505605665 08/05/2019 PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1 Stylesheet Version v1.2 EPAS ID: PAT5652466

| SUBMISSION TYPE: | | NEW ASSIGNMENT | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------------|
| IATURE OF CONVEYAN | CE: | CE: ASSIGNMENT | | |
| CONVEYING PARTY DA | TA | | | |
| | | Name | | Execution Date |
| RONALD SILVER | | | | 08/05/2019 |
| JASWINDER SINGH | | | | 08/02/2019 |
| DAVID M. GINTER | | | | 08/05/2019 |
| PAUL WANG | | | 07/31/2019 | |
| MICHAEL BARDELL | | | | 07/31/2019 |
| | Г А | | | |
| Name: | | RPILLAR INC. | | |
| Street Address: | 510 LA | KE COOK ROAD | | |
| City: | DEER | FIELD | | |
| State/Country: | ILLINC | DIS | | |
| Postal Code: | 60015 | | | |
| Property Type | | Number | | |
| Property Type | | | | |
| | | 16671767 | | |
| Application Number: | | 16531463 | | |
| Application Number: | | 10331403 | | |
| | ATA | | | |
| Application Number: CORRESPONDENCE DA Fax Number: Correspondence will be | sent t | (309)675-1236 o the e-mail address first; if that is | | |
| Application Number: CORRESPONDENCE DA Fax Number: Correspondence will be using a fax number, if p | sent t | (309)675-1236 o the e-mail address first; if that is d; if that is unsuccessful, it will be | | |
| Application Number: CORRESPONDENCE DA Fax Number: <i>Correspondence will be using a fax number, if p</i> Phone: | sent t | (309)675-1236 o the e-mail address first; if that is d; if that is unsuccessful, it will be 3096755140 | | |
| Application Number: CORRESPONDENCE DA Fax Number: <i>Correspondence will be using a fax number, if p</i> Phone: Email: | sent t | (309)675-1236 o the e-mail address first; if that is d; if that is unsuccessful, it will be 3096755140 US_docket_clerk@cat.com | | |
| Application Number: CORRESPONDENCE DA Fax Number: Correspondence will be using a fax number, if p Phone: Email: Correspondent Name: | sent t | (309)675-1236 o the e-mail address first; if that is d; if that is unsuccessful, it will be 3096755140 US_docket_clerk@cat.com CATERPILLAR INC. JOINT OC | | |
| Application Number: CORRESPONDENCE DA Fax Number: Correspondence will be using a fax number, if p Phone: Email: Correspondent Name: Address Line 1: | sent t | (309)675-1236 o the e-mail address first; if that is d; if that is unsuccessful, it will be 3096755140 US_docket_clerk@cat.com CATERPILLAR INC. JOINT OC 100 NE ADAMS | | |
| Application Number: CORRESPONDENCE DA Fax Number: Correspondence will be using a fax number, if p Phone: Email: Correspondent Name: Address Line 1: Address Line 4: | sent to | (309)675-1236 o the e-mail address first; if that is d; if that is unsuccessful, it will be 3096755140 US_docket_clerk@cat.com CATERPILLAR INC. JOINT OC 100 NE ADAMS PEORIA, ILLINOIS 61629-9510 | | |
| Application Number: CORRESPONDENCE DA Fax Number: <i>Correspondence will be</i> <i>using a fax number, if p</i> Phone: Email: Correspondent Name: Address Line 1: Address Line 4: ATTORNEY DOCKET NU | sent to | (309)675-1236 o the e-mail address first; if that is d; if that is unsuccessful, it will be 3096755140 US_docket_clerk@cat.com CATERPILLAR INC. JOINT OC 100 NE ADAMS PEORIA, ILLINOIS 61629-9510 120451-047UT1 | | |
| Application Number: CORRESPONDENCE DA Fax Number: Correspondence will be using a fax number, if p Phone: Email: Correspondent Name: Address Line 1: Address Line 4: ATTORNEY DOCKET NU NAME OF SUBMITTER: | sent to | (309)675-1236 o the e-mail address first; if that is d; if that is unsuccessful, it will be 3096755140 US_docket_clerk@cat.com CATERPILLAR INC. JOINT OC 100 NE ADAMS PEORIA, ILLINOIS 61629-9510 120451-047UT1 PAMELA SKELTON | | |
| Application Number: CORRESPONDENCE DA Fax Number: Correspondence will be using a fax number, if p Phone: Email: Correspondent Name: Address Line 1: Address Line 4: ATTORNEY DOCKET NU NAME OF SUBMITTER: SIGNATURE: | sent to | (309)675-1236 o the e-mail address first; if that is d; if that is unsuccessful, it will be 3096755140 US_docket_clerk@cat.com CATERPILLAR INC. JOINT OC 100 NE ADAMS PEORIA, ILLINOIS 61629-9510 120451-047UT1 PAMELA SKELTON /Pamela Skelton/ | | |
| Application Number: CORRESPONDENCE DA Fax Number: Correspondence will be using a fax number, if p Phone: Email: Correspondent Name: Address Line 1: Address Line 4: ATTORNEY DOCKET NU NAME OF SUBMITTER: | sent to | (309)675-1236 o the e-mail address first; if that is d; if that is unsuccessful, it will be 3096755140 US_docket_clerk@cat.com CATERPILLAR INC. JOINT OC 100 NE ADAMS PEORIA, ILLINOIS 61629-9510 120451-047UT1 PAMELA SKELTON | | |
| Application Number: CORRESPONDENCE DA Fax Number: <i>Correspondence will be</i> <i>using a fax number, if p</i> Phone: Email: Correspondent Name: Address Line 1: Address Line 4: ATTORNEY DOCKET NU VAME OF SUBMITTER: BIGNATURE: | MBER: | (309)675-1236 o the e-mail address first; if that is 3096755140 US_docket_clerk@cat.com CATERPILLAR INC. JOINT OC 100 NE ADAMS PEORIA, ILLINOIS 61629-9510 120451-047UT1 PAMELA SKELTON /Pamela Skelton/ 08/05/2019 | | |

ASSIGNMENT

WHEREAS I/We, the below named inventor(s), [hereinafter referred to as Assignor(s)], have made an invention entitled:

STOICHIOMETRIC ENGINE SYSTEM UTILIZING THREE-WAY CATALYST UPSTREAM OF TURBINE

for which I/We will or have filed a patent application; and

WHEREAS, **CATERPILLAR INC.**, a corporation of Delaware whose post office address is 510 Lake Cook Road, Suite 100, Deerfield, IL 60015, United States of America (hereinafter referred to as Assignee), is desirous of securing the entire right, title, and interest in and to this invention, and in and to the patent application for this invention and any and all patents to be issued upon this application throughout the world;

NOW THEREFORE, be it known that for good and valuable consideration the receipt of which from Assignee is hereby acknowledged, I/We, as Assignor(s), have sold, assigned, transferred, and set over, and do hereby sell, assign, transfer, and set over unto the Assignee, its lawful successors and assigns, my/our entire right, title, and interest in and to this invention, and this application, and all divisions, and continuations thereof, and all patents which may be granted thereon, and all reissues thereof, as well as all rights to claim priority in any country or jurisdiction or patent office on the basis of this application, and all applications for patents which may hereafter be filed for this invention in any country or jurisdiction or patent office, and all extensions, renewals, and reissues thereof; and I/We hereby authorize and request any official of any country or jurisdiction or patent office whose duty it is to issue patents on applications as described above, to issue all patents for this invention to Assignee, its successors and assigns, in accordance with the terms of this Assignment;

AND, I/WE HEREBY covenant that I/We have the full right to convey the interest assigned by this Assignment, and I/We have not executed and will not execute any agreement in conflict with this Assignment;

AND, I/WE HEREBY further covenant and agree that I/We will, without further consideration, communicate with Assignee, its successors and assigns, any facts known to me/us respecting this invention, and testify in any legal proceeding, sign all lawful papers when called upon to do so, execute and deliver any and all papers that may be necessary or desirable to perfect the title to this invention in said Assignee, its successors or assigns, execute all divisional, continuation, and reissue applications, make all rightful oaths and generally do everything possible to aid Assignee, its successors and assigns, to obtain and enforce proper patent protection for this invention in any country or jurisdiction or patent office, it being understood that any expense incident to the execution of such papers shall be borne by the Assignee, its successors and assigns;

AND, I/WE HEREBY authorize Assignee or the attorneys/representatives of Assignee to insert here in parentheses the country, application number, and official filing date (United States Application No. <u>16/531,463</u>, filed <u>August 5, 2019</u>).

IN TESTIMONY WHEREOF, I/We have hereunto set our hands.

| 1. FULL NAME OF SOLE OR FIRST ASSIGNOR Ronald Silver | ASSIGNOR'S SIGNATURE | DATE Angust 5, 2019 |
|---------------------------------------------------------|----------------------|------------------------|
| ADDRESS 5631 N. Prospect Road, Peoria, IL 61614 | | CITIZÈŇSHIP US |
| | | |
| 1 WITNESS NAME | WITNESS SIGNATURE | DATE |
| CHARLIE KIM | Celk | August 5, 2019 |
| ADDRESS 11115 N HARE | L WAY | CITIZENSHIP USA |
| DUNLAP, IL | 61525 | |
| 2. WITNESS NAME BOBBY JOHN | WITNESS SIGNATURE | DATE 08/05/2019 |
| ADDRESS 2310 W, KEMEIE | -D c.T | CITIZENSHIP ZNDZA |
| PEDALA, 12-616 | | |

| 2. FULL NAME OF SECOND ASSIGNOR, IF ANY Jaswinder Singh | ASSIGNOR'S SIGNATURE | DATE 多/ン/(ペ |
|------------------------------------------------------------|----------------------|--------------------|
| ADDRESS 625 S. Prairieview Drive, Dunlap, IL 6 | CITIZENSHIP US | |
| | | |
| 1. WITNESS NAME | | DATE |
| Kant Staves | 1 Kulls- | 8/z/19 |
| ADDRESS 1999 W FORESTALED DR | PEDELA IL 61615 | citizenship USA |

| 6 | |
|-------------------------------------|-------------|
| 2. WITNESS NAME WITNESS SIGNATURE | DATE |
| Roser L. Unien Jr. Room S. Umen Gr. | 8/a/19 |
| ADDRESS / | CITIZENSHIP |
| 10518 N. Schapp Lin Venia TT. 61615 | 11514 |
| // | |
| | ľ |

| 3. FULL NAME OF THIRD ASSIGNOR, IF ANY DAVID M. GINTER | ASSIGNORS SIGNATURE | 57/202019 |
|--------------------------------------------------------|---------------------|-------------------|
| ADDRESS 924 W. Loire Ct., #502, Peoria, IL 61614 | | CITIZENSHIP US |
| | | |

| 1. WITNESS NAME | WITNESS-919NAZURE/ | DATE | |
|-----------------------------------------------------------------------------------------------------------------|--------------------|-------------------------|--|
| Chad koci | (low them | 8/5/19 | |
| ADDRESS Les Shappy Creek | * | CITIZENSHIP | |
| Washington TL 615 | 7(| USA | |
| | | | |
| Press and a second s | | | |
| 2. WITNESS NAME | WITNESS SIGNATURE | DATE | |
| 2. WITNESS NAME Christophes Lusardi | | DATE 8/5/2019 | |
| <u>Christophen</u> Lusardi ADDRESS | | 8/s/2019 Citizenship | |
| Christopher Lusardi | | 8/5/2019 | |

| 4 FULL NAME OF THIRD ASSIGNOR, IF ANY Paul Wang | ASSIGNOR'S SIGNATURE | DATE 7/3///9 |
|----------------------------------------------------------|--------------------------------|-----------------------------|
| Aconess 7316 N. Edgewild Drive, Peoria, IL 61614 | | CITUZENSHIP US |
| | | |
| r withers name Niko Landin | WITNESS SIGNATURE Mile Shin | date 7/3//(9 |
| 400 RESS Grey Eagle Cir. N., Colorado Springs, CO, 80919 | | CITIZENSHIP Q.S. Citizen |
| 2. WITNESS NAME | | |
| Anold Kim | MITNESS SIGNATURE | 1/31/2es/9 |
| ADDRESS 2306 W Paddington | CE. Peosta, UL | CITIZENSHIP C/_S |
| ş | | |

| 5. FULL NAME OF THIRD ASSIGNOR, IF ANY MICHAEI Bardell | ASSIGNOR'S SIGNATURE | DATE 7/31/19 |
|--------------------------------------------------------|----------------------|-------------------|
| ADDRESS 313 W. Wynnwood Drive, Peoria, IL 61614 | | CITIZENSHIP US |
| 1. WITNESS NAME CHARLIE KIM | WITNESS SIGNATURE | DATE 7/31/19 |
| ADDRESS UIIS N HAZEL WAY | | CITIZENSHIP |
| DUNLAP, IL 6. | 1525 | |
| | | |

| 2. WITNESS NAME Arnold Kim | WITNESS SIGNATURE Auglid IX: | DATE 1/31/2019 |
|-------------------------------|---------------------------------|-------------------|
| 2306 W. Paddington | ct. Reoria, IL 6/615 | CITIZENSHIP US |
| | | |

Page 6 of 6

PATENT REEL: 049958 FRAME: 0164

RECORDED: 08/05/2019