International Journal of Interdisciplinary Innovative Research &Development (IJIIRD)
ISSN: 2456-236X
Vol. **06** Issue **02** | **2022**

Automatic Voltage Stabilizer

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ABSTRACT

This A voltage stabilizer may be a trick which is employed to sense unfitting voltage levels and proper them to supply a practically stable output where the load is connected. Here we'll learning the planning of a straightforward automatic AC voltage stabilizer which might be used for the above purpose. during this circuit, active and passive devices, like diodes, IC, resistor, relay, transformer, capacitor etc. are used. songle step down transformer and songle maximize transformer have also been employed in this working. just in case the road voltage crosses a programmed threshold, the comparator detects it and its output proximately goes high, switching ON the transistor and therefore the relay for the specified actions. The relay contacts are appropriately joined to the transformer taps for executing the above actions as per the commands given by the op-amp output. The designed circuit operates successfully and therefore the results obtained are satisfactory. When mounted, the relay trips whenever the input voltage crosses 230 volts, bringing the output to 218 volts and keeps it until the voltage reaches higher levels. When the voltage drops back to 225, the relay gets de-energized pulling the voltage to 238 volts and continues the alteration because the voltage further goes down. The above action keeps theoutput to the appliance well between 200 to 250 volts with variations starting from 180 to 265 volts.

Keyword: - Transformer, Resistor, Capacitor, Relay, Threshold, IC, etc.

1. INTRODUCTION

A voltage stabilizer is a device that detects and corrects abnormal voltage levels, resulting in a reasonably steady output at the output to which the load is attached. Which is made up of discrete components such as transistors. Itcan be used to protect loads like TVs, refrigerators, and VCRs from unwanted over and under line voltages, as well as surges induced by sudden mains power failure/resumption. This circuit can be used directly between the main supply and the load, or it can be added between an existing automatic/manual stabilizer and the load. When the mains voltage exceeds a predetermined threshold, the non-inverting IC detects it and its output goes high, turning onthe transistor and relay to perform the desired operations.

The contacts of the DPDT relay are linked up to a transformer, which is a regular transformer that has been adapted to serve the role of a stabilizer transformer. As a result, if the input AC voltage approaches a preset threshold value, the transformer subtracts some voltage to prevent the voltage from reaching unsafe levels, and vice versa in low voltage scenarios.

1.1 Block Diagram

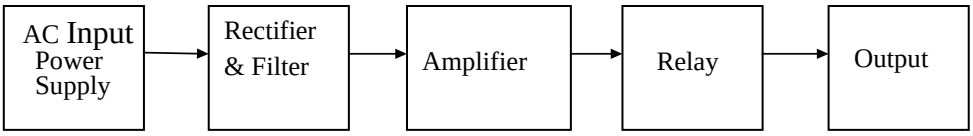

Fig 1: Block diagram of Voltage Stabilizer

1.2 Operation

The rectifier receives a 220V ac supply from the supply line and flows the rectifier's ac voltage. The voltage ac to dc is converted by the rectifier, and the filtering dc is achieved by the capacitor. The ac supply voltage is compared by an operational amplifier or comparator. A relay is a type of electrical switch. It's While the relay is activated, normally-open (NO) contacts connect the circuit; when the relay is inactive, the circuit is disconnected. While the relay is activated, normally-closed (NC) contacts disconnect the circuit; when the relay is inactive, the circuit is linked. Two circuits are controlled by change-over (CO) or double-throw (DT) contacts: one normally-open contact and one normally-closed contact with a common terminal. The output voltmeter displays a constant voltage.

2. LITERATURE REVIEW

When a non-sterilized input voltage is supplied into the controller, the outcome is a fully steady and voltage-free stable output voltage. In interconnected supply systems, a static system serves as the stability configuration for voltage changes and transient disturbances. When operating in unfavorable or atypical situations, such as three- phase short circuit systems, the addition of an adaptive controlled stabilizer loop system to the controller improves the overall power system stabilizer's performance. In high-power applications static systems, the voltage fluctuations caused by the loads will be minimized. In a continuous supply of AC power involving an electronic system, overvoltage reduces stabilizer life and undervoltage reduces efficiency.

3. DESCRIPTION OF EQUIPMENTS

Sr.no.	Component Name	Rating & Quantity
1	Resistor R1 & R2	10KΩ
2	Resistor R3	470kΩ
3	Variable Resistor	10KΩ
4	Capacitor C1	1000 µF/25 V
5	Diode D1 & D2	1N 4007
6	Zener Diode Z1 & Z2	4.7 V/ 400mW
7	Transformer TR1	0V - 12 V, 500mA
8	Transformer TR2	9V-0V-9V, 5A.
9	Op-Amp	LM 741
10	Transistor	BC 547
11	Relay	DPDT, 12V, 200Ω
12	LED	Red (1)
13	Voltmeter	0V – 300V

3.1 Circuit & Operation

- **How the Circuit Functions**

A voltage stabilizer is a device that detects and corrects abnormal voltage levels, resulting in a reasonably steady output at the output to which the load is attached. Here, we'll look at how to make a simple automatic mains AC voltage stabilizer that can be used for the aforementioned purpose. The entire circuit is configured with the single op amp IC 741, as shown in the diagram. It becomes the overall design's control section.

The IC is wired as a comparator, and we all know how well the IC 741 and other op amps work in this mode. Its two inputs are appropriately setup for the aforementioned operations. The IC's pin #2 is clamped to a reference level provided by the resistor R1 and the Zener diode, while pin #3 receives the sample voltage from the transformer or supply source. This voltage serves as the IC's sensing voltage and is proportionate to our mains supply's fluctuating AC input. The preset is used to define the triggering point, or the point at which the voltage is considered harmful or improper. This will be covered in the setup method section. As soon as pin #3 hits the set point, pin #6, the IC's output, goes high, activating the transistor/relay stage. When the mains voltage exceeds a predetermined threshold, the non-inverting IC detects it and its output goes high, turning on the transistor and relay to perform the desired operations. The contacts of the DPDT relay are linked up to a transformer, which is a regular transformer that has been adapted to serve the role of a stabilizer transformer.

The transformer's primary and secondary windings are coupled in such a way that, by switching its taps appropriately, it can add or subtract a particular magnitude of AC mains voltage and deliver the result to the output connected load. The relay contacts are connected to the transformer taps in the correct order to carry out the above activities in accordance with the op amp output directives. When the input AC voltage approaches a preset threshold value, the transformer deducts some voltage and tries to prevent the voltage from reaching harmful levels, and vice versa when the voltage is low.

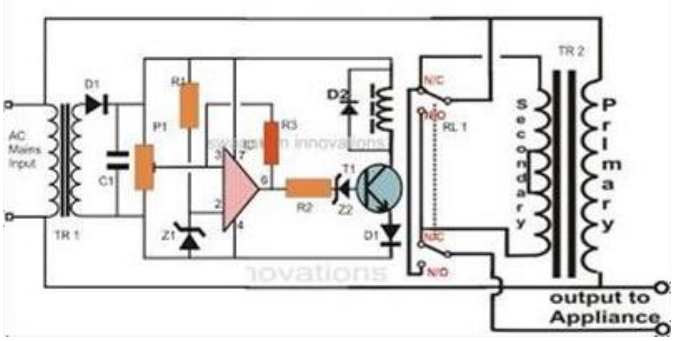

Fig. No. 2: Circuit diagram of voltage stabilizer

- **Operation**

The following procedures can be used to set up the proposed simple automatic voltage stabilizer circuit: Do not connect the transformers to the circuit at first. Power the circuit across C1 with a variable power supply, with the positive going to the terminal of R1 and the negative going to the cathode line of D2. Set the voltage to around 12.5 volts and alter the setting so that the IC's output simply turns high and the relay is triggered. When the voltage is reduced to around 12 volts, the op amp should trip the relay back to its original condition or de-energize it. Alter the voltage from 12 to 13 volts, which should cause the relay to flip flop appropriately. The procedure for setting up your account is now complete. You can now connect both the transformer and the circuit in their proper placements. The circuit for our basic home-made mains voltage stabilizer is complete. When the relay is fitted, it trips whenever the input voltage exceeds 230 volts, bringing the output to 218 volts and maintaining this distance as the voltage rises. When the voltage falls below 225 volts, the relay de-energizes, bringing the voltage up to 238 volts and maintaining the difference as the voltage falls further. The foregoing procedure keeps the appliance's output between200 and 250 volts, with fluctuations between 180 and 265 volts.

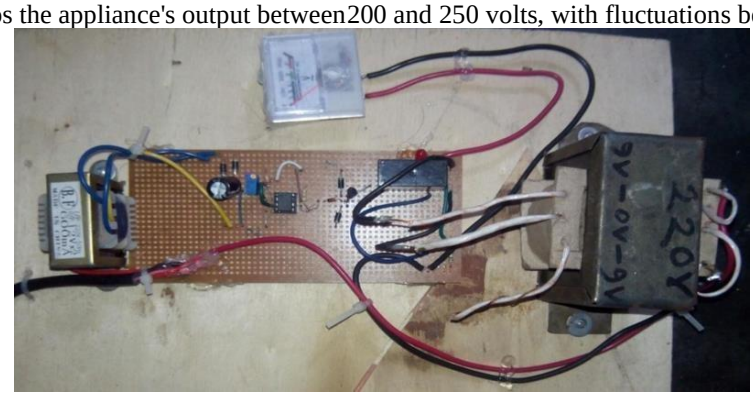

Fig. No. 3 Hardware of the Voltage stabilizer

3.2 Discussion About Utilities & Limitation:

- **Utilities:**
  - ❖ 1 Over-voltage protection & Under-voltage protection
  - ❖ Protection against transients
  - ❖ High reliability
  - ❖ High performance
  - ❖ Low cost
  - ❖ protections to load from frequent turning ON & OFF by providing time delay. If the mains voltage begins to fluctuate in the region of the under or over voltage preset points, an under-voltage relay is activated.
  - ❖ It can be used to protect loads such as refrigerator, T.V and VCR from undesirable over and under linevoltages.

- **Limitations**
  - ❖ When installed, the relay trips whenever the input voltage crosses 230 volts, bringing the output to 218volts and keeps this distance continuously as the voltage reaches higher levels.
  - ❖ 2When the voltage drops back to 225, the relay gets de-energized pulling the voltage to 238 volts andmaintains the difference as the voltage further goes down.
  - ❖ 3The above action keeps the output to the appliance well between 200 to 250 volts with fluctuationsranging from 180 to 265 volts.

4. CONCLUSION

It's a low-cost automatic voltage stabilizer circuit that's made with transistors and other discrete components. It can be used to protect loads like refrigerators, TVs, and VCRs from unwanted over and under line voltages, as well as surges generated by sudden mains power failure/resumption. A voltage stabilizer is a device that detects and corrects abnormal voltage levels, resulting in a reasonably steady output at the output to which the load is attached. Here, we'll look at how to make a simple automatic mains AC voltage stabilizer that can be used for the aforementioned purpose. The entire circuit is configured with the single op amp IC 741, as shown in the diagram. It becomes the overall design's control section. The IC is wired as a comparator, and we all know how well the IC 741 and other op amps work in this mode. Its two inputs are appropriately setup for the aforementioned operations. The entire circuit is configured with the single op amp IC 741, as shown in the diagram. It becomes the overall design's control section. The IC is wired as a comparator, and we all know how well the IC 741 and other op amps work in thismode. Its two inputs are appropriately setup for the aforementioned operations. You can now connect both the transformer and the circuit in their proper placements. Our basic voltage stabilizer circuit is now complete.

5. ACKNOWLEDGEMENT

The project team would like to express their gratitude to Asst. Professor Darshana Waghade for her continued support, assistance, and leadership. I'd also like to convey my heartfelt gratitude to Prof. S. Mahajan, the principal of Manav School of Engineering. I also want to thank my parents and friends for assisting me in completing this project in such a short amount of time.

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