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Hybrid Inverter with Solar Power System

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ABSTRACT: Inverters are frequently utilized in home and industrial settings to act as an alternative source of electricity in case the utility network's electrical supply is interrupted. However, due to the low capacity of the battery, the inverter was shut down for the heavy-load appliances. This endeavour is constructed in a way that uses solar energy to get around this restriction. An inverter powered by a battery makes up the hybrid inverter with a solar battery charging system. It incorporates maximum power point tracking (MPPT) to extract maximum power from the solar panels and efficiently charge the batteries. With the assistance of driver circuitry and a transformer, this inverter can generate up to 230V. The solar power source itself and the grid power supply are used to charge the battery. If the solar power supply is available, the relay circuitry uses the solar power to supply the load. Otherwise, the load connects to the grid power supply. The battery is also charged by this solar power source to be used as a backup in the future. When solar power is unavailable, charging the battery with the main supply is a pleasant option. As a result, this inverter may last longer and give the consumer an uninterrupted power supply.

KEYWORDS: Inverters, batteries, solar power microcontroller.

I. INTRODUCTION

The world is moving towards renewable energy sources due to the increasing concern for environmental degradation and the finite availability of fossil fuels. Solar energy has gained significant attention among renewable sources due to its abundance and wide availability. Solar energy is harnessed using photovoltaic (PV) panels, which generate direct current (DC) electricity. However, the generated DC electricity needs to be converted into alternating current (AC) electricity before households and industries can use it. This is where the inverter comes into play. The use of solar energy as a source of electricity has been increasing rapidly in recent years. This has been driven by the need for clean and sustainable energy sources to mitigate the impact of climate change. Solar energy is particularly attractive because it is abundant, free, and available in almost every part of the world. However, the intermittent nature of solar energy presents a challenge, particularly in areas where the power grid could be more reliable. To address this challenge, hybrid solar inverters have been developed. Hybrid solar inverters combine the functionality of a solar inverter and a battery inverter in a single device.

II. LITERATURE REVIEW

The world is moving towards renewable energy sources due to the increasing concern for environmental degradation and the finite availability of fossil fuels. Solar energy has gained significant attention among renewable sources due to its abundance and wide availability. Solar energy is harnessed using photovoltaic (PV) panels, which generate direct current (DC) electricity. However, the generated DC electricity needs to be converted into alternating current (AC) electricity before households and industries can use it. This is where the inverter comes into play. The use of solar energy as a source of electricity has been increasing rapidly in recent years. This has been driven by the need for clean and sustainable energy sources to mitigate the impact of climate change. Solar energy is particularly attractive because it is abundant, free, and available in almost every part of the world. However, the intermittent nature of solar energy presents a challenge, particularly in areas where the power grid could be more reliable. To address this challenge, hybrid solar inverters have been developed. Hybrid solar inverters combine the functionality of a solar inverter and a

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battery inverter in a single device. They are designed to enable solar energy to be stored in batteries and used when solar does not produce electricity. This provides a more reliable and constant source of electricity, even in areas with unreliable power grids. This final-year project aristo implement and fabricate a hybrid solar inverter. The hybrid solar inverter will be designed to enable the seamless integration of solar panels, batteries, and the power grid. It will be capable of managing the flow of energy between these sources, ensuring that energy is stored efficiently and used when needed

III. BLOCK DIAGRAM

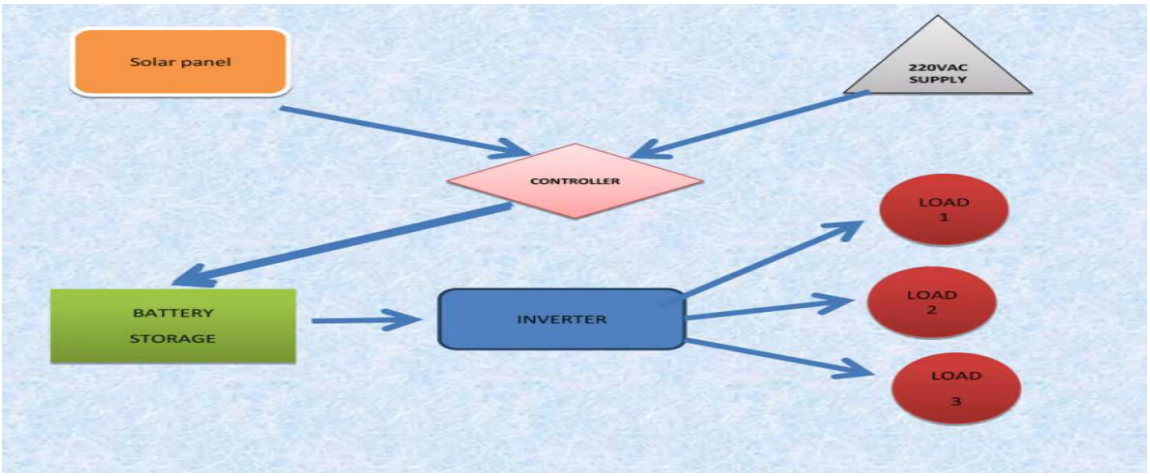

Fig.1. Block Diagram

Hardware required are: -
1.Microcontroller.
2.Solar panel with battery.
3.Relay.
4.Switching circuit and filter.
5.Control circuit.
6. Transformer.

IV. HARDWARE DETAILS

1.MICROCONTROLLER: -Sometimes referred to as an embedded controller or microcontroller unit (MCU), microcontrollers are found in automobile engine control systems, robots, office machines, medical devices, mobile radio transceivers, vending machines and home appliances, among other devices. They're simple miniature PCs designed to control small features of a larger component without a complex front-end operating system.

2. RELAY: - We use relays for a wide range of applications such as home automation, cars and bikes (automobiles), industrial applications, DIY Projects, test and measurement equipment, and many more. But what is Relay in Electricals? How a Relay Works? What are the Applications of Relays? Let us explore more about relays in this guide A Relay is a simple electromechanical switch. While we use normal switches to close or open a circuit manually, a Relay is also a switch that connects or disconnects two circuits. But instead of a manual operation, a relay uses an electrical signal to control an electromagnet, which in turn connects or disconnects another circuit. Relays can be of different types like electromechanical, solid state. Electromechanical relays are frequently used. Let us see the internal parts of this relay before knowing about working of relay. Although many different types of relay were present, their working is same.

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3.TRANSFORMER: - A transformer is an electrical device which, by the principles of electromagnetic induction, transfers electrical energy from one electric circuit to another, without changing the frequency. The energy transfer usually takes place with a change of voltage and current.

A transformer is a device that transfers electrical energy from one circuit to another. Mutual induction connects two circuits. It is also utilized for electrical power transmission via electromagnetic induction. Electric power is transferred without even any frequency modification.

4. FILTER CIRCUIT: - Switching circuit and filter is use for filter the wave form and reduce the fluctuation. And it reduces the noise level in the output waveform Hence increase the efficiency of the inverter

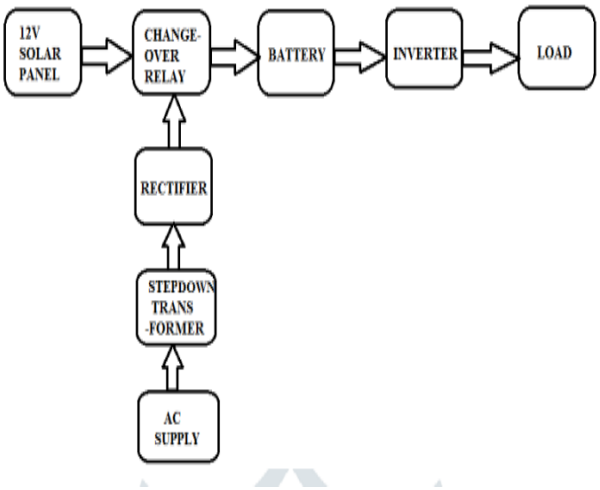
A filter circuit is an electronic device which blocks the ac component present in the rectified output and allows the dc component to reach the load. The following figure shows the functionality of a filter circuit. A filter circuit is constructed using two main components, inductor and. capacitor.

5.BATTERY: A battery is a device that stores chemical energy and converts it to electrical energy. The chemical reactions in a battery involve the flow of electrons from one material (electrode) to another, through an external circuit. The flow of electrons provides an electric current that can be used to do work.

A Battery is use for store the energy. The battery taken power from solar and it will start to charge. Battery capacity measure in Ah (ampere hours).

Batteries and similar devices accept, store, and release electricity on demand. Batteries use chemistry, in the form of chemical potential, to store energy, just like many other everyday energy sources.

V. FLOW OF THE SYSTEM



VI. ADVANTAGES

1. Energy independence and reliability
2. Cost savings
3. Environmental benefits and sustainability
4. High efficiency

VII. CONCLUSION

The following enhancements will significantly improve the system's efficiency, reliability, and user experience.

Real-time power mixing between grid and solar can be explored using zero-crossing techniques. The system can automatically take appropriate actions by integrating fault detection mechanisms, such as isolating faulty components or notifying the user of necessary maintenance or repairs.

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