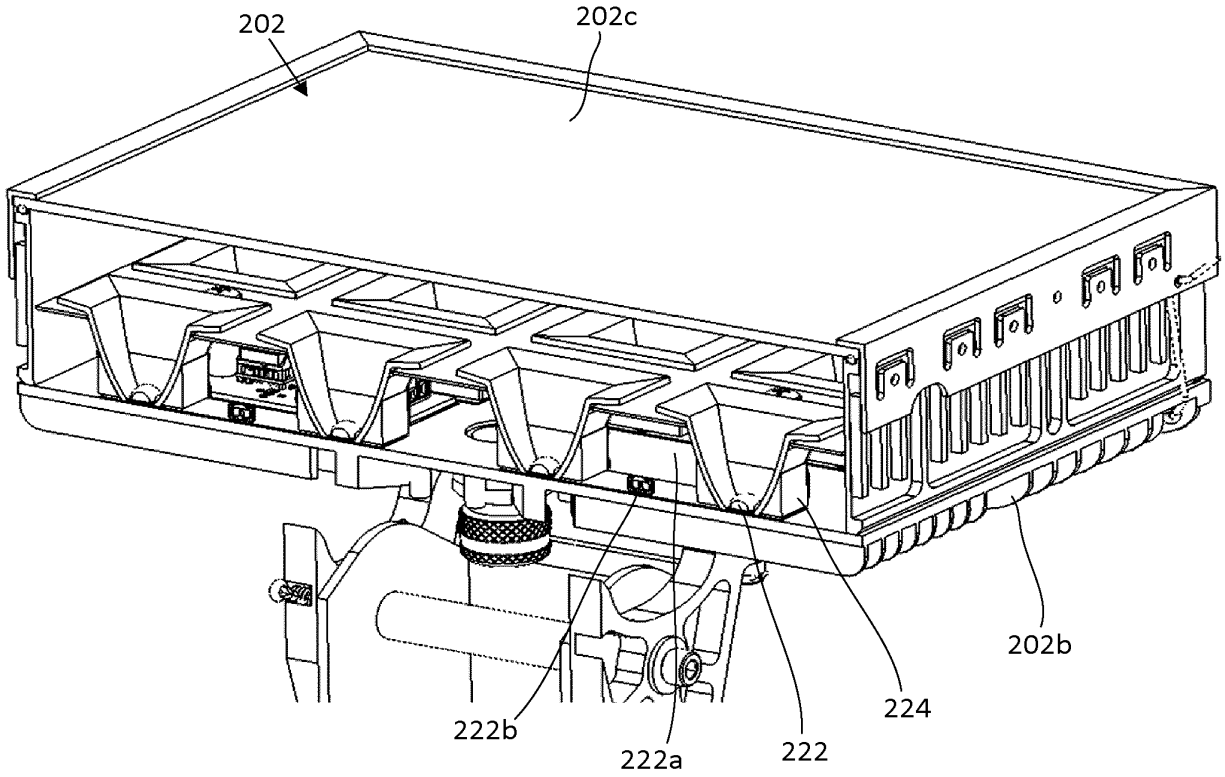


FIGURE 7E

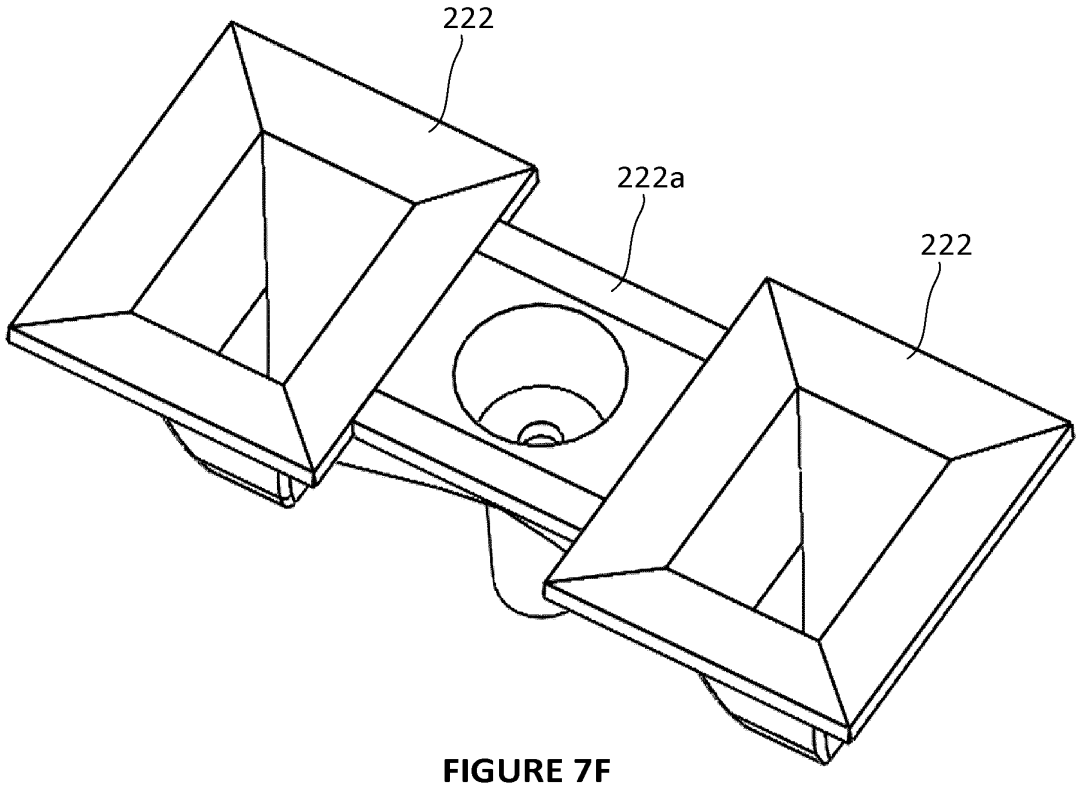


FIGURE 7F

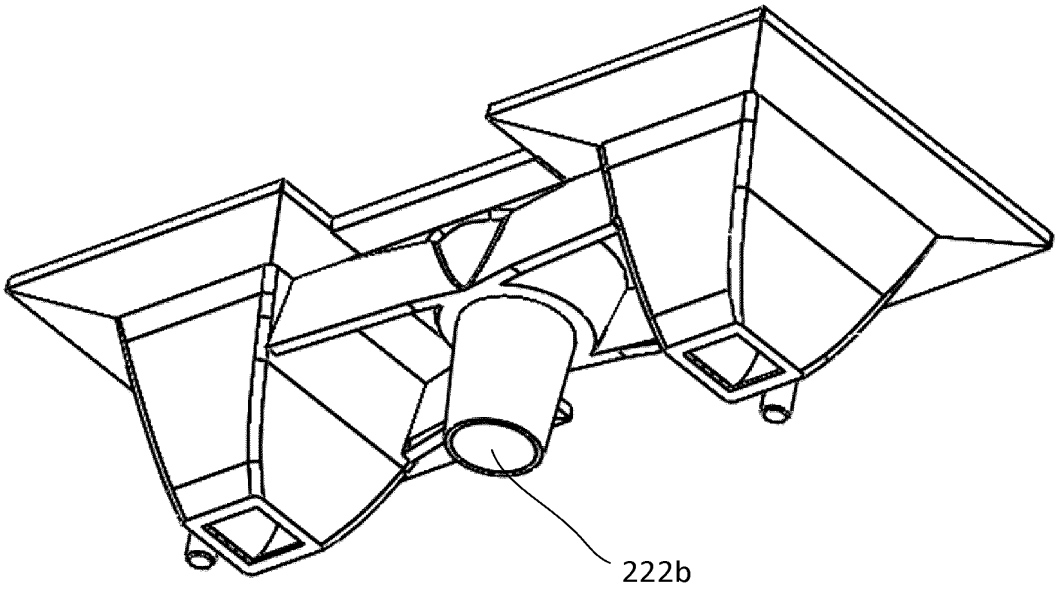


FIGURE 7G

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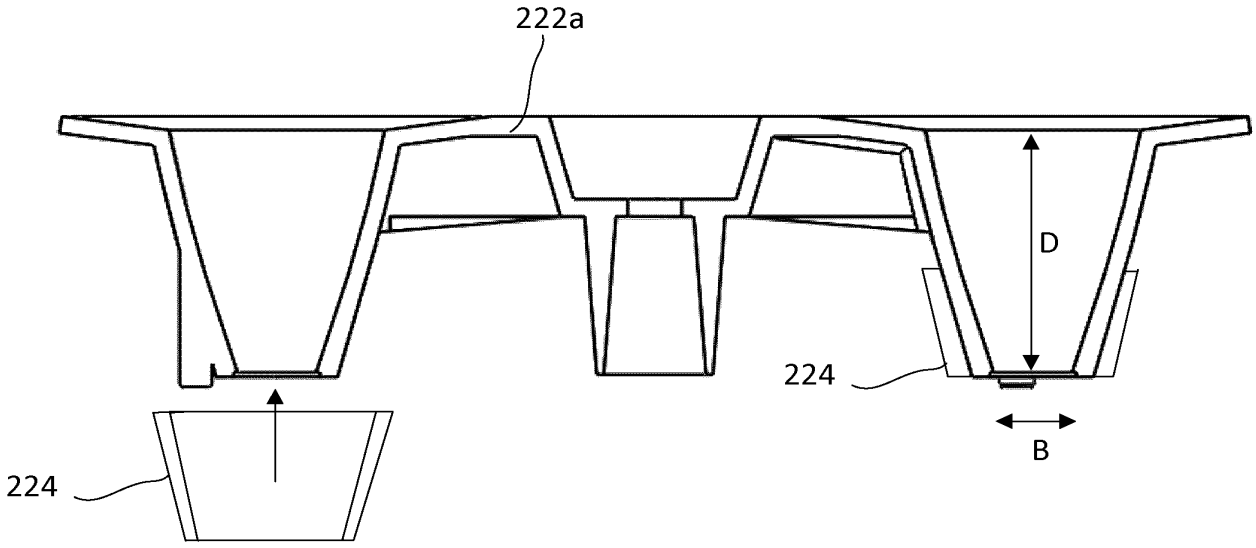


FIGURE 7H

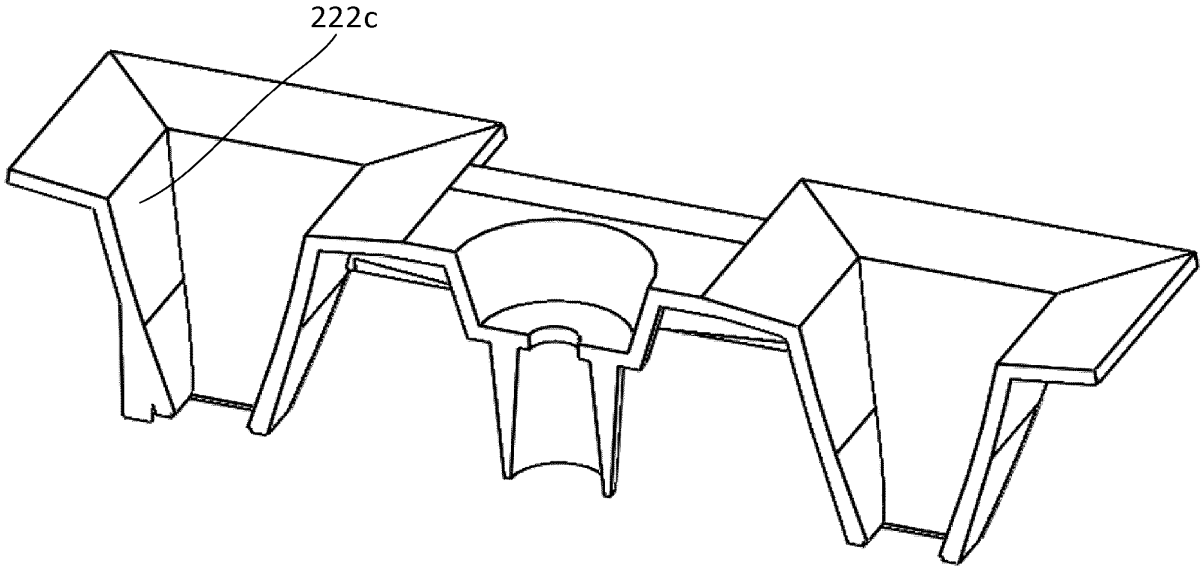


FIGURE 7I

Petitioner Ensign
Exhibit 1002 - 201 of 336

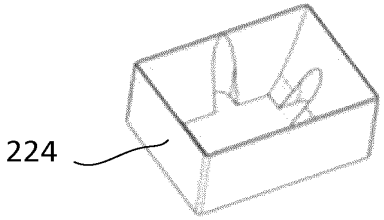


FIGURE 7J

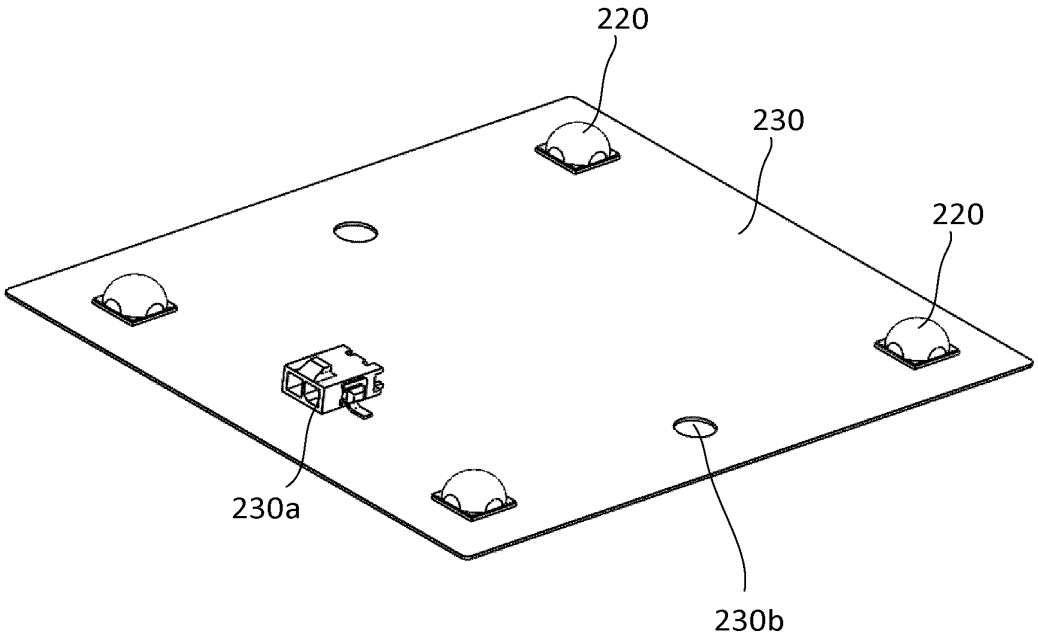


FIGURE 7K

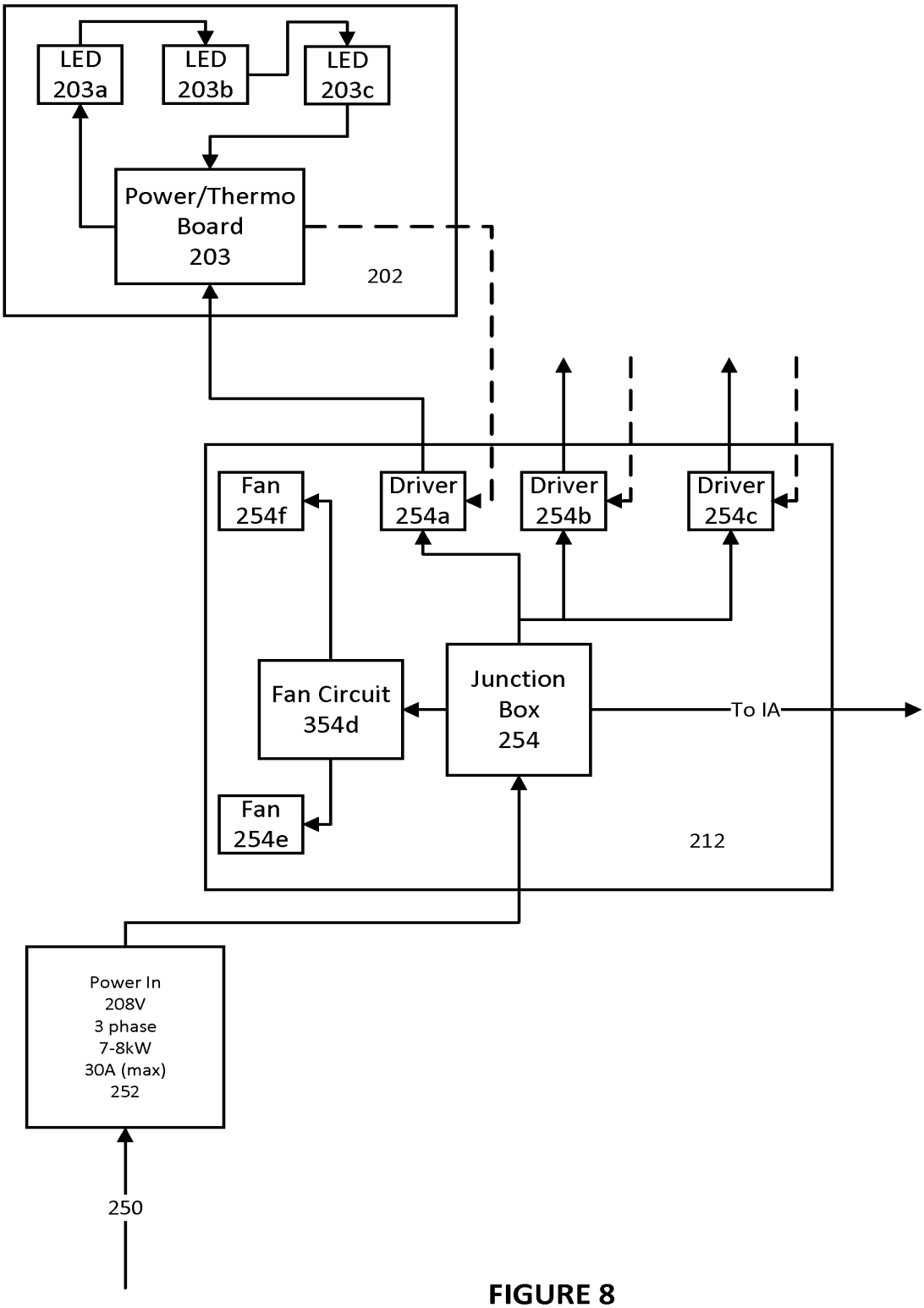


FIGURE 8

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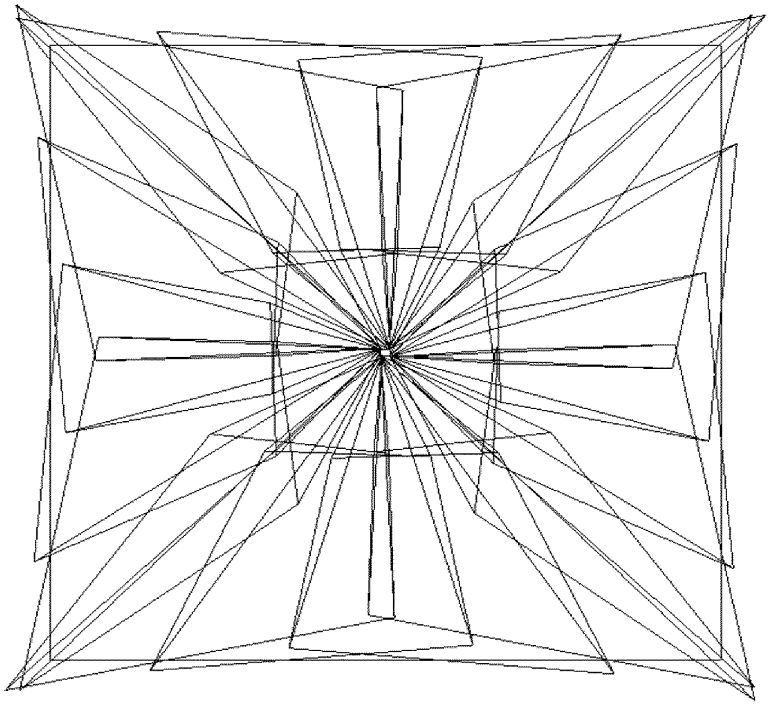


FIGURE 9

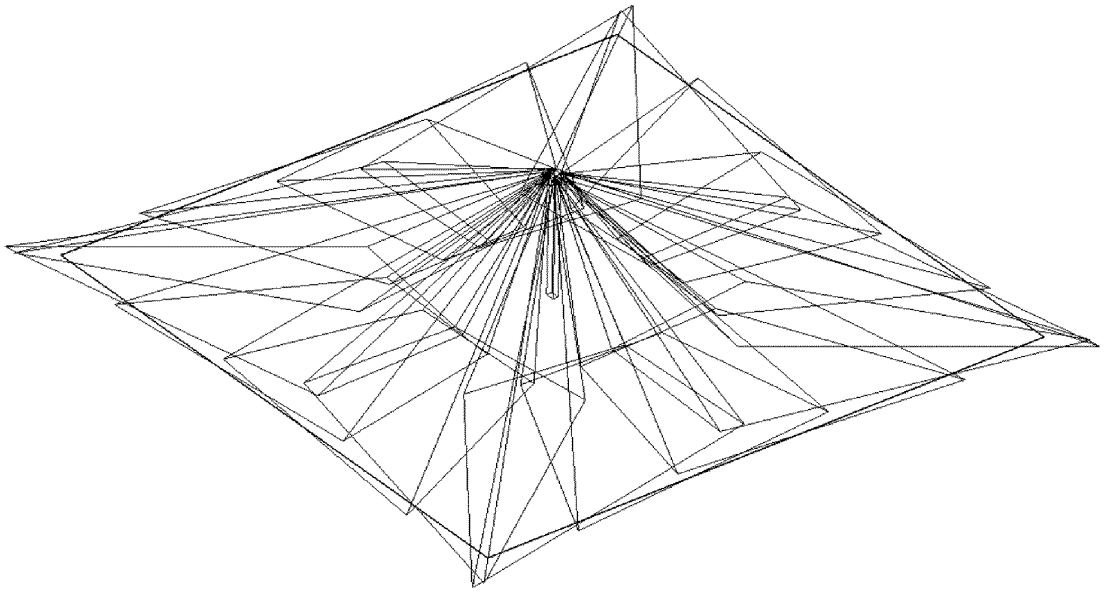


FIGURE 9A

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2019/050410

A. CLASSIFICATION OF SUBJECT MATTER
IPC: ***F21V 29/60*** (2015.01), ***F21K 9/00*** (2016.01), ***F21V 29/61*** (2015.01), ***F21V 29/70*** (2015.01), ***F21V 29/74*** (2015.01), *E21B 15/00* (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC: **F21V 29/60, F21K 9/00, F21V 29/61, F21V 29/70, F21V 29/74, E21B 15/00**

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)
FAM PAT (QUESTEL ORBIT) AND CANADIAN PATENT DATA BASE (INTELLECT)
Keywords: air flow, conduit, LED, rail, reflector

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages		Relevant to claim No.
X	US 2015/0138780 A1 (YOSHIZAWA, K. et al.) Description pages 4 to 7, Fig. 3 and 5	21 May 2015 (21-05-2015)	1 to 14, 16 to 29 and 32 to 37
X	CN 206338693 U (DENG, Y.) Google translation of the description, Fig. 1	18 July 2017 (18-07-2017)	1 to 10, 12, 17 to 20, 22 to 29, 31, 32, 34 and 35
X	CN 206890253 U (CAI, T. et al.) Google translation of the description, Fig. 2	16 January 2018 (16-01-2018)	1 to 10, 12, 16 to 18, 20, 22 to 29 and 31 to 33
A	CN 101943354 A (ZHOU, M. et al.) Google translation of the description , Fig. 5 and 8	12 January 2011 (12-01-2011)	1 to 8, 10, 12, 16 to 18, 22 to 29 and 31 to 33
A	US 8704262 B2 (LIVESAY, W. R. yet al.) The entire document	22 April 2014 (22-04-2014)	1 to 37

☐ Further documents are listed in the continuation of Box C.

☑ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search
05 June 2019 (05-06-2019)

Date of mailing of the international search report
28 June 2019 (28-06-2019)

Name and mailing address of the ISA/CA
Canadian Intellectual Property Office
Place du Portage I, C114 - 1st Floor, Box PCT
50 Victoria Street
Gatineau, Quebec K1A 0C9
Facsimile No.: 819-953-2476

Authorized officer
Malgorzata Samborski (819) 639-7895

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Box No. II **Observations where certain claims were found unsearchable (Continuation of item 2 of the first sheet)**

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

1. ☐ Claim Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claim Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claim Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III **Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:
The claims are directed to a plurality of inventive concepts as follows:

Group A - Claims 1 to 31 are directed to an LED lighting system with an air flow system;

Group B - Claims 32 to 35 are directed to an LED lighting system with a support matrix, a housing and a heat sink; and

Group C - Claims 36 and 37 are directed to a control system for an LED light system including a power driver, a temperature sensor and a controller.

The claims must be limited to one inventive concept as set out in PCT Rule 13.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☑ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claim Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

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Exhibit 1002 - 206 of 336

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CA2019/050410

Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
US2015138780A1	21 May 2015 (21-05-2015)	US2015138780A1	21 May 2015 (21-05-2015)
		DE212013000173U1	11 March 2015 (11-03-2015)
		JP2014044935A	13 March 2014 (13-03-2014)
		WO2014021087A1	06 February 2014 (06-02-2014)
CN206338693U	18 July 2017 (18-07-2017)	None	
CN206890253U	16 January 2018 (16-01-2018)	None	
CN101943354A	12 January 2011 (12-01-2011)	CN101943354A	12 January 2011 (12-01-2011)
		CN101943354B	07 August 2013 (07-08-2013)
US8704262B2	22 April 2014 (22-04-2014)	US2014042467A1	13 February 2014 (13-02-2014)
		US8704262B2	22 April 2014 (22-04-2014)
		CA2929535A1	07 May 2015 (07-05-2015)
		CN105579763A	11 May 2016 (11-05-2016)
		CN105579763B	01 June 2018 (01-06-2018)
		EP3019790A1	18 May 2016 (18-05-2016)
		EP3019790A4	01 March 2017 (01-03-2017)
		EP3066381A2	14 September 2016 (14-09-2016)
		JP2016525798A	25 August 2016 (25-08-2016)
		US8558438B2	15 October 2013 (15-10-2013)
		US8575641B2	05 November 2013 (05-11-2013)
		US8823035B2	02 September 2014 (02-09-2014)
		US9057499B2	16 June 2015 (16-06-2015)
		US9062854B2	23 June 2015 (23-06-2015)
		US9214616B2	15 December 2015 (15-12-2015)
		US9243782B2	26 January 2016 (26-01-2016)
		US9267668B2	23 February 2016 (23-02-2016)
		US10121950B2	06 November 2018 (06-11-2018)
		US10125931B2	13 November 2018 (13-11-2018)
		US2014146527A1	29 May 2014 (29-05-2014)
		US2014362563A1	11 December 2014 (11-12-2014)
		US2014369030A1	18 December 2014 (18-12-2014)
		US2015138779A1	21 May 2015 (21-05-2015)
		US2016273720A1	22 September 2016 (22-09-2016)
		WO2015006593A1	15 January 2015 (15-01-2015)
		WO2015066703A2	07 May 2015 (07-05-2015)
		WO2015066730A1	07 May 2015 (07-05-2015)

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Exhibit 1002 - 207 of 336

Electronic Acknowledgement Receipt

EFS ID:	41105050
Application Number:	16571527
International Application Number:	
Confirmation Number:	1021
Title of Invention:	ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM
First Named Inventor/Applicant Name:	JOSHUA C. ALLISON
Customer Number:	9629
Filer:	Clay Erik Hawes/Deborah Rypacek
Filer Authorized By:	Clay Erik Hawes
Attorney Docket Number:	120257-5001 US02
Receipt Date:	12-NOV-2020
Filing Date:	16-SEP-2019
Time Stamp:	13:00:18
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	1_CM5001_US02_IDS.pdf	1237002 66050a44da1da8b4054b694e7c8fb7fdb53d8407	no	4

Warnings:

Information:					
A U.S. Patent Number Citation or a U.S. Publication Number Citation is required in the Information Disclosure Statement (IDS) form for autoloading of data into USPTO systems. You may remove the form to add the required data in order to correct the Informational Message if you are citing U.S. References. If you chose not to include U.S. References, the image of the form will be processed and be made available within the Image File Wrapper (IFW) system. However, no data will be extracted from this form. Any additional data such as Foreign Patent Documents or Non Patent Literature will be manually reviewed and keyed into USPTO systems.					
2	Foreign Reference	2_CA3096128.pdf	4434829 ba1a7e5441e513ee1e822b3b8c00e335341 6fc56	no	72
Warnings:					
Information:					
3	Foreign Reference	3_WO2019191843A1.pdf	4425746 1dd8bdfe71a79bf9fd3ae80a84677ea504cd 551f	no	74
Warnings:					
Information:					
			Total Files Size (in bytes):	10097577	

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

Electronic Patent Application Fee Transmittal

Application Number:	16571527
Filing Date:	16-Sep-2019
Title of Invention:	ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM
First Named Inventor/Applicant Name:	JOSHUA C. ALLISON
Filer:	Clay Erik Hawes
Attorney Docket Number:	120257-5001 US02

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	2202	1	50	50
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**50**

Electronic Acknowledgement Receipt	
EFS ID:	40917350
Application Number:	16571527
International Application Number:	
Confirmation Number:	1021
Title of Invention:	ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM
First Named Inventor/Applicant Name:	JOSHUA C. ALLISON
Customer Number:	9629
Filer:	Clay Erik Hawes
Filer Authorized By:	
Attorney Docket Number:	120257-5001 US02
Receipt Date:	22-OCT-2020
Filing Date:	16-SEP-2019
Time Stamp:	13:52:37
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$50
RAM confirmation Number	E20200LD53105699
Deposit Account	500310
Authorized User	Clay Hawes
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.17 (Patent application and reexamination processing fees) 37 CFR 1.21 (Miscellaneous fees and charges)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Preliminary Amendment	CM_5001US02_SecondPrelimAmnd.pdf	126731 20fcd289c879fbc32df375c03ebd3cf0101e2356	no	7
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	29904 6b3a7e03bfd62aa724f1a1729f3d6d49a7a3ea13	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	156635		

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

ELECTRONICALLY FILED IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.:	16/571,527	Confirmation No.:	1021
Applicant:	C&M Oilfield Rentals, LLC		
Filed:	September 16, 2019		
TC/A.U.:	2879		
Examiner:	Hines, Anne M.		
Docket No.:	120257-5001 US02		
Customer No.:	9629		
Title:	ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM		

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

SECOND PRELIMINARY AMENDMENT

Dear Examiner:

Please amend and consider the above-identified application per the following Amendments to Claims.

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

1-12. (Cancelled)

13. (Previously Presented) A lighting system mounted on a rig; the lighting system comprising:

a plurality of light units, each light unit comprising:

a mounting pole comprising a continuous structure, wherein each light unit comprises a separate mounting pole, such that the system comprises a plurality of mounting poles;

a bracket configured to connect the mounting pole to the handrail of the rig; and

a light fixture comprising one or more lights, the light fixture coupled to the mounting pole, wherein the light fixture may be coupled to the mounting pole in a first position or a second position; and

wherein the light fixture is proximate to the handrail of the rig in both the first position and the second position.

14. (Previously Presented) The lighting system of claim 1, further comprising safety nets connected to the rig.

15. (Previously Presented) The lighting system of claim 1, wherein the light fixture is secondarily coupled to the rig using a cable.

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16. (Previously Presented) The lighting system of claim 1, wherein, when the light fixture is in the first position, the one or more lights of the light fixture are oriented away from the rig.

17. (Previously Presented) The lighting system of claim 16, wherein, when the light fixture is in the second position, the one or more lights of the light fixture are oriented towards the rig.

18. (Previously Presented) The lighting system of claim 1, wherein the bracket is welded to the rig.

19. (Previously Presented) The lighting system of claim 1, wherein the mounting pole and bracket are connected to the rig using U-shaped bolts.

20. (Previously Presented) The lighting system of claim 13, wherein the rig is a drilling rig.

21. (Currently Amended) A rig comprising:

a derrick;

a crown deck at the top of the derrick, the crown deck comprising a handrail; and

a plurality of light units attached to the handrail, each light unit comprising:

a mounting pole, wherein each light unit comprises a separate mounting pole, such that the system comprises a plurality of mounting poles;

~~a bracket configured to connect the mounting pole to the handrail;~~ and

a light fixture comprising one or more lights, the light fixture coupled to the mounting pole~~, wherein the light fixture may be coupled to the mounting pole in a first position or a second position~~.

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22. (Previously Presented) The rig of claim 21, further comprising safety nets connected to the rig.

23. (Currently Amended) The rig of claim 21, wherein the light fixture is ~~secondarily~~ coupled to the rig using a cable.

24. (Currently Amended) The rig of claim 21, wherein the light fixture may be coupled to the mounting pole in a first position or a second position and, when the light fixture is in the first position, the one or more lights of the light fixture are oriented away from the rig.

25. (Previously Presented) The rig of claim 24, wherein, when the light fixture is in the second position, the one or more lights of the light fixture are oriented towards the rig.

26. (Currently Amended) The rig of claim 21, further comprising a ~~wherein the~~ bracket configured to connect the mounting pole to the handrail ~~is welded to the rig~~.

27. (Currently Amended) The rig of claim 26 ~~21~~, wherein the mounting pole and bracket are connected to the rig using U-shaped bolts.

28. (Previously Presented) The rig of claim 21, wherein the rig is a drilling rig.

29. (Previously Presented) The rig of claim 21, wherein one or more of the plurality of mounting poles comprises a continuous structure.

30. (Previously Presented) The rig of claim 21, wherein the light fixture is proximate to the handrail in both the first position and the second position.

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31. (Currently Amended) A method for illuminating a wellsite, comprising:

mounting a plurality of mounting poles on a crown deck of a rig, wherein each of the plurality of mounting poles is attached to a handrail of the crown deck;

mounting a plurality of lights to [[a]] the plurality of mounting poles ~~points on a rig~~, wherein each of the plurality of mounting poles ~~points~~ supports at least one of the plurality of lights, and each of the plurality of lights is mounted to only one of the plurality of mounting poles ~~points~~; and

illuminating the wellsite using the plurality of lights.

32. (Previously Presented) The method of claim 31, further comprising individually adjusting each of the plurality of lights.

33. (Currently Amended) The method of claim 31, wherein mounting a plurality of mounting poles on a crown deck of a rig ~~lights to a plurality of mounting points on a rig~~ comprises:

attaching a removable bracket to one or more of the mounting poles ~~points~~ on the rig; and

using the removable bracket the attach one or more of the [[a]] mounting poles ~~points~~ to the rig[[;]]

~~coupling one or more lights of the plurality of lights to the mounting pole~~.

34. (Cancelled)

35. (Currently Amended) The method of claim 31 ~~34~~, wherein each of the plurality of lights mounted at the one or more of the plurality of mounting poles attached to ~~points located on~~ the handrail of the crown deck of the rig is proximate to the handrail.

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36. (Previously Presented) The method of claim 31, further comprising:

coupling each light of the plurality of lights to one or more cables; and

coupling the one or more cables to the rig.

37. (Previously Presented) The method of claim 31, further comprising installing a safety net below one of the plurality of lights.

38. (New) The method of claim 31, wherein one or more of the plurality of mounting poles comprises a continuous structure.

39. (New) The method of claim 35, wherein one or more of the plurality of mounting poles comprises a continuous structure.

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REMARKS

Claims 38 and 39 have been added in this paper. Claims 1-12 were previously cancelled. Claims 21, 23, 24, 26, 27, 31, 33, and 35 are amended. Claim 34 is cancelled. Accordingly, claims 13-33 and 35-39 are currently pending.

It is believed that no unpaid fees are due. If there are any fees due in connection with this filing, please charge the fee to Deposit Account No. 50-0310, referencing 120257-5001 US02. If, while considering this reply, the Examiner believes that a telephone conference would be beneficial towards furthering prosecution of this case, the Examiner is strongly encouraged to contact the undersigned attorney at the number listed.

Dated: October 22, 2020

Respectfully submitted,

Customer Number: 09629

/C. Erik Hawes /
C. Erik Hawes
Registration No.: 63328
MORGAN, LEWIS & BOCKIUS LLP
713-890-5000 x 5165
Attorney for Applicant

DB1/ 116235783.5

Petitioner Ensign
Exhibit 1002 - 220 of 336

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	16571527
Filing Date	2019-09-16
First Named Inventor	Joshua C. Allison
Art Unit	2879
Examiner Name	
Attorney Docket Number	120257-5001 US02

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20160109079		2016-04-21	McKinley et al.; McKinley Service Equipment, Inc.	
	2	20170023195		2017-01-26	Gowanlock et al; Apollo Energy Services Corp	
	3	20190242218		2019-08-08	Gowanlock; Apollo Energy Services Corp.	

If you wish to add additional U.S. Published Application citation information please click the Add button. Add

FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	3034206	CA		2018-03-08	Gowanlock; Apollo Energy Services Corp		

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16571527
	Filing Date	2019-09-16
	First Named Inventor	Joshua C. Allison
	Art Unit	2879
	Examiner Name	
	Attorney Docket Number	120257-5001 US02

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16571527
	Filing Date	2019-09-16
	First Named Inventor	Joshua C. Allison
	Art Unit	2879
	Examiner Name	
	Attorney Docket Number	120257-5001 US02

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/C. ERIK HAWES/	Date (YYYY-MM-DD)	2020-09-22
Name/Print	C. ERIK HAWES	Registration Number	63328

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(74) Agent: BORDEN LADNER GERVAIS LLP

(54) Titre : APPAREIL DE FORAGE AVEC UN SYSTEME D'ECLAIRAGE FIXE A CELUI-CI ET PROCEDE
(54) Title: DRILLING RIG WITH ATTACHED LIGHTING SYSTEM AND METHOD

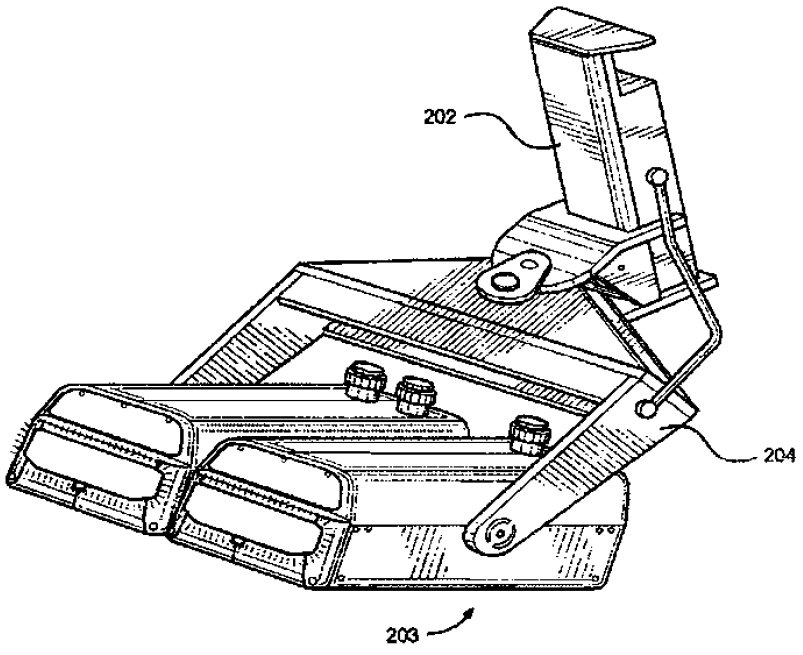


FIG. 2

(57) Abrégé/Abstract:
An attachable lighting system for a drilling rig. A method of providing lighting to a drilling rig site comprising, attaching at least one light fixture directly to the crown of a drilling rig on each of at least two sides, wherein the light fixture contains a fixed or removable light fixture attachment connecting the light fixture to the crown, resulting in one or more of enhanced evenness of site lighting, reduced shadows, reduced light pollution, reduced power consumption and/or reduced diesel usage.

DRILLING RIG WITH ATTACHED LIGHTING SYSTEM AND METHOD

Cross-Reference to Related Applications

[0001] This international application claims the benefit of U.S. Provisional Application Ser. No. 62/381,941, filed August 31, 2016 which may relate to subject matter disclosed in one or more of U.S. Applications Ser. No. 62/366,377, filed July 25, 2016; Ser. No. 62/196,556, filed July 24, 2015; Ser. No. 14/093,097, filed November 29, 2013; Ser. No. 14/632,592, filed February 26, 2015; Ser. No. 62/109,966, filed January 30, 2015; and Ser. No. 62/127,020, filed March 2, 2015. The entirety of each of the aforementioned applications is specifically incorporated herein by reference for all purposes.

Field of the Invention

[0002] The present invention relates generally to the field of drilling apparatuses, such as oil drilling rig arrangements, and in particular to a lighting system for use on a drilling rig

Background of the Invention

[0003] Drilling rigs are used to form wellbores for the purpose of extracting oil, natural gas or other fluids from subsurface deposits. Drilling rigs can also be used for sampling subsurface mineral deposits, testing rock or ground fluid properties and for installing subsurface utilities, instrumentations, tunnels or wells. In implementation, drilling rigs may be mobile equipment transportable by truck, rail, trailers, or similar, rigs may also be semi-permanent and permanent fixtures as in the case for oil drilling of large wells. Marine-based structures are also widely known. Generally, the term drilling rig refers to an arrangement of equipment that is used to penetrate the subsurface of the earth's crust.

[0004] Drilling operations typically occur during daylight hours and visibility in and around the drilling rig has historically only been required when manual work is being done, inspection and calibration, for example. There is a desire to increase productivity by providing visibility during hours of low daylight, and this has thus far been accomplished by providing mobile lighting arrangements on vehicles proximate the drilling rig, or otherwise manually adding or providing impromptu lighting arrangements.

[0005] These arrangements are inadequate and not readily adaptable to systematic visibility improvements in appropriate locations around a drilling rig.

Summary of the Invention

[0006] A method of providing lighting to a drilling rig site is described herein including attaching at least one light fixture directly to the crown of a drilling rig on each of at least two sides of the crown, where the light fixture contains a fixed or removable light fixture attachment connecting the at least one light fixture to the crown, resulting in one or more of enhanced evenness of site lighting, reduced site shadows, reduced site light pollution, reduced site power consumption and/or reduced site diesel usage.

[0007] Additional embodiments described herein include: the method described above where the light fixture and light fixture attachment are a single piece; the method described above where the light fixture is fixed or adjustable; the method described above where the light fixtures are attached around the perimeter of the crown; the method described above where the light fixtures are attached to all sides of the crown; the method described above where more than one light fixture is attached to each side of the crown; the method described above where said each light fixture attachment holds one or more light fixture spaced vertically or horizontally from each other; the method described above where each lighting fixture can swivel and/or tilt; the method described above additionally including secondary containment; the method described above where the crown forms a generally rectangular shape; and the method described above where the lighting is provided to 180 degrees to 360 degrees around the drilling site.

[0008] A drilling rig is also described including a derrick or mast and crown, having a drilling site lighting system attached thereto, comprising at least one light fixture attached directly to the crown on each of at least two sides, wherein the light fixture contains a fixed or removable light fixture attachment connecting the light fixture to the crown, resulting in one or more of enhanced evenness of site lighting, reduced site shadows, reduced site light pollution, reduced site power consumption and/or reduced site diesel usage.

[0009] Additional embodiments described herein include: the drilling rig described above where the light fixture and light fixture attachment are a single piece; the drilling rig described above where the light fixture is fixed or adjustable; the drilling rig described above where the light fixtures are attached around the perimeter of the crown; the drilling rig described above where the light fixtures are attached to all sides of the crown; the drilling rig described above

where more than one light fixture is attached to each side of the crown; the drilling rig described above where said each light fixture attachment holds more than one light fixture spaced vertically or horizontally from each other; the drilling rig described above where each lighting fixture can swivel and/or tilt; the drilling rig described above additionally including secondary containment; the drilling rig described above where the crown forms a generally rectangular shape; and the drilling rig described above where the lighting is provided to 180 degrees to 360 degrees around the drilling site.

[0010] These and additional embodiments are further described below.

Brief Description of the Drawings

[0011] Embodiments will now be described, by way of example only, with reference to the attached Figures, wherein:

[0012] Figure 1A is a lighting system mounted on a drilling rig as described herein.

[0013] Figure 1B is a side view of one embodiment of a light fixture as described herein.

[0014] Figure 2 is a perspective view of one embodiment of a light fixture as described herein.

[0015] Figure 3 is a perspective view showing an embodiment of secondary containment as described herein.

Detailed Description

[0016] An embodiment of a conventional drilling rig 40 with the light fixtures described herein is illustrated in Figure 1A, where the drilling rig 40 includes a derrick 14, which provides a support structure for a majority of the equipment used to raise and lower drillstring 25 into and out of a wellbore. The drillstring 25 may be an assembled collection of drillpipe, drill collars, or any other assembled collection of assorted tools and equipment connected together and run into the wellbore to facilitate the drilling of a well. The drillstring 25 may be raised and lowered into and out of the wellbore by the draw-works 7, which includes a spool powered by a motor or other power source 5. A drill line 12, which may be a thick, stranded metal cable, is run through a travelling block 11. Typically, the crown block 13 remains stationary while travelling block 11 moves vertically with the drillstring 25. The combination of the crown block 13 and the travelling block 11 provides a significant mechanical advantage for lifting the drillstring 25.

Further, a swivel 18 may be attached to the travelling block 11 to allow rotation of the drillstring 25 without twisting the travelling block 11. Drill pipes 16 and hole casing 26 are also shown.

[0017] The drilling rig 40 further includes a rotary table 20mounted in a rig floor 21, which is used to rotate the drillstring 25 along with a kelly drive 19. Kelly drive 19, attached at an upper end to the swivel 18 and at a lower end to the drillstring 25, is inserted through the rotary table 20 to rotate the drillstring 25 (drillstring rotation shown by arrow "R"). Kelly drive 19 may be square, hexagonal, or any other polygonal-shaped tubing and is able to move freely vertically while the rotary table 20rotates it. Alternatively, drilling rig 30 may include a top drive (not shown) in place of kelly drive 19 and rotary table 20. Additionally, blowout preventers ("BOPs") may be located below the rig floor 21 and installed atop a wellhead 27 to prevent fluids and gases from escaping from the wellbore. An annular BOP 23 and one or more ram BOPs 24 are shown and are commonly understood in the art.

[0018] During drilling operations, drilling fluid may be circulated through the system to carry cuttings away from the bottom of the wellbore as drilling progresses. Drilling fluid may be stored in mud tanks 1 before being drawn through suction line 3 by mud pumps 4. Drilling fluid (drilling fluid route is indicated by arrows "F") is then pumped from mud pumps 4 through a hose 6, up a stand pipe 8, through a flexible hose 9, and down into the wellbore. Drilling fluid returning from the wellbore is routed through a flow line 28 to shakers 2, which are used to separate drill cuttings from the drilling fluid before it is pumped back down the wellbore.

[0019] The light fixtures described herein (29) are shown attached directly to the crown, in this instance visible on three sides. The light fixture (101 and 203) as shown in this embodiment also in Figure 1B and in perspective view in Figure 2 is held by a bracket (102 and 204) which permits the light fixture to swivel both in a horizontal and vertical orientation. And in this embodiment, the light fixture is connected to the crown directly through the light fixture attachment (103 and 202). The light fixtures can be commercially purchased or custom designed with commercially available materials to suit the use and situation, including specific materials of use (e.g., carbon steel or aluminum, etc.) and light power needs or desired.

[0020] It should also be noted that the entire unit can also be built with secondary containment on all the equipment as demonstrated in Figure 3. For example, safety certified nets (302) around each light fixture (301) can be secured to lugs or other attachment points on the crown, safety certified cables can also be attached to each light fixture and likewise be secured to lugs or other attachment points on the crown, etc. so that nothing can drop off of or

fall from the unit, i.e., it is constructed to meet or exceed all industry "Drops standards" - the drop program standard to build equipment ensuring things don't fall or get dropped from heights.

[0021] The scope of the claims should not be limited by the preferred embodiments set forth in description of the preferred embodiments or in the examples, but should be given the broadest interpretation consistent with the description as a whole.

CLAIMS:

1. A method of providing lighting to a drilling rig site comprising, attaching at least one light fixture directly to the crown of a drilling rig on each of at least two sides of the crown, wherein the light fixture contains a fixed or removable light fixture attachment connecting the at least one light fixture to the crown, resulting in one or more of enhanced evenness of site lighting, reduced site shadows, reduced site light pollution, reduced site power consumption and/or reduced site diesel usage.
2. The method of claim 1, wherein the light fixture and light fixture attachment comprise a single piece.
3. The method of claim 1, wherein the light fixture is fixed or adjustable.
4. The method of claim 1, wherein the light fixtures are attached around the perimeter of the crown.
5. The method of claim 1, wherein the light fixtures are attached to all sides of the crown.
6. The method of claim 1, comprising more than one light fixture attached to each side of the crown.
7. The method of claim 1, wherein said each light fixture attachment holds one or more light fixture spaced vertically or horizontally from each other.
8. The method of claim 1, wherein each lighting fixture can swivel and/or tilt.
9. The method of claim 1, additionally including secondary containment.
10. The method of claim 1 wherein the crown forms a generally rectangular shape.
11. The method of claim 1, wherein the lighting is provided to 180 degrees to 360 degrees around the drilling site.
12. A drilling rig including a derrick or mast and crown, having a drilling site lighting system attached thereto, comprising at least one light fixture attached directly to the crown on each of at least two sides, wherein the light fixture contains a fixed or removable light fixture attachment connecting the light fixture to the crown, resulting in one or more of enhanced evenness of site lighting, reduced site shadows, reduced site light pollution, reduced site power consumption and/or reduced site diesel usage.
13. The drilling rig of claim 12, wherein the light fixture and light fixture attachment comprise a single piece.
14. The drilling rig of claim 12, wherein the light fixture is fixed or adjustable.

15. The drilling rig of claim 12, wherein the light fixtures are attached around the perimeter of the crown.
16. The drilling rig of claim 12, wherein the light fixtures are attached to all sides of the crown.
17. The drilling rig of claim 12, comprising more than one light fixture attached to two or more sides of the crown.
18. The drilling rig of claim 12, wherein said each light fixture attachment holds more than one light fixture spaced vertically or horizontally from each other.
19. The drilling rig of claim 12, wherein each lighting fixture can swivel and/or tilt.
20. The drilling rig of claim 12, additionally including secondary containment.
21. The drilling rig of claim 12, wherein the crown forms a generally rectangular shape.
22. The drilling rig of claim 12, wherein the lighting is provided to 180 degrees to 360 degrees around the drilling site.

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(19) World Intellectual Property Organization
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(71) Applicant: **APOLLO ENERGY SERVICES CORP** [CA/CA]; Building 1000, 10213 Township Road 284a, PO BOX 469, Crossfield, Alberta T0M 0S0 (CA).

(72) Inventor: **GOWANLOCK, Matthew**; 2336 Baywater Crescent SW, Airdrie, Alberta T4B 0T4 (CA).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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(54) Title: DRILLING RIG WITH ATTACHED LIGHTING SYSTEM AND METHOD

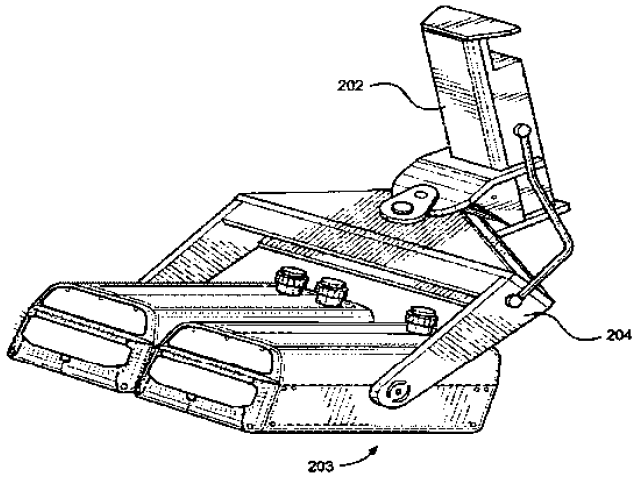


FIG. 2

(57) Abstract: An attachable lighting system for a drilling rig. A method of providing lighting to a drilling rig site comprising, attaching at least one light fixture directly to the crown of a drilling rig on each of at least two sides, wherein the light fixture contains a fixed or removable light fixture attachment connecting the light fixture to the crown, resulting in one or more of enhanced evenness of site lighting, reduced shadows, reduced light pollution, reduced power consumption and/or reduced diesel usage.

[Continued on next page]

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Declarations under Rule 4.17:
— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:
— *with international search report (Art. 21(3))*

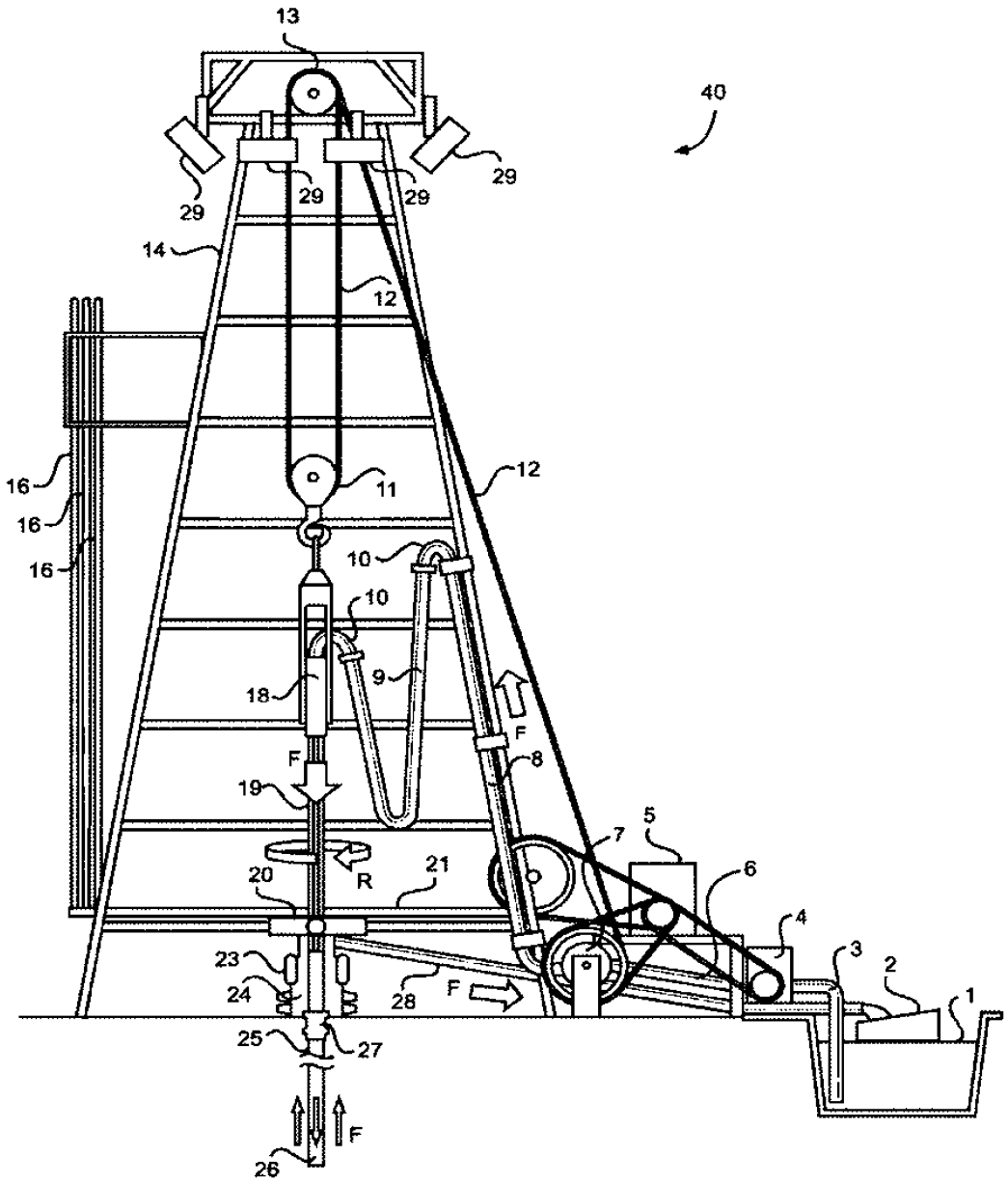

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FIG. 1A

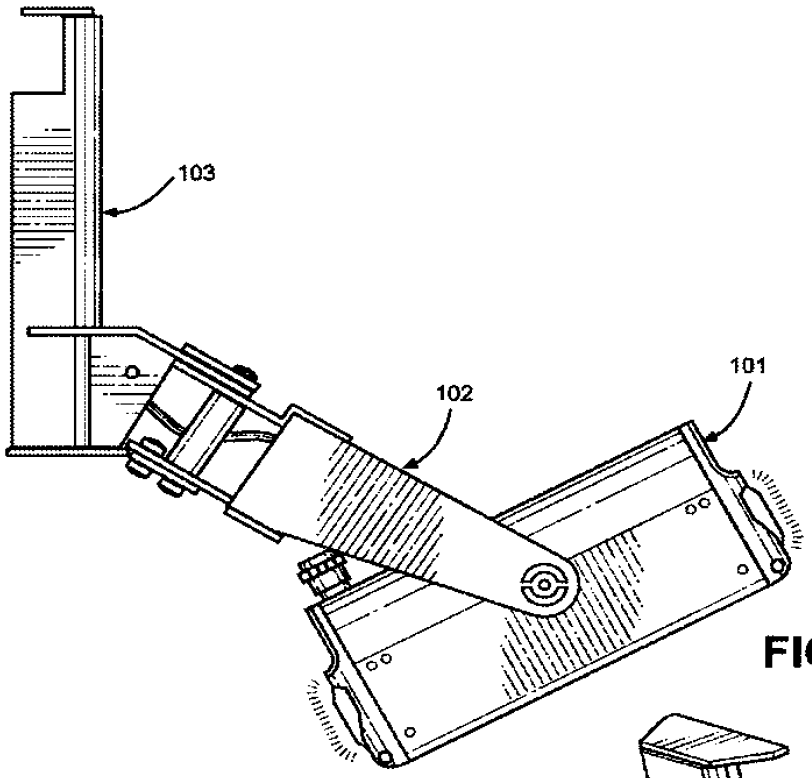


FIG.1B

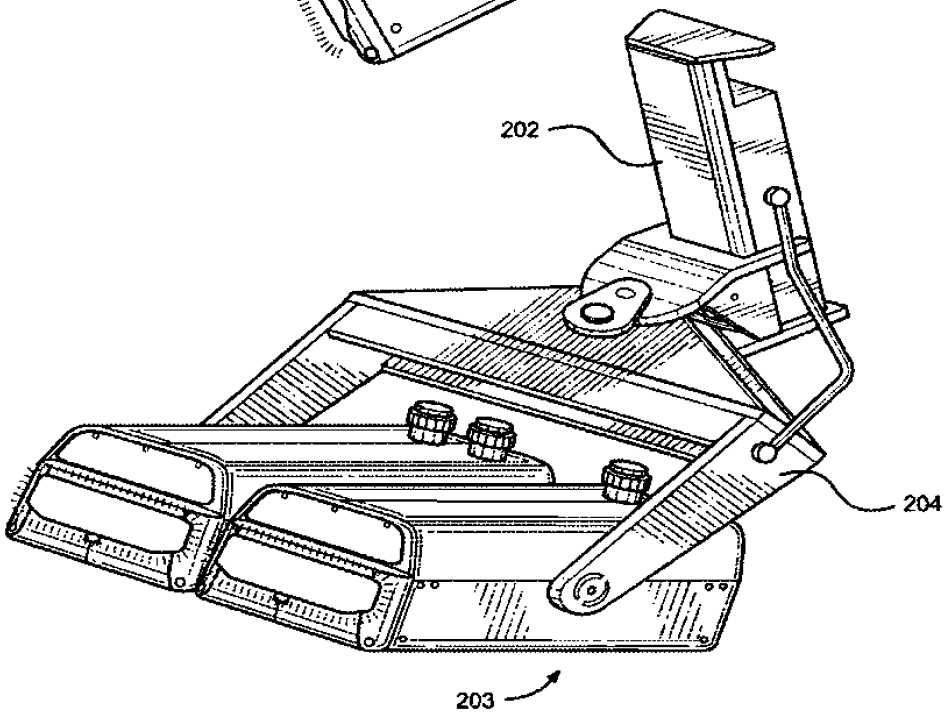


FIG. 2

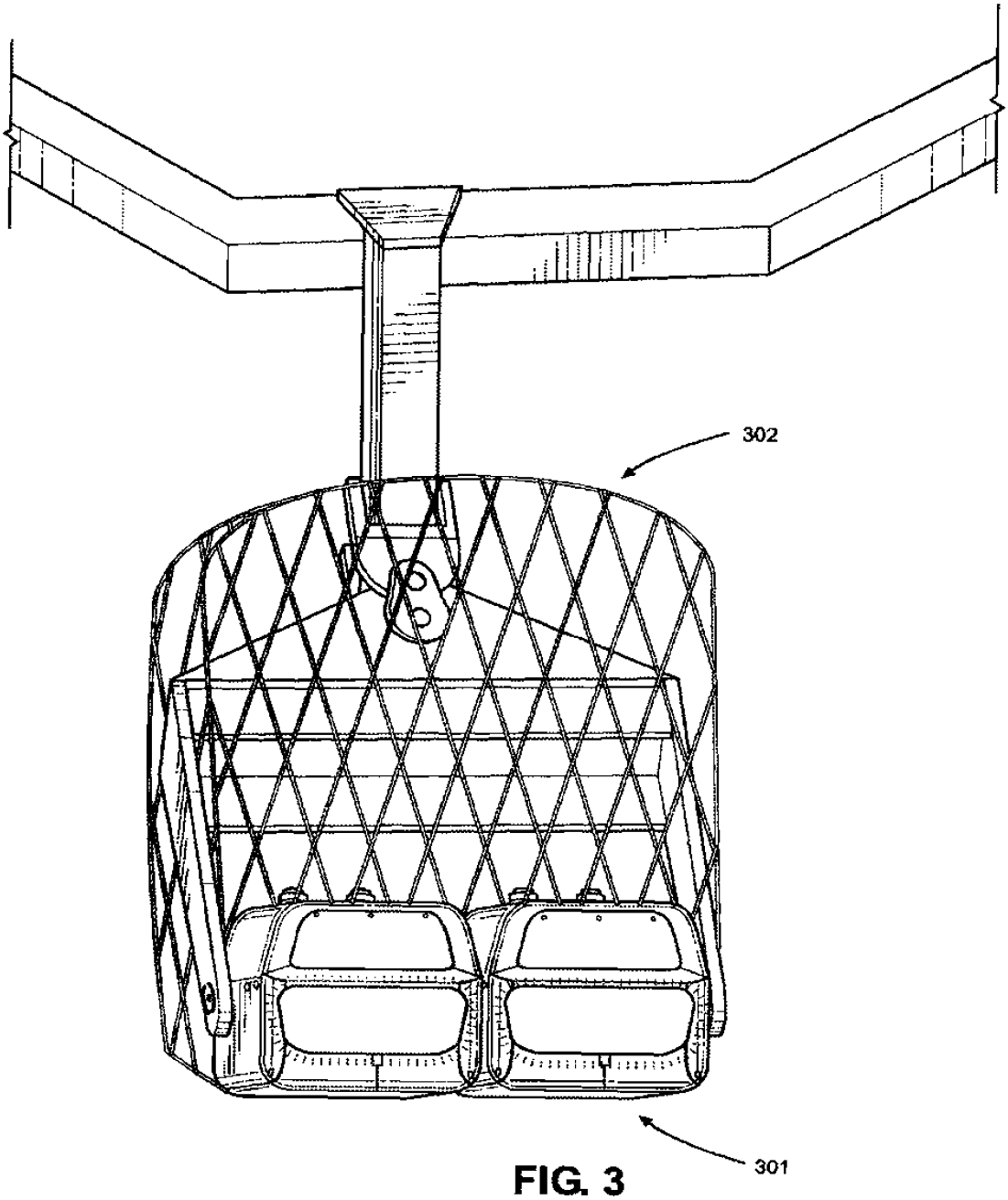


FIG. 3

Electronic Acknowledgement Receipt

EFS ID:	40634129
Application Number:	16571527
International Application Number:	
Confirmation Number:	1021
Title of Invention:	ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM
First Named Inventor/Applicant Name:	JOSHUA C. ALLISON
Customer Number:	9629
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	0_CM_5001_US02_Second_IDS.pdf	1195525 9f1e89ae84aa1a9ccdae8437d3e4c4a3f455cee0	no	4

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2	Foreign Reference	CA3034206.pdf	415984 3bbe04146df8d37c35973b02fdb78bf8910d2a7d	no	13
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New International Application Filed with the USPTO as a Receiving Office

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

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	16571527
Filing Date	2019-09-16
First Named Inventor	Joshua C. Allison
Art Unit	2879
Examiner Name	
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	1	D757343		2016-05-24	Dupuis et al.; Apollo Energy Services Corp.	
	2	5272611		1993-12-21	Lai	
	3	8814221		2014-08-26	Grant; Swivelpole Patent Pty Ltd.	
	4	9316390		2016-04-19	Gowanlock et al.; Apollo Energy Services Corp.	
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	7	10125935		2018-11-13	Gowanlock et al.; Apollo Energy Services Corp.	
	8	10145544		2018-12-04	Gowanlock et al.; Apollo Energy Services Corp.	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16571527
	Filing Date	2019-09-16
	First Named Inventor	Joshua C. Allison
	Art Unit	2879
	Examiner Name	
	Attorney Docket Number	120257-5001 US02

	9	10392826		2019-08-27	Pannekoek et al.; Swivelpole Patent Pty Ltd.	
	10	10473282		2019-11-12	Allison et al.; JCA Rentals, LLC	
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	2	20120217897		2012-08-30	Gordin et al.; Musco Corporation	
	3	20130135848		2013-05-30	Chrysanthous	
	4	20180010748		2018-01-11	Gowanlock; Apollo Energy Services Corp.	
	5	20180163956		2018-06-14	Gowanlock; Apollo Energy Services Corp.	
	6	20180187873		2018-07-05	Carroll; Location Illuminator Technologies	

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	Art Unit	2879
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	1	108240588	CN		2018-07-01	Liu Chunxin		
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	First Named Inventor	Joshua C. Allison
	Art Unit	2879
	Examiner Name	
	Attorney Docket Number	120257-5001 US02

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/C. ERIK HAWES/	Date (YYYY-MM-DD)	2020-09-11
Name/Print	C. ERIK HAWES	Registration Number	63328

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(19)中华人民共和国国家知识产权局

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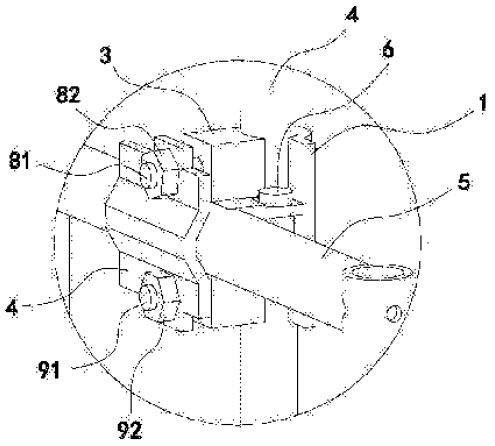
权利要求书2页 说明书7页 附图3页

(54)发明名称

灯杆安装结构及其照明系统

(57)摘要

本发明公开了一种灯杆安装结构及其照明系统，属于照明领域的技术方案，其包括灯杆抱箍、栏杆抱箍和联接件；灯杆抱箍设有贯通其相对两侧的第一灯杆固定槽；栏杆抱箍设有贯通其相对两侧的第一栏杆固定槽；联接件包括相对布置的第一表面和第二表面，第一表面设有贯通其相对两侧的第二灯杆固定槽，第二表面设有贯通其相对两侧的第二栏杆固定槽，第二灯杆固定槽与第二栏杆固定槽的长度方向相互垂直；灯杆抱箍安装在第一表面上，第一灯杆固定槽和第二灯杆固定槽均套在灯杆表面；栏杆抱箍安装在第二表面上，第一栏杆固定槽和第二栏杆固定槽均套在栏杆表面；由于本发明无需进行动火作业，从而大大提高了施工效率，为客户和施工人员均带来极大的便利。



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1.一种灯杆安装结构，其特征在于，

包括灯杆抱箍、栏杆抱箍和联接件；

所述灯杆抱箍的表面设有第一灯杆固定槽，所述第一灯杆固定槽贯通所述灯杆抱箍相对的两侧；

所述栏杆抱箍的表面设有第一栏杆固定槽，所述第一栏杆固定槽贯通所述栏杆抱箍相对的两侧；

所述联接件包括相对布置的第一表面和第二表面，所述第一表面上设有第二灯杆固定槽，所述第二灯杆固定槽贯通所述第一表面相对的两侧，所述第二表面上设有第二栏杆固定槽，所述第二栏杆固定槽贯通所述第二表面相对的两侧，所述第二灯杆固定槽与所述第二栏杆固定槽的长度方向相互垂直；

所述灯杆抱箍安装在所述第一表面上，所述第一灯杆固定槽和所述第二灯杆固定槽均用于套在灯杆表面；

所述栏杆抱箍安装在所述第二表面上，所述第一栏杆固定槽和所述第二栏杆固定槽均用于套在栏杆表面。

2.根据权利要求1所述的灯杆安装结构，其特征在于，所述灯杆安装结构包括有转轴，所述灯杆抱箍设有耳板，所述联接件设有转轴台，所述转轴穿过所述耳板和所述转轴台，将所述灯杆抱箍联接固定于所述联接件上，所述灯杆抱箍能够通过翻动移向和移离所述第一表面。

3.根据权利要求2所述的灯杆安装结构，其特征在于，

所述灯杆安装结构包括有第一螺栓和第一螺母，所述第二栏杆固定槽设有第一沉孔，所述灯杆抱箍设有第一通孔；

所述第一螺栓穿过所述第一沉孔及所述第一通孔，并与所述第一螺母螺纹联接；

所述第一沉孔的形状大小与所述第一螺栓的头部形状大小相匹配，所述第一螺栓的头部容纳于所述第一沉孔内。

4.根据权利要求3所述的灯杆安装结构，其特征在于，所述第一通孔为条形孔，所述第一通孔的长度方向，与所述第二栏杆固定槽的长度方向一致。

5.根据权利要求1所述的灯杆安装结构，其特征在于，

所述灯杆安装结构包括有第二螺栓和第二螺母，所述第二灯杆固定槽设有第二沉孔，所述栏杆抱箍上设有第二通孔；

所述第二螺栓穿过所述第二沉孔及所述第二通孔，并与所述第二螺母螺纹联接；

所述第二沉孔的形状大小与所述第二螺栓的头部形状大小相匹配，所述第二螺栓的头部容纳于所述第二沉孔内。

6.根据权利要求5所述的灯杆安装结构，其特征在于，

所述灯杆安装结构包括有第三螺栓和第三螺母，所述第二灯杆固定槽设有第三沉孔，所述栏杆抱箍上设有第三通孔；

所述第二沉孔和所述第三沉孔分别布置于所述第二栏杆固定槽的两侧，所述第三通孔与所述第二沉孔相对布置，所述第三通孔与所述第三沉孔相对布置；

所述第三螺栓穿过所述第三沉孔及所述第三通孔，并与所述第三螺母螺纹联接；

所述第三沉孔的形状大小与所述第三螺栓的头部形状大小相匹配，所述第三螺栓的头

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部容纳于所述第二沉孔内。

7.根据权利要求1所述的灯杆安装结构，其特征在于，

所述灯杆抱箍的一表面设有第一凸起部，所述第一凸起部延伸至所述灯杆抱箍的两侧；

所述灯杆抱箍的另一表面往所述第一凸起部凹陷，形成所述第一灯杆固定槽，所述第一灯杆固定槽贯通所述第一凸起部的两端。

8.根据权利要求1所述的灯杆安装结构，其特征在于，

所述栏杆抱箍的一表面设有第二凸起部，所述第二凸起部延伸至所述栏杆抱箍的两侧；

所述栏杆抱箍的另一表面往所述第二凸起部凹陷，形成所述第一栏杆固定槽，所述第一栏杆固定槽贯通所述第二凸起部的两端。

9.根据权利要求1所述的灯杆安装结构，其特征在于，所述第一栏杆固定槽两侧的槽壁往外倾斜，以使所述第一栏杆固定槽呈敞口状。

10.一种照明系统，其特征在于，包括灯杆、栏杆和权利要求1至9任一项所述的灯杆安装结构，所述第一灯杆固定槽和所述第二灯杆固定槽均套在所述灯杆表面，所述第一栏杆固定槽和所述第二栏杆固定槽均套在所述栏杆表面。

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灯杆安装结构及其照明系统

技术领域

[0001] 本发明涉及一种灯杆安装结构及其照明系统。

背景技术

[0002] 现有的步道平台灯采用立杆式安装方式，即在步道的外侧围栏杆上固定灯杆，高度一般为2.5米。在步道平台外侧栏杆上安装灯杆，灯杆的固定一般采用两种方式：一是焊接安装板，然后利用U型卡扣来固定灯杆，二是把灯杆直接焊接在栏杆上。这两种固定方式不仅均需要申请动火作业票，而且安装现场需要做安全防护措施，因此在现场施工不便，为了完成施工，往往需要客户亲自陪同，而有时还只能利用大修时期停机安装灯具，这不仅给客户带来较多不便，而且给安装公司的市场运作带来不利。

发明内容

[0003] 本发明的目的在于提供一种灯杆安装结构及其照明系统，以解决现有灯杆固定必须动火作业的问题。

[0004] 为了解决上述技术问题，本发明提供了一种灯杆安装结构，包括灯杆抱箍、栏杆抱箍和联接件；所述灯杆抱箍的表面设有第一灯杆固定槽，所述第一灯杆固定槽贯通所述灯杆抱箍相对的两侧；所述栏杆抱箍的表面设有第一栏杆固定槽，所述第一栏杆固定槽贯通所述栏杆抱箍相对的两侧；所述联接件包括相对布置的第一表面和第二表面，所述第一表面上设有第二灯杆固定槽，所述第二灯杆固定槽贯通所述第一表面相对的两侧，所述第二表面上设有第二栏杆固定槽，所述第二栏杆固定槽贯通所述第二表面相对的两侧，所述第二灯杆固定槽与所述第二栏杆固定槽的长度方向相互垂直；所述灯杆抱箍安装在所述第一表面上，所述第一灯杆固定槽和所述第二灯杆固定槽均用于套在灯杆表面；所述栏杆抱箍安装在所述第二表面上，所述第一栏杆固定槽和所述第二栏杆固定槽均用于套在栏杆表面。

[0005] 优选的，所述灯杆安装结构包括有转轴，所述灯杆抱箍设有耳板，所述联接件设有转轴台，所述转轴穿过所述耳板和所述转轴台，将所述灯杆抱箍联接固定于所述联接件上，所述灯杆抱箍能够通过翻动移向和移离所述第一表面。

[0006] 优选的，所述灯杆安装结构包括有第一螺栓和第一螺母，所述第二栏杆固定槽设有第一沉孔，所述灯杆抱箍设有第一通孔；所述第一螺栓穿过所述第一沉孔及所述第一通孔，并与所述第一螺母螺纹联接；所述第一沉孔的形状大小与所述第一螺栓的头部形状大小相匹配，所述第一螺栓的头部容纳于所述第一沉孔内。

[0007] 优选的，所述第一通孔为条形孔，所述第一通孔的长度方向，与所述第二栏杆固定槽的长度方向一致。

[0008] 优选的，所述灯杆安装结构包括有第二螺栓和第二螺母，所述第二灯杆固定槽设有第二沉孔，所述栏杆抱箍上设有第二通孔；所述第二螺栓穿过所述第二沉孔及所述第二通孔，并与所述第二螺母螺纹联接；所述第二沉孔的形状大小与所述第二螺栓的头部形状

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大小相匹配，所述第二螺栓的头部容纳于所述第二沉孔内。

[0009] 优选的，所述灯杆安装结构包括有第二螺栓和第二螺母，所述第二灯杆固定槽设有第三沉孔，所述栏杆抱箍上设有第三通孔；所述第二沉孔和所述第三沉孔分别布置于所述第二栏杆固定槽的两侧，所述第二通孔与所述第二沉孔相对布置，所述第三通孔与所述第三沉孔相对布置；所述第三螺栓穿过所述第三沉孔及所述第三通孔，并与所述第三螺母螺纹联接；所述第二沉孔的形状大小与所述第二螺栓的头部形状大小相匹配，所述第二螺栓的头部容纳于所述第二沉孔内。

[0010] 优选的，所述灯杆抱箍的一表面设有第一凸起部，所述第一凸起部延伸至所述灯杆抱箍的两侧；所述灯杆抱箍的另一表面往所述第一凸起部凹陷，形成所述第一灯杆固定槽，所述第一灯杆固定槽贯通所述第一凸起部的两端。

[0011] 优选的，所述栏杆抱箍的一表面设有第二凸起部，所述第二凸起部延伸至所述栏杆抱箍的两侧；所述栏杆抱箍的另一表面往所述第二凸起部凹陷，形成所述第一栏杆固定槽，所述第一栏杆固定槽贯通所述第二凸起部的两端。

[0012] 优选的，所述第一栏杆固定槽两侧的槽壁往外倾斜，以使所述第一栏杆固定槽呈敞口状。

[0013] 为了解决上述技术问题，本发明提供了一种照明系统，包括灯杆、栏杆和上述的灯杆安装结构，所述第一灯杆固定槽和所述第二灯杆固定槽均套在所述灯杆表面，所述第一栏杆固定槽和所述第二栏杆固定槽均套在所述栏杆表面。

[0014] 本发明的有益效果如下：

[0015] 由于所述灯杆抱箍安装在所述第一表面上，所述第一灯杆固定槽和所述第二灯杆固定槽均用于套在灯杆表面，所述栏杆抱箍安装在所述第二表面上，所述第一栏杆固定槽和所述第二栏杆固定槽均用于套在栏杆表面，所以本发明能够通过夹持方式固定灯杆和栏杆，整个安装过程无需进行动火作业，同理，其拆卸过程也只需拆除栏杆抱箍和灯杆抱箍便可实现，从而大大提高了施工效率，为客户和施工人员均带来极大的便利。

附图说明

[0016] 为了更清楚地说明本发明的技术方案，下面将对实施方式中所需要使用的附图作简单地介绍，显而易见地，下面描述中的附图仅仅是本发明的一些实施方式，对于本领域普通技术人员来讲，在不付出创造性劳动的前提下，还可以根据这些附图获得其他的附图。

[0017] 图1是本发明灯杆安装结构优选实施方式提供的应用状态示意图；

[0018] 图2是图1的A部分放大示意图；

[0019] 图3是本发明灯杆安装结构优选实施方式提供的拆解放大示意图；

[0020] 图4是本发明灯杆安装结构优选实施方式提供的灯杆抱箍结构示意图；

[0021] 图5是本发明灯杆安装结构优选实施方式提供的栏杆抱箍结构示意图；

[0022] 图6是本发明灯杆安装结构优选实施方式提供的联接件结构示意图一；

[0023] 图7是本发明灯杆安装结构优选实施方式提供的联接件结构示意图二。

[0024] 附图标记如下：

[0025] 1、灯杆抱箍；11、第一灯杆固定槽；12、耳板；13、第一通孔；14、第一凸起部；

[0026] 2、栏杆抱箍；21、第一栏杆固定槽；22、第二通孔；23、第三通孔；24、第二凸起部；

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[0027] 3、联接件；31、第一灯杆固定槽；311、第一沉孔；312、第二沉孔；32、第二栏杆固定槽；321、第一沉孔；33、转轴台；

[0028] 4、灯杆；5、栏杆；6、转轴；

[0029] 71、第一螺栓；72、第一螺母；

[0030] 81、第二螺栓；82、第二螺母；

[0031] 91、第三螺栓；92、第三螺母。

具体实施方式

[0032] 下面将结合本发明实施方式中的附图，对本发明实施方式中的技术方案进行清楚、完整地描述。

[0033] 从图1至7可知，本发明所述的灯杆安装结构，包括灯杆抱箍1、栏杆抱箍2和联接件3；所述灯杆抱箍1的表面设有第一灯杆固定槽11，所述第一灯杆固定槽11贯通所述灯杆抱箍1相对的两侧；所述栏杆抱箍2的表面设有第一栏杆固定槽21，所述第一栏杆固定槽21贯通所述栏杆抱箍2相对的两侧；所述联接件3包括相对布置的第一表面和第二表面，所述第一表面上设有第二灯杆固定槽31，所述第二灯杆固定槽31贯通所述第一表面相对的两侧，所述第二表面上设有第二栏杆固定槽32，所述第二栏杆固定槽32贯通所述第二表面相对的两侧，所述第二灯杆固定槽31与所述第二栏杆固定槽32的长度方向相互垂直；所述灯杆抱箍1安装在所述第一表面上，所述第一灯杆固定槽11和所述第二灯杆固定槽31均用于套在灯杆4表面；所述栏杆抱箍2安装在所述第二表面上，所述第一栏杆固定槽21和所述第二栏杆固定槽32均用于套在栏杆5表面。

[0034] 在现有技术中，灯杆4的安装固定均需动火作业，因此现场需要设置各种安全防护措施，占用施工空间，为施工带来各种不便，而且动火作业后难以进行重新安装，所以大多情况需要客户陪同监工，不但为客户带来不便，也影响施工人员的工作效率。

[0035] 为解决上述问题，本实施方式提供了一种灯杆安装结构，具体如下：

[0036] 1、将第一栏杆固定槽21套于栏杆5表面，然后再用第二栏杆固定槽32套于栏杆5表面，并将栏杆抱箍2与联接件3安装固定，以实现灯杆安装结构与栏杆5的安装固定；

[0037] 2、将灯杆4嵌入第二灯杆固定槽31内，然后再用第一灯杆固定槽11套于灯杆4表面，并将灯杆抱箍1与联接件3固定联接，以实现灯杆安装结构与灯杆4的安装固定。

[0038] 显然，上述整个安装过程无需进行动火作业，同理，其拆卸过程也只需拆除栏杆抱箍2和灯杆抱箍1便可实现，从而大大提高了施工效率，为客户和施工人员均带来极大的便利。

[0039] 另外，还需指出以下几点：

[0040] 1、由于本实施方式主要通过第二灯杆固定槽31、第二栏杆固定槽32分别对灯杆4、栏杆5进行定位，所以如图6和7所示，可以将联接件3设置为十字形，减少联接件3的体积，不但降低了生产成本，而且部件的减轻也便于工作人员进行安装操作；

[0041] 2、在组装状态时，第一灯杆固定槽11与第二灯杆固定槽31应相对布置，且两者的延伸方向相同；

[0042] 3、同理，在组装状态时，第一栏杆固定槽21与第二栏杆固定槽32应相对布置，且两者的延伸方向相同；

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[0043] 4、如图4和7所示，为加强与灯杆4的贴合程度，可以将第一灯杆固定槽11和第二灯杆固定槽31的槽面均设为弧形面，其中，该弧形面可以与灯杆4的外表面相适配，以便第一灯杆固定槽11和第二灯杆固定槽31与灯杆4的外表面紧密贴合。

[0044] 本发明的优选实施方式如图2、4和7所示，所述灯杆安装结构包括有转轴6，所述灯杆抱箍1设有耳板12，所述联接件3设有转轴台33，所述转轴6穿过所述耳板12和所述转轴台33，将所述灯杆抱箍1联接固定于所述联接件3上，所述灯杆抱箍1能够通过翻动移向和移离所述第一表面。

[0045] 灯杆抱箍1与联接件3可以是拆卸关系，譬如在灯杆抱箍1上设置安装孔，联接件3上设置螺纹孔，通过螺栓穿过安装孔与螺纹孔联接，便可实现灯杆抱箍1与联接件3的安装固定，若需卸下灯杆抱箍1，只需取下螺栓，便可实现灯杆抱箍1的完全拆卸了。

[0046] 但完全拆卸的方式不便运输和安装，所以本实施方式将灯杆抱箍1与联接件3设为活动联接关系，具体如下：

[0047] 1、由于所述转轴6穿过所述耳板12和所述转轴台33，将所述灯杆抱箍1联接固定于所述联接件3上，所以需要固定灯杆4时，可以通过转动将灯杆抱箍1移离联接件3的第一表面，然后将灯杆4嵌入第二灯杆固定槽31内；

[0048] 2、同理，当需要固定灯杆4时，再通过转动将灯杆抱箍1移向联接件3的第一表面，直至第一灯杆固定槽11套于灯杆4外，然后对灯杆抱箍1和联接件3进行安装固定，便可实现灯杆4的安装固定；

[0049] 3、若需拆除灯杆4，只需先解除灯杆抱箍1和联接件3之间的安装固定，然后通过转动将灯杆抱箍1移离联接件3的第一表面，便可对灯杆4进行拆除。

[0050] 所以本实施方式将灯杆抱箍1与联接件3构成一个整体，只需进行简单的翻动操作，便可实现灯杆4的安装、拆除，无需同时握持多个部件，为工作人员的安装、拆除工作带来极大的便利。

[0051] 另外，上述耳板12的数量可以为一个，譬如定义转轴台33包括相对的第一端面和第二端面，转轴6穿过第一端面、第二端面和耳板12，然后在转轴6的端部联接螺母，便可实现灯杆抱箍1与联接件3的活动联接。

[0052] 但为了加强灯杆抱箍1与联接件3的联接稳固性，如图2、4和7所示，本实施方式优选将耳板12设为两个，两个耳板12相对布置，然后转轴台33嵌入两个耳板12之间，通过转轴6转轴6穿过转轴台33和两个耳板12，以实现灯杆抱箍1与联接件3的活动联接。

[0053] 本发明的优选实施方式如图3、6和7所示，所述灯杆安装结构包括有第一螺栓71和第一螺母72，所述第二栏杆固定槽32设有第一沉孔321，所述灯杆抱箍1设有第一通孔13；所述第一螺栓71穿过所述第一沉孔321及所述第一通孔13，并与所述第一螺母72螺纹联接；所述第一沉孔321的形状大小与所述第一螺栓71的头部形状大小相匹配，所述第一螺栓71的头部容纳于所述第一沉孔321内。

[0054] 本实施方式的有益效果如下：

[0055] 1、在对栏杆5固定前，先将第一螺栓71插入第一沉孔321内，由于所述第一沉孔321的形状大小与所述第一螺栓71的头部形状大小相匹配，所以第一螺栓71的头部能够完全容纳于第一沉孔321内，避免与栏杆5产生接触，从而保证栏杆抱箍2和联接件3能够紧密套牢栏杆5；

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[0056] 2、需要对灯杆抱箍1固定时，通过转动将灯杆抱箍1移向联接件3的第一表面，第一螺栓71的端部将穿过第一通孔13，由于第一螺栓71的头部容纳于第一沉孔321内，且所述第一沉孔321的形状大小与所述第一螺栓71的头部形状大小相匹配，所以第一螺栓71将无法转动，此时将第一螺母72与第一螺栓71的端部联接，通过转动第一螺母72便可将灯杆抱箍1夹稳在联接件3的第一表面上，无需人为固定第一螺栓71，为安装过程带来极大的便利。

[0057] 本发明的优选实施方式如图3、4和6所示，所述第一通孔13为条形孔，所述第一通孔13的长度方向，与所述第二栏杆固定槽32的长度方向一致。

[0058] 当转动灯杆抱箍1移向联接件3的第一表面时，若第一螺栓71较长，则第一螺栓71的端部会与灯杆抱箍1产生抵接，导致第一螺栓71无法插入第一通孔13内，所以只能选择特定规格的第一螺栓71，从而限制了第一螺栓71的选择范围。

[0059] 为解决上述问题，本实施方式将第一通孔13设为条形孔，具体如下：

[0060] 若第一通孔13为普通通孔，当转动灯杆抱箍1移向联接件3的第一表面时，第一螺栓71将可能与第一通孔13的左侧相邻部位抵接，但由于本实施方式的第一通孔13为条形孔，所以原来产生抵接的部位也将变为第一通孔13的一部分，保证了第一螺栓71能够顺利插入第一通孔13内。

[0061] 另外，为进一步增加第一螺栓71的可选范围，如图4所示，可以将第一通孔13贯通灯杆抱箍1的侧壁，使得第一螺栓71无法与灯杆抱箍1产生抵接，保证了各种长度的第一螺栓71也可顺利插入至第一通孔13内。

[0062] 本发明的优选实施方式如图3、5、6和7所示，所述灯杆安装结构包括有第二螺栓81和第二螺母82，所述第二灯杆固定槽31设有第二沉孔311，所述栏杆抱箍2上设有第二通孔22；所述第二螺栓81穿过所述第二沉孔311及所述第二通孔22，并与所述第二螺母82螺纹联接；所述第二沉孔311的形状大小与所述第二螺栓81的头部形状大小相匹配，所述第二螺栓81的头部容纳于所述第二沉孔311内。

[0063] 本实施方式的有益效果如下：

[0064] 1、在对灯杆4固定前，先将第二螺栓81插入第二沉孔311内，由于所述第二沉孔311的形状大小与所述第二螺栓81的头部形状大小相匹配，所以第二螺栓81的头部能够完全容纳于第二沉孔311内，避免与灯杆4产生接触，从而保证灯杆抱箍1和联接件3能够紧密套牢灯杆4；

[0065] 2、需要对栏杆抱箍2固定时，将第一栏杆固定槽21套于栏杆5表面，第二螺栓81的端部将穿过第二通孔22，由于第二螺栓81的头部容纳于第二沉孔311内，且所述第二沉孔311的形状大小与所述第二螺栓81的头部形状大小相匹配，所以第二螺栓81将无法转动，此时将第二螺母82与第二螺栓81的端部联接，通过转动第二螺母82便可将栏杆抱箍2夹稳在联接件3的第二表面上，无需人为固定第二螺栓81，为安装过程带来极大的便利。

[0066] 本发明的优选实施方式如图3、5、6和7所示，所述灯杆安装结构包括有第三螺栓91和第三螺母92，所述第二灯杆固定槽31设有第三沉孔312，所述栏杆抱箍2上设有第三通孔23；所述第二沉孔311和所述第三沉孔312分别布置于所述第二栏杆固定槽32的两侧，所述第二通孔22与所述第二沉孔311相对布置，所述第三通孔23与所述第三沉孔312相对布置；所述第三螺栓91穿过所述第三沉孔312及所述第三通孔23，并与所述第三螺母92螺纹联接；所述第三沉孔312的形状大小与所述第三螺栓91的头部形状大小相匹配，所述第三螺栓91

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的头部容纳于所述第三沉孔312内。

[0067] 为增强栏杆抱箍2与联接件3的固定强度，本实施方式增加了第三螺栓91和第三螺母92，具体如下：

[0068] 将第一栏杆固定槽21和第二栏杆固定槽32均套于栏杆5外，此时第二沉孔311与第二通孔22对准、第三沉孔312与第三通孔23对准，然后用第二螺栓81穿过第二沉孔311和第二通孔22、用第三螺栓91穿过第三沉孔312和第三通孔23，最后用第二螺母82与第二螺栓81的端部联接、用第三螺母92与第三螺栓91的端部联接，便可实现栏杆抱箍2与栏杆抱箍2的联接固定；从图5至7可知，第二沉孔311和第二通孔22置于第二栏杆固定槽32的上方，第三沉孔312和第三通孔23置于第二栏杆固定槽32的下方，从而使得栏杆抱箍2的上下方均得以固定，为栏杆抱箍2的固定强度提供了保证。

[0069] 本发明的优选实施方式如图4所示，所述灯杆抱箍1的一表面设有第一凸起部14，所述第一凸起部14延伸至所述灯杆抱箍1的两侧；所述灯杆抱箍1的另一表面往所述第一凸起部14凹陷，形成所述第一灯杆固定槽11，所述第一灯杆固定槽11贯通所述第一凸起部14的两端。

[0070] 由于所述灯杆抱箍1的另一表面往所述第一凸起部14凹陷，形成所述第一灯杆固定槽11，以使灯杆抱箍1整体大致呈图4所示的片状，不会存在设置凹槽部分薄、其余部分厚的现象，不但节省了生产用料，也保证了灯杆抱箍1整体强度的一致性。

[0071] 本发明的优选实施方式如图5所示，所述栏杆抱箍2的一表面设有第二凸起部24，所述第二凸起部24延伸至所述栏杆抱箍2的两侧；所述栏杆抱箍2的另一表面往所述第二凸起部24凹陷，形成所述第一栏杆固定槽21，所述第一栏杆固定槽21贯通所述第二凸起部24的两端。

[0072] 由于所述栏杆抱箍2的另一表面往所述第二凸起部24凹陷，形成所述第一栏杆固定槽21，以使栏杆抱箍2整体大致呈图5所示的片状，不会存在设置凹槽部分薄、其余部分厚的现象，不但节省了生产用料，也保证了栏杆抱箍2整体强度的一致性。

[0073] 本发明的优选实施方式如图5所示，所述第一栏杆固定槽21两侧的槽壁往外倾斜，以使所述第一栏杆固定槽21呈敞口状。

[0074] 由于栏杆5的尺寸各异，为了加强灯杆安装结构的适用范围，本实施方式将第一栏杆固定槽21两侧的槽壁设为往外倾斜，以使所述第一栏杆固定槽21呈敞口状，所以管径较小的栏杆5将嵌入第一栏杆固定槽21较深的位置，以此与第一栏杆固定槽21的两侧槽壁抵接，而管径较大的栏杆5将嵌入第一栏杆固定槽21较浅的位置，以此与第一栏杆固定槽21的两侧槽壁抵接，从而保证对多种尺寸的栏杆5均可进行紧密夹持。

[0075] 从图1至7可知，本发明所述的照明系统，包括灯杆4、栏杆5和上述的灯杆安装结构，所述第一灯杆固定槽11和所述第二灯杆固定槽31均套在灯杆4表面，所述第一栏杆固定槽21和所述第二栏杆固定槽32均套在栏杆5表面。

[0076] 同理，本发明所述照明系统应用上述的灯杆安装结构后，能够抛弃动火作业，通过栏杆抱箍2、灯杆抱箍1和联接件3便可实现灯杆4的快速安装，而且拆卸过程也只需拆除栏杆抱箍2、灯杆抱箍1和联接件3便可实现，从而大大提高了施工效率，为客户和施工人员均带来极大的便利。

[0077] 以上所述是本发明的优选实施方式，应当指出，对于本技术领域的普通技术人员

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来说，在不脱离本发明原理的前提下，还可以做出若干改进和润饰，这些改进和润饰也视为本发明的保护范围。

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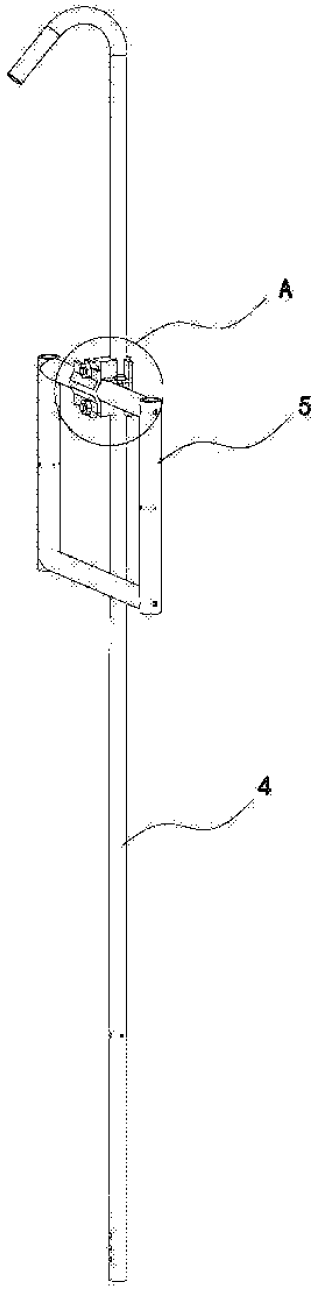


图1

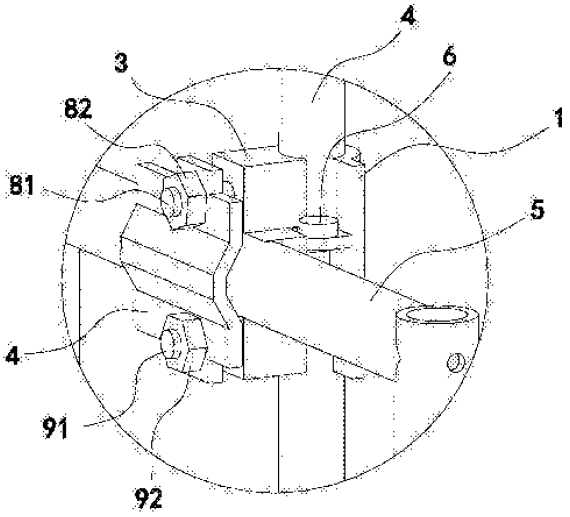


图2

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Exhibit 1002 - 255 of 336

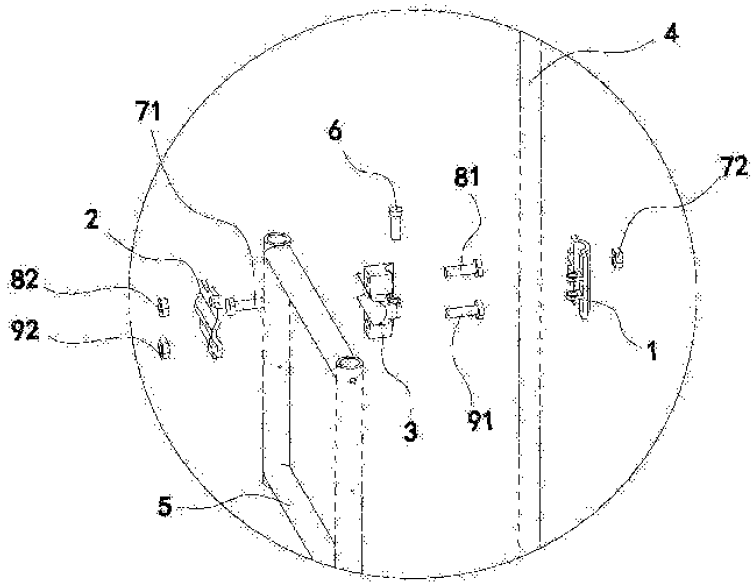


图3

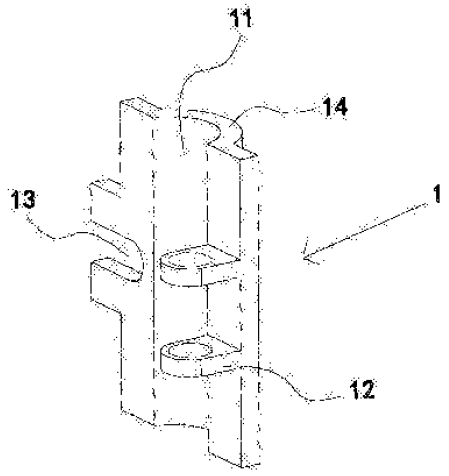


图4

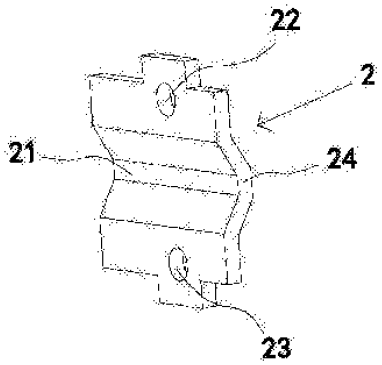


图5

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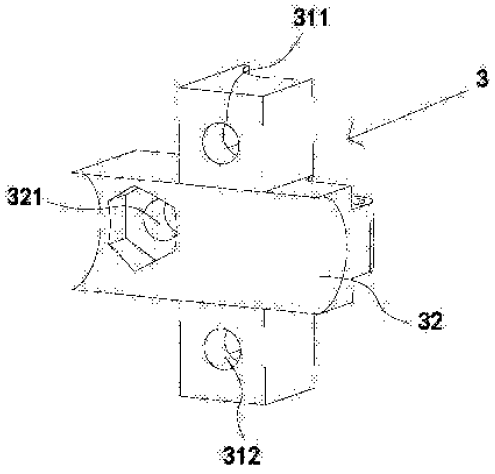


图6

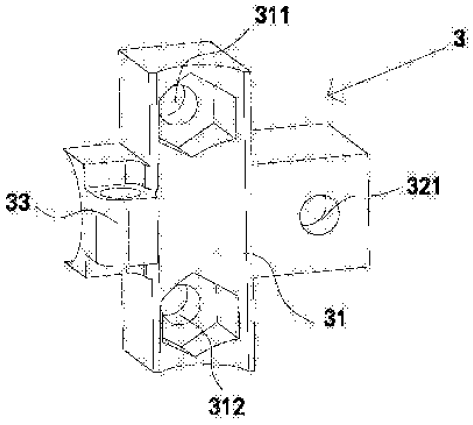


图7

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Electronic Patent Application Fee Transmittal

Application Number:	16571527
Filing Date:	16-Sep-2019
Title of Invention:	ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM
First Named Inventor/Applicant Name:	JOSHUA C. ALLISON
Filer:	Clay Erik Hawes
Attorney Docket Number:	120257-5001 US02

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	2202	5	50	250
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**250**

Electronic Acknowledgement Receipt	
EFS ID:	40538591
Application Number:	16571527
International Application Number:	
Confirmation Number:	1021
Title of Invention:	ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM
First Named Inventor/Applicant Name:	JOSHUA C. ALLISON
Customer Number:	9629
Filer:	Clay Erik Hawes
Filer Authorized By:	
Attorney Docket Number:	120257-5001 US02
Receipt Date:	11-SEP-2020
Filing Date:	16-SEP-2019
Time Stamp:	18:39:22
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$250
RAM confirmation Number	E20209AI39561466
Deposit Account	500310
Authorized User	Clay Hawes
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.17 (Patent application and reexamination processing fees) 37 CFR 1.21 (Miscellaneous fees and charges)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Preliminary Amendment	0A_CM_5001US02_Preliminary Amendment.pdf	129753 5422e46a379f73f6b8413221054ac1236429872e	no	7
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	0B_CM_5001_US02_IDS.pdf	1099220 f82f8b0499173d485dc01901540d655676c7943a	no	5
Warnings:					
Information:					
3	Foreign Reference	Foreign_CN108240588.pdf	552027 7b0d694d258e213c623b699441378886d7c6011d	no	13
Warnings:					
Information:					
4	Non Patent Literature	Non_Patent_Swivelpole-North-American-Cataloguex.pdf	5993167 b41fc67210bc3fc40b512982de17a9a0d8247949	no	28
Warnings:					
Information:					
5	Fee Worksheet (SB06)	fee-info.pdf	29973 e5276e42feec3b74603037794f0918ca858d455f	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	7804140		

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New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

ELECTRONICALLY FILED IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.:	16/571,527	Confirmation No.:	1021
Applicant:	C&M Oilfield Rentals, LLC		
Filed:	September 16, 2019		
TC/A.U.:	2879		
Examiner:	Hines, Anne M.		
Docket No.:	120257-5001 US02		
Customer No.:	9629		
Title:	ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM		

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

PRELIMINARY AMENDMENT

Dear Examiner:

Please amend and consider the above-identified application per the following Amendments to Claims.

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

1-12. (Cancelled)

13. (New) A lighting system mounted on a rig; the lighting system comprising:

a plurality of light units, each light unit comprising:

a mounting pole comprising a continuous structure, wherein each light unit comprises a separate mounting pole, such that the system comprises a plurality of mounting poles;

a bracket configured to connect the mounting pole to the handrail of the rig; and

a light fixture comprising one or more lights, the light fixture coupled to the mounting pole, wherein the light fixture may be coupled to the mounting pole in a first position or a second position; and

wherein the light fixture is proximate to the handrail of the rig in both the first position and the second position.

14. (New) The lighting system of claim 1, further comprising safety nets connected to the rig.

15. (New) The lighting system of claim 1, wherein the light fixture is secondarily coupled to the rig using a cable.

16. (New) The lighting system of claim 1, wherein, when the light fixture is in the first position, the one or more lights of the light fixture are oriented away from the rig.

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17. (New) The lighting system of claim 16, wherein, when the light fixture is in the second position, the one or more lights of the light fixture are oriented towards the rig.

18. (New) The lighting system of claim 1, wherein the bracket is welded to the rig.

19. (New) The lighting system of claim 1, wherein the mounting pole and bracket are connected to the rig using U-shaped bolts.

20. (New) The lighting system of claim 13, wherein the rig is a drilling rig.

21. (New) A rig comprising:

a derrick;

a crown deck at the top of the derrick, the crown deck comprising a handrail; and

a plurality of light units, each light unit comprising:

a mounting pole, wherein each light unit comprises a separate mounting pole, such that the system comprises a plurality of mounting poles;

a bracket configured to connect the mounting pole to the handrail; and

a light fixture comprising one or more lights, the light fixture coupled to the mounting pole, wherein the light fixture may be coupled to the mounting pole in a first position or a second position.

22. (New) The rig of claim 21, further comprising safety nets connected to the rig.

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23. (New) The rig of claim 21, wherein the light fixture is secondarily coupled to the rig using a cable.

24. (New) The rig of claim 21, wherein, when the light fixture is in the first position, the one or more lights of the light fixture are oriented away from the rig.

25. (New) The rig of claim 24, wherein, when the light fixture is in the second position, the one or more lights of the light fixture are oriented towards the rig.

26. (New) The rig of claim 21, wherein the bracket is welded to the rig.

27. (New) The rig of claim 21, wherein the mounting pole and bracket are connected to the rig using U-shaped bolts.

28. (New) The rig of claim 21, wherein the rig is a drilling rig.

29. (New) The rig of claim 21, wherein one or more of the plurality of mounting poles comprises a continuous structure.

30. (New) The rig of claim 21, wherein the light fixture is proximate to the handrail in both the first position and the second position.

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31. (New) A method for illuminating a wellsite, comprising:

mounting a plurality of lights to a plurality of mounting points on a rig, wherein each of the plurality of mounting points supports at least one of the plurality of lights, and each of the plurality of lights is mounted to only one of the plurality of mounting points; and

illuminating the wellsite using the plurality of lights.

32. (New) The method of claim 31, further comprising individually adjusting each of the plurality of lights.

33. (New) The method of claim 31, wherein mounting a plurality of lights to a plurality of mounting points on a rig comprises:

attaching a bracket to one or more of the mounting points on the rig;

using the bracket the attach a mounting pole to the rig;

coupling one or more lights of the plurality of lights to the mounting pole.

34. (New) The method of claim 31, wherein one or more of the plurality of mounting points on a rig are located on a handrail of a crown deck of the rig.

35. (New) The method of claim 34, wherein each of the plurality of lights mounted at the one or more of the plurality of mounting points located on the handrail of the crown deck of the rig is proximate to the handrail.

36. (New) The method of claim 31, further comprising:

coupling each light of the plurality of lights to one or more cables; and

coupling the one or more cables to the rig.

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37. (New) The method of claim 31, further comprising installing a safety net below one of the plurality of lights.

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REMARKS

Claims 1-12 have been cancelled in this paper, and claims 13-37 have been added. Accordingly, claims 13-37 are currently pending.

If there are any fees due in connection with this filing, please charge the fee to Deposit Account No. 50-0310, referencing 120257-5001 US02. If, while considering this reply, the Examiner believes that a telephone conference would be beneficial towards furthering prosecution of this case, the Examiner is strongly encouraged to contact the undersigned attorney at the number listed.

Dated: September 11, 2020

Respectfully submitted,

Customer Number: 09629

/C. Erik Hawes /
C. Erik Hawes
Registration No.: 63328
MORGAN, LEWIS & BOCKIUS LLP
713-890-5000 x 5165
Attorney for Applicant

DB1/ 115953950.2

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PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/571,527	Filing Date 09/16/2019	☐ To be Mailed

ENTITY: ☐ LARGE ☑ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $50 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $230 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	09/11/2020	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 25	Minus	** 20	= 5		x $50 =	250
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x $230 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	250

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/VIKKI GRAY/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, 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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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/571,527	Filing Date 09/16/2019	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	09/11/2020	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 25	Minus	** 12	= 13		x $100 =	1300
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 1	= 2		x $460 =	920
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	2220

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LDRC
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/CARMEN D WILLIAMS/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, 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.

PTO/SB/06 (09-11)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/571,527	Filing Date 09/16/2019	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	09/11/2020	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 25	Minus	** 12	= 13		x $100 =	1300
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 1	= 2		x $460 =	920
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	2220

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LDRC
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/CARMEN D WILLIAMS/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, 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.

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
16/571,527	09/16/2019	2879	785	120257-5001 US02	12	1

CONFIRMATION NO. 1021

CORRECTED FILING RECEIPT

9629
Morgan, Lewis & Bockius LLP (WA)
1111 Pennsylvania Avenue, N.W.
Washington, DC 20004

OC000000119133780

Date Mailed: 03/04/2020

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

JOSHUA C. ALLISON, CODY, WY;
JOSH HAALAND, CODY, WY;
JESSICA IVANOFF, CODY, WY;

Applicant(s)

C&M OILFIELD RENTALS, LLC, CODY, WY;

Assignment For Published Patent Application

C&M OILFIELD RENTALS, LLC, CODY, WY

Power of Attorney: The patent practitioners associated with Customer Number 9629

Domestic Priority data as claimed by applicant

This application is a CON of 16/138,723 09/21/2018 PAT 10473282
which is a CIP of 16/009,032 06/14/2018
which claims benefit of 62/643,663 03/15/2018

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 09/26/2019
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/571,527**
Projected Publication Date: Not Applicable
Non-Publication Request: No
Early Publication Request: No
**** SMALL ENTITY ****
Title

ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM

Preliminary Class

362

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative,

this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop

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Exhibit 1002 - 275 of 336

technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

Petitioner Ensign
Exhibit 1002 - 276 of 336

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/571,527	09/16/2019	JOSHUA C. ALLISON	120257-5001 US02

CONFIRMATION NO. 1021

9629
Morgan, Lewis & Bockius LLP (WA)
1111 Pennsylvania Avenue, N.W.
Washington, DC 20004

POA ACCEPTANCE LETTER

OC000000115133537

Date Mailed: 03/04/2020

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/28/2020.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/vnguyen/

PTO/AIA/80 (07-17)
Approved for use through 03/31/2021. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

[X] Practitioners associated with Customer Number: 9629

OR

[ ] Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

[ ] The address associated with Customer Number:

OR

[ ]

Firm or Individual name		
Address		
City	State	Zip
Country		
Telephone	Email	

Assignee name and address: C&M OILFIELD RENTALS, LLC
519 Circle Drive
Cody, Wyoming 82414 United States of America

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of the practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee.

Signature Joshua C Allison	Date 2-25-20
Name Joshua C. Allison	Telephone 512-663-0732
Title President, C&M Oilfield Rentals, LLC	

This collection of information is required by 37 CFR 1.31, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public, which is to update (and by the USPTO to process) the file of a patent or reexamination proceeding. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 18 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.

Electronic Acknowledgement Receipt

EFS ID:	38722591
Application Number:	16571527
International Application Number:	
Confirmation Number:	1021
Title of Invention:	ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM
First Named Inventor/Applicant Name:	JOSHUA C. ALLISON
Customer Number:	9629
Filer:	Clay Erik Hawes
Filer Authorized By:	
Attorney Docket Number:	120257-5001 US02
Receipt Date:	28-FEB-2020
Filing Date:	16-SEP-2019
Time Stamp:	12:36:18
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	0_CM_5001US02_16571527_ADSXX_UNDERLINED.pdf	2631276 584c91ba49c5eb3492d70093e0d205f167d48258	no	8

Warnings:

Information:					
This is not an USPTO supplied ADS fillable form					
2	Req to correct/update/change appl name until pay issue fee	1_CM_5001US02_REQtoChangeApplicantName.pdf	120180 d174f0f714669c537d5ef91dff64f0d9655a7880	no	1
Warnings:					
Information:					
3	Assignee showing of ownership per 37 CFR 3.73	2_CM_5001US02_REQtoChangeApplicantNameStatement373.pdf	133047 22bba622131833ad8a3a252fa12ded4fc214f768	no	2
Warnings:					
Information:					
4	Power of Attorney	3_CM_5001US02_Power_UnitedStates.pdf	483048 dd090a010db6d70d453da674ab32aeb70d7110ed	no	1
Warnings:					
Information:					
		Total Files Size (in bytes):	3367551		

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

New Applications Under 35 U.S.C. 111

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

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

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

New International Application Filed with the USPTO as a Receiving Office

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

PTO/AIA/14 (02-18)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	120257-5001 US02
	Application Number	
Title of Invention	IMPROVED ELEVATED STRUCTURE-MOUNTED LIGHTING 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.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	JOSHUA	C.	ALLISON	

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

City	CODY	State/Province	WY	Country of Residence	US

Mailing Address of Inventor:

Address 1	C/O JCA RENTALS, LLC
Address 2	3429 COTTONWOOD AVENUE

City	CODY	State/Province	WY
Postal Code	82414	Country	US

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	JOSH		HAALAND	

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

City	CODY	State/Province	WY	Country of Residence	US

Mailing Address of Inventor:

Address 1	C/O JCA RENTALS, LLC
Address 2	3429 COTTONWOOD AVENUE

City	CODY	State/Province	WY
Postal Code	82414	Country	US

Inventor 3 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	JESSICA		IVANOFF	

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

PTO/AIA/14 (02-18)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	120257-5001 US02
	Application Number	
Title of Invention	IMPROVED ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM	

City	CODY	State/Province	WY	Country of Residence	US

Mailing Address of Inventor:

Address 1	C/O JCA RENTALS, LLC		
Address 2	3429 COTTONWOOD AVENUE		
City	CODY	State/Province	WY
Postal Code	82414	Country	US

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

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	9629		
Email Address	WAPATENTS@MORGANLEWIS.COM	Add Email	Remove Email
Email Address	NEIL.OZARKAR@MORGANLEWIS.COM	Add Email	Remove Email

Application Information:

Title of the Invention	IMPROVED ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM		
Attorney Docket Number	120257-5001 US02	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	8	Suggested Figure for Publication (if any)	8

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

PTO/AIA/14 (02-18)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	120257-5001 US02
	Application Number	
Title of Invention	IMPROVED ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM	

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	9629		

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 of	16138723	2018-09-21
Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
16138723	Continuation in part of	16009032	2018-06-14
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
16009032	Claims benefit of provisional	62643663	2018-03-15

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	120257-5001 US02
	Application Number	
Title of Invention	IMPROVED ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM	

Foreign Priority Information:

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).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

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.

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	120257-5001 US02
	Application Number	
Title of Invention	IMPROVED ELEVATED STRUCTURE-MOUNTED LIGHTING 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.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	120257-5001 US02
	Application Number	
Title of Invention	IMPROVED ELEVATED STRUCTURE-MOUNTED LIGHTING 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

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: ~~JCA RENTALS, LLC~~ C&M OILFIELD RENTALS, LLC

Mailing Address Information For Applicant:

-->> **Address 1**	~~3429 COTTONWOOD AVENUE~~ 519 CIRCLE DRIVE		
Address 2			
City	CODY	**State/Province**	WY
Country	US	Postal Code	82414
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee 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.

CORRECTED ADS

PTO/AIA/14 (02-18)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	120257-5001 US02
	Application Number	
Title of Invention	IMPROVED ELEVATED STRUCTURE-MOUNTED LIGHTING 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.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☒

-->> Organization Name: ~~JCA RENTALS, LLC~~ C&M OILFIELD RENTALS, LLC

Mailing Address Information For Assignee including Non-Applicant Assignee:

-->> **Address 1**	~~3429 COTTONWOOD AVENUE~~ 519 CIRCLE DRIVE		
Address 2			
City	CODY	**State/Province**	WY
Country i	US	Postal Code	82414
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

Signature:

Remove

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

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	/C. ERIK HAWES/			Date (YYYY-MM-DD)	2020-02-28
First Name	C. ERIK	Last Name	HAWES	Registration Number	63328

Additional Signature may be generated within this form by selecting the Add button. Add

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	120257-5001 US02
	Application Number	
Title of Invention	IMPROVED ELEVATED STRUCTURE-MOUNTED LIGHTING 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.**

Doc Code: R46C.REQ
Document Description: Request under 37 CFR 1.46(c) to correct, update or change the applicant.

PTO/AIA/41 (04-15)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

REQUEST TO CORRECT OR UPDATE THE NAME OF THE APPLICANT UNDER 37 CFR 1.46(c)(1), OR CHANGE THE APPLICANT UNDER 37 CFR 1.46(c)(2)

(FOR USE ONLY IN APPLICATIONS FILED ON OR AFTER SEPTEMBER 16, 2012)

Application Number	16571527
Filing Date	September 16, 2019
First Named Inventor	Joshua C. Allison
Art Unit	2879
Examiner Name	Unassigned
Practitioner Docket Number	120257-5001 US02

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

Applicant hereby **requests that the name of the applicant be corrected or updated under 37 CFR 1.46(c)(1), or that the applicant be changed under 37 CFR 1.46(c)(2),** in the above-identified application. **Requests under 37 CFR 1.46(c)(1) or (c)(2) cannot be submitted after payment of the issue fee or if the application has been patented.**

Please check the applicable box(es) below.

☐ 1. This request is to **correct or update the name of the applicant** (**under 37 CFR 1.46(c)(1)**) and includes:

☐ An application data sheet (ADS) in accordance with 37 CFR 1.76(c) with the corrected or updated information shown with markings (*e.g.*, underlining for insertions, strikethrough for deletions). A Corrected Web-based ADS may be used.

Note: Requests under 37 CFR 1.46(c)(1) may be filed to correct typographical errors in the name of the § 1.46 applicant, or for updating the name of the § 1.46 applicant (*i.e.*, where there is no change in the applicant itself but just in the applicant's name). See the Manual of Patent Examining Procedure (MPEP) section 605.01.

■ 2. This request is to **change the applicant** (**under 37 CFR 1.46(c)(2)**) and includes:

■ An application data sheet (ADS) in accordance with 37 CFR 1.76(c) that identifies the changes with proper markings (underlining for insertions and strikethrough for deletions). A Corrected Web-based ADS may be used.

■ A Statement Under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent). See MPEP 325.

I am the

☐ applicant* ■ attorney or agent of record Registration number 63328 ☐ attorney or agent acting under 37 CFR 1.34 Registration number _____

Signature /C. ERIK HAWES/
Typed or printed name C. ERIK HAWES
Date February 28, 2020

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. *Juristic entities must be represented by a patent practitioner (See 37 CFR 1.31, applicable to any paper filed on or after September 16, 2012 that is presented on behalf of a juristic entity, regardless of application filing date). Submit multiple forms if more than one signature is required, see below**.

■ ** Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.36. 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.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: C&M OILFIELD RENTALS, LLC

Application No./Patent No.: 16571527 Filed/Issue Date: SEPTEMBER 16, 2019

Titled: IMPROVED ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM

C&M OILFIELD RENTALS, LLC, a CORPORATION

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel _____, Frame _____, or for which a copy thereof is attached.

B. ☑ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: INVENTORS To: JCA RENTALS, LLC

   The document was recorded in the United States Patent and Trademark Office at

   Reel 046308, Frame 0148, or for which a copy thereof is attached.

2. From: JCA RENTALS, LLC To: C&M OILFIELD RENTALS, LLC

   The document was recorded in the United States Patent and Trademark Office at

   Reel 051933, Frame 0824, or for which a copy thereof is attached.

This collection of information is required by 37 CFR 3.73(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.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☐ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/C. ERIK HAWES/	February 28, 2020
Signature	Date
C. ERIK HAWES	63328
Printed or Typed Name	Title or Registration Number

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/571,527	09/16/2019	JOSHUA C. ALLISON	120257-5001 US02

CONFIRMATION NO. 1021

9629
Morgan, Lewis & Bockius LLP (WA)
1111 Pennsylvania Avenue, N.W.
Washington, DC 20004

PUBLICATION NOTICE

OC000000113833028

Title:ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM

Publication No.US-2020-0011496-A1
Publication Date:01/09/2020

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently https://portal.uspto.gov/pair/PublicPair. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

UNITED STATES PATENT AND TRADEMARK OFFICE

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

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
16/571,527	09/16/2019	2875	785	120257-5001 US02	12	1

CONFIRMATION NO. 1021

FILING RECEIPT

9629
Morgan, Lewis & Bockius LLP (WA)
1111 Pennsylvania Avenue, N.W.
Washington, DC 20004

OC000000111479088

Date Mailed: 09/30/2019

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

JOSHUA C. ALLISON, CODY, WY;
JOSH HAALAND, CODY, WY;
JESSICA IVANOFF, CODY, WY;

Applicant(s)

JCA RENTALS, LLC, Cody, WY;

Assignment For Published Patent Application

JCA RENTALS, LLC, CODY, WY

Power of Attorney: The patent practitioners associated with Customer Number 9629

Domestic Priority data as claimed by applicant

This application is a CON of 16/138,723 09/21/2018
which is a CIP of 16/009,032 06/14/2018
which claims benefit of 62/643,663 03/15/2018

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 09/26/2019
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/571,527**
Projected Publication Date: 01/09/2020
Non-Publication Request: No
Early Publication Request: No
**** SMALL ENTITY ****
Title

ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM

Preliminary Class

362

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative,

this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop

technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

Petitioner Ensign
Exhibit 1002 - 296 of 336

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 16/571,527

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	75		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	330		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	380		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	12 minus 20 =	*	x 50 =	0.00	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1 minus 3 =	*	x 230 =	0.00			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	785		TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)	OR	RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

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

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

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

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

PTO/AIA/80 (07-17)
Approved for use through 01/31/2018. OMB 0651-0035
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POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

[X] Practitioners associated with Customer Number: 9629

OR

[ ] Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

[X] The address associated with Customer Number: 9629

OR

[ ]

Firm or individual name		
Address		
City	State	Zip
Country		
Telephone	Email	

Assignee name and address: JCA Rentals, LLC
3429 Cottonwood Avenue
Cody, WY 82414 United States of America

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of the practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee.

Signature	Date March 15, 2018
Name Joshua C. Allison	Telephone 512-663-0732
Title President	

This collection of information is required by 37 CFR 1.31, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public, which is to update (and by the USPTO to process) the file of a patent or reexamination proceeding. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 18 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.

IMPROVED ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM

TECHNICAL FIELD

[0001] The present application relates to lighting systems, and more particularly, to lighting systems that may be used for a drilling application.

BACKGROUND

[0002] Lighting systems for drilling rigs and their surrounding areas are critical to ensure continuous and safe operation of well sites. To ensure even and effective lighting of the well site, lighting systems have previously been installed on the uppermost portion of the drilling rig, also referred to as the "crown" of the rig. Prior art crown-mounted lighting systems developed for oil rigs are limited in several ways. Their designs are complicated and designed for specific rigs or rig types. Typically, once they are designed for a particular rig or a particular type of rig, the lighting systems designs are limited and are not able to be adapted for other uses.

[0003] Prior art lighting systems for drilling rigs are fixed, monolithic structures that are typically crown or frame systems, with a single size and layout accommodating one type of light and rig. Because they are a single structural unit, they are heavy and typically require cranes along with multiple workers for installation, removal, and adjustments. A typical rig lighting frame system may require between 6 and 12 hours for installation. Further, before a derrick can be moved, the lighting systems must be removed—again with all of the necessary equipment and personnel—and a similar amount of time may be required for uninstallation. These installation and uninstallation times extend the time needed between rig deployments. Due to the high cost of operating a rig, any such delay is extremely inefficient for the operator of a wellsite. These factors also increase the time required to be spent on maintaining these systems, which also increases safety risk.

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SUMMARY

[0004] An improved elevated structure-mounted lighting system is disclosed. In addition to being used on rigs, embodiments of the lighting system may be used with different applications, including for drilling, production, refineries, frac sites, construction, and other industrial applications that may use tower/mast type equipment. The improved elevated structure-mounted lighting system may accommodate any style or design of crown section of a drilling rig and may be mounted on a pole or independent mount system.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] Embodiments of the present invention are described with reference to the following figures. The same numbers are used throughout the figures to reference like features and components. Various embodiments may utilize elements and/or components other than those illustrated in the drawings, and some elements and/or components may not be present in various embodiments. Elements and/or components in the figures are not necessarily drawn to scale.

[0006] FIG. 1 illustrates a prior art crown-mounted frame-based lighting system.

[0007] FIG. 2 shows a three-dimensional isometric view of three embodiments of the improved elevated structure-mounted lighting system that are depicted relative to a crown deck.

[0008] FIG. 3 illustrates an elevation view of three embodiments of the improved elevated structure-mounted lighting system that are depicted relative to a crown deck.

[0009] FIGS. 4A and 4B are enlarged views of two embodiments of a light fixture and cap of a light unit of the improved elevated structure-mounted lighting system.

[00010] FIG. 5 is an enlarged view of an embodiment of a light fixture and a cap of a light unit illustrating different positions of the light fixture.

[00011] FIG. 6 is a side view of an embodiment of a light fixture mounting pole.

[00012] FIG. 7A is a side view of the embodiment of FIG. 6 with a light fixture that is attached to rails.

[00013] FIG. 7B is a side view of the embodiment with a single mounting plate.

[00014] FIG. 8 is a perspective view of the embodiment of FIG. 6.

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DETAILED DESCRIPTION

[00015] Fig. 1 illustrates a prior art lighting system 100. The prior art lighting system is built from a single frame 120 which includes multiple frame lights 130. The frame lights 130 are rigidly fixed onto the frame 120 and cannot be adjusted or repositioned. The frame 120 includes the electrical connections for the lights. The frame 120 may be installed on the crown 110, or top, of a drilling rig such that the ground around the drilling rig is illuminated when in use.

[00016] Fig. 2 shows a three-dimensional isometric view and Fig. 3 shows an elevation view of three embodiments of the improved elevated structure-mounted lighting system 200 that are depicted relative to a crown deck. The embodiments of the lighting system 200 may be mounted on the crown deck of a drilling rig or on other elements of a frame structure. The lighting system 200 is lightweight in design and may be manufactured using any type of metal, including aluminum, steel, carbon, hot roll, etc. The frame structure may be hollow to reduce weight. The lighting system is also modular, which allows it to be assembled on site without the use of heavy equipment, cranes, harnesses, supports, cables, etc. This reduces the risk of accidents and the time and costs associated with the same. In an embodiment, a pole-mounted design may be set up by two people in under one hour. The system may accommodate a variety of different light types, with differing luminosities and power consumption, that may be selected based on the particular application. Variations of light types may include combustion-proof and/or LED lights.

[00017] The lighting system 200 is modular and assembled using multiple standalone pieces that may be configured to different structures. Three lighting unit embodiments from Figs. 2 and 3 are shown in an I-shape 210, T-shape 220, and L-shape 230, but this is not limiting and other configurations or modifications may be used, due in part to the modular nature of the system. There is no master frame or master support structure, which allows for configurability and customization.

[00018] As shown in Fig. 3, the light units 210, 220, and 230 may include a mounting pole 240, a bracket for a top rail 242, a bracket for a bottom rail 244, a cap 246, and a light fixture 248. The bracket for a top rail 242 and bracket for a bottom rail 244 may be used to attach the light mounting pole 240 to rails 205 of a crown deck of a drilling rig using U-shaped bolts or straps, as shown in Fig. 2. The straps are wrench-type straps that may be made out of a plastic composite. In another

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embodiment, the mounting pole 240 may be welded directly to the drilling rig crown or other structure.

[00019] In the alternative embodiment shown in Fig. 6, mounting pole 240 may be attached to the crown deck or other structure using brackets 300 and 310 that attach to top rail 242 and bottom rail 246 respectively. In this particular embodiment, bracket 300 comprises a top mount plate 320 and a top rail clamp 330, while bracket 310 comprises bottom mount plate 360 and clamp plate 370. One benefit of this alternative embodiment is allowing the use of shorter mounting poles, which thereby reduces the overall weight of the system. As shown more clearly in Fig. 7A, top mount plate 320 includes a vertical portion 322 that is substantially parallel to the central axis of mounting pole 240 and a horizontal portion 324 that is substantially parallel to the top surface of top rail 242. Similarly, top rail clamp 330 includes a vertical portion 332 that is substantially parallel to the central axis of mounting pole 240 and a horizontal portion 334 that is substantially parallel to the top surface of top rail 242. The horizontal portions of top mount plate 320 and top rail clamp 330 are connected together, as for example by one or more bolts, as shown in Fig. 7. Alternatively, as shown in Fig. 7A, top mount plate 320 and top rail clamp 330 may be combined into a single component that hooks over the top of top rail 242.

[00020] Mounting pole 240 is held in place and attached to top rail 242 by the use of one or more bolts 340, which are inserted through both top mount plate 320 and top rail clamp 330. In the embodiment of Fig. 7A with no separate top rail clamp, bolt(s) 340 are inserted through both vertical portions of top mount plate 320.

[00021] Mounting pole 240 may be further held in position using one or more tube clamps 350, which are bolted or otherwise connected to top mount plate 320 and/or bottom mount plate 360.

[00022] Also as shown in Fig. 7A, bottom mount plate 360 includes a vertical portion 362 that is substantially parallel to the central axis of mounting pole 240. Optionally (but not shown), bottom mount plate 360 may also include a horizontal portion that is substantially parallel to the bottom of bottom rail 244. Clamp plate 370 also includes a vertical portion 372 that is substantially parallel to the central axis of mounting pole 240. Also, optionally (but not shown), clamp plate 360 may include a horizontal portion that is substantially parallel to the bottom of bottom rail 244. Alternatively, as shown in Fig. 7B, bottom mount plate 360 and clamp plate 370 may be combined

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into a single component 336 that hooks over the bottom of bottom rail 242. In Fig. 7B, bolt 340 may be optional.

[00023] Mounting pole 240 is held in place and attached to bottom rail 244 by the use of one or more bolts 380, which are inserted through both bottom mount plate 360 and clamp plate 370. In the embodiment of Fig. 7A with no separate clamp plate, bolt(s) 380 are inserted through both vertical portions of bottom mount plate 360. Mounting pole 240 may be further held in position using tube clamp 350, which is also bolted or otherwise connected to mount plate 320.

[00024] As shown in Fig. 6, top mount plate 320 and bottom mount plate 360 are also connected to each other, using one or more bolts 390 or other fastening devices, providing further stability and for this alternative embodiment.

[00025] In addition, top mount plate 320 and bottom mount plate 360 may be configured with one or more vertically extending apertures 392 (as shown in FIG. 8), allowing the two mount plates to be moved vertically in relation to each other, while still providing the ability to insert bolt(s) 390 or other fastening devices through both mount plates. The vertically extending apertures 392 thus allow this alternative embodiment to be used on crown decks or other structures with a wide range of different dimension and configurations.

[00026] The light fixture 248 connects structurally and electrically to the cap 246, which houses wiring to accommodate any light fixture 248 that may be attached. Referring to Figs. 4A and 4B, the light fixture 248 may be bolted to the cap 246, but is preferably connected to the cap using a pin-based engagement. The pins 250 may be removable. Once the light fixture 248 is engaged with the cap 246 such that pinholes 252 are aligned, one or more pins 250 may be inserted to securely connect the light fixture 248 to the cap 246. Because the pins 250 are removable, the light fixture 248 may be disconnected and removed from the cap 246 by removing the pins 250. The light fixture 248 and cap 246 are preferably structured so that the light fixture 248 may be engaged with the cap 246 to face outward (as shown in Fig. 4A) or to face inward (as shown in Fig. 5). This may be accomplished by aligning the pinholes 252 in at least a first position or in a second position. The light fixture 248 may be configured in the outward position for use and installed in the inward position for transport.

[00027] Based on the design, more than two positions may be contemplated. For example, as shown in Fig. 7A, mounting pole 240 may be configured with a plurality of pinholes 252. In this

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embodiment, where mounting pole 240 is cylindrical, pinholes 252 may be radially spaced around the circumference of mounting pole 240. In addition, light fixture 248 may be connected to cap 246 by the use of light bracket 400. In this embodiment, as shown in Fig. 7A, light bracket 400 comprises a generally cylindrical portion 402, which extends telescopically into at least the upper portion of mounting pole 240. In addition, cylindrical portion 402 is configured with one or more pinholes 404 which are configured to be aligned with the one or more pinholes 252 on mounting pole 240. In this way, pin(s) 250 may be used to maintain light fixture 248 in a plurality of different positions simply by removing pin 250 rotating the light bracket 400 until pinhole 404 aligns with a different pinhole on mounting pole 240, and reinserting pin 250 in the new position.

[00028] Safety cables connected between the light fixture 248 and cap 246 may be used as a backup in the event that pins 250 back out or are sheared during an extreme weather condition.

[00029] With prior art lighting systems, when a square frame is mounted, the lights are also fixed and cannot be moved as they are attached to the frame as a single unit. In contrast, in the improved elevated structure-mounted lighting system, each light may be mounted on a standalone base, and does not have to be attached to a master frame. Referring back to Figs. 2 and 3, multiple light units 210, 220, and 230 may be installed on a crown in different configurations.

[00030] Accordingly, the lights may be individually shifted up, down, left, or right. Based on the location of a light unit 210, 220, or 230, if more surface area is required to be lit on a particular side, the lights may be configured and directed in that direction, or the light pole may be adjusted to achieve optimal surface lighting. Individual LED bulbs may be angled in a way to produce the greatest amount of light without dissipation. In an embodiment, efficient lights allow the lighting system to be run from 120V or 240V. The lights may come with dimmer, solar, and/or sensor options. These factors allow for lighting to be achieved more efficiently than prior art lighting systems.

[00031] Metal safety nets may also be affixed to the crown below the light units 210, 220, and 230. In additional to its modular frame design, the lighting system 200 may use consistent nut and bolt sizes, which allows flexibility and interoperability in its structural design and assembly.

[00032] The modular nature of the improved elevated structure-mounted lighting system also allows for it to be serviced or adjusted while it is erect and installed. There is a single cable to connect to a power source from crown to ground. At the lighting junction box, 12 quarter turn

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Appletons may be used. Woodhead plugs may also be used on the junction box. Further, the improved elevated structure-mounted lighting system does not have to be removed or taken down when the derrick or other applications are being transported or moved, which is allowed because the cords may be disconnected, rather than removed, during transport. Once transport is complete, the cords may be reconnected. Other features, such as an explosion-proof control panel on the ground with power switches may be used. As noted above, due to the high costs of rig operation, reducing time for installation and maintenance and improving safety are significant factors to reducing operation costs.

[00033] Many modifications and other implementations beyond those set forth herein will be apparent having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the systems and methods described herein are not to be limited to the specific implementations disclosed and that modifications and other implementations are intended to be included within the scope of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense and not for purposes of limitation.

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CLAIMS

1. A structure-mounted lighting system comprising:

a plurality of light units, each light unit comprising:

a mounting pole coupled to a cap and configured to be connected to the structure;

a light fixture electrically and structurally coupled to the cap, the light fixture comprising one or more lights; wherein the light fixture may be structurally coupled to the cap in a first position or a second position.

2. The structure-mounted lighting system of claim 1, further comprising safety nets connected to the structure.

3. The structure-mounted lighting system of claim 1, wherein the light fixture is structurally coupled to the cap using one or more bolts.

4. The structure-mounted lighting system of claim 1, wherein the light fixture is structurally coupled to the cap using one or more pins.

5. The structure-mounted lighting system of claim 1, wherein the light fixture is secondarily coupled to the cap using a cable.

6. The structure-mounted lighting system of claim 1, wherein, when the light fixture is in the first position, the one or more lights of the light fixture are oriented away from the structure.

7. The structure-mounted lighting system of claim 6, wherein, when the light fixture is in the second position, the one or more lights of the light fixture are oriented towards the structure.

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8. The structure-mounted lighting system of claim 1, wherein the mounting pole is welded to the structure.

9. The structure-mounted lighting system of claim 1, wherein the mounting pole is connected to the structure using U-shaped bolts.

10. The structure-mounted lighting system of claim 1, wherein the mounting pole is connected to the structure using straps.

11. The structure-mounted lighting system of claim 11, wherein the straps are made from a plastic composite.

12. The structure-mounted lighting system of claim 1, wherein the structure is a crown of a drilling rig.

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ABSTRACT

An improved elevated structure-mounted lighting system is disclosed. The lighting system may be used on drilling rigs, or with other applications, including for drilling, production, refineries, frac sites, construction, and other industrial applications that may use tower/mast type equipment. The improved elevated structure-mounted lighting system may accommodate any style or design of crown section of a drilling rig and may be mounted on a pole or independent mount system.

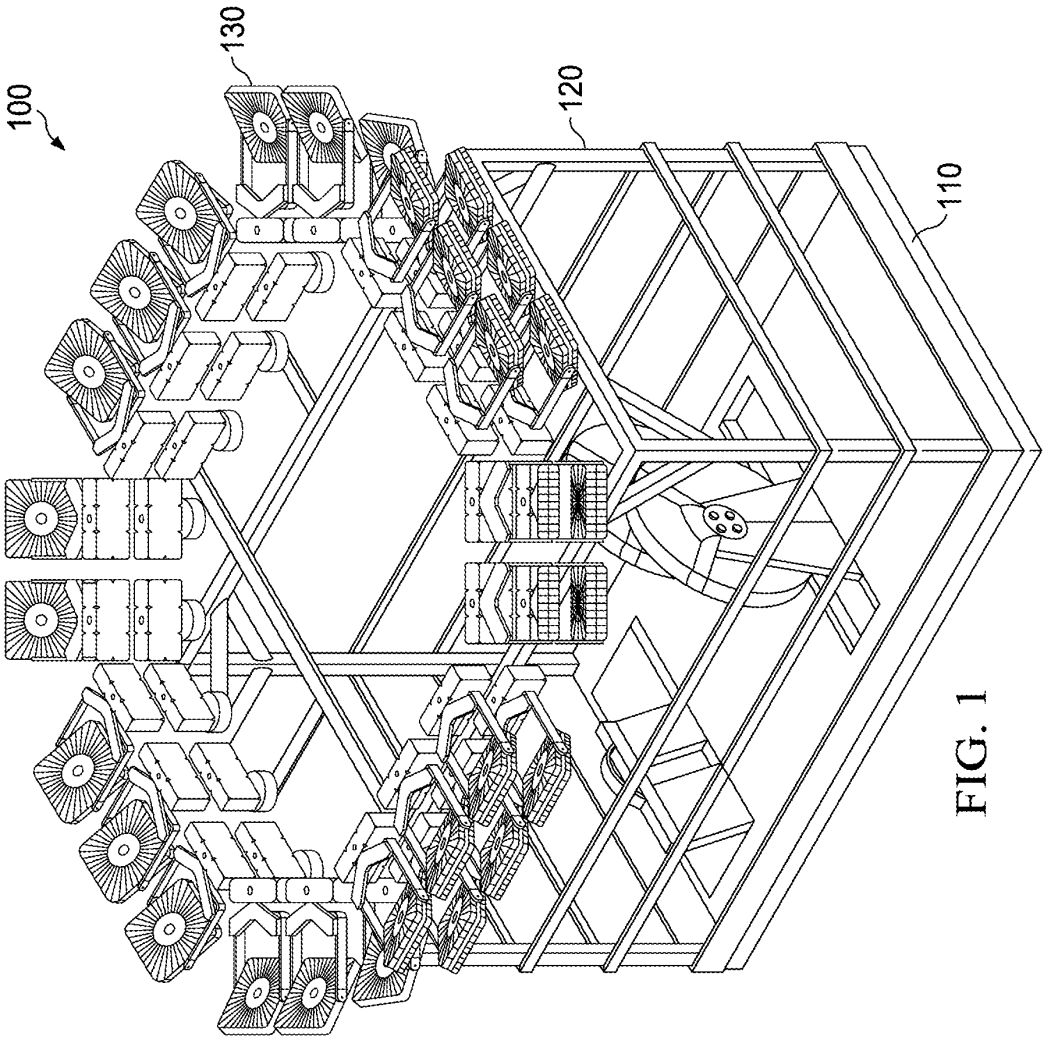


FIG. 1

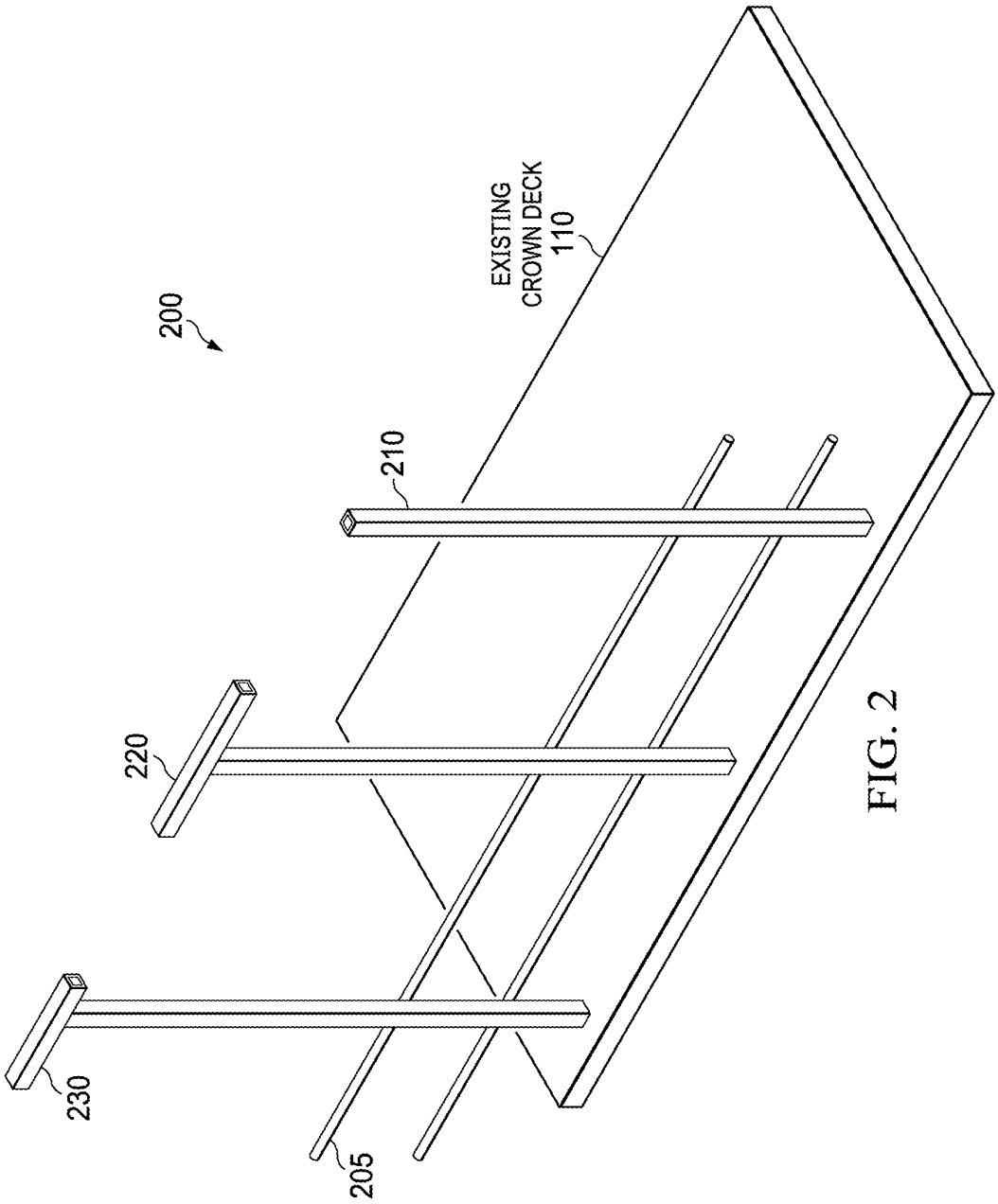


FIG. 2

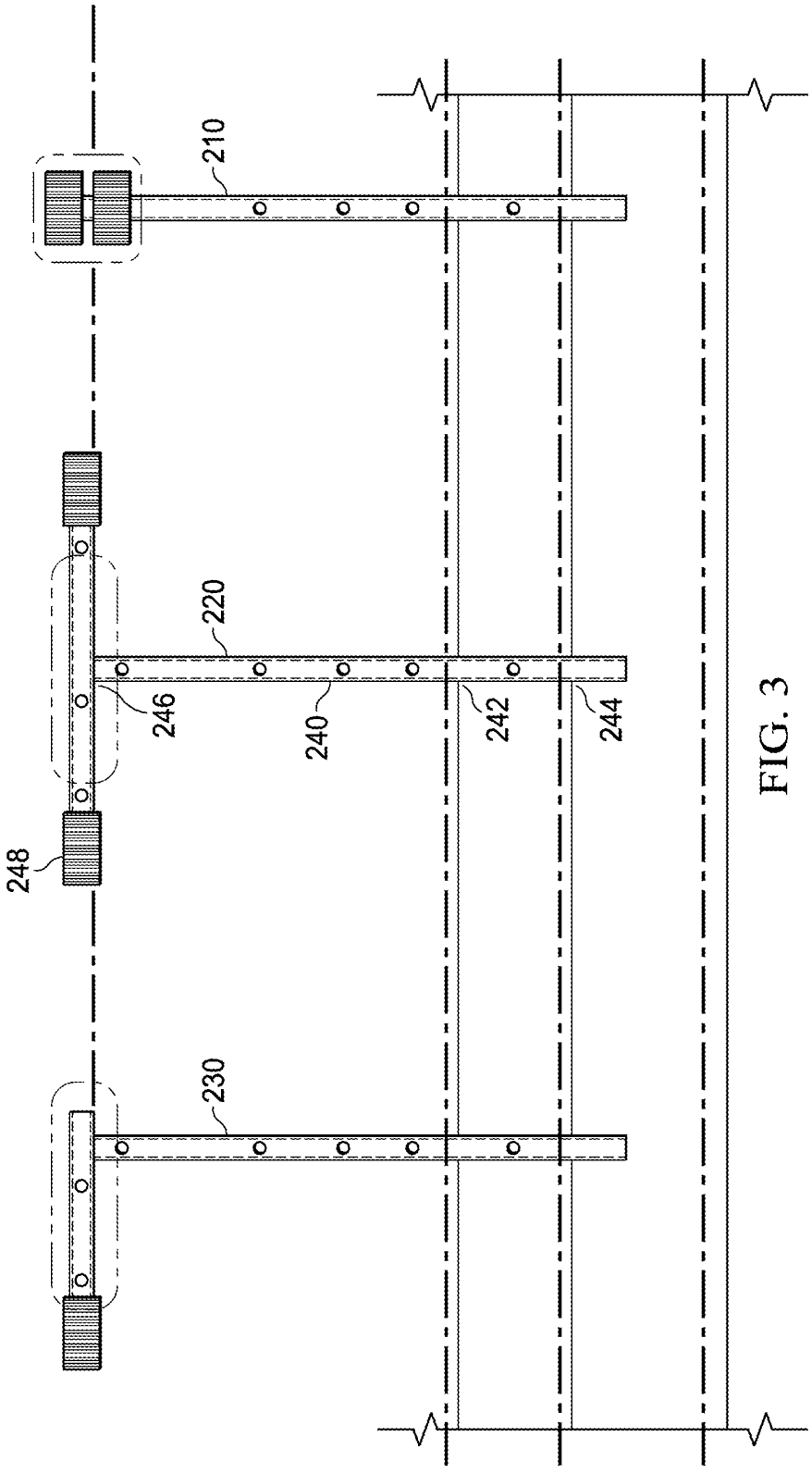


FIG. 3

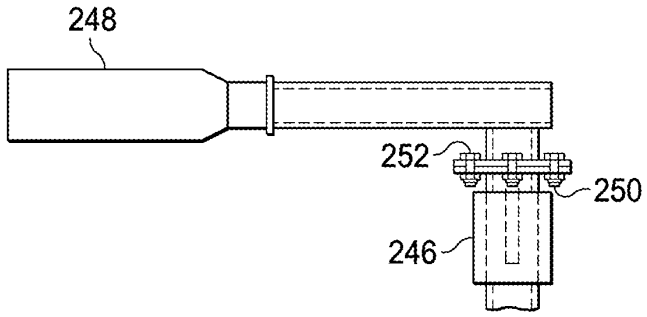


FIG. 4A

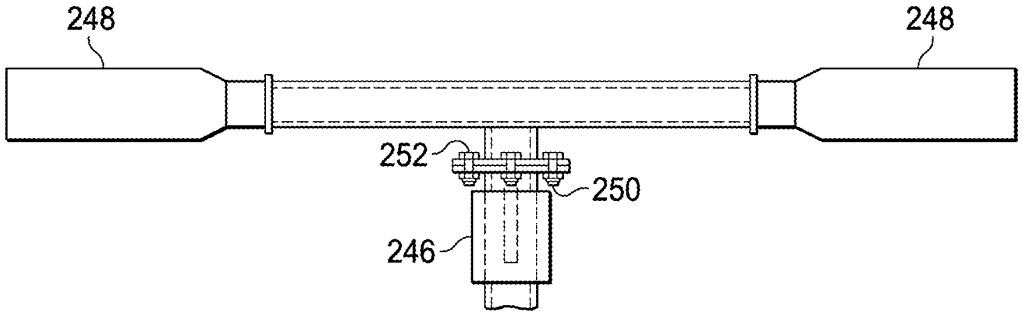


FIG. 4B

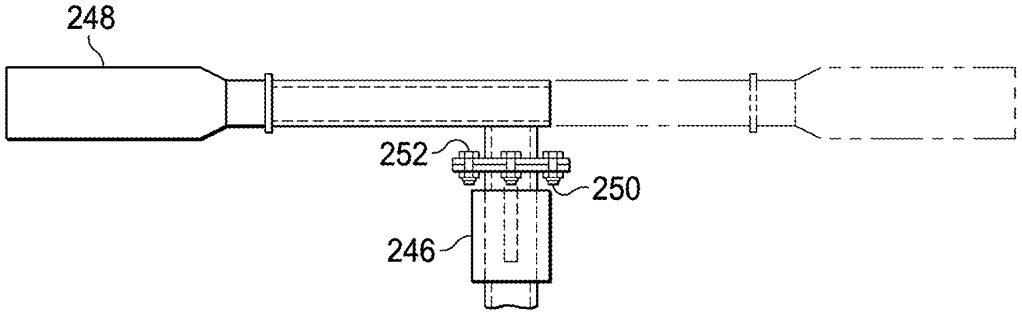


FIG. 5

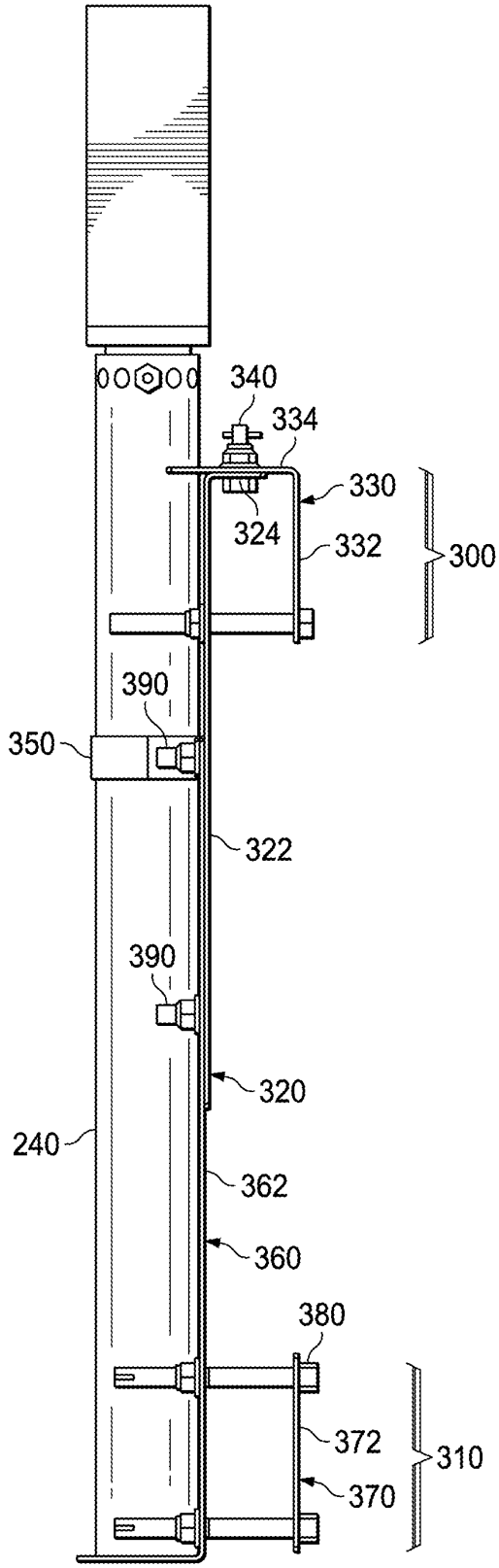

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FIG. 6

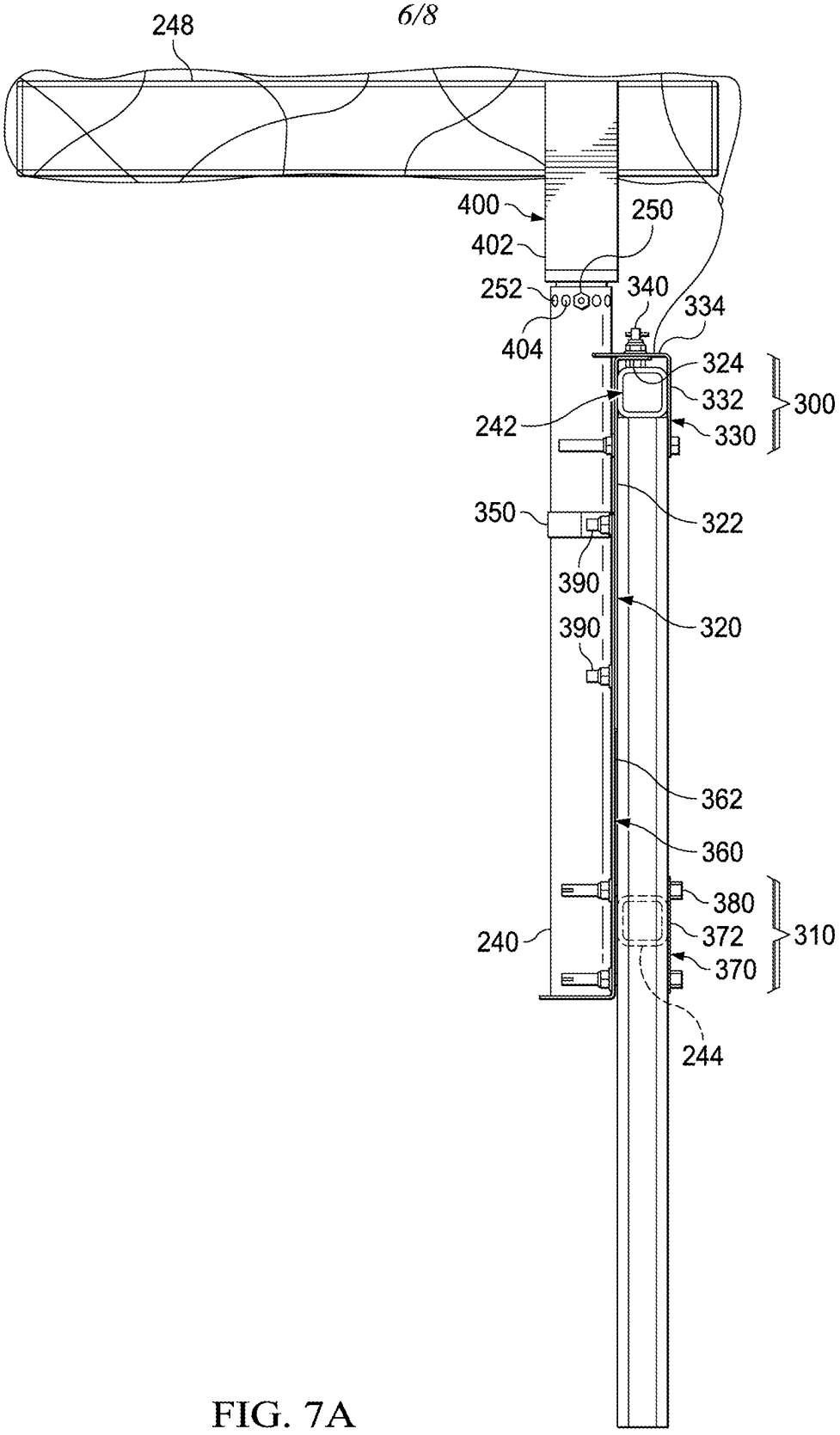

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FIG. 7A

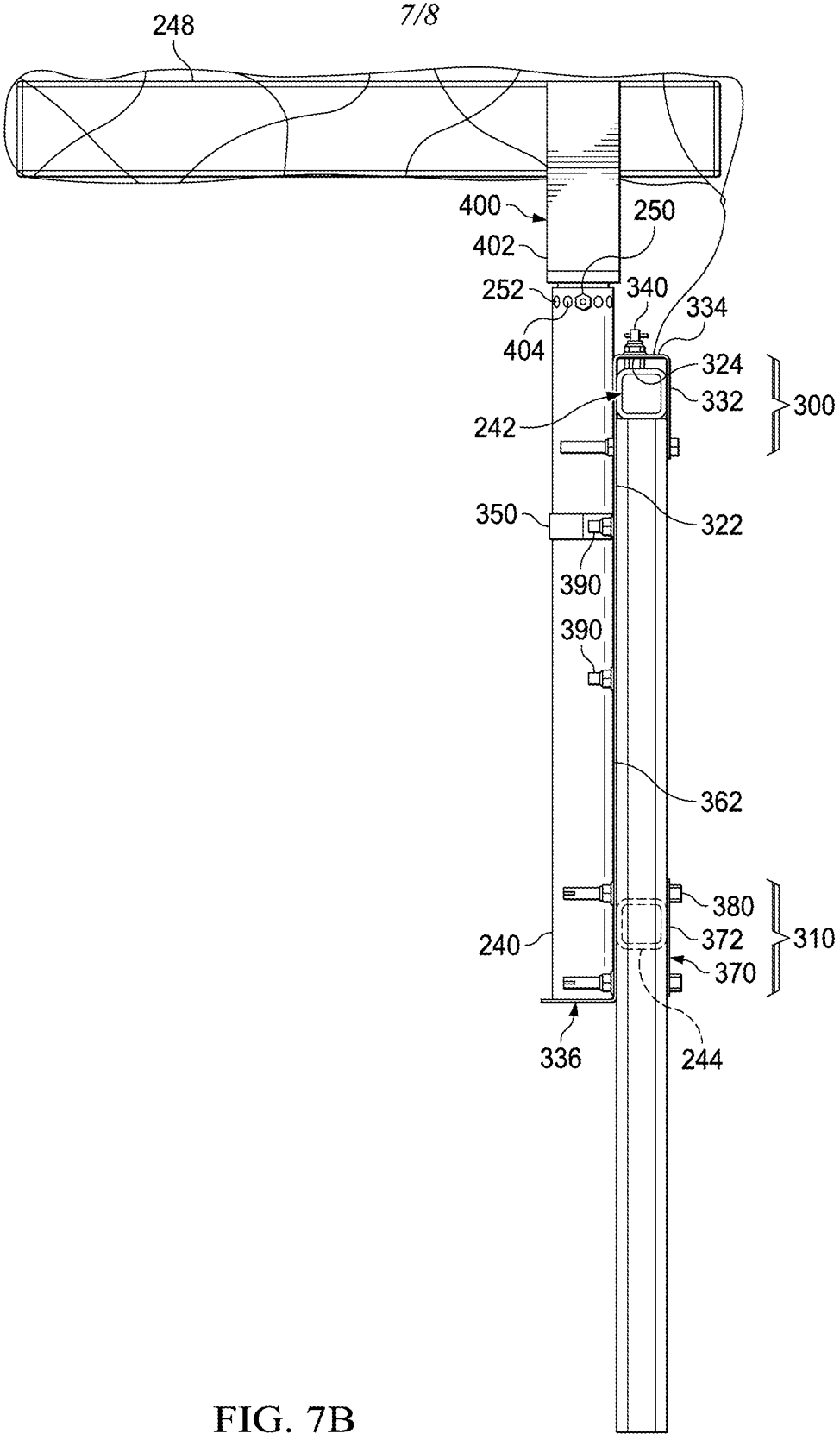

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FIG. 7B

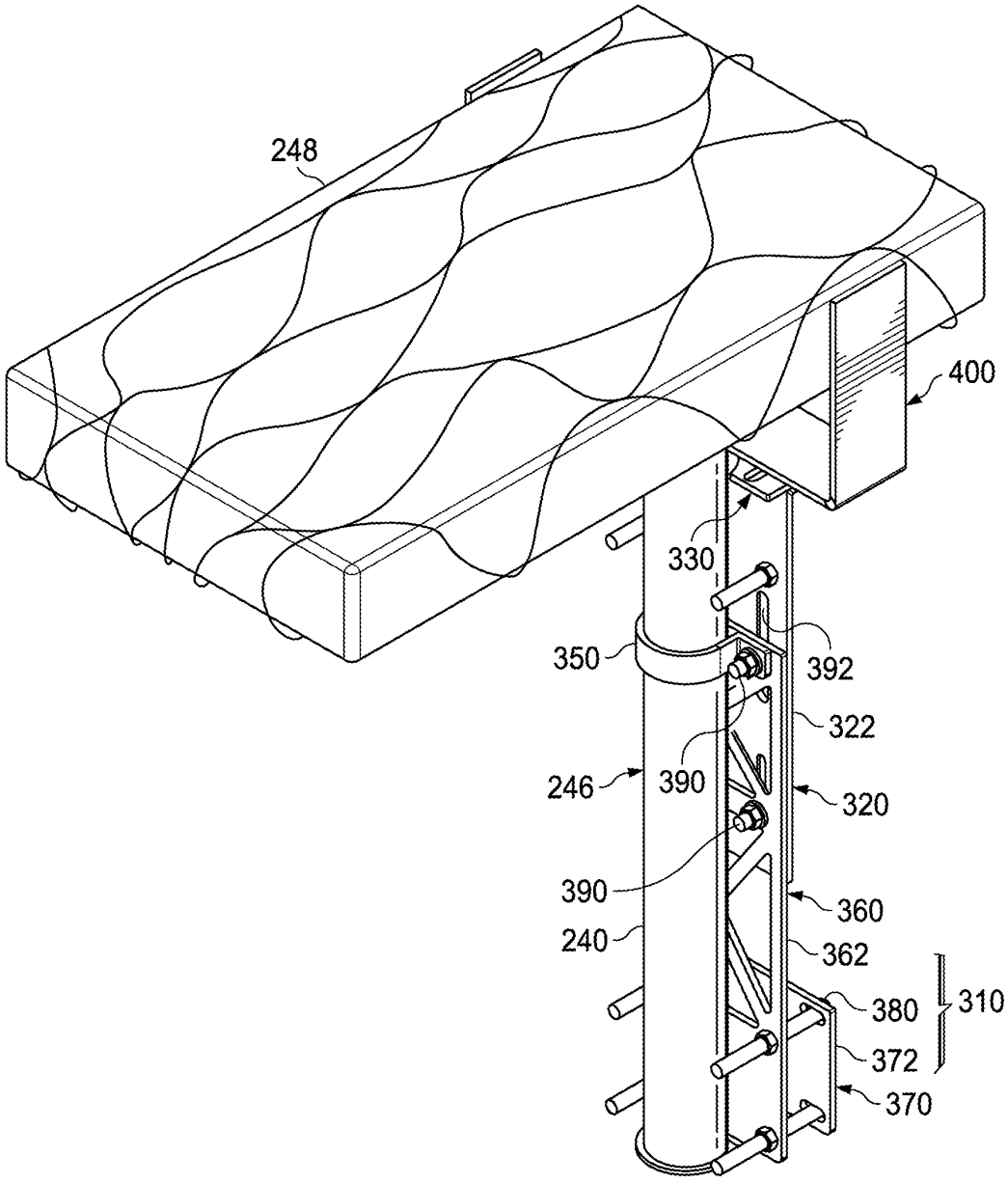

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FIG. 8

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	IMPROVED ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM
First Named Inventor/Applicant Name:	JOSHUA C. ALLISON
Filer:	Clay Erik Hawes
Attorney Docket Number:	120257-5001 US02

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY FILING FEE (ELECTRONIC FILING)	4011	1	75	75
UTILITY SEARCH FEE	2111	1	330	330
UTILITY EXAMINATION FEE	2311	1	380	380
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**785**

Electronic Acknowledgement Receipt	
EFS ID:	37172756
Application Number:	16571527
International Application Number:	
Confirmation Number:	1021
Title of Invention:	IMPROVED ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM
First Named Inventor/Applicant Name:	JOSHUA C. ALLISON
Customer Number:	9629
Filer:	Clay Erik Hawes
Filer Authorized By:	
Attorney Docket Number:	120257-5001 US02
Receipt Date:	16-SEP-2019
Filing Date:	
Time Stamp:	13:44:26
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$785
RAM confirmation Number	E20199FD45020132
Deposit Account	500310
Authorized User	Clay Hawes
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.17 (Patent application and reexamination processing fees) 37 CFR 1.21 (Miscellaneous fees and charges)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	1_CM5001US02_ADS.pdf	1294490 bb6a3b500969828e806e250eb9a28eec254965c8	no	9
Warnings:					
Information:					
2	Oath or Declaration filed	2_CM5001US02_3Declarations.pdf	247371 d7819720b4b3ae7d7680b097712f8ad9d1c8413e	no	3
Warnings:					
Information:					
3	Assignee showing of ownership per 37 CFR 3.73	3_CM5001US02_373Statement.pdf	117432 9fecd99b4a66e2730075eea12bee085bff5878c7	no	3
Warnings:					
Information:					
4	Power of Attorney	4_CM5001US02_PowerofAttorney.pdf	145438 3594e6a62cb767765c4870237995b1b918f56f60	no	1
Warnings:					
Information:					
5		5_CM5001US01_SPECCLAIMSABS.pdf	151924 20117c9df46ea8d3a0fc2ab29b33372cfa6ea108	yes	10

Multipart Description/PDF files in .zip description

Document Description	Start	End
Specification	1	7
Claims	8	9
Abstract	10	10

Warnings:					
Information:					
6	Drawings-only black and white line drawings	6_CM5001US02_DRAWINGS.pdf	947909 0b08615aadff01137bfae0e3e49305f0d706d88d	no	8
Warnings:					
Information:					
7	Fee Worksheet (SB06)	fee-info.pdf	34722 cc765d1bfb0e86ca2563038831934b9df147bfab	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	2939286	

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

<u>New Applications Under 35 U.S.C. 111</u>
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	120257-5001 US02
	Application Number	
Title of Invention	IMPROVED ELEVATED STRUCTURE-MOUNTED LIGHTING 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.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	JOSHUA	C.	ALLISON	

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

City	State/Province	Country of Residence
CODY	WY	US

Mailing Address of Inventor:

Address 1	C/O JCA RENTALS, LLC
Address 2	3429 COTTONWOOD AVENUE

City	State/Province	Postal Code	Country
CODY	WY	82414	US

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	JOSH		HAALAND	

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

City	State/Province	Country of Residence
CODY	WY	US

Mailing Address of Inventor:

Address 1	C/O JCA RENTALS, LLC
Address 2	3429 COTTONWOOD AVENUE

City	State/Province	Postal Code	Country
CODY	WY	82414	US

Inventor 3 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	JESSICA		IVANOFF	

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	120257-5001 US02
	Application Number	
Title of Invention	IMPROVED ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM	

City	CODY	State/Province	WY	Country of Residence	US

Mailing Address of Inventor:

Address 1	C/O JCA RENTALS, LLC		
Address 2	3429 COTTONWOOD AVENUE		
City	CODY	**State/Province**	WY
Postal Code	82414	**Country**	US

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

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	9629		
Email Address	WAPATENTS@MORGANLEWIS.COM	Add Email	Remove Email
Email Address	NEIL.OZARKAR@MORGANLEWIS.COM	Add Email	Remove Email

Application Information:

Title of the Invention	IMPROVED ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM		
Attorney Docket Number	120257-5001 US02	**Small Entity Status Claimed**	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	8	**Suggested Figure for Publication (if any)**	8

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	120257-5001 US02
	Application Number	
Title of Invention	IMPROVED ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM	

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	9629		

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 of	16138723	2018-09-21
Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
16138723	Continuation in part of	16009032	2018-06-14
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
16009032	Claims benefit of provisional	62643663	2018-03-15

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	120257-5001 US02
	Application Number	
Title of Invention	IMPROVED ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM	

Foreign Priority Information:

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).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

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.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	120257-5001 US02
	Application Number	
Title of Invention	IMPROVED ELEVATED STRUCTURE-MOUNTED LIGHTING 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.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	120257-5001 US02
	Application Number	
Title of Invention	IMPROVED ELEVATED STRUCTURE-MOUNTED LIGHTING 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

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	JCA RENTALS, LLC		
Mailing Address Information For Applicant:			
Address 1	3429 COTTONWOOD AVENUE		
Address 2			
City	CODY	**State/Province**	WY
Country	US	Postal Code	82414
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee 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.

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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	120257-5001 US02
	Application Number	
Title of Invention	IMPROVED ELEVATED STRUCTURE-MOUNTED LIGHTING 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.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☒

Organization Name	JCA RENTALS, LLC

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1	3429 COTTONWOOD AVENUE		
Address 2			
City	CODY	**State/Province**	WY
Country i	US	Postal Code	82414
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

Signature:

Remove

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

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	/C. ERIK HAWES/			Date (YYYY-MM-DD)	2019-09-16
First Name	C. ERIK	Last Name	HAWES	Registration Number	63328

Additional Signature may be generated within this form by selecting the Add button. Add

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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	120257-5001 US02
	Application Number	
Title of Invention	IMPROVED ELEVATED STRUCTURE-MOUNTED LIGHTING 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.**

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 the Freedom of Information Act requires disclosure of these records.

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 CooperationTreaty.

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.

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	IMPROVED ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [■] The attached application, or
- [ ] United States application or PCT international application number _____ filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: JOSHUA C. ALLISON Date (Optional) : _____

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1 minute 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.

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	IMPROVED ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [■] The attached application, or
- [ ] United States application or PCT international application number _____ filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: JOSH HAALAND Date (Optional): 9/24/18

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1 minute 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.

PTO/AIA/01 (06-12)
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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	IMPROVED ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [■] The attached application, or
- [ ] United States application or PCT international application number _____ filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: JESSICA IVANOFF Date (Optional) : _____

Signature: Jessica Ivanoff

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1 minute 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.**

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STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: JCA RENTALS, LLC

Application No./Patent No.: _____ Filed/Issue Date: 2019-09-16

Titled: IMPROVED ELEVATED STRUCTURE-MOUNTED LIGHTING SYSTEM

JCA RENTALS, LLC, a CORPORATION

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 046960, Frame 0139, or for which a copy thereof is attached.

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

   1. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached.

   2. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached.

This collection of information is required by 37 CFR 3.73(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.

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STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

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4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

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5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☐ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/C. ERIK HAWES/	2019-09-16
Signature	Date
C. ERIK HAWES	63328
Printed or Typed Name	Title or Registration Number

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.