

Gearless Mechanism in Right Angle

Atish Lahu Patil¹, Vinay Prabhakar Jadhav², Sagar Padmakar Patil³, Roshan Suresh Shelar⁴
^{1,2,3,4}Department of Mechanical Engineering
Vishwatmak Om Gurudev College of Engineering
Aghai-Kalyan, India
¹patilatish60@gmail.com
²vinayj994@gmail.com
³shelarroshan6@gmail.com
⁴sagarp1610@gmail.com

Prof. Pavan Nikam
Assistant Professor. Department of Mechanical Engineering
Vishwatmak Om Gurudev College of Engineering
Aghai-Kalyan, India.

Abstract— Today's world requires speed on each and every field. Hence rapidness and quick working is the most important. Now days for achieving rapidness, various machines and equipments are manufactured by man. The engineer inconstantly conformed to the challenges of bringing ideas and design in to reality. New machines and techniques are being developed continuously to manufacture various products at cheaper rates and high quality. The project GEARLESS TRANSMISSION is being compact and portable equipment, which is skillful and is having something precise in transmitting power at right angle without any gears being manufactured.

I. INTRODUCTION

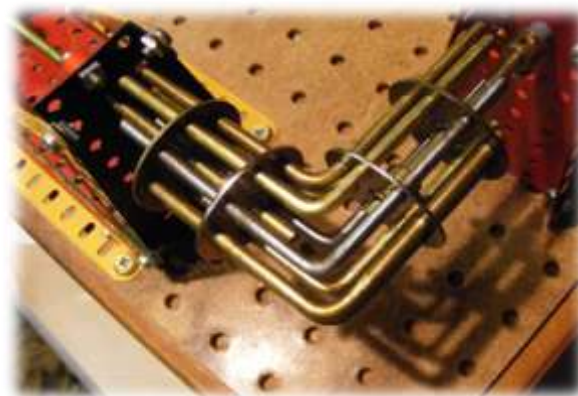
What is Gearless Mechanism?

→ Gearless mechanism is an link mechanism of slider and pair, which is also known as *El-bow mechanism*

The component is exceptionally valuable for 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. Similarly high proficiency between the info and the yield power shafts as to the rigging efficiencies.

It has intricately examined in point of interest in the whole books o designing that the apparatus drives have low mechanical efficiencies. Since Factor identifying with under frictional Forces between the mating gear teeth, the unpredictable chasing of the riggings, the reaction between the teeth can't be overcome and consequently the proficiency can't be more than 55% of late apparatuses of warm slant sort are being made in poly propylene and epoxy material where the Frictional Forces are similarly disposed of. Despite the fact that such apparatuses are utilized for moderately little applications the proficiency is not more than 42%. The El-bow Mechanism transmits the I/P power towards the O/P side such away that the rakish Forces created in the slacks are essentially transmitted with the assistance of connections which takes up the I/P power and the right point drive is exchanged towards the O/P slack and

stick get together. Thus next to no grinding plays while the force is being transmitted; the chasing and kickback one missing. In this way, it is valued that proficiency as high as 90-92% are conceivable in apparatus less transmission component.

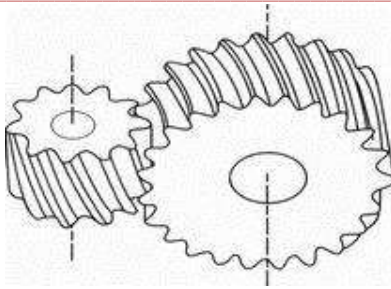


II. LITERATURE REVIEW

Skew Shaft :- The term "shaft", used in this standards 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 non-intersecting are known as skew shafts.

Types of gears used for transmission of power at Right Angle!

1. Helical Gear:



The teeth on **helical gears** are cut at an angle to the face of the gear. When two teeth on a helical gear system engage, the contact starts at one end of the tooth and gradually spreads as the gears rotate, until the two teeth are in full engagement. This gradual engagement makes helical gears operate much more smoothly and quietly than spur gears.

2. Bevel & Pinion Gear:



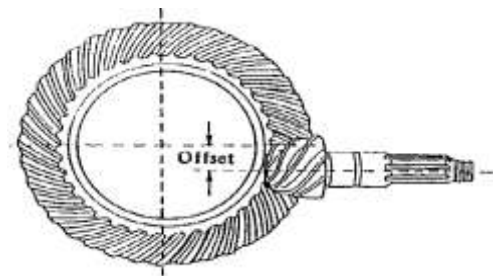
Bevel gears are gears where the axes of the two shafts intersect and the tooth-bearing faces of the gears themselves are conically shaped. Bevel gears are most often mounted on shafts that are 90 degrees apart, but can be designed to work at other angles as well. The pitch surface of bevel gears is a cone.

3. Worm & Worm Gear:



Worm gears are used when large gear reductions are needed. It is common for worm gears to have reductions of 20:1, and even up to 300:1 or greater. Many worm gears have an interesting property that no other gear set has: the worm can easily turn the gear, but the gear cannot turn the worm. This is because the angle on the worm is so shallow that when the gear tries to spin it, the friction between the gear and the worm holds the worm in place. worm drive can reduce rotational speed or allow higher torque to be transmitted.

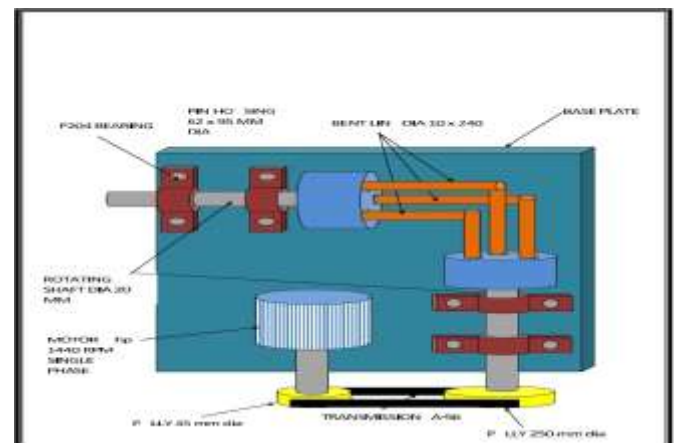
4. Hypoid gears :-



Hypoid gears look like winding slope gears with the exception of the pole tomahawks don't cross. The pitch surfaces seem cone shaped yet, to make up for the balance shaft, are truths being told hyperboloids of insurgency. Hypoid riggings are quite often intended to work with shafts at 90 degrees. The result that apparatus proportions of 60:1 and higher are achievable utilizing a solitary arrangement of hypoid apparatuses. This style of apparatus is most regular in driving mechanical differentials, which are typically straight cut incline gears, in engine vehicle axles.

III. COMPONENTS OF THE MODEL AND OPERATION

CONCEPT DRAWING OF MACHINE



Construction

- ⇒ It consist of links or rods that are bend exactly at 90 degree (right angle).
- ⇒ The number of links required would be 3 to 8.
- ⇒ The more the links, the smoother will be the operation.
- ⇒ Links are made up of bright bars as the bright bar material has good surface finish.
- ⇒ These links slides inside the through and through drilled cylinder.

- ⇒ Thus forming a sliding pair.
- ⇒ These cylinders are coupled to the input and output shaft with help of key.
- ⇒ Power is supplied by electric motor.

WORKING

The Gearless transmission or El-bow mechanism is a device for transmitting Motions at any fixed angle between the driving and driven shaft. The synthesis of this mechanism would reveal that it comprises of a number of links would be between 3 to 8 the more the links the smoother the operation. These links 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° 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 an 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 in Fig. in the meanwhile the other roads have of course passed through the same cycle of movements all rods are successively sliding inwards and outwards. Although this transmission is an old one many mechanics are skeptical about its operation, however it is not only practicable but has proved satisfactory for various applications when the drive is for shafts which are permanently located at given angle. Although this illustration shows a right angle transmission this drive can be applied also to shafts located at intermediate angle between 0° and 90°. In making this transmission, it is essential to have the holes for a given rod located accurately in the same holes must be equally spaced in radial and circumferential directions, be parallel to each rod should be bent to at angle at which the shaft are to be

located. If the holes drilled in the ends of the shafts have "blind" or closed ends, there ought to be a small vent at the bottom of each rod hole for the escape of air compressed by the pumping action of the rods.

These holes are useful for oiling to avoid blind holes shafts may have enlarged port or shoulder. This transmission may be provided centrally and in line with the axis of each shaft and provided with a circular groove at each rod or a cross-pin to permit rotation of the shaft about the rod simply active as a retaining device for shipping and handling purposed.

As mentioned in first chapter that we are showing two applications of

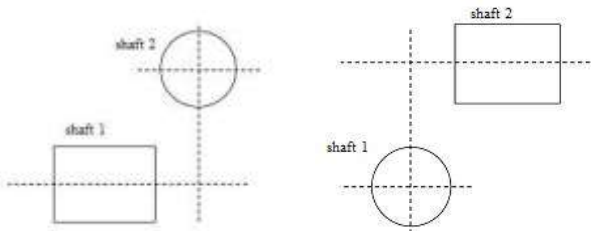
This mechanism at a time.

- 1) As a wood cutting machine The cutter is attached on the output shaft
- 2) When motion is transmitted through mechanism to output shaft the shaft will start to rotate at adjusted speed. The speed is adjusted by means of pulley (i.e.RPM). The cutters Will also start to rotate along with the shaft the because of cutter is 250mm.the through slot introduces in the table for free rotation of cutter edges in table. Now the feed given to wooden rods or plywood to cut in desire shape and size. The speed is adjusted by means of pulley (i.e...RPM). The cutters will also start to rotate along with the shaft the because of cutter is 250mm. the through slot is introduced in the table. Now feed given to wooden rods or plywood to cut in desired shape and size.
- 3) As a air compressor or air pump -> the compressor or and pump also introduced in our project when the links inside the drilled holes are reciprocates as well as revolves along the axis of cylinder it gives the compressor effect. Among the three links when first pin goes at inner dead center it sucs the air then it start to move at outer dead center by revolving, it compresses the air against seal and cylinder head discand does simultaneously by three links and we can get continue discharge of air the quantity.
- 4) Mechanical seal is defined as a devise which seals by virtue of axial contact pressure between two relatively flat surfaces in a plane right angle to the axis of the shaft .The seal used in EL-BOW m/c

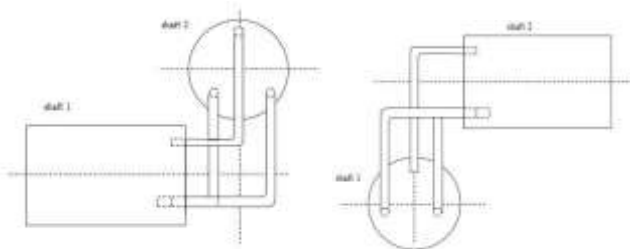
compressor is stationary type. It is place between cylinder and cylinder head.

IV. POSSIBLE ARRANGEMENTS OF LINKS

View of the Shafts Below diagram shows a different view of the shaft arrangement which are skew and angle between them is 90 degrees, which helps us in the understanding of the arrangement of shafts. In below figure



Views of Setup Different views of the setups are shown in Figure .These views show the arrangement of links and shaft.



Analysis of Mechanism

From the above diagram's and views the setup is clearly established in the mind, but as for convenience here we use the front view of the setup for analysing the mechanism of setup.

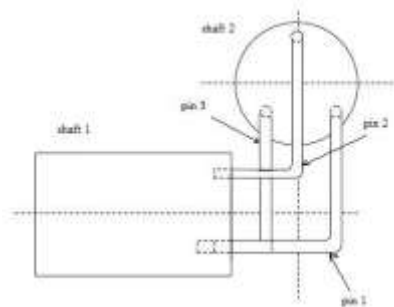


Figure Setup

Let at the starting instant shaft 1 starts rotation with 3 links in anticlockwise direction and a reaction force developed at the pin surface which in contact with the shaft and this force transferred to the other end of the pin which is in the shaft and applying on the shaft 2 due to which shaft 2 starts rotating in the same direction as shaft 1, after 120 degree rotation pin 1 comes at the place of pin 2 & pin 2 comes at the place of pin 3 & pin 3 comes at the place of pin 1 by sliding in shaft and self adjusting. This motion repeated for

next 120 degrees and further for next 120 degrees and links are exchanging the position in successive order as discussed before.

V. ADVANTAGES

1. High Efficiency between input and output power shafts.
2. This coupling enables a variable parallel offset between two shafts. They provide constant speed velocity with extremely low backlash, and their compact designs provide large floor space savings.
3. Easy manufacturing of links and links in comparison of crossed helical and worm gear.
4. Very little friction.
5. Hunting & backlash is absent.
6. Backlash-free shaft securement and torque transmission .
7. This is a very smooth-acting device, and the power loss is minimum.
8. It can be run at nearly any speed, even at high speed and is very quiet.
9. Time-saving installation due to simple and fast shaftsecurement.

VI. APPLICATIONS

1. Driving for all kinds four faced tower clocks. The elbow mechanism was first use in the year 1685 for the famous London tower clock named bigben.
2. The mechanism is invariable used for multiple spindle drilling operation called the gang drilling.
3. Used for angular drilling between 0 to 90 degree position.
4. Lubrication pump for C.N.C. lathe machines.
5. The mechanism is very useful for a reaching a drive at a clumsy location.
6. Air blower for electronic and computer machine.
7. The mechanism has found a very usefully use in electronic and computer technology for multiple.
8. The elbow mechanism is used for movement of periscope in submarines, the year 1685 for the famous London tower clock.

VII. CONCLUSIONS

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 a 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*(El-bow mechanism) which we have managed to successfully device after long & hard input in conceiving its working principle.

REFERENCES

- [1] Book s. s. rattan Mc Graw Hill Education (India) private limited, new delhi.
- [2] A. Kumar and S. Das, "An arrangement for power transmission between co-axial shafts of different diameter", International journal of engineering research and technology .
- [3] "Gear less power transmission: parallel offset shaft coupling", Journal
- [4] <https://www.youtube.com/watch?v=> School of Mechanical and Building Sciences.

Books

- [1] Strength of Materials by RS Khurmi & Gupta.
- [2] Design Data Hand Book by Mahadevan.
- [3] Machine Design by Bhandari.