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RESEARCH ARTICLE OPEN ACCESS

S.P.A.R.C
(System Protection And Reclosure Circuit)

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ABSTRACT
This Paper Is Designed To Overcome Problems Related To Over Voltage, Double Phase Interference And Voltage Surges Mainly Due To Sudden Lightning In Homes. Usually In Home Appliances, The Distance Between The Two Contact Poles In Any Electronic Or Electrical Devices Is Very Less, So During Lightning, High Voltage Gets Induced Due To Spark Produced By Lightning. This High Voltage Is Capable Of Crossing The Poles Of The Contact Causing Damages To The Appliances. Even If The Fuses Trips Off During Such Conditions, Arching Takes Place Since A Very High Voltage Gets Induced Into The Power Line. Thus A Solution To Increase The Distance Between The Contact Poles Thereby Reducing The Possibility For High Voltages Crossing The Contact Poles. In Addition, An Automatic Control By A User To Return Back His Home Lost Power.. Nowadays One Ourselves Go And Switch On The Fuse After It Has Been Tripped Off. The Mechanism Also Provides Protection Against Double Phase Interference At Its Root. This Is A Innovated Multi-Protection System That Provides Protection Against Almost All Problems.
***Keywords*:** Innovation Policy, Voltage, Project, Interference, Lightning, Current.

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I. INTRODUCTION

In The Present Scenario, Though There Are Many Devices Like Stabilizers, Surge Protectors, Circuit Breakers Etc. That Protect Against Over Voltage, There Are Many Cases In Which The Appliances Such As Fans, Tubes, TV Etc. Gets Damaged. A Stabilizer Stabilizes The Voltage And A Common Surge Protector Will Stop Voltage Spikes/Surges But Not The Violent, Catastrophic Burst Of Current From A Close Lighting Strike. ELCB, MCB, UPS Etc. Do Not Protect From Surges. The Problem With Lightning Is That Simple Controls Can Be Replaced And More Complex Control Boards And Circuit Boards May Have Down Line Damage That Is Not Easily Detected And Through Assessment Should Be Made Before Replacing Multiple Boards With Caution. Potential Future Failure Is Always Risk Of Any Electronic That Has Been Hit With Voltage But Not Properly Accessed. This Results In Frequent Replacement Of Electronic Devices Which May Not Be Economical. Thus We Have To Find A Solution To Provide Protection Against All These Problems. Transformers In Sub-Stations Have Sufficient Distance Between The Contact Poles. Due To This, The Effect Of Lightning Is Minimized. But The Small Distance Between The Contact Poles In Household Circuit Is Sufficient For High Voltages Produced During Lightning To Cross The Contact Poles Even When There Is No Main Supply (I.E, Arcing).

Overvoltage Causes Considerable Damage To Electrical And Electronic Equipment. In Many Cases, All It Takes Is A Small Voltage Peak On The Supply Line. This Is Apparent From Damage Profiles Of Destroyed Lines, Circuit Boards Or Switching Devices. Such Damage Can Be Prevented By Taking The Proper Measures To Protect From Overvoltage. Roughly A Third Of All Claims Reimbursed By Building Insurers Can Be Attributed To Lightning Strikes And Overvoltage Events. For Homeowners Insurance, That Rate Of Claims Is Even H

II. METHOD

My Solution Is Represented In The Following Block Diagram. The First Two Blocks Represent Main Power Supply By State Government. RCCB Is Used To Cut Off The Supply When Lightning Strikes Or When There Are Other Unbalances In Power Line. When There Is No Power Supply, RCCB Does Not Work. During This Condition, The Controller Gets Its Supply From An External Battery Source. At This Time The Poles Are NORMALLY OPEN Which Is Connected To The Motor. When There Is Power Supply, The RCCB Works And The Contact Poles Come Closer. This Is Done With Help Of Motor Controlled By A Microcontroller. When Lightning Strikes, RCCB Gets Automatically Tripped Off Thus No Power Supply. Thus The Motor Reverts Back To Its Initial Position. The Output Of The Circuit Goes To Distribution Board. Similarly In Double Phase Conditions, Appliances Gets Damaged. This Is Because Of Neutral Wire Failure. An Overvoltage

Protector And Double Phase Interference Is Inbuilt In The Same Circuit. During Opening Of Current Carrying Contacts In A Circuit Breaker The Medium In Between Opening Contacts Become Highly Ionized Through Which The Interrupting Current Gets Low Resistive Path And Continues To Flow Through This Path Even The Contacts Are Physically Separated. During The Flowing Of Current From One Contact To Other The Path Becomes So Heated That It Glows.

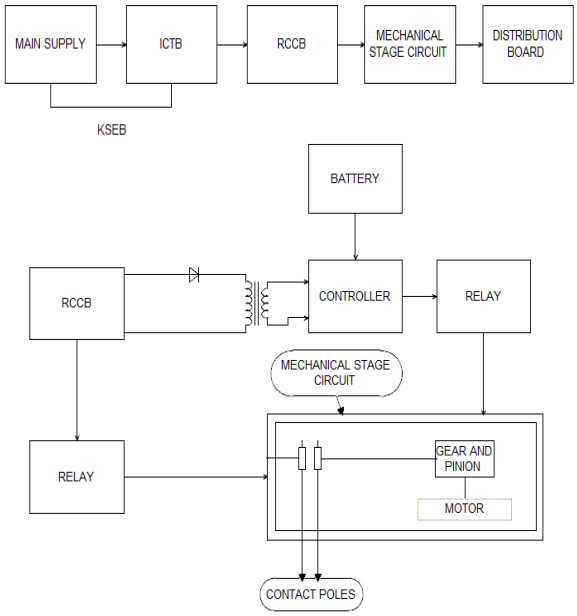


Fig 1: Block Diagram

This Project Consists Of Three Stages:

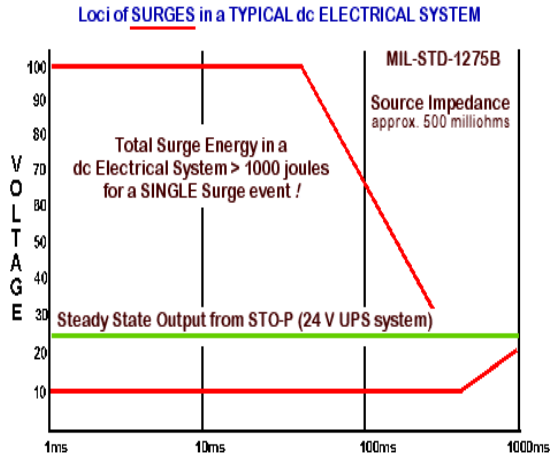
- First Stage – Mechanical Stage
- Second Stage – Message Transmission Stage
- Third Stage – Message Reception Stage

III. DISCUSSION

RCCB (Residual Current Circuit Breaker) Is Used To Protect The Circuit During Lightning Or Any Other Unbalances. RCCB Works Only When There Is A Main Supply. When There Is No Supply, The RCCB Does Not Work. During The Condition The Controller Gets Its Power From The Battery. At This Time The Contact Poles Are Normally Open Which Is Connected To A Motor. When There Is A Provision For Power Supply, The RCCB Works And The Contact Poles Come Closer For A Normal Working. This Is Done With The Help Of A Driven Motor By The Controller. Whenever The Lightning Strikes, The RCCB Gets Automatically Tripped Off Thereby Producing No Supply To The Controller. Depending On This Condition, The Controller Provides Output To The Motor Thereby Reverting Back To Its Original Position. Similar Is The Case With The Double Phase Interference Which Occurs Due To The Neutral Wire Failure Thereby Resulting In Double The Original Voltage. Initially When There Is A Current Supply We Get An Input Voltage Of 230V Which Is Fed Into A Full Wave Rectifier Thereby Producing Output In Both Positive And Negative Cycle. The Required Voltage For Relay And Motor To Drive Is 12V. Thus An Opto Coupler Which Consists Of An LED And A Transistor. When The LED Gets Turned ON, The Base Of The Transistor Gets Saturated So We Get A Negative Voltage At Npn Transistor. Hence The Ground Value Which Is Negative Enter The Transistor And Goes On To The Next Pnp Transistor. Here +5V Is Given To The Emitter And Relay Gets Turned ON. In Double Phase, The Same Procedure Is Repeated With Variations In The Resistance Value And That +5V Is Given To The Collector Of The Transistor Which Is Connected To The Input Of The First Pnp Transistor. The Pulse Obtained Is Fed Into The Microcontroller And Thus The Motor Rotates And Thus The Poles Come In Contact With Each Other Thereby Supplying Power To The Rest Of The System. When There Is N Current, There Is No Output From The Optocoupler. An External Voltage Of +5V For The Motor To Rotate Is Given In Anticlockwise Direction And Poles Come In Distance. When Double Phase Come In The Main Power Line There Is A Chance Of Electrical Shocks For People And Damage For Appliances. In This Project A 440V Is Used. When This 440V Enters The Main Power Line Relay R2 Gets Tripped Off And The Microcontroller Gets Input From The External Battery Source And The Poles Move In Distance From Each Other Thereby Preventing The High Voltage From Entering The Distribution Board. Whenever The Power Supply In Our Households Is Cut Off Or The RCCB Gets Tripped Off Or In Case Of Double Phase, The Contact Poles Moves Apart And The Corresponding Message Indicating The Reason I.E, Over Voltage Or Earth Fault, Is Sent To The Programmed SIM Number. This Mainly Allows Users To Know The Current Situation In Their Homes. This Helps Us To Identify The Fault. This Is Done With The Help Of GSM Module. Only Two Wires Are Used (TX, RX) Except Power Supply To Interface With Microcontroller. The Built In Power Supply Allows You To Connect Wide Range Of Unregulated Power Supply. Using This Modem, You Can Send SMS, Data And Read SMS Through Simple AT Command. When A Message Is Sent To The Transmitter It Is Possible To Know About The Fault Reason In The Power Line. Thus If The Fault Is Due To RCCB Trip, The User Can Determine Whether Or Not To Turn On The Fuse Automatically From A Distance Apart By Using An SMS System. Such A Use Is Applicable In Our Day To Day Life. The Daily Manual Switching Of Fuses In Households, Small Industries Can Be Replaced With This Mechanism. In This, The Switching Is Done As Follows:

Once The User Sends A Command Eg; # In This Case, The Message Is Sent To The SIM In The

GSM Module. When The SIM Receives The Message, It Sends An "ON" Condition To The Motor (60rpm) Which Is Attached To The System. This Is Connected To A Switching Mechanism Which Is Designed Specifically (Fig 6.5). As The Motor Turns, The Fuse Trip Moves Upwards. For This To Happen The Motor Is Placed In An Abrupt Manner To Offer Easy Control Of Fuse Switch. After A Time Delay Of 250ms, The Motor Stops Rotating. By This Time The Fuse Moves Upwards, The Poles Come In Contact And Current Flows Through Our Distribution Board.



IV. MERITS

The Existing Surge Protectors Fail To Overcome The Effect Of Lightning All The Time Because The Process Of Arching Is Not Compensated In The Surge Protectors. This System, Improves The Existing Limitation (I.E., Arching Due To Lightning) And Incorporates All The Safety Measures Like Protection Against Over Voltage, Double Phase Interference And Surges Due To Lightning Into One Unit, Where The Need For Individual Protection Device Is Eliminated.

One Can Receive Message To Our Phone Indicating The Reason For The Power Supply Cut Off, I.E., Over Voltage Or Earth Fault.

By Sending A Message Back, We Can Turn On The Fuse Again Automatically With The Help Of A Motor Which Restores The Power Supply. Thereby, Transforming The System Into Completely Automated System. An Instance Of The Above Case Is Applicable For Many Uses. One Example Is Decay Of Perishable Food Products In The Fridge Once The Trip Takes Place For A Long Period Of Time. So Automatic Resetting Of Tripped Fuse Allows The Normal Functioning Of Fridge Thus Preventing Decay Of Food.

Application

1 Safety Unit In Households Incorporating All Protection Devices

2. Helps To Know The Faults By Wireless Communications.

3. Automatic Resetting Of Tripped Fuses.

V. CONCLUSION AND FUTURE SCOPE

This Is A Multi-Purpose Protection Device That Can Provide Protection Against Over Voltage, Double Phase Interference And Surges Due To Lightning. It Incorporates All The Safety Measures Into One Unit Thus Eliminating The Need For Individual Protection Device. We Can Receive The Messages Regarding The Trip Due To Lightning On Our Phone And Sending A Message Back Can Reset The Fuse Automatically Thus Providing Completely Automated Switching. This Unit Can Minimize The Damage Of Electronics During Lightning And High Cost Devices Can Be Protected.

In Order To Improve The Speed Of Switching, Solenoid Switching Can Be Designed And Used, Replacing The Gear Motor Mechanism Which Further Improves The Working. The Battery Can Be Charged By Employing A Solar Panel Which Further Improves The Efficiency. These Are The Further Developments That Can Be Brought To The System Which Improves The Performance Of The Proposed System.

VI. LITERATURE SURVEY

On Looking Into The Current Scenario A Small Survey Was Conducted To Get More Information's And Details. As A Part Of This Survey, Consulted Staffs Opinions From Electrical Service Centers And The Inference Was Obtained. It Has Been Inferred That Most Of The Electronic And Electrical Devices Are Damaged Due To Sudden High Voltage And High Current. This Is Mainly Found During Lightning. Till Now There Have Been No Measures Found Yet To Prevent Lightning Damages Inside Home. In Telegraph.Co.Uk There Are Many Questions For The Solution Due To Lightning, So I Take This Opportunity To Present My Solution For The Over Voltage , Over Current , Double Phase , Automatic Control Of Main Fuses In Households And Small Scaled Industries.

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