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"AUTOMATIC POWER-ADJUSTABLE CHARGER"

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Abstract : *Smartphones and multiple electronic gadgets have become a daily necessity for our life as we have created a huge interdependency on gadgets. Introduction of the electronic gadgets with multiple features have made our lifestyle easier and faster. Smartphones are the most importance and widely used electronic gadget and it can be observe that every new day brings a better innovation in its manufacturing. Along with the innovation In the smartphone, we need a major innovation in its charging methods. In the initial days of the mobile phone manufacturing, its chargers used to work on the constant current supply system. After few years the next generation chargers came with the constant voltage system and the next major update was the introduction of the constant current And constant voltage charging system, which was used for a larger period of time. When the competition in the field of innovation incremented massively, smartphone brands focused on making there smartphone charging rate faster than others and they started using the microcontrollers for increasing there charger's output. There are multiple smartphone brands with there own different charging technologies like DASH, TURBO, VOOC etc. These charging technologies works on there full potential when connected to The devices which support those technology's communication. When we connect these high power output chargers to the devices which doesn't support its communication Style , the charger doesn't supply the power with the full potential even if the device is capable of handling the load. There is a need for a charger which doesn't have the compatibility issues with any kind of devices which require the power input between The range of power output supplied by the charger. There is the need for the charger with the wide range of power supply that can charge a earpiece to smartphone. In our Auto Power Adjustable charger's proposed methodology , we are considering all the above parameters to create a universal charger, which can be used to charge any type of device in its output range. We will add an extra circuit which will be responsible for the feedback from the device's battery for analysing the required power output . We will supply the exact amount of power which is required by the device and it will minimize the chances of the damage on the less powered batteries. The test results are showing the positive responses till the date . Arduino is the major component , which is responsible for the decision making in the regulation of the power output. Here we can conclude that our charger can eliminate the chances of the damage on the battery and it can supply the power output of a wide range.*

Keywords – *Adjustable,Battery, Charger, Power, Smartphones*

I. INTRODUCTION

Nowadays, the importance of the smartphones and other electronic gadgets Have Increased massively in our day to day life and it will keep on increasing in the future . Our smartphones have become a centralized electronic unit that manages a lots of different kind of work and performing multiple tasks at a time consumes more power than a basic gadget, hence the power requirement has increased massively. It wasn't a major problem when our mobile phones were just a basic device for communication purpose but globalization and the customer demands led the mobile phone Manufacturers to produce the phones which were capable of performing multiple tasks along with

basic communication. After addition of multiple advance features, our basic phones became smart Phone and more features led to the incrementation of battery consumption. To fulfil the required amount of power, we had to increase the capacity of our batteries used in the smartphones. Higher Capacity battery were taking longer time to get recharge and in this competitive world, no one wants to waste their precious time while charging phone therefore we need powerful chargers and this requirement led to the manufacturing of chargers with heavy power output (10W ,20W,30W,65W). Every smartphone have its own different charger that is capable of supplying the power required for charging the battery in the specified time by the manufacturer.

II. PROBLEM STATEMENT AND OBJECTIVE

PROBLEM STATEMENT:-

Due to very high competition standard in the smartphone manufacturing, Each and every smartphone brand wants to produce the smartphone with best in class features which will attract the customers toward itself. This competition have led the brands to produce the smartphones which can operate for longer period after a single charge and this can only be possible by increasing the capacity of battery used and proper power optimization. Currently we have multiple different type of smartphones with there different battery capacity (2500mah, 3000mah, 4000mah, 5000mah etc.) For the smartphones with different battery capacity, manufacturer provides different chargers with different power output. The major problem arises, when we connect our smartphone to a different charger rather than the charger provided by the manufacturer. Due to high amount of variety in the chargers, maximum amount of chargers do damage to the battery of other smartphone which are not compatible with it because of the difference between the required rate of charging of the battery and the supplied power output by the charger. When we connect a battery which require lower rate of charging to a charger with high power output, it leads to the reduction of the life of the battery and explosion or heating of battery. You can't observe the damage on the battery instantly but with the passing time it will become a visible damage. When we connect a battery which require faster rate of charging to a charger with low power output, the time required to charge the battery get longer and leads to the wastage of important time. Charging at a slow rate does not do any kind of damage to the battery life but in this impatient and faster world no one wants to waste there time while charging phone.

Objective:-

Our main objective is to manufacture a smartphone charger which is not based on traditional charging technology of constant current or constant voltage. We will make a charger which will adjust its power output according to the power required by the smartphone battery. Our charger will detect the amount of power required by the battery by conversing with its circuit and then our charger will supply the exact amount of power by adjusting its current and voltage supply. We are trying to make our charger capable of charging almost every available smartphone irrespective of its requirement, whether it is high or low. If a smartphone supports the fast charging up to 20W or 40W then our charger will upply the power of 20W or 40W based on requirement.

If a smartphone supports the slow charging up to 3-5 W then our charger will supply the exact power required , not more than that. Using our charger will minimize the damages on the battery from the charger end

III. METHODOLOGY

To overcome the problem of the damage on the battery by the use of different Chargers, we will use a different charging approach by the addition of a newer communicating circuit. This circuit communication will be managed by the micro-Controller.

Working process of auto-adjustable charger:-

The step by step working of auto-adjustable charger is explained in below paragraph.

Charger will take the normal 220-230V and 50Hz Ac supply from our normal charging point. The current will pass through the loop with the **Fusible resistor**, which will be responsible for handling the overpower supply from the charging point and it will act like a fuse, which will protect our circuit from the damage due to over power supply than allowed. A Fusible resistor is a wire -wound resistor that is designed to burn open easily when the power rating of the resistor is exceeded. This AC current will pass through the bridge rectifier unit, which will convert the AC current supply to DC current supply. Bridge rectifier is a combination of four diode which are used to convert the normal AC supply to DC current supply. This DC current will get pass through the **Capacitor** and the **Inductor** connected in the loop. This will filter the DC supply and a smooth DC supply will be obtained. This DC supply is passed through the **MOSFET Inverter** circuit. This inverter circuit converts the DC supply to the high frequency AC supply. MOSFET is a semiconductor transistor, which is know for its quick switching ability. The transformers only work with the AC current supply and we increased the frequency of the AC current for reducing the size of the electrical components used as the capacitance is inversely proportional to the frequency. This high frequency AC current passes through the **Stepdown Transformer** and our 220V AC is now converted into 15V 4A AC supply. This AC current passes through the rectifier circuit and get converted into the DC supply which is filtered by the use of capacitor and inductors. The **ARDUINO** microcontroller with voltage sensor and smartphone battery load will form a different loop of measuring the voltage across the smartphone battery. This will get us the information about the battery specification and its required charging rate. **ARDUINO** will perform all the calculation part about the required and supply current and it will instruct the voltage regulator and current regulating circuit accordingly for managing the proper required output.

3.1.1 Flow chart of the working of the charger:-

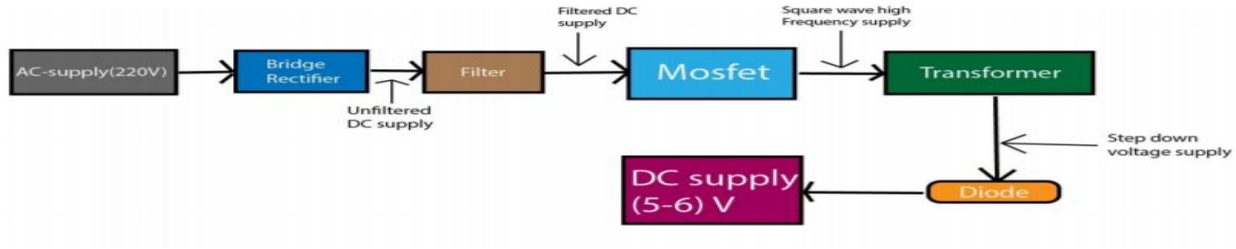

Fig.3.1 charging circuit of normal mobile charger

3.1.2 Flow chart of auto-adjustable charger:-

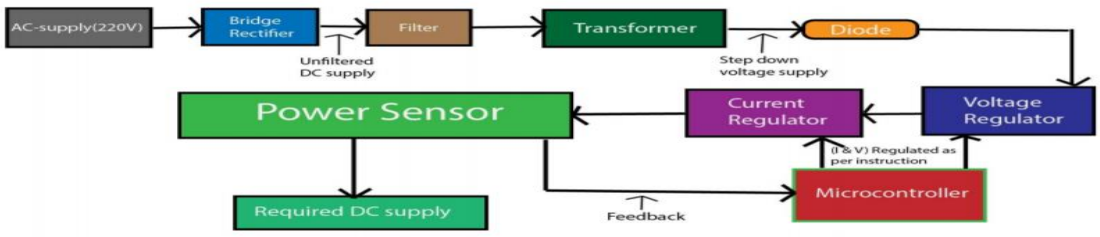

Fig 3.2

3.1.3 Circuit diagram of the Auto Adjustable Charger: -

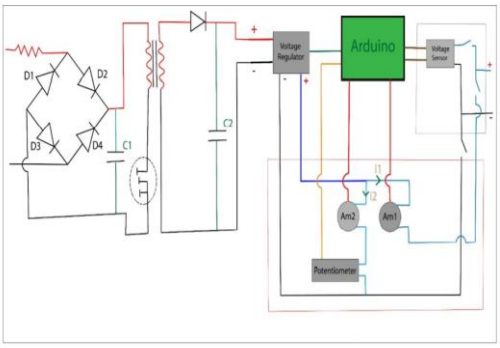

Fig 3.3

3.1.4 New Additional Integrated Circuit :-

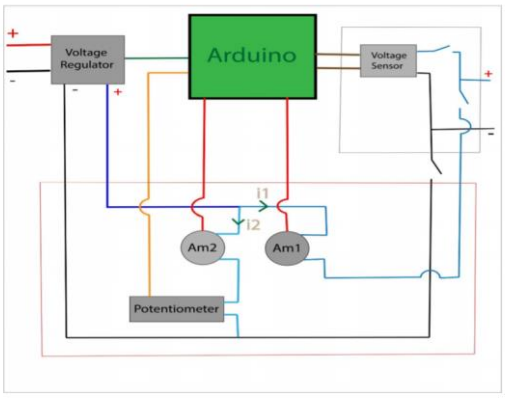

Fig 3.4

3.1.5. Battery voltage measuring loop:-

Fig 3.5

3.1.6.Actual testing Performed

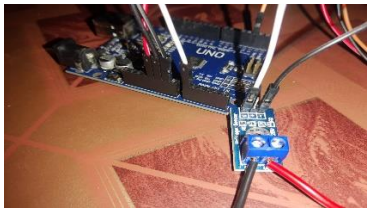

Fig 3.6

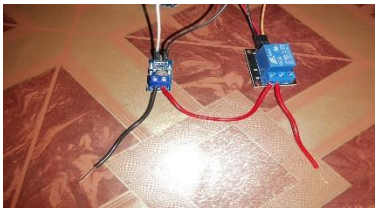

Fig 3.7

3.1.7 Power Output Regulating Circuit:-

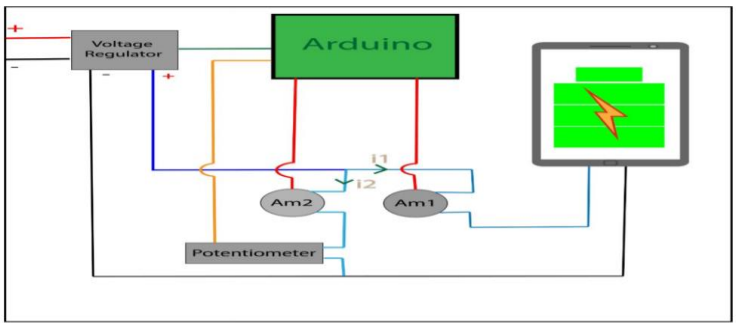

Fig 3.8

3.1.8 Voltmeter reading testing photo :-

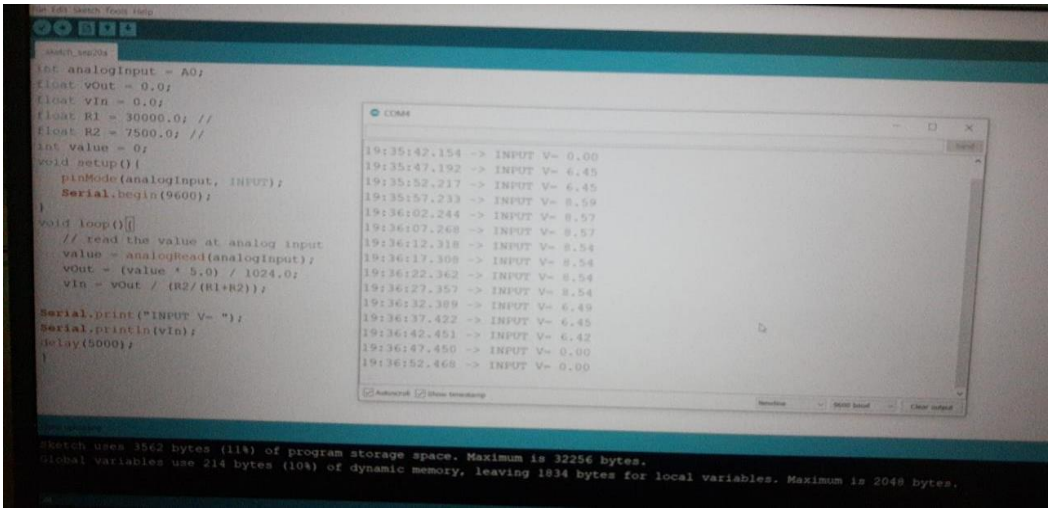

Fig 3.9

V. CONCLUSION

We have tested different electrical components to meet our requirements, and we have shortlisted the components which are providing good efficiency according to our requirements. We have conducted the several experiments and we have successfully regulated the current and voltage according to the requirement of battery. By using this we can regulate the voltage between 3.5V TO 12V and the current between 0.5A to 4A.This aims to work in between this given range and produce efficient results on it. Here we can conclude that our charger can eliminate the chances of the damage on the battery and it can supply the power output of a wide range.

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Above all, to the great almighty, the author of knowledge and wisdom, for his countless love.

REFERENCES

Journal Papers:

[1] PATENT NO: US 6,404,169 B1 **Randall Wang**, 4978Santa Anita Ave., Temple City, CA(US) 91780., AUTO-CONTOLLER FOR BATTERY CHARGER USING THERMO-CONTROL AND CURRENT BALANCE TECHNOLOGY.

[2] PATENT NO: US 7,893,657 B2,MUTI-POWER CHARGER AND BATTERY BACKUP SYSTEM , Anand Kumar Chavakula, 1836 Metzerott Rd., ADT. 608, Hyattsville, Md (US) 20783.

[3] PATENT NO: US D714,215 S DEVELOPMENT OF AN INTELLIGENT PORTABLE BATTERY CHARGER , Yan-Kai Bian, Shuang Tian Chinese Journal Of Power Sources, 30 (8), 677, 2006.

[4] PATENT NO: US 2,410,527,AUTO-CHARGER Willam.G.Schinske ,Sycamore, III., Assignor, By Mesne Assignments, To Ideal Industries, Inc., Sycamore, III, A Corporation Of Delaware Application JULY 17, 1994, Serial No. 545 378.

[5] PATENT NO: US 8,107,243 B2, PORTABLE MULTI-DEVICE POWER SUPPLY, BATTERY CHARGER, AND DOCKING SYSTEM, DARREN S. GUCCIONE ,Wheaton, IL (US); Craig B. Lurey, EL Dorado Hills, CA (Us).

Books:

Basic electrical & electronics engineering (BEE) by Prof. Ravish Singh