

Innovative Idea for Automobiles Having Zero Harmful Emissions: A Review

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Abstract:

Nowadays, every living organism on this planet is facing problem due to extremely polluted air. Harmful automotive emissions are responsible for 50 to 90 percent of air pollution. If this vehicle emission is continuously going to the atmosphere then living organism will be completely vanished from this planet. So, we have to think about replacement of way of power generation inside the vehicles. Our focus of this study is to present a way by using which we can run automobile without producing any harmful emissions.

Keywords — Four stroke engine, two stroke engine, mechanical watch, small key car, mainspring.

1. INTRODUCTION

1.1 Automobile engines

As we all know about the problem created by automobile, yet no one wants to stop the use of automobile because these vehicles make our life very simple and easy. In some emergency case like a hospital, school, agriculture products etc, we need vehicles for transportation and we cannot imagine our corporate life without these vehicles. So we have to replace the working method of automobiles not replace the automobile.

For understanding the new way of working on automobiles, we have to discuss conventional or running concept of automotive vehicles.

Any automobile engines either they are four stroke engine or two stroke engine, either they are petrol engine or diesel engine, they consist of mainly four processes-

- 1) Suction- In this process fuel enters into the combustion chamber.
- 2) Compression- In this process fuel compressed to very high pressure causes very high increases in temperature of the fuel.
- 3) Expansion or power stroke- In this process fuel mixture start to ignite and combustion of fuel take places causes an enormous amount of increase in pressure and temperature inside the combustion

chamber. This increase in pressure causes movement of piston from top dead centre to bottom dead centre and crank shaft attached to the piston is starting to move in circular motion. In this way generation of power takes place and this power transferred to the wheel of vehicles.

- 4) Exhausts stroke- After combustion of fuel, the gas formed is removed out from the combustion chamber using exhaust valves.

1.2 Alternative method

So the disadvantage in power generation in an automobile is harmful exhaust gases. These exhaust gases will always produce from vehicle when power generation in automobile takes place due to combustion of fuels.

Now for understanding the alternative method of power generation in automobile, we should know about the working concept of two devices-

MECHANICAL WATCH- What a fantastic working of mechanical watch. In the mechanical watch, the input energy given for its working is only twist energy which is given by hand by just rotating the key in

anticlockwise or clockwise and the watch gives us accurate time for next twenty four hours. This happens because of a property of material used in mechanical watch which absorb energy and transfer it to the needle of a watch in a constant way. So here we should notice about the property of material which are used in mechanical watches. The material which absorbs twist energy and then transfer constant force to the needle in watch is known as mainspring.



Fig1. MECHANICAL WATCH

ii) One of the interesting properties of the mainspring is that it transfer constant force to the needle in such a accurate way that time shown by watch is exactly correct with respect to other time showing machines. This property of mainspring forced the researcher to think about its uses in different places.

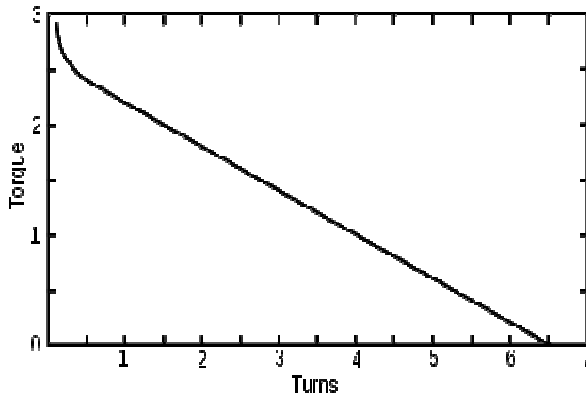


Fig.2 Torque Turns diagram

From graph we can see that the force (torque) decreases linearly with respect to unwinds. Hence, using mainspring we can able to display the time in a mechanical watch accurately.

iii) **SMALL KEY CAR-** The small key car which is usually played by children is the model of our prototype car or automobiles. It is interesting to know that these models available around our society, but no one pay attention towards its huge model and operating phenomena. The working concept of these small key cars are similar to working of mechanical watch. Key nob provided in car is twisted by hand in anticlockwise direction. In this way mainspring present in key car stores these twist energy and release these energy when desire by operator. The release of energy by mainspring makes the key car to move in a forward direction and key car able to cover few metres distance.



Fig3. Mechanical Key Car

So, these small key vehicles can be converted into big vehicles which will have the large energy storage capacity and large energy transferring capacity by introducing just high capacity mainspring. If the capacity of the mainspring is increased by any method, then by twisting the key we can store the large amount energy in mainspring and these energy will transferred to the vehicles for running purpose when required, in a similar way as in a small key car. Hence our study is completely concentrated toward the study about the mainspring or mainspring type material and we will try to find out the effective method, so that the energy storage and working capacity of the mainspring is increased considerably.

An alloy containing a mixture of elements in which the steel is the main ingredient as well as other elements such as carbon, chromium nickel with its percentage of composition less than 2.1%,

30% and 8.5% respectively. These alloying element added to the steel to improve its various properties as for example resistance to rust and corrosion gained due to the formation of a coherent thin layer which is not visible from the chromium oxide stick to the surface of the metal and pure from corrosion, and this become protective sufficiently in high percentage whenever the rate of chromium is high in the steel[1]

2. LITERATURE REVIEW

A. John A. Taylor [1]

studied on the “Effect of Iron in Al-Si Casting Alloys” and he founds that the combination of aluminium and iron as an alloys are very effective way to increases the strength of iron with less density. He observed that the aluminium can enters into the iron intermolecular structure and gives a new arrangement of lattice formation causes changes the molecular structure of iron. These changes can adversely affect mechanical properties, especially ductility, and also lead to the formation of excessive shrinkage porosity defects in castings.

B. JE Hanafee et al[2]

performed their research on the “Effect of nickel on hot hardness of aluminum alloys” and they introduces with world with new concept of increasing hot hardness of material. However, they performed experiment on aluminium and they found that the hot hardness of aluminium increased upto very high magnitude by using nickel as an alloy.

C. Y. Wang, Y. Xiong [3]

investigate the “Effects of beryllium (Be) in Al-7Si-0.4Mg-0.2Ti-xFe-xBe cast alloy” and they suggests that the beryllium addition changes the shape of iron-rich compound from needle or plate shapes to chinese scripts or polygons and the iron-rich compound (named Be-Fe) is aggregated when the composition of iron is high. They also found that Be-Fe is formed during peritectic reaction on titanium-rich particle and located inside the α -Al. These changes result to the higher mechanical properties of the alloy.

D. Murali, S and Trivedi, A and Shamanna et[4]

worked on the topic of “Effect of iron and combined iron and beryllium additions on the fracture toughness and microstructures of

squeeze-cast Al-7Si-0.3Mg alloy they observed that fracture toughness of iron can be reduced by increasing iron content and also suggest that the detrimental effect of iron can be completely neutralize by adding small amount of beryllium.

E. Soo Woo Nam and Duck Hee Lee[5]

performed their research on the “Effect of manganese on the mechanical behavior of aluminium alloys” and they conclude their results by following points- (a) Increase in manganese about 0.5 % by weight in aluminium alloy increases the tensile and yield strength of aluminium considerably. (b) Improves low cycle fatigue resistance of aluminium. (c) Corrosion resistance of aluminium also increased upto high magnitude.

3. MAINSPRING

The mainspring also known as spiral torsion spring or metal ribbon. Mainspring able to store energy when it twisted and we can able to take this energy back when required with constant magnitude of forces. Losses of energy in mainspring are negligible. Mainspring used as a power source in mechanical watches, kitchen timers, music boxes, small car toys etc.

Mainspring are made up of carbon steel alloy. Nowadays, property of the mainspring is enhanced by using iron, nickel and chromium alloy. Sometime along with these alloys also cobalt, molybdenum or beryllium is added so that mainspring able to perform its function for a long time. On the basis of its property and manufacturing process mainspring sometime also known as blue carbon steel and sometimes it is known as white metal spring.

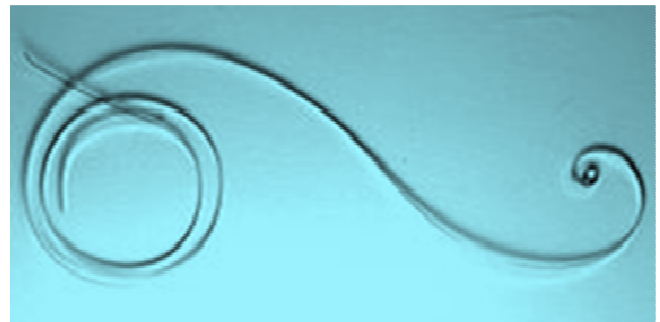


Fig.4 Mainspring used in watch

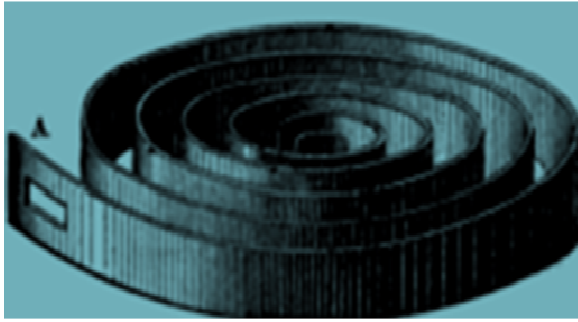


Fig.5 Mainspring used in small toy

4. NEED OF STUDY

- i) Air pollution is increased upto very harmful level and if sufficient and appropriate step not taken by the world, then no one can able to survive on this planet due to air pollution.
- ii) Control noise pollution which is created by automobiles.
- iii) To save the conventional source of energy like- petrol, diesel, kerosene, etc. because once it vanished, then we cannot able to take it back at any conditions.
- iv) The manufacturing cost of automobile is so high that poor people not able to buy this, so innovative idea in power generation in vehicles will reduce the manufacturing cost of automobile.

5. OBJECTIVE OF STUDY

- i) Increase the strength of mainspring by using suitable alloy.
- ii) Increase the strength, reliability and its energy storage capacity by selecting an appropriate heat treatment method.
- iii) Find out the best available element on earth which performs very well as in mainspring role.
- iv) Determine the factor on which property of mainspring depend.

6. PROPOSED METHOD

- i) For manufacturing of mainspring, we will use method like- powder metallurgy, cold rolling, forging and some non conventional machining processes.
- ii) Use computational fluid dynamics software for prediction and determination of its nature with respect to loading condition.

7. GOVERNING EQUATION

For analysis of mainspring using CFD software and for calculating some unknown property of mainspring we can use following governing equation-

- i) Law of conservation of mass.
- ii) Conservation of momentum.
- iii) Conservation of energy.
- v) Newton's third law.
- vi) Gibb's free energy equation.

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