

Broken wire detector using EMF Technique

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Abstract –

Finding the breakage of current conducting wire inside an insulator or PVC is very difficult, so here we use the simple NPN transistor (BC-547) to identify the exact location of breakage of wire. Our device detects the presence current flowing in the wire by emf technique. If the current passes through the wire there will be emf (electromagnetic field) this emf is absorbed by the device then the LED turns on and buzzer turns on and if there is no current is passing through the wire then there is no emf produced by the wire the LED and buzzer turns off,

I. INTRODUCTION

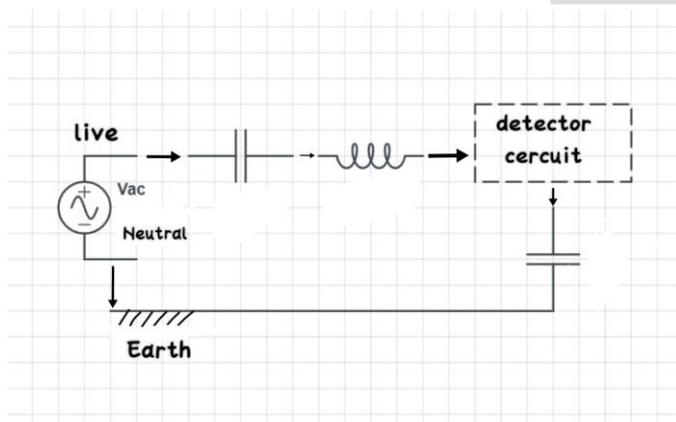
Today we use many types of gadgets and electrical appliances where they need power connection like cell phones, television, refrigerator etc..... For all these we supply power using insulated wire where it is covered by the PVC covering for the protection purpose of the user, but some time it becomes a problem. Over the long period some wires would get damaged inside the PVC, which means there will be break down of the wire and stops functioning. So here we can replace the wire but sometimes it would be costlier to replace so we need a device to point the exact location of the wire.

II. OBJECTIVE

Our fundamental point in this project is to find the specific of breakage in directing wires disguised in PVC coat with out truly harming the coat consequently lessening the exercise in futlity as well as assets.

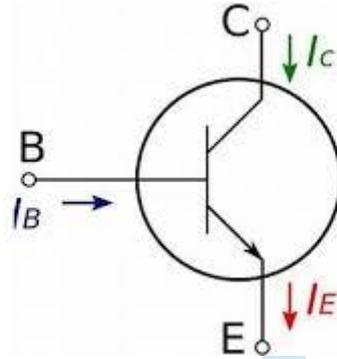
III. BLOCK DIAGRAM AND GENERAL DISCRPTION

The coil in the circuit it looks like a coil but it acts as a one side plate oh a capacitor. So, if we increase the area of its surface then there will be more EMF is collected and it works as we increase the surface area.



Fig(a)

The live voltage is reference to the earth and there is a very tiny straight capacitance between the earth which can be or the contact with the body to the circuit and with the capacitance between the antenna and the live wire so, here the circuit closes and it can pick up the live voltage. But the transferred EMF to the is very low. So, in order to detect this very low energy voltage source we need to draw a extremely small current from the detector coil.



BJT NPN Transistor
Fig (B)

The transistor that we have used in the detector circuit is BJT (bipolar junction transistor). basically, in this type of transistor the current into the collector side is β (beta) times larger than the current into the base side (may be β value can be more the hundreds). According to the NPN transistor configuration β is called as the DC current gain and it is ratio of collector current I_C and base current I_B .

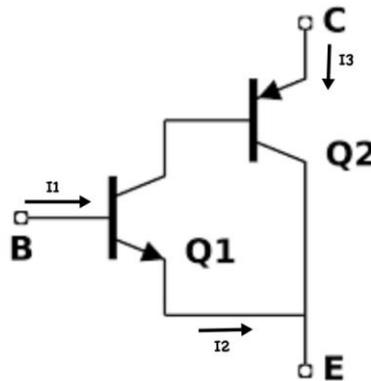
That is β is given by =>

$$\beta = I_C / I_B$$

Therefore, we get collector current as,

$$I_C = \beta * I_B$$

Here β is also known as the H_{fe} which is constant that can be high value (may be in hundreds value). Which means we can start a much larger collector to emitter current? Now from our detector circuit we have the pair of transistors Q_1 And Q_2 these types of pair connection are called as Darlington pair. so, if we need a specific range of output current, we need β times of current in Q_1 and another β times current Q_2 .



Darlington pair

Fig(C)

According to Darlington pair circuit in fig(c) the base current from the transistor Q₁ is equal to β times of emitter current.

So, we can write it has:

$$I_1 = \beta * I_2 \Rightarrow \text{equation(1)}$$

And the I_2 which is the emitter current of Q₁ is interconnected to another emitter that is transistor Q₂. So, the current I_2 is equal to the β times of I_3 .

So, we can write it has:

$$I_2 = \beta * I_3 \Rightarrow \text{equation(2)}$$

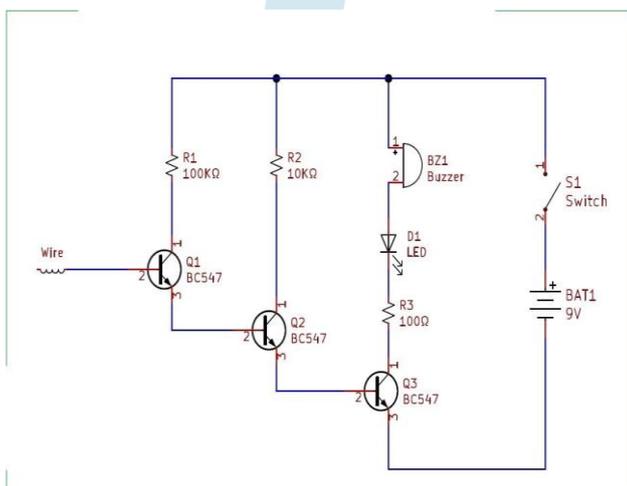
From equation (1) and equation (2) we can write it has

$$I_3 = \beta^2 * I_1$$

By observing the above equation say that to turn on the capacitor Q₃ we need a supper smaller base current from transistor Q₁ which is base current I_1 .

Finally, the combination of Q₁ and Q₂ works as an amplifier and Q₃ transistor works as a switch.

V1. CERCUIT DIAGRAM



Fig(D)

Above circuit diagram represents our detector circuit

C. Abbreviations and Acronyms

Define abbreviations and acronyms the first time they are used in the text, even if they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, ac, dc, and rms do not have to be defined. Do not use abbreviations in the title unless they are unavoidable.

D. Equations

1) DC current gain

$$\beta = I_C / I_B$$

where

β = DC current gain

I_C = collector current

I_B = base current

2) collector current

$$I_C = \beta * I_B$$

According to Darlington pair circuit

So, we can write it has:

$$I_1 = \beta * I_2 \Rightarrow \text{equation(1)}$$

I_2 which is the emitter current of Q_1 is interconnected to another emitter that is transistor Q_2 . So, the current I_2 is equal to the β times of I_3 .

So, we can write it has:

$$I_2 = \beta * I_3 \Rightarrow \text{equation(2)}$$

From equation (1) and equation (2) we can write it has

$$I_3 = \beta^2 * I_1$$

By observing the above equation say that to turn on the capacitor Q_3 we need a super smaller base current from transistor Q_1 which is base current I_1 .

Finally, the combination of Q_1 and Q_2 works as an amplifier and Q_3 transistor works as a switch.

ACKNOWLEDGMENT

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