

DESIGN AND IMPLEMENTATION OF A MICROCONTROLLER BASED REGENERATIVE BRAKING SYSTEM

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Abstract : The Hybrid Electric Vehicle has become one of the most promising vehicles. In the automobile industry due to its energy saving ability and low emission of harmful pollutants.

Regenerative braking is an energy recovery mechanism which slows a vehicle or object by converting its kinetic energy into a form which can be either used immediately or stored until needed. This contrasts with conventional braking systems, where the excess kinetic energy is converted to unwanted and wasted heat by friction in the brakes, or with dynamic brakes, where energy is recovered by using electric motors as generators but is immediately dissipated as heat in resistors.

INTRODUCTION

Regenerative braking is an energy recovery mechanism which slows a vehicle or object by converting its kinetic energy into a form which can be either used immediately or stored until needed.

The most common form of regenerative braking system involves an electric motor as an electric generator. Using microcontroller Atmel-89C51, we are operating the whole regenerative mechanism.

Regenerative braking project, we have gained quite knowledge in designing the circuit and learnt the coding.

In electric railways the electricity generated is fed back into the supply system. In battery electric and hybrid electric vehicles, the energy is stored chemically in a battery electrically in a bank of capacitors or mechanically in a rotating flywheel. Hydraulic hybrid vehicles use hydraulic motors to store energy in the form of compressed air.

The model of the microcontroller used here is Atmel89c51 and the DC motor along with battery and one push-to-on control switches and a power supply consisting of a 7805 regulator IC and two 100 μ F capacitors are used in braking system.

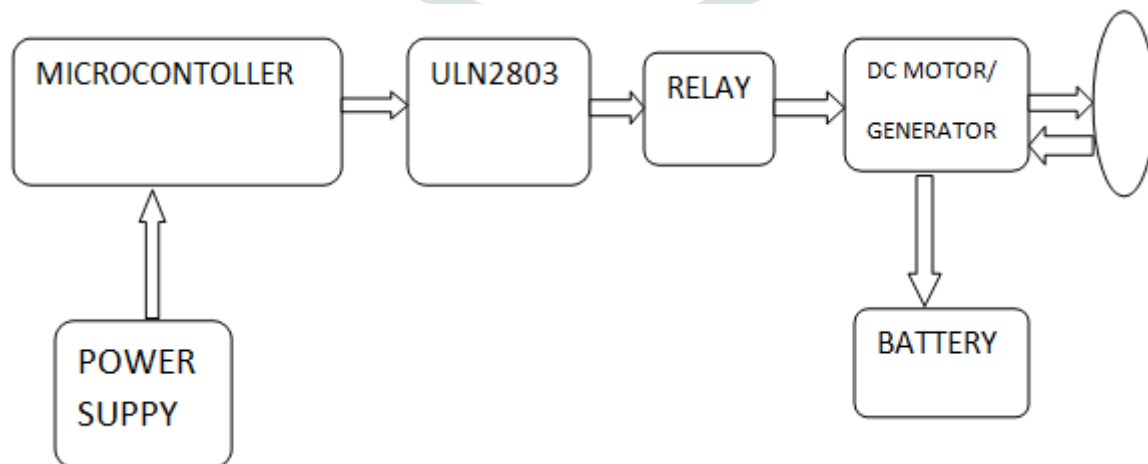


Fig (a) : BLOCK DIAGRAM

Microcontroller : This project employees 8-bit microcontroller from ATMEL which is used for sending signals to the braking system through relay.

Power supply : Supply of 230v, 50Hz ac signal from main supply board is given to the relay module as per the requirement.

ULN2803 : As the microcontroller maximum voltage is 5v,this component is used for supplying 12V to run the DC motor as it receives signal from the microcontroller.

Relay : It is a mechanically operated switch which provides one signal at a time in the output that is either low or high.

Working principle:

The most common form of regenerative braking system involves an electric motor as an electric generator. Using microcontroller Atmel-89C51, we are operating the whole regenerative mechanism. This would make the operation more efficient. The whole process is related to the charging function of battery used in the project by using flywheel as a storage element the heat energy dissipated around the brake pads can be used and thus converted for charging the battery.

Operation:

When power is supplied to the relay using microcontroller it switches on

The relay operates in two modes:(a)Normally open (b)Normally closed

When the relay is normally opened the battery supplies the power to the motor and thus motor starts rotating. As a result flywheel also rotates with the speed of motor.

But when the relay is normally closed the whole process goes into reverse the motor stops and circuit breaks but due to rotating flywheel the energy in the form current flow towards the battery.

In this way the battery gets discharged and recharged many times as required.

The charging and discharging indication is indicated by LEDs which makes it easier to understand.

This operation requires software programming which would be loaded in microcontroller which will control the relay module. The regenerative braking using microcontroller requires software to run the circuit connected at the output of the microcontroller.

SOFTWARE DISCRPTION

KEIL:

Keil compiler is software used where the machine language code is written and compiled. After compilation, the machine source code is converted into hex code which is to be dumped into the microcontroller for further processing. Keil compiler also supports C language code.

SOURCE CODE:

```
#include<regx.51h>
Sbit SW=P1^0;
Sbit RLY=P2^2;
Sbit LED=P2^2;
Main()
{
SW=1;
RLY=0;
LED=0;
While(1)
{
If(sw==1)
{
RLY=1;
LED=1;
}
Else
{
RLY=0;
LED=0;
}
}
```

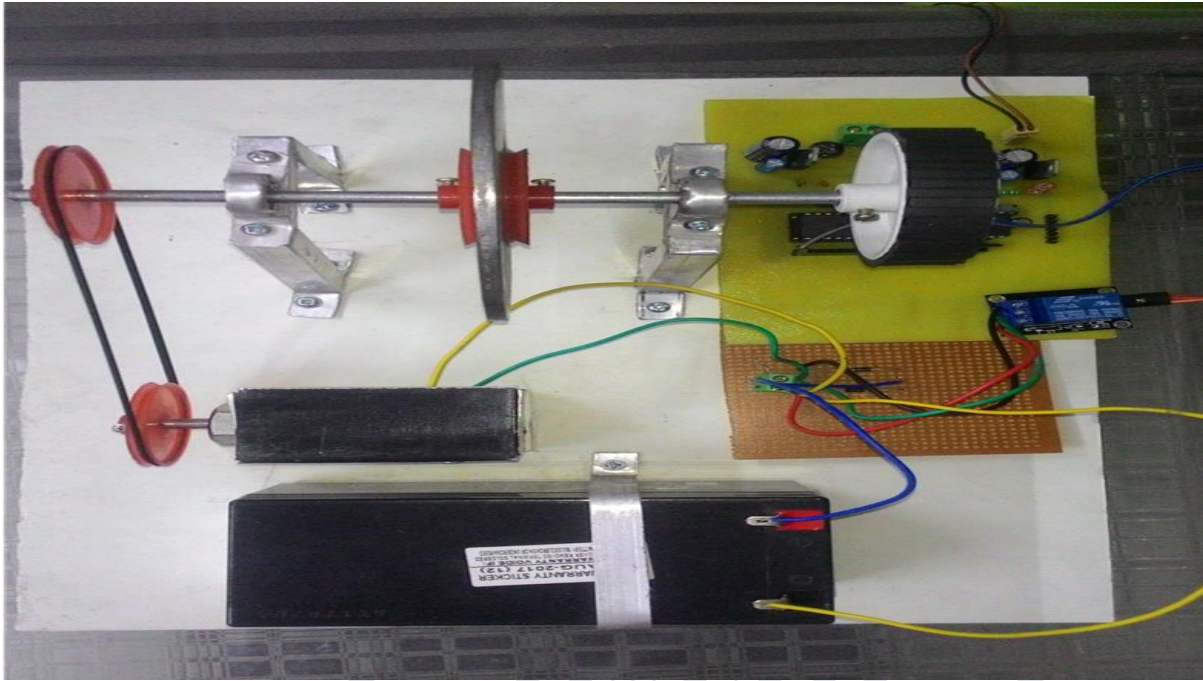


Figure-component system

CONCLUSION:

After completion of this regenerative braking project, we have gained quite knowledge in designing the circuit and learnt the coding. The circuit has been implemented on bread board and solid on general purpose PCB. This circuit can operate in two modes with play and pause switches.

We have also learnt about the procedure involving in PCB circuit designing. The concept related to the project and many more.

Thus we have concluded that Regenerative braking system is future concept for automobile system as it skips the requirement of fuel based system.

References :

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