GENERATION OF ELECTRICITY USING SPEED BREAKER AND PROVIDING THE ENERGY FOR HOME AUTOMATION

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Abstract: In our daily life power becomes basic need for human life. Energy has been the necessary source for human survival. The energy can be neither created nor destroyed but it can be converted into different forms. The most of the electrical energy is being generated by using conventional energy sources but by the excessive use these conventional sources are depleting.so to satisfy the basic need for power we need to execute different methods and develop non-conventional sources which are eco-friendly. Vehicles have been a part of our life, The kinetic energy by the movement of vehicles over a speed breaker can be converted into mechanical energy using rack and pinion mechanism. Then this mechanical energy is converted into electrical energy by using generator. Therefore, large amount of energy can be conserved by this arrangement. Our project is to generate the energy and use it for Home Automation. We all prefer centralized control system over the conventional switch system.so home automation system using Arduino can be used. The loads can be turned on or off through sensors rather than by going to the switch and turning then on or off. this would be helpful for elderly people and also handicapped people. Generating electricity by speed breaker is very useful and ultimately can be used for different purpose here we are using this energy for home automation.

Index Terms - **speed breakers, home automation, Electrical energy, nonconventional source, eco-friendly, rack and pinion, Arduino, sensors.**

I. INTRODUCTION

Energy which is generated using the conventional forms gets eventually exhausted one day and they are also the cause of environmental pollution and also impacts human health. Most electricity today is generated using fossil fuels. The fossil fuels need to be transported which adds additional cost. Depending on the particular fossil fuel and the method of burning numerous gases like sulfur dioxide, nitrogen dioxide, ozone, are released into the atmosphere. Ultimately these conventional sources come to end one day we need different alternatives to satisfy the basic need of our power so we propose a nonconventional power generating system based on speed breaker mechanism. This also meets the criteria of not producing the polluting products. The fear of exhaustion can also be neglected as there are more vehicles now-a-days. The growth rate of vehicles in India has increased almost 10 percent annually during the last decade [1]. After generation of electrical energy, it can be utilized for different purpose or uses so here in this project we utilized this for automation of home. As technology is growing there is need to adapt with the growing technology. The energy which is generated if not utilized properly the whole process is wasted. So, we need to utilize this properly to conserve the energy. the automation of home conserves energy. An automatically accessible environment is created so that we can control the appliances. The goal of this project is to develop a secure Home Automation system. People who are dependent on others can also control this very easily. Hence, we can accomplish both the generation and conservation of energy

II. ENERGIES INVOLVED

The energy we get at first is not electrical energy there are other energies involved from which we convert them into electrical energy so the different energies involved here are kinetic energy, mechanical energy and electrical energy

A. Kinetic energy:

Kinetic energy is the energy an object has because of its motion. It depends on the mass and speed. Kinetic energy depends on the velocity of the object squared. Kinetic energy can be transferred between objects and transformed into other kinds of energy. Kinetic energy, must always be either zero or a positive value.

The kinetic energy can be given by $\frac{1}{2}mv^2$

B. Mechanical energy:

Mechanical energy is the sum of both kinetic energy and potential energy, it means it has relation with both motion and position of the object. kinetic energy here is called as motion energy and potential energy is called as stored energy.

C. Electrical energy:

The energy which is due to the flow of charged particles is called electrical energy. The speed of the movement electrons defines the amount of energy. for the movement of charged particles we need to apply some external force otherwise called as potential. when the force is exerted on the charged particle we get electrical energy.

III. METHODOLOGY

There are different mechanisms for the generation of electricity using speed breaker in this project rack and pinion mechanism is used over the other mechanism because of its high efficiency. The electrical energy stored is used for home automation so the main components of the Home Automation are Arduino and sensors. Sensors are used to sense the temperature and amount of light [2]. This is a very simple model of home automation

IV. DESIGN AND IMPLEMENTATION

vehicle pressure on the speed breaker, Below or underneath the speed breaker an arrangement for the conversion of electrical is energy is made by using some gears, springs, shafts and rack and pinion. so, when pressure is given the springs tend to compress and the load of vehicle is transferred to the rack and pinion which takes this motion of energy which is vertical and converts it into the rotational motion and this is transmitted to the larger sprocket which is connected to the same shaft as that of the pinion and then it is transmitted to the other gears called pawl and ratchet through the chain as the sprocket arrangement is connected by a chain drive the speed available at larger sprocket is characteristically multiplied at the smaller sprocket [1].Thus the speed achieved is high. the shaft which has smaller sprocket also has two gears of different diameter meshed with each other and a flywheel. The speed from the smaller sprocket is given to the smaller gear through the larger gear to achieve high speed. There will be some fluctuations to avoid them a flywheel is mounted between gears and small sprocket. finally, the smaller gear is coupled to the generator or dynamo. The generator converts this mechanical energy to electrical energy. The energy is stored in a battery.
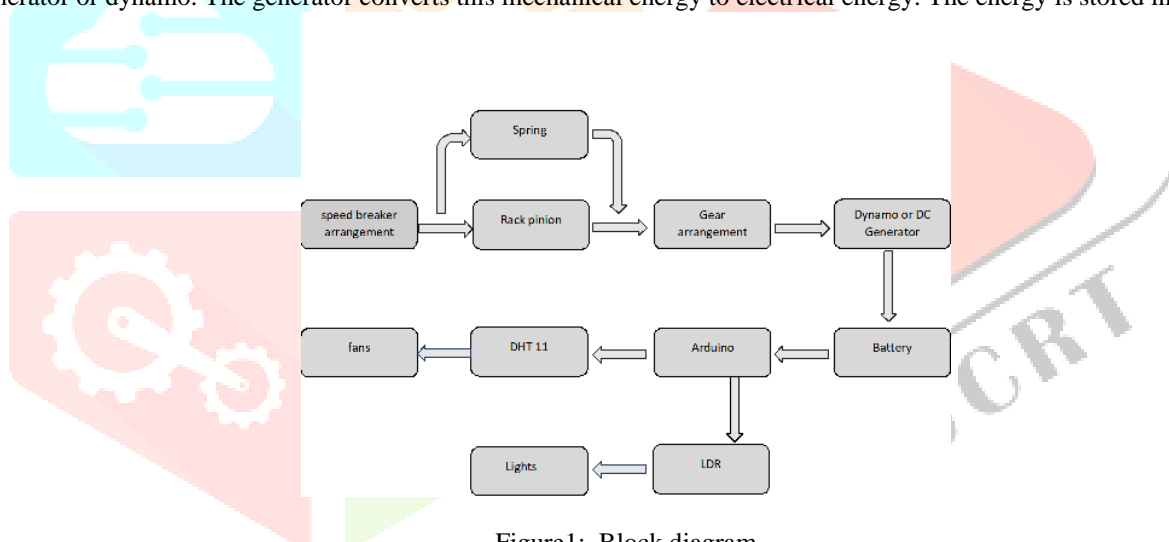

Figure1: Block diagram

The temperature and humidity sensor is placed and a LDR is also placed these sensors respectively are used to control the fan and lights. So, the temperature and humidity sensor compare's the temperature of the surroundings with temperature that is programmed to the Arduino and then turns or off the fan automatically. Similarly, the LDR senses the amount of light and when the lights low it turns on the lights otherwise turns off.

V. COMPONENTS

A. Speed breaker

The curved and hinged type structure across the road to regulate the speed of the vehicles is called speed breaker. The top portion and the visible portion is speed breaker. It is made of iron.

B. springs

Springs are used for compression and expansion. They absorb energy due to vibrations. springs are usually made up of hardened steels.

Figure 2: springs

C. Rack and pinion

The rack is a rectangular bar which has teeth on one side and pinion is a circular gear. The both are meshed with the teeth. it is used for converting linear motion into rotational motion or vice versa.

Figure 3: Rack and pinion

D. Ball bearings

A ball bearing is a type of rolling-element that uses balls to maintain the separation between the bearing races. It permits relative motion between the surfaces which are in contact while carrying loads. The relative motion between the components causes the balls to roll with little sliding. The ball bearing is used to reduce friction and transmit the motion effectively.

Figure 4: ball bearing

E. Shaft

It is a rotating element it is used to mount objects and used to transfer the energy to other objects

Figure 5: shaft

F. Sprocket and Chain drive

A sprocket is a toothed wheel that fits onto a shaft. It is prevented from rotating on the shaft by a key that fits into keyways in the sprocket and shaft. A chain is used to connect two sprockets. One sprocket is the driver sprocket. The other sprocket is the driven sprocket. The motion is transferred between sprockets through chain

Figure 6: sprocket and chain drive

G. Pawl and Ratchet

The purpose of a ratchet and pawl is to allow a shaft to rotate in one direction only. The ratchet is a gear which has teeth and it is circular in shape. The pawl is a spring load hook type structure which is pivoted at one end and the other end makes contact with the teeth of the ratchet. It fits in to the space between the teeth of the ratchet and thus prevents the reverse motion by restricting the backward movement of the ratchet [].
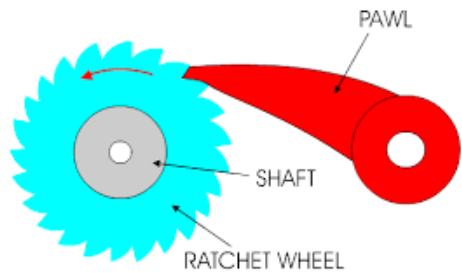

Figure 7: pawl and ratchet

H. Flywheel

Flywheel is used for smooth output .it reduces the fluctuations [3]. The other function of this is to release and absorb energy

Figure 8: flywheel

I. Battery

Battery is used to store the generated energy. The energy is stored in the form of chemical energy
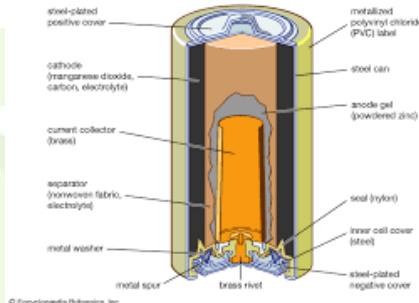

Figure 9: battery

J. Generator

The device which converts mechanical energy into electrical energy is called generator. An AC generator is used for producing alternating current which contains an assembly of stationary(stator) and moving parts (rotor). The rotor is connected with the gear. The torque which generated by gear rotates the rotor of the generator. The rotor creates a moving magnetic field around the stator, which induces a voltage difference between windings of stator and produce the alternating current (AC) output of the generator [3]
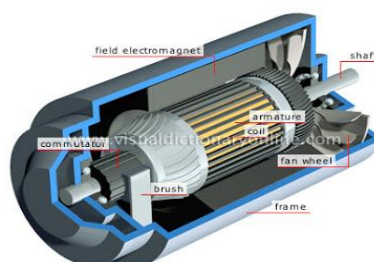

Figure 10: generator

K. Arduino

The Arduino Uno is an open-source microcontroller board based on the Microchip Atmega328P Microcontroller and developed by Arduino cc. The board is equipped with sets of digital and analog input/output pins, It has 14 digital input/output pins, It has 14 digital input/output pins, 6 analog input, a 16 MHZ crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. "UNO" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno is the latest in a series of USB Arduino boards and reference model for Arduino platform. The Arduino Uno can power via the USB connection or with external power supply. External power can come either from AC to DC.   The Arduino are programmed using a dialect of feature from programming language C and C++. In addition to using traditional compiler tool chains, the Arduino provide integrated development environment (IDE) based on processing language project [5]
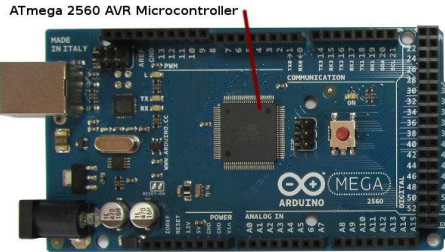

Figure 11: Arduino

L. DHT11

The DHT11 is a digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin. It is simple to use. [2]
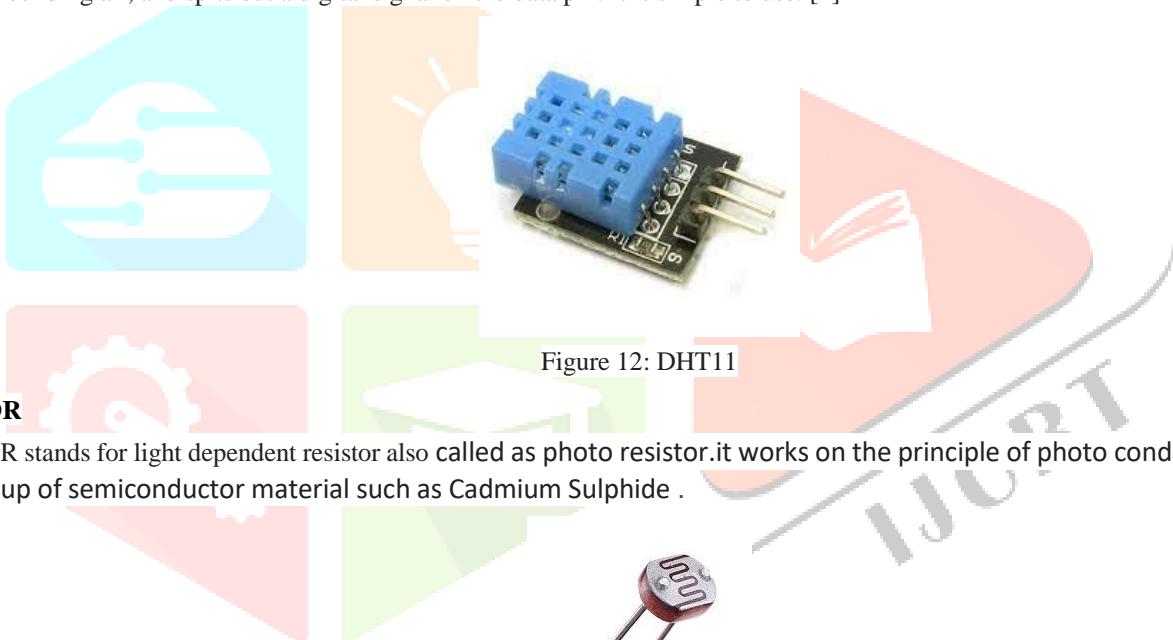

Figure 12: DHT11

M. LDR

LDR stands for light dependent resistor also called as photo resistor.it works on the principle of photo conductivity. It is made up of semiconductor material such as Cadmium Sulphide .
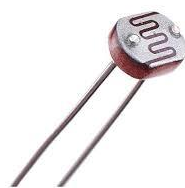

Figure 13: LDR

VI. POWER CALCULATION

let a car of 1000kg moving over a speed breaker of height 12 cm

so, work done = weight of body *distance travelled

weight of body=1000*9.8=9800 N

work done=9800*0.12=1,176 N-m.

power=work done/second

power=1,176/60=19.6 w

power for 24 hours or 1 day=1176*24=28.2 kw.

VII. ADVANTAGE

- It is eco-friendly. It does not produce any harm ful products into the atmosphere and has no impact on human health and wildlife habitat also.

- The installation and maintenance is also very easy.

- It does not need a huge place or area which is for wild life it is constructed below the speed breaker. it takes less floor area.

- It has high efficiency and helps in reducing load on the national grid.

- There is no involvement of any fossil fuels so there will be no transportation cost as well as input fuel cost.

- The sensors used here are also of low cost.

VIII. CONCLUSION

A nonconventional method is used for generation of electricity and also the project describes how to utilize the energy in a manner that conserves energy by automation. Due to increase in the population there is a grave need of thinking and utilizing other sources for power as the conventional forms gets exhausted one day and another issue which needs focus is environment pollution. So,This project meets both the criteria and fulfils our requirements. It will be great benefit to the country and as well as for the world

IX. REFERENCE

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