Analysis over the Technique to Improve the Mechanical Vibration Absorption System of Light Automobile Vehicles

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Abstract — We know that the compression springs are used in light automobile vehicles. These springs are fixed vertically over the axle to absorb the vibrations and vertical impacts. But sometimes the impact is applied horizontally or at any angle to the vertical. By this the vertical absorbers are failed to absorb the vibrations and impacts. Here we have required such type absorbers which may absorb the vibrations and impacts at any angle like given fig.(1).

Keywords: Improved Mechanical Vibration Absorption System

I. INTRODUCTION

The automobile vehicles are damaged immediately due to repeating vibrations and impacts. If the shock absorbers are made such type that it is capable to absorb the all direction shocks and impacts easily then by this the running performance of the vehicle may be improved significantly. Repeating and sudden impacts are the big reasons for damaging the vehicles fastely. So it is very necessary that the vibration absorption system should be improved till a sufficient limit.

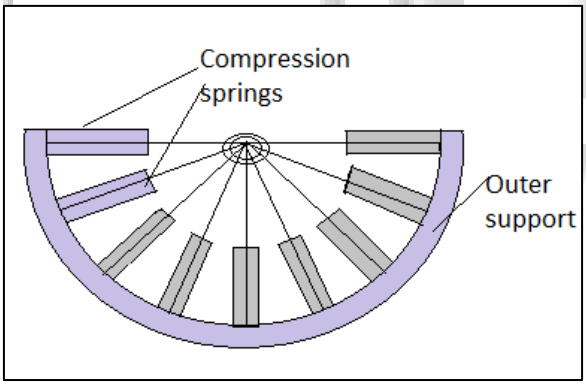

Fig. 1: Combined Spring

A. Methodology related to the effect on running performance of the vehicle –

At broken roads the vehicle suspension system is disturbed completely due to repeating impacts on the vehicle. But by providing this improvement on the mechanical absorption system we can minimize the various type small, big and sudden impacts occurred due to broken road and pits on the road. Due to providing perfect balancing over the wheels the vehicle is run at average speed and at average power consumption. In other words we can say that the performance of the vehicle improves sufficiently till a big limit.

B. Methodology related to the improvement on vibration absorption system –

A significant improvement is provided over the vibration absorption system by changing the new absorber system to the old one. Here according the fig.(1) it is clear that this type spring shocker or spring absorber is capable to absorb the all direction shocks and impacts. By this the vehicle is balanced in all directions significantly, alignment problem is minimized till a sufficient limit. Besides it the vehicle suspension system will be stable till a sufficient long time period. Here the vehicle will be safe if the minor accidents are provided because at such condition the impacts will be absorbed mostly.

C. Methodology related to the effect on the way over which the vehicle is running –

The way over which the vehicle is running, should be smooth and plan as far as possible. There are the various type factors which disturb the vehicle running speed and vibration absorption.

For example –

- Broken roads with pits.
- Sudden up down of roads.
- Continuous deep lining over the road after construction.
- Sharp brakers.

Here due to these factors the absorbers used in vehicles create the serious problem at run time suddenly. Besides it the vehicle slips seriously and due to this the accidents are provided generally.

II. ANALYSIS

A. Analysis over the effectiveness due to change in previous vibration absorption system –

The improved vibration absorption system becomes very effective than the previous one because here the vibrations are absorbed more effectively and easily. Here the vibrations are absorbed more effectively because the all directional impacts are absorbed totally within seconds.

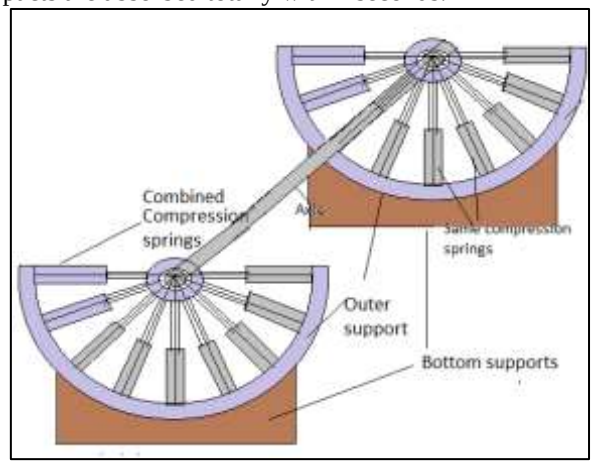

Fig. 2: Axle mounted on combined springs

B. Analysis over the energy absorbed by this improved vibration absorption system –

Due to this improvement in vibration absorption system the shock energy is absorbed sufficiently. Besides it we can see the clear effect by comparison of their results.

We know that the energy absorbed by ordinary absorber is given by –

$$U = (\tau^2/ 4GK^2)\times V$$

While the energy absorbed by new developed absorber is given by –

$$U = (\tau^2 N/ 4GK^2)\times V$$

τ = shear stress
G = modulus of rigidity
K = Wahl's stress factor
V = volume of compression spring
N = no. of compression springs subjected to compression and tension events for new absorber

Here it is clear that the total compression and tension load applied over the vehicle is absorbed by the no. of springs subjected to the loading in the developed vibration absorption system. By this the working life and funtionality of the newly developed vibration absorption system both are increased significantly.

C. Analysis over the shocks and impacts absorbed by this improved vibration absorption system –

Due to absorption of shocks, impacts perfectly at any time and in all directions the running of vehicle becomes smooth and easy till a sufficient limit. Besides it the stability of the vibration absorption system is increased sufficiently due to distribution of whole deflection and whole shear stress applied in no. of sub springs.

D. Analysis over the effect on vehicle performance and efficiency –

Vehicle performance is improved sufficiently because the mostly shocks, impacts are absorbed by the improved vibration absorption system. The time wasted is reduced in travelling over the broken roads significantly. Besides it the efficiency of the vehicle is improved sufficiently, in resultant the average of the vehicle is also improved. Besides it there are following changes provided due to development of new improved vibration absorption system.

1) Spring rate or stiffness - the spring rate OR stiffness for same spring is improved from $k = w/\delta$ to $Nk = w/\delta$.

Where w - the weight applied.
δ – deflection of the single spring.
N – no of springs subjected to the compression, tension events.

Here it is clear that the stiffness of new vibration absorption system (combined spring) is improved by N times due to dividation of load applied in same N no of springs.

Maximum shear stress for the same spring is reduced from $\tau_O = K8wD/\pi d^3$ to $\tau_N = K8wD/N\pi d^3$ due to dividation of whole shear stress in same no. springs in a combined spring. Here →

K → is wall,s factor.
w→ total weight applied
D→ diameter of coil of spring.
d→ diameter of spring wire.

Hence the deflection and angle of deflection both for same springs are reduced significantly from $\delta_O = 8wD^3n/Gd^4$ to $\delta_N = 8wD^3n/NGd^4$ and from $\theta_O = 16wD^2n/Gd^4$ to $\theta_N = 16wD^2n/NGd^4$ due to dividation of whole deflection and angle of deflection over the same N no. of springs of the combined spring.

III. CONCLUSION

It is clear that this type improved vibration absorption system will be more effective and more responsive in comparison with the previous one. And many more points will be improved which will affect the vehicle working performance critically.

REFERENCE

[1] Design of m/c elements.
[2] Self-thinking.

