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Design of Lift up Chair

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Abstract - *This project consist of hydraulic cylinder for mechanism. The lift up chair is easy way to lift the person who has fallen on the ground. It takes few minute to assemble and disassemble . it is quick, fast, safe and stable operation which helps comfort while lifting the fallen person, it requires minimum physical effort to operate it. It contains part like back rest, front legs, back legs, seat, hydraulic cylinder and pump. The mechanism is very simple and it is very easy to manufacture. Nowadays chairs are available in the market in different types of batteries and electric motor specification but here we are going to operate the chair with the help of mechanical elements such as Hydraulic Cylinder, Hydraulic Hand Pumps, shaft, levers stoppers etc. Here the cost of Chair will become so much less than that of the chairs with electric motor and batteries because of the use of mechanical components instead of electrical components. While using the chair following points should be kept in mind or followed*

1. *All lock pins are inserted.*
2. *Cylinder is bolted.*
3. *Hand pump operation should be slow.*
4. *Feet of the patient are kept on floor.*

First we designed this lift up chair is from "CATIA V5" and then the actual prototype is made & tested for its working. This will give design of lift up chair.

Key Words: Hydraulic, Cylinder, Pump, CATIA V5 etc.

1. INTRODUCTION

The chair is simply a lifting chair that helps human who has fallen down, to stand up easily. It can be operated by one person or with help of one assistant. It carries maximum weight with minimum human efforts. The time required for a chair is minimum and structure is compact. The state of the art lifting chair, is used by personnel in home care as well as for ambulance services and all personnel working with lifting and moving of individuals with reduced mobility in general. Patients having muscular diseases like knee problem, back problem , spinal problem and paralysis can be stand up by their own and be independent. In case of accident, the Chair only need one assistant to help the victim to at almost standing position.

2. METHODOLOGY

In this design of our Lift up chair .we can use the hydraulic cylinder operated by the hydraulic pump for lifting purpose. The motion of stroke of cylinder is according to the pump. In this project we had first made rough designs of chair by pencil to get a primary idea about operation of system. According to design we made the prototype of actual chair using wood and nut bolts. After that we finalized one design of chair and made 3D modeling on software CATIA V5as shown in fig. To understand the working we made ANSYS stress distribution. According to this we made frame of chair having material mild steel with two cross sections , one is 50*25 mm rectangular bar and 25*25mm of square bar . Using the rectangular bar we made back legs, front legs with back rest. For completion of these parts we were going through cutting, bending, drilling, welding processes. For cushioning of back rest we used foam and leather cover. For mounting the hydraulic cylinder we used 25*25mm of bar which connects front legs of chair. The hydraulic cylinder mounted on this bar with use of nut and bolt and connected to seat portion. The pump which is connected to hydraulic cylinder through a pipe. seat is made up of two 19 mm circular rod having length 470mm which passing through back legs and front legs which has three circular foam which helps the person to land over it comfortably.

3. WORKING MECHANISM

The mechanism used in the lift-up chair is extremely simple. The mechanism consists of very few parts namely:

1. Cylinder (Capacity 500Kg),
2. Two cylindrical rods of 19mm diameter.(470mm length)
3. A horizontal support (2*1 inch rectangular M.S bar),

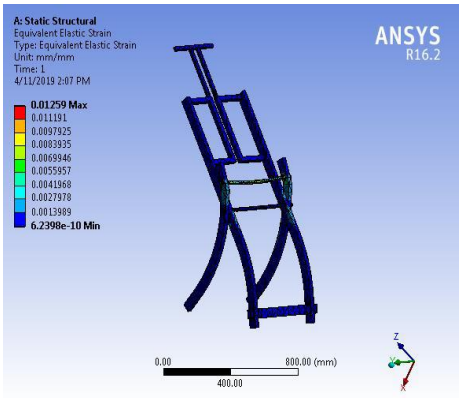
Actual working of chair:

The chair contains a 3 point pivot mechanism held together by two horizontal cylindrical bars of 19mm diameter. The third point of the pivot is the ground.

The mechanism is attached to the rear legs which have wheels mounted at the end for ease of moment. Once the cylinder is attached to the front legs of the chair and bolted in, the yoke is attached to the round bar (at the top), this bar as mentioned above is attached to the rear legs and at an angle. A second bar (again attached to the rear legs) which sits below the first bar acts as a second point of the pivot mechanism. The wheels act as the third point in the pivot mechanism. Once the pumping action is initiated and once the cylinder starts to extend, it pushes the top most rod, as the rod is being pushed now because of second point in the pivot mechanism the rear legs start to move. The wheels here give ease of moment as mentioned above, and all of this in turn contributes towards pulling the rear two legs forward resulting in lifting up the lift-up chair. (Also a note here is that as the bars are going to be the seat, they are wrapped in foam for cushioning purpose).

4. ANSYS DESIGN

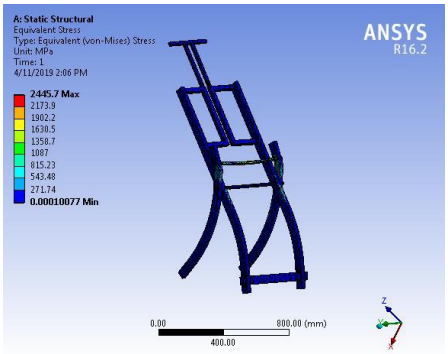
4.1 Equivalent Elastic Strain



Model (A4) > Static Structural (A5) > Solution (A6) > Equivalent Elastic Strain

Time [s]	Minimum [mm/mm]	Maximum [mm/mm]
1.	6.2398e-010	1.259e-002

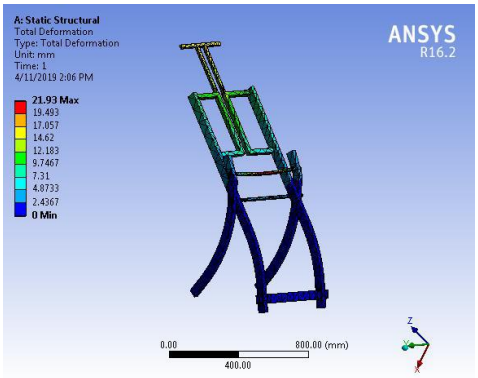
4.2 Equivalent Stress



Model (A4) > Static Structural (A5) > Solution (A6) > Equivalent Stress

Time [s]	Minimum [MPa]	Maximum [MPa]
1.	1.0077e-004	2445.7

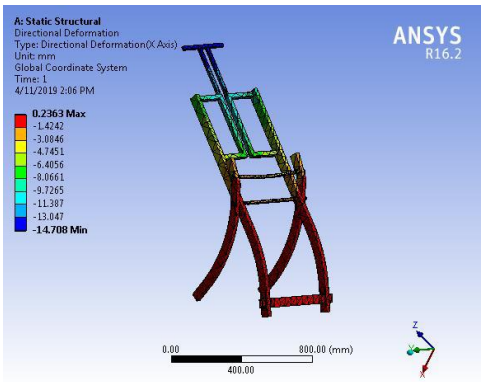
4.3 Total Deformation



Model (A4) > Static Structural (A5) > Solution (A6) > Total Deformation

Time [s]	Minimum [mm]	Maximum [mm]
1.	0.	21.93

4.4 Directional Deformation



Model (A4) > Static Structural (A5) > Solution (A6) > Directional Deformation

Time [s]	Minimum [mm]	Maximum [mm]
1.	-14.708	0.2363

5. CONCLUSIONS

1. The conclusion of lift up chair is that it is easy way to lift a fallen person.
2. It requires minimum time to assemble the parts and to lift the fallen person.
3. Lift up chair is easy to handle.
4. The conclusion of lift up chair is to lift the fallen person with maximum safety and comfort.

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BIOGRAPHIES

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