Fabrication of Mechanized System Fitting Ceiling Fan Semi-Automatically

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***Abstract*- In most of the load lifting devices it is necessary to use a pair of two identical or different parts for the motion transmission. In most of the devices the pairs used are worm-gear, belt-pulley, rope-pulley, chain-pulley etc. The selection of appropriate pair depends on parameters such as space requirement, type of load to be handled, desired efficiency of the system. In Most of the cases the worm-gear pair is used due to its advantages over other systems such as higher efficiency, compactness and simple construction. It also exhibits the self-locking ability which allows the input member (gear) to rotate the output member (worm) in either directions but it does not allow the output member to rotate the input member when the driving force on input member is suddenly reduced. This self-locking ability is also useful for the safety of operators working in the vicinity of this system. It prevents the probable accidents due to falling of lifted load when the driving force on the input member is removed or suddenly released. This paper is focused on the study of probable alternative methods for the conventional worm and gear system to achieve better efficiency and simplicity. The self-locking ability can also be obtained with help of worm pair system. So our paper comprises of the various uses of self-locking ability of mating worm pair system. In our paper various systems are studied in which the self-locking ability of worm pair system is used.**

***Index terms*- Load Lifting Devices, Self-Locking, Mating Worm, Worm Pair System**

I.INTRODUCTION

Load lifting devices are mostly used for lifting, moving and store the goods within a company or at site. In most of the applications worm gear drive is used to lift and carry the loads. This drive is mostly used due to its simplicity and ability of providing desirable torque with the help of different gear ratios. This drive mostly contains of a worm and gear pair. The worm acts as an input whereas gear acts as output. The motor is used to provide required input rotary motion to the worm which in turn transfers this rotary motion to the gear. The load drum is provided to the gear shaft which rotates due to rotary motion of gear and in turn the load gets lifted. The higher speed reduction ration can be obtained with the help of this worm gear system. There are some losses in this system due to the friction between the worm and gear. This worm gear system have an ability of self-locking due to which the input member can rotate the output member in either directions but when the driving force on input member is suddenly removed or it is reduced then it doesn't allow the output member to rotate the input member. This ability of self-locking ensures the safe operation of any material carrying system. It also acts as safety feature for the motor in order not to get damaged due to its opposite rotation. This worm gear system has some important advantages like self-locking ability and simplicity in construction but it also has some disadvantages like poor efficiency. It hardly provides the efficiency around 40 %. This is due to its friction between worm and gear. So our main aim behind this review is that to find out the alternate pair of objects which also has the self-locking ability, higher efficiency as compared to worm gear system and simple in construction. In this paper we have summarized the use of worm pair in various engineering applications. This worm pair also has the ability of self-locking as that of worm and gear pair. This ability plays a vital role in reliability and safety for the people working around this system.

II. LITERARTURE SURVEY

Fenge Li & Jing Ning Ta [1] invented that a pair of a worm-gear pair exhibits a self-locking ability. The drive train comprises of a worm connected to a motor shaft and is in mesh with a worm wheel which is connected to the output shaft. There is some amount

of loss of power because of friction between worm and worm wheel. By making some changes friction can lead to some arrangement where the load cannot back drive the motor due to losses in the gear this is called the self-locking. This property is very important in certain applications, such as for lifting large loads or for security or safety issues such as for doors and windows, especially windows of a vehicle, in which the theft is to prevented it is important that the windows cannot be pulled down to gain access. To have self-locking of gear drive, the design of the worm and the worm wheel has to be modified from ideal or optimal from an efficiency point of view. The lead angle of worm is reduced so that there are more number of threads per unit length, also the friction between the worm and worm wheel is increased by making the surfaces rough. This invention is related to worm gear drives & in particular to self-locking worm gear drives. There is certain loss of power due to friction between worm and worm wheel. By making certain modification friction can lead to arrange where the load can't back drives the motor due to losses in the gear this is called the self-locking.

III. COMPONENT OF PROJECT

1-WORM & WORM GEAR

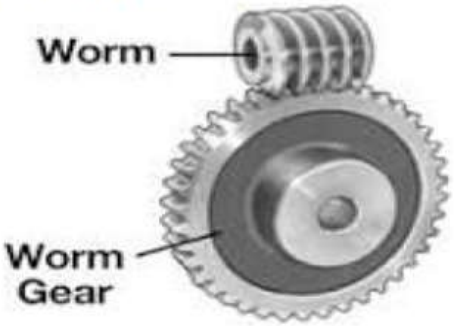

Fig. 1. Worm & worm gear.

Fig.1.

Arrangement of a worm and worm wheel

1 The gear material is cost iron.
2 The number of teeth on worm gear is 26 and the number of teeth on worm is 3.
3 The worm is a single point starting teeth.
4 The trolley is mounted on worm gear.

LEAD SCREW

Fig. 2. Lead screw.

1 Lead screw is use in this project for lifting purpose of the trolley.
2 Lead screw also known as power screw or translation screw.
3 Larg load carrying capability and compact.
4 Simple to design and easy to manufactured.
5 Large mechanical advantage and precise and accurate linear motion.

ROLLER TYPE BALL BEARING

Fig. 3.Ball bearing

1 Bearing is a mechanical element use for the carrying load under the action of rolling motion by placing some rolling element.
2 The rotating shaft is fitted in the hole of the bearing tightly.

IV.WORKING OF PROJECT MODEL

1 Name of the project is based Mechanized System for Fitting ceiling Fan Semi-Automatically.
2 This Working Device only using for ceiling works Like; Fan Fitting Light Fitting Painting Fine Putting work, and Decorations, etc.
3 About mechanism nut-screw and worm gear mechanism Elevating Screw Motion is Up And Down with respect to the requirement height to the Operator.

4 Upward and downward position screws are used. These models are generally used in ceiling works.
5 Worm gear and worm wheel used for rotary motion converts into linear motion to the elevating screw.
6 Elevating screw is motion is up and down with respect to the requirement height to the operator.
7 Top most position of the lead screw there is ceiling fan drum holding device also called as fixture, fixture are welded to lead screw.
8 The table are arrangement in ladder are attached to comfort to the operator.

V. DESIGN OF SYSTEM

Worm teeth (Z1) = 3
Worm wheel (Z2) =26
(1)-Centre distance (a) =1/2*m*(q+Z2)
Where
Module (m) = D/T
=220/26
=8mm
Diametral quotient (q) =d1/m
d1= pitch circle dia. Of the worm
q=60/8=7.5
a = 1/2*8*(7.5+26)
=134mm
(2) Speed reduction =Z2/Z1
=26/3
=9
(3) Dimension of worm
d1 = q*m
=7.5*8
=60mm
d a1 = m(q+2)
=8*(7.5+2)
=76mm
tan λ = z1/q
=3/7.5
λ = 21.80
where
λ = lead angle
d f 1 = m(q+2-4.4cos21.8)
= 43mm
Circular pitch (Px) = π*m
= 25.132mm
(4) Dimension of worm wheel
d2 = m*z2
= 208mm
da 2 = m(z2+4cosλ-2)
= 221.71mm
df 2 = m(z2-2-.4cosλ)
= 189.02mm
Where
da1= outside dia. of worm (mm)
df1 = root dia. of worm (mm)
da2= outside dia. of wheel (mm)
df2 = root dia. of wheel (mm)

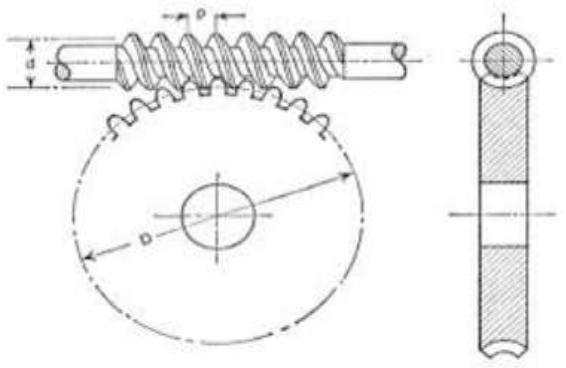

Fig. 6. Layout view of warm and warm gear.

VI. IMPLICATIONS OF THIS SURVEY

The researchers invented that a pair of a worm-gear pair exhibits a self-locking ability. They have studied the loss of power due to friction between worm and worm wheel and some modifications with which the friction can lead to arrange where the load can't back drives the motor due to losses in the gear this is called the self-locking. Some of the researchers have also studied mechanisms which convert the rotary motion into rectilinear motion. However the use of mating worm pair for load lifting devices despite of their self-locking ability and ability to convert the rotary motion into rectilinear motion was remaining unexplored due to power losses in worm gears and efficiency of the worm gear which depends on coefficient of friction and the lead angle.

VII. SCOPE FOR RESEARCH

This survey highlights the unexplored area for further research leading to the design and development of mating worm pair for their use in load lifting devices. The main property which is a worm gear system exhibit is its self-locking ability. We have also

considered the system of worm pair due to its property of self-locking as that of worm and gear system. Due to this property worm pair can be used in various applications such as differential gear mechanism used in vehicles, self-locking system for load lifting, automatic dual ratio motion convertor, etc.

Out of all these applications I have selected to work on worm pair system

VIII. CONCLUSION

We have proposed the system for lifting the load which uses the pair of worms instead of conventional worm and gear system. The main intension behind development of this system is to improve the efficiency of the conventional system and also to improve the reliability and safety of conventional system, also the cost of manufacturing and space requirement is also important for the development of this system.

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