ARCHITECTURE FOR OVERLOAD PROTECTION IN ELECTRICAL CIRCUITS

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Abstract: **In this paper a phase distribution scheme in the electrical circuits has been discussed to overcome the problem of overload in domestic circuits. This paper presents a circuit in which if overload occurs in one phase then it can utilize the power by distributing the excess load to other phase. Thus, this improves the overall working of power system. But, if the value of load distributed on other phase also gets increased or get overloaded then the whole system gets shut down automatically.**

Keywords: **Overload Protection, Phase Distribution, Current Transformer, Power Systems**

I. INTRODUCTION

Electrical Power System protection is required for protection of both user and the system equipment itself from fault, hence electrical power system is not allowed to operate without any protection devices installed. Power System fault is defined as undesirable condition that occurs in the power system. These undesirable conditions such as overload, short circuit, current leakage, ground short, over current and over voltage. With the increasing loads, overload protection has become more important today. The ability of protection system is demanded not only for economic reason but also consumers just expect 'reliable' service.

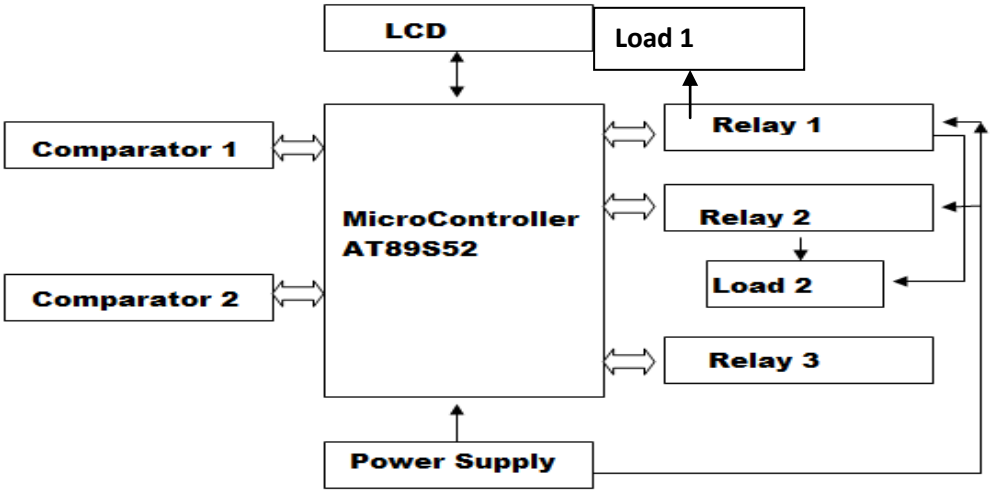

Fig.1 Block Diagram for the Proposed Architecture

All domestic loads are single phase supply and if overload occurs, even if the power is available in other phases we cannot utilize the power. So, we have designed a circuit in which even if overload occurs in one phase then in this condition also we can utilize the power by distributing the excess load to other phase. Thus, this improves the overall working of power system. But, if the value of load distributed on other phase also gets increased or get overloaded then the whole system get shut down automatically. Thus, it protects the power system from overload condition by distributing the load.

II. PROPOSED WORK

In this we are using relay as a phase. Two relays are used as two individual phases, one as main supply phase and another as distributing phase. Bulbs of different rating are used to show different load and microcontroller is used for providing control signals to different circuitry. LCD is used for displaying what is happening in the project like normal load when load is favorable, overload and distributed when load exceeds the preset value and power cut when the whole system is unable to handle the

load. Now in our designed circuit i.e Overload protection cum phase distributor in which the power system is protected from overload condition not by interrupting the supply but by distributing the load from the overloaded phase to the normal phase in which the load is minimal. In this way we get the uninterrupted supply even when there is a condition of overload occurs.

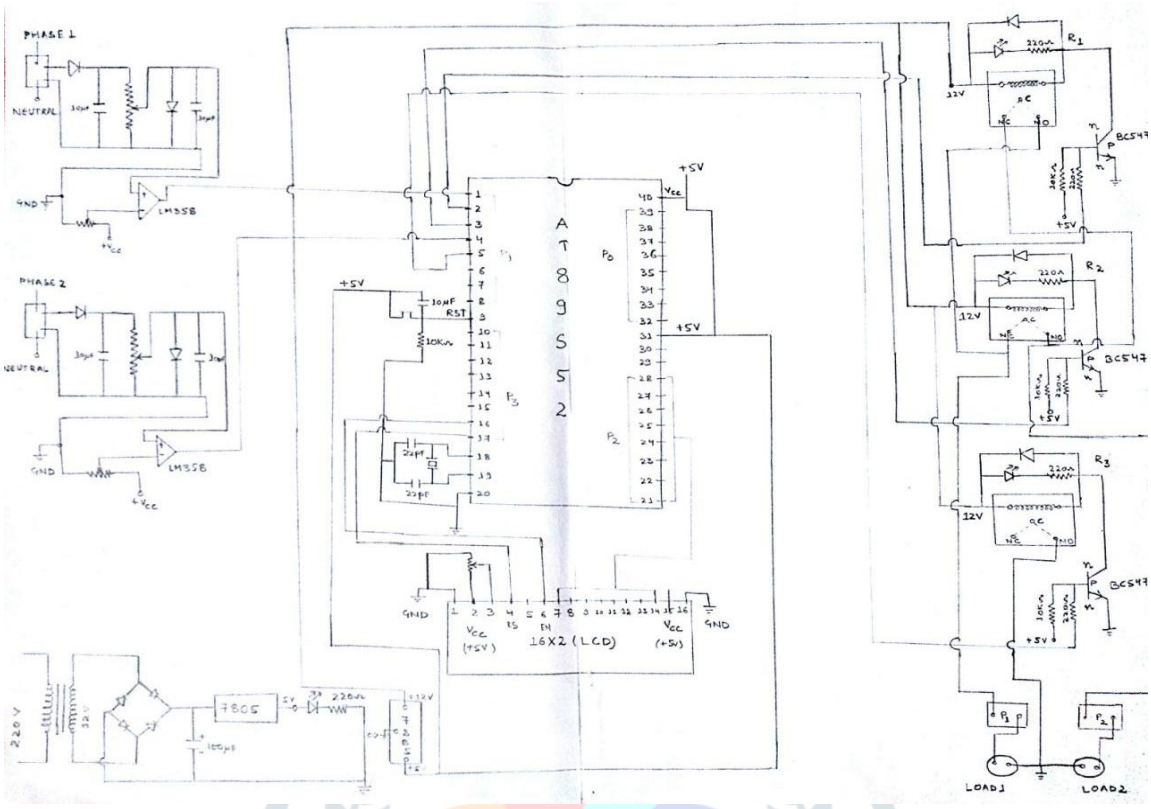

Fig.2 Schematic Diagram for Proposed Circuit

As, relay use 12v of supply as input , so here a transformer is used to step down the 220v supply coming as input to the transformer to 12v as output. Now, bridge rectifier is used to convert AC to DC and the capacitor connected to this is used to convert pulsating DC into non-pulsating DC. A voltage Regulator is used to give 5v as output and this 5 v is used as input to different components such as Microcontroller, LCD, Comparator, Transistor. Microcontroller has been used to control the circuit. LCD is used to display the conditions of the system such as the normal condition, overload condition, overload and distributed condition and power cut off. In this we are using relay as a phase. Two relays are used as two individual phases, one as main supply phase and another as distributing phase. Third relay is used to provide grounding to the both relays. In normal condition load 1 and load 2 is connected to phase 1 through phase 1 i.e only relay 1 is ON at that time. When there is overload on phase 1 then at that time a control signal is send through microcontroller to relay 2 and then load 1 and load 2 is distributed half to phase 1 and half to phase 2. Now if the value of load also gets increased to a level that is not reliable to phase 2 then at that time a control signal is given by microcontroller to off the relay 3 which in cut the grounding to both the loads and protect the whole power system.

III. RESULT ANALYSIS

Table 1. Result Analysis Showing Phase Distribution across different loads

S.no.	Load 1(Watt)	Load 2(Watt)	Voltage across load 1(Volt)	Voltage across load 2(Volt)
1.	15	15	212	0
2.	15	40	212	0
3.	15	60	213	0
4.	15	100	212	0

5.	40	15	213	0
6.	40	40	214	0
7.	40	60	213	0
8.	40	100	213	0
9.	60	15	214	0
10.	60	40	214	0
11.	60	60	213	0
12.	60	100	214	0
13.	100	15	212	212
14.	100	40	213	212
15.	100	60	212	212

When relay 1 suffers the condition of overloading then the current transformer is used to compare the current and comparator is used to give a signal to microcontroller that overloading has occur and the relay 2 becomes operational means the half load gets distributed from relay 1 to relay 2. If overloading occurs on relay 2 then with the help of current transformer and comparator, a signal is given to microcontroller. After this microcontroller will give a signal to relay 3 and relay 3 will stop to give grounding to load 1 and load 2. Thus relay 1 and relay 2 becomes non-operational and thus protects from the overloading condition.

IV. CONCLUSION

The use of two relays i.e. one as the main and the other one as phase distributor balances the load in the operational circuit by distributing the load as per the need. Thus the use of relays along with the microcontroller overcomes the condition of unequal phase distribution in the power system.

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