Gearless Power Transmission upto 180 Degree

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Abstract: *Now Day's Gearless transmission mechanism transmits power from input to output shaft by means of sliding links that form revolute pair with the hub. Links bent at required angle slide inside the holes in the hub. Thus, as the holes in input hub rotate; it pushes the links and in turnout put hub is rotated. This mechanism can be used as replacement for bevel gears in low cost, low torque application. It can transmit at any angle 0 to 180 degree. In this paper the mechanism is studied and a possible go-kart transmission layout is fabricated and few future applications are suggested. In this project we make the power transmission in 180 degrees without losses. In daily routine we use the power transmission device or system, but some system has use gears and various components for power transmission. Because of gears we losses some power and losses of power and energy that's why we make power transmission in 180 degree. In this project we can transmit power in 180 degree without loss.*

Keywords: *Power Transmission, Shaft.*

I. INTRODUCTION

Today's world requires speed on each and everyfield. Hence rapidness and quickworking is the most important. Now days for achieving rapidness, various machines andequipment's are manufactured. Gears are costly to manufacture. Its need to increase the efficiency of transmission which cannot be done using geared transmission. Gearlesstransmission mechanism is capable of transmitting power at any angle without any gearsbeing manufactured. So here I introduced a gearless power transmission system for skewshafts which reduce the losses, cost & save the time and space. This system allows thechanging in the orientation of shafts during motion which is very interesting andfascinating about this mechanism. Also, during analysis of mechanism and working it isseen that this gearless transmission can be used for both intersecting shafts and skew shaftsbut here we introduced a solution for skew shafts so main attention is towards the skewShafts. Gearless power transmission up to 180 degrees can be achieved through variousmechanisms such as harmonic drives, cycloidal drives, and magnetic drives.

Harmonicdrives use flexible components such as a wave generator, a flex spline, and a circular splineto transmit power between the input and output shafts. The wave generator rotates eccentrically and creates a deformation in the flex spline, which in turn causes rotation inthe circular spline. This allows for precise and efficient power transmission up to 180degrees. Cycloidal drives use a cycloidal disk and cycloid pins to transmit power. Theinput shaft drives the cycloidal disk, which rotates eccentrically and drives the cycloid pins around the circumference of the output ring gear. This mechanism allows for smooth andprecise power transmission up to 180 degrees. Magnetic drives use magnetic fields totransmit power without any mechanical contact. They consist of two parts: a driving sectionand a driven section.

The driving section generates a rotating magnetic field, which induceseddy currents in the driven section and causes it to rotate. This mechanism allows forprecise and efficient power transmission up to 180 degrees.Overall, these mechanismsprovide a reliable and efficient means of power transmission without the use of gears,making them ideal for various industrial applicationIt is an ingenious link mechanism of slider and kinematic chain principle. Transmits powerat any angle without utilising gearsTransmits the power between two shafis whose axes are at 90 degrees through bent links.Three links slide relatively according to the motion given to input shaft. Due to this, therotational motion of input shaft is converted into sliding motion of links which is thenconverted to rotational motion of the output shaft.

II. CONSTRIUCTION& WORKING

It is an ingenious link mechanism of slider and kinematic chain principle. Transmits power at any angle without utilising gears Transmits the power between two shafts whose axes are at 90 degrees through bent links. Three links

slide relatively according to the motion given to input shaft. Due to this, the rotational motion of input shaft is converted into sliding motion of links which is then converted to rotational motion of the outputshaft The Gearless transmission or El-bow mechanism is a device for transmitting motion at any fixed angle between the driving and driven shaft. The synthesis of this mechanism would reveal that it comprises of a number the escape of air compressed by the pumping action of the rodsof pins would be in between 3 to 8, the more the pins the smoother the operation. These pins slide inside hollow cylinders thus formatting a sliding pair.

Our mechanism has 3 such sliding pairs. These cylinders are placed in a Hollow pipe and are fastened at 120 degrees to each other. This whole assembly is mounted on brackets wooden table. Power is supplied by an electric motor. The working of the mechanism is understood by the diagram. An unused form of transmission of power on shaft located at angle. Motion is transmitted from driving to the driven shaft through the roads which are bent to conform to the angles between the shafts. These roads are located at in the holes equally spaced around a circle and they are free to slide in & out as the shaft revolves. This type of drive is especially suitable where quite operation at high speed is essential but only recommended for high duty. The operation of this transmission will be apparent by the action of one rod. During a revolution. If we assume that driving shaft "A" is revolving as indicated by arrow the driven shaft B will rotate counter clockwise. As shaft A turns through half revolution C shown in the inner and most effective driving position slides out of both shafts A & B The first half revolution and rod "C" then will be at the top then during the remaining half this rod "C" slide in wards until it again reaches to inner most position shown.

III. DESIGN

3.1 DESIGN CALCULATIONS

Testing of the machine and for functioning

Power of motor = ¼ H.P = 746 x 0.25 = 186.5 N- m /s

Rpm of motor N= 1440 rpm

Power of motor P =186.5 watt.

$P = 2\pi N\ TP\ /60$ --------- (Eq.1)

Where, N = Rpm of motor = 1440

T = Torque transmitted

From eq.1 we get,

$186.5 = 2\pi \times 140 \times T/60$

T = 1.23 N-m

T = 1238 N-mm.

3.2 DESIGNING OF SHAFT

Following stresses are normally adopted in shaft design

Max tensile stress = 60 N/mm2

Max shear stress = 40 N/mm2

Considering 25 % overload

Tmax= 1238 x 1.25= 1.525 x 10 3 N-mm

The shaft is subject to pure torsional stress

We know T= 3. 14/16 x fs x d3

15250 = 3. 14/ 16 x 70x d3

D =10.20mm

Taking factor of safety = 2

D = 10 x 2 = 20mm

A shaft diameter is 20mm and length is 230mm

$M = 2151.11N \times 230mm$

$= 494755.3 Nmm$

Bending stress for shaft

$\sigma = 32M\pi \times d3$

=186.649N/mm²

Tensional shear stress of shaft

$Mt = \frac{60 \times 10^6 \, kw}{2\pi n}$

Where, Kw=7.5, n=120

Mt=596831.03Nmm

$T = 16Mt/\pi d^3$

$= 16 \times 596831.03 / \pi \times 20^3$

=112.57N/mm

3.3 DESIGNING OF HUB

Considering a hub of internal diameter is 32mm and outer diameter is 92mm, length is 82mm.

$p = 100 \times 9.81 = 981$

$\sigma b = pD_i^2 / D_0^2 - D_i^2$

$= 980 \times 32^2 / 92^2 - 32^2$

=135.01N/mm

3.4 DESIGNING OF EL-BOW ROD

We know that, Same torque is transmitted to bent link shaft

So, torque on each shaft = T /3 = 15250 /3 = 5083 N mm

T= 3. 14/16 x fs x d3

5083 = 3. 14/ 16 x 70x d3

D = 7.17 mm.

Take approximately D=8mm.

Diameter of rod is 8mm and length is 300mm

$Z = 0.78R^3$

$= 0.78 \times 4^3$

= 49.92 kg/mm²

Bending stress of rod

$\Sigma = PL/4Z$

$= 186.5 \times 300 / 4 \times 49.92$

=280.19 N/mm²

IV. CONCLUSION

During working on experimental setup and after a long discussion it is observed that proposed arrangement Used for any set of diameters with any profile of shafts for Skew shafts of any angle but the shaft's must be having the Rotational motion about his own axis, transmission of motion Is very smooth and desirable and used only for the equal R.P.M. of driving shaft and driven shaft by employing links or Given type of links for appropriate joints for revolute pair. Some successful mechanical devices function Smoothly however poor fly they are made while other does This only by virtue of an accurate construction & fitting of Their moving parts.

This projects which looks very simple & easy to Construct was actually very difficult to conceive & imagine Without seeing an actual one in practice. Motions demands to Be studied first & we have done that very thing. We find that while acceptable analysis for existing mechanism can often Be Made quite easily, we cannot without insight & Imagination make effective synthesis of new mechanism Hence we are mould to present this our project gear less Transmission at 90 degree (El-bow mechanism) which we Have managed to successfully device after long & hard input In conceiving its working principle.

V. ADVANTAGES

- Low Cost
- Easy And Time Saving Installation of Setup

- Very Less Skill Is requiredfor Setup
- The Main and Very Interesting Advantage of This Proposed System Is That We Can Changes the Position of Shafts During Motion or During Intermittent Position According to Need by Using Given Type of Links at The Place of Pins Which Is Not Possible in Any Existing System Ttll Now.
- Since Any Dimension of Any Component Used Is Not Out the Shafts Dimensions Limit, A Large Reduction in The Size of The Machines Is Possible. Inshort, A Large Space Saving Should Be Done.
- Less Heat Generation During Working
- Easy To Drive
- More Suffient Speed

VI.APPLICATION

• Used For Angular Drilling Between 0 To 90 Degree Position.

• Lubrication Pump for C.N.C. Lathe Machinesh

• The Mechanism Is Very Useful for A Reaching a Drive at A Clumsy Location.

• Air Blower for Electronic And Computer Machine.

• The Mechanism Has Found a Very Usefully Use in Electronic and Computer Technology for Multiple.

• The Elbow Mechanism Is Used for Movement of Periscope in Submarine

• It Transmit Power Up to 180 Degree Without Losses.

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