

Electromagnetic Levitation of Automobile Seat

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ABSTRACT

While driving a vehicle a driver has a lot of inconvenience due to different reasons. One of the reason is because of the jerks that reach the driver. Because of these jerks a driver may lose control over his/her vehicle.

To avoid such problems we can use the magnetic levitation technology to make the driver more comfortable. This technology uses magnets to repel another magnet to levitate an object.

Keywords

Repulsive electromagnetic levitation; magnetic flux; electromagnetism; electronic control unit; magnetic flux

1. INTRODUCTION

Automobile has become an essential part of our lives. It is no longer used only for the sake of transportation. The aesthetics and the ergonomics became an important aspect for a person to buy an automobile. The suspension system plays an important role for the occupants to be in a comfortable position. But even after the shocks being absorbed by the suspension system the occupants receive some amount of jerks due to the transfer of the load which was not absorbed by the suspension. This load gets transferred to the recipient and the occupant will feel the jerk. The electromagnetic levitation technology can be a solution for this problem.

2. ESTABLISHMENT OF THEORY

The repulsive electromagnetic levitation works on the basic principle of magnetism which is like poles repel and unlike poles attract. When a current is sent through electromagnetic substance they behave as a magnet. Thus if we place another magnet above the electromagnet, it will

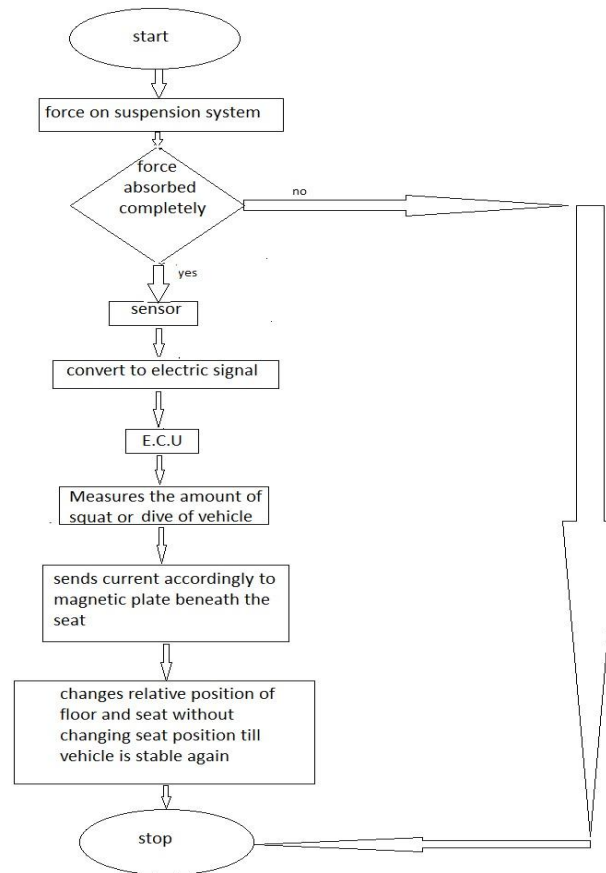
either attract or repel based on the polarity of magnet. By this we can lift a body.

If we place a few strong magnets below the seat and an electromagnet at the floor of the vehicle we can levitate the seat. But this alone cannot be implemented as this system will act in a similar fashion the solid member did and it won't be stable enough to sustain the pseudo forces that will act on it during the acceleration and deceleration of vehicle. So providing a magnetic plate which will both attract and repel the magnet underneath the seat will do the purpose of stabilizing it and it will get levitated.

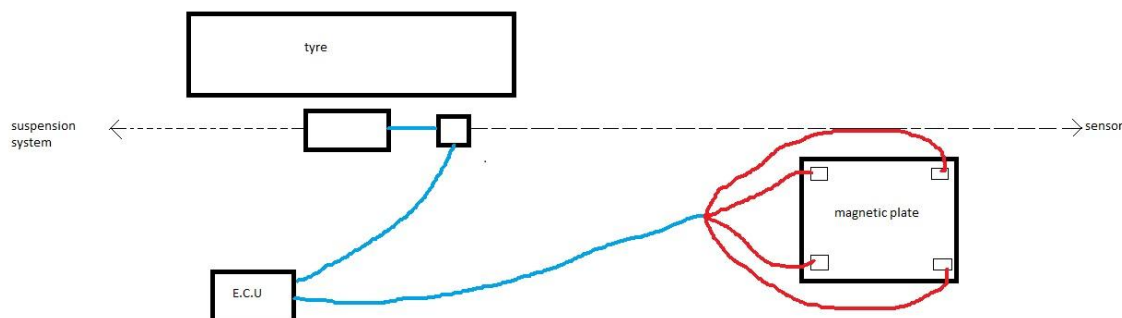
Even this system cannot be implemented directly as it will act as a pure solid member without having any effect on the jerk. This is where electromagnets come into picture.

A sensor may be added in a vehicle so that it will sense the force that went without getting absorbed by the suspension. This force is converted into electrical energy using transducers and sent to the electronic control unit. The ECU then calculates the amount of current that needs to be sent to the electromagnets so that the person will not feel the jerk. Thus the occupant will not feel the jerk as the seat on which he is sitting will be independent of the frame movement. The ECU is programmed such that it will send the current according to the calculations and thus making the seat independent. For e.g. if the car comes over a bump then the nose of the car raises and back gets lifted. The ECU senses it and sends the current to electromagnet so that its relative position between the front of the seat and ground is lowered and the relative position of the rear of seat increases. That means the ECU sends more current to the magnet below the rear part of the seat and less current to the front part of seat thus changing the relative position of seat and floor of car but not the position of the seat.

3. OPERATIONAL FLOW CHART

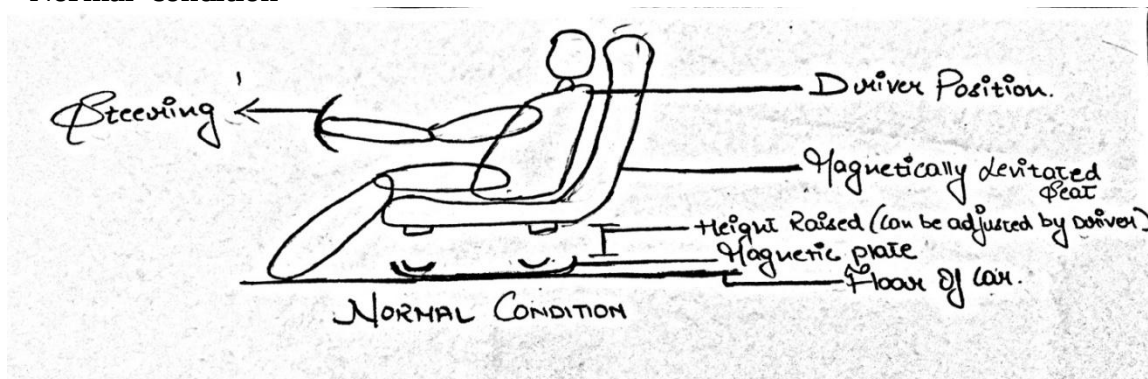


4. SCHEMATIC DIAGRAM



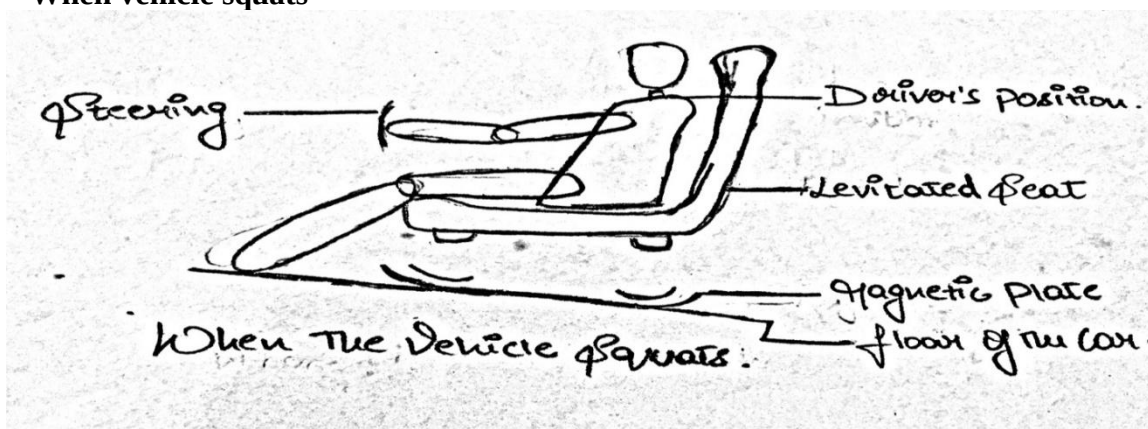
5. SKETCHES

5.1 Normal condition



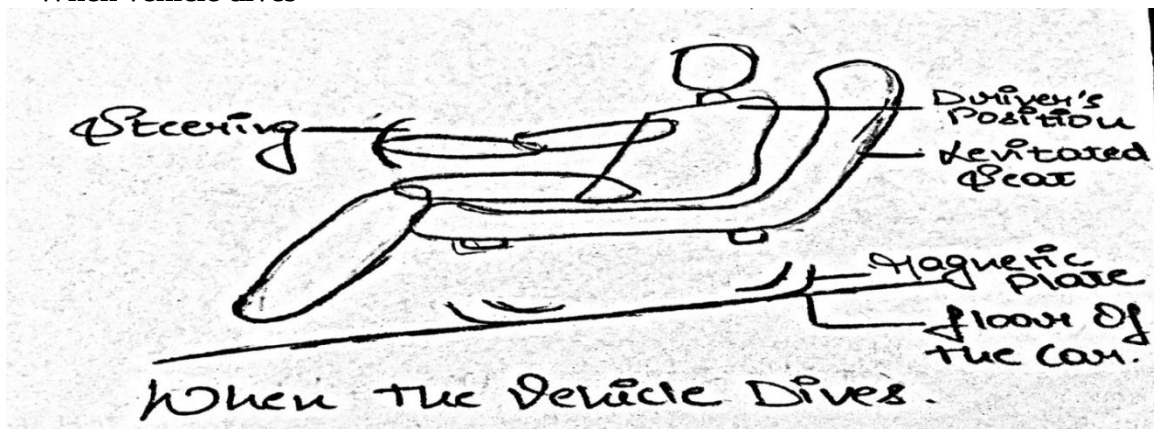
Normal condition

5.2 When vehicle squats



When vehicle squats

5.3 When vehicle dives



When vehicle dives

*note that these images are exaggerated for better visual clarity.

6. ADVANTAGES

- Greater comfort of the driver.
- Aesthetics will improve.
- Leg room for the rear passengers will increase.

7. DISADVANTAGES

- Cost of the vehicle will increase
- Maintenance cost will increase
- Magnetic compatibility of other components needs to be checked.
- High energy losses.

8. CONCLUSION

Electromagnetic levitation technology can improve the ergonomics of a vehicle but will increase the price of it. Thus can be used for luxurious cars.

9. REFERENCES

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