90 DEGREE POWER TRANSMISSION

[1]Tushar Pargi [2]Mr.Bhaumik Bhandari [3]Dr. Dipesh Patel

[1] Student of D.A.Degree Engineering & Technology, Mahemdabad-Gujarat, India

[2]Assistant Professor in Mechanical Engineering Department

[3]Head of the Institute

Abstract

Introduced gearless power transmission arrangement used for skew shafts. In this transmission system no. of pins or links used must be odd.3, 5, 7, 9…. & centers of any two pins or links hole must not be on that line which represent the diameter of the shaft. If more pins or links used motion will be smoother, but increase in no. of pins or links not at the cost of strength of the shaft. Pins or links are fixed (may be permanent or temporary) in the drilled holes at each shaft ends due to which motion is transferred. The dimensions of the pins or links and angle for the pins are all given very precisely, holes drilled very accurately.

Gearless transmission mechanism transmits power from input to output shafts 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 turn output hub is rotated. This mechanism can be used as a replacement for bevel gears in low cost, low torque applications. It can transmit at any angle 0 to 180.

Proposed arrangement used for skew shafts at any angle & if there is a need, we can change the angle between shafts during motion or during intermittent motion with any profile of shafts having rotational motion along its own axis. The working of this arrangement is very smooth & use very effectively with a very minimum amount of power losses.

Keywords

Gearless power Transmission, Right Angle, Transmission, Elbow

Introduction

In today's world energy is the prime requirement in each and every field. As the world is progressing towards the 22nd century every bit of energy becomes crucial because the resources that we have for producing energy is very limited and soon will be getting finished. For transmitting motion and power from one shaft to another which are non-parallel or intersecting and co- planar bevel gearing are

generally employed. But there are some inherent disadvantages associated with bevel gearing stated as complexity in manufacturing, high cost of replacement. To overcome all these difficulties, we have a mechanism which transmits motion between the two non-parallel (intersecting) and coplanar shafts. The mechanism is known as Gearless mechanism is equipment consisting of elbow rods, hub and shaft. Gearless elbow mechanism works on the principle of slider and kinematic chain principle. This time world requires speed on each and every engineer's field are confronted to the challenges of efficient transmission of power. Gearless transmission is an ingenious link mechanism of slider and kinematic chain principle. It is also known as ELBOW mechanism. This project is the useful to improve the quality of gear being manufactured and can be made in very less time. The component is exceptionally cornering or transmitting movements at right points. However, in certain mechanical application gearless transmission at right angle can likewise work at insensitive or exact edge plane can be contrasted with worm and worm rigging or slant and pinion gear which are constantly utilized as a part of the business for various application.

Skew Shaft The term "shaft", used in this standard has a wide meaning and serves for specifications of all outer elements of the part, including those elements, which do not have cylindrical shapes and "skew" means non parallel and non-intersecting so the shafts which are non-parallel and nonintersecting are known as skew shafts. Gears: Gears are used for transmitting power from one part of the machine to another. Gears are usually made of metal and have high strength as they have to run at high speed and transfer power efficiently.

Functions of gears are: Increase speed, Increase force, Change direction

Types of gears used for transmission of power at Right Angle: Bevel & Pinion Gear, Worm& Worm Gear, Hypoid gears.

Elbow Mechanism the Elbow Mechanism is the mechanism which is used to transmit power though strong shafts which are bend at 90°.In this the power is given to the outer plate and the outer plate rotates through which the L – shaped shafts and through which the power is transmitted to other plate which is present at an angle of 90°.Hence very little friction plays while the power is being transmitted.

The basic design of parts and assembly in Unigraphics. The following figure shows the isometric view of the rendered picture from the Unigraphics Software model.

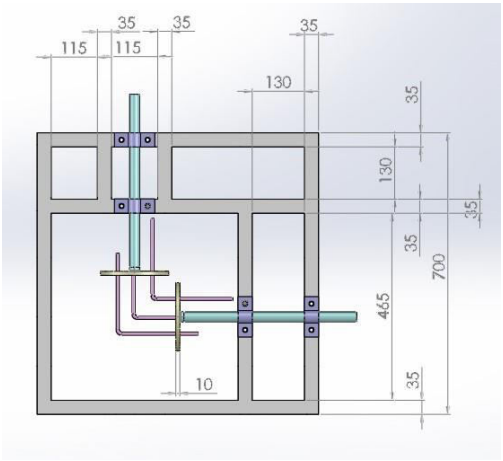

Figure *1*

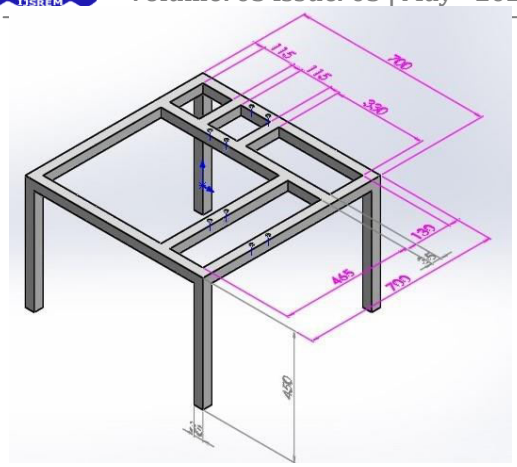

Figure 2

Shafts, Elbow rods and hub are required and are being used here to transmit the power from one position to the other.

Items use of bushes and other items for connecting the metal pieces along with the shafts for proper power transmission.

The motor being used here is of power

First the base plate was fitted with the supports under it.

Then motor and shaft assembly separately were fixed to the base plate.

Now comes the main part of the picture- the discs with the L-shaped frames were coupled with the Shafts Finally the shaft assembly on the other side was also been attached.

Total assembly was done and some painting work is done for good visual appearance.

Finished product was obtained. (fig 3 is final design)

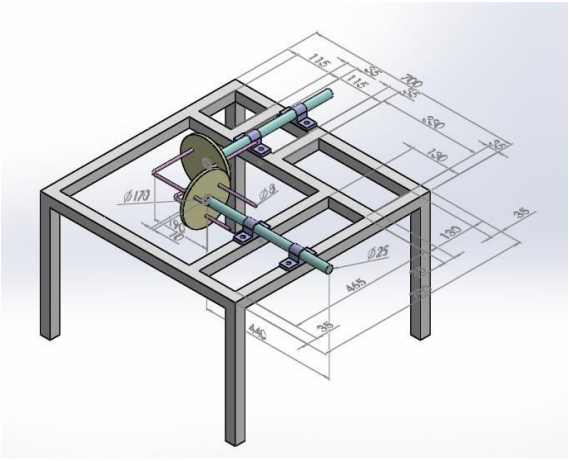

Figure 3

Literature review

Before we actually start with the project it was important to make market study and understand the current existing systems. With this forming the first phase towards the approach of the project, a number of research papers were studied to understand the currently existing systems. In addition, since this is a new topic the amount of data available is very less so a brief study was done over the internet which is documented below.

In the paper of "Ashish Kumar et al. performed study on Multi Angular Gearless Drive." The mechanism was loaded with 3 Nos. of L-pins. Parts of mechanism were modeled on Solid Works and the analysis of the mechanism was carried out on ANSYS. The study of mechanism was carried with 0.63 Moment of Inertia (Provided by Solid Works). Behavior of system is plotted on different charts i.e., Velocity vs. Time, Acceleration vs. Time, Angular Acceleration vs. Time, Separation Distance vs. Time. From This it was concluded that the final design thus obtained is capable of transmitting torque.

In this paper "Atish Lahu Patil had studied Gearless Mechanism in Right Angle." The mechanism was consisting 3 pins bent equally at 90^0. It was found from study that the more the Nos. of link will make the operation smoother. The pins were made up of bright bar with a excellent surface finish. The wood cutter was mounted on the output shaft which can cut up to 250mm width of wooden sheet. By working on experimental setup and after a long Study it is Concluded 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 38 Yasarkhan, S.Raihan, P.Pankil, P.Hiren and Devendra Patel 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.

Calculation

DESIGN OF MAIN SHAFT

Here,

Motor specification: P = 3 HP

N = 90 RPM

Now,

P = 3 * 746 Watt

= 2238 watt or Nm/s

As we know,

$P = T * \omega$

$= T * (2*\pi*N/60)$

$2238*10^3 = T * (2*3.14*90/60)$

$T = 237.459*10^3$ NM ..... (1)

Taking overloading 25%

$T_{max} = T*1.25$

$= 237.459*10^3*1.25$

$= 296.82*10^3$ NM ..... (2)

Now,

$T_{max} = \frac{\pi}{16} * \tau * d^3$

Here τ = 240 MPa (for mild steel)

$296.82*10^3 = \frac{\pi}{16} * 240 * d^3$

d = 18.46 mm

So, taking d = 20 mm (standard)

DESIGN OF HUB

Here,

Load (W) = 100*9.81

= 981 N

$\sigma_b = \frac{W}{A}$ $(A = \pi r^2; r = 50 \text{ mm})$

= 981*4*1000/ (3.14*10000)

= 124.9 N/mm^2 ..... (3)

- Which is in safe limit from analysis

DESIGN OF BENT LINKS

Here,

$T = T_{max} / 3$

$= 296.82*10^3 / 3$

$= 98.94*10^3$ N.mm

So,

$T = \frac{\pi}{16} * \tau * d^3$

$98.94*10^3 = \frac{\pi}{16} * 240* d^3$

From above we get;

d = 12.80 mm

So, take it d = 13 mm ….....(4)

Scope and Objective

1. Working on stress concentration is recommended.
2. Working on aluminum as a prime material is Recommended.
3. Fatigue analysis is recommended
4. Analysis of the mechanism with higher no of elbow rods is recommended

The objective of this project is to understand and implementation of elbow mechanism for the transmission of power from one shaft to another shaft which are in right angle without the usage of gears. To analysis the revolution speeds at specific hub dimension on the basis of fabrication model.

Aim of Project

Today, the bending machine that available in the market is for the sheet metal and tube bending machine. Many machine makers vary their products based on the capacity of the bending machine and power driven or manual. Moreover, most of the machine uses roll bending type. This type of machine has 3 rolls which is 1 roll is fixed and the other 2 are adjustable. The metal pipe needs to put in the roller and then rolls around it until the desire shape is acquired. The products that can be produced with this machine are various curves, structural elements, automobile parts etc.

- To prepare our self and to work individually.
- To get the knowledge of each team member in various subject which we have studied up till now.
- To develop skill in various functions of manufacturing.
- To develop problem solving skill.

Conclusion

The gearless power transmission is one of the budding ideas of the technology. The project 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. We find that while acceptable analysis for existing mechanism can often be made quite easily. 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

References

[1]. Amit Kumar, Mukesh Kumar, "Gearless Power Transmission for Skew Shafts (A SRRS Mechanism)", International Journal of Advanced Science and Technology, Vol.79, pp. 61-72, 2015.

[2]. Atish Lahu Patil, Vinay Prabhakar Jadhav, Sagar Padmakar Patil, Roshan Suresh Shelar, "Gearless Mechanism in Right Angle", w2 Journal on Recent Trends and Innovation in Computing and Communication, Vol.4,Issue 4, pp. 145-149.

[3]. Navneet Bardiya, Karthik.T, L Bhaskara Rao, "Analysis and Simulation of Gearless Transmission Mechanism", International Journal of Core Engineering & Management (IJCEM), Vol.1, Issue 6, , pp. 136-143, 2014.

[4] Design of Machines by R.S. Khurmi (S. Chand publication)