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Suggested Methodology for Compact Flywheel System of Passenger Cars

V. J. Dhore[1], Prof. E. R. Deore[2]
Dept. Mechanical Engineering[1,2,],S S V P S Bapusaheb Shivajirao Deore College of Engineering, Dhule [1,2]
Email:vjdme.ggsp@gmail.com[1],erdmech@yahoo.com[2]

Abstract-All engines have flywheels or weighted crankshafts that balance out compression and power strokes, maintain idle, aid starting and reduce component wear. If the flywheel is too light the motorcycle requires more effort to start, idles badly, and is prone to stalling. The study focuses on Flywheel mass optimization will lead to better acceleration characteristics of the vehicle. Lowered weight of flywheel system will reduce system weight thereby leading to better fuel economy of vehicle. Compact size: The size of the flywheel will lead to better cabin space of vehicle. By this research study target is to minimize not only weight & to change design but also the energy of Dual mass flywheel make effective in 1.3 times than the Conventional flywheel.

Index Terms-Flywheel Design, Geometrical Design, FEA

1. INTRODUCTION

All engines have flywheels or weighted crankshafts that balance out compression and power strokes, maintain idle, aid starting and reduce component wear. If the flywheel is too light the motorcycle requires more effort to start, idles badly, and is prone to stalling. Weight is not the important factor here, but inertia. Inertia is stored energy, and is not directly proportional to flywheel weight. It's possible to have a light flywheel with much more inertia than a heavier flywheel.

Optimization has been becoming vital to enhance the operation of the specific component so as to get the maximum profit, with minimum cost and the least use of energy. Optimization is the act of obtaining the best result under given circumstances. In design, construction, and maintenance of any engineering system, engineers have to take many technological and managerial decisions at several stages. The ultimate goal of all such decisions is either to minimize the effort required or to maximize the desired benefit.

2. BEST FINDINGS WITH FEA METHODOLOGY

a) Suggested design for compact flywheel.
b) Design and development of inertia augmentation mechanism.
c) Design & Development of Optimized flywheel using inertia augmentation technique.

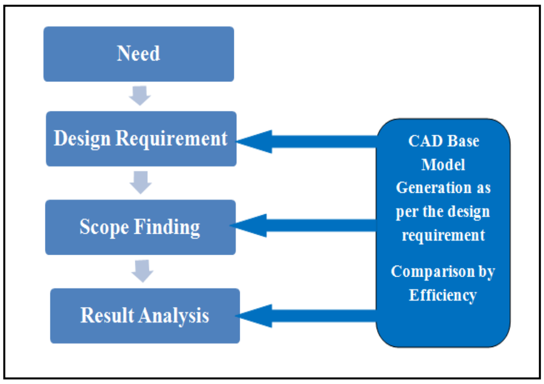

Fig. 1 Flow chart for designing methodology of flywheel

3. FLYWHEEL DESIGN

Any power the motor develops must accelerate the flywheels before leaving the sprocket shaft, and any used in bringing the flywheel up to speed is not available at the rear wheel. This will not show up on a steady-state or rear wheel dyno or simple desk-top dyno program, but is detectable in a transient dyno that accelerates the engine at a specific rate (300 or 600 RPM per second are common).

Flywheel inertia is stored when you rev the engine slightly before letting the clutch out - this small amount of extra power helps in getting the motorcycle underway with minimal effort. By "borrowing" power for a few seconds, the engine has to develop less to move from a standing start. Once the clutch is completely engaged, inertia can no longer be borrowed - the motorcycle can only use what it produce in real time.

In any event, except for when the clutch is slipped all flywheel weight reduces acceleration.

There is no engine speed or other condition where extra flywheel weight helps.

The amount of power a motor develops is not related to flywheel weight. Heavy flywheels do NOT “make more torque”, this is completely fictional. The power is merely stored by the flywheels, and they only have what is diverted from the primary drive.

3.1 *Suggested Mechanism*

Thus it is safe to interpret from above discussion that the flywheel inertia plays a major role in vehicle optimized performance and by suitable modifying the flywheel mass of flywheel can be reduces by still maintaining the inertia.

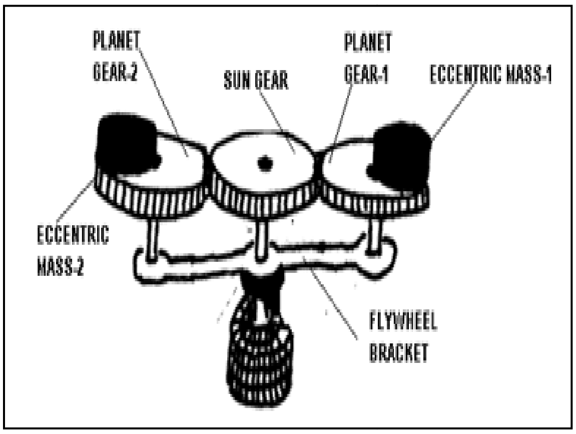

Fig. 2 Inertia augmentation mechanisms

Two gear wheel rotors are swiveling stored on a main rotor shaft. The main rotor shaft is for his part stored on the tax axle swiveling. The gear wheel rotors reach into the tax gear wheel and unreel around this. On the gear wheel rotors mirror-symmetrically eccentric cam weights are appropriate to the tax axle. During a circulation of the rotors around the tax gear wheel move the eccentric cam weights on a certain course, which runs eccentrically to the tax axle. This course results from 2 rotations, which are “engaged” into one another. The eccentric cam weights turn around the axles of the gear wheel rotors and these turn around the tax axle.

The above mechanism working can be categorized in to two cases namely, when masses are close to the tax axle and other when they are away from the tax axle.

The figure. 3 shows free un-damped vibrations set up of two mass- two spring system. As shown in the figure the input to the system is in the form of an low energy intermittent input from any power source (excitation) , this results in free un-damped vibrations are set up in the system resulting in the free to and free motion of the mass (m1)& (m2) , this motion is assisted by gravity and will continue until resonance occurs, i.e., the systems will continue to work long after the input (which is intermittent) has ceased, hence the term free energy is used

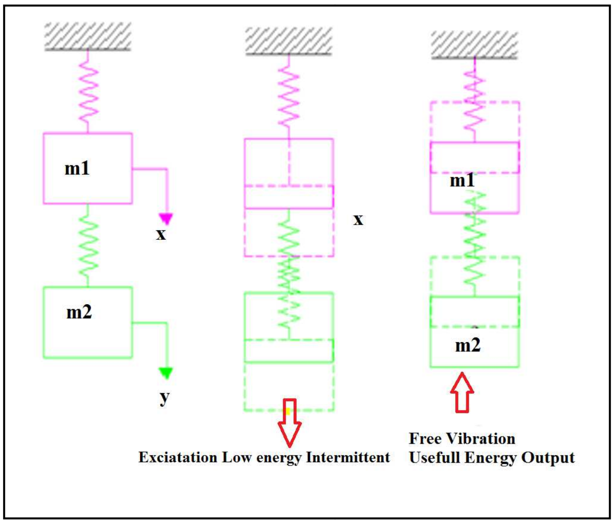

Fig. 3 Principle operation of free undamped vibration of two spring.

Figure. 4 shows suggested CAD base model design of flywheel in passenger car for considering effectiveness criteria with reference to conventional flywheel. Naming description of elements is mention in Table 1. (Description of fig.4 notation).

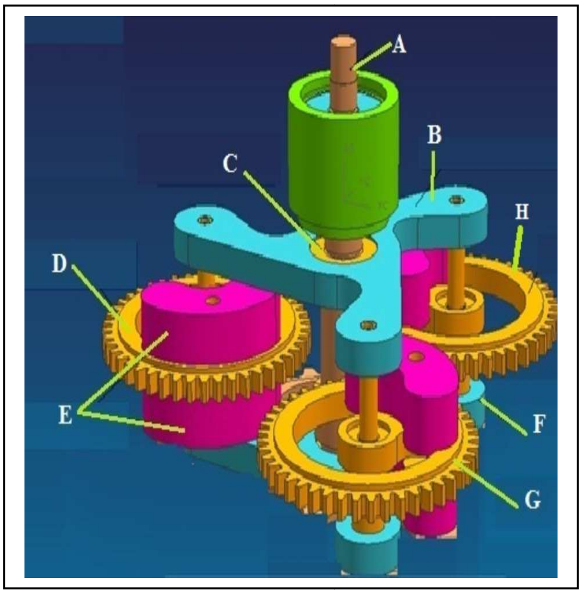

Fig.4 CAD model for flywheel inertia augmentation mechanism.

Table 1. Description of fig.4 notation.

Fig. Notation	Description
A	Engine Shaft
B	Flywheel Bracket -1
C	Uni Directional Clutch
D	Planet Gear-3
E	Eccentric Mass
F	Flywheel Bracket -2
G	Planet Gear-2
H	Planet Gear-1

4. CONCLUSION

The study concludes that flywheel mass optimization will lead to better acceleration characteristics of the vehicle. Lowered weight of flywheel system will reduce system weight thereby leading to better fuel economy of vehicle. Compact size: The size of the flywheel will lead to better cabin space of vehicle. The new design shows free un-damped vibrations set up of two mass- two spring system. In suggested flywheel design the input to the system is in the form of an low energy intermittent input from any power source (excitation) , this results in free un-damped vibrations are set up in the system resulting in the free to and fro motion of the mass, this motion is assisted by gravity and will continue until resonance occurs, i.e., the systems will continue to work long after the input (which is intermittent) has ceased and hence the term free energy is used in new suggested design for better energy efficiency than conventional flywheel.

Acknowledgments

It gives me immense pleasure in publishing this paper on Suggested Methodology for Compact Flywheel System of Passenger Cars. I would like to thank to my guide and Head of Mechanical Department Prof. E. R. Deore for his valuable guidance and encouragement.

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