Application of Six Bar Linkage for Path Reverse Rotation

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***Abstract:-* A six-bar linkage is a one level of-flexibility system that is developed from six connections and seven joints. The purpose of our project was to explore the characteristics of six bar linkage mechanism for reverse rotations and characterize the major difference between reverse rotation and other kinematic machine these differences would allow as to develop demonstration which would be used to help future students understand how six bar linkage for reverse rotation machines functions and how to produce a specified motion with them. Our machine is a reverse rotation mechanism designed to run at low speed, to operate from the lever and the motion create clock wise and anti clock wise at a sudden time.**

1. INTRODUCTION

Watt's linkage is a type of mechanical linkage invented by James Watt in which the central moving point of the linkage is constrained to travel on an approximation to a straight line. It was described in Watt's patent specification of 1784 for the Watt steam engine. It is also used in auto mobile suspensions, allowing the axle of a vehicle to travel vertically while preventing sideways motion. Watt's linkage consists of a chain of three rods, two longer and equal length ones on the outside ends of the chain, connected by a short rod in the middle. The outer endpoints of the long rods are fixed in place relative to each other, and otherwise the three rods

are free to pivot around the joints where they meet. Thus, counting the fixed-length connection between the outer endpoints as another bar, Watt's linkage is an example of a four-bar linkage. This type of linkage is one of several types described in Watt's 28April 1784 patent specification. However, in his letter to Boulton he was actually describing a development of the linkage which was not included in the patent. The slightly later design, called a parallel motion linkage, led to a more convenient space-saving design which was actually used in his reciprocating (or rotary) beam engines.

The context of Watt's innovation has been described by C. G. Gibson: during the Industrial Revolution, mechanisms for converting rotary into linear motion were widely adopted in industrial and mining machinery, locomotives and metering devices. Such devices had to combine engineering simplicity with a high degree of accuracy, and the ability to operate at speed for lengthy periods. For many purposes approximate linear motion is an acceptable substitute for exact linear motion.

The earlier single-action beam engines used a chain to connect the piston to the beam and this worked satisfactorily for pumping water from mines, etc. However, for rotary motion a linkage that works both in compression and tension provides a better design and allows a double-acting cylinder to be used. Such an engine incorporates a piston acted upon by steam alternately on the two sides, hence doubling its power. The linkage actually used by Watt (also invented by him) in his later rotary beam engines was called the parallel motion linkage, a development of "Watt's linkage", but using the same principle. The piston of the engine is attached to the central point of the linkage, allowing it to act on the two outer beams of the linkage both by pushing and by pulling. The nearly linear motion of the linkage allows this type of engine to use a rigid connection to the piston without causing the piston to bind in its containing cylinder. This configuration also results in a smoother motion of the beam than the single-action engine, making it easier to convert its back-and-forth motion into rotation.

The present work delivers the optimal dimensional synthesis of a six-bar linkage with rotational constraints in which a point on the second dyad generates the desired path.

2.SIX –BAR LINKAGE MODEL

Numerous working processes in machines and devices are successfully performed even when the paths of working bodies do not realize ideal shapes. It is enough that they come closer to the desired paths, i.e., that they are within the allowed deviations around the given paths. Since the increase in the number of members of the mechanism and the accompanying imprecision in manufacturing increase the imprecision of the path, it is necessary to be oriented towards the mechanisms with a smaller number of members. Figure 1 represents the modeling principles of six-bar mechanism and figure 2 represents the CATIA modeling of same mechanism.

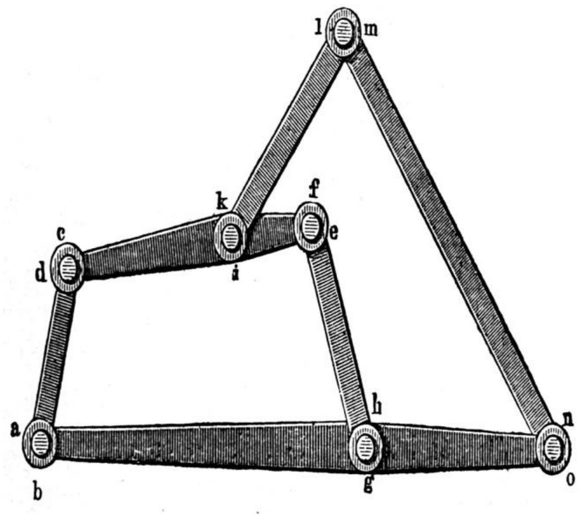

FIGURE 1. SIX-BAR LINKAGE

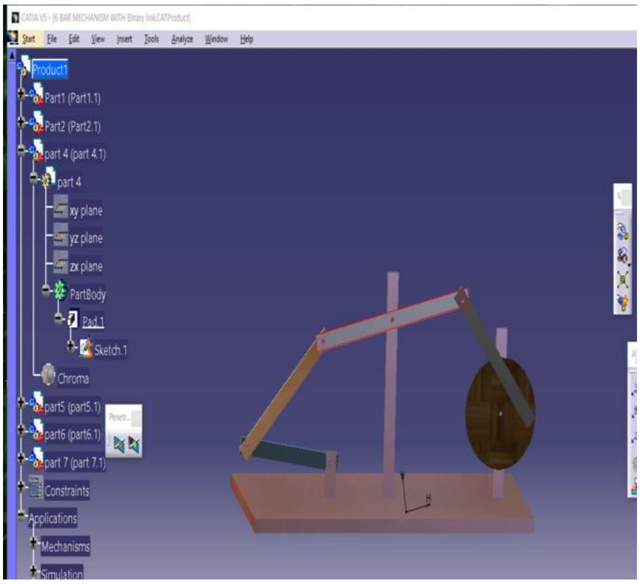

FIGURE 2 CATIA MODELING SIX-BAR MECHANISM

1.DESIGN PROCEDURE

The design objective in this work is to find an optimum value of the distance between the front axle and the rack axis so that the optimum value results in minimum steering error on the line of rear axle. The steering error is to be made as small as possible. .The error found out by the difference of the actual six bar mechanism and the basic four bar steering mechanism is to be minimal.

1. As we start the design procedure for the six-bar mechanism we set the initial constant parameters such as wheelbase, track width, rack length.
2. Then we also take in consideration the parameters which have to be fixed due to the constraints of the other systems or stock parts.
3. Then we take an initial guess of the distance between the rack axis and the kingpin to kingpin axis of the wheels
4. According to it we find out the lengths of the tie rods of the mechanisms Further we analyses the steering error that has occurred due to the constrains and the set parameters.

ASSEMBLED VIEW

FIGURE 3 SIX BAR ASSEMBLED MODEL

CONCLUSION

The purpose of the project was to design and construct a kinematic motion of six bar linkage for reverse rotation device. The project achieved varying levels of success in different facets. Beginning with general research into reverse rotation devices, the project followed a methodology of determining the design space, building a mathematical model and then implementing that model. The design process as a whole was experienced from start to finish and incorporated a multitude of different aspects of engineering. Designing this mechanism was an excellent experience in tackling a design project was the majority of constraints were self impost. The final design produced is an effective one; however errors in the model do lead to some doubts as well as area for the project to progress into. Hope fully, with a little work, the mechanism will be operational and seen by future kinematics students for years to come.

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