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SMART BRAKING SYSTEM

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Abstract: This Research Titled Smart Braking System Deals With The Proper Management Of Heat Losses That Occur During The Application Of Conventional Fricitional Brakes. In This A Major Amount Of Wasted Energy Is Converted Into Usable Energy And Thus Increasing The Overall Efficiency Of The Vehicle.
Keywords: Smart Braking System, Regenerative Brakes, Heat Losses, Traditional Dynamic Brakes.

I. INTRODUCTION

Smart braking means reduce losses and regenerate power by using mechanical structure. Systems use friction to counteract the forward momentum of a moving car. As the brake pads rub against the wheels (or a disc connected to the axle), excessive heat energy is also created. This heat energy dissipates into the air, wasting up to 30% of the car's generated power. Over time, this cycle of friction and wasted heat energy reduces the car's fuel efficiency. More energy from the engine is required to replace the energy lost by braking. Hybrid gas/electric automobiles now use a completely different method of braking at slower speeds. While hybrid cars still use conventional brake pads at highway speeds, electric motors help the car brake during stop-and-go driving. As the driver applies the brakes through a conventional pedal, the electric motors reverse direction. The torque created by this reversal counteracts the forward momentum and eventually stops the car. But regenerative braking does more than simply stop the car. Electric motors and electric generators (such as a car's alternator) are essentially two sides of the same technology. Both use magnetic fields and coiled wires, but in different configurations. Regenerative braking systems take advantage of this duality. Whenever the electric motor of a hybrid car begins to reverse direction, it becomes an electric generator or dynamo. This generated electricity is fed into a chemical storage battery and used later to power the car at city speeds.
Regenerative braking takes energy normally wasted during braking and turns it into usable energy. It is not, however, a perpetual motion machine. Energy is still lost through friction with the road surface and other drains on the system. The energy collected during braking does not restore all the energy lost during driving. It does improve energy efficiency and assist the main alternator.

II. COMPARISON OF DYNAMIC AND REGENERATIVE BRAKES

Dynamic brakes ("rheostatic brakes" in the UK), unlike regenerative brakes, dissipate the electric energy as heat by passing the current through large banks of variable resistors. Vehicles that use dynamic brakes include forklifts, Diesel-electric locomotives and streetcars.
If designed appropriately, this heat can be used to warm the vehicle interior. If dissipated externally, large radiator-like cowls are employed to house the resistor banks.
The main disadvantage of regenerative brakes when compared with dynamic brakes is the need to closely match the generated current with the supply characteristics. With DC supplies, this requires that the voltage be closely controlled. Only with the development of power electronics has this been possible with AC supplies, where the supply frequency must also be matched (this mainly applies to locomotives where an AC supply is rectified for DC motors). A small number of mountain railways have used 3-phase power supplies and 3-phase induction motors. This results in a near constant speed for all trains as the motors rotate with the supply frequency both when motoring and braking.

III. THE MOTOR AS A GENERATOR

Vehicles driven by electric motors use the motor as a generator when using regenerative braking: it is operated as a generator during braking and its output is supplied to an electrical load; the transfer of energy to the load provides the braking effect. Early examples of this system were the front-wheel drive conversions of horse-drawn cabs by Louis Antoine Krieger (1868-1951). The Krieger electric landaulet had a drive motor in each front wheel with a second set of parallel windings (bifilar coil) for regenerative braking. An Energy Regeneration Brake was developed in 1967 for the AMC Amitron. This was a completely battery powered urban concept car whose batteries were recharged by regenerative braking, thus increasing the range of the automobile. Many modern hybrid and electric vehicles use this technique to extend the range of the battery pack. Examples include the hybrids Toyota Prius, Honda Insight, and the Vectrix electric maxi-scooter.

3.1 LIMITATIONS OF TRADITIONAL FRICTIONAL BRAKES

Traditional friction-based braking is used with mechanical regenerative braking for the following reasons:

- The regenerative braking effect drops off at lower speeds, therefore the friction brake is still required in order to bring the vehicle to a complete halt, although malfunction of a dynamo can still provide resistance for a while. Physical locking of the rotor is also required to prevent vehicles from rolling down hills.
- The friction brake is a necessary back-up in the

event of failure of the regenerative brake.

- Most road vehicles with regenerative braking only have power on some wheels (as in a 2WD car) and regenerative braking power only applies to such wheels, so in order to provide controlled braking under difficult conditions (such as in wet roads) friction based braking is necessary on the other wheels.
- The amount of electrical energy capable of dissipation is limited by either the capacity of the supply system to absorb this energy or on the state of charge of the battery or capacitors. No regenerative braking effect can occur if another electrical component on the same supply system is not currently drawing power and if the battery or capacitors are already charged. For this reason, it is normal to also incorporate dynamic braking to absorb the excess energy.
- Under emergency braking it is desirable that the braking force exerted be the maximum allowed by the friction between the wheels and the surface without slipping, over the entire speed range from the vehicle's maximum speed down to zero. The maximum force available for acceleration is typically much less than this except in the case of extreme high-performance vehicles. Therefore, the power required to be dissipated by the braking system under emergency braking conditions may be many times the maximum power which is delivered under acceleration. Traction motors sized to handle the drive power may not be able to cope with the extra load and the battery may not be able to accept charge at a sufficiently high rate. Friction braking is required to absorb the surplus energy in order to allow an acceptable emergency braking performance.

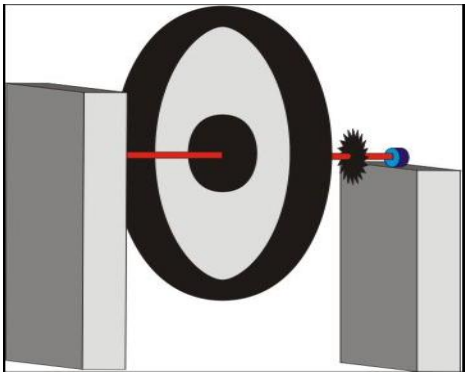
IV. PRINCIPLE AND WORKING

In this project we are using our vehicle momentum force into electrical energy at the time of applying braking system.

4.1 CONSTRUCTION

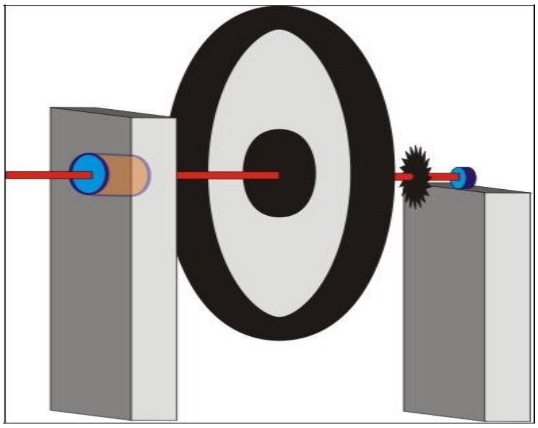
STEP 1

WE ARE USING SIMPLE WHEEL IN OUR PROJECT AND FIXED ON WOODEN FRAME WITH HELP OF BEARING.



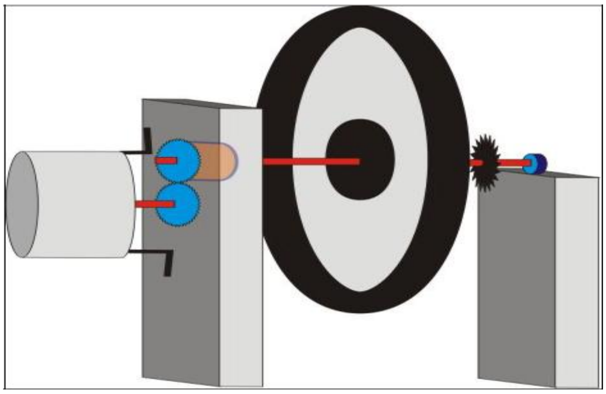
STEP 2

WE FIX ONE ELECTROMAGNATIC CLUTCH ON THE SIDE OF WHEEL SHAFT AND ONE GEAR ON OTHER SIDE OF SHAFT AS SHOWN BELOW DIAGRAM.



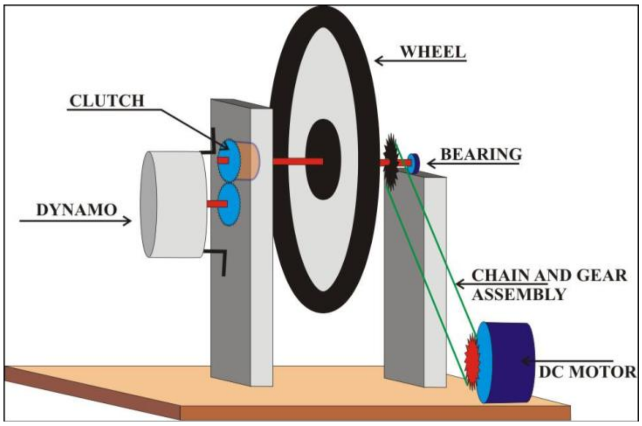
STEP-3

NOW WE FIX ONE DYNAMO ATTACH WITH ELECTROMAGNATIC CLUTCH AS SHOWN BELOW.



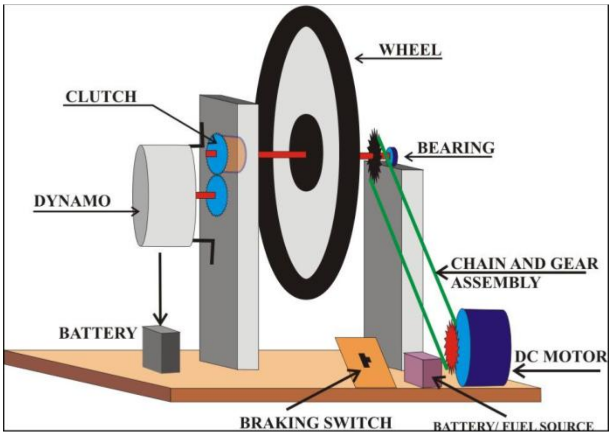
STEP-4

ON THE OTHER SIDE OF WHEEL WE ATTACH ONE DC GEAR MOTOR WITH CHAIN ASSAMBLY. WE USE DC GEAR MOTOR AS ENGINE IN OUR MODEL.

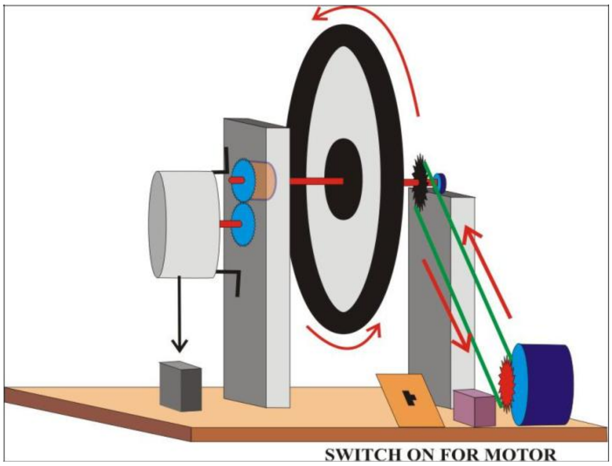


STEP-5

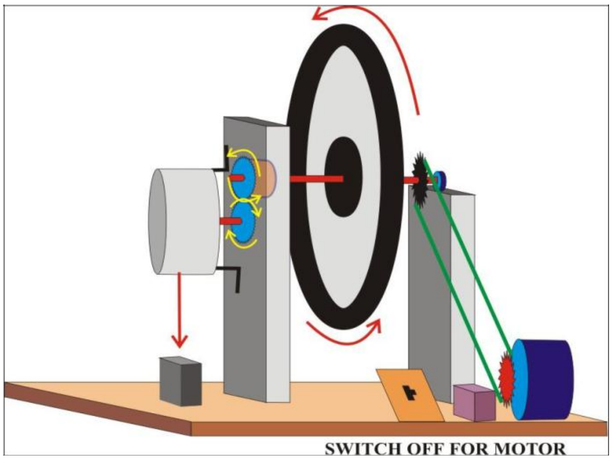
WE CONTROL DC MOTOR WITH SIMPLE SLIDING TWO WAY SWITCH (SLIDING SWITCH CAN STOPAND PLAY TWO DEVICE AT THE SAME TINE) AS SHOWN BELOW.

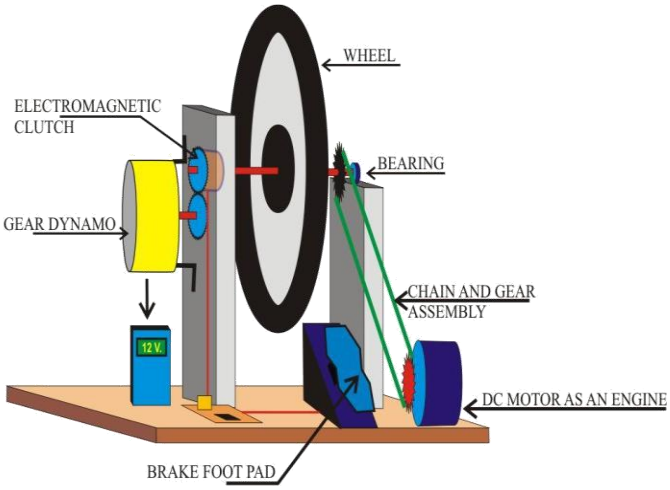


STEP-6
SYSTRM DRIVE
DC MOTOR DRIVE WHEEL WITH THE HELP OF GEAR ASSAMBLY.

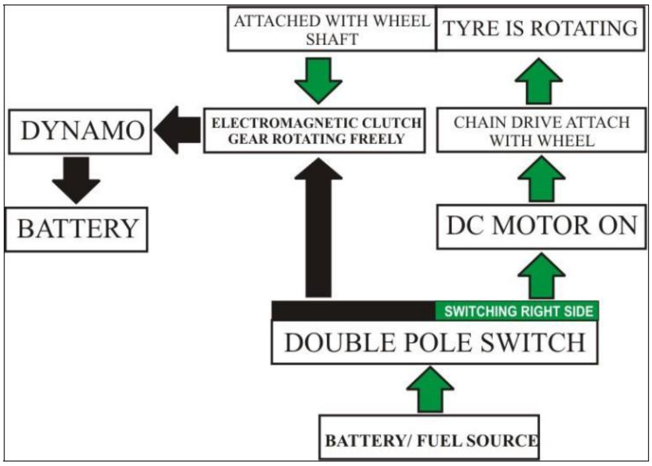


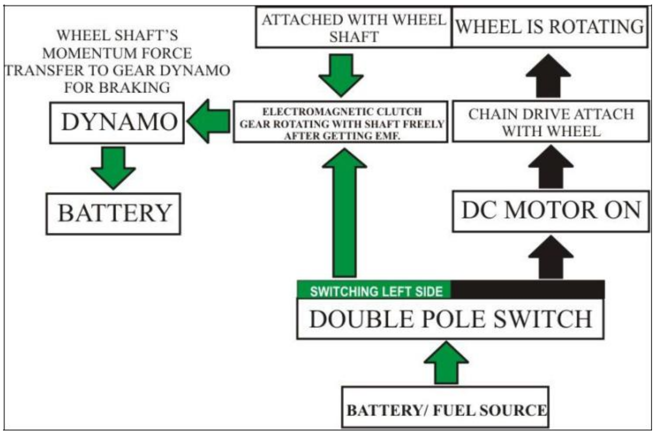
STEP-7
POWER REGENERATE AT THE TIME OF BRAKING WHEN WE SLIDING SWITCH OFF TO MOTOR SUPPLY THEN SWITCH ON ELECTROMAGNATIC CLUTCH POWER SUPPLY.
Electromagnatic Clutch Engages With Wheel Shaft And Transfure Wheel Rotation In The Dynamo For Stopping Wheel Rotation.
When Dynamo Rotates It Applied Brake To The Wheel Shaft And Produce Energy, Which Is Storing In Battery As Shown Below.





4.2 WORKING BLOCK DIAGRAM





V. COMPONENTS USED

- Electromagnetic Clutch
- Dynamo
- DC gear motor
- Transformer
- Brake paddle
- Bearing
- Wheel
- Chain assembly
- Wooden frame

VI. CONCLUSION

The energy efficiency of a conventional brake is only about 20 percent, with the remaining 80 percent of its energy being converted to heat through friction. The miraculous thing about regenerative braking is that it may be able to capture as much as half of that wasted energy and put it back to work.

- This reduces fuel consumption by 10 to 25 percent. Hence regenerative braking plays an important role in fuel consumption and also in the field of speed.
- The lower operating and environment costs of a vehicle with regenerative braking system should make it more attractive than a conventional one. The traditional cost of the system could be recovered in the few years only.
- The exhaust emission of vehicle using the regenerative braking concept would be much less than equivalent conventional vehicle as less fuel are used for consumption.
- These systems are particularly suitable in developing countries such as India where buses are the preferred means of transportation within the cities.

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