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SELF LOCKING GRIPPER

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ABSTRACT

Material handling is the primary activity of every manufacturing organization. It has been estimated that at least 15 to 25% of the cost of the product is attributable to material handling activities. In case of machine tools like lathe or vertical machining centres it is desired to handle heavy jobs, which is conventionally done manually using chain blocks. This method is time consuming, unsafe and takes a lot of labour time adding to unproductive time of machine. Thus there is a need of a modified work handling device in the form of jaw capable to handle heavy pipes as well as plates with equal efficiency. In this paper 'Self Locking Gripper System', as per our time estimate. In this paper, 'Self-Locking Gripper System', was designed and fabricated keeping in mind its use in industries, so we adopted and choose all the channels that reduced the overall cost. Therefore the model manufactured by us can well meet the economic demand and multiple tasks of industries due to its low initial cost. Another notable aspect is that the maintenance is minimal. In conceiving, planning, designing, & manufacturing this multipurpose assembly has given us ample practical experience.

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I. INTRODUCTION

The clamping in the case of twin jaw gripper as shown above that is presently used is a function of the pull force applied to the pull tie rod attached to one of the jaw arms...but sometimes the tie rod pull force may reduce and become insufficient to grip the object in the jaw owing to the slack in the pull chain attached to the tie rod, this may lead to slipping of the gripped object further leading to accident that may lead damage to work-piece / property or human life. Conventional cranes and hoist system use chain block and hook system for lifting or in some cases gripper jaw that operate on pull of a wire rope are used. The gripping force provided to the wire rope decides as to how the job is held in the jaw system. In event this force is reduce by some reason there is risk that the job will fall from the jaw, which may lead to fatal accidents and loss of property and life. The 'zero slip' jaw gripper system uses a set of twin worms with self-locking ability which ensures that once the griping force is applied to the jaw system the job will not slip or fall unless until the worm system activates the release. This ensures maximum safety to life and property with minimal cost and space input. There are multiple issues involved in the design of the wrist and gripper linkage. It should be remotely operated, it should enter the vessel through available port sizes, there should be vision camera attached at the wrist for monitoring, motors should be operated With man-in-loop configuration and finally, the end effectors (After wrist) should able to twist the tile screws in case of the replacement requirements. A mechanical gripper is end effectors that use mechanical fingers actuated by a mechanism to grasp an object. The fingers, sometimes called the jaws, are the appendages of the gripper that actually make contact with the object either by physically constraining the object with the fingers or by retaining the object with the help of friction between the fingers. For a Two jaw cam actuated rotary gripper there is a cam and follower arrangement, often using a spring-loaded follower which can provide for the opening and closing of the gripper. The movement of cam in one direction would

force the gripper to open, while the movement of the cam in opposite direction causes the spring to force the gripper to close. The advantage of this arrangement is that the spring action would accommodate different sized parts. Most mechanical drives used in grippers are based on cam and followers or rack and pinion gears as force convertors. Cam driven gripper jaws normally enjoy a relatively large stroke not normally achievable with other gear types. As a prime mover almost any form of electrically commutated DC servo motor is suitable.

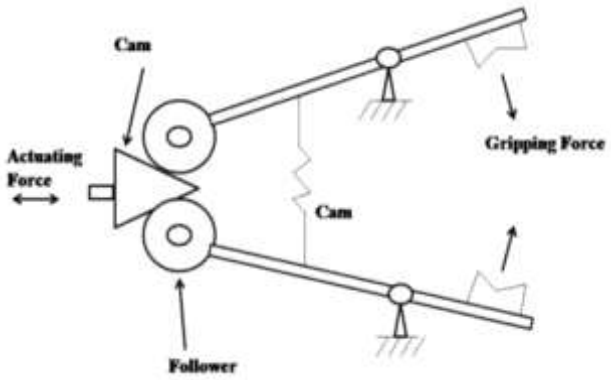

Fig 1. Two Jaw Cam Actuated Rotary Gripper

The gripper is an important component of a robot, its role being to link the manipulated object to an element of the guiding device. Most robot mounted gripping systems are two-jawed (two-fingered) and are used for both manipulation and assembling tasks. Two-jawed grippers are the most frequently used, due the simplicity of their object gripping configuration and mounting and deploying characteristics. The gripper achieves its role by clamping, namely it grasps the object by means of mechanical contact forces, unlike other types of gripping systems that can be magnetic, vacuum-based, electro-static, etc.

There are many work pieces which can withstand the necessary gripping force without sustaining damage. But there are other work pieces which are for example polished, thin-walled, soft, brittle or super-finished and which can be damaged during gripping, especially by clamp-type grippers which impose a point loading. Point loading is the contact force per unit gripping area which results from clamp gripping. In most cases the actuation of gripping systems is ensured by electric motors. Pneumatic drives have been generally avoided because of control and compliance related problems.

Over the last years, however, certain advantages of this type of actuation, like the compactness of the driving elements, the favorable power to weight ratio, low costs, easy maintenance, and clean working environment have made these drives increasingly attractive and have led to their more frequent utilization in robotics. The force applied to the jaw gripper comes through a set of self locking screws hence only when the tie rod lever when rotated anti-clockwise with purpose loosen the job will the job loosen ...but the job on its own cannot slip as the tendency to slip will result in an resultant clamping force due to the self locking screw mechanism, hence the design of the zero-slip gripper is fool proof and secure as compared to the earlier device mentioned above resulting in maximum safety of work-piece / property or human life.

II. PROBLEM STATEMENT

Conventional method is time consuming, unsafe and takes a lot of labor time: Using by self-locking gripper system the working time will be reduced and also it is very safe for material handling. The system is very flexible.

Conventional material handling is adds to the cost of the product and not to its value:

In self-locking gripper system there is not lot of maintenance cost as like conventional gripper system and it is very essential system for material handling that's why there are no ads to the cost of the product and it is valuable.

Slipping of the gripped object:

As compare to conventional gripper we give the maximum safety of the work-piece property and labor by using our zero-slip gripper.

Damage to work-piece property or human life:

As compare to conventional system the worm and worm gear arrangement both jaws are under work and fix the object till the unloading from the gripper that's why there is no chances of damage to work-piece and not harmful to human life.

III. SCOPE OF THE PROJECT

a. Minimize in overall cost:

As Self Locking Gripper reduces material handling cost which directly affect the overall cost

b. Reduction in material loss:

As this system does not damage to material while working it reduces material losses.

c. Possibility of harm to labors is avoided:

This system is easy to operate so it does not harmful to operator. d. Saving in labor cost:

The extra manpower required for material handling is get minimized, so it reduces labor cost.

e. Great saving in time:

This system reduces the extra time which is being wasted during material handling.

f. No damage to the material:

As self-locking phenomenon is there the material handling is completely safe.

g. Increase in efficiency is possible:

Considering all above factors, it is possible to increase the efficiency of system.

IV. DESIGN

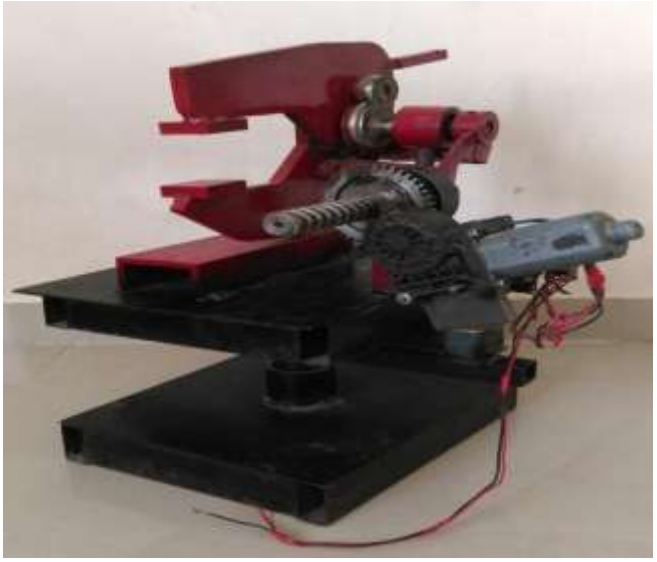

Fig 2. Construction of Self Locking Gripper

Construction:

The setup comprises of the following parts:

1. Motor: The PMDC geared motor is with 5 watt power 92 rpm as output and with an integral 9 teeth 2 module pinion on the output shaft of the motor.

2. Spur Driven Gear: The spur driven gear is the driven gear mounted on the nut held in ball bearing 6005zz .The spur gear is 2 module 44 teeth.

3. Screw: The screw is 24 mm diameter 8 mm pitch; it is constrained to slide only to and fro in the input load arm lever by means of slot provided on screw.

4. Input load arm lever: This arrangement is a lever 25x6 mm cross section and it is held on the input worm shaft in the boss.

V. CONCLUSION

It gives us immense pleasure to have completed our project, 'Self Locking Gripper System', as per our time estimate .Our Project. 'Self-Locking Gripper System', was designed and fabricated keeping in mind its use in industries, so we adopted and choose all the channels that reduced the overall cost. Therefore the model manufactured by us can well meet the economic demand and multiple tasks of industries due to its low initial cost. Another notable aspect is that the maintenance is minimal. In conceiving, planning, designing, & manufacturing this multipurpose assembly has given us ample practical experience.

REFERENCES

[1] Wiktor W Panjuchin Self locking Dual worm gear & tools to produce it US Patent55,22,278 June 1996.

[2] Alex Kapelevich and Elias Taye Applications for Self-Locking Gears Spline & Gear Dec 2008

[3] Tudor Deaconescu Pneumatic Muscle actuated gripper IMECS2011MARCH 2011

[4] Brian Carlisle Ken Goldberg a Pivoting Gripper for Feeding Industrial Parts IEEE Trans. on Systems, Man, And Cybernetics, 4 2012

[5] Madhusmita Senapati V.Balakrishnan, J.Srinivas3 Gripper Considerations for In-Vessel Tile Handling Tasks in a Fusion Reactor Vessel International Journal of Research in Advent Technology, Vol.2, No.7, July 2014

