Gearless Transmission Mechanishm

Surykar Pundlik Shivaji[1], Melkunde Manmath Shivsharan[2], Gade Prathamesh Keshavrao[3], Bhande Sakshi Ramdas[4] , Prof. Rathod Yuvraj Shivaji [5]

[1, 2, 3, 4]Dept of Mechanical Engineering

[5]Guide Lecturer, Dept of Mechanical Engineering

[1, 2, 3, 4, 5] Vishweshwarayya Institute Of Engineering & Technology, Almala, Maharashtra ,India

Abstract- *Gearless transmission mechanisms, often referred to as elbow or link-based transmission systems, provide an alternative method of power transfer without the use of conventional gears. These systems utilize a network of rotating links and joints to transmit motion and torque from the driving shaft to the driven shaft. This approach reduces mechanical complexity, minimizes friction losses associated with gear teeth, and lowers maintenance requirements. The gearless transmission mechanism is particularly useful in applications where shafts intersect at various angles and smooth, continuous motion is required. This study discusses the working principle, design considerations, components, advantages, limitations, and potential applications of gearless transmission systems. The aim is to analyze their efficiency, reliability, and feasibility as a substitute for traditional gear-based transmissions in mechanical and industrial systems.*

Keywords: Gearless Transmission, Link Mechanism, Power Transmission, Mechanical Design, Elbow Mechanism.

I. INTRODUCTION

In modern mechanical systems, transmission of power plays a crucial role in transferring motion and torque from one shaft to another. Traditionally, gears are used for this purpose. However, gear-based systems involve friction, noise, and frequent maintenance due to wear and tear.

A gearless transmission mechanism provides an innovative alternative. It uses links and bearings to transmit motion between shafts at desired angles, eliminating the need for gears. This system reduces losses due to friction, ensures smooth power transfer, and requires less maintenance.

Gearless mechanisms are commonly used in hand drills, automobile steering systems, and certain industrial machinery where compact and efficient power transmission is needed.

II. HISTORICAL

Origins of Gearless Transmission Mechanism

The concept of gearless transmission has its roots in the fundamental principles of kinematic link mechanisms and rotary motion transfer. Since ancient times, mechanical power has been transmitted using simple mechanisms such as belts, chains, pulleys, and gears. However, the idea of transmitting motion without using gear teeth emerged from the study of linkage mechanisms and crank arrangements. Early mechanical engineers experimented with slider-crank and cam-follower systems to convert and transmit motion without relying on meshing gears. These mechanisms were mainly used in small machines and hand-operated devices where simplicity and case of fabrication were important.

During the late nineteenth and early twentieth centuries, advancements in mechanism design and machine theory led to the development of various link-based rotary transmission systems. Engineers focused on reducing friction, noise, and wear caused by gear tooth contact. As a result, alternative transmission methods using elbow mechanisms, universal joints, and multi-link rotary arrangements were introduced for specific industrial applications.

III. OBJECTIVE

The objective of the gearless transmission mechanism is to design and analyze a system that can transmit power between shafts without the use of gears. It aims to reduce mechanical complexity, minimize friction and maintenance, and provide smooth and efficient power transmission using link-based mechanisms. The study also focuses on evaluating the performance, reliability, and practical applications of gearless transmission systems as an alternative to conventional gear-driven mechanisms in mechanical and industrial fields.

IV. WORKING PRINCIPLE

The gearless transmission mechanism works on the principle of link mechanism and rotary motion transfer. Instead of gears, it uses a set of bent links (elbow rods) connected between the driving shaft and the driven shaft. When the input shaft rotates, the attached disc also rotates and moves the bent links in a circular path. These links transmit the motion to another dise connected to the output shaft.

The continuous movement of the links converts the rotary motion of the input shaft into rotary motion of the output shaft, even when the shafts are placed at an angle (such as 90°). Thus, power is transmitted smoothly through mechanical links without the need for gears, making the system simpler and reducing friction and maintenance.

V. ADVANTAGES

1. **Simple Design** - The mechanism has a simple construction since it does not use complex gear arrangements.
2. **Low Maintenance** - Fewer components and no gear teeth reduce wear and tear, resulting in lower maintenance requirements.
3. **Reduced Friction Losses** - Absence of gear meshing decreases friction, improving efficiency.
4. **Smooth Power Transmission** - Motion is transferred smoothly through links, reducing noise and vibration.
5. **Flexible Shaft Arrangement** - Power can be transmitted between shafts placed at different angles, such as 90°.
6. **Cost Effective** - Manufacturing and maintenance costs are lower compared to traditional gear systems.
7. **Lightweight System** - The mechanism is generally lighter because it does not require heavy gear assemblies.
8. **Less Noise** - Since there is no gear engagement, the system operates more quietly.

VI. FOLLOWING ARE THE MAIN COMPONENTS OF GEAR-LESS TRANSMISSION MECHANISM

1. L-Shaped Frame (Base Structure)
2. Shaft (Solid Circular Rod)
3. Pedestal Bearing
4. Circular Disk
5. Bent Rod (Linkage)
6. Nut & Bolt
7. Motor

1. L-Shaped Frame

2. Shaft

3. Pedestal Bearing

4. Circular Disk

5. Bent Rod

6. **Nut & Bolt**

7. Motor

VII. CONCLUSION

The gearless transmission system provides a simple and efficient way to transfer motion without using gears. It offers advantages such as reduced friction, noiseless operation, compact design, and less maintenance. Although it may not handle very high torque loads, its performance is adequate for moderate mechanical applications. This mechanism can be further developed using advanced materials and optimized link geometries for industrial use.

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