SHORT CIRCUIT INDICATOR

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Abstract: Short circuit condition is a condition in input terminals of a power supply get in electrical contact with each other causing huge current flow. This leads to very large heat generation which can damage the system and also pose a threat to people nearby it. Thus, short circuit condition is necessary to be detected and be attended immediately. Short Circuit Indicator Project does the task of detecting the short circuit in a circuit in which it is connected automatically. We have demonstrated the short circuit in our circuit board using a wire piece which has very low, close to zero value of resistance thus creating a short circuit at the source connector.

***Index Terms*–Buzzer,Resistor,Diodes,Transistors,PCB,LED.**

1.Introduction

Short circuit can cause circuit damage, overheating, fire or explosion. Although A Short circuit is an abnormal connection between two nodes of an electric circuit intended to be at different voltages. This results in an electric connected limited only by the Thevenin equivalent resistance of the rest of the network which usually the result of a fault, there are cases where short circuits are caused intentionally, for example for the purpose of voltage sensing crowbar circuit protectors. Short circuit is a condition in which the input terminals of the power supply get in contact with each other causing huge current flow. This leads to very large heat generation which can damage the system and also pose a threat to people nearby it. Thus, short circuit condition is necessary to be detected and be attended immediately. Short circuit indicator project does the task of detecting the short circuit in a circuit in which it is connected automatically. With the help of regulator and a pair of transistors we lit up a indicator LED which glows up only when there is short circuit occurring. In this way one can easily understand the short circuit condition and take appropriate measure of cutting of the power supply and removing the short circuit.

In main circuits, short circuits may occur between two phases, between a phase and neutral or between a phase and earth. Such short circuits are likely to result in a very high current and therefore quickly trigger an over current protection device. To help reduce the negative effects of short circuits, power distribution transformers are deliberately designed to have a certain amount of leakage reactance. In power sockets or even the site of the short circuit itself). Such is a common cause of an electric arc, if it forms during the short circuit, produces high amount of heat and can cause ignition of combustible substances as well. In industrial and utility distribution systems, dynamic by high short- forces generated circuit currents cause conductors to spread apart. Bus bars, cables, and apparatus can be damaged by the forces generated in a short circuit.

2.LITERATURE SURVEY:

Recently, various investigations on transmission line fault analysis using WT, KPCA, NN, SVM,FLC,AFL and WSE etc., have been discussed. With their application certain investigation on transmission line fault analysis is proposed in the research work. Few schemes for fault detection, classification and location of power transmission lines are presented.

Short circuit current literature survey report contains the results of a literature investigation on short circuit current limiters the occasion for this is a research program performed in the group called apparatus and systems for electrical energy supply of the Eindhoven University of technology on a method of short circuit current limiting. For this research the availability of survey of the literature on the subject appeared desirable.

With reference to A.Bhatia(introduction to short circuit) [2]:

A short circuit results in excessive current flow in the power source through the 'short,' and may even cause the power source to be destroyed. In electrical devices, unintentional short circuits are usually caused when a wire's insulation breaks down, or when another conducting material (such as water) is introduced, allowing charge to flow along a different path than the one intended.

Damage from short circuits can be reduced or prevented by employing fuses, circuit breakers, or other overload protection, which disconnect the power in reaction to excessive current. If a fuse is in the supply circuit, it will do its job and blow out, thus opening the circuit and stopping the current flow. If a circuit breaker is in the supply circuit, it will trip and open the circuit.

Example regarding reference[3]

A common type of short circuit occurs when the positive and negative terminals of a battery are connected with a low-resistance in the connection, like a wire With a low resistance in the connection, a high current will flow, causing the delivery of a large amount of energy in a short period of time.

A high current flowing through a battery can cause a rapid increase of temperature, potentially resulting in an explosion with the release of hydrogen gas and electrolyte(an acid or a base), which can burn tissue and cause blindness or even death. Overloaded wires will also overheat causing damage to the wire's insulation, or starting a fire. High current conditions may also occur with electric motor loads under stalled conditions, such as when the impeller of an electrically driven pump is jammed by debris; this is not a short, though it may have some similar effects.

In electrical devices unintentional short circuits are usually caused when a wire's insulation breaks down, or when another conducting material is introduced, allowing charge to flow along a different path than the one intended.

In mains circuits, short circuits may occur between two phases, between a phase and neutral or between a phase and earth (ground). Such short circuits are likely to result in a very high current and therefore quickly trigger an over current protection device. However, it is possible for short circuits to arise between neutral and earth conductors, and between two conductors of the same phase. Such short circuits can be dangerous, particularly as they may not immediately result in a large current and are therefore less likely to be detected. Possible effects include unexpected energisation of a circuit presumed to be isolated. To help reduce the negative effects of short circuits,

power distribution transformers are deliberately designed to have a certain amount of leakage reactance. The leakage reactance (usually about 5 to 10% of the full load impedance) helps limit both the magnitude and rate of rise of the fault current.

A short circuit may lead to formation of an electric arc. The arc, a channel of hot ionized plasma, is highly conductive and can persist even after significant amounts of original material from the conductors has evaporated. Surface erosion is a typical sign of electric arc damage. Even short arcs can remove significant amounts of material from the electrodes. The temperature of the resulting electrical arc is very high (tens of thousands of degrees), causing the metal on the contact surfaces to melt, pool and migrate with the current, as well as to escape into the air as fine particulate matter.[3]

Short circuit forces and winding deformation failure modes:

When a transformer is subjected to a short circuit in the attached network, then it experiences considerably increases current flows for the duration of the external fault. The magnitudes of the resulting 'through fault' currents are usually much higher than normal in – service currents, because they are no longer limited by the load impedance and may only be limited by the impedance of the transformer itself. The short circuit may arise because of a defect arising in the another item of network equipment, or as a result of a system or environmentally generated transient , example close up lightning strike, which causes a phase to earth fault. Arising from the radial and axial forces acting on windings, the major deformation modes caused by fault currents are:

1. Radial buckling
2. Conductor tilting
3. Conductor bending between supporting spacer columns, local distortion of the winding.
4. Conductor telescoping in windings of limited radial thickness and restraint where conductors have been able to pass axially passed each other.
5. Spiral tightening under twisting forces
6. Collapse of the winding and supports

Movement of the winding leads, particularly tap leads.

COMMON FAILURE MODES:

Failure modes of large power transformers are not always straight forward. But purely from an assumption of the failure experienced in a large power transformer, most transformer failures can be classified into either one or a combination of more than one of the following three modes

1. Break down of insulation as a whole due to severe solid insulation ageing.
2. Break down of insulationby part, duetopremature ageing by localized high temperature overheating.
3. Mechanical failure of windings.

3.PROBLEM STATEMENT

A short circuit is a fault. It means there is a very low resistance conducting path from one side of a component to other. A short circuit makes the circuit behaves as if the component wasn't there. The component stops working and the current everywhere in that circuit will increase, which can damage other components or, in extreme cases, cause a fire. So how can we explain shorts? A very misleading way of explaining them is to say that current takes the easiest path.

A high current flowing through a battery can cause a rapid increase of temperature, potentially resulting in an explosion with the release of hydrogen gas and electrolyte (an acid or a base), which can burn tissue and cause blindness or even death. Overloaded wires will also overheat causing damage to the wires insulation, or starting a fire. . Whenever you are working with electricity, the proper use of safety precautions is of the utmost importance to remember, in the front of all electronic technical manuals, you will always a find a section on safety precautions. Also posted on each piece of equipment should be sign list in the specific functions.

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Whenever you are working with electricity the proper use of safety precautions is of the at most importance to remember In the front of all electronic technical manuals, you will always find a section on safety precautions. Also posted on each piece of equipment should be a sign listing the specific precautions for that equipment. One area that is sometimes overlooked, and is a hazard especially on-board ship, is the method in which equipment is grounded

BLOCK DIAGRAM:

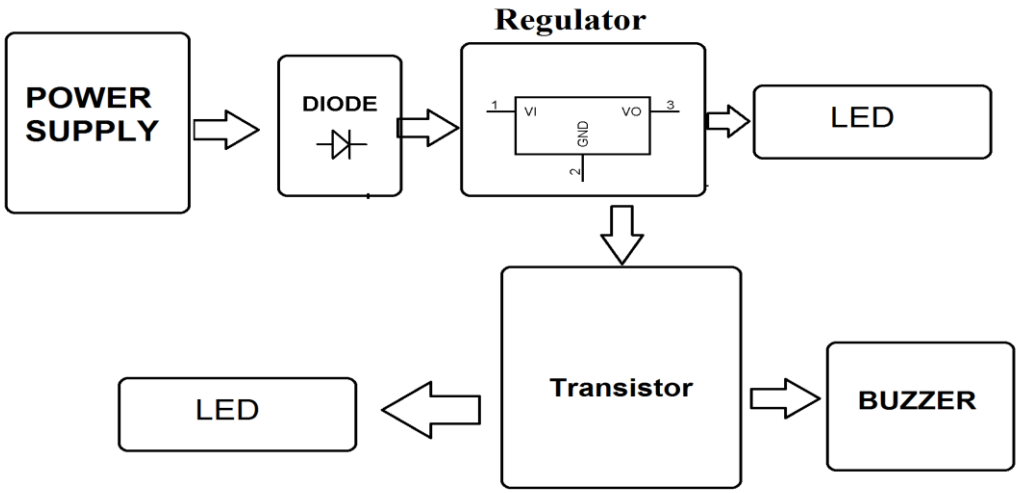

Fig1.1 Block diagram

CIRUIT DIAGRAM

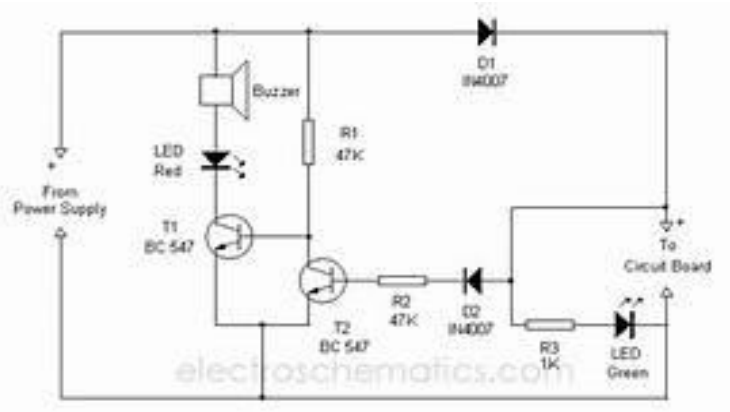

Fig 1.2: circuit diagram

SOLUTION

When you connect a wire across the terminals of a bulb you are effectively creating a little parallel circuit. The thing with parallel circuit is that the effective resistance is less than the smaller resistance. In this case the smallest is just the wire and this has a very low resistance indeed.

LADDER SHORT CIRCUIT:

Along a wire, there should be a place where some insulation is burnt where short circuit occurs. Sometimes you might also want to locate a place where there is a lapse of electrical connection or where there is a break along a wire. To locate wires that are broken you can measure the resistance with a multi meter. First shut off all power to item and wires that we are going to test. Set to measure resistance at the highest setting place one lead at the beginning or at the end of the wire and then place the other lead the other end of the wire. With the measurement of infinite resistance or very high resistance, that means there is a break in that wire. With zero or very little resistance, that means the wire is good. Safety is a large concern.

Resistor troubles are the simplest. However, like the others they must be considered.

1. A resistor can open.
2. A resistor can increase invalue.
3. A resistor can decrease in value.

RESULTS:

Short circuit analysis uses the point to point method to calculate fault currents at various points in an electrical system up to 600v. Calculations can be made from the utility transformer secondary to the utilization equipment in an electrical system. Print outs are available for each calculations, and the helps system guides you through the calculations.

- Save time by easily obtaining the short circuit magnitude at each point in the power system.
- Design safer systems by comparing the calculated fault current to the ratings of installed equipment.
- Increase design reliability by supporting proper selection of circuit protection equipment for protection and coordination.
- Reports AC and DC currents for four user defined times.
- Reports zero crossing time of total current.

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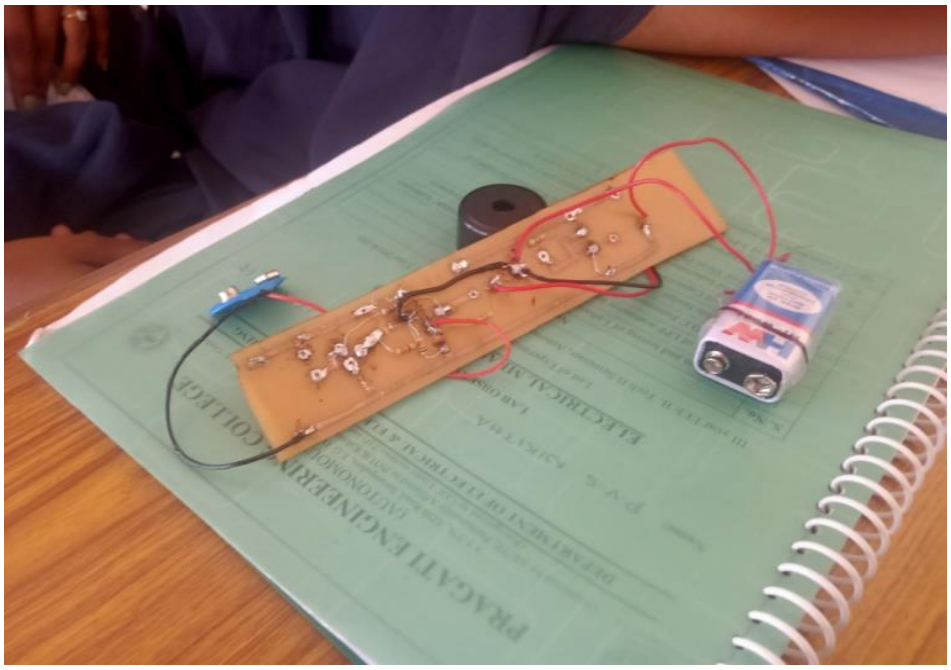

Fig 1.3 prototype of short circuit indicator

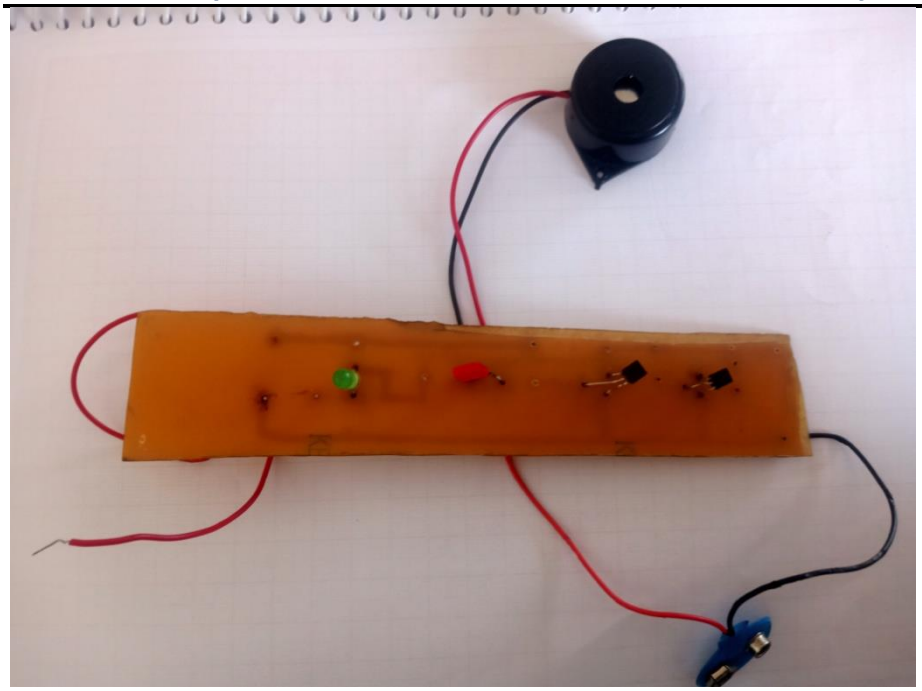

Fig1.4 The other side of the component

CONCLUSION:

Finally, in short circuit study, we have to learn about the short circuit and we have to clarify some doubtable questions like: what is short circuit? How it happens? When it happens? Why it happens? , when it happen? , why it happens? And also learn prevention methods of short circuit study. Short circuit (fault current) studies are required to insure that existing and new equipment rating are adequate to withstand the available short circuit energy at each point in the electrical system. Whenever you are working with electricity, the proper use of safety precautions is of the utmost importance to remember, in the front of all electronic technical manuals, you will always a find a section on safety precautions. Also posted on each piece of equipment should be sign list in the specific precautions for that equipment. One area that sometimes over looked, and is a hazard especially on-board ship, is the method in which the equipment is grounded. By grounding the return side of the power transformer to the metal chassis, the load being supplied by the power supply can be wired directly to necessity of wiring directly to the return side of transformer is eliminated.

Fault currents that exceed equipment rating are capable of extensive equipment damage and are serious threat to human life. Recently, 23000 fire complaints a year from all over state. There are a lot of fire accidents are occurred due to this short circuit.To protect the buildings from this short circuits we have to learn about this short circuit phenomenon.

FUTURE SCOPE:

Line Short Circuit And Earth Fault Indicator the fault current in the line will increase, when the current increases more than a certain set value, the use of over current fault indicator will alarms display. Such indicators need to set a Short Circuit And Earth Fault Indicator alarm threshold in advance, short circuit in general400A-1200A,ground generally in the 5-60A,,adjustable range. When the line short circuit and earth fault indicator, the line will occur more significant instantaneous current changes ,when the protection device action trip, the line steady current will be zero. Detection of the current value of this mutation , but also to determine the short circuit and earth fault indicator .Because thus type of indicator does not need to set the alarm threshold in advance, its scope of application is more extensive. But because of the need for real-time monitoring of line current, product power consumption , shorter service life.

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APENDIX:

1. Resistor -47Kohms
2. Resistor- 1k ohms
3. Resistor-47K ohms
4. Transistor T1- BC547
5. Transistor T2-BC547
6. Diode D1-IN4007
7. Diode D2-IN4007

A red LED, A green LED, A Buzzer

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