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Smart Electricity Generation Through Straps and Entry Carpets of Bus and Local Trains by Solenoid

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Abstract— *Solenoid has numerous applications the electronic applications incorporate simple and advanced circuits utilizing meager movies and dynamic gadgets, for example, Josephson intersections and huge scale applications incorporate magnets for power applications, for example, engines and generators, for attractive reverberation, for quickening agents, and link applications, for example, control transmissions. The part of solenoid where we are focusing is generating electricity through solenoid. We all travel from one place to another place daily due to the purpose of work by various means of transport. But the common transport system which we use is bus or local train. It is found that 60% of Indians use bus or local train to travel for a short distance amongst the local areas of the city. So as these many people travel through bus or local train everyday generally there is always rush in bus or local train and people stand still on bus or local train holding the strap. As there are many people using straps of bus and local train to stand still we can utilize the mechanical energy which they are using to stand to generate electricity. One more way of generating electricity through this local transport system is by entry carpets. As more than half of the population of India uses public transport, by this it could be deducted easily that the number of passengers who would board in would also get out of the public transport. So, the mechanical energy of the feet of people on entry carpets also could be converted into electrical energy.*

Keywords—electricty generation; straps; bus; local trains; entry carpets

I. INTRODUCTION

Objective of this project is to generate electricity from straps and entry carpets of bus and local trains and provide that electricity for charging of small electronic gadgets such as mobile, i-pods MP3 players, digital cameras, smart phones, tablet PCs etc [1].In today's world there are huge number of people who use these small devices and carry additional power sources to charge them but due to additional functionalities of these smart devices the energy stored in the battery of these small devices are consumed to its full limit. There are many technologies which proposes the concept of converting the surrounding energy among us into electrical energy. There are some concepts which include harvesting electrical energy from our own body through walking; breathing etc[2,3,4,5,6] .According to statistics 70-80% of India's population uses public transport such as bus or local trains to travel for a short period of time[7,8,9]. As there are numerous people who travel through bus and local train holding the strap to stand still. So when they hold the strap they apply pressure on the strap [10, 11]. So we could convert that mechanical energy into electrical energy which could be used for various purposes such as charging small devices in bus or local trains and as numerous people would move in and move out of bus or local train at each stop the pressure which they would be applied on entry carpets while moving in or moving out of the bus or local train could be converted into electrical energy.

The scope of this project is to generate electricity which is easily available in bus and local trains in a considerable amount which can be used for various purposes by the help of solenoid. As solenoid is used for various purposes but one of its major advantage is that it can be used to generate to generate electricity. At present this project has not been implemented and neither being created but if this project comes to practical use we can use this electricity to charge mobile phone and to light internal bulbs and lights in bus or local train and through this we can save a lot of electricity and we can also give a new facility of providing charging points in bus or local trains which in current scenario is unavailable.

This paper is organized as follows; Section II presents the

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description of how the electricity is generated from strap by solenoid. Section III presents the description of how the electricity is generated by entry carpets of bus and local train. Section IV deals with the description of solenoid. Section V deals with amount of energy which could be generated by solenoid. Section VI has conclusion elements.

II. ELECTRICITY GENERATION THROUGH STRAP

Every time we hold or hold tight strap of transport or nearby prepare we easily put our whole-body weight on the strap of transport or neighborhood prepare so when the transport or nearby prepare moves and when it applies break once in a while the pressure because of body weight and idleness on the strap of transport or neighborhood prepare increments. What's more, this strain can be utilized for producing power. Along these lines, for creating power by the strap of transport or neighborhood prepare an engine or a dynamo can be utilized. A major preferred standpoint of utilizing these solenoids is that these have a spring-stacked shaft instrument, which implies that the main successful compel required for producing power by the unit is the gravitational drive, while the strap is very still, and when the strap is being pulled while holding or hanging the spring activity of the solenoid supplements the activity making the framework greatly effective. So, on the off chance that we append this solenoid to the strap of transport or nearby prepare and every time the solenoid shaft is pulled or pushed, the magnet connected with the pole inside the unit communicates with the loop encompassing the magnet creating power which gets to be distinctly accessible over the associating wires of the solenoid

Since the back and forth movement of the solenoid shaft should incite a substituting current at the yield, this needs to redressed for procuring a DC, that is the reason an extension rectifier might be seen associated with the wires of the solenoid.

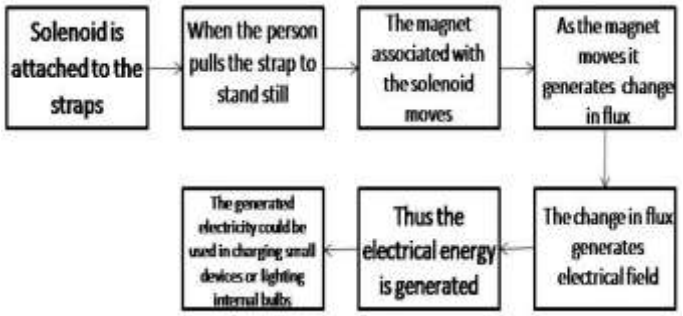

Fig.1: Sectional front view of solenoid attached to a strap.

The above Fig I is a sectional front view of solenoid attached to a strap. This figure is made in solid works to show the attachment of solenoid to the strap. As shown in the above figure the solenoid is attached upside down to the strap so that the coil act as spring.

III. ELECTRICITY GENERATION THROUGH ENTRY CARPETS

Whenever we get into the bus or local train it is known that we would again get out of the bus at certain stops so by this it could be deducted easily that we would definitely step on the entry carpets while getting in or getting out of the bus or local train. Each time when we step in on the entry carpets of the bus or the local train we effortlessly put our entire body weight on the entry carpets due to which a lot of pressure or mechanical energy is stored in the carpet and this pressure or mechanical energy can be converted into electrical energy through solenoid. The solenoid which would be used to generate electricity would be kept under the entry carpets of bus or local train. As the solenoid have spring stacked shaft component it would require less compel to create power so at whatever point any individual would venture on the passage cover for getting in or escaping the transport or nearby prepare the solenoid to the section rugs of transport or neighborhood prepare and every time the solenoid shaft is pushed and the magnet connected with the pole inside the unit associates with the curl encompassing the magnet producing power which gets to be distinctly accessible over the interfacing wires of the solenoid. Since the forward and backward movement of the solenoid shaft should actuate a substituting current at the yield, this needs to redressed for gaining a DC, that is the reason an extension rectifier might be seen associated with the wires of the solenoid as we accomplished for the straps.

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Fig.2: Front view of solenoid attached to entry carpets

The number of solenoids which are attached to the entry carpets is four and the reason for attaching four solenoids to the entry carpets is because it would prove a complete balance to the person who would be stepping on it and would make sure that it could produce electricity independent of the position of where the person is stepping on the carpet. However, since solenoids regularly utilize an iron pole as the plunger, we can't anticipate that the framework will produce any power until this bar is changed into a magnet to start with, on the grounds that exclusive a moving magnet will have the capacity to create power when traveled through a loop of wire.

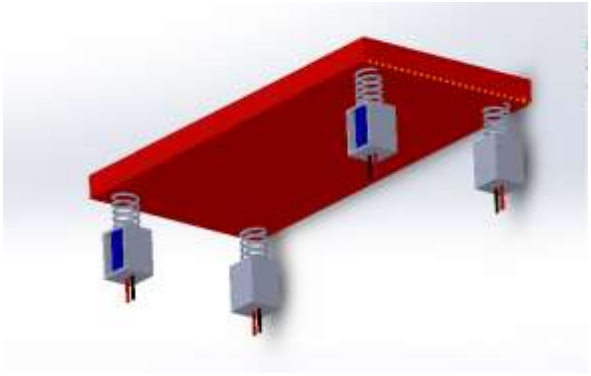
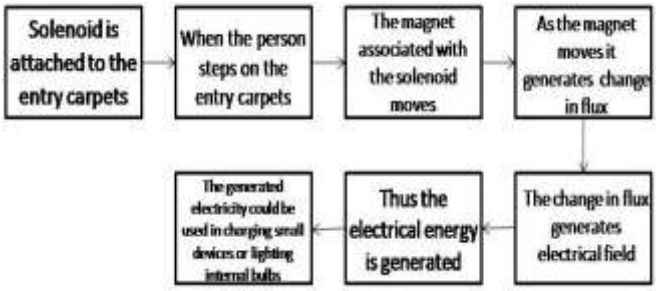


Fig.3: Isometric view of solenoid attached to entry carpets



IV. SOLENOID USED FOR ENTRY CARPETS AND STRAP AND ENTRY CARPET

A solenoid is a sort of electromagnet when the design is to produce a controlled attractive field. On the off chance that the reason for these solenoid is rather to block changes in the electric current, a solenoid can be more particularly named an inductor as opposed to an electromagnet.

So when a bar magnet is embedded in a solenoid it produces attractive flux which prompts to era of power it creates a changing attractive field. As Maxwell's conditions Faraday's law prompts to change in attractive field and results in an electric field, which offers ascend to a current in an adjacent wire. It's not the attractive field giving the constrain, it's the electric field created by the changing attractive field. In material science the term alludes to a loop whose length is significantly more noteworthy than its distance across, regularly wrapped around a metallic centre, which delivers a uniform attractive field in a volume of space (where some investigation may be completed) when an electric current is gone through it. As the solenoid is a sort of electromagnet which produces a controlled attractive field. As all electromagnets and inductors are solenoids it has a horseshoe sort of curl instead of a round and hollow solenoid shape and the term additionally allude to an assortment of transducer gadgets that change over vitality into direct movement. The term is additionally regularly used to allude to a solenoid valve which is a coordinated gadget containing an electromechanical solenoid which activates a pneumatic or water powered valve, or a solenoid switch which is a particular kind of hand-off that inside utilizations an electromechanical solenoid to work an electrical switch for instance, a vehicle starter solenoid or a direct solenoid, which is an electromechanical solenoid. Solenoid jolts makes a sort of electronic-mechanical locking component which likewise exist. the attractive field inside a vastly long solenoid is homogeneous and its quality does not rely on upon the separation from the hub, nor on the solenoid cross-sectional zone. There is the deduction for the attractive flux thickness around a solenoid that is sufficiently long so periphery impacts can be overlooked. By this we can quickly realize that the flux thickness vector focuses in the positive z heading inside the solenoid, and in the negative z course outside the solenoid. We can see this by applying the correct hand hold manage for the field around a wire. On the off chance that we wrap our correct hand around a wire with the thumb indicating toward the current, the twist of the fingers demonstrates the carries on. Since it manages a long solenoid, the majority of the parts of the attractive field not calling attention to offset by symmetry. Outside, a comparative cancelation happens, and the field is just indicating downwards. By Ampere's law, we realize that the line necessary of b the attractive flux thickness vector around this circle is zero, since it encases no electrical streams it can be likewise expected that the circuital electric field going through the circle is steady under such condition a consistent or continually changing current through the solenoid). We have appeared over that the field is indicating upwards inside the solenoid, so the flat bits of circle c don't contribute anything the

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indispensable. Since we can discretionarily change the measurements of the circle and get a similar outcome, the main physical clarification is that the integrands are really equivalent, that is, the attractive field inside the solenoid is drastically uniform. Note, however, that nothing disallows it from differing longitudinally, which in truth it does. The above figure demonstrates the solenoid which is to be utilized for strap for creating power. in the event that the solenoid is built as a wire winding (as frequently done by and by), then it radiates an outside field an indistinguishable route from a solitary wire, because of the present streaming generally speaking down the length of the solenoid.

Fig.4: Solenoid used in strap for generating electricity.

A change can be quite recently executed by joining a couple neodymium magnets at the top edge of the solenoid bar, as exhibited as takes after, this will change the entire plunger into a fruitful magnet, which would be then prepared to associate with the twist of the solenoid for making power, if you have whatever other convincing methodology for changing the post into a ceaseless magnet, you can use it for conveying a prevalent response from the operations. The above figure demonstrates the solenoid which is to be utilized for strap for creating power. in the event that the solenoid is built as a wire winding (as frequently done by), then it exudes an outside field an indistinguishable path from a solitary wire, because of the present streaming generally speaking down the length of the solenoid. An adjustment can be essentially executed by appending a couple neodymium magnets at the top edge of the solenoid bar, will change the whole plunger into a viable magnet, which would be then ready to cooperate with the loop of the solenoid for creating power, in the event that you have some other successful technique for changing the pole into a perpetual magnet, you can utilize it for delivering a superior reaction from the operations.

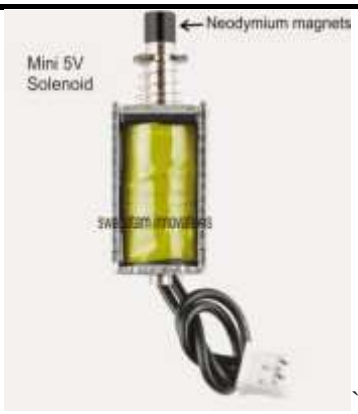

Fig.5: Modified solenoid for generating electricity.

V. ENERGY PRODUCED BY SOLENOID

As the energy generated by solenoid is proportional to the number of people using strap and number of people stepping on the entry carpets but it can be assumed that the every person who would be stepping in the bus would definitely step on the carpet as well so the exact amount of energy which could be generated by strap and entry carpets cannot be predicted .

But by the formula

F = (n * i)2 x magnetic constant * a/ (2 * g2) the formula of current I can be determined which is

$$I = \frac{G}{2N}\sqrt{\frac{F\times 2\times 10^{7}}{\pi\times A}}$$

Where F is Force applied on strap by the person to stand still and on entry carpets while stepping in. The expression I is the current and the expression G is the Length of the gap between the solenoid and a piece of metal and the expression A is the area of the solenoid and the expression N is the numbers of turns and the magnetic constant is 4*PI*10-7

So the energy generation is generally dependent on force applied on strap and entry carpets. And force also varies on strap on different moments as when the bus or the local train moves suddenly the force on the strap is maximum due to inertia as the body gets a jerk and moves backwards and then when the bus suddenly stops the body moves forward and again the force on the strap is maximum due to inertia. The force on entry carpets may also vary as the force applied on the entry carpets would be proportional to the weight of that person. By considering the above formula the n which is number of turns in the coil also varies as it depends on the force but as to generate electricity the average number of turns which should be present in the solenoid should be three to four hundred and the value of g (the length of gap which should be present between the coil) is very less as the number of turns in the coil is very much .As the force applied on strap cannot be calculated as it

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would varying but the force which would applied on entry carpets while stepping in the bus would be around 600-700 N.

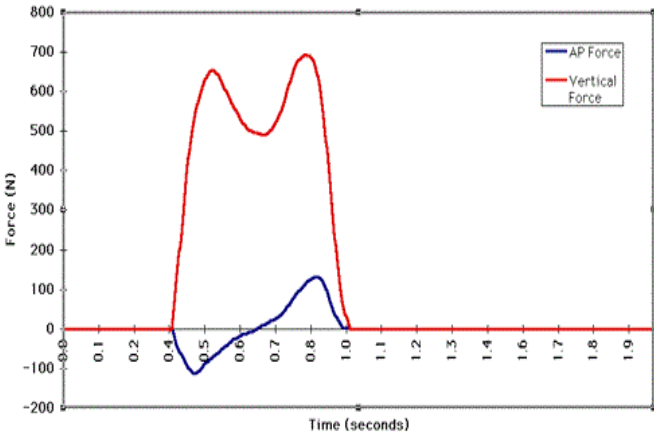

Fig.6:. Force applied on entry carpets by average person.

By the above figure of graph the force on entry carpets applied by average person can be resulted as considerable so the current generated by the entry carpets and strap would also be in considerable amount .As the amount of energy required for charging the mobile phone is 4.1 watt and by having this system in bus or local train it can easily that amount of energy and giving a extra facility to the people travelling through bus or local train.

VI. CONCLUSION

It was observed that the current produced by strap and entry carpets of bus and local train can be predicted as in considerable amount and could be used for various purposes such as charging mobile phones and lighting of inside bulbs of bus and local train and it can also be concluded that the electricity is produced when a mechanical stress is applied on the strap and entry carpets by the person when travelling through the bus or local train stops or move suddenly or while stepping in or stepping out of the bus or local train. This mechanical stress on strap and entry carpets of bus or local train is converted into electrical energy with the help of solenoid as when the shaft of the solenoid associated with magnet is pushed or pulled an electro motive force was generated and thus the electricity was generated.

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