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Development of Automatic/Manual Power Off, Power Change over Device

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Abstract **- The automatic/manual power off, power change over device is design to Change power supply from private that is power generator to public power supply, Switch off the private power generator when public power supply comes and Make provision for manually switching off private generator inside the building.**

The design of this device was achieved using component that work base on the principle of electromagnetism, logic connection and switches this component were customise to achieve this possibility. This customisation influence the ampere, compensated for variable load. For maximum safety fuse and protective component is incorporated into the device, several test have proof the device reliability over a period of five years. This will help in the proper management of energy.

Keywords **- Automatic, Power Change Over, Electromagnetism, Customize Component.**

I. INTRODUCTION

In most part of Nigeria today electric power is not stable because of this most people prefer using private power supply to ease up the situation, power supply have to be change from one source to another manually this is always stressful, because of this challenges this device was created.

Also User of private power supply keeps their generator running even when the public supply is available unknowingly. This result to waste of energy and money, this was identified as a problem and against this problem that this project originated.

The device is made of an electromagnetic component that perform more than one function, when the current flow through this device, switches are close while some open depending where the power source is from. either public power supply or private, if it from the public source this component will actuate, and switch off the private source and automatically change the source from private to public source, at this point were the feeding is from public source the private source remain idle except disconnected from the device, this is one of the safety majors incorporated in the system

The device can be used in Modern house, commercial complexes, hotel, hospital, factories depending on the ampere that correspond with the load capacity

II. METHODOLOGY

Design development and consideration.

As an electrical related project the primary concern for material selection were safety, strength, reliability conductivity, resistivity, corrosion, wear resistance weight shape and size, cost of production, serviceability human factor

Principle and analysis

The automatic /manual power off, power change over device work base on the principle of electromagnetism the principle is called Faraday's Law of Electromagnetic Induction, which state that the magnitude of induced electromotive force (e.m.f) is equal to the rate of change of magnetic flux, it is known that when an electric current flow through a conductor, a magnetic field is immediately induced to existence in the space surrounding the conductor, it can also be said that when electron are in motion the produce a magnetic field

Explanation supposes a coil has N turn and flux through it change from an initial value of $N\varphi_1$ webers to the final value $N\varphi_2$ webar in time (t) in second. since flux linkage mean the product of number of turn and the flux linkage with the coil, we have

Initial flux linkage $=N.\varphi_1$, and final flux = $N.\varphi_2$

Induce e.m.f $e = (N.Q_2 - N.Q_1)/t$ wb/s OR

$$= N(Q_2 - Q_1)/t \text{ volt} \quad (1)$$

Putting the above expression in its differential form we get e.m.f $e = d/dt, = (N.Q) = N(d/dt)$ volt (2)

In equation (1) and (2) e is the amount electromotive force (e.m.f) establish when current passes through a coil of N turn for mechanical manipulation of the switch,

III. MATERIAL SELECTION

The material used for this device are commonly sourced, the material component used where chosen base on the data available according to product safety commission and standard organization of Nigeria, this component are efficiency and affordable ,the device is made up of the following component;

1. Relay
2. Fuse
3. Voltmeter
4. Connectors
5. Casing etc

Fig.1. The device on testing process

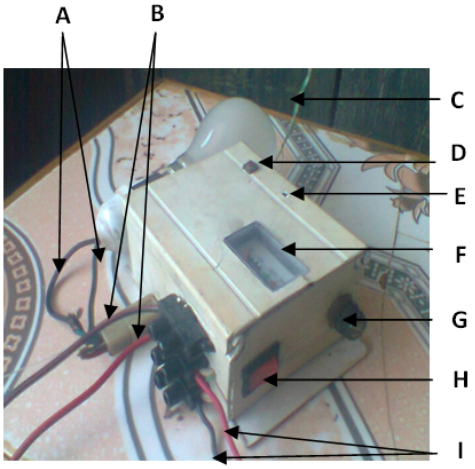

Fig.2. The device and its nomenclature

A - Output terminal, to load
B - Input terminal from public source
I - Input terminals from private generator source
C - Generator switch terminal
D - Generator off
E - Indicator light
F - Voltmeter
G - Replaceable fuse
H - Power switch

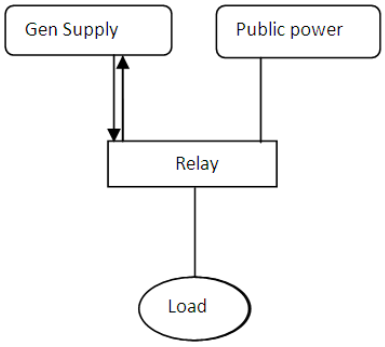

Fig.3. The block diagram of the device

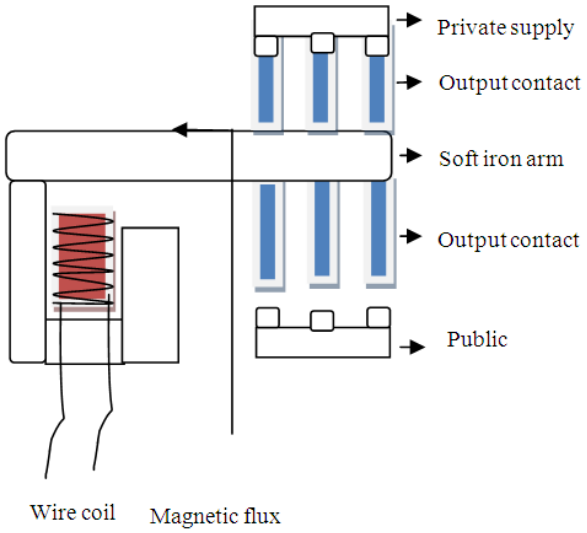

Fig.4. Internal operation

Fig.1 Shows the device on test, Fig.4 shows the operation that takes place inside the device, when the coil is energise with public supply. at this point the soft iron is magnetise downward the by disengaging the contact from the private supply to the public supply, also turn off the private supply.

To get the desired magnetic flux the formula below was used.

Field strength (H)

H = N.L/l in AT/m (3)

The unit is A/m because turn has no unit
H is the magnetic field strength
N is number of turn of wire
A is cross sectional area of the core (m^2)
L is length of magnetic path (m)
I is ampere of the coil (A)
AT/m is unit of magnetic field strength, ampere-turn per metre

Flux density (B)

Electromagnetic effect of material varies base on their permeability for this reason selection of medium was done base on this

$\mu_o.\mu_r$ = absolute permeability,
$\mu_o = 4\pi \times 10^{-7}$, $\mu_r = 1$
$B = \mu_o.\mu_r, H = (\mu_o.\mu_r N.I)/L$ wb/m^2 unit in H/m
Total flux produce $\varphi = B \times A = (\mu_o.\mu_r.A.N.I)/L$ in wb
Magnetic flux $Q = N.I/(L/\mu_o\mu_r A)$ in wb (4)

The numerator (N.I) which produces magnetization in the magnetic circuit is known as magneto motive force (m.m.f)

The denominator $L/(\mu_o\mu_r A)$ is called the ***reluctance*** of the electric circuit and is analogous to resistance in electric circuit

Also = m.m.f/reluctance

V. Operational Description

Fig .2 shown the device and it outward nomenclature operational step. Fig.3 shows the block diagram of the device, from the diagram the arrows indicate direction of signal and current flow, the flow between the relay and generator supply shows power supply from generator to relay and also feedback signal from relay to the generator this signal turnoff the generator when the relay is energies by public supply.

From figure (2) A is connected to the load, ;B is connected to single phase110,/220volt,50-60Hz,red wire to life, black to neutral respectively ;C, is connected to generator switch.

When the public supply is available the device is power at the same time passing supply to the load, when public supply goes off the supply change to generator.

VI. Conclusion

This device presented here has the tendency of automatically making power changing over of any source very easy, safe and convinces compared to the existing

ones. One of its greatest advantage is its compatibility with difference power generator, where this device is located the power generator can be turn off at any time.

This automatic change over device makes provision for appropriate used of electric power and also save the energy we expend in manual operation. From our several experiment this device has been proof durable and efficiency recommend that the device can be used in residential, public building and industrial firm.

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