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Crowbar Devices Used for Over Voltage Protection

Shefali Sinha[1], Mr. Anil Gupta[2], Mr. Manish Khemariya[3]
[1]*M. Tech, Control System, Electrical Department,* [2]*Assistant Professor(Guide) LNCT, BHOPAL,* [3]*Professor(Co-Guide) LNCT, Bhopal*

Abstract: ***One of the most common reason for the damage of electrical equipment in your power system is due to voltage Transient. There are various methods for overvoltage protection. In this paper, Protection from overvoltage is implemented with the help of Crowbar device. With the help of Gate triggering, a silicon controlled rectifier(SCR) and TRIAC is turned ON which ultimately protects the loads from overvoltage. Amplifiers are also being used to amplify the output voltage. Practically the condition arises when the regulator is short. To check this, we would produce excess voltage by varying the resistance connected between input and Output of regulator.***
Keywords: Over voltage protection, SCR, TRIAC, Transient Amplifier, Regulator, Crowbar circuit.

I. INTRODUCTION

In electrical conveyance frameworks, dependably there exist an electrical homeless people which are accessible in the shape voltage surges. Really, they were not given the due significance preceding the presence and execution of semiconductor gadgets.

A large portion of the electrical and hardware gadgets can be influenced and/or harmed by voltage homeless people or it might be because of mix of voltage and current. High voltage can open unintended current ways, for example, forward or turn around breakdown of diodes or oxides achieving their separate voltage inside incorporated circuits.

In hardware circuits three stick positive and negative regulators are normally used to give stable DC voltages. These controllers are exceptionally easy to utilize and simple to supplant parts. Be that as it may, here and there, blame can happen in such controllers. Inside the chip of these sorts of controller's temperature delicate circuit is given. Because of inordinate heap of present, abundance warmth is delivered which kills the controller, in this manner making the defend for the gadget/stack.

At the point when such coordinated circuits are utilized constantly for quite a long time or days together, it can make the information and yield short which can be a basic circumstance if the heap is costly or delicate one. In such cases to shield the heap from intemperate voltage, over voltage assurance circuit utilizing crowbar gadgets is created. This paper talks about the subtle elements of the created over voltage security crowbar circuits for low voltage loads.

The outlined circuit utilizes silicon controlled rectifier (TYN 204) as a defensive segment which gets turned ON when overvoltage is delivered. The yield of the controller IC is associated with the speaker circuit which gives required trigger flag. The Zener diode (12V/2W) is associated with the base of the transistor which is turned on when the yield of the controller surpasses 12V. The transistor which thusly creates current to trigger the SCR.

II. OVER VOLTAGE PROTECTION USING SCR AS A CROWBAR DEVICES

The assurance circuit depicted here comprises of single stage transistor speaker, Zener diode and silicon controlled rectifier. The Zener diode is associated over the base of the transistor. The yield taken from the emitter of the transistor is connected to the entryway terminal of SCR by means of resistor R6 which controls the door current of SCR under typical course of operation.

The circuit of over voltage assurance utilizing SCR as a crowbar gadget is as appeared in Fig.1. It shields the heap from over voltage. In the event that the voltage surpasses past the withstanding voltage limit of the gadget it might harm it. When the controller yield voltage begins expanding, the crowbar security circuit separates the heap from supply. In the circuit, the substantial change in gatherer current delivers little change in the base current of a transistor. The SCR simply carry on as a directing wire in the lading state. Regardless of the possibility that the door current is expelled, the operation of the SCR is not influenced.

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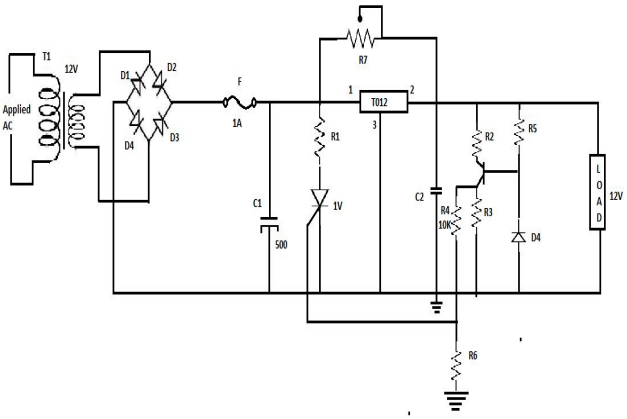

Fig. 1 Over voltage protection using SCR as a crowbar Device

III. OVER VOLTAGE PROTECTION USING TRIAC AS A CROWBAR DEVICE

Some circuit utilizes TTL ICs. For this, the supply voltage is an awesome concern. Slight increment in supply from the evaluated 12 V may harm the IC. At the point when breaker is utilized alone it doesn't serve the issue on the grounds that to pass over the circuit may take some time as much as a few milliseconds which is sufficient time for the IC to get harmed.

Fig. 2 demonstrates the improvement of an over voltage assurance circuit utilizing TRIAC as a crowbar gadget. In this circuit the TRIAC short-circuits the power supply and smoulders the wire.

Here it is not a self-evident actuality for the smouldering time of the wire in light of the fact that the power supply is as of now shorted by the TRIAC and the yield voltage will be zero. At the point when the yield voltage surpasses 12V, the Zener diode D5 leads and switches ON the TRIAC T1. Here TRIAC goes about as a shut switch in this way, shorting the circuit. The yield voltage drops to zero and circuit gets scorched off. The exchanging of the TRIAC is quick. It takes just couple of microseconds. so there will be no harm to the TTL ICs or whatever other such voltage touchy parts in the heap circuit.

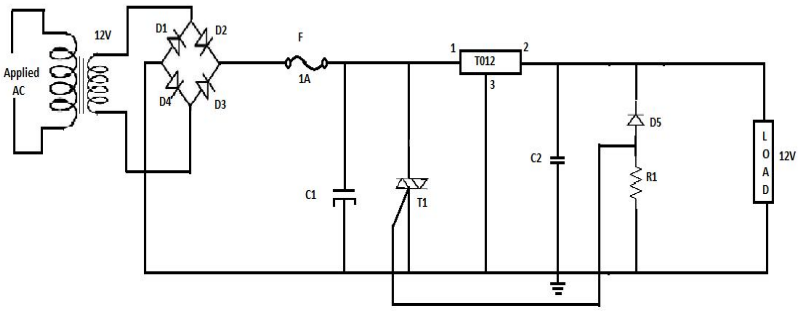

Fig. 2 Over voltage protection circuit using TRIAC as a crowbar device

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IV. RESULTS AND DISCUSSION

The circuit as appeared in Fig. 1 is mounted on the bread board. Resistance R7 is varied and relating voltage over the heap is measured with the help of advanced multi-meter. The estimation of resistance R7 is varied (decreasingly) from 520Ω in ventures of 50Ω. Tentatively, it was watched that for R7=80Ω, the yield begins rising and meter perusing indicates 12.10 V. On the off chance that the resistance is diminished to R7=50O, yield voltage still increments to 12.12V. Additionally diminish in R7=40Ω, the yield voltage increments to 12.15V, meld wire shines and it extinguishes.

Resistance R7 (Ω)	Voltage Across Load (V)	Fuse Condition
520	12.00	OK
480	12.00	OK
440	12.00	OK
400	12.00	OK
360	12.00	OK
320	12.00	OK
280	12.00	OK
240	12.00	OK
200	12.00	OK
160	12.00	OK
120	12.00	OK
80	12.10	OK
50	12.12	OK
40	12.15	BLOWN

At the point when resistance R7 is pulled back, quickly the yield increments marginally. As of now SCR gets an activating heartbeat, it turns ON and brings substantial current through the wire. Because of this, circuit wire extinguishes instantly and the heap gets detached from the supply. Table 1 demonstrates the voltage comparing to various estimations of R7, as read on advanced multi-meter and relating wire condition. At long last, the yield voltage all of a sudden drop to 0V. The circuit demonstrates that the heap is shielded from the yield voltage on the off chance that it surpasses 12.15V. Reducing the estimation of resistance R7, the impact of short out in the controller IC is Considerations accepted to be created. Because of the short out in the controller IC, the adjustment in yield voltage happened from 12V to 12.15V. The controller IC, SCR and TRIAC ought to be mounted on reasonable warmth sink to stay away from harm to them.

V. CONCLUSION

Over voltage protection research is successfully planned, designed, implemented and tested critically with the help of SCR and TRIAC. These were utilized as a crowbar gadgets. Meld condition was estimated by varying the resistance esteem associated over the controller. Test output comes out to as when resistor esteem is 40Ω, breaker is blown. In this manner shielding the heap from over voltage.

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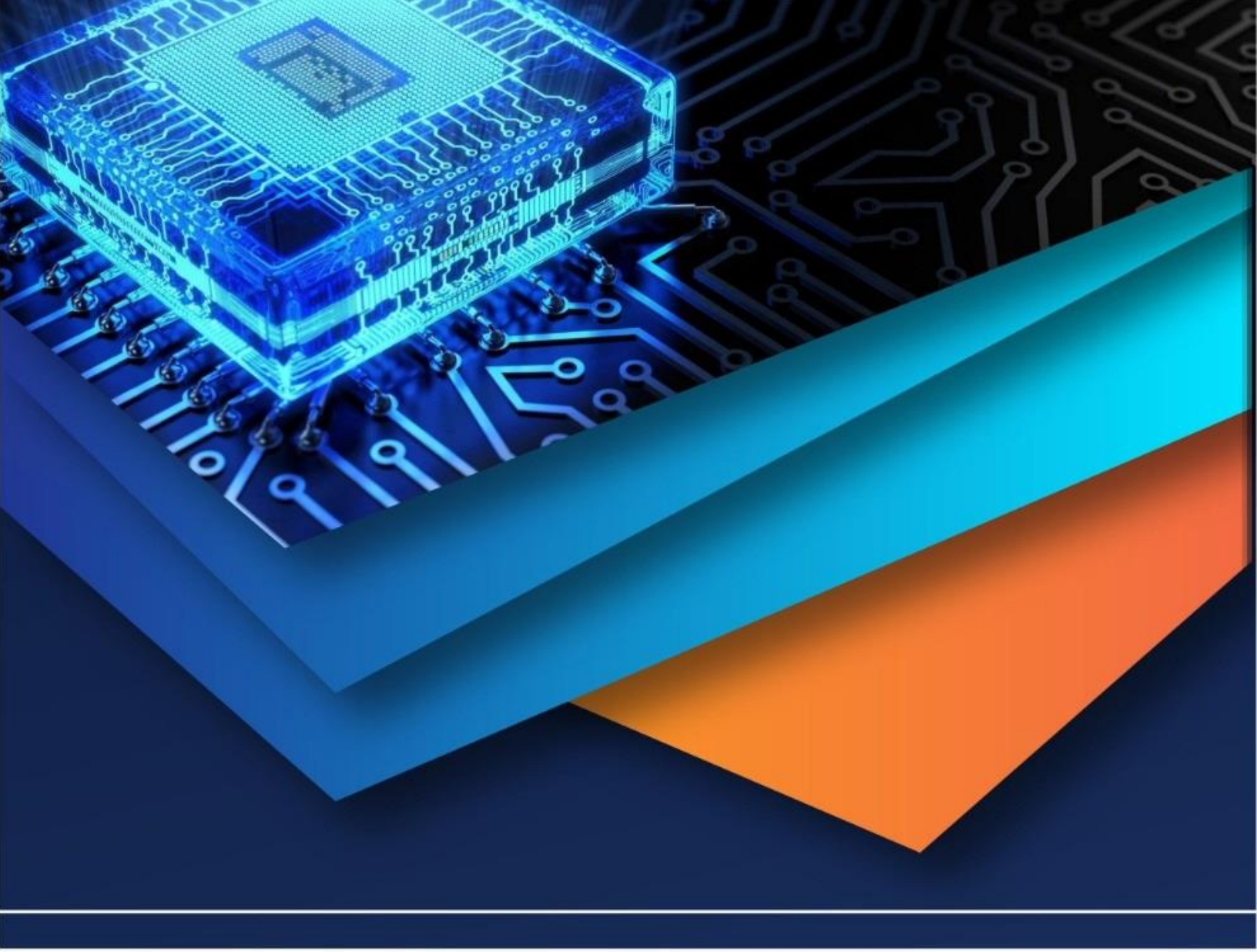

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