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DESIGN & MODIFICATION OF TACKLE

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ABSTRACT

The practice of lifting large and heavy loads by the use of mechanical block and tackle dates back to the Sumerians of Mesopotamia in 1500 BCE. Later, human, animal or water powered capstans or windlasses paved path to the modern age lifting systems. All these systems used a counterweight that employed just enough power required to raise the weight of the load. Modern age lifting systems such as electric chain hoists and pneumatic air balancers are commonplace at warehouses and manufacturing plants which ease material movement. Most manufacturing facilities use air hoists with a hook or an outer gripping tackle to securely lift and move heavy components. An outer gripping tackle however poses a problem when working with space constraints i.e., when components are to be moved and stacked tightly on a pallet or inside a box. The aim is to design and develop a hoist system with an inner clamping tackle controlled by a solenoid valve which both reduces cycle time and increases operator efficiency.

Index Terms *- Air Balancer, Inner clamping tackle, Outer clamping tackle, Solenoid valve*

1. INTRODUCTION

Balancers are a time and money-saving tool assist device used when performing repetitive high-cycle tasks in a work cell environment. They are a simple and cost-effective alternative to manual lifting. Balancers use either spring or pneumatic air mechanisms to create a zero-gravity movement of tools or materials. Balancers manipulate suspended objects at the pace of the operator's movements and when used in conjunction with jibs and workstation cranes efficiently handle all types of tools and parts at high speeds. If the load changes (i.e., a different tool is used in the work cell) balancers are easily adjusted to accommodate.

A pneumatic system is a system that uses compressed air to transmit and control energy. In a pneumatic control system, energy is stored in a potential state under the form of compressed air. Working energy (kinetic energy and pressure) results in a pneumatic system when the compressed air is allowed to expand. Working energy transmitted pneumatically must be directed and under complete control at all times. One of the advantages of transmitting energy pneumatically is that energy can be controlled relatively easily by using valves. In pneumatic systems compressor is used as the power source to raise the pressure of the air to the required level quite slowly. The operating pressure in pneumatic systems is around 6 to 8 bar.

2. PROBLEM STATEMENT

Fig : Outer side tackle

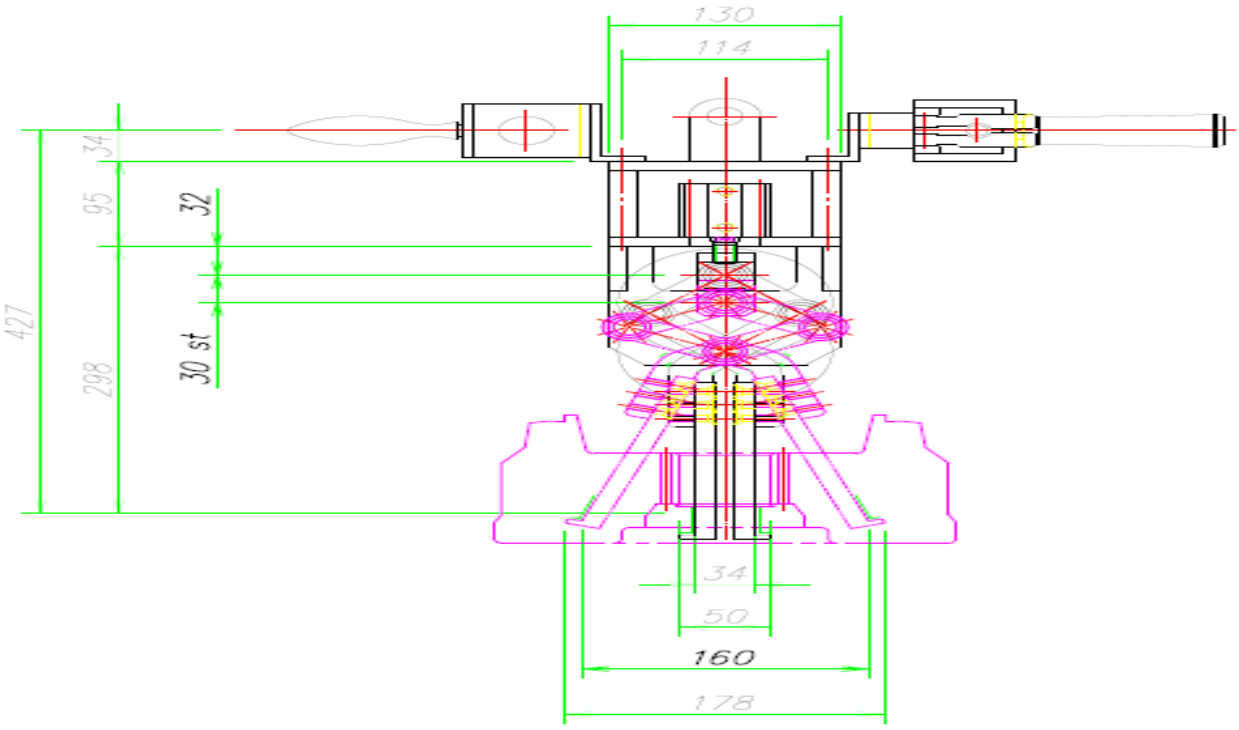
In existing air balancer tackle outer side of tackle causes difficulties for loading & unloading flanges. Because of heavy weight of tackle as well as outer side tackle is not suitable for loading and unloading of flange in box.

Objectives: Design and modification of inner side tackle to reduce the cycle time and reduce the operator ergonomic problems.

3. LIST OF COMPONENTS

Sr.no	Component	Quantity
1	Solenoid valve	2
2	Single acting cylinder	1
3	Clamping device	2
4	Housing	1
5	Rubber pad	2

4. DESIGN



5. WORKING

Air compressor is a pneumatic device that coverts power into potential energy stored in pressurized air that is compressed air with the help of electric motor. When tank pressure reaches to its lower limit, the air compressor turns on again and re-pressurizes the tank.

After compressor we have set up of air dryer to avoid water condensation in a pneumatic system, the basic function of the air dryer is to remove moisture from the air by cooling it with a refrigerant. Thus, the water vapour is condensed, and the air can be compressed. After that this connection of pipes passes on main assembly line where first FRL is installed. FRL is Filter, Regulator and Lubricator. FRL is used for clean air in pneumatic system. Filters remove water, dirt and other harmful debris from an air system. If any particles passes with air in air balancer then solenoid valve which are placed in air balancer are get rusted hence we set up FRL.

Then two pipe connections from FRL are connected with air balancer. In air balancer two solenoid valves are present. A solenoid valve, also known as electrically–operated valve which controls the flow of air. Solenoid valves eliminate the need for manual or pneumatic control of a pneumatic control of a pneumatic circuit and only require electrical input that is air pressure. In that connection we have to place single acting cylinder which have one port where pressurized air enters.

The two connection of pipes which are coming from FRL that is connected with two solenoid valves, one solenoid valve is used for up-down motion and another is used for clamp-disclamp of inner side tackle and again from two connections from another side of solenoid valves go back and connect with FRL. With the help of this connections air circulations done.

6. ADVANTAGES AND APPLICATIONS

Advantages: -

- Air Balancer is easy to Loading and Unloading.
- For different model we can set manually adjust position of Air Balancer.
- It does not require electricity
- It has one-time investment.
- They are simple and cost-effective alternative to manual lifting.
- The air is kept clean since the balancer operates without lubrication.

Applications: -

- Inner side tackles uses in machining operation industry.
- Air Balancer is used for assembly lines where precision load positioning is required.
- Air Balancers are time and money saving tool assist device used when performing repetitive high cycle tasks in a work cell environment.
- If the load changes balancers are easily adjusted to accommodate.
- If the load changes balancers are easily adjusted to accommodate.

7. RESULT AND CONCLUSION

Fig: Outer side tackle

Fig: Inner side tackle

Inner side tackle is better than outer side tackle for lift the flange, because outer side tackle takes time very much for adjust and hold the flange. Inner side tackle quickly adjust and hold flange.

Parameter	Outer side tackle	Inner side tackle
Required time for hold flange	45 Sec.	27 sec.
Production Rate	16 Job Per Hour	21 Job Per Hour

Table: Comparison of outer side tackle and inner side tackle

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