

Smart Automated Rubber Tapping Machine with Latex Vessel Positioning

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ABSTRACT

There is a huge demand for rubber in India for making many Products. Now a day's peoples are collecting the latex from the rubber tree by manual or semi-Automatic rubber tapping methods. The automatic rubber tapping Machine which already exist can be connected directly to the ac supply. To make a device which operates with dc source, a rechargeable battery is connected through the automatic rubber tapping machine through a power regulator. Here we are developing a power regulator for the automatic rubber tapping machine to avoid the battery discharge. Also the power regulator is connected in between the Automatic Rubber Tapping Machine and 12V rechargeable battery. The power regulator converts the DC-DC current.

Keyword-Dc-Dc current boost converter, power regulator,

I. INTRODUCTION

Rubber is a plantation crop that is widely grown in southern India. There exists a vast majority of rubber cultivators in Karnataka and Kerala. The rubber plant is not a native plant of India. Dutch colonialists who also cultivated rubber in their plantations in Indonesia introduced the rubber plant to Kerala, India; because of its similar tropical climate. Rubber is an economic crop.

The rubber plant produces sticky, white latex that is collected and processed to produce natural rubber. Natural rubber is an elastomer that was originally derived from latex, a milky colloid produced from Overview of Rubber Tapping Rubber tapping is the process by which the latex is collected from a rubber tree. An incision is made in the tree's bark, which cuts through the latex vessels, from which the product then flows.

Timing of the incision must be planned within the planting cycle to optimize the latex yield. Every day a worker goes to hundreds of trees in the early morning and scrapes away the caked latex and a thin layer of bark. The latex flows down the spiral into a cup for two hours before the sap hardens and closes the cut in the tree. Currently the largest problem with tapping rubber trees is due to the care that must be taken to avoid damaging the tree.

Workers are trained for six months before learning the proper technique and a poor tapper can kill many valuable trees. Now a day the manual or semi- automatic rubber tapping process is used for collecting the latex. Rubber tree tapping is usually done using a manual type tapping knife. By using this knife, bark consumption and cutting depth cannot be controlled.

Imperfect tapping reach the cambium layer and this will be the result in the tree surface will bulge out. So the tapping cycle tree is reduced (only one time is tapped at a point of the tree surface).



Fig 1.1 convectional tapping

II. LITERATURE REVIEW

In the journal paper titled as [1] says that of the multi-mode charging circuit is provide a hybrid charging modes. The four modes are also used for the multi-mode charging circuit. In this mode battery cannot be revolutionary improve charging technology. The DSP based charging circuit can easily implement four different charging modes. This circuit is a good facility for the subsequent research on charging strategies.

Another paper [2] says the Microgrid is uses renewable energy based on power generation connected in a grid system. The renewable energy consist of 3kV photovoltaic with 12V for Ah battery, dc to dc converter and single phase dc to ac inverter. The microgrid development of providing good solution to supply power.

In this paper [3] also including the automated battery charger is designed devices are consist of a performance charging of a charging units. It will also designed 12V lead acid battery and each battery provides to the drive circuit, transformer and power supply module. Constant-current and constant voltage charging methods are used for the battery.

Next paper [4] says that, boost regulator used for the battery operation. In this method will be used for the SMPS. It is a simple boost supply. An SMPS can be offer boosted power level and allow longer operation times from a given battery. A dc-dc boost switching converter is the answer to low voltage battery problems for mobile, portable or emergency-power operation are used.

This paper [5] says charging systems for the Microgrid System Experimental results. The growing industry trend on renewable energy resources are becoming widespread in the world.it consist of the three sections. First is modelling of battery and battery charger. Second is simulation of the target system, then last is control algorithm.

Another one is [6] says, high boost dc/dc voltage conversion. The two phases used audio amplifier is presented. First phase is uses a conventional boost converter and the second phase employs the inverted type. In experimental are also performed using input voltage of 12V for a 120W circuit.

This paper [7] also include the 12V portable battery charging system.it is uses 12V lead acid batteries. It is also used for the sudden failure of vehicle charging systems.The component used to actualize the design work were listed and the design specification were tabulated with the circuit diagram. Then this process is AC power supply, rectification, charging, deactivation and full charge.

In this paper [8] including the universal DC power supply using the solar photovoltaic, utility and battery power sources.It was developed and tested in order to provide uninterrupted power for DCappliances. In the solar system parallel combination of the three diodes at the output function. The universal power supply system was tested under various operating conditions. In this system outputs, all the power sources were available, during utility power failure and only stored energy. In this system also used for the battery, direct current, photovoltaic, and power, solar and universal battery.

In this paper[9] also consist of the instant power supply design and development. IPS is stands for Instant Power Supply. It is an electrical device that provides power when the main supply failure. When the main supply is not available then the battery supplies the power. IPS have also some limitations. It is also become unstable output voltage, battery longibility is small and high cost. LM 338 voltage regulator is use in this power circuit and the battery will be charged properly. These circuit uses for the some devices are active and passive, such as diodes, transistors, capacitors, resistors etc.

In the paper [10] is says that portable charger with energy conversion is a wastage of the energy. The piezoelectric material represents the charge generator for the proper energy conversion. It is mainly focused on designing a shoe charger for mobile phone. In the power sources for the microelectronic are continuously decreasing. The purpose of developing this model is to be solve the problem of the time consumption for waiting mobile phone to be fully

III. METHODOLOGY

The proposed project contain microcontroller, sensors, current divider, display circuit, isolators, charge controller, DC to DC Current Converter. Current divider is used to distribute the power required for each motor

for the three motor for tapping. The current sensor sensing the current from the converter to the machine. Then the microcontroller will give the signal to the firing circuit and charge controller. By this we can operate automatic rubber tapping machine using dc source without losses

BLOCK DIAGRAM

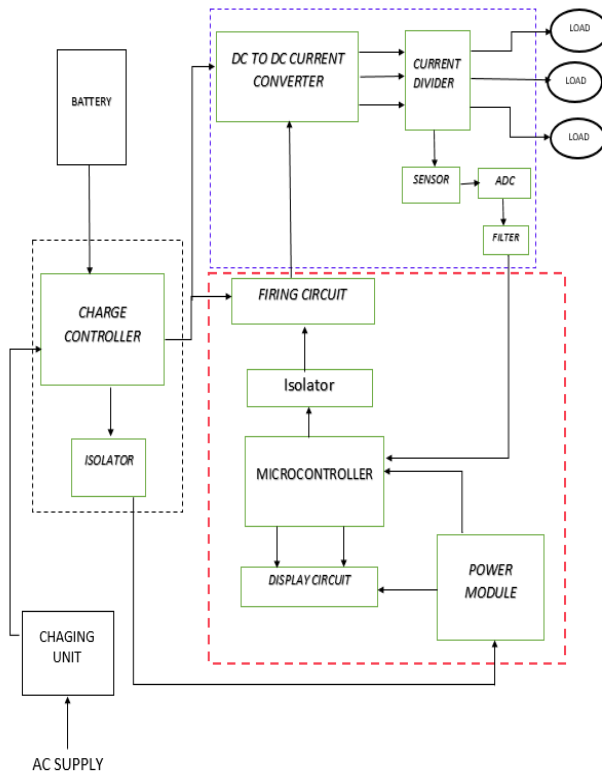


Fig 3.1 block diagram

A.MICROCONTROLLER

ATMEGA 328P

ATMEGA 328 is a single chip microcontroller. It is created by an Atmel in the Mega AVR. It has a modified Harvard architecture of 8 bit RISC processor core. The Atmel 8 bit AVR RISC-based microcontroller combines 32KB. ISP flash memory with read-while-write capabilities. 1KB EEPROM, 2KB SRAM, 23 general purpose working registers, three flexible timer/counter with compare modes, internal and external

interrupts, serial programmable USART, a byte oriented 2wire serial interface, SPI serial port 6channel 10bit A/D converter programmable watch dog timer with internal oscillator and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughput approaching 1MIPH per MHz. Atmega 328 is commonly used in autonomous systems, low powered, low-cost microcontroller is need.

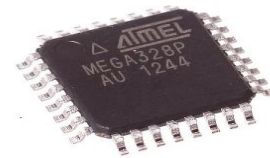


Fig 3.2 ATMEGA 328P

B. BUCK CONVERTER

A buck converter is a DC-to-DC power converter which steps down voltage from its input (supply) to its output (load). It is a class of switched-mode power supply (SMPS) typically containing at least two semiconductors (a diode and a transistor, although modern buck converters frequently replace the diode with a second transistor used for synchronous rectification) and at least one energy storage element, a capacitor, inductor, or the two in combination. To reduce voltage ripple, filters made of capacitors (sometimes in combination with inductors) are normally added to such a converter's output (load-side filter) and input (supply-side filter).

Switching converters (such as buck converters) provide much greater power efficiency as DC-to-DC converters than linear regulators, which are simpler circuits that lower voltages by dissipating power as heat, but do not step up output current.

C.ANALOG TO DIGITAL CONVERTER

In electronics, an analog to digital converter is a system that converts an analog signal, such as a sound picked up by a microphone or light entering a digital camera, into a digital signal. An ADC may also provide

an isolated measurement such as an electronic device that converts an input analog voltage or current to a digital number representing the magnitude of the voltage or current. Typically the digital output is a two's complement binary number that is proportional to the input, but there are other possibilities.

There are several ADC architectures. Due to the complexity and the need for precisely matched components, all but the most specialized ADCs are implemented as integrated circuits. A digital-to-analog converter (DAC) performs the reverse function; it converts a digital signal into an analog signal.

D.12V BATTERY CHARGING SYSTEM

The essential use of 12V lead acid batteries in automobile engines to power incorporated electrical appliances, and also the sudden failure of vehicle charging systems that often give rise to a drain of battery cells has necessitated the construction of battery chargers suitable for fully restoring the lost charge into the required 12V battery cells. Most 12V battery charging devices built for commercial services are usually heavy and bulky and lack a protection circuit and a sensitized control circuit required for automatic deactivation of charging once the battery is fully charged. In this new design product, the size of the battery charger was made portable and light in weight to enable end users to convey it as easily as possible. Short circuits and current reverse protection were incorporated as well. A sensitized control circuit was implemented to ensure that charging is terminated immediately when the battery is fully charged. This is to avoid the possible occurrence of overcharging that may result in loss of electrolytes.

The life span of a battery mostly used by automobile drivers can be maximized by avoiding over loading, overcharging, and inputting charge current higher than battery manufacture's rated value. It was observed over time that most commercial battery charging service centers in town (Enugu, Nigeria) that are patronized by type that is built without an automatic charging cut-off circuit to provide charging services to their customers. The unavailability of this automatic charging cut-off circuit causes the operator to constantly be on manual check to determine when the connected battery is charged.



Fig 3.3 12V Rechargeable Battery

E.POWER REGULATOR

A power regulator or power electronics module provides the physical containment for several power components, usually power semiconductor devices. These power semiconductors are typically soldered on a power electronic substrate that carries the power semiconductors, provides electrical and thermal contact and electrical insulation where needed.

This is a simple boost supply, designed to make up output voltage level at the cost of some additional current draw from the battery. It was designed for an output current of about 20 A. When turned off, the battery voltage (less one diode voltage drop) is present at the output terminals of the supply. No power transfer relays or switches are required. The supply can be set up to operate on demand or continuously, depending on user requirements. A switch or relay contact is used to switch the power supply control power off when not in use. This reduces power consumption during periods of inactivity or when voltage is sufficient to power the radio. Two “on demand” inputs are provided to enable the voltage boost function. One of the inputs is a simple remote enable input, and requires only a battery voltage signal. This can be used in conjunction with a control signal from a radio to key the supply or it can be enabled by a toggle switch for manual operation. The other input is an RF detector. The RF detector can be used to monitor the RF output of the attached radio and allow the voltage boost to take place when the radio is transmitting. The RF detector attaches directly to the lead of most radios using a coax T fitting or a coupling transformer. This design has been tested with radios

transmitting from several watts to 100 W. Operation at higher power levels may require some circuit modifications.

The battery can produce a power of 12v, 2.2A and it is not sufficient to operate machine, it requires a current of 10A to 20A. So the battery will be discharge, here we need a power regulator to produce power required for the machine.



Fig 3.4 Power Regulator

F. CHARGE CONTROLLER

A charge controller, charge regulator or battery regulator limits the rate at which electric current is added to or drawn from electric batteries.¹ It prevents overcharging and may protect against overvoltage, which can reduce battery performance or lifespan, and may pose a safety risk. It may also prevent completely draining ("deep discharging") a battery, or perform controlled discharges, depending on the battery technology, to protect battery life.^{[2][3]} The terms "charge controller" or "charge regulator" may refer to either a stand-alone device, or to control circuitry integrated within a battery pack, battery-powered device, or battery charger.

G. ISOLATOR

An isolator is a device used for isolating a circuit or equipment from a source of power. An isolator is a mechanical switching devices that, in the open position, allows for isolation of an input and output of the device. It is the part of the circuit in which the fault takes place from the main supply. It is used in high voltage devices such as transformers etc. Isolators block the DC signals

and allow the AC signals to pass. Circuit breaker is a protecting device which act as a switch.

WORKING FLOW CHART

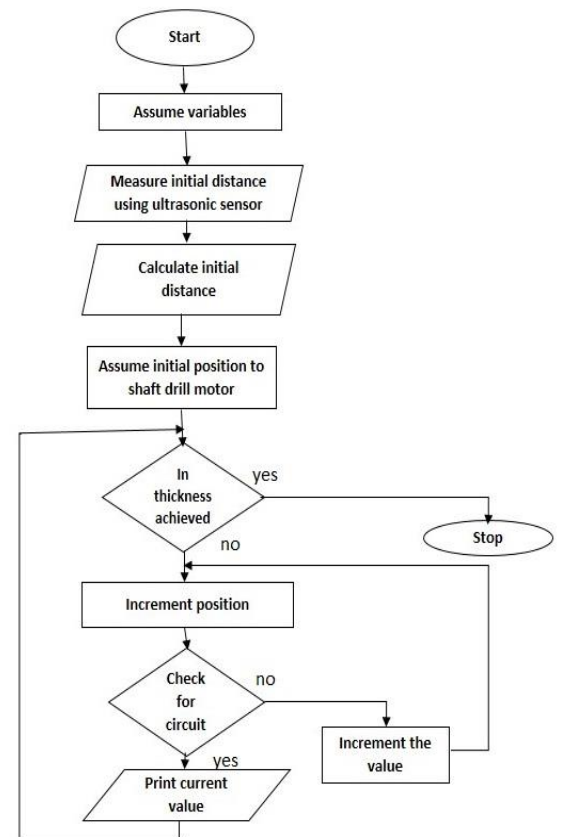


Fig 3.5 Flow Chart

IV. CONCLUSION

The Automatic rubber tapping machine for tapping process has limitations. They are quick discharge of batter, maximum current rating of battery is 2.2A but load current capacity of tapping machine is 20A maximum. The recharging process is time consuming. So this project will be overcome these limitations to the develop a Power Regulator for Automated Rubber Tapping Machine.

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