

Article Overview

Photovoltaic distribution boxes and junction boxes are patented devices designed to connect, protect, and manage solar modules while improving installation, heat dissipation, and electrical efficiency.

Key Patents and Innovations

- o Smart Photovoltaic Power Distribution Box (US20210263578A1) This patent describes a smart distribution system for PV microgrids with minimal energy storage. It includes methods to monitor power demand, determine excess capacity, and activate power outlets accordingly. The system optimizes energy distribution and reduces reliance on large batteries, making it suitable for off-grid or developing regions .
- o Photovoltaic Junction Box with Enhanced Cable Fixing (US20230327605A1) This invention focuses on mechanical stability and connection reliability. The junction box includes a box body, electrical assembly, and fixing members that secure cables through grooves and concave surfaces. This design prevents cables from loosening or detaching due to external forces, improving safety and durability .
- o Distribution Box for Photovoltaic Power Stations (CN111969449A) This patent addresses installation efficiency and wall protection. The distribution box features a box body with quick-mounting fastening and anti-loosening mechanisms, including press-fastening and suction components. These mechanisms reduce installer fatigue, prevent wall damage, and maintain aesthetic integrity during installation .
- o Photovoltaic Junction Box with Electrical Signal Management (US20240396495A1) This junction box integrates a capacitor and dual conversion circuits to filter AC components in DC input and smooth current fluctuations. A control unit determines the maximum power output, ensuring efficient energy utilization from solar cells .
- o Ventilated Photovoltaic Junction Box (US10340846B2) This patent improves heat dissipation by incorporating ventilation passageways between the cover and receiving chamber. The design prevents overheating of diodes, enhancing service life and maintaining photoelectric conversion efficiency. It is particularly useful for high-power solar panels where thermal management is critical .

Summary of Features Across Patents

- o Electrical Protection: Junction boxes safeguard solar modules and manage current flow.
- o Mechanical Stability: Fixing members and anti-loosening mechanisms prevent cable detachment.
- o Smart Control: Some boxes include control units to optimize power output and distribution.
- o Installation Efficiency: Quick-mounting and ergonomic designs reduce labor and wall damage.
- o Thermal Management: Ventilation and heat dissipation features extend component lifespan. These patents collectively demonstrate the evolution of photovoltaic distribution boxes from simple connection devices to smart, durable, and thermally optimized systems suitable for modern solar installations.

A retractable, distribution box technology, used in photovoltaic power generation, photovoltaic modules, electrical

This application relates to the field of photovoltaic technologies, and in particular, to a power converter box and a photovoltaic system.

The invention discloses photovoltaic box-type substation and photovoltaic distribution system, are related to transformer station

The photovoltaic alternate current and direct current intelligent distribution box has photovoltaic module junction, direct current side

By using the distribution box provided in the invention, wiring is convenient and simultaneously a probability of generating a short

The string combiner boxes form subsystems that can be standardized according to the number of strings, voltage and rated current.

A junction box adapted to provide an electrical connection to an electrical wire attached to a photovoltaic panel. The junction box has

Photovoltaic (PV) grid-connected distribution boxes play an essential role in solar power generation systems. These boxes facilitate

Discover what a solar distribution box (PV combiner box) is, why it's critical for PV systems,

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CROSS-REFERENCE TO RELATED APPLICATION This application claims the benefit of the filing date under 35

According to another aspect of the invention, a photovoltaic system having multiple fuses is provided and includes combiner boxes

A photovoltaic junction box is disclosed. The photovoltaic junction box has a housing, a plurality of conduction terminals disposed in

Photovoltaic technology has developed rapidly over the last thirty years. The main activities of photovoltaic patents

Heat Dissipation for a Photovoltaic Junction Box Abstract An apparatus of a junction box component housed in a junction box and

This chapter outlines the results of patent analyses regarding recent developments in photovoltaics, with a special focus on the four

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