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Power Transmission At 90° through Links

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ABSTRACT: Now-a-days with the development in machineries, the motion needs to be transferred from one shaft to other. Our project POWER TRANSMISSION THROUGH LINKS MECHANISM is a compact and portable equipment, which is precise to transmit power at right angle without any gears being manufactured. It basically uses different arrangement of skew shafts in which no. of link must be odd i.e. 3, 5, 7,9,11 etc., The more the number the smoother the transfer of motion but with increase in number of links increases the cost and at the same time reduces the strength of shaft, So it is required to select the number of links as per the requirement. These links slides in the drilled holes in the respective discs.
This arrangement can be used for skew shafts at any angle and if there is a need we can change the angle between the driving shaft and the driven shaft with any profile of shafts having rotational motion along its own axis.

Keywords: skew shaft, revolute pair, sliding pair, hyperboloids, front/side/top view.

I. INTRODUCTION

Transmission of power for skew shafts with the aid of either crossed helical gear or worm gear or hypoid gears in a machine can be used but the manufacturing of these gear is very intricate, power loss in gears due to sliding motion and the shaft orientations is limited to some extent which means that it is not possible for every shaft orientation because of standardization of gears, so need arises for a better system.

So introduction of power transmission by links mechanism system for skew shafts which reduce the losses, cost, save the time, space and complexity in manufacturing. On the other hand, this system allows for changing in the orientation of shafts during motion which is very fascinating about this mechanism.

Also during analysis of mechanism and working it is seen that this mechanism can be used for both intersecting shafts and skew shafts but here we introduced a solution for skew shafts so main attention is towards the skew shafts.

As the name is introduced is SRRS mechanism that is

- S -sliding pair made between link 1 and shaft 1.
- R -revolute pair made between link 1 and link 3.
- R -revolute pair made between link 3 and link 2.
- S -sliding pair made between link 2 and shaft 2.

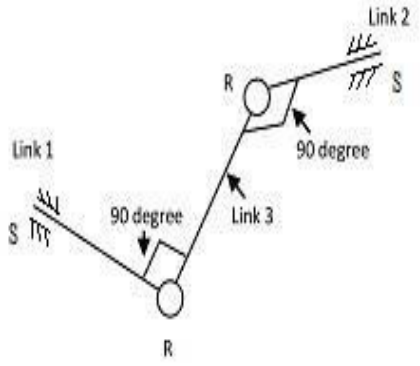

Fig. 1. SRRS Link in Space.

II. LITERATURE REVIEW

(a) ***Skew Shaft***: - The term shaft is a rotating machine element, generally having circular in cross section, which is used to transmit power from one element to another, or from a machine which generates power to a machine which absorbs power. The various parts such as pulleys and gears are mounted on it. , and "skew" means non-parallel and non-intersecting so that type of shafts which are non-parallel and non-intersecting are also known as skew shafts.

(b) *Crossed helical gears* - Helical gears offer a replacement over spur gears. The leading edges of the teeth that are not parallel to the axis of rotation, but these are set at an angle. Since the gear is curved, this angling causes the tooth shape to be a segment of a helix. Helical gears can be engaged in parallel or crossed orientations. When the shafts are parallel to each other, this is the common orientation. In the latter, the shafts which are non-parallel, and in this arrangement the gears are sometimes known as "skew gears". For a 'crossed' or 'skew' arrangement, the gears should have the same pressure angle and normal pitch.

(c) *Worm Gears* - A worm drive is a gear arrangement in which a worm (which is a gear in the form of a screw) engage with a worm gear (which is similar in aspect to a spur gear, and it is also called a worm wheel).

Like other type of gear arrangements, a worm drive can decrease rotational speed or permit higher torque to be transmitted.

Worm gears are three types, the first are the type of non-threaded worm gears. These do not have a thread or groove, these are machined around the circumference of besides the worm or worm wheel. The second are the type of single-threaded worm gears, in which the worm wheel is threaded. The final type are the type of double-threaded worm gears, which have both gears threaded. This type of gearing can support the highest loading.

(d) Hypoid gears **-** Hypoid gears be similar to spiral bevel except the shaft axes does not intersect. Hypoid gears are always designed to operate with shafts at 90^0. Depending on which side of the shaft is offset to, relative to the angling of the teeth, than with gear teeth, but also having a sliding action along the meshing teeth as it rotates and therefore generally require some of the most viscous types of gear oil to negotiate it being thrust our from the mating tooth faces, the oil is normally classify HP (for hypoid) followed by a number denoting the viscosity. Also, the link may be designed with lesser teeth than a spiral bevel link, with the result that gear ratios of 60:1 and higher are reliable using a single set of hypoid gears. This type of gear is most common in driving mechanical differentials, which are generally straight cut bevel gears, in motor vehicle axles.

III. COMPONENTS OF THE MODEL

In this part different views of the arrangement and the components used for different arrangement, this is necessary to understand the proper working and setup of the arrangement.

A. View of Shafts

Following diagram shows a different view of the shaft arrangement, which are skew and angle between them is 90^0, which helps us in understanding the arrangement of shafts. In figure below (a) front view (b) side view (c) top view.

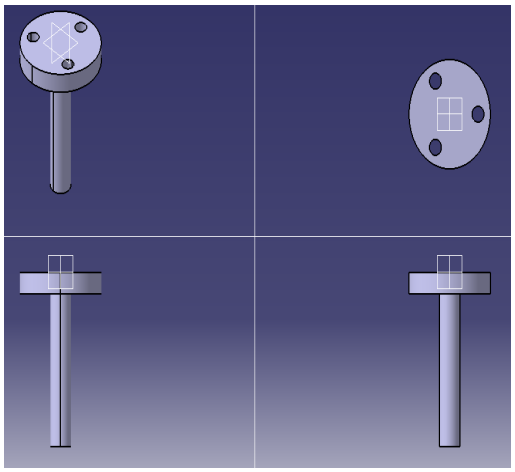

Fig. 2. View of Shafts.

B. Views of the Link

Different views of the link according to the setup are shown (a) Front view (b) Side view (c) Top view. These links are used for transmitting power when there is no change in direction of shafts during motion.

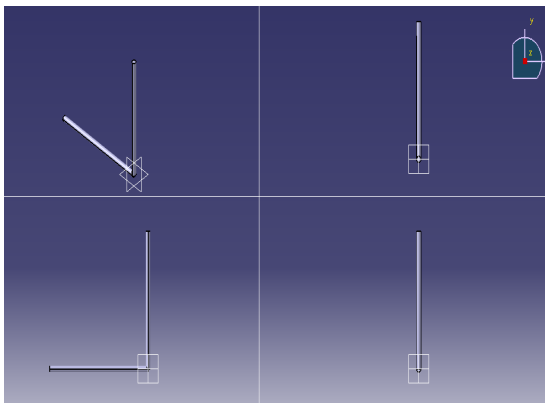

Fig. 3. View of Link.

C. Views of Setup

Different views of the setups are (a) Front view. (b) Side view (c) Top view. This view show the arrangement of links and shafts.

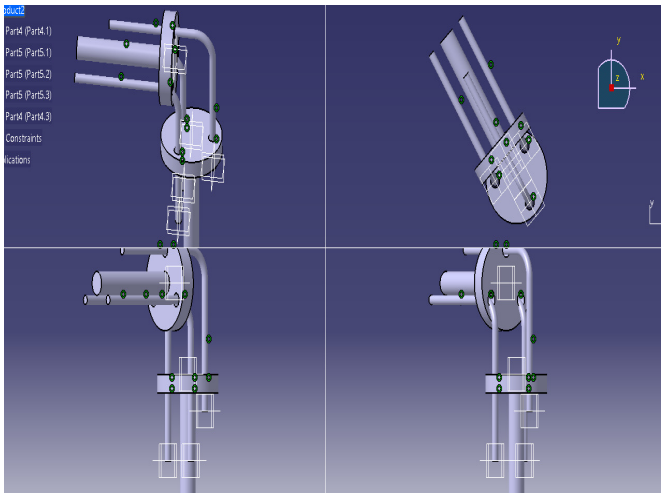

Fig. 4. View of Setup.

D. Arrangement of Link in Shaft

In the below diagram for basic arrangement of link in the shaft holes are shown. The diagram clearly shows that link used are in odd no.3, 5, 7, 9… and centers of any two link holes must not be on that line which shows the diameter of the shaft and angle between all successive holes must be equal for smoother power transmission.

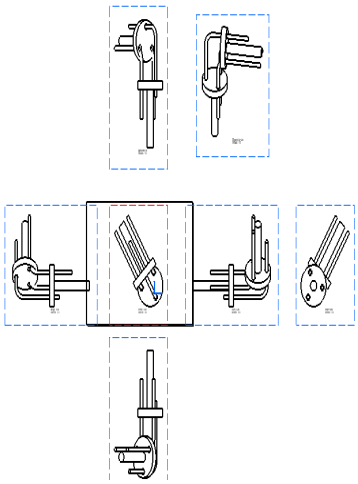

Fig. 5. All Views.

As mentioned, angle between the centers of any two link holes must not be on that line which shows the diameter of the shaft if this happen angle between them is 180^0 and during motion link or links used are trying to overlap each other because of this
motion obstructed.

Also, as we mentioned that link number must be odd and angle between successive holes are equal so it can be easily understood that why it is necessary.

E. Analysis of Mechanism

From the above mention diagrams and views the setup is clearly confirmed in the mind, but as for satisfaction here we use the front view of the setup for analyzing the mechanism of setup.

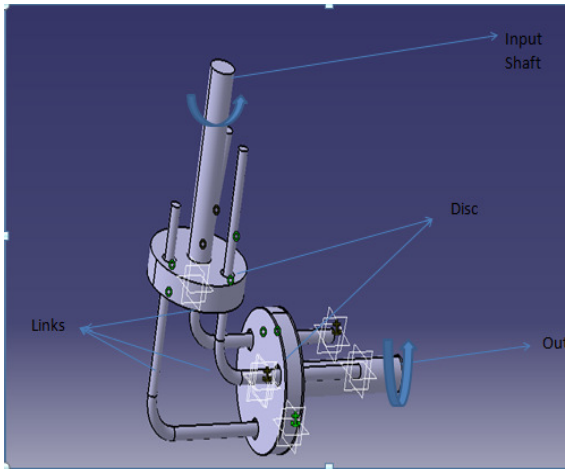

Fig. 6. Analysis of Mechanism.

IV. WORKING

At first input shaft start rotating with 3 links in anti-clockwise direction and a reaction force is developed at the link surface which is in contact with the shaft and this force transmitted to the other end of the link which is in the shaft and applying on the output shaft due to which output shaft starts rotating in the same direction as input shaft , after 120 degree rotation link 1 comes at the place of link 2 and link 2 comes at the place of link 3 and link 3 comes at the place of link 1 by sliding in shaft and self-adjusting. This motion is repeated for next $120^0$and further for next 120 degrees and link are exchanging the position in successive order.

V. COMPARISON WITH EXISTING SOLUTIONS

- This arrangement gives the appropriate range of different shaft diameter, which is standard or non-standard which is not possible in the available gear arrangement because the manufacturing of gears for skew shafts is very complicated.
- This mechanism with link can be used for high speeds and for high loads which is similar to the worm gear and it is not possible for crossed helical gears.
- This mechanism not having any possibility like slipping and over hauling as in crossed helical gears so power loss is low in introduced arrangement and used for high loads with proper rigidity of shafts and link.
- The main advantage of this system is that we can change the positioning of shafts during motion or during intermittent motion according to need by using given type of links at the place of link which is not possible in any existing system till date.
- Repairing cost on failure of any component is low.
- Minimum setup cost.
- Time saving and installation setup is easy.
- Easy manufacturing of links as compared to crossed helical and worm gear.
- Skill labor required for setup is very less.

VI. APPLICATIONS

- The mechanism is invariable used for multiple link and gang drilling operation.
- Applicable for angular drilling between 0^0 to 90^0 positions.
- Lubricating pump for C.N.C. lathe machines.
- The mechanism is useful for reaching a drive at an awkward location.
- Air blower for electronic and computer machine.
- The mechanism is found to be useful in computer and electronic technology for multiple.

VII. CONCLUSIONS

- With the help of this system, we can reduce the cost in power transmission.
- Further advancement in this system can be made**.**
- Our design uses simple ideas and mechanisms to get a complicated set of actions and is intended to emulate the actions of the operators.

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