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DESIGN AND FABRICATION OF AUXILIARY SKELETION STRUCTURE

Dinesh Babu.R[1], S.Suresh Kumar[2]

Department of Mechanical Engineering, Saveetha School of Engineering Saveetha Institute of Medical and Technical Sciences, Thandalam, Chennai – 602 105,

ABSTRACT

Auxiliary structure has evolved as a loading tool for rehabilitation and engineering and engineering applications. It is more commonly called as Exoskeleton structure (External Skeleton). It can be worn close to our body. It gives some part of the energy for the work which we are going to do. According to the application, Auxiliary structure are designed and powered in such a way to do the work. Here, the design and fabrication of auxiliary structure of hand for rehabilitation and assistive engineering were made with the help of the pneumatic power.

INTRODUCTION

Auxiliary skeleton structure is an external homework that can be worn externally by a person. It is a powered system of pneumatic that delivers, at least some part of energy for the limb movement0.With the help of this device, the user will no longer feel any fatigue in carrying heavy load for long period of time. It accelerates the strength, endurance to the wearer.

WORKING PRINCIPLE GENERAL

Pneumatic cylinders are used to actuate the external arm. Pneumatic cylinder is mounted on the appropriate position in the frame to get the required motion of the arm.

PASCAL'SLAW

It is a principle in fluid mechanics which states that pressure at a point has infinite direction and thus a pressure change at any point in a confined incompressible fluid is transmitted throughout the fluid such that the same change occurs everywhere.

PNEUMATICS

Pneumatics is a branch of engineering that makes use of gas or pressurized air. pneumatic systems used in industries are commonly powered by compressed air or
compressed inert gases. A centrally located and electrically powered compressor powers cylinders, air motors and other pneumatic devices. A pneumatic system controlled through manual or automatic solenoid valves is selected when it provides a lower cost, more flexible or safer alternatives electric motors and actuators. Pneumatics also has applications in dentistry, construction, mining and other areas.

PNEUMATIC CYLINDERS

Pneumatic cylinders are mechanical devices which use the power of compressed gas to produce force in the reciprocating linear motion. Like hydraulic cylinders, something forces a piston to move in the desired direction. The piston is a disc or cylinder, and the piston rod transfers the force it develops to the object to be moved. Engineers sometimes prefer to use pneumatics because they are quieter, cleaner and do not require large amounts of space for fluid storage. Because the operating fluid is a gas, leakage from a pneumatic cylinder will drop out and

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contaminate the surroundings, making pneumatics more desirable where cleanliness is are requirement.

In general, once actuated, compressed air enters into the tube at one end of the piston and imparts force on the piston. consequently, the piston becomes displaced.one major issue engineers come across working with pneumatic cylinders has to do with the compressibility of a gas. Many studies have been completed on how the precision of a pneumatic cylinder can be affected as the load acting on the cylinder tries to further compress the gas used. Under the vertical load, a case where the cylinder takes on the full load, the precision of the cylinder is affected the most. A study at the national Cheng kung university in Taiwan, concluded that the accuracy is about ± 30 nm, which is still within a satisfactory range but shows that the compressibility of an air has an effect on the system.

Fail safe mechanisms-pneumatic systems are often found in settings where even rare and brief system failure is unacceptable. In such situations, locks can sometimes serve as a safety mechanism in case of loss of air supply (or its pressure falling) and, thus the remedy or abate any damage arising in such a situation. Leakage of air from the input or output reduces the output pressure.

PNEUMATIC CYLINDER

FIG 1 PNEUMATIC CYLINDER

SPECIFICATIONS:

- Diameter of the piston-25mm
- Strokelength -125mm
- Material usedforrod - Mildsteel
- Yieldstress -36kgf/mm²
- Seals -Nitride(buna-N)Elastomer
- Endcones-Mildsteel
- Piston-EN8
- Media-air
- Temperature -0 to80°c
- Max pressure range-8×10^5

LEVERVALVE

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FIG 2 LEVER VALVE

SPECIFICATIONS:

- Max pressure range-0 to $8\times10^5 N/m^2$
- No of ports-5

PIPE FITTINGS

FIG 3 PIPE FITTING

SPECIFICATIONS:

- Max pressure range – 0 to $8\times10^5 N/m^2$
- Temperature -0 to80°c
- Fluid media – Air
- Temperature -0 to80°c
- Max pressure range -$8\times10^5 N\backslash mm^2$

HOSES

FIG 4 HOSES

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SPECIFICATIONS:

- Max pressure range – 0 to $8\times10^5 N/m^2$
- Outer diameter -6mm
- Inner diameter-4mm

MATERIAL USED

SI NO	MATERIAL	TYPE
1	EN8	Hollow pipe
2	Mild Steel	Metal plate(2mm)
3	Mild Steel	Square tube
4	EN8	Circular rod

TABLE 1 MATERIALS USED

FABRICATION

SI NO	OPERATIONS INVOLVED
1	Cutting
2	Grinding
3	Notch
4	Drilling
5	Welding
6	Fillet

TABLE 2 FABRICATION PROCESS

FABRICATION OF BODYFRAME

FIG 5 BODY FRAME

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NOTCH

Notch is the process of grinding of one of the two mating pipes according to its thickness and angle between the pipes. Here the two mating pipes are same dimensions and same material. Notch curve is rolled over the pipes and notch is taken according to its requirement. notch is done with angle grinder.

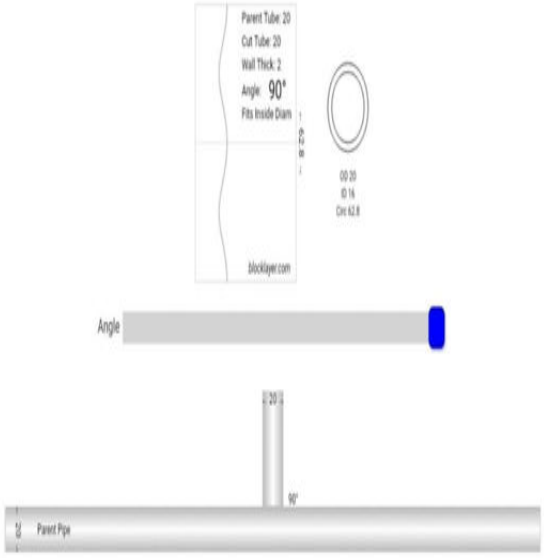

FIG 6 NOTCH CALCULATION

GRINDING, DRILLING ANDWELDING

Square tube is grinded in such a way that it completely fits on the hollow pipe and the upper edge of the square tube is flattened. It is done with angle grinder.arc welding is done in the appropriate position. Here tag is done followed by run. Before welding, drilling is done in m.s sheet metal. 3 pairs of 6 identical hole is drilled.

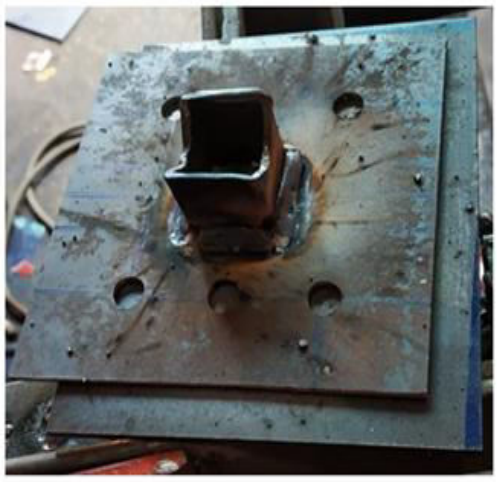

FIG 7 WELDING AND DRILLING OF PLATE

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FABRICATION OF VERTICALMEMBER

FIG 8 FABRICATION OF VERTICAL MEMBER

DRILLING

Hollow pipes are cut down for the required length and appropriate points are marked for drilling process. Drilling is done in such a way that the concentric holes are created on both surfaces (upper and lower) drilling is done in pillar drilling machine.M8 holes are drilled such that M8 bolt gets fit into the plate and vertical member.

WELDING

There are 4 mounts in the vertical structure. Two mounts for supporting pneumatic cylinder and another two for supporting horizontal member. The mount positions are marked and the mounts are welded there. Edges of the mounds are grinded.

FABRICATION OF HORIZONTALMEMBER

FIG 9 FABRICATION OF HORIZONTAL MEMBER

DRILLING

Circular rod is cut and according to the M8 hole, it is drilled in the pillar drilling machine. Edges of the rod are chamfered.

FIG 10 DRILLING OF CIRCULAR ROD

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GRINDING ANDWELDING

Hollow pipes are grinded and cut to the required length for handle, weight attachment rod and they are welded.

OVERALLFABRICATION

Fabrication is done in such a way that it can be adjustable for various body size and height. here it is suitable for 9 body variants with three adjustment for body height and three adjustment for body size.

To get different body size, vertical member is moved horizontally and can be fastened with the help of concentric holes on the vertical member and body frame. To get different heights, vertical member is moved vertically in the body frame in the subsequent concentric holes.

FIG 11 OVERALL FRAME

PHOTOGRAPHY

FIG 12 FINAL OUTCOME OF PROJECT

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FIG 13 FRONT VIEW OF PROJECT

FIG 14 SIDE VIEW OF PROJECT

FIG 15 BACKSIDE VIEW OF PROJECT

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CONCLUSION

This project work has provided us an excellent opportunity and experiment, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, assembly and machining while doing this project work. We feel that the project work is a good solution to bridge the gates institution and industries. We are proud that we have completed the work within the limited time successfully**. "AUXILIARY SKELETON STRUCTURE"** is working with satisfactory condition. Thus we developed **a "AUXILIARY SKELETON STRUCTURE"** which helps to know how to achieve low cost automation. The operating procedure of this system is very simple, so any person can operate. By using more techniques, they can be modified and developed according to the application.

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