MOBILE DC 12V TO AC 240V 50HZ CONVERTER

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ABSTARCT

This project title is mobile DC 12V to AC 240V 50Hz converter which is a device that will convert a DC voltage to AC voltage. When we traveling in car, there is some problem that might be occurring such as our handset battery flat and we need it for emergency cases. This project might help a little bit to overcome this problem. User can get an AC supply in their car just connect this converter to the cigarette lighter slot and then it will produce an AC voltage. This converter is design small so it can be mobile and save space in the vehicle. This converter is suitable to use for charging handset and laptop.

ABSTRAK

Tajuk untuk projek ini adalah pengubah 12V DC kepada 240V AC 50 Hz mudah alih. Apabila kita melakukan perjalanan menaiki kenderaan contohnya kereta, kita akan menghadapi sesetengah masalah seperti telefon kehabisan bateri dan kita amat memerlukannya untuk membuat panggilan contohnya ketika kecemasan. Melalui projek ini sedikit sebanyak dapat menyelesaikan masalah tersebut. Pengguna boleh mendapatkan bekalan elektrik 240V AC dengan hanya menyambungkan pengubah ini kepada slot penghidup api di dalam kereta dan ia akan menghasilkan bekalan elektrik. Penukar ini direka agar tidak terlalu besar agar mudah dibawa kemana sahaja dan menjimatkan ruang ketika digunakan di dalam kereta. Pengubah ini paling sesuai untuk digunakan untuk cas semula bateri telefon dan komputer riba.

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CHAPTER I

INTRODUCTION

1.1 Project Background

This project title is mobile DC 12V to AC 240V 50Hz converter which is a device that will convert a DC voltage to AC voltage. The main idea of this project is we will able to get 240V source in motor vehicle like car, mpv and many more even when we are getting outdoor activities such as camping where we just need to bring a 12V battery. The output 240V AC can be used to recharge the laptop, PDA and many lower current rate device by using the normal available charger provide by gadget manufacture. The word mobile means this device is movable which it is not huge in size where it can be placed anywhere and did not use large area when put in vehicle. This invention will avoid headache to find out the compatible in car charger for each gadget you have.

The significant we can get from this project is this project is a useful kit to apply in any vehicle. This project also will make user save their money from buy many charger to use in vehicle because for each device there were different chargers. This converter is not only for using in vehicle but it also can be apply when doing outdoor activities such as camping when we need an ac source and we just need to bring a 12V battery. This project can be developing to a high watt converter for high watt device such as TV and microwave.

1.2 Objective Of Project

The objective of this project is to design a converter circuit that produce 240V AC output from 12V DC input. The input is come from 12V battery. When we apply this converter in vehicle we can plug in the input in the cigarette lighter slot and when for outdoor usage there is cable to connect the input to the battery.

The next objective is to understand the concept of this converter. All the process from beginning or input from DC to AC output must be understandable. How this converter work and how it convert from DC to AC also must be know.

Last but not least to make this converter mobile and easy to apply. The word mobile means this converter is small in size where it will use less space while using it in vehicle and light. This converter is simple to apply where it just need to connect to the input and it ready to use.

1.3 Scope of Project

This project only uses an electronic component that will convert DC 12V to AC 240V. It will use 555 IC to convert the DC to AC and step up it using transformer. In the middle of the process of step up and convert there will be amplifying process which use an amplifier circuit to make the AC is suitable to step up.

The power usage from this converter is only below 100watt. The devices that can use this converter are low watt device such as charger for handset, PDA, laptop, i-pod and many more. When the device that been use is more than 100watt, this converter will overload and the fuse will be automatic burn. It will maintain the same frequency as main power source which is 50Hz.

This project must be design not to big so it will save space while using it in vehicle and it also mobility where it can be take anywhere. It is also light and small so it easy to bring anywhere.

1.4 Problem Statement

When traveling in vehicle, we have some difficulty such as to charge our handset, laptop, PDA and many more low current devices. It will make difficulties to us when we need that device for some emergency cases such as handset but it cannot use because out of battery when we traveling. Each device have different charger for in vehicle usage. It will cost a lot of money to buy many different chargers. This project will help out user a little bit where they can save their money.

1.5 Method of Project

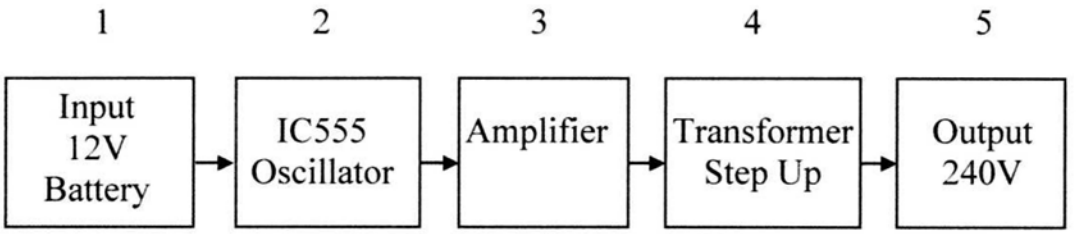

Figure 1.1: Block diagram

CHAPTER II

LITERATURE REVIEW

2.1 Historic Of Inverter

2.1.1 Early Inverter

From the late nineteenth century through the middle of the twentieth century, DC-to-AC power conversion was accomplished using rotary inverters or motor-generator sets. In the early twentieth century, vacuum tubes and gas filled tubes began to be used as switches in inverter circuits. The most widely used type of tube was the thyratron.

The origins of electromechanical inverters explain the source of the term inverter. Early AC-to-DC inverters used an induction or synchronous AC motor direct-connected to a generator (dynamo) so that the generator's commutator reversed its connections at exactly the right moments to produce DC. A later development is the synchronous inverter, in which the motor and generator windings are combined into one armature, with slip rings at one end and a commutator at the other and only one field frame.

The result with either is AC-in, DC-out. With an M-G set, the DC can be considered to be separately generated from the AC; with a synchronous inverter, in a certain sense it can be considered to be "mechanically rectified AC". Given the right

auxiliary and control equipment, an M-G set or rotary inverter can be "run backwards", converting DC to AC.

2.1.2 Controlled Rectifier Inverters

Since early transistors were not available with sufficient voltage and current ratings for most inverter applications, it was the 1957 introduction of the thyristor or silicon-controlled rectifier (SCR) that initiated the transition to solid state inverter circuits.

The commutation requirements of SCRs are a key consideration in SCR circuit designs. SCRs do not turn off or commutate automatically when the gate control signal is shut off. They only turn off when the forward current is reduced to zero through some external process. For SCRs connected to an AC power source, commutation occurs naturally every time the polarity of the source voltage reverses. SCRs connected to a DC power source usually require a means of forced commutation that forces the current to zero when commutation is required. The least complicated SCR circuits employ natural commutation rather than forced commutation. With the addition of forced commutation circuits, SCRs have been used in the types of inverter circuits described above.

In applications where inverters transfer power from a DC power source to an AC power source, it is possible to use AC-to-DC controlled rectifier circuits operating in the inversion mode. In the inversion mode, a controlled rectifier circuit operates as a line commutated inverter. This type of operation can be used in HVDC power transmission systems and in regenerative braking operation of motor control systems.

Another type of SCR inverter circuit is the current source input (CSI) inverter. A CSI inverter is the dual of a six-step voltage source inverter. With a current source inverter, the DC power supply is configured as a current source rather than a voltage source. The inverter SCRs is switched in a six-step sequence to direct the current to a three-phase AC load as a stepped current waveform. CSI inverter

commutation methods include load commutation and parallel capacitor commutation. With both methods, the input current regulation assists the commutation. With load commutation, the load is a synchronous motor operated at a leading power factor.

As they have become available in higher voltage and current ratings, semiconductors such as transistors that can be turned off by means of control signals have become the preferred switching components for use in inverter circuits.

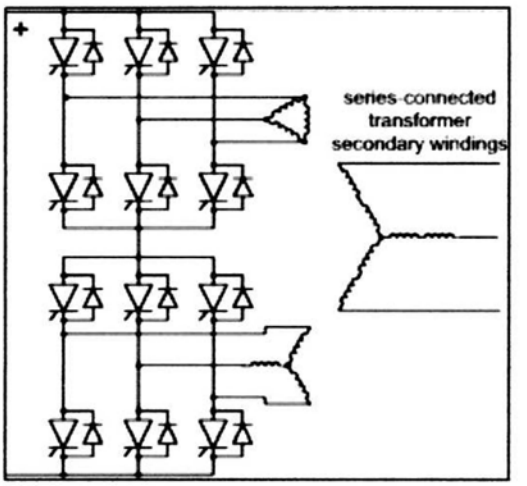

Figure 2.1: 12-pulse line-commutated inverter circuit

2.1.3 Rectifier And Inverter Pulse Numbers

Rectifier circuits are often classified by the number of current pulses that flow to the DC side of the rectifier per cycle of AC input voltage. A single-phase half-wave rectifier is a one-pulse circuit and a single-phase full-wave rectifier is a two-pulse circuit. A three-phase half-wave rectifier is a three-pulse circuit and a three-phase full-wave rectifier is a six-pulse circuit.

With three-phase rectifiers, two or more rectifiers are sometimes connected in series or parallel to obtain higher voltage or current ratings. The rectifier inputs are supplied from special transformers that provide phase shifted outputs. This has the effect of phase multiplication. Six phases are obtained from two transformers, twelve

phases from three transformers and so on. The associated rectifier circuits are 12-pulse rectifiers, 18-pulse rectifiers and so on.

When controlled rectifier circuits are operated in the inversion mode, they would be classified by pulse number also. Rectifier circuits that have a higher pulse number have reduced harmonic content in the AC input current and reduced ripple in the DC output voltage. In the inversion mode, circuits that have a higher pulse number have lower harmonic content in the AC output voltage waveform.

2.2 Inverter Applications

There are many devices that use inverter application. For example DC power source utilization, uninterruptible power supplies, induction heating, high-voltage direct current (HVDC) power transmission, variable-frequency drives and electric vehicle drives.

2.2.1 DC Power Source Utilization

An inverter allows the 12 or 24 volt (battery) DC power available in an automobile or from solar panels to supply AC power to operate equipment that is normally supplied from a main power source. Inverters are also used to provide a source of AC power from photovoltaic solar cells and fuel cell power supplies.

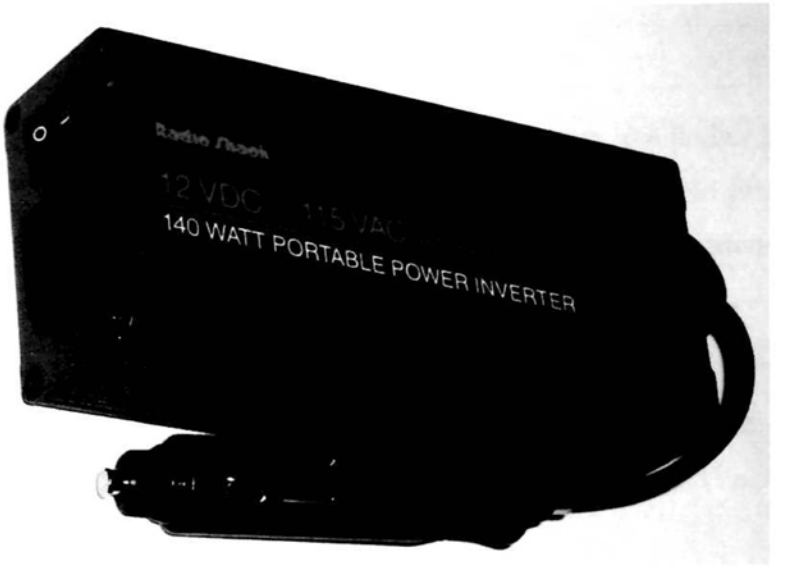

Figure 2.2: 12V DC to 240V AC inverter

2.2.2 Uninterruptible Power Supplies

One type of uninterruptible power supply uses batteries to store power and an inverter to supply AC power from the batteries when main power is not available. When main power is restored, a rectifier is used to supply DC power to recharge the batteries.

Figure 2.3: Uninterruptible power supply