

Warp Beam Carrier for Power Looms

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Abstract - For the past years textile industry has a better development. But it has less material handling equipments. Till now the large weighted beams are lifted and transmitted only by human hands. To overcome the problem, we have decided to fabricate a carrier for warp beam which is large beam that has to be changed often. Our main objective is to reduce manual work, increase easy material handling. Our project consists of hydraulic pump, hydraulic jack, steel frames. A Warp Beam carrier is a device used for lifting or lowering a warp beam by means of a hydraulic cylinder with the chain. It may be manually operated, electrically or pneumatically driven. The warp beam is attached to the lifting hook. The range of lifting machines can be applied across all industry sectors.

1. INTRODUCTION

The Warp Beam is a iron rod in which the thread required for power loom to make cloth. The rod when empty weighs up to 30 kg. If it is loaded weighs up to 300 kg. In small scale power loom industries there is no equipment to the handle the warp beam. The principal parts of load-lifting machines are the frame, the lifting mechanism, and the carrying (grasping) system. Self-propelled machines are equipped with a mechanism for movement; rotating types are equipped with a rotation mechanism. The load-grasping mechanism, like the design of the machine itself, depends on the size, weight, and nature of the load to be moved, as well as on the technical aspects of manufacturing process involved.

2. PROBLEM IDENTIFICATION

1. The material handling equipment to handle warp beams for power looms is not available.
2. Warp beams are lifted, transported and fixed with man power only as shown in Fig -1.
3. It consumes more time and huge man power to lift warp beams to higher level.

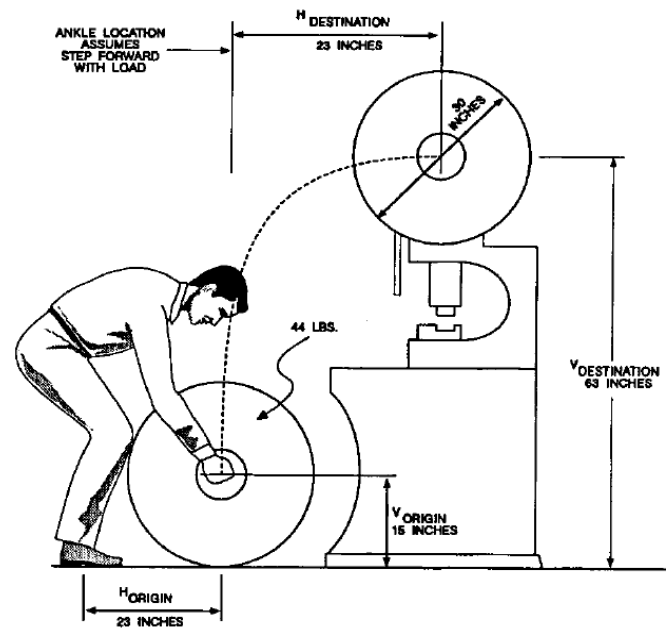


Fig -1: Manual method for handling

2. WORKING PRINCIPLE

Let initially warp beam is at the ground level position. Warp beam carrier is moved near to the warp beam. The height of the carrier is adjusted so the L hook goes under the axial beam of warp beam. The lever of hand operated hydraulic pump is pressed up and down. Now oil inside the sump is forced into the cylinder. The piston moves up and thus the warp beam gets lifted up. Then the carrier is moved with the help of swivel caster nearer to the power loom machine. The position of the carrier is adjusted so that the axis of the warp beam is parallel to the U shaped fixtures in both ends of the power loom. Now the pressure relief valve of the pump is released. The flow of oil in the cylinder to the sump makes the L hook to gradually lower its height. Therefore the warp beam comes down and axial beam perfectly fits into the U shaped fixture. The whole setup can be pulled off from the power loom. A frame is often a structural system that supports other components of a physical construction and/or steel frame that limits the construction's extent. Cast iron frame is a building technique with a "skeleton frame" of vertical cast iron columns and horizontal beams, constructed in a rectangular grid to support carrier.

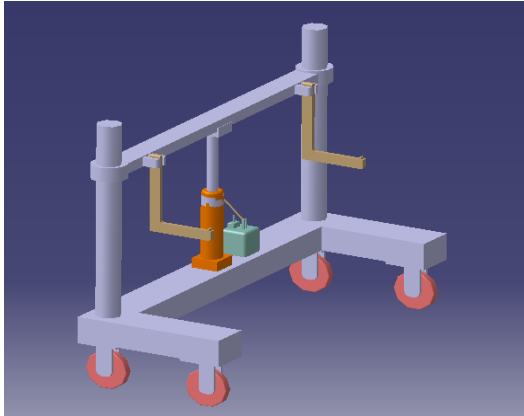


Fig -2: Conceptual Design

2.1 Single Acting Hydraulic Cylinder

Single acting hydraulic cylinders are the simplest form of hydraulic cylinder which is used for pulling, lifting, moving and holding the load. Single acting hydraulic cylinder is displayed here in following fig.3. Single acting cylinder, as shown in figure, will have one port i.e. cap end port. Single acting cylinder, as name indicates, will be operated hydraulically in one direction only. Single acting hydraulic cylinder will have one piston within a cylindrical housing. When hydraulic oil will be supplied to its cap end port, hydraulic pressure force will be applied over the piston or plunger and hence piston will be extended and this stroke of cylinder will be termed as forward stroke.

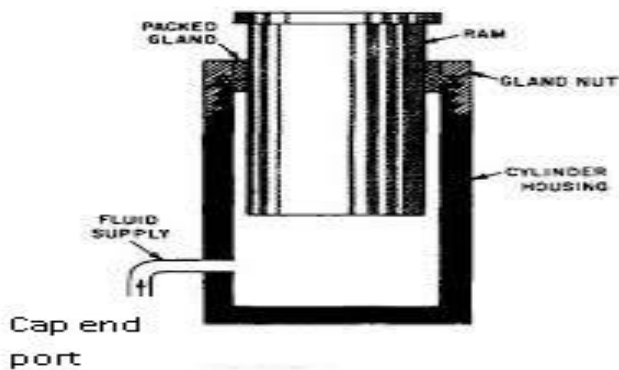


Fig -3: Single acting hydraulic cylinder

For return stroke or during retraction of cylinder, piston or plunger will be returned due to its own weight or by any mechanical media i.e. spring force. When piston will start its retraction i.e. return stroke due to its self weight or spring force, oil will flow back to reservoir during retraction of cylinder. Hence piston will be operated hydraulically only in one direction i.e. during extension or forward direction. Retraction of cylinder will not be operated by hydraulic force but also it will be operated by mechanical force such as spring force or piston may also returns due to its self weight on the basis of design of cylinder. Single acting cylinders are

classified in two types on the basis of mechanism of retraction of cylinder.

1. Single acting cylinder- Gravity return
2. Single acting cylinder- Spring return

In gravity return type single acting cylinder, hydraulic cylinder will lift the weight once hydraulic oil will be supplied to the cap end port of the cylinder because pressure force will be applied over the piston. Single acting gravity return cylinder is displayed here in following fig-4.

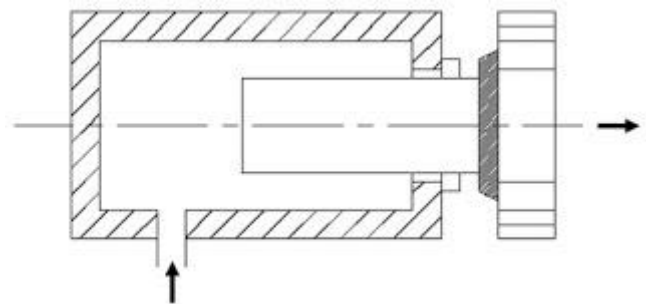


Fig -4: Single acting cylinder- Gravity return

For retracting the hydraulic cylinder, hydraulic oil supply will be removed from the cylinder by simply connecting the pressure port to reservoir and therefore cylinder will be retracted due its self weight or by gravity and hydraulic oil will be returned back to reservoir from cylinder during retraction of cylinder.

2.2 Hand Operated Hydraulic Pump

Hydraulic pumps are used in hydraulic drive systems and can be hydrostatic or hydrodynamic. A hydraulic pump is a mechanical source of power that converts mechanical power into hydraulic energy (hydrostatic energy i.e. flow, pressure). It generates flow with enough power to overcome pressure induced by the load at the pump outlet. When a hydraulic pump operates, it creates a vacuum at the pump inlet, which forces liquid from the reservoir into the inlet line to the pump and by mechanical action delivers this liquid to the pump outlet and forces it into the hydraulic system. Hydrostatic pumps are positive displacement pumps while hydrodynamic pumps can be fixed displacement pumps, in which the displacement (flow through the pump per rotation of the pump) cannot be adjusted, or variable displacement pumps, which have a more complicated construction that allows the displacement to be adjusted. Although, hydrodynamic pumps are more frequent in day-to-day life. Hydrostatics pump which are of various types works on the principle of Pascal's law and fig.5 shows hydraulic pump.



Fig -5: Hydraulic Pump

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2.3 Swivel Caster

A caster is a wheeled device typically mounted to a larger object that enables relatively easy rolling movement of the object. Casters are essentially special housings that include a wheel, facilitating the installation of wheels on objects. Swivel caster allows for movement in multiple directions as shown in fig.8. They can have one or two sets of raceways that allow the caster to swivel 360 degrees under a load.



Fig -5: Swivel Caster

3. CONCLUSION

Our project can be used in small scale power loom industries. This is having a very low initial and maintenance cost. The main important part of our project is there are hydraulic pump and hydraulic cylinder which are very helpful to lift the warp beam in shorter period of time. This project utilizes the power of the gravity return stroke to lower down the same material in the same time. It is useful as it reduces human effort. Thus overall the project is having a great advantage thus can be used in present as well as future

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