Analysis Of Pawl Ratchet Mechanism In Heavy Vehicles

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Abstract – The Ratchet And Pawl, a very simple device which allows a shaft to turn only one way. The Pawl and Ratchet mechanism plays a vital role in providing one way transmission and safety against heavy loading conditions. Antiroll back mechanism has been analyzed using ANSYS software. The analysis results are concluded in detail.

Key Words: Pawl, Ratchet, ANSYS, Antiroll back system.

1.Introduction

The paper provides systems and methods for preventing a vehicle from reverse movement on a slope and hill. The system comparison of a heavy commercial vehicle. A ratchet and pawl device connected to at least one wheel of the vehicle. And mechanism ie Actuator which will control the movement of the pawl while engaging or disengaging the mechanism where in the system may be engaged using an engaging mechanism when reverse motion is undesirable or to be restricted, and may be disengaged when the reverse motion is desirable and is to be.

2. Components

Ratchet and Pawl:

A ratchet consists of a round gear tooth, and a spring loaded pin called pawl that engages the teeth. when the ratchet are moving in the forward direction the pawl easily slides over, the tip of each tooth. When ratchet move in the opposite or backward direction, pawl is locked between the teeth and prevents the backward motion. The ratchet wheel widely used in mechanical field. The materials consider for ratchet wheel and pawl pin are plain carbon steel and structural steel respectively. Both surfaced are considered to be hardened. The number of teeth on ratchet wheel is assumed as 15. The solid works CAD three dimensional model of pawl and ratchet shown in figure 1 and figure 2.

3. Properties Of Materials

* Part Name: Ratchet Wheel

*Material Name: Plain Carbon Steel

1) Tensile Strength: 650 Mpa
2) Poisson Ratio : 0.29
3) Modulus of elasticity: 2.1e+005
4) Shear Modulus: 81395 Mpa
5) Density: 7.86e-006 Kg/mm^3
6) Bulk Modulus: 1.667e+005
7) Yield Strength: 380 Mpa
8) Hardness: 400 BHN
9) Elongation%: 30%
4. RESULTS

ANSYS Results are shown below.

Fig-3: Working Mechanism of Model

Fig-4: ANSYS Model Of Pawl And Ratchet

Fig-5: Geometry

Fig-6: Total Deformation

Fig-7: Equivalent Stress
3. CONCLUSIONS

The ANSYS results shown on pawl ratchet mechanism
1) maximum factor of safety: 15
2) total deformation: 0.03275 mm
3) Equivalent (von-mises) stresses: 240.05 Mpa

Above 240.05 Mpa is a maximum stress above that stress mechanism will fail. Mechanism hoist capacity of 6 Tonne Maximum Factor of safety for mechanism is 15. When factor of safety is greater than 15 mechanism fails. Minimum factor of safety is 1.294. The antiroll back mechanism design and analysis in ANSYS Software was able to fulfils all results and give better solution for heavy loading conditions.

REFERENCES


