

Smart Bus Stop with Foot Rocker Power Generator

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Abstract: *Public transportation infrastructure plays a vital role in urban and rural mobility; however, most bus stops lack basic facilities such as lighting, safety systems, and digital information services. This paper presents a Smart Bus Stop integrated with a Foot Rocker Power Generator, a patented and innovative system designed to generate electrical energy through human foot movement.*

The proposed system combines a foot rocker mechanism (patented technology) with solar photovoltaic panels to create a hybrid renewable energy system. Mechanical energy generated from pedestrian foot movement is converted into electrical energy using a gear-driven DC generator and stored in batteries. This stored energy is used to operate LED lighting, USB charging ports, CCTV cameras, emergency panic buttons, and digital display boards.

The system is energy-independent, cost-effective, and suitable for rural, urban, and power-deficient areas. By integrating renewable energy with smart infrastructure, the project enhances commuter safety, convenience, and sustainability while supporting initiatives such as Smart City Mission and Digital India...

Keywords: Foot Rocker Generator, Smart Bus Stop, Renewable Energy, Human Power Generation, Smart Infrastructure, Sustainable Design, Patent Technology.

I. INTRODUCTION

Public transportation is essential for daily commuting, yet the infrastructure of bus stops in many parts of India remains underdeveloped. Most bus stops lack proper lighting, security systems, and real-time information facilities.

Additionally, unreliable electricity supply in rural and semi-urban areas restricts the implementation of smart technologies. This results in poor passenger safety and inconvenience.

To address these challenges, this project proposes a Smart Bus Stop powered by a Foot Rocker Generator (Patented Technology) combined with solar energy. The system ensures continuous power supply while enhancing safety, comfort, and sustainability.

II. PROBLEM STATEMENT

Bus stops in India face several issues:

- Lack of proper lighting leading to unsafe conditions at night
- Absence of CCTV surveillance and emergency systems
- No mobile charging or digital information facilities
- Dependence on unreliable grid electricity
- Inaccessibility of smart infrastructure in rural areas



These limitations highlight the need for an energy-independent and smart bus stop system.

III. PROPOSED SOLUTION

The proposed system introduces a hybrid renewable energy solution:

Foot Rocker Mechanism (Patented) → Converts foot movement into electrical energy

Solar Panels → Generate energy during daytime

Battery Storage → Stores energy for continuous use

The generated energy powers:

LED lighting

USB charging ports

Digital display boards

CCTV cameras

Emergency panic buttons

This system ensures continuous, reliable, and eco-friendly power supply without grid dependency.

IV. METHODOLOGY

A. Research and Feasibility Study

A detailed study was conducted on:

Human-powered energy systems

Solar energy integration

Existing smart bus stop designs

Feasibility was analyzed based on cost, materials, safety, and efficiency.

B. Design and Planning

The system includes:

Foot pedal (rocker mechanism)

Spring and gear arrangement

DC generator

Battery storage system

Electrical components (LED, USB ports, sensors)

The bus stop structure was designed to integrate all components safely.

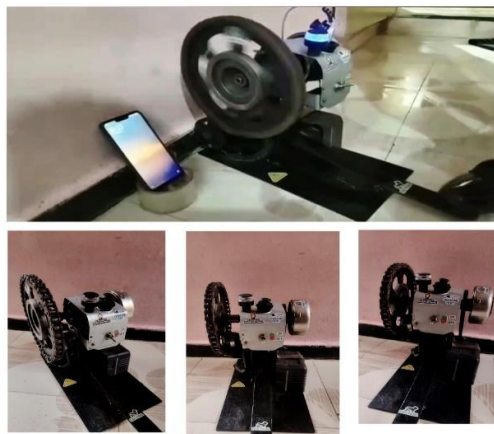


Fig. Foot Rocker Power Generator



C. Working Principle

- When a commuter presses the foot rocker:
- Mechanical energy is generated
- Energy is transmitted via gear mechanism
- DC generator converts it into electrical energy
- Energy is stored in batteries
- This energy is later used for lighting and other facilities.

V. ADVANTAGES

- Patented Foot Rocker Technology-Unique human-powered energy generation system
- Energy Independence-No reliance on grid electricity
- Enhanced Safety-CCTV, panic buttons, and proper lighting
- Passenger Convenience-Charging ports and digital information
- Eco-Friendly Design-Uses renewable energy, reduces carbon footprint

VI. APPLICATIONS

- Urban and rural bus stops
- Smart City projects
- Emergency power backup systems
- Public infrastructure modernization
- Educational and research demonstrations.

VII. RESEARCH WORK

This project is supported by studies in:

- Smart infrastructure systems
- Renewable energy technologies
- Urban transport modernization

Previous works include smart city frameworks and solar-powered systems; however, integration of foot rocker power generation with smart bus stops is a patented and original innovation.

VIII. CONCLUSION

The Smart Bus Stop with Foot Rocker Power Generator is an innovative and sustainable solution for modern transportation infrastructure.

By combining patented human-powered energy generation with solar energy, the system ensures continuous operation without dependence on conventional electricity. It enhances safety, comfort, and accessibility for commuters.

This project demonstrates strong potential for real-world implementation and scalability, contributing to the development of smart and sustainable cities.

IX. ACKNOWLEDGMENT

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