INTELLECTUAL PROPERTY INDIA
PATENTS | DESIGNS | TRADE MARKS
GEOGRAPHICAL INDICATIONS

सत्यमेव जयते

क्रम सं/SL No :044190747

पेटेंट कार्यालय,भारत सरकार | The Patent Office, Government Of India

पेटेंट प्रमाण पत्र | Patent Certificate

(पेटेंट नियमावली का नियम 74) | (Rule 74 of The Patents Rules)

पेटेंट सं. / Patent No.	:	545404
आवेदन सं. / Application No.	:	201941054078
फाइल करने की तारीख / Date of Filing	:	27/12/2019
पेटेंटी / Patentee	:	Dr. Narendra Kumar Yegireddy

प्रमाणित किया जाता है कि पेटेंटी को, उपरोक्त आवेदन में यथाप्रकटित *WATER HARVESTING CULVERT STRUCTURE TO RECHARGE GROUND WATER* नामक आविष्कार के लिए, पेटेंट अधिनियम, 1970 के उपबंधों के अनुसार आज तारीख दिसम्बर 2019 के सत्ताईसवें दिन से बीस वर्ष की अवधि के लिए पेटेंट अनुदत्त किया गया है।

It is hereby certified that a patent has been granted to the patentee for an invention entitled *WATER HARVESTING CULVERT STRUCTURE TO RECHARGE GROUND WATER* as disclosed in the above mentioned application for the term of 20 years from the 27th day of December 2019 in accordance with the provisions of the Patents Act,1970.

अनुदान की तारीख : 20/07/2024
Date of Grant :

उन्नत की चंडित
पेटेंट नियंत्रक
Controller of Patents

टिप्पणी - इस पेटेंट के नवीकरण के लिए फीस, यदि इसे बनाए रखा जाना है, दिसम्बर 2021 के सत्ताईसवें दिन को और उसके पश्चात प्रत्येक वर्ष मे उसी दिन देय होगी।

Note. - The fees for renewal of this patent, if it is to be maintained, will fall / has fallen due on 27th day of December 2021 and on the same day in every year thereafter.

(12) PATENT APPLICATION PUBLICATION
(19) INDIA
(22) Date of filing of Application :17/11/2021

(21) Application No.202141052910 A
(43) Publication Date : 03/12/2021

(54) Title of the invention : DC-DC HIGH GAIN CLUSTER CONVERTER

(51) International classification :H02M0001000000, H02M0003070000, H02M0003158000, B60L0058200000, H02M0003335000
(86) International Application No :NA
Filing Date :NA
(87) International Publication No : NA
(61) Patent of Addition to Application Number :NA
Filing Date :NA
(62) Divisional to Application Number :NA
Filing Date :NA

(71)**Name of Applicant :**
1)Satya Institute of Technology and Management
Address of Applicant :Kondakarakam, Gajularega, Vizianagaram, Andhra Pradesh, India – 535001. ---------- ----------
2)Agrayana Electric Technologies Pvt.Ltd
Name of Applicant : NA
Address of Applicant : NA
(72)**Name of Inventor :**
1)Dr.Narendra Kumar Yegireddy
Address of Applicant :Professor, EEE, Satya Institute of Technology and Management, Kondakarakam, Gajularega, Vizianagaram-535001, Andhra Pradesh, India. ---------- ----------
2)Gurumurthy Nagiredla
Address of Applicant :Maruthi Nagar, Aiyyannapeta, Vizianagaram-535003, Andhra Pradesh, India. ---------- ----------
3)Dr.Majji Sashibhushana Rao
Address of Applicant :Director, Satya Institute of Technology and Management, Kondakarakam, Gajularega, Vizianagaram-535001, Andhra Pradesh, India. ---------- ----------
4)Mantri Swathi
Address of Applicant :Assistant Professor, EEE, Satya Institute of Technology and Management, Kondakarakam, Gajularega, Vizianagaram-535001, Andhra Pradesh, India. ---------- ----------
5)Relli Pavani
Address of Applicant :Assistant Professor, EEE, Satya Institute of Technology and Management, Kondakarakam, Gajularega, Vizianagaram-535001, Andhra Pradesh, India. ---------- ----------

(57) Abstract :
ABSTRACT: Title: DC-DC High Gain Cluster Converter The present disclosure proposes a DC-DC high gain cluster converter that aids to reduce the size of the converter and provides high voltage conversion ratio. The DC-DC high gain cluster converter circuit comprises a first switched-inductor circuit 102, a second switched-inductor circuit 104 and a pair of main switches 106a and 106b. The proposed DC-DC converter provides high gain and reduces the size of magnetic components. The proposed high gain DC-DC converter topology achieves high voltage conversion with low duty cycle. The proposed non-isolating DC-DC high gain converter operates as transformer-less converter and avoids electromagnetic interference and electromagnetic compatibility effects. The proposed efficient high gain DC-DC converter reduces the size of magnetic components. The proposed high gain DC-DC converter reduces current stress of inductors and reduces voltage stress of switches.

No. of Pages : 20 No. of Claims : 10

(12) PATENT APPLICATION PUBLICATION
(19) INDIA
(22) Date of filing of Application :17/11/2021

(21) Application No.202141052909 A
(43) Publication Date : 03/12/2021

(54) Title of the invention : ELECTROSTATIC PRECIPITATOR WITH SPRAYING MECHANISM

(51) International classification	:B03C0003410000, B03C0003120000, B03C0003017000, F24C0015200000, B03C0003160000
(86) International Application No Filing Date	:NA :NA
(87) International Publication No	: NA
(61) Patent of Addition to Application Number Filing Date	:NA :NA
(62) Divisional to Application Number Filing Date	:NA :NA

(71)**Name of Applicant :**
1)Satya Institute of Technology and Management
Address of Applicant :Kondakarakam, Gajularega, Vizianagaram-535001, Andhra Pradesh, India. ---------- ----------
2)Agrayana Electric Technologies Pvt.Ltd
Name of Applicant : NA
Address of Applicant : NA
(72)**Name of Inventor :**
1)Dr.Narendra Kumar Yegireddy
Address of Applicant :Professor, EEE, Satya Institute of Technology and Management, Kondakarakam, Gajularega, Vizianagaram-535001, Andhra Pradesh, India. ---------- ----------
2)Gurumurthy Nagiredla
Address of Applicant :Plot no 17, Maruthi Nagar, Aiyyannapeta, Vizianagaram-535003, Andhra Pradesh, India. ---------- ----------
3)Chelapaka Venkatalakshmi
Address of Applicant :Associate Professor, Mechanical Engineering, Satya Institute of Technology and Management, Kondakarakam, Gajularega, Vizianagaram-535001, Andhra Pradesh, India. ---------- ----------
4)Gottapu Tirupati Naidu
Address of Applicant :Assistant Professor, EEE, Satya Institute of Technology and Management, Kondakarakam, Gajularega, Vizianagaram-535001, Andhra Pradesh, India. ---------- ----------
5)Chappa Suresh
Address of Applicant :Assistant Professor, Mech, Satya Institute of Technology and Management, Kondakarakam, Gajularega, Vizianagaram-535001, Andhra Pradesh, India. ---------- ----------
6)Thirumalaraju.V.S.S.V.Rama Raju
Address of Applicant :Satya Institute of Technology and Management, Kondakarakam, Gajularega, Vizianagaram-535001, Andhra Pradesh, India. ---------- ----------
7)Gottimukkala Sai Varma
Address of Applicant :Satya Institute of Technology and Management, Kondakarakam, Gajularega, Vizianagaram-535001, Andhra Pradesh, India. ---------- ----------
8)Boddu Kameswara Rao
Address of Applicant :Satya Institute of Technology and Management, Kondakarakam, Gajularega, Vizianagaram-535001, Andhra Pradesh, India. ---------- ----------
9)Korada Saikumar
Address of Applicant :Satya Institute of Technology and Management, Kondakarakam, Gajularega, Vizianagaram-535001, Andhra Pradesh, India. ---------- ----------
10)Bandaru Bhanu Prakash
Address of Applicant :Satya Institute of Technology and Management, Kondakarakam, Gajularega, Vizianagaram-535001, Andhra Pradesh, India. ---------- ----------

(57) Abstract :
ABSTRACT: Title: Electrostatic Precipitator with Spraying Mechanism The present disclosure proposes an electrostatic precipitator with liquid vapour spraying mechanism. The electrostatic precipitator with liquid vapour spraying mechanism aids to reduce ionization strength required and consumes less power. The electrostatic precipitator with liquid vapour spraying mechanism comprises an inlet 102, a plurality of ionization electrodes 104, a plurality of collecting electrodes 106, and an outlet 108. The proposed electrostatic precipitator with liquid vapour spraying mechanism is capable collecting particles such as dust or mist or other contaminated particles effectively. The proposed electrostatic precipitator reduces the ionization strength of a medium between electrodes and thereby reduces the power consumption.

No. of Pages : 19 No. of Claims : 10

(12) PATENT APPLICATION PUBLICATION
(19) INDIA
(22) Date of filing of Application :19/05/2022

(21) Application No.202241028780 A
(43) Publication Date : 17/06/2022

(54) Title of the invention : Switched Capacitor Based Multi Level Inverter

(51) International classification :H02M0007483000, H02M0007487000, H02M0001000000, H02M0007490000, H03H0019000000
(86) International Application No :PCT// Filing Date :01/01/1900
(87) International Publication No : NA
(61) Patent of Addition to Application Number :NA Filing Date :NA
(62) Divisional to Application Number :NA Filing Date :NA

(71)**Name of Applicant :**
1)Mr.Gurumurthy Nagiredla
Address of Applicant :Plot no 17, AGRAYANA ELECTRIC TECHNOLOGIES Pvt.ltd, Maruthi nagar, Vizianagaram, Andhra Pradesh, India – 535003 Vizianagaram ---------- ----------
2)Dr.Narendra Kumar Yegireddy
3)Prof. G.Raja Rao
4)Mr.K.S.Ravi Kumar
5)Dr.Balamurali Surakasi
6)Dr.T.A.N.S.N. Varma
Name of Applicant : NA
Address of Applicant : NA
(72)**Name of Inventor :**
1)Mr.Gurumurthy Nagiredla
Address of Applicant :Plot no 17, AGRAYANA ELECTRIC TECHNOLOGIES Pvt.ltd, Maruthi nagar, Vizianagaram, Andhra Pradesh, India – 535003 Vizianagaram ---------- ----------
2)Dr.Narendra Kumar Yegireddy
Address of Applicant :Professor EEE, Satya Institute of Technology and Management, Kondakarakam, Gajularega, Vizianagaram, Andhra Pradesh, India – 535001 Vizianagaram ---------- ----------
3)Prof. G.Raja Rao
Address of Applicant :Head of the department, EEE, Anil Neerukonda Institute of Technology and Sciences, Sangivalsa, Visakhapatnam, Andhra Pradesh, India – 531162 Visakhapatnam ---------- ----------
4)Mr.K.S.Ravi Kumar
Address of Applicant :Associate Professor, Department of EEE, MVGR College of Engineering, Vijayaram Nagar campus, Chintalavalasa, Vizianagaram, Andhra Pradesh, India – 535005 Vizianagaram ---------- ----------
5)Dr.Balamurali Surakasi
Address of Applicant :Associate Professor, EEE Department, Anil Neerukonda Institute of Technology and Sciences, Sangivalsa, Visakhapatnam, Andhra Pradesh, India – 531162 Visakhapatnam ---------- ----------
6)Dr.T.A.N.S.N. Varma
Address of Applicant :Associate Professor, Department of ECE, MVGR College of Engineering, Vijayaram Nagar campus, Chintalavalasa, Vizianagaram, Andhra Pradesh, India – 535005 Vizianagaram ---------- ----------

(57) Abstract :
ABSTRACT: Title: Switched Capacitor Based Multi Level Inverter The present disclosure proposes a switched capacitor based multi-level inverter topology with reduced input capacitance to improve the overall gain and reduce total harmonic distortion for wide range of applications such as solar panels and electric vehicles. The overall architecture 100 of a switched capacitor based multilevel inverter comprises a solar photovoltaic array 102, a controller 104, a boost converter 106, and a multi-level inverter. The multilevel inverter (MLI) for renewable energy systems is configured with lesser semiconductor devices to reduce the cost and size of the inverter and improve efficiency and reliability. The proposed switched capacitor based multi-level inverter reduces the device count and operates at a low switching frequency, thereby reducing transient stress.

No. of Pages : 29 No. of Claims : 6

(12) PATENT APPLICATION PUBLICATION
(19) INDIA
(22) Date of filing of Application :17/11/2021

(21) Application No.202141052908 A
(43) Publication Date : 03/12/2021

(54) Title of the invention : COMPACT RESONANT IMPEDANCE INVERTER FOR ELECTRIC VEHICLES

(51) International classification	:H03F0001020000, F04B0035040000, B60L0053140000, B60L0058210000, H02M0001000000
(86) International Application No Filing Date	:NA :NA
(87) International Publication No	: NA
(61) Patent of Addition to Application Number Filing Date	:NA :NA
(62) Divisional to Application Number Filing Date	:NA :NA

(71)**Name of Applicant :**
1)Dr. Narendra Kumar Yegireddy
Address of Applicant :Professor, Department of EEE, Satya Institute of Technology and Management (SITAM), Gajularega, Vizianagaram-535003, Andhra Pradesh, India ---------- ----------
Name of Applicant : NA
Address of Applicant : NA
(72)**Name of Inventor :**
1)Dr. Narendra Kumar Yegireddy
Address of Applicant :Professor, Department of EEE, Satya Institute of Technology and Management (SITAM), Gajularega, Vizianagaram-535003, Andhra Pradesh, India ---------- ----------
2)Gurumurthy Nagiredla
Address of Applicant :Reddikancheru, Bhogapuram, Vizianagaram-535216 Andhra Pradesh, India ---------- ----------
3)Netipalli Prudhvi
Address of Applicant :H.No.400 Pradeep nagar, Vizianagaram-535003 Andhra Pradesh, India ---------- ----------
4)Dr.Botsa Srinivas
Address of Applicant :Associate Professor, Department of Mathematics, Satya Institutes of Technology and Management (SITAM), Gajularega, Vizianagaram-535003 Andhra Pradesh, India ---------- ----------
5)Relli Pavani
Address of Applicant :Assistant Professor, Department of EEE, Satya Institute of Technology and Management (SITAM), Gajularega, Vizianagaram-535003, Andhra Pradesh, India ---------- ----------
6)P.V.S.K.Phanidhar Varma
Address of Applicant :Associate Professor, Department of Physics, Satya Institute of Technology and Management (SITAM), Gajularega, Vizianagaram-535003, Andhra Pradesh, India ---------- ----------
7)Dr.P.Srinivasarao
Address of Applicant :Associate Professor, Department of EEE, Chadalawada Ramanamma Engineering College (Autonomous), Renugunta Road, Tirupathi-517506, Andhra Pradesh, India ---------- ----------
8)Sruthi Gusidi
Address of Applicant :Student, Department of CSE, Satya Institute of Technology and Management (SITAM), Gajularega, Vizianagaram-535003, Andhra Pradesh, India ---------- ----------

(57) Abstract :
ABSTRACT: Title: Compact Resonant Impedance Inverter for Electric Vehicles The present disclosure proposes a compact resonant impedance inverter for electric vehicles that aids to reduce the size of batteries required and thereby provides smooth control of electric vehicles. The present invention utilizes boot factor technique for bringing the required output voltage. The compact resonant impedance inverter for electric vehicles comprises a DC power source, a plurality of inductors, at least two capacitors, a pulse width modulation inverter, and a 3-phase AC output. The compact resonant impedance inverter provides smooth control to the electric vehicles at lower voltages. The compact resonant impedance inverter for electric vehicles provides high voltage AC power with a smaller number of batteries and replaces DC motor with AC motors in electric vehicles.

No. of Pages : 16 No. of Claims : 7

(12) PATENT APPLICATION PUBLICATION
(19) INDIA
(22) Date of filing of Application :20/07/2021

(21) Application No.202141032508 A
(43) Publication Date : 30/07/2021

(54) Title of the invention : RELIABLE BIDIRECTIONAL DC-DC CONVERTER CIRCUIT WITH SINGLE INDUCTOR

(51) International classification	:H02M0003158000, H02M0001000000, H02M0003335000, H02M0001440000, H02M0001320000
(31) Priority Document No	:NA
(32) Priority Date	:NA
(33) Name of priority country	:NA
(86) International Application No Filing Date	:NA :NA
(87) International Publication No	: NA
(61) Patent of Addition to Application Number Filing Date	:NA :NA
(62) Divisional to Application Number Filing Date	:NA :NA

(71)**Name of Applicant :**
1)Satya Institute of Technology and Management
Address of Applicant :Kondakarakam, Gajularega, Vizianagaram-535001, Andhra Pradesh, India. Andhra Pradesh India
2)Agrayana Electric Technologies Pvt. Ltd
(72)**Name of Inventor :**
1)Dr.Narendra Kumar Yegireddy
2)Gurumurthy Nagiredla
3)T.Damodara Venkata Appala Naidu
4)P.Karunakar
5)Allu Venkateswararao
6)Bogurothu Chandini
7)Lopinti Vijaya Mary Grace
8)Kagitha Padma Sri
9)Kameswarao Boddu

(57) Abstract :
ABSTRACT: Title: Reliable Bidirectional DC-DC Converter Circuit with Single Inductor The present disclosure proposes a bidirectional DC-DC converter circuit with single inductor that aids to reduce the number of individual capacitors for every switch in the clamping circuit. The proposed converter circuit has enhanced reliability and life. Further, the proposed converter minimizes the switch voltage stresses in the converter and thereby improve the performance of the converter. The size, weight and volume of the converter are reduced to thereby reduce the overall cost. The bi-directional DC-DC converter is suitable for high power applications.

No. of Pages : 13 No. of Claims : 6

पेटेंट कार्यालय
शासकीय जर्नल

OFFICIAL JOURNAL
OF
THE PATENT OFFICE

निर्गमन सं. 48/2019	शुक्रवार	दिनांक: 29/11/2019
ISSUE NO. 48/2019	FRIDAY	DATE: 29/11/2019

पेटेंट कार्यालय का एक प्रकाशन
PUBLICATION OF THE PATENT OFFICE

(12) PATENT APPLICATION PUBLICATION
(19) INDIA
(22) Date of filing of Application :12/11/2019

(21) Application No.201941046021 A
(43) Publication Date : 29/11/2019

(54) Title of the invention : POWER GENERATION USING SWING MOTION ENERGY

(51) International classification :B63H19/02
(31) Priority Document No :NA
(32) Priority Date :NA
(33) Name of priority country :NA
(86) International Application No :NA
Filing Date :NA
(87) International Publication No : NA
(61) Patent of Addition to Application Number :NA
Filing Date :NA
(62) Divisional to Application Number :NA
Filing Date :NA

(71)**Name of Applicant :**
1)Satya Institute of Technology and Management
Address of Applicant :Gajularega, Vizianagaram, 535002, Andhra Pradesh, India Andhra Pradesh India
(72)**Name of Inventor :**
1)Ch.Venkata Lakshmi
2)Dr.Dwivedula Venkata Ramamurthy

(57) Abstract :
The present disclosure provides a system which harvests energy by utilizing children"s energy (mechanical energy) at whatever point they play i.e., on standard playing types of gear like seesaw or teeter-totter, swing, slider, etc., and then converts it into electrical energy. The system comprises of a swing means and an energy harvesting means. The energy harvesting means further comprises a sprocket, a gear box, an energy transmission means and a storage means. The system is used to produce power and as well as to increase the usage of power effectively. The electrical energy transmitted from the dynamo is stored in a battery or cell which further can be utilized for multiple applications such as sign lights (LED™s), mobile charging and the like.

No. of Pages : 15 No. of Claims : 6

(12) PATENT APPLICATION PUBLICATION
(19) INDIA
(22) Date of filing of Application :12/11/2019

(21) Application No.201941046022 A
(43) Publication Date : 29/11/2019

(54) Title of the invention : EDUCATOR PERFORMANCE ASSESSMENT SYSTEM

(51) International classification :G06F3/04
(31) Priority Document No :NA
(32) Priority Date :NA
(33) Name of priority country :NA
(86) International Application No :NA
Filing Date :NA
(87) International Publication No : NA
(61) Patent of Addition to Application Number :NA
Filing Date :NA
(62) Divisional to Application Number :NA
Filing Date :NA

(71)**Name of Applicant :**
1)Satya Institute of Technology and Management
Address of Applicant :Gajularega, Vizianagaram, 535002, Andhra Pradesh, India Andhra Pradesh India
(72)**Name of Inventor :**
1)Dr.Dwivedula Venkata Ramamurthy
2)Ch.Venkata Lakshmi

(57) Abstract :
The present disclosure discloses an educator performance assessment system which selects best educator in an educational institution based on the policy attributes and feedback collected from students, administrators, and self-appraisal-data of educator. The system selects best educator in a transparent manner so that questions on the selection process do not rise. The system captures the policy of institute in terms of the attributes and to provide a method which obtains feedback in a systematic manner i.e., in a visual appeal manner. The system then compute a merit index to each educator member based on a rigorous Multiple Attribute Decision Making (MADM) and technique for order of preference by similarity to ideal solution (TOPSIS) methodology.

No. of Pages : 19 No. of Claims : 10

पेटेंट कार्यालय
शासकीय जर्नल

OFFICIAL JOURNAL
OF
THE PATENT OFFICE

निर्गमन सं. 48/2019	शुक्रवार	दिनांक: 29/11/2019
ISSUE NO. 48/2019	FRIDAY	DATE: 29/11/2019

पेटेंट कार्यालय का एक प्रकाशन
PUBLICATION OF THE PATENT OFFICE

(12) PATENT APPLICATION PUBLICATION
(19) INDIA
(22) Date of filing of Application :12/11/2019

(21) Application No.201941046021 A
(43) Publication Date : 29/11/2019

(54) Title of the invention : POWER GENERATION USING SWING MOTION ENERGY

(51) International classification :B63H19/02
(31) Priority Document No :NA
(32) Priority Date :NA
(33) Name of priority country :NA
(86) International Application No :NA
Filing Date :NA
(87) International Publication No : NA
(61) Patent of Addition to Application Number :NA
Filing Date :NA
(62) Divisional to Application Number :NA
Filing Date :NA

(71)**Name of Applicant :**
1)Satya Institute of Technology and Management
Address of Applicant :Gajularega, Vizianagaram, 535002, Andhra Pradesh, India Andhra Pradesh India
(72)**Name of Inventor :**
1)Ch.Venkata Lakshmi
2)Dr.Dwivedula Venkata Ramamurthy

(57) Abstract :
The present disclosure provides a system which harvests energy by utilizing children"s energy (mechanical energy) at whatever point they play i.e., on standard playing types of gear like seesaw or teeter-totter, swing, slider, etc., and then converts it into electrical energy. The system comprises of a swing means and an energy harvesting means. The energy harvesting means further comprises a sprocket, a gear box, an energy transmission means and a storage means. The system is used to produce power and as well as to increase the usage of power effectively. The electrical energy transmitted from the dynamo is stored in a battery or cell which further can be utilized for multiple applications such as sign lights (LED™s), mobile charging and the like.

No. of Pages : 15 No. of Claims : 6

(12) PATENT APPLICATION PUBLICATION
(19) INDIA
(22) Date of filing of Application :12/11/2019

(21) Application No.201941046022 A
(43) Publication Date : 29/11/2019

(54) Title of the invention : EDUCATOR PERFORMANCE ASSESSMENT SYSTEM

(51) International classification :G06F3/04
(31) Priority Document No :NA
(32) Priority Date :NA
(33) Name of priority country :NA
(86) International Application No :NA
Filing Date :NA
(87) International Publication No : NA
(61) Patent of Addition to Application Number :NA
Filing Date :NA
(62) Divisional to Application Number :NA
Filing Date :NA

(71)**Name of Applicant :**
1)Satya Institute of Technology and Management
Address of Applicant :Gajularega, Vizianagaram, 535002, Andhra Pradesh, India Andhra Pradesh India
(72)**Name of Inventor :**
1)Dr.Dwivedula Venkata Ramamurthy
2)Ch.Venkata Lakshmi

(57) Abstract :
The present disclosure discloses an educator performance assessment system which selects best educator in an educational institution based on the policy attributes and feedback collected from students, administrators, and self-appraisal-data of educator. The system selects best educator in a transparent manner so that questions on the selection process do not rise. The system captures the policy of institute in terms of the attributes and to provide a method which obtains feedback in a systematic manner i.e., in a visual appeal manner. The system then compute a merit index to each educator member based on a rigorous Multiple Attribute Decision Making (MADM) and technique for order of preference by similarity to ideal solution (TOPSIS) methodology.

No. of Pages : 19 No. of Claims : 10

पेटेंट कार्यालय
शासकीय जर्नल

OFFICIAL JOURNAL
OF
THE PATENT OFFICE

निर्गमन सं. 41/2022	शुक्रवार	दिनांक: 14/10/2022
ISSUE NO. 41/2022	FRIDAY	DATE: 14/10/2022

पेटेंट कार्यालय का एक प्रकाशन
PUBLICATION OF THE PATENT OFFICE

(12) PATENT APPLICATION PUBLICATION
(19) INDIA
(22) Date of filing of Application :08/10/2022

(21) Application No.202241057634 A
(43) Publication Date : 14/10/2022

(54) Title of the invention : SYSTEM AND METHOD TO CALIBRATE COMBUSTION TIME FOR SOLID PROPELLANT GRAINS

(51) International classification :C06B0021000000, C06B0045100000, C03C0021000000, F02K0009260000, C06B0033040000
(86) International Application No :PCT//
Filing Date :01/01/1900
(87) International Publication No : NA
(61) Patent of Addition to Application Number :NA
Filing Date :NA
(62) Divisional to Application Number :NA
Filing Date :NA

(71)**Name of Applicant :**
1)Mr. ANISH SOLOMAN TIGGA
Address of Applicant :PG SCHOLAR, DEPARTMENT OF MECHANICAL ENGINEERING, K L DEEMED TO BE UNIVERSITY, KONERU LAKSHMAIAH EDUCATION FOUNDATION, GREEN FIELDS, VADDESWARAM, GUNTUR DISTRICT, ANDHRA PRADESH – 522502 ---------- ----------
2)Dr. G. MURALI
3)Mr. P.S.N. MASTHAN VALI
4)Mr. G. SURYA CHANDRA SWAMY
Name of Applicant : NA
Address of Applicant : NA
(72)**Name of Inventor :**
1)Mr. ANISH SOLOMAN TIGGA
Address of Applicant :PG SCHOLAR, DEPARTMENT OF MECHANICAL ENGINEERING, K L DEEMED TO BE UNIVERSITY, KONERU LAKSHMAIAH EDUCATION FOUNDATION, GREEN FIELDS, VADDESWARAM, GUNTUR DISTRICT, ANDHRA PRADESH – 522502 ---------- ----------
2)Dr. G. MURALI
Address of Applicant :PROFESSOR, DEPARTMENT OF MECHANICAL ENGINEERING, K L DEEMED TO BE UNIVERSITY, KONERU LAKSHMAIAH EDUCATION FOUNDATION, GREEN FIELDS, VADDESWARAM, GUNTUR DISTRICT, ANDHRA PRADESH – 522502 ---------- ----------
3)Mr. P.S.N. MASTHAN VALI
Address of Applicant :RESEARCH SCHOLAR, DEPARTMENT OF MECHANICAL ENGINEERING, K L DEEMED TO BE UNIVERSITY, KONERU LAKSHMAIAH EDUCATION FOUNDATION, GREEN FIELDS, VADDESWARAM, GUNTUR DISTRICT, ANDHRA PRADESH – 522502 ---------- ----------
4)Mr. G. SURYA CHANDRA SWAMY
Address of Applicant :ASSISTANT PROFESSOR, DEPARTMENT OF MECHANICAL ENGINEERING, SATYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, GAJULAREJA, VIZIANAGARAM (DT), ANDHRA PRADESH-535002. INDIA. ---------- ----------

(57) Abstract :
ABSTRACT SYSTEM AND METHOD TO CALIBRATE COMBUSTION TIME FOR SOLID PROPELLANT GRAINS A solid propellant is simple and reliable rocket fuel. Once ignited, the propellant cannot be stopped since they burn until they run out. Solid fuel rockets are widely used in military applications such as missiles because they can be stored for long periods of time without degrading the propellant. The primary objective of this research is to study the burnout mass of solid propellants using various propellants and catalysts. Potassium Nitrate (KNO3) was chosen as an oxidant in the experiment because of its compatibility with other ingredients and low-cost affordability. KNO3 was used as an oxidizer in 65% ratio with 34% of the fuel and 1% of the catalyst. KNO3, fuel ingredients like Fructose, Glucose and Lactose with catalysts Copper and Aluminium were taken in powdered form. Cylindrical stainless steel with one closed end was taken to fill the cavity, and a concentric hole was made for constant burning. This propellant-filled chamber was attached to a C Clamp so that it does not propel during fuel combustion when thrust is formed. The obtained result shows that the longest burnout mass was secured by burning Glucose with Copper powder and KNO3 for 136 s when compared to the shortest burnout mass was secured by burning Lactose with Aluminium powder and KNO3 mixture to 57 s. The highest temperature of the mixture was Lactose with Copper powder and KNO3 resulted in 518 ℃ when compared to the lowest temperature of the mixture was Glucose with Copper powder and KNO3 was 211.75 ℃.

No. of Pages : 22 No. of Claims : 8

Welcome Saurabh Kumar Jain Sign out

Controller General of Patents, Designs & Trade Marks

सत्यमेव जयते

G.A.R.6
[See Rule 22(1)]
RECEIPT

Docket No 99337 **Date/Time 2022/10/08 12:33:58**

To
Mr. ANISH SOLOMAN TIGGA, PG SCHOLAR, DEPARTMENT OF MECHANICAL ENGINEERING, K L DEEMED TO BE UNIVERSITY,KONERU LAKSHMAIAH EDUCATION FOUNDATION, GREEN FIELDS,VADDESWARAM, GUNTUR DISTRICT, ANDHRA PRADESH – 522502, INDIA

CBR Detail:

Sr. No.	Ref. No./Application No.	App. Number	Amount Paid	C.B.R. No.	Form Name	Remarks
1	TEMP/E1/65842/2022-CHE	202241057634	1600	40672	FORM 1	SYSTEM AND METHOD TO CALIBRATE COMBUSTION TIME FOR SOLID PROPELLANT GRAINS
2	E12/7731/2022/CHE	202241057634	2500	40672	FORM 9	----

TransactionID	Payment Mode	Challan Identification Number	Amount Paid	Head of A/C No
N-0001035000	Online Bank Transfer	0810220005673	4100.00	1475001020000001

Total Amount : ₹ 4100
Amount in Words: Four Thousand One Hundred Only

Received from Saurabh Kumar Jain the sum of ₹ 4100 on account of Payment of fee for above mentioned Application/Forms.

* This is a computer generated receipt, hence no signature required.

Print

Home About Us Contact Us

"FORM 1 THE PATENTS ACT 1970 (39 of 1970) and THE PATENTS RULES, 2003 APPLICATION FOR GRANT OF PATENT (See section 7, 54 and 135 and sub-rule (1) of rule 20	(FOR OFFICE USE ONLY)

Application No.	
Filing date:	
Amount of Fee paid:	
CBR No:	
Signature:	

1. APPLICANT'S REFERENCE / IDENTIFICATION NO. (AS ALLOTTED BY OFFICE)	

2. TYPE OF APPLICATION [Please tick ( ) at the appropriate category					
Ordinary (√)		Convention (x)	PCT-NP (x)		
Divisional ()	Patent of Addition ( )	Division ( )	Patent of addition ()	Division ( )	Patent of Addition ( )

3A. APPLICANT(S)

Name in Full	Nationality	Country of Residence	Address of the Inventor	
Mr. ANISH SOLOMAN TIGGA	INDIAN	INDIA	House No	PG SCHOLAR, DEPARTMENT OF MECHANICAL ENGINEERING, K L DEEMED TO BE UNIVERSITY, KONERU LAKSHMAIAH EDUCATION FOUNDATION,
			Street	GREEN FIELDS,VADDESWARAM,
			City	GUNTUR DISTRICT
			State	ANDHRA PRADESH
			Country	INDIA
			Pin code	522502
Dr. G. MURALI	INDIAN	INDIA	House No.	PROFESSOR, DEPARTMENT OF MECHANICAL ENGINEERING, K L DEEMED TO BE UNIVERSITY, KONERU LAKSHMAIAH EDUCATION FOUNDATION,
			Street	GREEN FIELDS,VADDESWARAM,
			City	GUNTUR DISTRICT
			State	ANDHRA PRADESH
			Country	INDIA
			Pin code	522502
Mr. P.S.N. MASTHAN VALI	INDIAN	INDIA	House No.	RESEARCH SCHOLAR, DEPARTMENT OF MECHANICAL ENGINEERING, K L DEEMED TO BE UNIVERSITY, KONERU LAKSHMAIAH EDUCATION FOUNDATION,
			Street	GREEN FIELDS,VADDESWARAM,
			City	GUNTUR DISTRICT
			State	ANDHRA PRADESH
			Country	INDIA
			Pin code	522502
Mr. G. SURYA CHANDRA SWAMY	INDIAN	INDIA	House No.	ASSISTANT PROFESSOR, DEPARTMENT OF MECHANICAL ENGINEERING, SATYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT
			Street	GAJULAREJA
			City	VIZIANAGARAM (DT)
			State	ANDHRA PRADESH
			Country	INDIA
			Pin code	535002

Natural Person (√)	Other than natural Person		
	Small Entity (x)	Startup (x)	Others (x)

4. INVENTOR(S) [Please tick at the appropriate category]		
Are all the inventor(s) same as the applicant(s) named above?	Yes (√)	

If "No", furnish the details of the inventor(s)

5. TITLE OF THE INVENTION

SYSTEM AND METHOD TO CALIBRATE COMBUSTION TIME FOR SOLID PROPELLANT GRAINS

6. AUTHORISED REGISTERED PATENT AGENT	IN/PA No.	- NA-
	Name	
7. ADDRESS FOR SERVICE OF APPLICANT IN INDIA	Name	Mr. ANISH SOLOMAN TIGGA
	Postal Address	PG SCHOLAR, DEPARTMENT OF MECHANICAL ENGINEERING, K L DEEMED TO BE UNIVERSITY, KONERU LAKSHMAIAH EDUCATION FOUNDATION, GREEN FIELDS, VADDESWARAM, GUNTUR DISTRICT, ANDHRA PRADESH – 522502
	Mobile No.	9933200151
	E-mail ID	anishsolomontigga@gmail.com

8. IN CASE OF APPLICATION CLAIMING PRIORITY OF APPLICATION FILED IN CONVENTION COUNTRY, PARTICULARS OF CONVENTION APPLICATION

Country	Application Number	Filing date	Name of the applicant	Title of the invention	IPC (as classified in the convention country)
NA	NA	NA	NA	NA	NA

9. IN CASE OF PCT NATIONAL PHASE APPLICATION, PARTICULARS OF INTERNATIONAL APPLICATION FILED UNDER PATENT CO-OPERATION TREATY (PCT)

International application number	International filing date
NA	NA

10. IN CASE OF DIVISIONAL APPLICATION FILED UNDER SECTION 16, PARTICULARS OF ORIGINAL (FIRST) APPLICATION

Original (first) application No.	Date of filing of original (first) application
NA	NA

11. IN CASE OF PATENT OF ADDITION FILED UNDER SECTION 54, PARTICULARS OF MAIN APPLICATION OR PATENT : NA

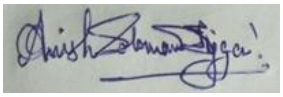
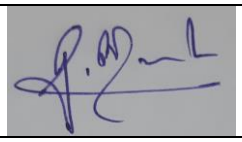
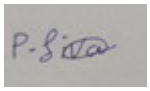
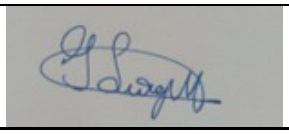
Main application/patent No. : NA	Date of filing of main application : NA

12. DECLARATIONS

(i) Declaration by the inventor(s)

(In case the applicant is an assignee: the inventor(s) may sign herein below or the applicant may upload the assignment or enclose the assignment with this application for patent or send the assignment by post/electronic transmission duly authenticated within the prescribed period).

We, the above named inventor(s) are the true & first inventor(s) for this Invention and declare that the applicant(s) herein are our assignee or legal representative.

NAME	SIGNATURE	DATE
Mr. ANISH SOLOMAN TIGGA		03/10/2022
Dr. G. MURALI		03/10/2022
Mr. P.S.N. MASTHAN VALI		03/10/2022
Mr. SURYA CHANDRA SWAMY		03/10/2022

(ii) Declaration by the applicant(s) in the convention country
(In case the applicant in India is different than the applicant in the convention country: the applicant in the convention country may sign herein below or applicant in India may upload the assignment from the applicant in the convention country or enclose the said assignment with this application for patent or send the assignment by post/electronic transmission duly authenticated within the prescribed period)

We, the applicant(s) in the convention country declare that the applicant(s) herein are our assignee or legal representative.
(a) Date
(b) Signature(s) -------NA----------
(c) Name(s) of the signatory

(iii) Declaration by the applicant(s)

- We the applicant(s) hereby declare(s) that: -
- We are in possession of the above-mentioned invention.
- The ~~provisional~~/complete specification relating to the invention is filed with this application.
- ~~The invention as disclosed in the specification uses the biological material from India and the necessary permission from the competent authority shall be submitted by me/us before the grant of patent to me/us.~~
- There is no lawful ground of objection(s) to the grant of the Patent to me/us.
- We are the true & first inventor(s).
- We are the assignee or legal representative of true & first inventor(s).
- ~~The application or each of the applications, particulars of which are given in Paragraph-8, was the first application in convention country/countries in respect of our invention(s).~~
- ~~We claim the priority from the above mentioned application(s) filed in convention country/countries and state that no application for protection in respect of the invention had been made in a convention country before that date by me/us or by any person from which I/We derive the title.~~
- ~~Our application in India is based on international application under Patent Cooperation Treaty (PCT) as mentioned in Paragraph-9.~~
- ~~The application is divided out of my /our application particulars of which is given in Paragraph-10 and pray that this application may be treated as deemed to have been filed on DD/MM/YYYY under section 16 of the Act.~~
- ~~The said invention is an improvement in or modification of the invention particulars of which are given in Paragraph-11.~~

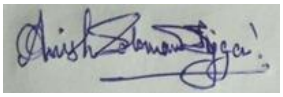
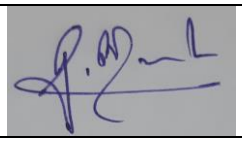
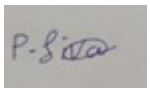
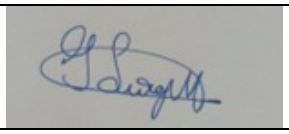
13. FOLLOWING ARE THE ATTACHMENTS WITH THE APPLICATION (a) Form 2

Item	Details	Fee	Remarks
Complete specification	No. of pages :20		
No. of Claim(s)	No. of claims : 08 and No. of pages :01		
Abstract	No. of pages :01		
No. of Drawing(s)	No. of drawings :-- and No. of pages:--		

~~# In case of a complete specification, if the applicant desires to adopt the drawings filed with his provisional specification as the drawings or part of the drawings for the complete specification under rule 13(4), the number of such pages filed with the provisional specification are required to be mentioned here.~~

~~(b) Complete specification (in conformation with the international application)/as amended before the International Preliminary Examination Authority (IPEA), as applicable (2 copies).~~
~~(c) Sequence listing in electronic form~~
~~(d) Drawings (in conformation with the international application)/as amended before the International Preliminary Examination Authority (IPEA), as applicable (2 copies).~~
~~(e) Priority document(s) or a request to retrieve the priority document(s) from DAS (Digital Access Service) if the applicant had already requested the office of first filing to make the priority document(s) available to DAS.~~
~~(f) Translation of priority document/Specification/International Search Report/InternationalPreliminary Report on Patentability.~~
(g) Statement and Undertaking on Form 3
(h) Declaration of Inventorship on Form 5
(j)……..

Total fee
We hereby declare that to the best of our knowledge, information and belief the fact and matters slated herein are correct and We request that a patent may be granted to us for the said invention.

NAME	SIGNATURE	DATE
Mr. ANISH SOLOMAN TIGGA		03/10/2022
Dr. G. MURALI		03/10/2022
Mr. P.S.N. MASTHAN VALI		03/10/2022
Mr. SURYA CHANDRA SWAMY		03/10/2022

To,
The Controller of patents, The Patent office at CHENNAI.

Form 2
THE PATENT ACT, 1970
(39 of 1970)
&
The Patent Rules, 2003
COMPLETE SPECIFICATION
(Section 10 and Rule 13)

SYSTEM AND METHOD TO CALIBRATE COMBUSTION TIME FOR SOLID PROPELLANT GRAINS

Name	Nationality	Address
Mr. ANISH SOLOMAN TIGGA	An Indian National	PG SCHOLAR, DEPARTMENT OF MECHANICAL ENGINEERING, K L DEEMED TO BE UNIVERSITY, KONERU LAKSHMAIAH EDUCATION FOUNDATION, GREEN FIELDS, VADDESWARAM, GUNTUR DISTRICT, ANDHRA PRADESH – 522502 Mobile: 9933200151 Email: anishsolomontigga@gmail.com
Dr. G. MURALI	An Indian National	PROFESSOR, DEPARTMENT OF MECHANICAL ENGINEERING, K L DEEMED TO BE UNIVERSITY, KONERU LAKSHMAIAH EDUCATION FOUNDATION, GREEN FIELDS, VADDESWARAM, GUNTUR DISTRICT, ANDHRA PRADESH – 522502. Mobile: 9442054281 Email: muralinitt@gmail.com
Mr. P.S.N. MASTHAN VALI	An Indian National	RESEARCH SCHOLAR, DEPARTMENT OF MECHANICAL ENGINEERING, K L DEEMED TO BE UNIVERSITY, KONERU LAKSHMAIAH EDUCATION FOUNDATION, GREEN FIELDS, VADDESWARAM, GUNTUR DISTRICT, ANDHRA PRADESH – 522502 Mobile: 9642848352 Email: sivanagamastanvali@gmail.com
Mr. G. SURYA CHANDRA SWAMY	An Indian National	ASSISTANT PROFESSOR, DEPARTMENT OF MECHANICAL ENGINEERING, SATYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, GAJULAREJA, VIZIANAGARAM (DT), ANDHRA PRADESH-535002. INDIA. Mobile: 9032612221 Email: surya.chandra12221@gmail.com

The following specification particularly describes the invention and the manner in which it is to be performed.

TECHNICAL FIELD OF INVENTION

Embodiments of the present invention relate to solid propellant and systems therefrom.

BACKGROUND AND PROBLEM WITH EXISTING ART

A solid-propellant rocket, also known as a solid rocket, is a rocket powered by solid propellants (fuel/oxidizer). Solid-fuel rockets propelled by gunpowder were utilized in battle as early as the 13th century by the Arabs, Chinese, Persians, Mongols, and Indians.

A strong rocket engine or composite charge rocket engine is a rocket with an engine that utilizes strong forces containing a fuel and an oxidizer. The strong charge is typically as a fuel grain set inside the inside of the rocket engine (for example in the ignition chamber) and consumed to deliver hot gases which, thusly, exit through the throat and spout of the rocket engine at high speed to give push which drives the rocket the other way.

Albeit fluid rockets are ordinarily involved today because of improved effectiveness and controllability when contrasted with strong rockets, strong rockets are as yet utilized in specific applications basically on the grounds that they are somewhat simple to produce and by and large display brilliant execution qualities. What's more, strong rockets are by and large less perplexing when contrasted with those utilizing fluid fills. Be that as it may, not at all like fluid charge

rockets, strong force rockets can't handle or change their push qualities after start by changing how much fuel entering the area of ignition.

US8051640B2: A strong fuel push control framework, strategy, and contraption for controlling burning of strong charges in a restricting grains strong force rocket motor (Monstrosity) is given. Specifically, a restricting grains rocket motor and drive framework is given, in which actuator implies associated are associated with strong force grains arranged in the strain vessel of the motor. The actuator implies are operable to specifically move the strong force grains together or separated comparative with each other, to such an extent that the consuming closures of the strong fuel grains abatement or increment comparative with each other. This activity controls the pace of ignition of the strong charge grains by shifting dividing distance between the consuming closures of the strong force grains, and empowers extinguishment and reignition of the Beast. Further, a technique is accommodating controlling the consume pace of strong force grains going through ignition in a restricting grains rocket motor.

US8336287B1: A strong rocket engine incorporates a burning chamber limited by an external packaging, a charge grain inside the ignition chamber, and an igniter inside the external packaging for lighting the fuel grain. A spout is coupled to the ignition chamber for delivering hot gasses developed from consuming the charge grain to give push to impelling the strong rocket engine. The force grain is a self-smothering charge grain that incorporates no less than one fuel, something like one oxidizing specialist, no less than one folio, and no less than one surfactant that gives oneself dousing property. The force grain gives a consuming rate as an element of tension that incorporates a negative strain reliance segment, wherein the consuming

rate in the negative strain reliance segment diminishes with expanding strain until an end pressure is arrived at which brings about extinguishment of the charge grain.

US7652488B1: The developed strategy for estimating the wellbeing of a strong rocket fuel incorporates implanting something like one piezoelectric capacitance sensor in the charge, where the capacitance of the sensor is an element of a modulus of the fuel, and where the position is chosen to quantify signs of pressure disappointment as a result of changes in the shear modulus. The capacitance of the sensor is estimated at a foreordained recurrence. The capacitance of the piezoelectric capacitance sensor is changed over into a computerized portrayal which is then changed over into the advanced portrayal of a modulus (or inclination modulus). In ensuing examination, the modulus (or slope of the modulus) is connected to the wellbeing of the strong rocket force.

US3468125A: This development connects with a different grain fuel powder charge and a technique for shaping same. An object of the development is to give a fuel powder charge which can be clung to the inward mass of a rocket engine packaging to oppose breaking or disintegrating of the charge because of high ballistic powers caused in sending off.

One more object of the development is to give means to trim the fuel powder charge inside the rocket engine in various circumferentially separated grains.

NON-PATENT LITERATURE STUDY

Strong rockets have customarily been very hard to control with regards to accuracy, throttleability, and reaction time. Conventional strategies for control have utilized huge, weighty hot gas valves, which limit the rocket to bring down performing, low consolidated stage particulate, cool-consuming charges. These strategies control the consuming or mass-development rate by changing the chamber pressure, which thusly shifts the stalemate distance of the fire zone (1-2 mm) from the strong force surface. This thusly fluctuates the intensity input, and consequently the downturn pace of the charge (see "Essentials of Strong Fuel Ignition" Kenneth K. Kuo, Martin Summerfield, Progress in Astronautics and Flying, Vol. 90, p. 891, October 1984, Amer Inst of Astronautics and Flying).

Further, ignition control utilizing valves is restricted by the high temperature ability of the development materials, which, thus, frequently requires the utilization of lower temperature charges having lower execution. What's more, the valves add intricacy, require critical improvement time, increment weight, cost, and electric power utilization while diminishing framework dependability. Valves additionally require cleaner, lower performing force gases when contrasted with higher performing charges utilizing metals and metal hydrides that produce consolidated stage oxide ignition items.

Notwithstanding the above lacks of valves to control ignition, not at all like the current development, hot gas valves are unequipped for empowering various patterns of extinguishment and reignition. Specifically, while utilizing hot gas valves to control burning, another pyrotechnic igniter should be accommodated every start occasion, as every pyrotechnic igniter is

obliterated during said occasion. Subsequently, an instrument for inclusion of another pyrotechnic igniter should additionally be given, in this way adding to the expense and intricacy of the framework.

Further customary strategies used to control strong rocket ignition incorporate changing the throat vent region of the engine with a hot-gas valve, or beating the consuming by hindering and afterward lighting new force consume region. Energy the board of strong rockets is at times accomplished by unexpected depressurization of the chamber by opening vent openings or valves.

Another option controllable rocket motor is a Monster (contradicting grains rocket motor). In such Monstrosity motors, strong forces might be smothered by making an unexpected lopsidedness in the intensity criticism from the fire zone two or three hundred microns over the charge surface, and the unburned fuel a couple hundred microns underneath the surface motors. This transient condition is commonly made by out of nowhere venting the strong rocket engine burning chamber gas, making a depressurization condition known as dp/dt. Run of the mill fuels, for example, the Monster sytheses working at a chamber tension of 1,000 psia are doused at a negative dp/dt of around 165,000 psi/sec, as displayed in FIG. 11 (see Kenneth K. Kuo, Martin Summerfield, "Essentials of Strong Fuel Burning", Progress in Astronautics and Air transportation, Vol. 90, pp. 661-732, October 1984, Amer Inst of Astronautics and Flight).

PROBLEM IDENTIFICATION

A sugar propellant rocket is a kind of solid propellant rocket manufactured with sugar as a fuel and an oxidizer. The propellant is made up of two components: the fuel and the oxidizer. Historically, sucrose was the most often utilized fuel. Because of their simplicity of manufacture, modern formulations often include fructose, sorbitol, and other sugar kinds. Potassium nitrate is the most often used oxidant. The most typical application of potassium nitrate is as a fertilizer.

The difficulties in creating high-energy rocket propellants are tremendous, hence the availability of low-energy sugar-based propellants in amateur rocketry continues to thrive. Major problems include a lack of resources and the expensive pricing of high-energy chemicals, technology, and tools. The most essential difficulty is also the safety of the ecosystem and property, because most high-energy rocket propellants are toxic and dangerous to nature. Sugar-based propellants, sometimes known as rocket candy, are a form of rocket propellant used in model rockets. Its primary fuel is sugar, and its oxidizer is low-energy nitrate. In certain circumstances, the propellant may consist of the fuel, the oxidizer, and the catalysts.

Using sucrose as fuel in a sugar propellant is regarded as a great active component; unfortunately, it is hampered by uneven propellant properties due to prolonged caramelization and an abnormally high-pressure index. The burning rate is affected by the value of the pressure exponent. High-pressure index values result in large variations in the burning rate with few changes in combustion chamber pressure, with potentially disastrous results.

A few researchers tried to study the thermodynamics and ballistic characteristics of sugar-based propellants. Foltran experimented to study the performance of and, a cold-manufactured

mechanical press with a mixture of 65% Potassium Nitrate and 35% Sucrose. For the propellant grain fabrication, the characteristic properties like density and burning rate and compression pressure was also studied. Yang explained the detailed process of a solid propellant rocket engine, starting with fundamental assumptions based on rocket engines with indistinguishable properties and utilizing modelling tools to calculate the performance of a solid propellant rocket. The experiment simulated the temperature of combustion products and the typical jet velocity or efflux velocity were both verified. The research also indicated that the main byproducts of the Sucrose and Potassium Nitrate burning process are carbon dioxide, carbon monoxide, and water. The addition of a catalyst to the propellant mixture is the most efficient and effective way of boosting the burn rate. The chemistry of the catalysts improves fuel and oxidizer burning reaction in the combustion chamber and enhancing heat transfer at the propellant surface layer.

OBJECTIVE OF THIS INVENTION

The main objective of this work is to investigate the burnout time of propellants with different propellants and a rocket propellant that might be utilized in sounding rockets for economically backward nations using the simplest method of manufacturing and widely available components. One more object of the innovation is to give numerous powder grains having wedge formed internal countenances which produce a cross-sectional design good for fast and complete burning.

SUMMARY OF THIS INVENTION

Materials

Fuel:

Fructose, Glucose and Lactose are used as fuel in this experiment. Minuscule fructose, glucose and lactose particles along with oxidizers catch fire in a flash due to their high proportion of surface area to volume.

Oxidizer:

Potassium Nitrate (KNO_3) is considered as an oxidizer in this experiment. Potassium nitrate fills the requirement for oxygen and occupies considerably less space, which leaves the blast alone stronger and quicker. It is a fundamental element of explosives.

Catalyst:

Copper and Aluminum Powder were used as catalysts because they are metals having high thermal conductivity and have a tendency to increase the burning time.

Measurement instruments used to study the experiment

K-Type Thermocouple:

K-type thermocouple (MAX6675) is a sensor that has the capacity to sense the temperature upto 1260 ℃.

Arduino UNO:

The Arduino UNO is a standard Arduino board. In Italian, UNO signifies "one." It is considered to be a powerful board that is used in a variety of tasks. The Arduino UNO board was created by Arduino.cc. In this experiment, the Arduino was used to calibrate the temperature and mass flow rate through the k-type thermocouple.

Methods

Fabrication of Casing:

A stainless steel cylinder of an outer diameter of 31 mm, an inner diameter of 22 mm, and a length of 90 mm was manufactured using a lathe machine. A schematic diagram of the dimensions of the casing is represented in figure 1.

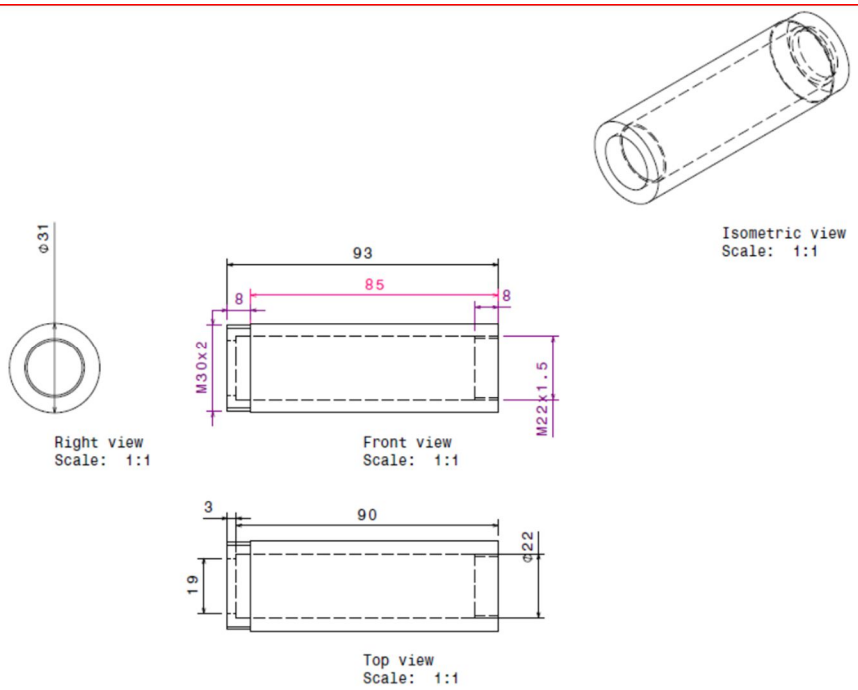


Figure 1 . Schematic diagram of the casing of stainless steel cylinder

Fabrication of Propellant

The total mass of the propellant mixture was 35g out of which 22.75 was of oxidizer that is potassium nitrate (KNO3), 11.25g was of fuel that is fructose/glucose/lactose (based on test) and 1g of catalyst was used that is copper/aluminium in powdered form (based on test).

Six different experiments were conducted with different sugar-based rocket propellant formulations. The first sample consists of potassium nitrate as an oxidizer, fructose as fuel and copper as a catalyst. The second sample consists of potassium nitrate as an oxidizer, glucose as a

fuel and copper as a catalyst. The third sample consists of potassium nitrate as an oxidizer, lactose as fuel and copper as a catalyst. The fourth sample consists of potassium nitrate as an oxidizer, fructose as fuel and Aluminium as a catalyst. The fifth sample consists of potassium nitrate as an oxidizer, glucose as a fuel and Aluminium as a catalyst. The sixth sample consists of potassium nitrate as an oxidizer, lactose as fuel and Aluminium as a catalyst.

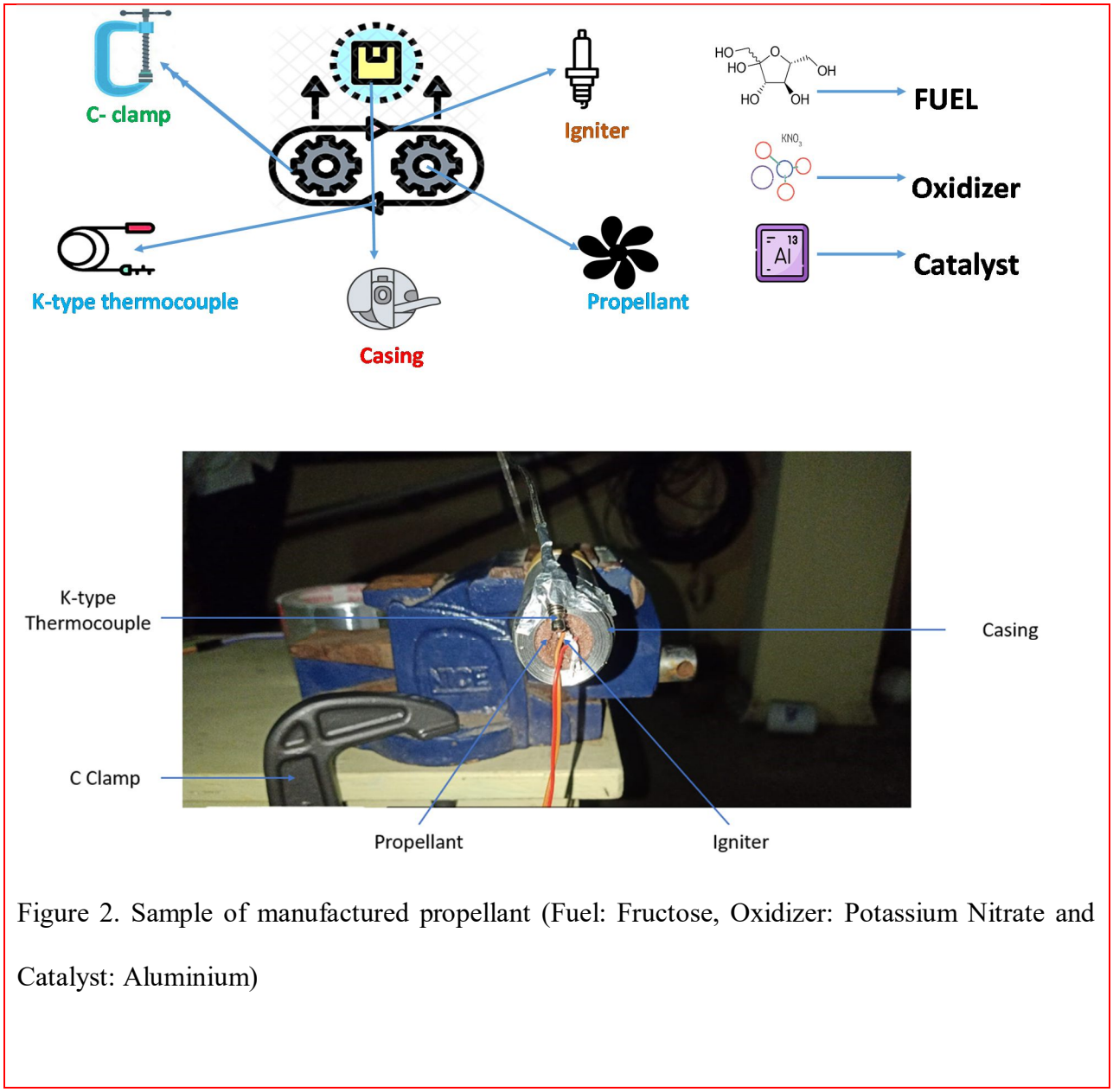


Figure 2. Sample of manufactured propellant (Fuel: Fructose, Oxidizer: Potassium Nitrate and Catalyst: Aluminium)

Figure 2 represents the sample of manufactured propellant of fructose as a fuel, potassium nitrate as an oxidizer and Aluminium as a catalyst. The fuel and oxidizer were blended at a 13:7 ratio. The calibrated burning period was 60 seconds, and the highest temperature obtained was 261.75℃.

Setup of Experiment:

An ignitor was connected to the exit of the solid propellant. The temperature sensor (K-type thermocouple) is connected to the end of the nozzle. The thermocouple sensor is connected to Arduino UNO which is used to calibrate the input. This UNO Arduino is connected to the laptop where the reading was noted down.

A vise was used to hold the stainless steel cylinder into which the propellant was filled, and a c clamp was used to hold the vise to a table, to prevent the casing from being driven by the propellant's thrust. The same setup was performed for all of the sample studies.

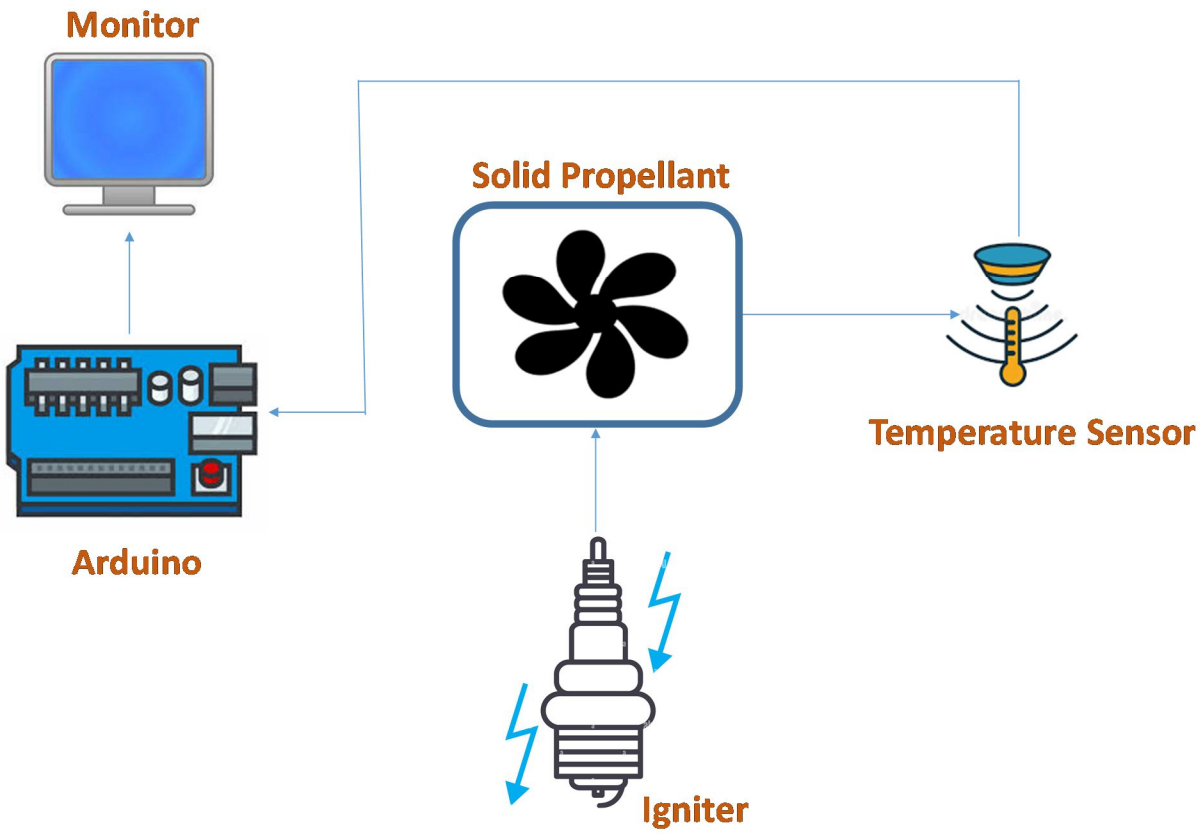


Figure 3. Schematic Setup of Experiment

Result and Discussion

Considering safety, in this investigation of burnout time of solid propellant with Potassium Nitrate (KNO_3) as the main oxidizer was taken as dry granules and fuel ingredients fructose, glucose, lactose and the catalyst copper and Aluminium mixtures were taken in powdered form. The result shows that the highest burnout time of Glucose with Copper powder and KNO_3 ran out unto 136 s when compared to the smallest burnout time of lactose with Aluminium powder and potassium nitrate mixture unto 57 s. The highest temperature of Lactose with Copper powder and Potassium Nitrate went unto 518 ℃ when compared to the lowest temperature of the mixture

Glucose with Aluminium powder and Potassium Nitrate unto 261.75 ℃. The combustion time of a solid fuel depends highly on the mode of preparation, particularly the granulometry, the degree of dryness, etc. The experiment concludes the simplest way of preparation and with easily available ingredients comparatively, with lesser cost, the burnout time of solid propellants with different propellant, lactose with copper dominating as catalyst and Potassium Nitrate combination proved to be the best solution and hence can be used as environmental friendly even for the economically backward countries can develop solid rocket propellants.

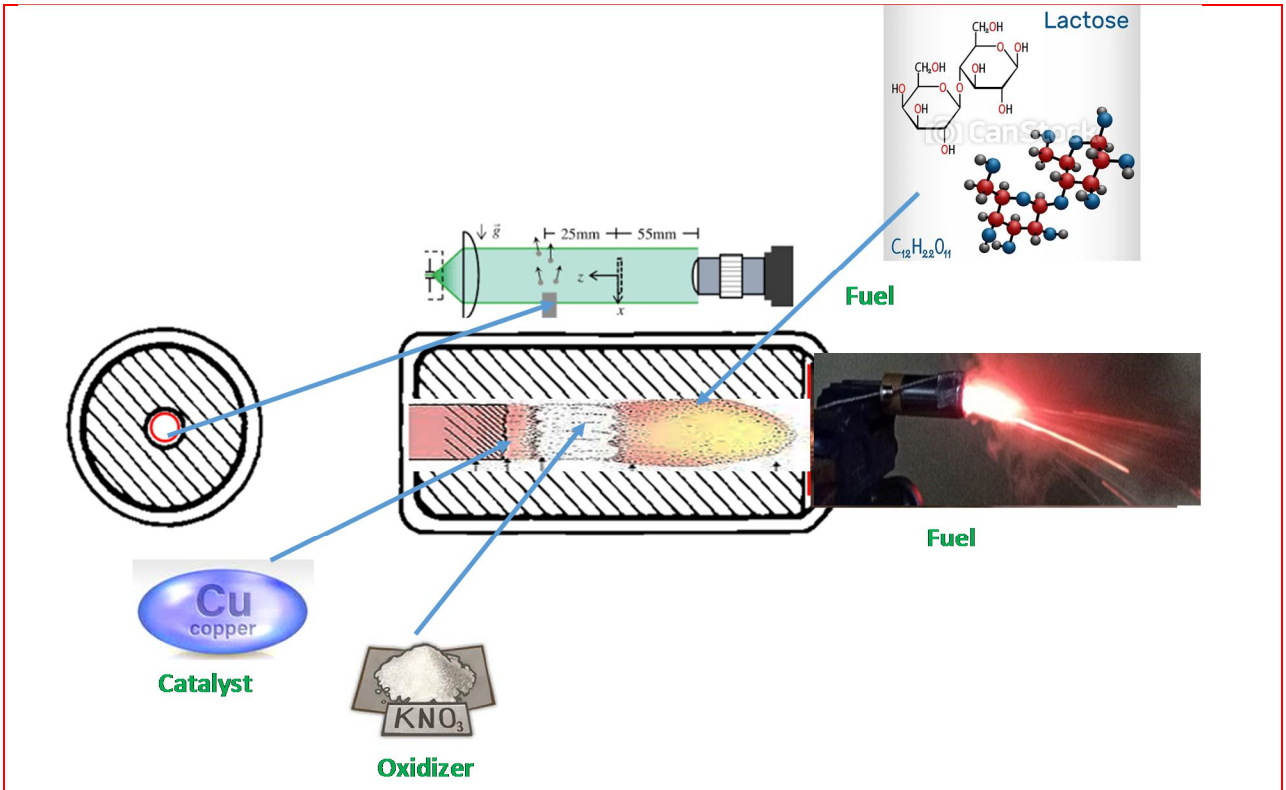


Figure 4. Burning of propellant (Fuel: Lactose, Oxidizer: Potassium Nitrate and Catalyst: Copper)

Figure 4 shows the burning of propellant having lactose as a fuel, potassium nitrate as an oxidizer and copper as a catalyst. The fuel and oxidizer were blended at a 13:7 ratio. The calibrated burning period was 68 seconds, and the highest temperature obtained was 518°C.

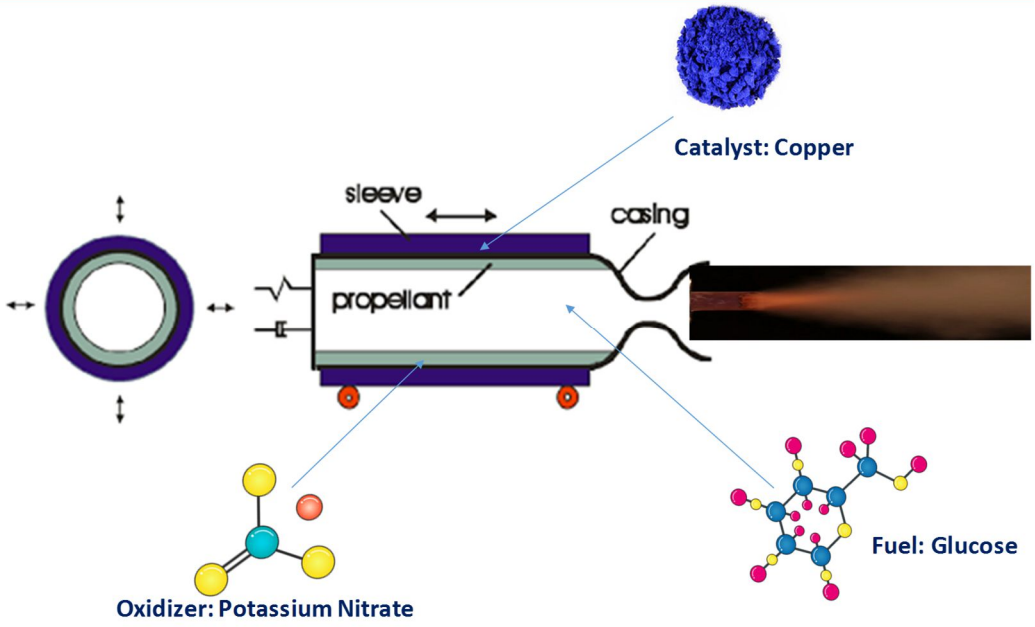
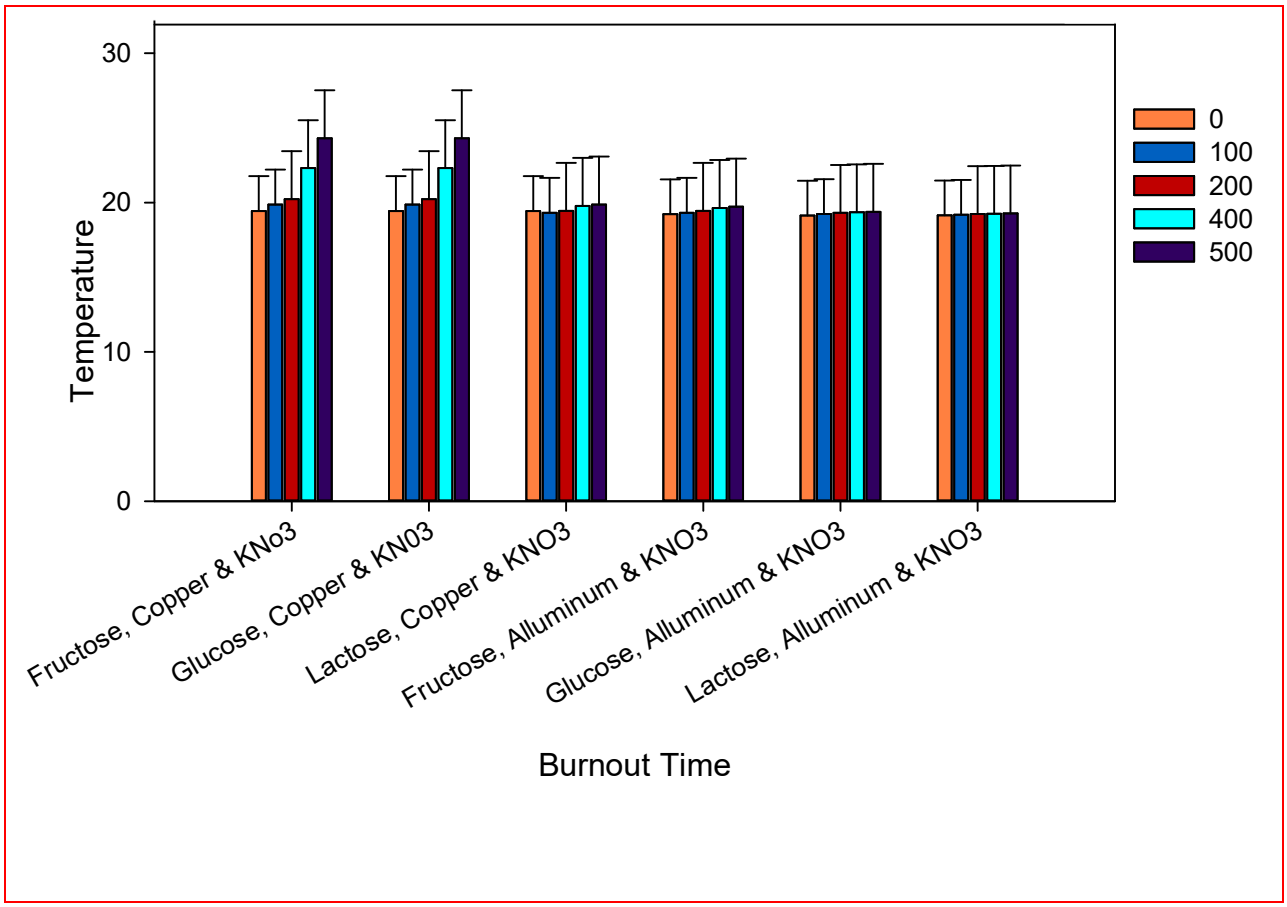


Figure 5. After burning of propellant (Fuel: Glucose, Oxidizer: Potassium Nitrate and Catalyst: Copper)

Figure 5 shows the burning of propellant having glucose as a fuel, potassium nitrate as an oxidizer and copper as a catalyst. The fuel and oxidizer were blended at a 13:7 ratio. The calibrated burning period was 136 seconds, and the highest temperature obtained was 211.75°C.



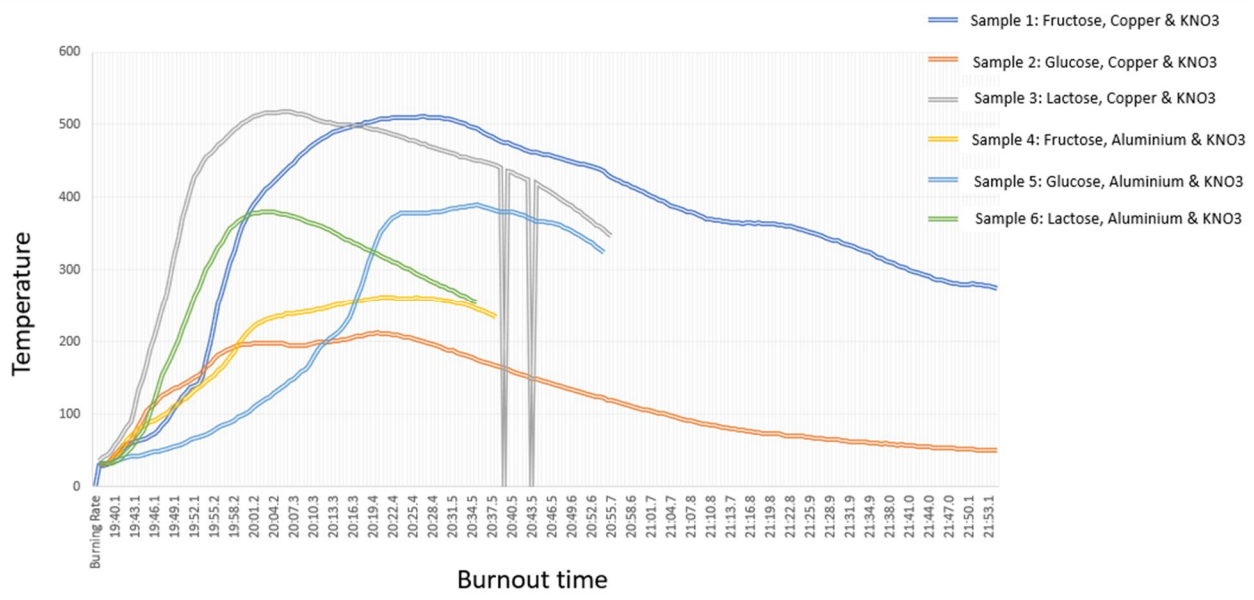


Figure 6. Burnout profile with respect to temperature for all the test samples

In sample 1, the cavity was filled with a mixture of Fructose as a fuel, Potassium Nitrate as an oxidizer and Copper powder as a catalyst used to increase the speed of burning time of the propellant. The maximum temperature calibrated was 510.75 ℃ and the Burning Time calibrated was 137 s.

In sample 2, the cavity was filled with the mixture of Glucose as a fuel, Potassium Nitrate as an oxidizer and Copper powder as a catalyst used to increase the speed of the burning time of the propellant. The maximum temperature calibrated was 211.75 ℃ and the Burning Time calibrated was 136 s.

In sample 3, the cavity was filled with the mixture of Lactose as a fuel, Potassium Nitrate as an oxidizer and Copper powder as a catalyst used to increase the speed of the burning time of the propellant. The maximum temperature calibrated was 518 ℃ and the Burning Time calibrated was 68 s.

In sample 4, the cavity was filled with the mixture of Fructose as a fuel, Potassium Nitrate as an oxidizer and Aluminium powder as a catalyst used to increase the speed of the burning time of the propellant. The maximum temperature calibrated was 261 ℃ and the Burning Time calibrated was 60 s.

In sample 5, the cavity was filled with the mixture of Glucose as a fuel, Potassium Nitrate as an oxidizer and Aluminium powder as a catalyst used to increase the speed of the burning time of the propellant. The maximum temperature calibrated was 388.75 ℃ and the Burning Time calibrated was 76 s.

In sample 6, the cavity was filled with the mixture of Lactose as a fuel, Potassium Nitrate as an oxidizer and Aluminium powder as a catalyst used to increase the speed of the burning time of the propellant. The maximum temperature calibrated was 379.5 ℃ and the Burning Time calibrated was 57 s.

CLAIM (S)

1. A solid propellant is simple and reliable rocket fuel, comprising: a combustion chamber bounded by an outer casing; a propellant grain within said combustion chamber; an igniter within said outer casing for igniting said propellant grain.

2. According to claim 1,wherein the Potassium Nitrate (KNO_3) was chosen as an oxidant in the experiment because of its compatibility with other ingredients and low-cost affordability. KNO_3 was used as an oxidizer in 65% ratio with 34% of the fuel and 1% of the catalyst. KNO_3, fuel ingredients like Fructose, Glucose and Lactose with catalysts Copper and Aluminium were taken in powdered form.

3. According to claim 1,wherein the propellant-filled chamber was attached to a C Clamp so that it does not propel during fuel combustion when thrust is formed. The obtained result shows that the longest burnout mass was secured by burning Glucose with Copper powder and KNO_3 for 136 s when compared to the shortest burnout mass was secured by burning Lactose with Aluminium powder and KNO_3 mixture to 57 s.

4. According to claim 1,wherein the highest temperature of the mixture was Lactose with Copper powder and KNO_3 resulted in 518 ℃ when compared to the lowest temperature of the mixture was Glucose with Copper powder and KNO_3 was 211.75 ℃.

5. According to claim 1,wherein the burning of propellant having glucose as a fuel, potassium nitrate as an oxidizer and copper as a catalyst. The fuel and oxidizer were blended at a 13:7 ratio. The calibrated burning period was 136 seconds, and the highest temperature obtained was 211.75℃.

6. According to claim 1,wherein the burnout time of solid propellant with Potassium Nitrate (KNO_3) as the main oxidizer was taken as dry granules and fuel ingredients fructose, glucose, lactose and the catalyst copper and Aluminium mixtures were taken in powdered form. The highest burnout time of Glucose with Copper powder and KNO_3 ran out unto 136 s when compared to the smallest burnout time of lactose with Aluminium powder and potassium nitrate mixture unto 57 s.

7. According to claim 1,wherein the highest temperature of Lactose with Copper powder and Potassium Nitrate went unto 518 ℃ when compared to the lowest temperature of the mixture Glucose with Aluminium powder and Potassium Nitrate unto 261.75 ℃. The combustion time of a solid fuel depends highly on the mode of preparation, particularly the granulometry, the degree of dryness, etc.

8. According to claim 1,wherein the simplest way of preparation and with easily available ingredients comparatively, with lesser cost, the burnout time of solid propellants with different propellant, lactose with copper dominating as catalyst and Potassium Nitrate combination proved to be the best solution and hence can be used as environmental friendly even for the economically backward countries can develop solid rocket propellants

ABSTRACT

SYSTEM AND METHOD TO CALIBRATE COMBUSTION TIME FOR SOLID PROPELLANT GRAINS

A solid propellant is simple and reliable rocket fuel. Once ignited, the propellant cannot be stopped since they burn until they run out. Solid fuel rockets are widely used in military applications such as missiles because they can be stored for long periods of time without degrading the propellant. The primary objective of this research is to study the burnout mass of solid propellants using various propellants and catalysts. Potassium Nitrate (KNO_3) was chosen as an oxidant in the experiment because of its compatibility with other ingredients and low-cost affordability. KNO_3 was used as an oxidizer in 65% ratio with 34% of the fuel and 1% of the catalyst. KNO_3, fuel ingredients like Fructose, Glucose and Lactose with catalysts Copper and Aluminium were taken in powdered form. Cylindrical stainless steel with one closed end was taken to fill the cavity, and a concentric hole was made for constant burning. This propellant-filled chamber was attached to a C Clamp so that it does not propel during fuel combustion when thrust is formed. The obtained result shows that the longest burnout mass was secured by burning Glucose with Copper powder and KNO_3 for 136 s when compared to the shortest burnout mass was secured by burning Lactose with Aluminium powder and KNO_3 mixture to 57 s. The highest temperature of the mixture was Lactose with Copper powder and KNO_3 resulted in 518 °C when compared to the lowest temperature of the mixture was Glucose with Copper powder and KNO_3 was 211.75 °C.

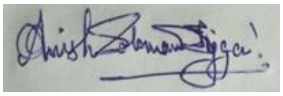
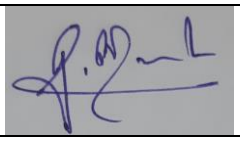
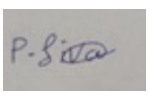
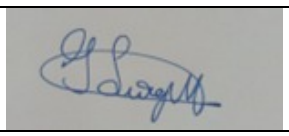
FORM-3
THE PATENTS ACT 1970
(39 of 1970)
&
The Patent Rules, 2003
STATEMENT AND UNDERTAKING UNDER SECTION 8
(See Section 8, rule 12)

NAME OF APPLICANTS & INVENTORS

SYSTEM AND METHOD TO CALIBRATE COMBUSTION TIME FOR SOLID PROPELLANT GRAINS

Name	Nationality	Address
Mr. ANISH SOLOMAN TIGGA	An Indian National	PG SCHOLAR, DEPARTMENT OF MECHANICAL ENGINEERING, K L DEEMED TO BE UNIVERSITY, KONERU LAKSHMAIAH EDUCATION FOUNDATION, GREEN FIELDS, VADDESWARAM, GUNTUR DISTRICT, ANDHRA PRADESH – 522502 Mobile: 9933200151 Email: anishsolomontigga@gmail.com
Dr. G. MURALI	An Indian National	PROFESSOR, DEPARTMENT OF MECHANICAL ENGINEERING, K L DEEMED TO BE UNIVERSITY, KONERU LAKSHMAIAH EDUCATION FOUNDATION, GREEN FIELDS, VADDESWARAM, GUNTUR DISTRICT, ANDHRA PRADESH – 522502. Mobile: 9442054281 Email: muralinitt@gmail.com
Mr. P.S.N. MASTHAN VALI	An Indian National	RESEARCH SCHOLAR, DEPARTMENT OF MECHANICAL ENGINEERING, K L DEEMED TO BE UNIVERSITY, KONERU LAKSHMAIAH EDUCATION FOUNDATION, GREEN FIELDS, VADDESWARAM, GUNTUR DISTRICT, ANDHRA PRADESH – 522502 Mobile: 9642848352 Email: sivanagamastanvali@gmail.com
Mr. G. SURYA CHANDRA SWAMY	An Indian National	ASSISTANT PROFESSOR, DEPARTMENT OF MECHANICAL ENGINEERING, SATYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, GAJULAREJA, VIZIANAGARAM (DT), ANDHRA PRADESH-535002. INDIA. Mobile: 9032612221 Email: surya.chandra12221@gmail.com

Hereby declare, We have not made any application for the same / substantially the same invention outside India.

NAME	SIGNATURE	DATE
Mr. ANISH SOLOMAN TIGGA		03/10/2022
Dr. G. MURALI		03/10/2022
Mr. P.S.N. MASTHAN VALI		03/10/2022
Mr. SURYA CHANDRA SWAMY		03/10/2022

To
The Controller of patents, The Patent office at CHENNAI.

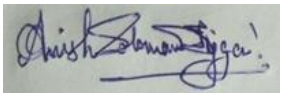
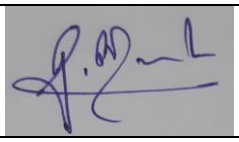
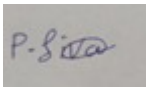
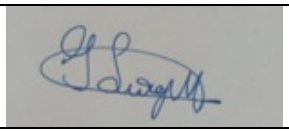
FORM 5
THE PATENTS ACT, 1970 (39 of 1970)
&
THE PATENTS RULES, 2003
DECLARATION AS TO INVENTORSHIP
(See section 8, rule 12)

1. Name of Applicant & Inventors

Name	Nationality	Address
Mr. ANISH SOLOMAN TIGGA	An Indian National	PG SCHOLAR, DEPARTMENT OF MECHANICAL ENGINEERING, K L DEEMED TO BE UNIVERSITY, KONERU LAKSHMAIAH EDUCATION FOUNDATION, GREEN FIELDS, VADDESWARAM, GUNTUR DISTRICT, ANDHRA PRADESH – 522502 Mobile: 9933200151 Email: anishsolomontigga@gmail.com
Dr. G. MURALI	An Indian National	PROFESSOR, DEPARTMENT OF MECHANICAL ENGINEERING, K L DEEMED TO BE UNIVERSITY, KONERU LAKSHMAIAH EDUCATION FOUNDATION, GREEN FIELDS, VADDESWARAM, GUNTUR DISTRICT, ANDHRA PRADESH – 522502. Mobile: 9442054281 Email: muralinitt@gmail.com
Mr. P.S.N. MASTHAN VALI	An Indian National	RESEARCH SCHOLAR, DEPARTMENT OF MECHANICAL ENGINEERING, K L DEEMED TO BE UNIVERSITY, KONERU LAKSHMAIAH EDUCATION FOUNDATION, GREEN FIELDS, VADDESWARAM, GUNTUR DISTRICT, ANDHRA PRADESH – 522502 Mobile: 9642848352 Email: sivanagamastanvali@gmail.com
Mr. G. SURYA CHANDRA SWAMY	An Indian National	ASSISTANT PROFESSOR, DEPARTMENT OF MECHANICAL ENGINEERING, SATYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, GAJULAREJA, VIZIANAGARAM (DT), ANDHRA PRADESH-535002. INDIA. Mobile: 9032612221 Email: surya.chandra12221@gmail.com

Hereby declare that the true and first inventor of the invention disclosed in the complete specification filed in pursuance of my application numbered _____ dated _____ **TITLE OF THE INVENTION: SYSTEM AND METHOD TO CALIBRATE COMBUSTION TIME FOR SOLID PROPELLANT GRAINS**

3.Declaration to be given when the application in India is filed by the Applicant in the convention country: -
I the applicant in the convention country hereby declare that our right to apply for a patent in India is by way or assignment from the true and first inventor.

NAME	SIGNATURE	DATE
Mr. ANISH SOLOMAN TIGGA		03/10/2022
Dr. G. MURALI		03/10/2022
Mr. P.S.N. MASTHAN VALI		03/10/2022
Mr. SURYA CHANDRA SWAMY		03/10/2022

To
The Controller of patents, The Patent office at CHENNAI.

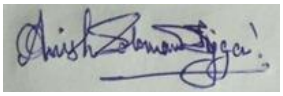
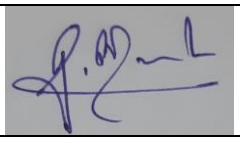
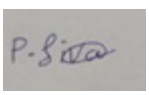
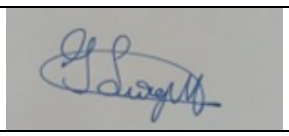
FORM 9
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003
REQUEST FOR PUBLICATION
(See section 11A(2); rule 24A)

We (state name, address and nationality of Applicant & Inventors)

TITLE OF THE INVENTION:
SYSTEM AND METHOD TO CALIBRATE COMBUSTION TIME FOR SOLID PROPELLANT GRAINS

Name	Nationality	Address
Mr. ANISH SOLOMAN TIGGA	An Indian National	PG SCHOLAR, DEPARTMENT OF MECHANICAL ENGINEERING, K L DEEMED TO BE UNIVERSITY, KONERU LAKSHMAIAH EDUCATION FOUNDATION, GREEN FIELDS, VADDESWARAM, GUNTUR DISTRICT, ANDHRA PRADESH – 522502 Mobile: 9933200151 Email: anishsolomontigga@gmail.com
Dr. G. MURALI	An Indian National	PROFESSOR, DEPARTMENT OF MECHANICAL ENGINEERING, K L DEEMED TO BE UNIVERSITY, KONERU LAKSHMAIAH EDUCATION FOUNDATION, GREEN FIELDS, VADDESWARAM, GUNTUR DISTRICT, ANDHRA PRADESH – 522502. Mobile: 9442054281 Email: muralinitt@gmail.com
Mr. P.S.N. MASTHAN VALI	An Indian National	RESEARCH SCHOLAR, DEPARTMENT OF MECHANICAL ENGINEERING, K L DEEMED TO BE UNIVERSITY, KONERU LAKSHMAIAH EDUCATION FOUNDATION, GREEN FIELDS, VADDESWARAM, GUNTUR DISTRICT, ANDHRA PRADESH – 522502 Mobile: 9642848352 Email: sivanagamastanvali@gmail.com
Mr. G. SURYA CHANDRA SWAMY	An Indian National	ASSISTANT PROFESSOR, DEPARTMENT OF MECHANICAL ENGINEERING, SATYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, GAJULAREJA, VIZIANAGARAM (DT), ANDHRA PRADESH-535002. INDIA. Mobile: 9032612221 Email: surya.chandra12221@gmail.com

Hereby request for early Publication of our application for Patent No. _____ dated _____ under section 11A(2) of the act.

NAME	SIGNATURE	DATE
Mr. ANISH SOLOMAN TIGGA		03/10/2022
Dr. G. MURALI		03/10/2022
Mr. P.S.N. MASTHAN VALI		03/10/2022
Mr. SURYA CHANDRA SWAMY		03/10/2022

To
The Controller of patents, The Patent office at CHENNAI.

(12) PATENT APPLICATION PUBLICATION
(19) INDIA
(22) Date of filing of Application :07/07/2021

(21) Application No.202141030516 A
(43) Publication Date : 16/07/2021

(54) Title of the invention : 3D fabrication of improved oxygen ion conducting ceramic fuel cells

(51) International classification	:C25B0001040000, H01M0004860000, H01M0004900000, C08G0065480000, C01B0013020000
(31) Priority Document No	:NA
(32) Priority Date	:NA
(33) Name of priority country	:NA
(86) International Application No Filing Date	:PCT// :01/01/1900
(87) International Publication No	: NA
(61) Patent of Addition to Application Number Filing Date	:NA :NA
(62) Divisional to Application Number Filing Date	:NA :NA

(71)**Name of Applicant :**
1)Dr. Beera Avinash Ben
Address of Applicant :Professor, Department of Mechanical Engineering, Avanthi IET Tagarapuvalasa,Vizag Andhra Pradesh India
2)Dr. Beera Satish Ben
3)Dr. Bapiraju Bandam
4)Sadhu Prasanth
5)Krishna Prafulla Badi
6)Boddu Rajnaveen
7)Dundi Jesraj Tataji
8)Yelisetti Yoganand
9)Hepsiba Seeli
10)Animireddy Sai Balaji Uttam
(72)**Name of Inventor :**
1)Dr. Beera Avinash Ben
2)Dr. Beera Satish Ben
3)Dr. Bapiraju Bandam
4)Sadhu Prasanth
5)Krishna Prafulla Badi
6)Boddu Rajnaveen
7)Dundi Jesraj Tataji
8)Yelisetti Yoganand
9)Hepsiba Seeli
10)Animireddy Sai Balaji Uttam

(57) Abstract :
Industrial scale deployment of fuel cells is essential for catalysing renewable clean energy production. The oxygen ion conducting ceramic electrolyte is key to accelerate renewable energy dependency. This invention details a new electrolyte composition and method for high cell performance. As well as a novel approach is adopted and disclosed in the current invention for which a 3D manufacturing route is experimentally studied to attain maximised material utilisation. Thus, produced fuel cell has proven to outperform cells developed by conventional techniques by 10.2%. The processing parameters and other technical data corresponding to optimal cell performance are disclosed in the relevant sessions of the invention documentation.

No. of Pages : 18 No. of Claims : 8