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CBR Detail:

Sr. No.	App. Number	Ref. No./Application No.	Amount Paid	C.B.R. No.	Form Name	Remarks
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(57) Abstract :
The present invention relates to an Artificial Rain-Generating Eco-Friendly Tree designed to provide a sustainable solution to water scarcity while promoting environmental sustainability. The invention comprises a tree-like structure integrated with atmospheric water generation (AWG) technologies configured to capture moisture from ambient air, condense it into water, and store the same within a trunk or root system. Renewable energy sources such as solar panels embedded in leaves or branches and/or wind turbines are employed to power the condensation and control systems, thereby enabling autonomous operation without reliance on fossil fuels. The invention further includes a water purification assembly having multi-stage filtration and sterilization units to ensure the quality of collected water. The purified water is subsequently released through a distribution manifold comprising spray, mist or drip nozzles for generating controlled and localized artificial rainfall. The invention additionally serves as a carbon sink, aids in ecological restoration, supports agriculture in arid and semi-arid regions, and provides scalable and low-maintenance deployment in urban and rural environments.

No. of Pages : 21 No. of Claims : 20

FORM 2

THE PATENTS ACT, 1970

(39 OF 1970)

AND

THE PATENTS RULES, 2003

COMPLETE SPECIFICATION

(*See* section 10; rule 13)

1. TITLE OF THE INVENTION

ARTIFICIAL RAIN-GENERATING ECO-FRIENDLY TREE

2. APPLICANT

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3. PREAMBLE TO THE DESCRIPTION

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

FIELD OF THE INVENTION

The present invention pertains to the field of biomimicry and environmental engineering and atmospheric water generation, specifically to a novel system and method for artificially inducing localized rainfall or generating water vapor through a tree-like structure. The invention employs renewable energy sources, such as solar power, to drive atmospheric water condensation processes, enabling controlled release of water to simulate rainfall. The invention integrates principles of atmospheric science, renewable energy utilization, and water management to create localized weather patterns for ecological restoration and agricultural support.

BACKGROUND OF THE INVENTION

The existing technologies for artificial rain generation and water collection face several significant drawbacks, particularly with respect to environmental sustainability and energy efficiency. Traditional methods, such as cloud seeding, frequently involve the use of chemical agents that may pose risks to ecosystems, vegetation and wildlife. These processes are also highly cost-intensive and dependent on specific atmospheric conditions, thereby limiting their reliability and applicability in addressing water scarcity. Consequently, such methods do not provide a sustainable or universally adaptable solution.

Conventional water generation technologies including atmospheric water generation (AWG) systems and desalination plants, further exacerbate these challenges. They are typically energy-intensive and rely heavily on non-renewable energy sources, such as fossil fuels, which contribute to global carbon emissions and environmental degradation. As a result, while these technologies may generate water, they do so at a considerable ecological cost.

Moreover, most existing solutions are large-scale and infrastructure-dependent, requiring significant capital investment, extensive maintenance, and uninterrupted energy supply. This makes them impractical for remote or off-grid regions, where access to reliable water resources is often most critical. The inability of such centralized systems to function effectively in

decentralized environments underscores their limited accessibility and adaptability.

Another limitation of prior art lies in inefficient water distribution mechanisms. Large irrigation networks often suffer from considerable water loss through evaporation and leakage, and they lack the precision to deliver water exactly where it is needed. This inefficiency reduces the overall effectiveness of such systems, particularly in water-stressed agricultural and urban settings.

Additionally, existing water generation methods often neglect broader environmental concerns. For example, desalination processes produce concentrated brine discharge, which adversely affects marine ecosystems. More broadly, these technologies fail to integrate ecosystem restoration or carbon reduction principles into their design.

Thus, there is a need to provide an environmentally sustainable, renewable and decentralized solution to water scarcity.

OBJECTS OF THE INVENTION

The primary object of the invention is to provide an artificial rain-generating eco-friendly tree comprising a tree-like superstructure configured to house functional modules and mimic the form of a natural tree.

Another object of the invention is to provide an atmospheric water generation module disposed within the superstructure and adapted to extract moisture from ambient air by condensation or sorption-assisted techniques.

A further object of the invention is to provide a perforated collector arranged at a canopy portion of the superstructure for intake of ambient air, said collector being provided with filtration means to prevent ingress of dust and debris.

Another object of the invention is to incorporate renewable energy sources including at least one photovoltaic panel and at least one wind turbine mounted on the superstructure.

Yet another object of the invention is to provide an energy storage unit electrically connected to the renewable energy sources for enabling continuous operation.

One other object of the invention is to provide a water collection and purification assembly comprising a condensation sump, outlet pipes, filtration means and a UV sterilization unit.

Another object of the invention is to provide a distribution manifold configured to release purified water in the form of localized artificial rainfall through nozzles adapted to simulate drizzle, shower or mist.

A further object of the invention is to provide a superstructure comprising a corrosion-resistant shell supported on an internal frame including service channels for cabling, refrigerant flow and drainage.

One other object of the invention is to provide a vertical-axis wind turbine coupled to a charge controller and configured to supplement power generation from the photovoltaic panel.

Another object of the invention is to provide chilled surfaces coated with a hydrophilic anti-fouling layer of TiO_2-silica to enhance condensation efficiency.

Yet another object of the invention is to provide a sorption-assisted cartridge selected from metal-organic framework, zeolite or silica gel materials adapted to capture and release water vapour.

Another object of the invention is to provide a water collection and purification assembly further comprising a flow sensor and sediment trap disposed in the outlet pipe to prevent backflow and contamination.

One further object of the invention is to provide a distribution manifold solenoid-controlled and adapted to release water in pulsed sequences to emulate natural rainfall patterns.

Another object of the invention is to provide an energy management and control system comprising a microcontroller adapted to monitor ambient temperature, humidity, dew point, irradiance, reservoir level, energy state and

water quality, and to optimize operation of the atmospheric water generation module and distribution manifold.

Another object of the invention is to provide a superstructure further comprising a radiative cooling surface for enhancing thermal rejection of the atmospheric water generation module.

Another object of the invention is to provide a system that is modular and scalable, enabling deployment in agricultural fields, urban landscapes or arid regions for generation of localized artificial rainfall and provision of environmental benefits including carbon sequestration and ecosystem restoration.

Another object of the invention is to provide a multi-stage filtration unit including at least one washable pre-filter, an activated carbon filter, and a fine cartridge filter of 5-micron rating.

Yet another object of the invention is to provide a sterilization unit comprising a UV-C LED chamber configured to inactivate bacteria, viruses and other microorganisms present in the condensed water.

One further object of the invention is to alternatively provide a low-power ozone micro-dosing module adapted to disinfect the collected water.

Yet another object of the invention is to provide a stainless steel reservoir having a vent filter for preservation of water quality prior to distribution.

Another object of the invention is to provide a distribution manifold comprising a plurality of micro-spray nozzles arranged around the canopy to generate localized rainfall in a radial pattern.

Another object of the invention is to provide misting nozzles configured to generate fine droplets for cooling, ecological restoration or leaf wetting in agricultural applications.

Another object of the invention is to provide drip-type nozzles mounted at adjustable heights to deliver larger droplets closer to the ground for soil infiltration and reduced evaporation.

Another object of the invention is to provide a distribution manifold configured to operate in selectable modes including drizzle, shower, mist or drip based on pre-set agronomic or ecological requirements.

Another object of the invention is to provide flow of water through the distribution manifold controlled by solenoid valves actuated by the microcontroller in response to sensed environmental parameters.

Another object of the invention is to provide a system adapted to schedule rain simulation in timed intervals or pulsed sequences to emulate natural rainfall patterns.

SUMMARY OF THE INVENTION

The present invention relates to an artificial rain-generating eco-friendly tree configured to generate localized rainfall in a controlled and sustainable manner. The invention comprises a tree-like superstructure which houses an atmospheric water generation module designed to extract moisture from ambient air by means of condensation or sorption techniques, the condensed water being collected, purified and stored within the structure. Renewable energy sources such as solar panels integrated into the canopy and a compact vertical-axis wind turbine mounted on the superstructure provide the necessary power for operation, supplemented by an internal rechargeable battery system for continuous functioning. Air is drawn through a perforated collector and filtered before entering the condensation chamber where water is produced, drained through outlet pipes, sterilized by filtration and UV treatment, and subsequently released through a controlled manifold to simulate natural rainfall in the form of mist, drizzle or shower as required. The system further incorporates sensing and control mechanisms for monitoring environmental parameters, optimizing power consumption, scheduling rain release and maintaining water quality. By virtue of its design the invention is self-sustaining, modular and adaptable, capable of deployment in agricultural fields, urban landscapes or remote arid regions, while simultaneously providing additional environmental benefits such as carbon sequestration, ecosystem restoration and reduction in dependency on large-scale irrigation infrastructure.

BRIEF DESCRIPTION OF DRAWINGS

Fig 1: Detailed flow chart of the invention

Fig 2: The architecture and working principle of the invention

DETAILED DESCRIPTION OF INVENTION

The present invention is a novel system designed to address the increasing problem of water scarcity while promoting environmental sustainability. The invention combines biomimicry with modern technology to create a self-sustaining system capable of generating artificial rain in a controlled and eco-friendly manner. By mimicking the structure and function of a natural tree, the present invention incorporates atmospheric water generation (AWG) technologies to capture and condense moisture from the atmosphere, thereby producing localized rainfall. The system operates on renewable energy sources such as solar or wind power, ensuring minimal environmental impact while providing a sustainable solution to water shortages in arid and semi-arid regions.

At its core, the present invention comprises a tree-like structure that functions both as the generator of artificial rainfall and as the means by which atmospheric moisture is captured and condensed. The structure replicates the form and function of a natural tree, including trunk, branches, and leaves, which collectively create a self-sustaining water generation system. The tree-like design not only enhances integration into natural and urban environments but also provides the added benefit of contributing to green cover in barren or developed areas. The invention may be deployed in a wide variety of environments, making it adaptable to diverse climates and geographical conditions.

The water generation process in the present invention relies on advanced atmospheric water generation techniques. Moisture from the surrounding air is captured by the leaf-like components of the structure, which are designed for efficient vapor extraction. The collected moisture is condensed through cooling, absorption, or similar moisture-extraction methods and stored within

the trunk or root system. The stored water is subsequently released in a controlled manner to simulate natural rainfall. This localized and targeted artificial rainfall is particularly advantageous for drought-prone regions and agricultural applications where water supply is inconsistent or inadequate.

The present invention is powered by renewable energy sources. Solar panels may be integrated into the leaves or branches of the structure, harnessing solar energy during daylight hours to drive the condensation process. In regions with higher wind availability, wind turbines may be incorporated into the structure to provide supplemental energy. This integration of renewable power sources enables the present invention to function independently of external power grids and eliminates reliance on fossil fuels. Such energy independence ensures sustainable operation, even in remote or off-grid areas.

Beyond water generation, the present invention also provides environmental benefits. The tree-like structure functions as a carbon sink, absorbing carbon dioxide from the atmosphere and contributing to greenhouse gas reduction. In addition, the artificial rainfall generated by the system supports ecosystem restoration in drought-affected regions by replenishing soil moisture, promoting vegetation growth, and enhancing agricultural productivity. As such, the present invention operates not only as a water generation system but also as a tool for climate change mitigation and environmental resilience.

A further unique aspect of the present invention is its scalability and adaptability. The system may be deployed on a small scale for residential, urban, or agricultural use, or expanded to larger scales for regions requiring substantial water generation. Its modular design allows multiple units to be installed in a given area, offering a scalable approach to regional water scarcity. The system is designed for low maintenance and requires minimal intervention during operation, making it practical and cost-effective for long-term use.

The present invention provides a comprehensive solution to the dual challenges of water scarcity and environmental sustainability. By integrating atmospheric water generation techniques with renewable energy and a

biomimetic design, the present invention offers localized artificial rainfall in a sustainable and environmentally responsible manner. The multifunctional nature of the invention—combining water generation, renewable energy use, carbon sequestration, and ecosystem restoration—establishes it as a holistic and innovative response to the global issues of water shortage and climate change.

Various components of the architecture of the present invention are detailed below:

1. **Tree-Like Superstructure:** The invention comprises a load-bearing superstructure resembling a trunk and branches. The trunk cavity houses the atmospheric water generation hardware and provides mounting points for the canopy collector, photovoltaic panels, and a compact wind turbine. The structure consists of a corrosion-resistant shell, such as powder-coated aluminum, fiber-reinforced polymer, or stainless steel, supported by an internal frame. The outer surface may incorporate textured polymer or bark-like finishes to integrate with landscapes. Service channels within the trunk accommodate cabling, refrigerant lines, and drainage. The base incorporates anchor bolts, a ground plate for stability, and lightning protection bonding.
2. **Wind Turbine:** A compact, low-noise vertical-axis wind turbine, such as a Darrieus or Savonius hybrid, is integrated into the superstructure. The turbine provides continuous trickle power, day or night, complementing solar energy. Generated power is routed through a rectifier and charge controller into the system energy bus. Flexible couplings and vibration dampers are included to reduce mechanical resonance and noise transmission into the structure.
3. **Atmospheric Water Generation (AWG) Module:** The AWG module constitutes the core of the system. It functions by drawing humid air across chilled surfaces, condensing water vapor into liquid. Two implementations are envisaged:

- **Direct Condensing:** Thermoelectric (Peltier) modules or vapor-compression mini heat pumps driving finned condenser plates.

- **Sorption-Assisted:** A removable cartridge containing a desiccant such as metal-organic frameworks (MOF), zeolite, or silica gel, which captures moisture and is regenerated by heating using renewable energy.

  Airflow is regulated by fans, and temperature control is achieved by a proportional-integral-derivative (PID) loop to maintain coil temperature above freezing, thereby preventing frost formation.

4. **Perforated Collector (Intake Shroud):** The invention incorporates a perforated diffuser positioned beneath the canopy. The diffuser comprises a disk-like structure with numerous small inlets to distribute suction uniformly. This arrangement reduces pressure drop, noise, and dust ingress, while improving airflow residence time across the condenser coil. The perforations may be formed from laser-cut stainless steel or molded polymer, with fine mesh inserts to block insects and debris.
5. **Condensation Surfaces and Sump:** Condensation occurs on cooled plates or coils coated with hydrophilic and anti-fouling materials such as TiO_2-silica. The coatings facilitate droplet spreading, rapid drainage, and self-cleaning under ultraviolet exposure. The plates are inclined toward a sump that collects condensate and prevents droplet re-entrainment into the exhaust airstream. Temperature and humidity sensors optimize coil performance for maximum yield with minimum energy consumption.
6. **Heat-Exchange Core:** The trunk cavity houses a vertical serpentine heat-exchange core. In a vapor-compression design, the core circulates refrigerant between evaporator and condenser. In a thermoelectric design, a chilled-water loop transfers heat to an external radiator. The heat-exchange core is fabricated from copper or micro-channel aluminum, with closed-cell insulation to minimize losses. Quick-disconnect fittings enable servicing without refrigerant leakage.
7. **Solar Photovoltaic Panel and Energy Bus:** Photovoltaic panels are integrated into the canopy structure, configured to resemble leaves. The panels supply energy to an internal lithium iron phosphate ($LiFePO_4$)

battery bank via a maximum power point tracking (MPPT) controller. Together with wind turbine input, the energy bus operates at 24/48 V DC and powers system fans, pumps, compressors, sensors, ultraviolet sterilizers, and control modules.

8. **Air Handling and Filtration:** Ambient air entering the system passes through a multi-stage filter arrangement. A washable pre-filter removes dust and pollen, while an optional activated-carbon layer mitigates odors and organic compounds. In sandy or coastal environments, a cyclonic pre-separator reduces particulate fouling. Low-noise, high-static fans ensure uniform airflow through the intake diffuser.
9. **Water Quality and Sterilization:** Collected condensate undergoes purification to ensure microbial safety. The water passes through a 5-micron cartridge filter followed by a UV-C sterilization chamber or a low-power ozone injection unit. A stainless steel reservoir with a vented filter maintains quality during storage.
10. **Distribution Manifold for Artificial Rain Generation:** A solenoid-controlled distribution manifold directs water from the reservoir to nozzles arranged around the canopy or ground level. The nozzles may be configured for micro-spray, fogging, or drip discharge to simulate rainfall in various forms, including drizzle, shower, or mist. The manifold can be programmed to optimize soil infiltration, leaf wetting, or cooling.
11. **Control System and Sensing:** The system incorporates a microcontroller that monitors ambient conditions including temperature, humidity, dew-point, wind speed, irradiance, water level, and energy storage state. The control unit regulates AWG operation, manages desiccant regeneration cycles, schedules water release, and logs performance. Wireless connectivity such as LoRaWAN or cellular communication supports remote monitoring and updates.
12. **Thermal Rejection and Radiative Cooling:** The hot side of the AWG system dissipates heat through a finned radiator integrated into the canopy exhaust path. A high-emissivity surface coating provides radiative cooling benefits, particularly at night. In sorption-based

implementations, waste heat or low-grade solar heat is employed for desiccant regeneration.

13. **Safety and Durability:** The structure is equipped with lightning protection, surge arrestors, and grounding. Hinged access panels allow maintenance of filters and cartridges. Wildlife-safe mesh guards and stainless steel fasteners are employed. All coatings are UV- and salt-spray-resistant to support coastal deployment.

Operational Summary:

In operation, renewable energy from the solar panel and wind turbine charges the energy bus. Fans draw ambient air through the perforated collector into the AWG module, where water vapor is condensed on chilled surfaces or desorbed from a sorbent cartridge. Condensate drains into the sump and reservoir, where it undergoes filtration and sterilization. The control system regulates water release through the manifold, producing localized, programmable artificial rainfall. The system operates autonomously and sustainably, providing a water source in regions of scarcity.

The key features of the invention may be summarised as:

1. Tree-Like Structure

- The invention is designed to resemble the structure of a natural tree, thereby achieving visual appeal and environmental integration.
- The tree-like form provides the structural framework necessary to support the components responsible for water generation, energy production, and storage.

2. Atmospheric Water Generation

- The invention employs atmospheric water generation (AWG) techniques to capture moisture from the air and convert it into usable water.
- This process simulates natural rainfall by extracting water vapor from the atmosphere, condensing it, and storing it for controlled release.

- Condensation- and absorption-based methods are utilized, enabling the system to generate water even in arid or semi-arid regions where conventional water sources are scarce.

3. Renewable Energy Sources

- To ensure sustainable operation, the invention relies exclusively on renewable energy sources such as solar or wind power.
- Solar panels may be integrated into the leaves or branches of the structure to harness solar energy.
- Wind turbines may also be incorporated to capture wind energy, supplementing the power requirements of the system.
- The renewable energy harvested powers the atmospheric water generation and associated processes, allowing the invention to operate autonomously and independently of fossil fuels or external power grids.

4. Environmental Benefits

- Beyond water generation, the invention provides significant environmental benefits.
- The tree-like structure functions as a carbon sink, absorbing carbon dioxide from the atmosphere and thereby contributing to greenhouse gas reduction.
- The artificial rainfall produced by the invention aids in ecosystem restoration, enhances soil fertility, and supports agricultural growth in drought-prone regions.
- These combined functions promote biodiversity and contribute to broader environmental sustainability.

5. Artificial Rain Generation

- The final stage of operation is the controlled release of stored atmospheric water in the form of artificial rainfall.

- This localized and targeted rainfall provides a reliable water source in areas suffering from scarcity.
- The artificial rain is particularly advantageous for agricultural and urban applications, ensuring efficient and site-specific water delivery.

We claim:

1. An artificial rain-generating eco-friendly tree comprising:

(a) a tree-like superstructure configured to house functional modules and mimic the form of a natural tree;

(b) an atmospheric water generation module disposed within said superstructure and adapted to extract moisture from ambient air by condensation or sorption-assisted techniques;

(c) a perforated collector arranged at a canopy portion of the superstructure for intake of ambient air, said collector being provided with filtration means to prevent ingress of dust and debris;

(d) renewable energy sources including at least one photovoltaic panel and at least one wind turbine mounted on said superstructure;

(e) an energy storage unit electrically connected to said renewable energy sources for enabling continuous operation;

(f) a water collection and purification assembly comprising a condensation sump, outlet pipes, filtration means and a UV sterilization unit; and

(g) a distribution manifold configured to release purified water in the form of localized artificial rainfall through nozzles adapted to simulate drizzle, shower or mist.

2. The artificial rain-generating eco-friendly tree as claimed in claim 1, wherein the tree-like superstructure comprises a corrosion-resistant shell supported on an internal frame, said shell including service channels for cabling, refrigerant flow and drainage.

3. The artificial rain-generating eco-friendly tree as claimed in claim 1, wherein the wind turbine is a vertical-axis unit coupled to a charge controller and configured to supplement power generation from the photovoltaic panel.

4. The artificial rain-generating eco-friendly tree as claimed in claim 1, wherein the atmospheric water generation module comprises chilled surfaces coated with a hydrophilic anti-fouling layer of TiO_2-silica to enhance condensation efficiency.

5. The artificial rain-generating eco-friendly tree as claimed in claim 1, wherein the atmospheric water generation module alternatively comprises a sorption-assisted cartridge selected from metal-organic framework, zeolite or silica gel materials adapted to capture and release water vapour.

6. The artificial rain-generating eco-friendly tree as claimed in claim 1, wherein the water collection and purification assembly comprises a flow sensor and sediment trap disposed in the outlet pipe to prevent backflow and contamination.

7. The artificial rain-generating eco-friendly tree as claimed in claim 1, wherein the distribution manifold is solenoid-controlled and adapted to release water in pulsed sequences to emulate natural rainfall patterns.

8. The artificial rain-generating eco-friendly tree as claimed in claim 1, wherein the energy management and control system comprises a microcontroller adapted to monitor ambient temperature, humidity, dew point, irradiance, reservoir level, energy state and water quality, and to optimize operation of the atmospheric water generation module and distribution manifold.

9. The artificial rain-generating eco-friendly tree as claimed in claim 1, wherein the superstructure further comprises a radiative cooling surface for enhancing thermal rejection of the atmospheric water generation module.

10. The artificial rain-generating eco-friendly tree as claimed in claim 1, wherein the system is modular and scalable, enabling deployment in agricultural fields, urban landscapes or arid regions for generation of localized artificial rainfall and provision of environmental benefits including carbon sequestration and ecosystem restoration.

11. The artificial rain-generating eco-friendly tree as claimed in claim 1, wherein the water purification assembly comprises a multi-stage filtration unit including at least one washable pre-filter, an activated carbon filter, and a fine cartridge filter of 5-micron rating.

12. The artificial rain-generating eco-friendly tree as claimed in claim 1, wherein the sterilization unit comprises a UV-C LED chamber configured to inactivate bacteria, viruses and other microorganisms present in the condensed water.

13. The artificial rain-generating eco-friendly tree as claimed in claim 1, wherein the sterilization unit alternatively comprises a low-power ozone micro-dosing module adapted to disinfect the collected water.

14. The artificial rain-generating eco-friendly tree as claimed in claim 1, wherein the purified water is directed to a stainless steel reservoir having a vent filter for preservation of water quality prior to distribution.

15. The artificial rain-generating eco-friendly tree as claimed in claim 1, wherein the distribution manifold comprises a plurality of micro-spray nozzles arranged around the canopy to generate localized rainfall in a radial pattern.

16. The artificial rain-generating eco-friendly tree as claimed in claim 1, wherein the distribution manifold comprises misting nozzles configured to generate fine droplets for cooling, ecological restoration or leaf wetting in agricultural applications.

17. The artificial rain-generating eco-friendly tree as claimed in claim 1, wherein the distribution manifold comprises drip-type nozzles mounted at adjustable heights to deliver larger droplets closer to the ground for soil infiltration and reduced evaporation.

18. The artificial rain-generating eco-friendly tree as claimed in claim 1, wherein the distribution manifold is configured to operate in selectable modes including drizzle, shower, mist or drip based on pre-set agronomic or ecological requirements.

19. The artificial rain-generating eco-friendly tree as claimed in claim 1, wherein the flow of water through the distribution manifold is controlled by solenoid valves actuated by the microcontroller in response to sensed environmental parameters.

20. The artificial rain-generating eco-friendly tree as claimed in claim 1, wherein the system is adapted to schedule rain simulation in timed intervals or pulsed sequences to emulate natural rainfall patterns.

Dated this 14th day of September 2025

Sudarshana Bandyopadhyay

Regn. No.: IN/PA 2802

Agent for the applicant

Phn No. 9748818235

Email: bandyopadhyay.sudarshana@gmail.com

APPLICATION NO._____

ABSTRACT

ARTIFICIAL RAIN-GENERATING ECO-FRIENDLY TREE

The present invention relates to an Artificial Rain-Generating Eco-Friendly Tree designed to provide a sustainable solution to water scarcity while promoting environmental sustainability. The invention comprises a tree-like structure integrated with atmospheric water generation (AWG) technologies configured to capture moisture from ambient air, condense it into water, and store the same within a trunk or root system. Renewable energy sources such as solar panels embedded in leaves or branches and/or wind turbines are employed to power the condensation and control systems, thereby enabling autonomous operation without reliance on fossil fuels. The invention further includes a water purification assembly having multi-stage filtration and sterilization units to ensure the quality of collected water. The purified water is subsequently released through a distribution manifold comprising spray, mist or drip nozzles for generating controlled and localized artificial rainfall. The invention additionally serves as a carbon sink, aids in ecological restoration, supports agriculture in arid and semi-arid regions, and provides scalable and low-maintenance deployment in urban and rural environments.

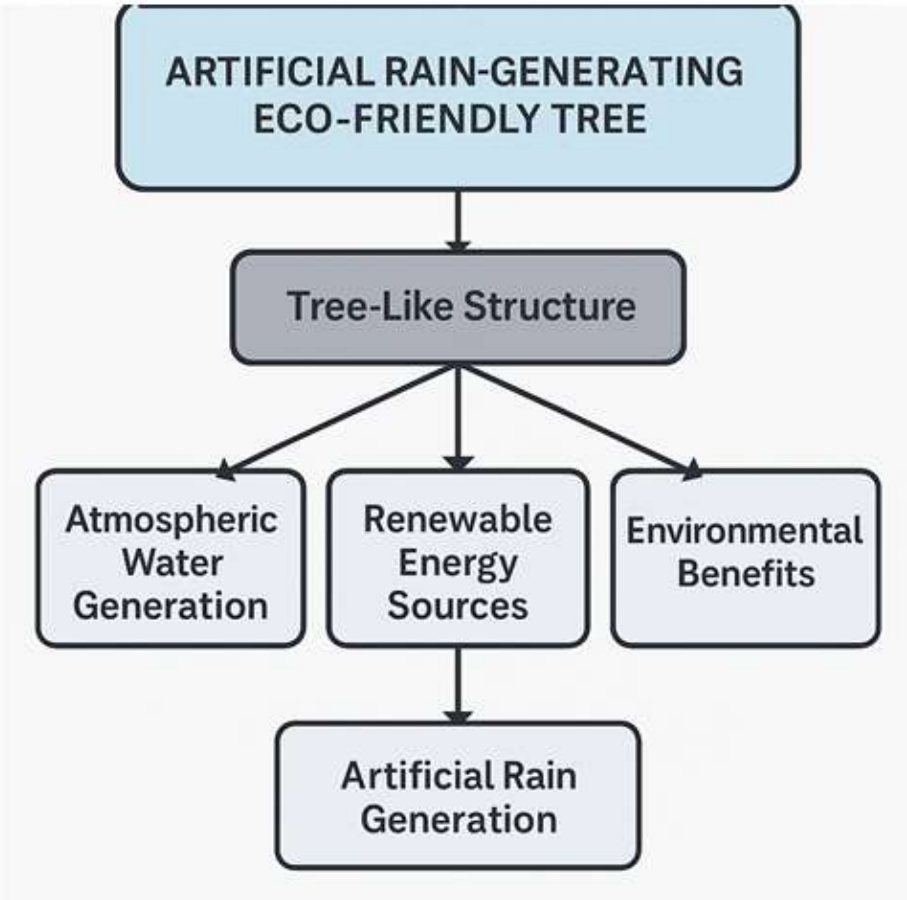
Fig 2

Applicant Name: SRJX RESEARCH AND INNOVATION LAB LLP

Total No. of Sheets: 2

Appl No. -

Sheet 1 of 2



Detailed Flowchart

Figure 1

Sudarshana Bandyopadhyay
Regn No.: IN/PA 2802
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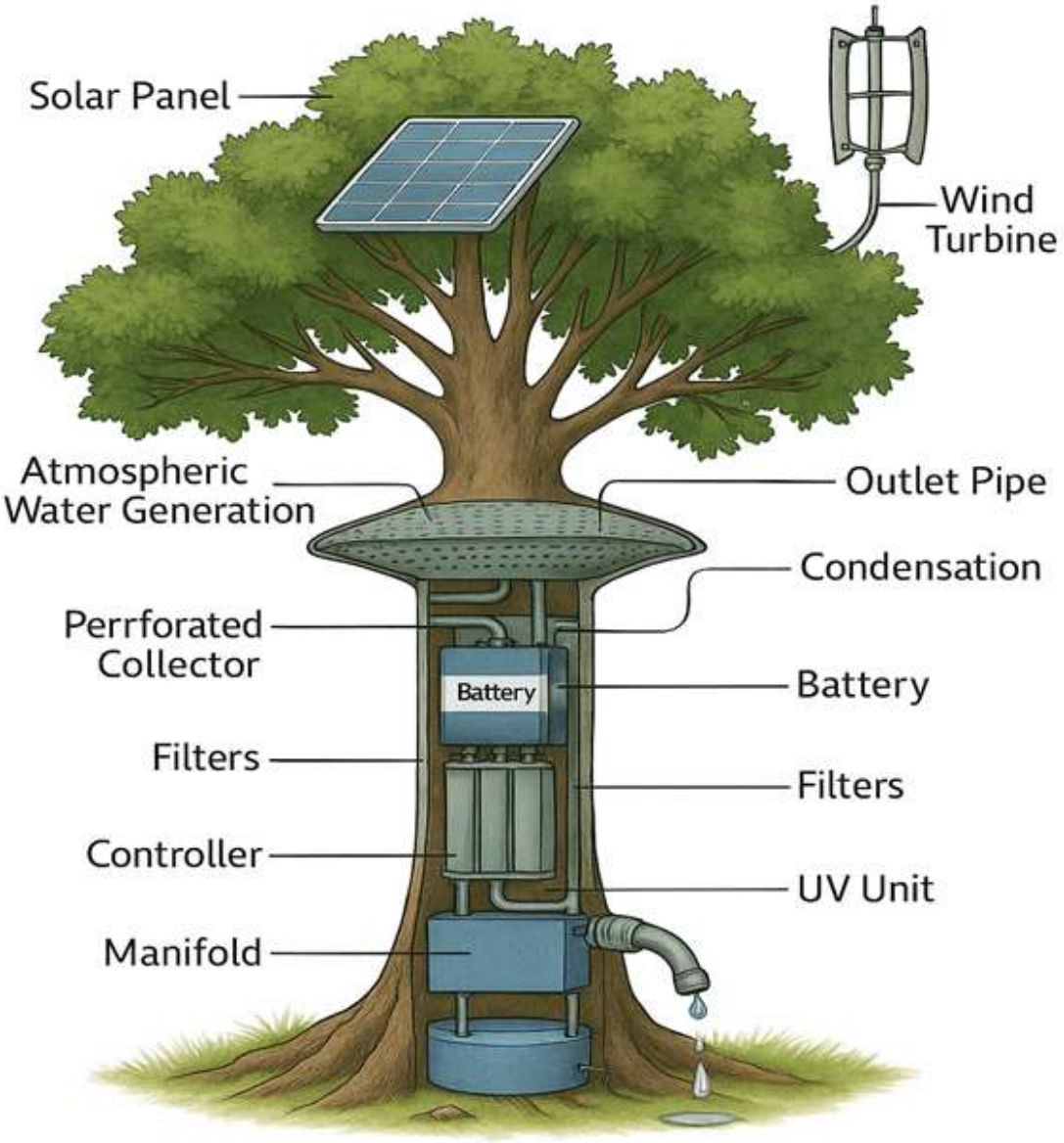
Applicant Name: SRJX RESEARCH AND INNOVATION LAB LLP

Total No. of Sheets: 2

Appl No. -

Figure 2 of 2



Detailed Architecture

Figure 2

Sudarshana Bandyopadhyay
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FORM 5
THE PATENTS ACT, 1970
(39 of 1970)
&
THE PATENTS RULES, 2003

Declaration as to Inventorship
[*See* section 10(6) and rule 13(6)]

1. **NAME OF APPLICANT**: SRJX RESEARCH AND INNOVATION LAB LLP,

hereby declare that the true and first inventor(s) of the invention disclosed in the complete specification filed in pursuance of our application numbered _____ dated 14 September 2025 are:

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Dated this 14th day of September 2025

Sudarshana

Name of the signatory:

Signature Not Verified
Digitally Signed.
Name: Sudarshana Bandyopadhyay
Date: 14-Sep-2025 22:41:32
Reason: Patent Efiling

Dated this 14th day of September 2025

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Phn No: 9748818235

To,
The Controller of Patents,
The Patent Office
At Kolkata

UDYAM REGISTRATION CERTIFICATE

UDYAM REGISTRATION NUMBER	**UDYAM-OD-07-0095836**
NAME OF ENTERPRISE	**SRJX RESEARCH AND INNOVATION LAB LLP**

TYPE OF ENTERPRISE *

SNo.	Classification Year	Enterprise Type	Classification Date
1	2025-26	Micro	16/08/2025

MAJOR ACTIVITY — **SERVICES**

SOCIAL CATEGORY OF ENTREPRENEUR — **GENERAL**

NAME OF UNIT(S)

S.No.	Name of Unit(s)
1	SRJX RESEARCH AND INNOVATION LAB LLP

OFFICAL ADDRESS OF ENTERPRISE

Flat/Door/Block No.	PLOT NO-3E/474	Name of Premises/ Building	SECTOR-9
Village/Town	CDA CUTTACK	Block	NA
Road/Street/Lane	Avinab Bidanasi	City	Cuttack Sadar
State	ODISHA	District	CUTTACK , Pin 753014
Mobile	9090255155	Email:	soumyajena1989@gmail.com

DATE OF INCORPORATION / REGISTRATION OF ENTERPRISE	**05/05/2025**
DATE OF COMMENCEMENT OF PRODUCTION/BUSINESS	**05/05/2025**

NATIONAL INDUSTRY CLASSIFICATION CODE(S)

SNo.	NIC 2 Digit	NIC 4 Digit	NIC 5 Digit	Activity
1	72 - Scientific research and development	7210 - Research and experimental development on natural sciences and engineering	72100 - Research and experimental development on natural sciences and engineering	Services

DATE OF UDYAM REGISTRATION	**16/08/2025**

* **In case of graduation (upward/reverse) of status of an enterprise, the benefit of the Government Schemes will be availed as per the provisions of Notification No. S.O. 2119(E) dated 26.06.2020 issued by the M/o MSME.**

For any assistance, you may contact:

1. District Industries Centre: CUTTACK (ODISHA)

2. MSME-DFO: CUTTACK (ODISHA)

Udyam Registration Number : UDYAM-OD-07-0095836

Type of Enterprise	MICRO	**Major Activity**	Services
Type of Organisation	Limited Liability Partnership	**Name of Enterprise**	SRJX RESEARCH AND INNOVATION LAB LLP
Owner Name	SRJX RESEARCH AND INNOVATION LAB LLP	**PAN**	AFPFS4480L
Do you have GSTIN	No	**Mobile No.**	9090255155
Email Id	soumyajena1989@gmail.com	**Social Category**	General
Gender	Male	**Specially Abled(DIVYANG)**	No
Date of Incorporation	05/05/2025	**Date of Commencement of Production/Business**	05/05/2025

Bank Details

Bank Name	IFS Code	Bank Account Number
Punjab national bank	PUNB0787800	7878002100002490

Employment Details

Male	Female	Other	Total
3	2	0	5

Investment in Plant and Machinery OR Equipment (in Rs.)

S.No.	Financial Year	Enterprise Type	Written Down Value (WDV)	Exclusion of cost of Pollution Control, Research & Development and Industrial Safety Devices	Net Investment in Plant and Machinery OR Equipment[(A)-(B)]	Total Turnover (A)	Export Turnover (B)	Net Turnover [(A)-(B)]	Is ITR Filled?	ITR Type
1	2023-24	Micro	0.00	0.00	0.00	0.00	0.00	0.00	No	NA

Unit(s) Details

SN	Unit Name	Flat	Building	Village/Town	Block	Road	City	Pin	State	District
1	SRJX RESEARCH AND INNOVATION LAB LLP	PLOT NO-3E/474	SECTOR-9	CDA CUTTACK	NA	Avinab Bidanasi	Cuttack Sadar	753014	ODISHA	CUTTACK

Official address of Enterprise

Flat/Door/Block No.	PLOT NO-3E/474	**Name of Premises/ Building**	SECTOR-9
Village/Town	CDA CUTTACK	**Block**	NA
Road/Street/Lane	Avinab Bidanasi	**City**	Cuttack Sadar
State	ODISHA	**District**	CUTTACK , **Pin :** 753014
Mobile	9090255155	**Email:**	soumyajena1989@gmail.com
Latitude	20.5021859203546	**Longitude:**	85.88860428847029

National Industry Classification Code(S)

SNo.	Nic 2 Digit	Nic 4 Digit	Nic 5 Digit	Activity
1	72 - Scientific research and development	7210 - Research and experimental development on natural sciences and engineering	72100 - Research and experimental development on natural sciences and engineering	Services

Are you interested to get registered on Government e-Market (GeM) Portal	No
Are you interested to get registered on TReDS Portals(one or more)	No
Are you interested to get registered on National Career Service(NCS) Portal	No
Are you interested to get registered on NSIC B2B Portal	No
Are you interested in availing Free .IN Domain and a business email ID	N/A
Are you interested in getting registered on Skill India Digital Portal	No
District Industries Centre	CUTTACK (ODISHA)
MSME-DFO	CUTTACK (ODISHA)
Date of Udyam Registration	16/08/2025
Date of Printing	16/08/2025

IEC Details	
IEC Number	
IEC Status	Inactive
IEC Registration Date	
IEC Modification Date	

"**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 ( )		PCT-NP ( )	
Divisional ( )	Patent of Addition ( )	Divisional ( )	Patent of Addition ( )	Divisional ( )	Patent of Addition ( )
3A. APPLICANT(S)					
Name in Full		Nationality	Country of Residence	Address of the Applicant	
SRJX RESEARCH AND INNOVATION LAB LLP		Indian	India	SRJX RESEARCH AND INNOVATION LAB LLP, Plot No - 3E/474, Sector-9, CDA, Post- Markat Nagar, Cuttack-753014, Odisha, India	
3B. CATEGORY OF APPLICANT [Please tick (✓) at the appropriate category]					
Natural Person ( )		Other than Natural Person			
		Small Entity (✓)	Startup ( )	Others ()	
4. INVENTOR(S) [Please tick (✓) at the appropriate category]					
Are all the inventor(s) same as the applicant(s) named above?		Yes ( )	No (✓)		

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

Name in Full	Nationality	Country of Residence	Address of the Inventor
DR SOUMYA RANJAN JENA	Indian	India	Plot No - 3E/474, Sector-9, CDA, Post-Markat Nagar, Cuttack-753014, Odisha, India
MR SANJOY SAHA	Indian	India	63/1, Thakur Para Road, P.O.- Naihati, North 24 Parganas, West Bengal-743165, India
DR SOHIT AGARWAL	Indian	India	D 388, Sarvanand Marg, Malviya Nagar, Jaipur-302017, Rajasthan, India

5. TITLE OF THE INVENTION

ARTIFICIAL RAIN-GENERATING ECO-FRIENDLY TREE

6. AUTHORISED REGISTERED PATENT AGENT(S)	IN/PA No.	2802
	Name	Sudarshana Bandyopadhyay
	Mobile No.	9748818235
7. ADDRESS FOR SERVICE OF APPLICANT IN INDIA	Name	**SUDARSHANA BANDYOPADHYAY**
	Postal Address	Ground Floor, S-456, LGF, Greater Kailash – II, New Delhi – 110048, India
	Telephone No.	NA
	Mobile No.	97488 18235
	Fax No.	NA
	E-mail ID	bandyopadhyay.sudarshana@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)

N.A.					

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

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
N.A.	

11. IN CASE OF PATENT OF ADDITION FILED UNDER SECTION 54, PARTICULARS OF MAIN	
Main application/patent No.	Date of filing of main application
N.A.	N.A.

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) is/are the true & first inventor(s) for this Invention and declare that the applicant(s) herein is/are my/our assignee or legal representative.

(a) Date:
(b) Signature:
(c) Name: **Dr Soumya Ranjan Jena**

(a) Date
(b) Signature(s):
(c) Name: **Mr Sanjoy Saha**

(a) Date:
(b) Signature:
(c) Name: **Dr Sohit Agarwal**

(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)

I/We, the applicant(s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative. – **N.A.**

(a) Date

(b) Signature(s)

(c) Name(s) of the signatory

(iii) Declaration by the applicant

We the applicant hereby declare that: -

[✓] We are in possession of the above-mentioned invention.

[✓] The complete specification relating to the invention is filed with this application.

[**x**] 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 us.

[**x**] We are the true & first inventor(s).

[✓] We are the assignee or legal representative of true & first inventor(s).

[**x**] The application or each of the applications, particulars of which are given in Paragraph-8, was the first application in convention country in respect of my invention(s).

[**x**] 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 us or by any person from which I derive the title.

[**x**] Our application in India is based on international application under Patent Cooperation Treaty (PCT) as mentioned in Paragraph-9.

[**x**] 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.

[**x**] 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/ provisional specification	No. of pages: 14	1600	Including Form 2, description,
No. of Claim(s)	No. of Claims = 20 No. of Pages = 4	-	Claim pages
Abstract	1		Abstract page
No. of Drawing(s)	No. of drawings = 2 and No. of pages = 2		Drawing sheets

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. Form 3: Statement and Undertaking
c. Form 5: Declaration as to inventorship
d. Power of Attorney
e. Form 28
f. Form 9

Total fee ₹ 7300/- is being paid online through electronic portal

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

Dated this 14th day of September 2025.

Signature:

Name: Sudarshana Bandyopadhyay
(Regn No: IN/PA 2802)
Agent for the Applicant
Phn no.: 97488 18235
email: bandyopadhyay.sudarshana@gmail.com

To,
The Controller of Patents
The Patent Office,
at Kolkata

FORM 28

THE PATENTS ACT,

1970 (39 of 1970)

AND

THE PATENTS RULES, 2003

TO BE SUBMITTED BY A SMALL ENTITY /STARTUP/EDUCATIONAL INSTITUTION

[See rules 2 (fa), 2(fb), 2(ca) and 7]

1	Name, address and nationality.	We, SRJX RESEARCH AND INNOVATION LAB LLP, of the address Plot No - 3E/474, Sector-9, CDA, Post- Markat Nagar, Cuttack-753014, Odisha, India, applicant in respect of the patent application no. _____ dated 14 September 2025 hereby declare that we are a micro entity in accordance with rule 2(fa) and submit the following document as a proof :
2	Documents to be submitted	
	i. For claiming the status of a **micro** entity:	
	A. For an Indian applicant: Evidence of registration under the Micro, Small and Medium Enterprises Act, 2006 (27 of 2006).	
3	To be signed by the applicant(s) / patentee (s) / authorised registered patent agent.	The information provided herein is correct to the best of my/our knowledge and belief. Dated this 14th day of September 2025
4	Name of the natural person who has signed.	Signature: Sudarshana

Signature Not Verified

Digitally Signed.
Name: Sudarshana Bandyopadhyay
Date: 14-Sep-2025 22:46:31
Reason: Patent Efiling

	Designation and official seal, if any, of the person who has signed.	Sudarshana Bandyopadhyay Regn. No.: IN/PA 2802 Agent for the applicant Phn No. 9748818235 Email: bandyopadhyay.sudarshana@gmail.com To The Controller of Patents, The Patent Office, At Kolkata

FORM 9

THE PATENTS ACT, 1970

(39 of 1970)

&

THE PATENTS RULES, 2003

REQUEST FOR PUBLICATION

[See Section 11A(2); Rule 24A]

We, SRJX RESEARCH AND INNOVATION LAB LLP, of the address Plot No - 3E/474, Sector-9, CDA, Post- Markat Nagar, Cuttack-753014, Odisha, India, hereby request for an early publication of our Patent Application No. _____ filed on 14 September 2025 under Section 11A(2) of the Act.

Dated this 14th day of September 2025

Sudarshana Bandyopadhyay
Regn No.: IN/PA 2802
Agent for the Applicants
Email: bandyopadhyay.sudarshana@gmail.com
Phn No: 9748818235

FORM 9

THE PATENTS ACT, 1970

(39 of 1970)

&

THE PATENTS RULES, 2003

REQUEST FOR PUBLICATION

[See Section 11A(2); Rule 24A]

We, SRJX RESEARCH AND INNOVATION LAB LLP, of the address Plot No - 3E/474, Sector-9, CDA, Post- Markat Nagar, Cuttack-753014, Odisha, India, hereby request for an early publication of our Patent Application No. _____ filed on 14 September 2025 under Section 11A(2) of the Act.

Dated this 14th day of September 2025

Sudarshana Bandyopadhyay
Regn No.: IN/PA 2802
Agent for the Applicants
Email: bandyopadhyay.sudarshana@gmail.com
Phn No: 9748818235

FORM 3

THE PATENTS ACT,

1970 (39 of 1970)

and

THE PATENTS RULES,
2003

STATEMENT AND UNDERTAKING UNDER SECTION 8

(See section 8; Rule 12)

1. Name of the applicant(s).	We, SRJX RESEARCH AND INNOVATION LAB LLP, Plot No - 3E/474, Sector-9, CDA, Post-Markat Nagar, Cuttack-753014, Odisha, India hereby declare:
2. Name, address and nationality of the joint applicant.	(i) that we have not made any application for the same/substantially the same invention outside India Or (ii) that we who have made this application No date 14th September 2025 alone/~~jointly~~ ~~with~~ ....., made for the same/ substantially same invention, application(s) for patent in the other countries, the particulars of which are given below:

Name of the country	Date of application	Application No.	Status of the application	Date of publication	Date of grant
N.A.					

3. Name and address of the assignee	(iii) that the rights in the application(s) have been assigned to SRJX RESEARCH AND INNOVATION LAB LLP, Plot No - 3E/474, Sector-9, CDA, Post-Markat Nagar, Cuttack-753014, Odisha, India

	that we undertake that upto the date of grant of the patent by the Controller, we would keep him informed in writing the details regarding corresponding applications for patents filed outside India within six months from the date of filing of such application. Dated this 14th day of September 2025
4. To be signed by the applicant or his authorized registered patent agent.	 Signature. .....
5. Name of the natural person who has signed.	Sudarshana Bandyopadhyay Regn. No.: IN/PA 2802 Agent for the applicant Phn No. 9748818235 Email: bandyopadhyay.sudarshana@gmail.com
	To The Controller of Patents, The Patent Office, at Kolkata
Note.- Strike out whichever is not applicable;	