Exoskeleton Wearable Chair (Chair-Less Chair)

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Abstract— this paper gives an idea about the exoskeleton based wearable chair is a modification of flat chair. This chair is helping full for persons those who have to stand for long hour daily ex on assembly lines. They have to stand for long hour (8-12hrs) this chair can be worn by the user with the help of straps to both legs. This will provide support for setting of a user without any interruption of the work it can set according to sitting posture at the required angle. It will improve working efficiency and reduce adverse effects on human health due to continue standing position. This has certain advantages over a flat chair such as its light in weight, it is easy to carry with user, i.e. it is portable, never become an obstacle to the user movement during work. Flexibility in its design makes it unique and cost effective.

Key words: Exoskeleton, Working Efficiency, Cost Effective

I. Introduction

Presently a day in quickly developing mechanical time there are such a significant number of innovation imagined to expanded in efficiency yet vital given to human solace this at second need and expanded in profitability is at first in the event that we need to stand ceaselessly for drawn out stretch of time with no unwinding and at the same time we need to concentrate on our work it will influence on our wellbeing and prompt certain issue, for example, hypertension, sadness and so on.

To beat the above disservices and accomplish both profitability and human wellbeing and solace the level seat isn't adequate this will prompt making of exoskeleton chair this is chair which can wear by client as demonstrated by its name with help of straps it offered help to leg and thigh of client which result into diminishment in muscle torment and issue in regards to bones emerge because of keeps remaining for extended periods. In the event that you work some place, for example, an industrial facility, distribution center, or eatery kitchen, at that point you'll know how tiring it can be to remain for a few hours on end. Lamentably, in any case, it isn't generally viable or safe to bear a stool with you wherever you go. That is the reason Swiss start up noonee has made the Chair less Chair. Worn as an exoskeleton on the back of the legs, it gives you a chance to walk or even keep running as required, yet can be bolted into a supporting structure when you go into a sitting position. Organization CEO Keith Gunura began building up the Chair less Chair in 2009, when he was an understudy in the Bioinspired Robotics Lab at the ETH Zurich explore organize. He was enlivened to do as such by recollections of his first occupation, in which he worked while remaining at a bundling line.

Presently in model shape and being effectively advertised, the gadget uses a controlled variable damper to help the wearer's body weight. The client basically twists their knees to get themselves down to the level at which they'd get a kick out of the chance to sit, and after that draws in the damper. The Chair less Chair at that point locks into that arrangement, coordinating their weight down to the foot rear areas of their shoes, to which it is joined – it additionally appends to the thighs through ties, and to the midsection utilizing a belt.

II. Objectives

1) To build up the wearable seat that can secure at different positions.
2) To increment the working ability of employee.
3) To lessen the heaviness of wearable chair.
4) To deliver the wearable chair with least cost.
5) To increment the solace to individual.

III. Dology

A. Material Selection

We have to select following material for respective components as follows.

- Cylinder – std. cylinder
- Pad – M S
- Belt – nylon
- Shoe – leather
- Shoe holder – M S
- Square block – M S
- Studs – M S

B. Procurement of material

We have to purches from various suppliers and some material from scrap

C. Designing of proposed model

We have to draw a cad model or sketches of various components.

D. Assembly

After drawing of cad model of require system we have to assemble component as per proposed diagram

E. Testing and analysis

After assembly we have to go for testing and analysis through FEA, for required different loading condition.

F. Validation

Than we have to test the model by seating number of person having different weight in order to check the sustainability of actual model

IV. Construction

As in our mechanism we used following Parts.

- Lether safety shoes
- Shoe holder
- Piston and cylinder
- Square block
- Lock nut

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- Thigh support
- Leg support

A. Construction and Working Process of Manufacturing

We will buy a leather safety shoe for which we will make C-frame, the frame is fixed with shoes with the help of stud passed through heels of the shoe and both end of stud is tightened with the help of nut. It will hold the shoe (shoe holder).

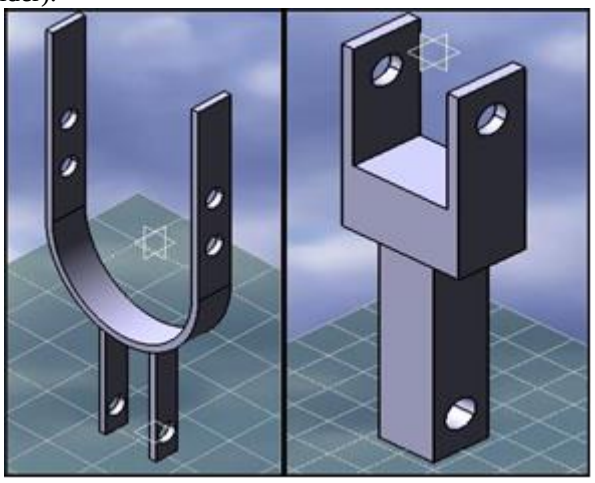

Fig. 1:

Now we will make a small square box one end of which is pivoted to shoe holder and another end is fixed to the bottom end of Piston connecting rod.

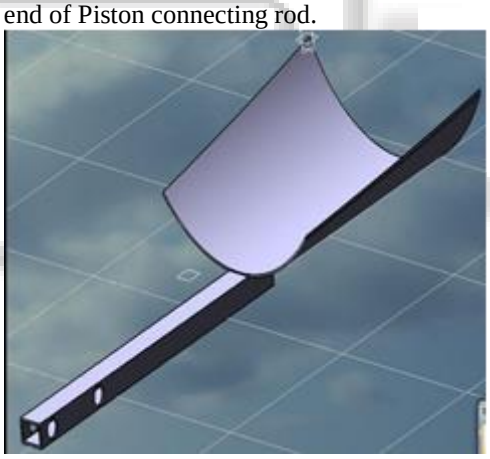

Fig. 2:

Now, we make leg holder which will hold the thigh and is made by taking MS sheet bended to the shape of thighs. Two nylon laces are fixed to the thigh holder with the help of pop rivet so that it can hold the leg. The leg holder is pivoted to square block and square block is fixed to cylinder. The cylinder pivoted with the help of this component to leg holder.

B. Cylinder

Pneumatic cylinder(s) (at times known as air chambers) are mechanical gadgets which utilize the energy of compacted gas to create a power in a responding direct movement. Like water powered barrels, something powers a cylinder to move the coveted way. The cylinder is a circle or barrel, and the cylinder pole exchanges the power it creates to the question be moved. Architects in some cases want to utilize pneumatics since they are calmer, cleaner, and don't require a lot of room for liquid stockpiling. Since the working liquid is a gas, spillage from a pneumatic barrel won't dribble out and taint the environment, making pneumatics more alluring where tidiness is a prerequisite.

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 air has an effect on the system.

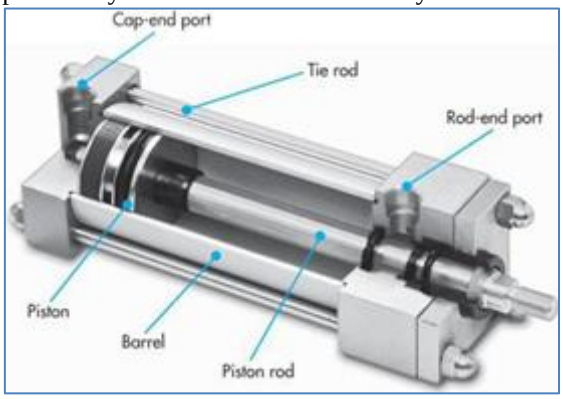

Fig. 3: Cylinder

Types: Although pneumatic cylinders will vary in appearance, size and function, they generally fall into one of the specific categories shown below. However, there are also numerous other types of pneumatic cylinder available, many of which are designed to fulfill specific and specialized functions.

1) Single-acting cylinders

Single-acting cylinders (SAC) use the pressure imparted by compressed air to create a driving force in one direction (usually out), and a spring to return to the "home" position. More often than not, this type of cylinder has limited extension due to the space the compressed spring takes up. Another downside to SACs is that part of the force produced by the cylinder is lost as it tries to push against the spring.

2) Double-acting cylinders

Double-acting cylinders (DAC) use the force of air to move in both extends and retract strokes. They have two ports to allow air in, one for outstroke and one for in stroke. Stroke length for this design is not limited; however, the piston rod is more vulnerable to buckling and bending. Additional calculations should be performed as well. Multi-stage, telescoping cylinder: Telescoping cylinders, also known as telescopic cylinders can be either single or double-acting. The telescoping cylinder incorporates a piston rod nested within a series of hollow stages of increasing diameter. Upon actuation, the piston rod and each succeeding stage "telescopes" out as a segmented.

Piston The main benefit of this design is the allowance for a notably longer stroke than would be achieved with a single-stage cylinder of the same collapsed (retracted) length. One cited drawback to telescoping cylinders is the increased potential for piston flexion due to the segmented piston design. Consequently, telescoping cylinders are primarily utilized in applications where the piston bears minimal side loading.

Hydraulic cylinders get their power from pressurized hydraulic fluid, which is typically oil. The hydraulic cylinder consists of a cylinder barrel, in which a piston connected to a piston rod moves back and forth. The barrel is closed on one end by the cylinder bottom (also called

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the cap) and the other end by the cylinder head (also called the gland) where the piston rod comes out of the cylinder. The piston has sliding rings and seals. The piston divides the inside of the cylinder into two chambers, the bottom chamber (cap end) and the piston rod side chamber (rod end / head end).Flanges, grunions, clevises, Lugs are common cylinder mounting options. The piston rod also has mounting attachments to connect the cylinder to the object or machine component that it is pushing / pulling. A hydraulic cylinder is the actuator or "motor" side of this system. The "generator" side of the hydraulic system is the hydraulic pump which brings in a fixed or regulated flow of oil to the hydraulic cylinder, to move the piston. The piston pushes the oil in the other chamber back to the reservoir. If we assume that the oil enters from cap end, during extension stroke, and the oil pressure in the rod end / head end is approximately zero, the force F on the piston rod equals the pressure P in the cylinder times the piston area

C. Advantages

1) It is automatic.
2) It is powerless
3) Provides maximum comfort.
4) It will light in weight
5) Compact in size and portable.er people, we have to tailor made it.

D. Disadvantages

1) Design consideration changes with variation in load

E. Applications

1) Industries
2) Old people
3) Warehouse
4) Kitchen
5) Restaurant
6) Society purposed
7) Hospitals

V. Conclusion

Hence our design is affordable and specially designed for the people at different assembly line work Due to this arrangement peoples felt relaxed who were suffering from the back pain and spinal cord diseases. The design project is a success based on tilting device. It reduced body fatigue and increased the workability of the person in the office hours as well as in the commercial places. When in full-scale production, the EBHS will be available in three size.

Fig. 4:

References

[1] Carr, Christopher E., and Dava J. Newman. "Characterization of a lower-body exoskeleton for simulation of space-suited locomotion."Acta Astronautica 62, no. 4 (2008): 308-323.
[2] Karavas, Nikos, Arash Ajoudani, Nikos Tsagarakis, Jody Saglia, Antonio Bicchi,and Darwin Caldwell. "Tele-impedance based assistive control for a compliant knee exoskeleton."Robotics and Autonomous Systems 73 (2015): 78-90.
[3] Zwerver, Johannes, Steven W. Bredeweg, and At L. Hof. "Biomechanical analysis of the single-leg decline squat." British journal of sports medicine 41, no. 4 (2007): 264-268.
[4] Niiyama, Ryuma, Akihiko Nagakubo, and Yasuo Kuniyoshi. "Mowgli: A bipedal jumping and landing robot with an artificial musculoskeletal system." In Robotics and Automation, 2007 IEEE International Conference on, pp. 2546-2551. IEEE, 2007.
[5] Jayawardena, Chandimal, Nilufar Baghaei, Kathiravelu Ganeshan, and Abdolhossein Sarrafzadeh. "Designing a socially assistive companion robotic wheel chair: RoboChair." In Robotics, Automation and Mechatronics (RAM), 2013 6th IEEE Conference on, pp. 231-236. IEEE, 2013

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