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Development of Trickle Charged Battery to Mobile Phones

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Abstract— Mobile phones are being used by almost all the individuals in the world. It is portable and hence it requires a good power supply. The power stored in the batteries last only for few hours and they really don't provide a better backup in times of need. People find it difficult to charge their batteries when they take up a long journey. Hence an alternative is needed to convert the power consumed and use it to charge the battery. Piezoelectric sensor – a new power conversion sensor provides a way to accomplish this process of charging the battery. The piezoelectric sensors are placed beneath the keypad. It generates mill volt of power when the keypad is pressed and the little power generated is fed to the circuit. The circuit contains a Buck-Boost converter which boosts the small current and feeds the battery with power supply. Hence the battery gets charged easily and rapidly. The micro controller assists the whole process of converting the power consumed and charging the mobile device. Thus people can charge their batteries anywhere and anytime.

Index Terms— Mobile phone, Keypad, Piezoelectric Sensor, Buck-Boost convertor, Battery.

1 INTRODUCTION

This paper is focused mainly to charge the battery from the power consumed by the mobile devices. The power in the battery gets dissipated when the keypad is pressed and also while speaking over the phone. Currently there are no convenient ways of charging the mobile anywhere and in times of need. Our paper proposes the use of power converters - piezoelectric sensors and buck-boost converter to boost the power consumed by the mobile and charges the battery. This is an easy way of charging the battery even with the little available power. Piezoelectric sensor generates millivolt of power when it is pressed and this little power needs to be boosted in order to get huge volts of current. Hence its output is fed to buck-boost converter which boosts the power. This boosted current is used to charge the batteries. Every time the keypad is pressed the battery gets charged automatically. This is an easy way of charging the battery.

2 EXISTING SYSTEM

The existing system of charging the battery uses direct current supply. This way of charging the battery provides uninterrupted power supply and the battery needs to be charged for hours. The direct power supply is not available everywhere. One has to carry the charger. The power in the mobile battery lasts only for few hours and thus they need to be charged often. Hence an alternative way of charging the battery is required.

3 PROPOSED SYSTEM

We propose a system of charging the battery by combing both piezoelectric sensor and buck-boost converter. These act as additional backup servers for charging the battery. The piezoelectric sensors are placed beneath the keypad of mobile phones. Whenever a key is pressed the piezoelectric sensors get activated and start generating millivolt of current. This process takes place rapidly as the user keeps on pressing the keypad frequently and faster. Thus huge amounts of power get generated automatically. The generated power is measured in terms millivolt which is very low to charge a 5V or a 12V battery. Hence it needs to be boosted in order to obtain high volume of current and make use of it to charge the battery. The boosted power from the buck-boost converter is used to charge the battery. We make use of microcontroller to assists the whole process of charging the battery from the consumed power.

4 SYSTEM BLOCK DIAGRAM

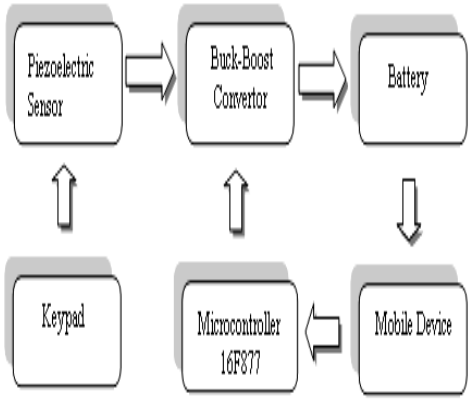

Fig 1 BLOCK DIAGRAM

4.1 KEYPAD

A keypad is a set of buttons arranged in a block which usually bear digits and other symbols and a complete set of alphabetical letters. The keypads are of various types such as tactile keypads, QWERTY keypads, Touch screen keypads.

Fig 2 KEYPAD

4.2 PIEZOELECTRIC SENSOR

Piezoelectric sensors have proven to be versatile tools for the measurement of various processes. The sensors are either directly mounted into additional holes into the cylinder head or the spark/glow plug is equipped with a built in miniature piezoelectric sensor. The high modulus of elasticity of many piezoelectric materials is comparable to that of many metals and goes up to 10e6 N/m^2. Even though piezoelectric sensors are electromechanical systems that react to compression, the sensing elements show almost zero deflection. This is the reason why piezoelectric sensors are so rugged, have an extremely high natural frequency and an excellent linearity over a wide amplitude range. Additionally, piezoelectric technology is insensitive to electromagnetic fields and radiation enabling measurements under high temperature. This is the ability to generate an electrical signal when the temperature of the crystal changes.

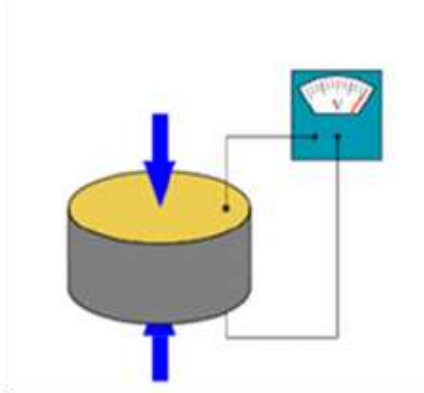

Fig 3 PIEZO ELECTRIC SENSOR

4.3 BUCK-BOOST CONVERTER

The buck-boost converter is a type of DC-DC converter that has an output voltage magnitude that is either greater than or less than the input voltage magnitude. It is a switch mode power supply with a similar circuit topology to the boost converter and buck converter. Two different topologies are called buck–boost converter. Both of them can produce an output voltage much larger (in absolute magnitude) than the input voltage. Both of them can produce a wide range of output voltage from that maximum output voltage to almost zero.

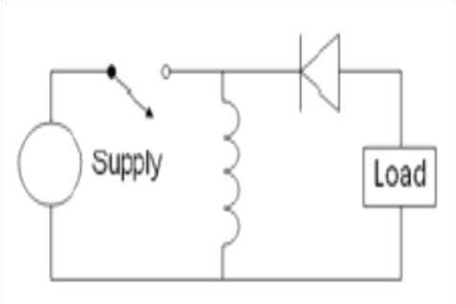

Fig 4 BUCK-BOOST CONVERTER

A buck converter is a step-down DC to DC converter. Its design is similar to the step-up boost converter, and like the boost converter it is a switched-mode power supply that uses two switches (a transistor and a diode), an inductor and a capacitor. A boost converter (step-up converter) is a power converter with an output DC voltage greater than its input DC voltage. It is a class of switching-mode power supply (SMPS) containing at least two semiconductor switches (a diode and a transistor) and at least one energy storage element. Filters made of capacitors (sometimes in combination with inductors) are normally added to the output of the converter to reduce output voltage ripple.

The basic principle of the buck–boost converter is fairly simple.

While in the On-state, the input voltage source is directly connected to the inductor (L). This results in accumulating energy in L. In this stage, the capacitor supplies energy to the output load. While in the Off-state, the inductor is connected to the output load and capacitor, so energy is transferred from L to C and R.

4.4 MICROCONTROLLER

The micro controller, which we are using here, is PIC16F877. It consists of 5 ports, ADC, CLK& MCLR. These are inbuilt within 40 pins. The micro controller accepts and gives the output in the digital form, which is the clock pulse required to drive the buck boost converter. Advantages of using PIC16F877 are that it is cheap and can be easily assembled. It can be reprogrammed and erased up to 10,000 times. Programming in PIC16F877 is also easier as the compilers for the program can be done using CCS C compiler which is available free. Hence it reduces the overall cost of the circuit.

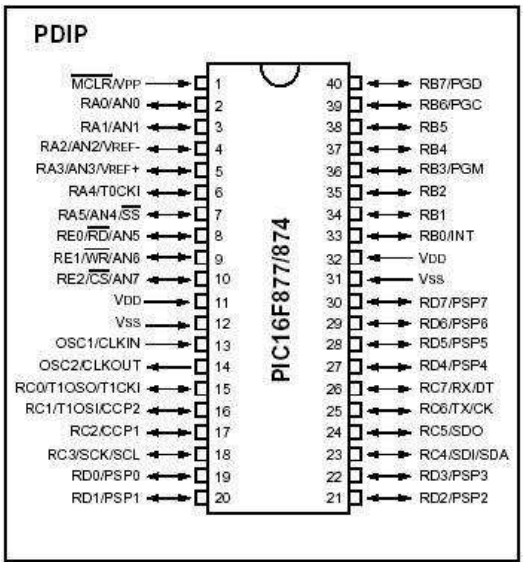

Fig 5 PIN CONFIGURATION OF PIC16F877

4.5 BATTERY

The battery provides the basic back up service by storing the extra charge obtained from the solar and wind panels. This also provides the power supply needed for the micro controller circuit that produces the clock for the buck boost converter circuit. The battery gets the input in the form of electrical energy from the buck converter circuit and in turn it provides a +5V dc voltage as output to activate the microcontroller. Thus the battery in the circuit plays a major role that it serves as a power supply and also as a source of back up service.

5 WORKING

The piezoelectric sensors are placed beneath the keypad of the mobile device. When the user presses and releases the keys, the piezoelectric sensors get activated. The piezoelectric sensors generate current as they contract and expand. This current generated is measured in terms of millivolt. The microcontroller accepts the input and gives the output in digital form that drives the buck-boost converter. If the output of the microcontroller is logic 0 the input voltage will be sent to the buck-boost converter to boost up to the required battery voltage and if it is logic 1 the input voltage will be reduced to the battery voltage. The power obtained from the piezoelectric sensors are very small current that needs to be boosted. Hence the output of the microcontroller will be logic 0 so it is fed to the buck-boost converter which boosts the available current and produces high power input which is used for charging the battery. Thus the battery gets charged automatically as the keys are pressed.

6 APPLICATIONS

Our proposed system finds its application in various devices. The same concept can be used to charge the batteries in laptops and even this kind of technology can be adopted in our normal computer keyboards. Rechargeable AA batteries can be charged by this charger and from those, many devices can be operated. Torches, Standalone Foot Charger, Radio – Humanitarian, Radio Consumer & Outdoors are fields where this new technology can be used.

7 ADVANTAGES

The main advantage of our project is that the charger need not be carried everywhere. Since the dissipated power is reused again it requires only little power from the main supply. The battery can be charged automatically and rapidly. Thus the mobile phones can be provided with uninterrupted power supply all the time.

8 CONCLUSION

As the proposed system uses the dissipated power from the mobile device to charge the battery, it is very useful every circumstances. The aim was to demonstrate the effective usage of pressing of keys to act as a source of electricity, thus providing a substitute for conventional method of energy generation using non- renewable sources of energy. Thus the use of a safe and easy power generating mechanism was established.

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