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RESEARCH ARTICLE

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COST EFFECTIVE POWER SUPPLY BASED ON TRANSFORMER-LESS CIRCUITRY USING BRIDGE RECTIFIER

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ABSTRACT

A power inverter or inverter is an electronic device or circuit that changes direct current(DC) to alternating current(AC). The input voltage, output voltage, frequency and overall power handling depend on the design of the specific device or circuit the inverter does not produce any power the power is provided by the dc source. A power inverter can be entirely electronic or may be a combination of mechanical effect (such as a rotary apparatus)and electronic circuitry static inverter do use moving parts in the conversion process

I.INTRODUCION

The circuit is used for lab purposes such as providing power supply for integrated circuit(IC'S) which is not more than 12-24V.For this purpose we are using regulated power supply (RPS) which consist of step down transformer, the work of this transformer is to convert ac to dc supply, since it is bulky and expensive, a bridge rectifier (full wave rectifier) can be used instead of a transformer. Since the ideal rectifiers does not consume power, the active power supplies by the source is absorbed by the load. The term load is used in its most common applications since the load can even be a voltage source as in the case of battery charging circuit. We have stimulated this circuit with the help of NI MULTISIM (National Instruments)

NI MULTISIM is an electronic schematic capture and simulation program which is part of a suite of circuit design programs, along with NI Ultiboard. Multisim is one of the few circuit design program to employ the original Berkeley spice based software simulation.

The simulation of this circuit has also been carried out using hardware components and output was verified successfully.

II.BACKGROUND

In this inverter we are using a full wave rectifier the main usage of the rectifiers is used to convert ac current to dc current which reduces the work of transformer. The 230v ac current is given to the 420kΩ resistor and 2.2uf x rated capacitor which is also called as ac capacitor and it is given to diode which acts as a bridge wave rectifier (full wave rectifiers). Full wave rectifiers act as a heart of circuit after this process the pure dc will not be obtain so that we are using filter capacitor which has a value of 1000uf 63v by this capacitor the pure dc is obtain and the capacitor is given to ½ w 100Ω resistor which supports the Zenerdiode (30v) and the led is given to indicate the power supply .we can vary the current from(0-30)v by using potentiometer. Eight segment display is used to display the current in digits .it is cost efficiency and reliability.

III. EXISTING SYSTEM

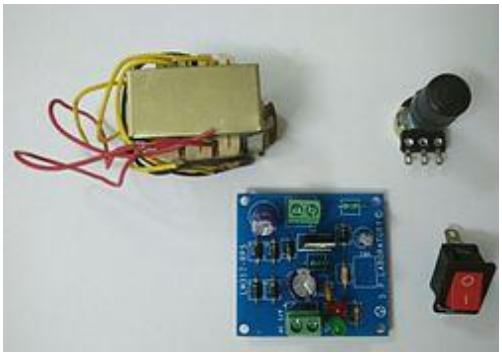

Fig 3.1 Components of Regulated Power Supply

Power supplies utilizing solid state devices such as transistors are well known in the art and have many useful applications. Typically such power supplies include transistorized DC. to AC. square wave oscillator inverters operating from a unidirectional input. These transistor oscillators include a pair of transistors and a saturable reactor. The transistors function essentially as switching elements with their switching time being controlled by the saturable reactor. DC. to A.C. inverters of this type are well known and one such inverter is disclosed.

Transistorized inverters are perfectly satisfactory as long as the supply voltage from which they operate is fairly low, in the order of 6-12 volts or so. If the supply voltage is in the order of 50-100 volts or more, however, a much more severe problem is present. In fact, transis' torized inverters are then comparatively unreliable or prohibitively expensive. That is, commercially available germanium transistors cannot be utilized since the maximum rated collector-emitter operating voltage V of the transistor is in this range.

As a result, the transistors are exposed to overvoltages and are subject to damage or destruction, if used to invert voltages in this range. Although silicon power transistors are available which have maximum rated collector-emitting operating voltages of several hundred volts, these transistors are so expensive as to make their commercial use in power supplies prohibitive. Consequently, the need exists for a solid state power supply which is capable of operating from high unidirectional input voltages.

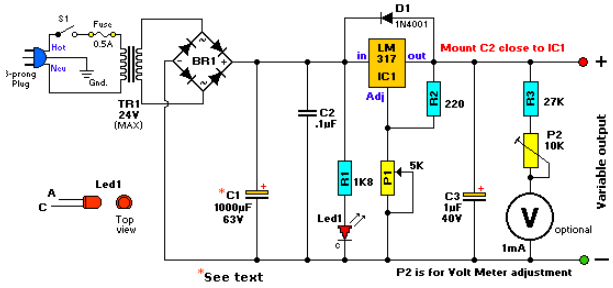

Fig 3.2 Circuit Diagram of Regulated Power Supply

IV. TRANSFORMERLESS RPS

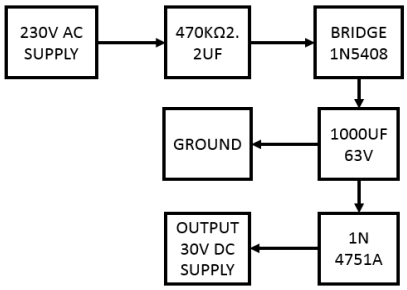

Fig 4.1 Block Diagram of Transformer-less RPS

In this inverter we are using a full wave rectifier the main usage of the rectifiers is used to convert ac current to dc current which reduces the work of transformer. The 230v ac current is given to the 420kΩ resistor and 2.2uf x rated capacitor which is also called as ac capacitor and it is given to diode which acts as a bridge wave rectifier (full wave rectifiers). Full wave rectifiers act as a heart of circuit after this process the pure dc will not be obtain so that we are using filter capacitor which has a value of 1000uf 63v by this capacitor the pure dc is obtain and the capacitor is given to ½ w 100Ω resistor which supports the Zenerdiode (30v) and the LED is given to indicate the power supply .we can vary the current from(0-30)v by using potentiometer. Eight segment display is used to display the current in digits .it is cost efficiency and reliability.

V.ADVANTAGES OF PROPOSED RPS

Every electronic circuit inevitably requires a DC power supply to operate. This voltage is basically derived from our domestic AC mains outlet and is stepped down to the required safe level, suitable for the connected circuit. Normally, we utilize an AC – DC adapter for the purpose.

These adapters fundamentally consist of three important components required for the above conversion: the Transformer, the Bridge Rectifier, and the Filter Capacitor. The Transformer is used to step down the applied AC mains through electromagnetic induction. But this voltage is still a low voltage AC and requires rectification and filtration. Rectification is done by the bridge rectifier (comprised of 4 rectifier diodes) and this rectified voltage is further filtered by the preceding electrolytic filter capacitor to produce a clean DC at the output.

The above process of obtaining DC from AC mains voltage is very efficient, invariably used everywhere, and has become quite a standard practice. However, since the size of transformers cannot be compromised, circuits employing these kinds of power supplies tend to become quite heavy and bulky.

SMPS power supplies are becoming pretty popular as they avoid the use of transformers and thus are able to maintain their compactness and weight to the lowest levels. But again, these power supplies are too costly and generally cannot be configured with simpler circuits with low current consumptions as that would make the unit's cost unnecessarily highly expensive. It's like attaching a jet engine to a bicycle.

Here we begin by discussing the drawbacks of capacitive power supply circuits and learn how they may be upgraded to form the ultimate "transformer-less" power supply, which may be as effective as its other counterparts, yet will be very cheap to build (hardly 30 cents), as well as compact and lightweight. Moreover, it's permanent.

VI.COST EFFECTINESS

Normal Power Supply
Transformer(TR124V) Bridge (1N4001) Capacitor(1000UF,63V,0.1UF) Resistor(1008KΩ,220KΩ,27KΩ) IC(LM317) Potentiometer(5KΩ,10KΩ)
INR=6668
Transformer-less Power Supply
Diode(1N5408) Resistor(10KΩ,100Ω1/2W,470KΩ) Capacitor (2.2UF 400V,1000UF 63V) Zener Diode(1N4751A) Potentiometer(10KΩ)
INR=100

VII.APPLICATIONS

- DC Power Source
- Regulated Power Supply
- Uninterruptible Power Supplies
- Electric Motor Speed Control
- Power Grid
- SOLAR
- Induction heating
- HVDC power transmission
- Electroshock weapon

VIII. SOFTWARE SIMULATION

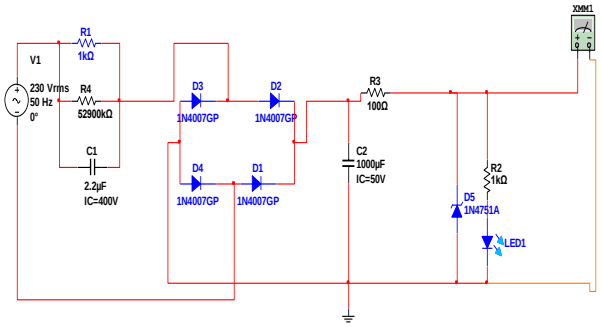

Fig 8.1 Simulation circuit for proposed RPS circuit

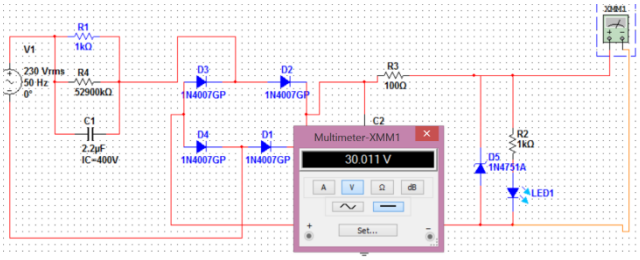

Fig 8.2 Shows the Output Of Simulation Circuit

The software used here is Ni Multisim which is used for creating circuit and the view of output the fig 8.1 shows the simulation circuit diagram and fig 8.2 shows the output of simulation.

IX. RESULTS AND DISCUSSION

The stimulation is done successfully in hardware components the fig 9.1 clearly shows the hardware equipment and fig 9.2 shows that the hardware components are in working condition and the output is clearly shown in multimeter display

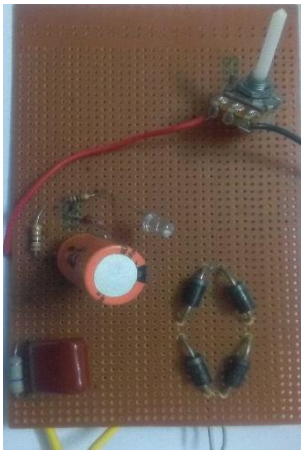

Fig 9.1 Hardware Implementation of proposed RPS

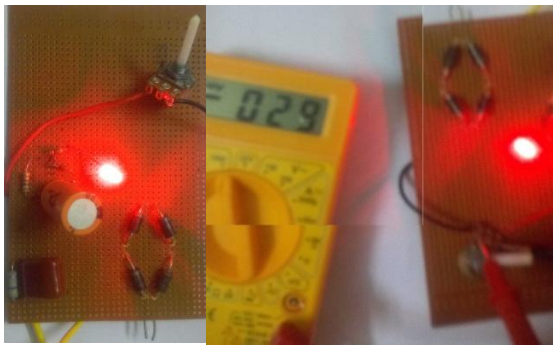

Fig 9.2 Output of proposed RPS

X. CONCLUSION AND FUTURE WORKS

Thus the output of the power supply has been done in simulation and hardware equipment and output is verified successfully. This method can be done using bridge rectifier without using transformer and size of power supply can be reduced, easy to portable as well as cost is reduced .this can also be used in lab for giving power supply to IC's.

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