GENERATING ELECTRICITY FROM ROTATIONAL WHEELS IN VEHICLES

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ABSTRACT - *There is so much energy going vain from vehicles like cars, cycles, trains, etc. just like useful river water mixing in the ocean. So, to avoid and get benefits of that energy we are coming up with a solution where, we can generate electrical energy from rotating wheels in the vehicles, by mounting magnets and copper coils in the wheel hub. The copper coils are surrounded by the magnet. Rotation of the magnet around the copper coils leads to generate electromagnetic flux. Due to this flux electrical energy is generated. The generated electricity is then transferred to a battery which is installed by us. The electrical energy can be stored in the battery until it gets fully charged. This process can be applied to both electric vehicles and non-electric vehicles. This process has the potential to generate enough power to recharge the battery. The installed battery can be act as an alternate battery to the vehicle.*

Key Words: *Electro-magnetic flux, Magnets, Copper, Copper Coils, Magnet housing, Battery.*

1. INTRODUCTION:

There are many ideas present on generating kinetic energy from rotating wheels where the energy is going vain from all types of transport vehicles. So, in this paper, we are giving another idea and its required calculation of how we can we renew and reuse. As all, we know that the 1st law of thermodynamics states that energy is neither created nor destroyed in fact it transforms from one form to another. In contrast, we are wasting the resources which can develop energy. Here, we are willing to generate electrical power from wheels of vehicles when it is in motion. For this process, we studied and researched a lot of best sources and concluded that to generate maximum efficiency of electrical power the best way is to use copper coils and magnets in the wheels of vehicles to generate the electrical power. The generated power will be sent to batteries and it works as a spare battery. We place the spare battery underneath the seat. We don't need to recharge the battery from the outer source. By this process, we can increase the range of vehicles as well as reduce the traveling costs.

1.1 SYSTEM ARRANGEMENT:

It is a bit complicated thing to arrange our system in wheels. In this case, we are a introducing new design according to our requirements to succeed in this innovation. Mainly we are arranging in the wheel hub. Here, the wheel hub contains the drum breaking or internal braking system of the vehicle. So, we remove the internal braking system then we arrange our appropriate system in this and we add a disc to the front wheel as of now to the wheel rim. The arrangement of magnet and copper coils shown Below in figure (1). Similarly, we install a battery under the seat.
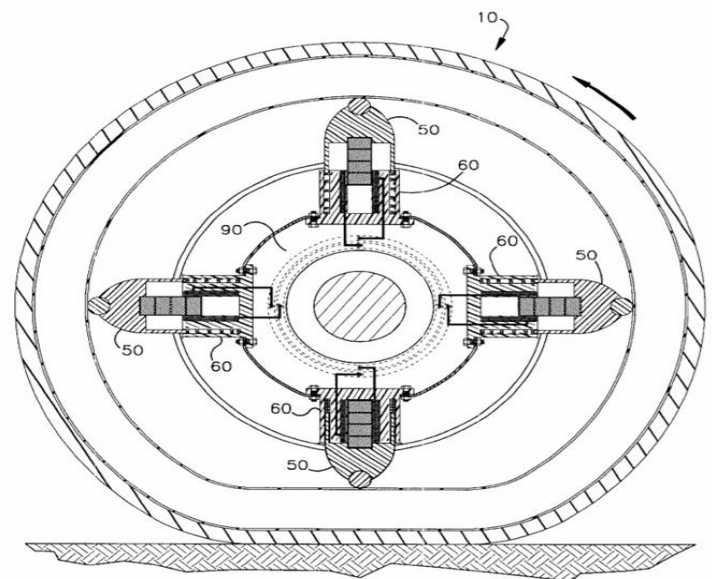

Fig – 1: Mounted magnets and copper coils [4]

Magnet Housing (50), Coil Housing (60), Slip Rings (90), Wheel Assembly (10)

1.2 GENERATING POWER:

A lot of studies proved that we can generate power by using copper coils and magnets. For instance, Generator.

Many metals contain electrons. We are using copper in this because we all are studying from childhood that ''copper is a good conductor of electricity''. It has a large number of electrons and they likely to move very easily. Here, the copper wire is wired in the form of coils as you can see in the electric motor. Likewise, we

wired the copper bindings according to the given design by us. Magnets have two poles which are north and south. The atoms in the magnets move in different directions. Few moves in one direction and others move in the opposite direction. The wired copper coils are placed as the stationary stator. The magnet is placed as a rotor which is rotor motion. The copper coils and magnets are placed as above figure (1) When the wheel rotates the magnet tends to rotate, due to the rotation of the magnet the electrons in the copper coil are activated and boosts which create electromagnetic flux, because of this flux electromotive force (emf) is induced. The induced emf produces current then the generated power is sent to be the battery which we placed under the seat.

2. RELATED LAWS:

→ When we move the magnet in between the copper coil the mechanical energy is converted into electrical energy.

→ Magnetic Flux - quantity of magnetic field linked to a surface area is known as magnetic flux.

→ Faradays 1st Law – change of magnetic flux linked to a coil induces an electromotive force (emf) across a coil.

Fig – 2

→ Faradays 2nd Law – the emf induced across the coil is equal to the rate of change of flux in the coil [5].

3. LITERATURE REVIEW:

[1] In his research srikar dasari said, there is so much kinetic energy and wind energy going in vain from the transport vehicles, just like river water mixing in the ocean. He added several ideas about how kinetic and wind energy can be useful and the advantages and disadvantages of each process in his research. [2] Ms. Ghaithaa and Mr. Neil M White discovered that we can generate electrical energy from rotational wheels by using a thunder trade piezoelectric generator. They designed the device which will mount on the rim of the vehicle which is used to generate power while moving the vehicle. [3] Ezhil Vignesh and co investigated that the major transportation network in India is railways. They emphasis the paper on the design of electrical energy in the supreme advanced technique, when compared to other procedures like solar, fuel, etc., rotational energy has much more efficient ways to generate electricity from train wheels. So, it can help to generate power supply for passengers to charge cell phones, laptops, etc., And also, they mentioned the expense for this scheme is less and affordable for the government to implement the process.
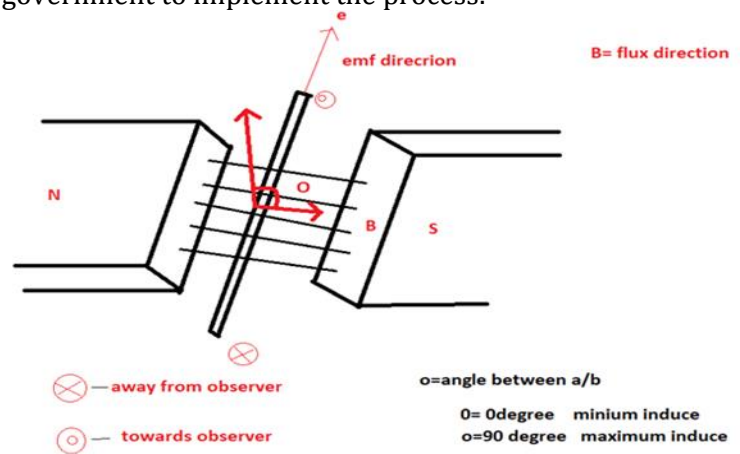

Fig – 3

4. CALCULATIONS:

This calculation gives the output of electricity generated from wheels. (The outputs are approximate only not accurate)
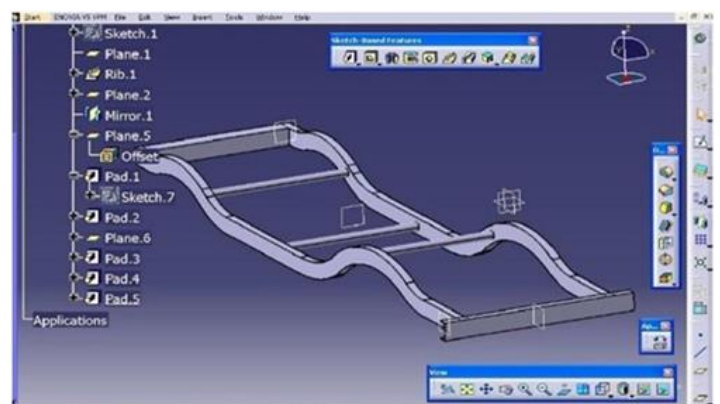

Fig – 4: Design model of chassis

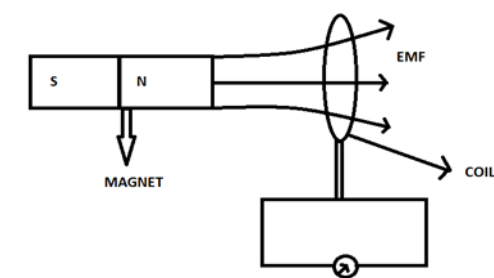The above diagram was made in Catia software. The calculation made is based upon the above figure.

Specifications of Ladder Chassis: -
Tire size marking = 225/55R17.
Rear Overhang (ROH) = 1020 millimeter.
Front Overhang (FOH) = 450/470 millimeter.
Gross Vehicle Weight (GVW) = 3000 kilograms.
Ertiga Specifications:
Length =4395millimeter.
Width =1735millimeter.
Height = 1690mm.
Basic Calculation for Chassis: -

Load of travelers = 75kg+65kg+87kg+85kg+84kg+90kg+65kg+89kg
 = 640kg
Total load performing on chassis = GVW + Weight of passengers
 = 3000 kg +640 kg
 =3640 kg

The taken ladder chassis has two longitudinal members so the load will be acted upon these two longitudinal members. For that reason, the load acting on each member will be half of the total load acting on the chassis.[5]
$$= 3640/ 2$$
Load acting on longitudinal chassis is 1820 Kg
Initially, the vehicle at rest then the initial velocity will be '0'
Let us assume the vehicle at a motion which is 10kmph then the velocity v = 2.77m/s
$v = r\omega$
$\omega = v/r$
$\omega = 2.77/0.017$
$\omega = 162.94$ per second
$\omega = 2pieN/60$
$N = 60*\omega/2pie$
$N = 60*162.94/2*3.14$
$N = 1556.75$ rpm

Total Tractive Effect (TTE)
TTE = Σ Resistances
TTE = Rolling Resistance + Gradient Resistance + Aerodynamic Drop + Acceleration
TTE = (mg μcosθ) + mg sinθ+1/2 C_d Av^2 + ma
Where,
C_d = Drag Coefficient = 0.45
A = Area
A= length * width * height
  = 4395*1735*1690
  = $12.88679925*10^{10}$ mm^3
  = 12.88679925 m^3
V = velocity

m = mass
g = gravity
a = acceleration
  = 2.77/1 = 2.71m/s^2
θ = 18.5

TTE = [3640kg * 9.81m/s * cos(18.5)] + 3640 * 9.81 sin (18.5) + ½ * 0.45 * 12.88679925m^3 * $(2.77)^2$ m/s + 3640 * 2.71
TTE = 33863.12 + 11330.44 +22.2464 + 10082.8
TTE = 55298.6064 N
Torque = Force * r_w
r_w = Wheel Radius
Force = Total Tractive Effect
Torque = 5529806064 N * 17mm
Torque = 940.076 Nm

POWER
Torque (Nm) = 60*power (KW)/2pieN
940.076 = 60*p/2*3.14*1556.75
Power = 153175.82 KW

Assumption:
→The amount of flux in a round magnet bar = 0.013weber's.
So, we were mounting 4 magnets to the wheel then the flux will be = 4*0.013
$Ø = 0.052$ Weber's
 When an armature is rotated through on revolution each conductor cuts the magnetic flux from all the N poles and also that entering all the S poles. Consequently, if Ø is the useful flux per pole in Weber's, entering a leaving the armature, P the number of pairs of poles and N the speed in revolutions per minute.

Time of one revolution = 60/N seconds
= 60/1556.75
= 0.03 sec
And the time taken by a conductor to move one pole pitch is = 60/N_r *1/2p
Therefore; The no. of pairs of poles
P = 2;
= 60/1556.75 * ½ (2)
= 9.63*10^{-3} sec
Therefore, rate at which conductor cuts the flux is
= Ø/ [60/N_r * 1/2p]
= 2ØN_r*p / 60 Weber's/sec
The average e.m.f generated in each conductor is
= 2ØN_rp/60
= 2*0.052*1556.75*2/60
= 5.39 volts

If Z is the total no. of armature conductors and C is the no. of parallel paths through winding between positive and negative brushes (d for wave winding and 2p for a lap winding)

Therefore, no. of conductors in series in each path
$$= z/c$$
$$= 4/2p$$
$$= 4/4$$
$$= 1$$

The brushes are assumed to be in contact with segments connected to conductor in which no e.m.f is been generated and the e.m.f generated in each conductor, while it is moving between positions of zero e.m.f, varies. The no. of conductors in series in each of the parallel path between the brushes remains practically constant. Hence, total e.m.f between brushes is

Average e.m.f per conductor * no. of conductors in series per path
$$= 2 Ø N_r p/60 * z/c$$

Therefore; $E = 2*z/c * N_r p/60 * Ø$

$$= 2*1*1556.75*2*0.052/60$$

$$= 5.39673 \text{ volts}$$

Therefore; we can generate voltage of 5.39673 volts per second.

(These calculations are not appropriate because we haven't done it practical and the generated voltage 5.39673 is approximate value)

5. ADVANTAGES:

• We don't need to recharge the battery separately.
• Generates electricity without pollution.

6. DRAWBACKS:

• To generate neat electricity the vehicle should maintain a constant speed.
• The milage can be reduced compared to the previous.
• Wheel hub design should be changed according to the given system.

7. CONCLUSION:

Approximately, 26000 amperes of current can be generated in one minute if we maintain 2300 rpm. The

generated electricity is further sent to be the battery which is under the seat. This process has the capability of generating enough power for all the accessories in the vehicle.

8. FUTURE SCOPE:

We gave an idea of multiplication power energy storage by using wheels from roadways. Our future is all about electric vehicles so, we can implement this idea to generate more power to the vehicle and it helps to increase the power efficiency in vehicles.

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