CENTRALISED LUBRICATION BY USING EPICYCLIC GEAR TRAIN

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ABSTRACT

In many industrial applications it is required to drive the actuators, hydraulic cylinders at variable speed this is only possible by variable discharge from a variable displacement pump so it is not feasible to use it. One method employed is to use a pump of higher discharge capacity, but higher capacity means higher cost and higher power consumption hence there is need of special pump system at low cost so that the requirement of variable discharge is met easily without much cost and set up. This paper deals with the design of such pump systems and its calculations.

The pump is characterized by high displacement rate similar to that of piston pump. While, in case of piston pump the pumping action is due to the reciprocal linear motion of piston. In case of epicyclic gear pump it is due to the relative motion of planet gear. It's a self-adjusting and no leak mechanical seal and thanks to its sealing method, prevents scoring of the pump drive shaft. Internal gear positive displacement rotary pumps. The flow is generated by two gears: the rotor and idler, one inside the other, divided by a crescent. As the gears rotate, liquid is drawn into the spaces created between the gears and the crescent. When the gears mesh, the liquid is forced out of the pump.

INTRODUCTION

A gear or cogwheel is a rotating machine part having cut teeth which mesh with another toothed part to transmit torque. Epicyclic gear transmissions are widely utilised in various industrial applications including robotic arms (1), hybrid vehicle power transmissions (2) and turbine generators (3). Analysing and enhancing the operational efficiency of gear transmissions are important to design optimisation and control. Recent study (4) showed that the input-split HEV (Hybrid Electric Vehicle) should be controlled by considering the transmission efficiency as well as the engine efficiency to optimise the overall system efficiency. Research in Ref. (5) emphasised that power flow and efficiency analysis enable transmissions to achieve high efficiency and low energy consumption by avoiding power circulation.

Despite the advantages of epicyclic gear trains such as compact structure, lightweight and high power density, they may have relatively low efficiency compare to simple gear systems (6). The principle power losses in gear trains are caused by sliding friction between meshing gear tooth surfaces, churning of lubrication oil and friction in shaft support bearings (7). Here, only power loss due to gear mesh is considered. Our previous work (8) indicated that immense latent power losses in gear meshes could significantly reduce the efficiency of an epicyclic gear train.

Many results have reported by studying simple and compound epicyclic gear systems. A general algorithm was reported in Ref. (6) to determine efficiency of spur-gear trains. Kahraman et al. (9) proposed a general formulation for kinematic analysis and power flow analysis.

AIM & OBJECTIVES

1 Identify the components of simple planetary gear set.

2. Identify the basic concepts and types of gears.

3. Define a compound planetary gear set and explain how it operates.

4. Identify the basic gear train arrangement used in transmissions.

5 To reduce the maintenance cost of motor and pumping system.

6 To reduce number of motor use in a conventional different lathe machine.

7 Instead using single motor the hole system supply the cooling fluid in different lathe machine

8 To achieve maximum discharge in a lathe machine.

LITERATURE REVIEW

A literature review is a text of a scholarly paper, which includes the knowledge including substantive findings, as well as theoretical and methodological contributions to a particular topic. Literature reviews are secondary sources, and do not report new or original experimental work and are not to be confused with book reviews that may also appear in the same publication. Literature reviews are a basis for research in nearly every academic field. The conventional lubrication system used by the company was not economical to use because for variable discharge different pumps, Motor, control valves were required for variable discharge due to that the overall setup cost increases and it was not economical for the company.

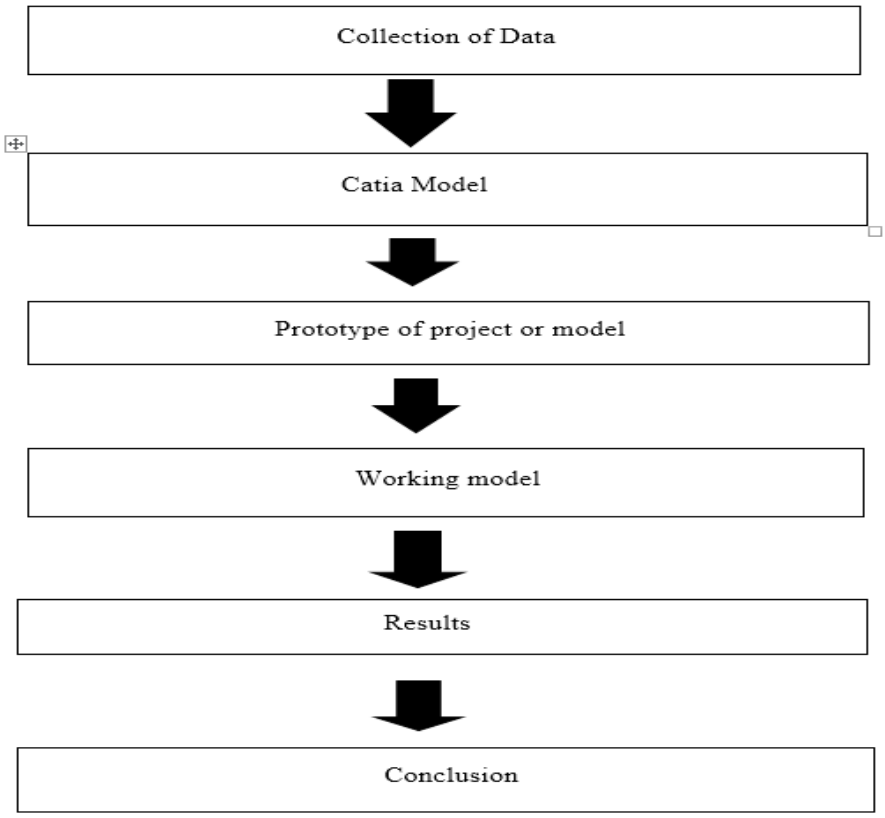
Vincent Babin et.al, this paper concluded that the dynamic equations for the mechanical transmission system are given and a dual-motor joint mechanism is designed and prototyped to test this new concept of robotic joint. A simple model of the three basic two-dof planetary drive systems was presented. In order to target retrofit applications, a ratio of one to one was sought between the primary input motor and the output.

Huayan Pu et.al, this paper concluded that the epicyclic gear mechanism is the key componentof e-Paddle-EGM to perform multiple gaits. Different velocity ratio, the virtual power flow isdistinguished into four cases. The efficiency formula and its applicable range are derived in eachcase. Two particular conditions verified the proposed efficiency formulas.

Mattia Battarra et.al, this paper concluded that the four different pump prototypes have been designed in order to evaluate the phenomenon under the effects of different design solutions. In particular, last prototype has been specifically designed to not be affected by cavitation throughout the entire working conditions range examined**.**

So, to overcome from this problem the new design for variable discharge, a pump has been developed i.e. “Centralized lubricating system using epicycle gear pump”. It is easy to handle, reduce overall cost, low maintenance.

METHODOLOGY



WORKING OF EPICYCLE GEAR PUMP

In the epicycle gear pump are consist of a Coolant Tank, Cooling Fluid, Motor, Sun Gear, Planet Gear, Shaft, Internal Gear Pump, Casing etc. When motor start the switch then the motor shaftrotates. The shaft are connected to the sun gear and sun gear mesh with the planet gear so planet gear are rotates also the planet gear shaft is connected to external gear in an internal gear pump so from thetank cooling fluid suck in an internal gear pump and discharge to the application wherever in cooling fluid required.

SCOPE OF PROJECT

1. Increase in productivity.
2. It can be used for various types of loads.
3. Variable discharge can be obtained by varying the number of teeth on gear.
4. Back pressure can be reduce by disconnecting one of the pump.

RESULT & CONLUSION

The efficiency and reliability of the centralised epicycle gear pump has enhanced by the system and the result of the centralised epicycle gear pump has made more reasonable. The problem stated to us was a fascinating one though we as an engineer had to solve it by using our expertise. We were ableto counter the problems raised at the site. The planet gears transmit the accumulated power to the sun gear, the output shaft.

REFERENCES

[1] Vincent Babin, Clement Gosselin and Jean-Franc¸Ois Allan, "A Dual-Motor Robot Joint Mechanism with Epicyclic Gear Train", Intelligent Robots and Systems, September 2014, Chicago, Il, Usa

[2] Huayan Pu, Jinglei Zhao, Yi Sun, Shugen Ma, Jun Luo, Jason Gu, Tao Wang And Zhenbang Gong, "Efficiency Analysis of Epicyclic Gear Mechanism of The Improved Paddle Mechanism Via Virtual Power", IEEE International Conference on Robotics and Biomimetics (Robio) Shenzhen, China, December 2013

[3] Mattia Battarra, Emiliano Mucchi, "Incipient cavitation detection in external gear pumps by means of vibroacoustic measurements", www.elsevier.com/locate/measurement, 5 July 2018

[4] Reference books N.S. salunke production engineering and technology and robotics