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Research Article

A REVIEW PAPER ON MINI INVERTER FOR SMALL RATING APPLIANCES

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Abstract: An inverter is a power electronics device that converts DC power into AC power at the desired output voltage and frequency. The primary objective of this project is to convert a 12V DC power supply into a 240V AC output using a transformer to step up the voltage. Additionally, the system is designed to deliver an output power of up to 1000 watts.The inverter circuit plays a crucial role in converting DC energy into AC, making it suitable for household electronic appliances. The circuit is designed to generate a sine wave output with low noise, operating within the range of 220V–240V AC.In the final section of this report, we provide suggestions and recommendations for potential future improvements, aiming to enhance the technology further.

Keywords: Inverter, Photovoltaic, Converter, Efficiency.

I. INTRODUCTION

This section presents the research methodology, outlining the techniques used to gather information and data for this project on a single-phase inverter. It also provides a theoretical background on how a single-phase inverter operates and the key components used in its construction.

This paper is particularly useful for small spaces, camping areas, and other remote locations where AC power is not readily available. The primary motivation behind this project is to develop a DC-to-AC power inverter that efficiently converts DC power into high-voltage AC power, similar to the electricity supplied by a standard electrical wall outlet. Inverters are widely used in situations where low-voltage DC sources, such as batteries, solar panels, or fuel cells, need to be converted into AC power for running household and industrial appliances. For example, an inverter can convert electrical power from a car battery to operate a laptop, TV, or mobile phone.

An AC electrical power supply is essential for operating most electronic devices. However, when the power goes out, using these devices becomes difficult. This issue can be resolved with an inverter, a device that converts DC (direct current) into AC (alternating current). The primary function of an inverter is to transform a DC input voltage into a symmetrical AC output voltage with the desired magnitude and frequency.

Inverters come in different wattage capacities, determined by the formula P=VIP=VI, where power (watts) depends on voltage and current. The wattage output is influenced by components such as transformers and coil wires, which are designed based on the required amperage.

There are various types of inverters, classified based on the number of phases, the use of power semiconductor devices, communication principles, and output waveforms. First, we will explore single-phase inverters. Then, we will discuss voltage source inverters (VSI) and current source inverters (CSI).

Inverters have a wide range of industrial applications, including speed control of induction and

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synchronous motors, induction heating, aircraft power supplies, uninterruptible power supplies (UPS), and high-voltage DC transmission. They are especially essential in towns and regions with unreliable electricity, making them a crucial technology for improving daily life. Studying inverters enhances our understanding of electrical and electronic systems.

II. OBJECTIVE

1. Planning and simulating a single stage beat width adjusted inverter that fully converts dc power to ac power is the main goal of this.
2. The inverter's 12V DC source from the battery is meant to provide 150 watts.
3. Five 9-watt driven lights or a maximum of 100-watt bulbs can be controlled by the inverter's 1.2 Amp of substitute current.
4. An inverter converts DC electricity from sources such as energy units, solar chargers, or batteries to AC power.
5. Power can be supplied via an inverter at any anticipated voltage.

In particular, it can surely operate AC hardware meant for mains activity or be adjusted to produce DC at any desired voltage.

III. WORKING

Here is a 100-Watt inverter circuit designed using a minimal number of components. Creating an efficient inverter with even fewer components would be quite challenging.

This circuit utilizes a CD4047 IC from Texas Instruments to generate 100Hz pulse trains, along with four 2N3055 transistors to drive the connected load. The CD4047 IC is configured as an astable multivibrator, producing two 100Hz pulse trains that are 180 degrees out of phase. These pulses are then pre-amplified using TIP122 transistors, whose outputs are further amplified by four 2N3055 transistors (two for each half-cycle) to power the inverter transformer.

The secondary winding of the transformer delivers a 220V AC output, making this inverter ideal for small loads such as light bulbs and fans. This design follows a simple and effective inverter principle, ensuring reliable operation. If you require a low-cost, 100W inverter, this circuit is an excellent choice.

IV. BLOCK DAIGRAM

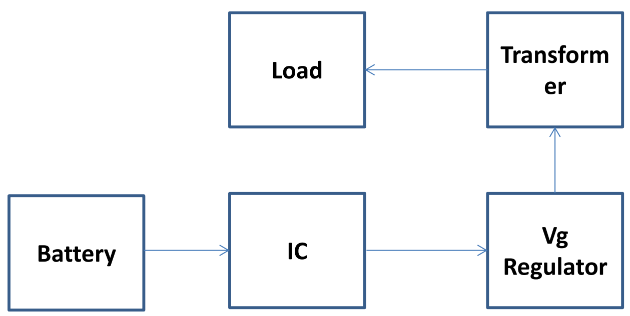

Fig. 2 :- Block Diagram

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In this block diagram, a 12V power supply is provided to a complementary MOS astable/bistable multivibrator. This circuit generates two output signals: one in-phase (180°) and one out-of-phase (180° out of phase). These signals are then fed into the base of a switching transistor (TIP122).
The collector supply is connected to a high-power transistor (TIP3055), which is used as a replacement for the 2N3055 complementary high-power transistor. The output is then passed through a voltage regulator, which stabilizes the voltage using a Zener diode and capacitor.
Finally, a step-up transformer converts 12V DC into 240V AC, which is then supplied to the connected load.

V. APPLICATIONS

These days, power inverters are commonly utilized for a variety of purposes, including powering televisions, radios, and cell phones in cars. People who own boats or campers, or who work on construction sites with restricted access to the electrical grid, can also benefit from them.
Long power lines are no longer necessary thanks to inverters, which allow users to produce AC power in locations where only batteries are accessible. Modified sine wave and pure sine wave power inverters are the two primary varieties that are currently on the market. The output properties of these inverters vary, influencing distortion and efficiency, which can have varying effects on electrical equipment.
With stepped transitions, a modified sine wave inverter creates a waveform that is more akin to a sine wave in shape than a square wave. In contrast to a pure sine wave inverter, this waveform is produced by alternating between three voltage levels at predetermined frequencies, simplifying the circuitry. The modified sine wave inverter is a practical and affordable way to power a variety of AC devices because of its simpler construction. It does have certain restrictions, though, because not all gadgets work well with its output. Computers and medical equipment, for example, are susceptible to signal distortion and need a pure sine wave power source to function at their best.

VI. CONCLUSION

To begin this project, we conducted research on existing inverter systems worldwide. An inverter is an electrical device that converts direct current (DC) into alternating current (AC). The converted AC output can be adjusted to a specific voltage and frequency using appropriate transformers, switching mechanisms, and control circuits. Solid-state inverters, which contain no moving parts, are widely used in various applications, ranging from small power supplies in computers to large-scale high-voltage DC transmission systems for bulk power distribution. Inverters are commonly used to convert DC power from sources like solar panels and batteries into usable AC power. Essentially, an inverter functions as the reverse of a rectifier. Through this project, we have gained valuable technical skills, including inverter operation, output generation, and voltage regulation. Additionally, we have developed practical expertise in electronic soldering, wiring, single-phase circuit connections, and selecting appropriate cable sizes for efficient power transmission.

VII. AUTHOR(S) CONTRIBUTION

The writers affirm that they have no connections to, or engagement with, any group or body that provides financial or non-financial assistance for the topics or resources covered in this manuscript.

VIII. CONFLICTS OF INTEREST

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

IX. PLAGIARISM POLICY

All authors declare that any kind of violation of plagiarism, copyright and ethical matters will taken care by all authors. Journal and editors are not liable for aforesaid matters.

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