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Design of Single Phase Sine Wave Inverter using Multivibrator IC

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ABSTRACT

In recent years, there is demand of inverters for utilizing DC power sources for both low and high power applications. These inverters are efficient and also prevent the electrical components from damaging. Research has been carried out on producing cost-effective and proficient pure sine wave inverter. This paper emphases a design that is highly useful for low power based applications. Multivibrator in this operating in astable mode for the PWM generation technique used to drive pure sine wave inverter. The design is easy to implement and proves to be cost real for low power applications.

KEYWORDS: *PWM, inverter, 555 timer IC.*

I. INTRODUCTION

With an aspire to provide energy needs of modern distributed systems address power concerns by including back-up power systems and power quality issues. Pure Sine Wave Inverter is one of the most recognizable technologies that have been utilized by both industrial and private sectors in Distributed Power Generation Systems.

DG Systems are normally assist Photovoltaic systems and fuel cells on small scale. Most of our present electrical systems are working on AC, therefore PV energies are first to be converted into AC to make them suitable for our regular loads or to connect it to grid. In case of power back-up systems, which require batteries as a source, inverter topology is an integral block to be implemented with the system.

II PROPOSED TOPOLOGY

The techniques to implement the pure sine wave inverter is also above products are not useful enough and are not in everyone's scope while catering low power applications pure sine wave inverter may have series of models to design and they must be able to operate along with competitive efficiency cost ease of implementation use.

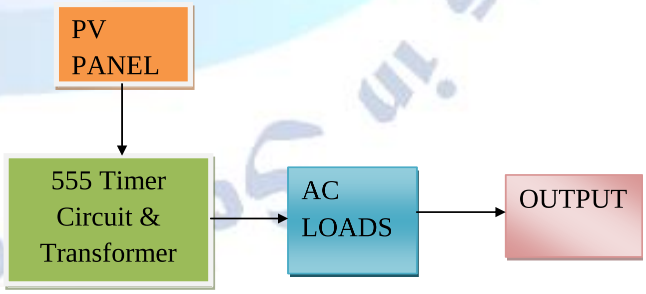

Fig. 1. Block diagram of the proposed topology

2.1 PV panel:

In this PV panel the photons will absorb the light illumination and the cells stored in this will result in migration of conduction band to valance band, that is the holes in the layer will be absorbed by the n type electrons this result in the layer to store energy and the load is connected across it which is connected to the voltage regulator or inverter type load

The main functions of the PV cell are:

- To convert the solar energy to directcurrent Electrical energy.
- Regulate the electrical energy output.
- Feed the electrical energy in to an external load circuit to perform and store the electrical energy in a battery subsystem for later use.

2.2 Timer circuit

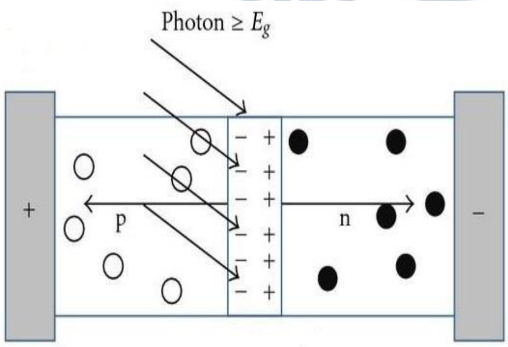

Fig 2. PV Cell

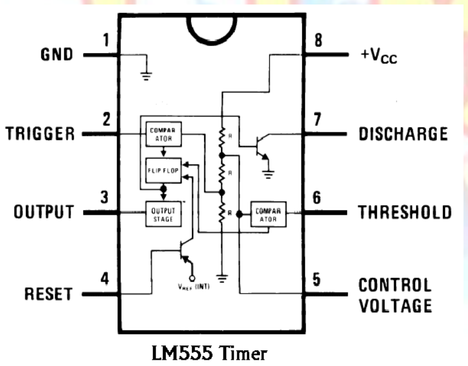

Fig. 3 Pin Diagram of LM555 Timer

2.2.1 555 timer IC:

The main objective of this paper is to produce sinusoidal waveform using multivibrator ICs. The application has been understood using NE555 timer IC which is fit for both mono-stable and astable applications. Similar others ICs the on-off time of this IC is also reliant on external capacitor. The capacitor takes finite period of time to charge and discharge through resistor which can be determined using R and C values using expressions.

t=R*C

One of the most common operational modes of this IC is its use as astablemultivibrator for fluctuating duty cycle generation. astablemultivibrator is arrangement of bistablemultivibrator to switch conditions periodically. Bistable is connected with RC network in feedback loop to control the RC time constant in this mode, it simply acts as an oscillator generating a continuous waveform of rectangular on-off pulses alternating between two voltage levels.

III ASTABLE MULTIVIBRATOR

Astablemultivibrator has automatic built in triggering which switches if continuously between its two unstable states both set and reset. Astablemultivibrator also known as free running multivibrator the astable circuit consist of two switching transistorsacross coupled feedback network time delay capacitors.

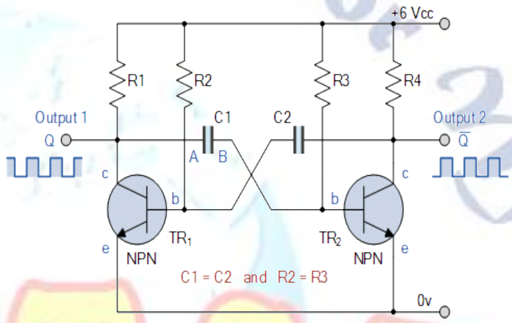

Fig. 4 Astablemultivibrator.

Astableoscillator produce a continuous square waveform its output.the basic circuit's astablemultivibrator operates as common emitter amplifier with 100% positive feedback. Astable Multivibrator can produce two very slot of square wave output waveform.

Timer based inverter circuit

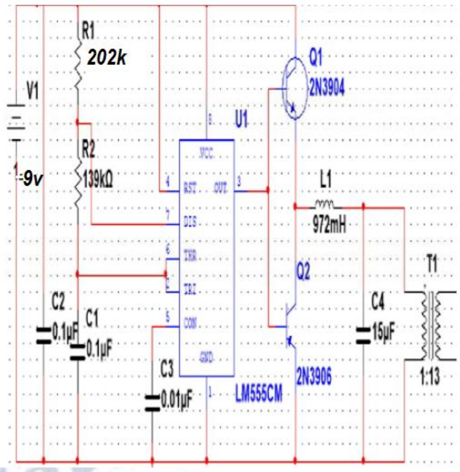

Fig.5 The diagram of proposed topology in MULTI SIM.

LM 555 IC based inverter circuit with configuration of giving a50HZ 220V output. Voltage is 12V DC input voltage. supply can be from any renewable energy generator, resistor R1,R2 and capacitor C1andC2. The resistor and capacitor will be designed as followings:

Frequency f=1.44/ (R1+2R2)*C (1)

F=50HZ;

%D=(R1+R2)/(R1+2R2) (2)

Let C1=0.1UF;
Using Equations (1) and (2);
To find the values of R1and R2.to design the 555 timer circuit.
Tc =charging
Time=0.693(R1+R2)*C,
Td =Discharging time 0.693R2*C
Let consider as duty cycle is 85%
frequency=50HZ, C=0.1uf
Equation(1):
(R1+2R2)*C=0.0288 (3)
Equation (2):
0.85=(R1+R2)/(R1+2R2);
R2=0.213R1 (4)
Equation (4) in (3):
R1=201 kilo ohm (5)
Equation (5) in (4);
R2=43 kilo ohm

The output from NPN and PNP transistor pair is in square wave which also contain harmonics and wave form will be disorded after simplification by the transistors, the proposed low pass filter configuration for 50HZ frequency.The harmonics are reduced and the output waveform is in the proper sinusoidal shape in the oscilloscope.

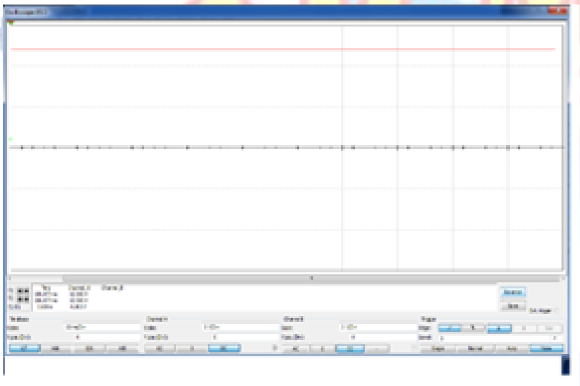

Fig 6 Wave form of 555 timer circuit

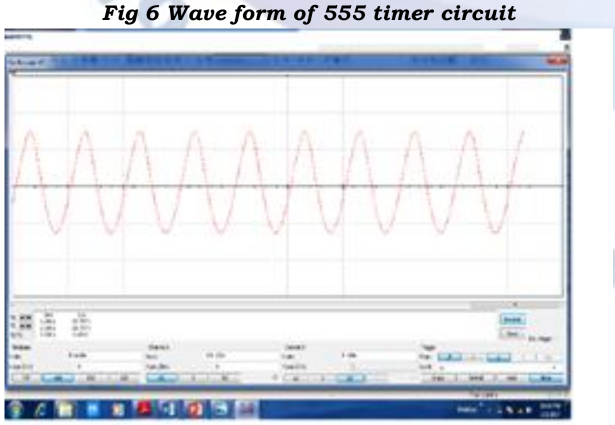

Fig 7 Wave form of Inverter circuit

IV CONCLUSION

The result shown has been done in the field of pure sine wave inverter but to obtain a waveform with reduced number of harmonics along with high efficiency which is easy to implement, cost proficient and reliable from consumers perspective design for low power application which is cheap to realize.

We plan to extend this work as mentioned in future work and present a better solution.

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