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Footstep Power Generation System

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ABSTRACT: Man needed and used energy at an increasing rate for sustenance and well-being from time immemorial. Due to this, much of the energy resources have been wasted and exhausted. The proposal for utilization of waste energy of foot power with human locomotion comes very much in relevance and importance to highly populated countries like India where railway stations, temples, etc., are overcrowded all round the clock. When the flooring is engineered with piezo electric technology, electrical energy created by pressure from steps is captured by floor sensors, converted into electrical charge by piezo transducers, then stored as a power source. And this power source has many applications in agriculture, home application, and street lighting, and as an energy source for sensors in remote locations. Walking generates vibrations that are usually wasted but can be converted into electricity. Converts footstep pressure into electrical energy by using piezoelectric materials. Transducers are placed in wood tiles, which can be installed in crowded areas to harness footstep energy.

KEYWORDS: Piezoelectric sensor Footstep Remote location Force and pressure Power generation

I. INTRODUCTION

The population of the country is constantly increasing and the requirement of the power is also increased day by day. So the wastage of energy is increased in many ways. So reforming this energy back to its usable form is the major solution. As technology is developed and the use of gadgets, electronic devices also increased. Power generation using conservative methods becoming deficient. There is a necessity arises for a different power generation method. At the same time the energy is wasted due to human locomotion and many ways. To overcome this problem, the energy wastage can be converted to usable form using the piezoelectric sensor. This sensor converts the pressure on it into a voltage. Hence by using this energy saving method that is the footstep power generation system, we are generating power. This project is used to generate voltage using footstep force. Hence, these systems are implemented on the public roads where people need to walk and also get to cross over on that system to access through entry or exit. Therefore, these systems could generate voltage at each step of a foot. Because of this reason, piezoelectric sensor is used in this system in order to measure the force, pressure, and acceleration by their transformation into electric signals. This system uses the voltmeter for the measurement of output, LED lights, the weight measurement system, and a battery for a better demonstration of the system. In another way, we are also saving a natural energy resource.

In this project the concentration is mainly on use of the piezoelectric crystals and films in high vibration system with efficient arrangement to get higher efficiency.

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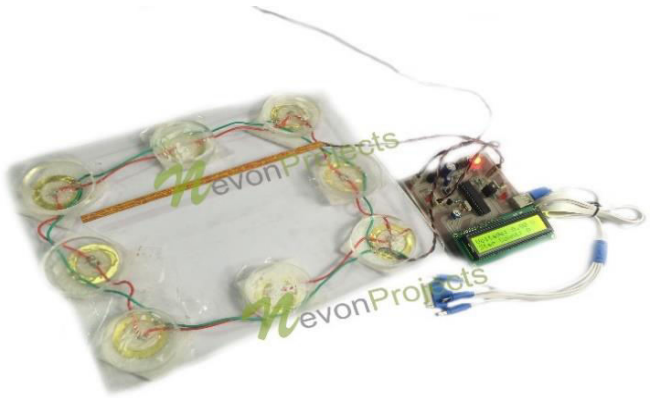
II. EXISTING SYSTEM

Footstep power generation is a revolutionary system that captures the energy generated through walking or running. Its primary mechanism involves a series of pressure-sensitive tiles or piezoelectric materials embedded in floors, which convert the mechanical energy from footsteps into electrical energy.

- Kinetic Energy Harvesting Existing systems capture wasted kinetic energy from foot traffic using piezoelectric materials.
- Low Energy Output: Current systems generate small amounts of electricity, suitable for powering low-energy devices like LEDs or sensors.
- Limited Deployment: These systems are mainly used in high-traffic areas like public walkways or experimental projects, but are not yet widely implemented.

A person stepping on these tiles causes pressure that induces an electrical charge, which can be captured within a battery or directly put to work for low-energy devices such as LED lights or sensors. This type of system is suitable for areas such as walkways, train stations, shopping malls, providing a sustainable mechanism to capture and utilize renewable energy in the particular area.



III. PROPOSED SYSTEM

This proposed footstep power generation system is aimed to provide maximum efficiency and scalability through the employment of highly advanced piezoelectric materials that can convert energy over levels and last for an extended period. These will therefore be strategically placed in high traffic areas such as walk ways, shopping malls, and transportation hubs that can maximize the capture of energy at specific points. Smart sensors will also be integrated into the system to scan foot traffic patterns that allow an ability to dynamically change the collection of energy for optimizing power generation based on real time data.

To actually enhance the storage and use of energy, the system proposed in this paper shall have a hybrid storage mechanism comprising super capacitors to provide short-time bursts of energy and batteries to store the energy for the long term. The power distribution shall be controlled by the smart energy management unit to ensure effective uses of the generated energy for lighting, charging stations, or low-power devices like sensors or public information systems. This is a scalable and sustainable design proposition for the urban environment, thus participating in clean energy schemes whilst reducing dependence on the grid.

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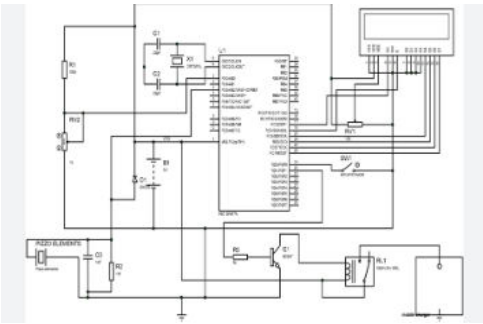

Circuit diagram

IV. FUTURE ENHANCEMENT

Integrate the system with IoT technology to send real-time alerts to designated contacts (e.g., family, police) when alcohol is detected.
Add a biometric system (fingerprint or facial recognition) to authenticate the driver before the start of the vehicle, and make sure only authorized people are driving it.
Implement advanced, non-invasive alcohol detection techniques such as skin sensors by touch through contact with the steering wheel or through breath analysis using infrared.
Deploy GPS and geo-fencing that would alert the authorities or the vehicle owner if an intoxicated person is trying to leave a designated area in an intoxicated state.
AI algorithms and computer vision that would monitor the driver's behavior by watching for drowsiness, erratic driving, or any other risky behavior other than alcohol detection.
Get connectivity with the On-Board Diagnostics OBD-II interface to collect information like speed, braking patterns, or engine performance at the time of suspected alcohol use.
To provide an emergency override system, implement a safe mode for the vehicle to be used in special situations such as medical emergencies while alerting the authorities.
Add voice alert to the system for raising awareness to the driver upon detection of alcohol and locks off, requesting him to breathe into the sensor for a retest.
Forward data to the cloud for further analyses to identify trends, repeat offenders, and output preventive recommendations based on the behavior of the driver.

V. CONCLUSION

In conclusion, footstep power generation is a promising and innovative approach toward sustainable harvesting of energy. This system will provide renewable power for a great number of applications in the urban environment-converting mechanical energy from footsteps into electrical energy. Advanced material inclusion and smart energy management systems assure efficiency, durability, and scalability while serving as a robust answer for power generation in the high-traffic areas like malls, sidewalks, and train stations.

This technology not only promotes clean energy initiatives but also encourages the development of smart cities by powering low-energy devices such as sensors and lighting systems. As the demand for renewable energy solutions grows, footstep power generation systems can play a crucial role in reducing carbon footprints and providing eco-friendly alternatives to traditional power sources.

More than this, the Footstep Power Generation can even raise the level of awareness among numerous people concerning energy saving and sustainability. To directly contribute to the production of energy by merely walking across the street, to a certain extent, makes one feel responsible for the environment because of this system. Coupled with improvement over time along with its increasing cost-effectiveness in order to be implemented into everyday infrastructure, cities will eventually become smarter, greener, and more energy-efficient.

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