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Smart Charging Station for Electrical Vehicle

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Abstract: *Many alternative styles of electrical vehicle (EV) charging technologies are described in literature and implemented in practical applications. This paper present an overview of the existing and proposed EV charging technologies in terms of converter cartography, the power levels, power flow directions and charging control strategies. An overview of the main charging methods is presented as well, particularly the goal is to highlight an effective and fast charging technique for lead acid battery. The invention relates to a charging technique of AN electrical vehicle charger, and particularly relates to a charging technique within the floating charging part. The charging method is categorized in that different current values can be selected according to the capability of a battery. Although electric vehicles (EVs) present benefits for the public as a whole, there are a number of hurdle for their extensive adoption, mainly the high speculation cost for the EV and for the infrastructure. Therefore, a sound industry model must be built up for charging service operators, which allows them to recover their costs while, at the same time, offer EV users a charging price which makes electro-mobility equivalent to inner combustion engine vehicles.*

Keywords: Electrical Vehicle Charging, Fast Charging Technique, Floating Charging Phase.

I. INTRODUCTION

Growing concern of CO2 emissions, greenhouse effects and fast depletion of fossil fuels raise the need to provide and adopt new eco-friendly property alternatives to the internal combustion engine (ICE) driven vehicles. For this reason, in the last decade, EVs have become in some way broad, principally because of their small fuel gas emissions and lesser reliance on oil. It is estimated that by 2022, EVs will be over 35 million in the world. However, a main problem associated with EVs is that their high penetration causes significant issues on the power distribution grid such as: power quality decline enhanced broken of line, downturn of distribution transformers, increased distortion and advanced fault current.

An electrical vehicle charging station is equipment that connects an electric vehicle (EV) to a starting place of electricity to recharge electric cars, neighbourhood electric vehicles and plug-in hybrid.

Charging stations are also called electric vehicle supply equipment (EVSE).

Different types of EVSE provide dissimilar speeds of charging.

Level 1 charging stations use a 120v, alternating-current (AC) plug and need an obsessive circuit. victimization this charging technique typically takes ten to twelve hours to totally charge the vehicles batteries.

Level 2 stations charge through a 240v, AC plug and require home charging or public charging equipment to be installed. With the use of this, an electrical can be fully charged in as early 6 hours or a little over.

Level 3 chargers are also known as DC fast chargers. Level 3 use a 480v, direct-current (DC) plug. It converts the AC current, into DC current for direct storage in electrical vehicle batteries. With the use of DC fast charger, an electric vehicle can be charged to 80% in less than an hour.

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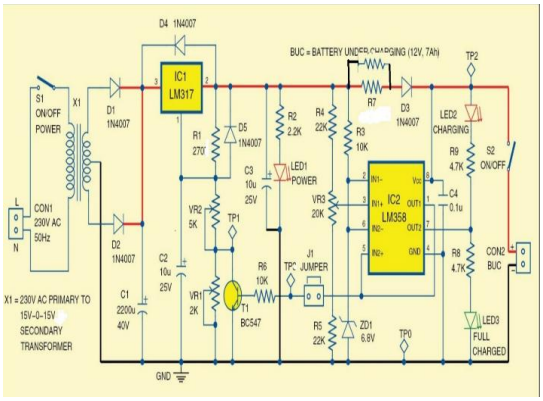
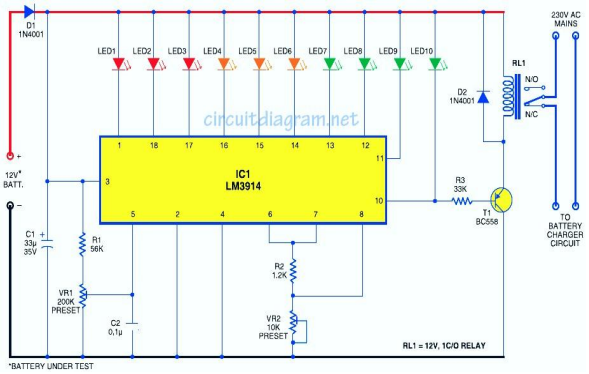
II. CIRCUIT DIAGRAMS





III. OPERATION

The 220/240V AC primary to 15-0-15, 2A secondary transformer used in this circuit which steps down the main voltage, then which is rectified by diodes D1 and D2 and smoothened by capacitor C1 and then in protection circuit we have use float charging method which prevents the battery from short circuit and over/under voltage protection. The charge controller prevents the battery from back flow of current or discharging.

The 12v, 7Ah lead acid battery is charged by two methods

(1) Slow charging by 1 ampere current.

(2) Fast charging by 1.5 to 2 ampere current.

The battery level indicator gives the percentage of charging of the lead acid battery between 0 to 100%.

IV. DESIGN METHODOLOGY

a) Paper design of the circuit.

b) obtaining all the components required to make the circuit to go in a float mode.

c) STEP DOWN TRANSFORMER

- Input: 220v/240v AC
- Output: 15v AC
- Ampere: 2A

d) RECTIFIER CIRCUIT

- Input: 15v AC
- output: 15v DC

e) Charge Controller.

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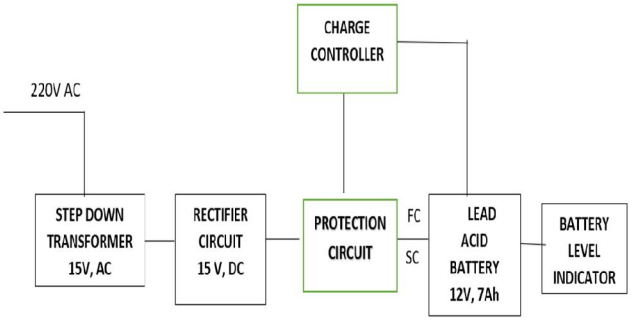
f) Protection Circuit
g) Lead Acid Battery (12V, 7Ah)
h) Battery Level Indicator.



BLOCK DIAGRAM

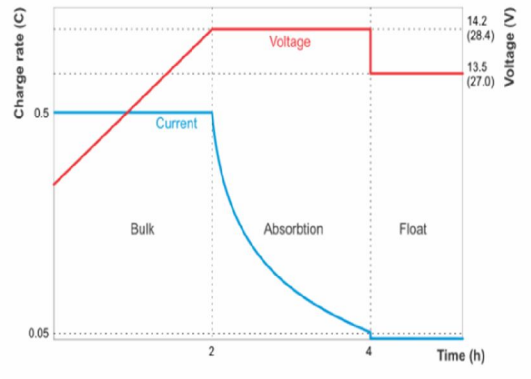
V. FLOAT CHARGING

Float charging is the technology and method of maintaining a battery in charged condition by applying a nonstop voltage and current at the least level to maintain a full or close to full charge.

This 12V battery protection circuit charges the battery at a selected voltage, that is, absorption voltage, and once the most charging voltage is earned, the circuit changes the output voltage to float voltage for maintaining the battery at that voltage.

The voltages are set for a lead acid battery 12V, 7Ah, for which absorption voltage is 14.1 to 14.3v and floating voltage is 13.6 to 13.8V. For safe working and to avoid overcharging of battery, absorption is selected 14.1V and floating voltage is selected as 13.6.

5.1 Float Charging Vs Level of Charging



VI. LIST OF EQUIPMENT'S

6.1 Semiconductors

- IC1= LM317 adjustable voltage regulator, LM3914
- IC2 = LM358 op-amp
- T1 =BC547 npn transistor
- LED1-LED13 = 5 mm LED
- ZD1= 6.8 v zener diode
- D1-D5= IN4007 rectifier diode

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6.2 Resistors

- R1= 240 ohm
- R2=2.2 kilo-ohm
- R3, R6=10 kilo-ohm
- R4, R5=22 kilo- ohm
- R7=0.2 ohm, 5W
- R8, R9= 4.7- kilo-ohm
- VR1= 2-kilo–ohm
- VR2= 5 kilo-ohm
- VR3 = 20 kilo-ohm

6.3 Capacitors

- C1= 4700 micro fared, 25V electrolytic
- C2, C3 = 10 micro fared, 25V electrolytic
- C4 = 0.1ceramic disk

6.4 Miscellaneous

X1= 220 v AC primary to 15-0-15, 2 A secondary transformer
CON1, CON2 = 2-pin connector for jumper J1
= 12V, 7Ah rechargeable battery
J1 = 2-pin connector for jumper J1 S1, S2 = on/off switch

6.5 Mechanical Equipment's:

Equipment's	Specification
• Wooden Board • Cardboard • Bottle caps	35*60 cm

VII. STEP-DOWN TRANSFORMER

A **step-down transformer** is a type of electrical device that converts the high voltage (HV) and low current from the primary part of the transformer to the low voltage (LV) and high current value on the secondary part of the transformer. The turn round of this is known as a step up transformer.
We are using 15-0-15 centre tap step down transformer.

The transformer is a basically a voltage control device that is used far in the distribution and transmission of alternating current power. The idea of a transformer was first discussed by Michael Faraday in the year 1831 and was carried forward by many other prominent scientific scholars. The general purpose of using transformers was to maintain balance between the electricity that was generated at very high voltages and consumption which was done at very low voltages.

7.1 Calculations

V=13.6 (approx.)
R= 9, 28 ohm
For Slow Charging.
I=V/R=13.6/28= 0.48~1A
For Fast Charging.
I=V/R=13.6/9= 1.5~2.0A
Charging Time of Battery:
= Battery in Ah/ Charging current
=7/1=7 hr (slow charging) = 7/2=3.5hr (fast charging)

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VIII. RESULT

When we have connected the battery to the circuit. It starts operating to charge the battery. Its our option to charge the battery in slow mode or quick mode. We have additionally used the float charging technique by that battery is totally charged it mechanically disconnected the charging by this our battery keep safe and work long life.

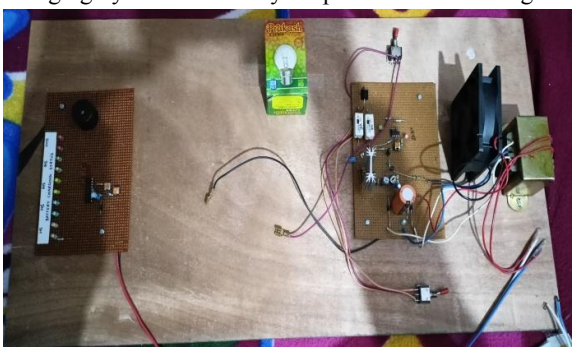

Figure: Smart Charging Station For EV

IX. CONCLUSION

Basis on the test results, the whole system performed according to the designed aim and objectives
The EV Charging Station is a high-quality, reliable, and fast electric vehicle charger. Its strength and extra safety features make it last for decades.
It has the ability to charge the battery in slow and fast mode.
If you love gadgets with as many smart features as possible, then this is ideal for you.
However, if you're looking for a high-end quality EV charging station that's very simple, you should give this product a chance.

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