iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 **Issue:** XI **Month of publication:** November 2019

DOI: http://doi.org/10.22214/ijraset.2019.11159

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177
Volume 7 Issue XI, Nov 2019- Available at www.ijraset.com

Design and Fabrication of Walking Support System

Anubhav Agnihotri[1], Anurag Singhal[2], Himkant Nigam[3], Jaskirat Singh[4]
[1, 2, 3, 4]*Undergraduate Students, Department of Mechanical Engineering, Pranveer Singh Institute of Technology, Kanpur*

Abstract: ***In this paper, design and fabrication of walking support system is discussed which is a new medical device that permits, upright, hands-free mobility. It is designed to reduce the fear of falling and the fatigue sometimes associated with struggling to walk. The need for such a system arises from day-to-day requirements in our society. The walking support system is intended to be used by people who struggle to walk securely and confidently, and to allow mobility without extreme fatigue or fear of falling. By securing the body's centre of gravity, it encourages upright posture, helps restore proper gait, and reinforces a sense of balance and confidence. Unlike a traditional walker, it can be used hands-free.***
Keywords: Walker, Mobility device, Physically disable, Walking support, Upright etc.

I. INTRODUCTION

As the major population of our country is in the middle age and unfortunately so many of them either face any accident or suffer from malnutrition due to lack of food with good nutrition. It leads to physical disability due to which they have to depend on others for support. This is also common with the old age people suffering from physical disability. So there is a requirement of an innovative solution to provide the independent walking of physically challenged people irrespective of the age. Hence we want to develop a model that can provide upright posture and stable gait, hands free movement to facilitate multitasking, effortless mobility (whether in a straight or curved path), no fear of falling either someone bents forward or backward or stops instantaneously, psychological positivity to user (since he will be walking normally among the crowd) and will be easily affordable.

A. Walking Support System Has Following Features

1) Multitasking facility due to independent and hands free movement.
2) No fe ar of falling due to stable structure along with support from seat and belt.
3) Cost effective due to optimized design.
4) Maintaining upright posture.
5) Due to proper cushioning there will be no strain on back or thighs even in a long run.
6) Psychological support as the end user can live independently in his free lifestyle in the society.
7) It will be designed in its simplest possible structure so that even the most elderly people can comprehend it easily and operate it easily without any problem.

B. Our Device Will Be Beneficial For Followings

1) People suffering from knee osteoarthritis.
2) Old age people either with one leg or both leg working.
3) People who have met with an accident and having one leg working.
4) People having deformed gait and having problem in walking.
5) People suffering from partial paralysis.

II. WORKING PRINCIPLE

Walking support system works on the principle of stable equilibrium. In classical mechanics, a particle is in mechanical equilibrium if the net force on that particle is zero [1]. In addition to defining mechanical equilibrium in terms of force, there are many alternative definitions for mechanical equilibrium which are all mathematically equivalent. In terms of momentum, a system is in equilibrium if the momentum of its parts is all constant. In terms of velocity, the system is in equilibrium if velocity is constant. In a rotational mechanical equilibrium the angular momentum of the object is conserved and the net torque is zero. [2]Its structure is designed in such a manner that the base area is larger than the area at plane passing through the centre of gravity of the system. It allows a stable structure and the user will not fall in any case because the centre of gravity of the system is fixed. Stable equilibrium is explained in the given figure:

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177
Volume 7 Issue XI, Nov 2019- Available at www.ijraset.com

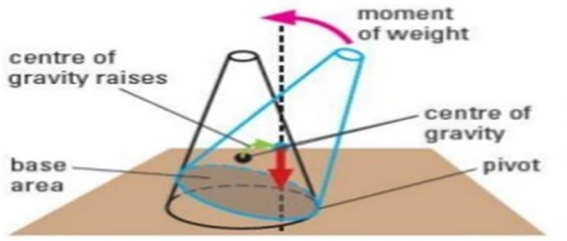


Fig. 1 Diagramatic explaination of working of centre of gravity to attain stable equilibrium

The 3D model of the structure of walking support system is shown in the figure. It is clear that its base area is larger than the area at plane passing through the centre of gravity of the system.

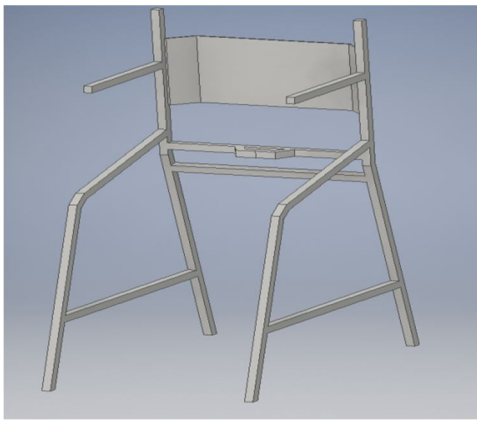


Fig. 2 Sample diagram of our proposed project

III.MECHANISM USED

In walking support system we have used a combination of seat, belt and back rest to fix the centre of gravity of the user as well as whole system and provide a stable posture to the user. The "center of gravity" of the body is a point at which all body weight can be assumed to be concentrated. The effective body weight passes through the center of gravity and acts vertically downward along the weight line.[3] An upright posture is the most suitable posture for walking as shown below:

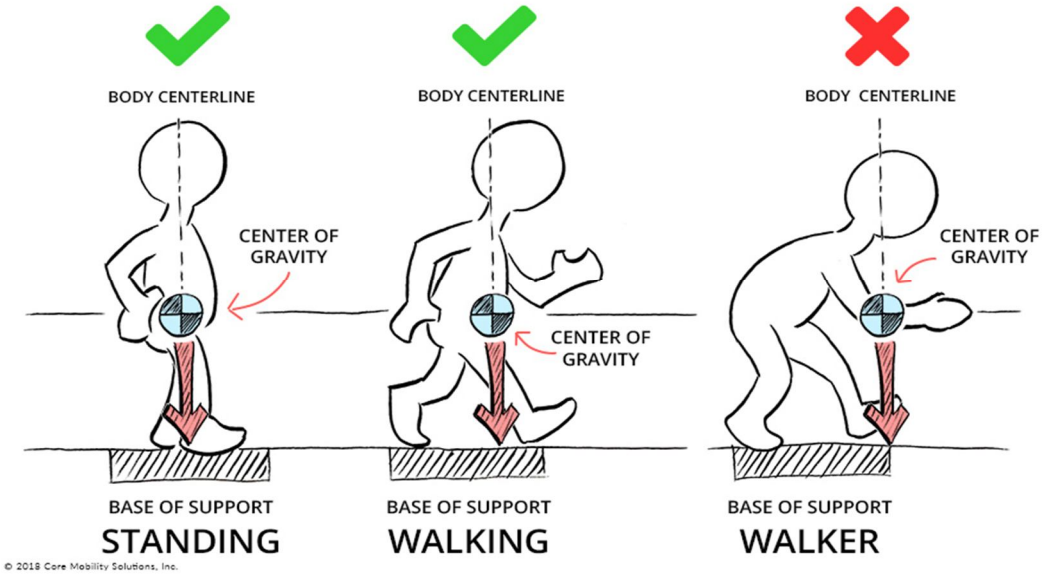


Fig. 3 Figure explaining shifting of centre of gravity

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177
Volume 7 Issue XI, Nov 2019- Available at www.ijraset.com

IV. LIST OF COMPONENTS

A. Square cross sectional hollow mild steel pipe
B. Caster wheels
C. Seat and height adjusting system
D. Braking arms
E. Braking wires
F. Braking levers
G. Plywood back rest
H. Rubber handles
I. Leather belt
J. Fasteners

V. SELECTION OF MATERIALS

In the context of product design, the main goal of material selection is to minimize cost while meeting product performance goals. Systematic selection of the best material (Table 1) for a given application begins with properties and costs of candidate materials.

Table I
Material Selection

Sr. No.	Component	Material
1	Structure	Mild steel
2	Wheel base	Galvanized steel
3	Wheel rim outer	Polymer
4	Backrest	Plywood
5	Belt	Leather
6	Sheet	Foam and rexine

VI. PROCESSES INVOLVED IN FABRICATION

A. Metal Cutting

We have used mild steel, square cross sectional pipes for making structure of our device. Many factors are involved in choosing a particular method or technology for cutting tube or pipe. The basic factors that affect the cut are the tube or pipe material, wall thickness, squareness of ends, end-conditioning requirements, and secondary process requirements. Other factors that play a role include production volume, cutting efficiency, overhead costs, and special requirements of the tube or pipe material [4]. To give the structure a proper shape we have used grinding wheels to cut down the pipes according to design. It gives a finished cut and the process cost is very less.

B. Welding

To join the structure we have used Shielded metal arc welding. In this process an electric current, in the form of either alternating current or direct current from a welding power supply, is used to form an electric arc between the electrode and the metals to be joined. The work piece and the electrode melts, forming a pool of molten metal (weld pool) that cools to form a joint. As the weld is laid, the flux coating of the electrode disintegrates, giving off vapors that serve as a shielding gas and providing a layer of slag, both of which protect the weld area from atmospheric contamination. Because of the versatility of the process and the simplicity of its equipment and operation, shielded metal arc welding is one of the world's first and most popular welding processes. It dominates other welding processes in the maintenance and repair industry, and though flux-cored arc welding is growing in popularity, SMAW continues to be used extensively in the construction of heavy steel structures and in industrial fabrication. The process is used primarily to weld iron and steels (including stainless steel) but aluminium, nickel and copper alloys can also be welded with this method.[5]

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177
Volume 7 Issue XI, Nov 2019- Available at www.ijraset.com

C. Assembly of Components

We have used various components like braking system, sheet, belt, caster wheels, back rest, handles etc. The assembly of these components is done by making holes by drilling operation on suitable locations and making temporary joints with the help of fasteners. For fluted drill bits, any chips are removed via the flutes. Chips may form long spirals or small flakes, depending on the material, and process parameters.[6]

The final assembled model is shown in the given figure:

Fig. 4 Working Model

VII. ADVANTAGES

A. Walking support system provides multitasking facility due to independent and hands free movement.
B. It is light weight and easily transportable.
C. There is no fear of falling due to stable structure along with support from seat and belt.
D. It is very cost effective due to optimized design.
E. It maintains upright posture of user by fixing its center of gravity.
F. Due to proper cushioning there will be no strain on back or thighs even in a long run.
G. Psychological support as the end user can live independently in his free lifestyle in the society.
H. Text Font of Entire Document

VIII. RESULT

Walking support system is found very helpful for people suffering from Osteoarthritis and having difficulties in walking.

The model is tested with full load capacity and found successful in its operation, due to the strong base to carry the load (up to 70-80 kg).

IX. CONCLUSIONS

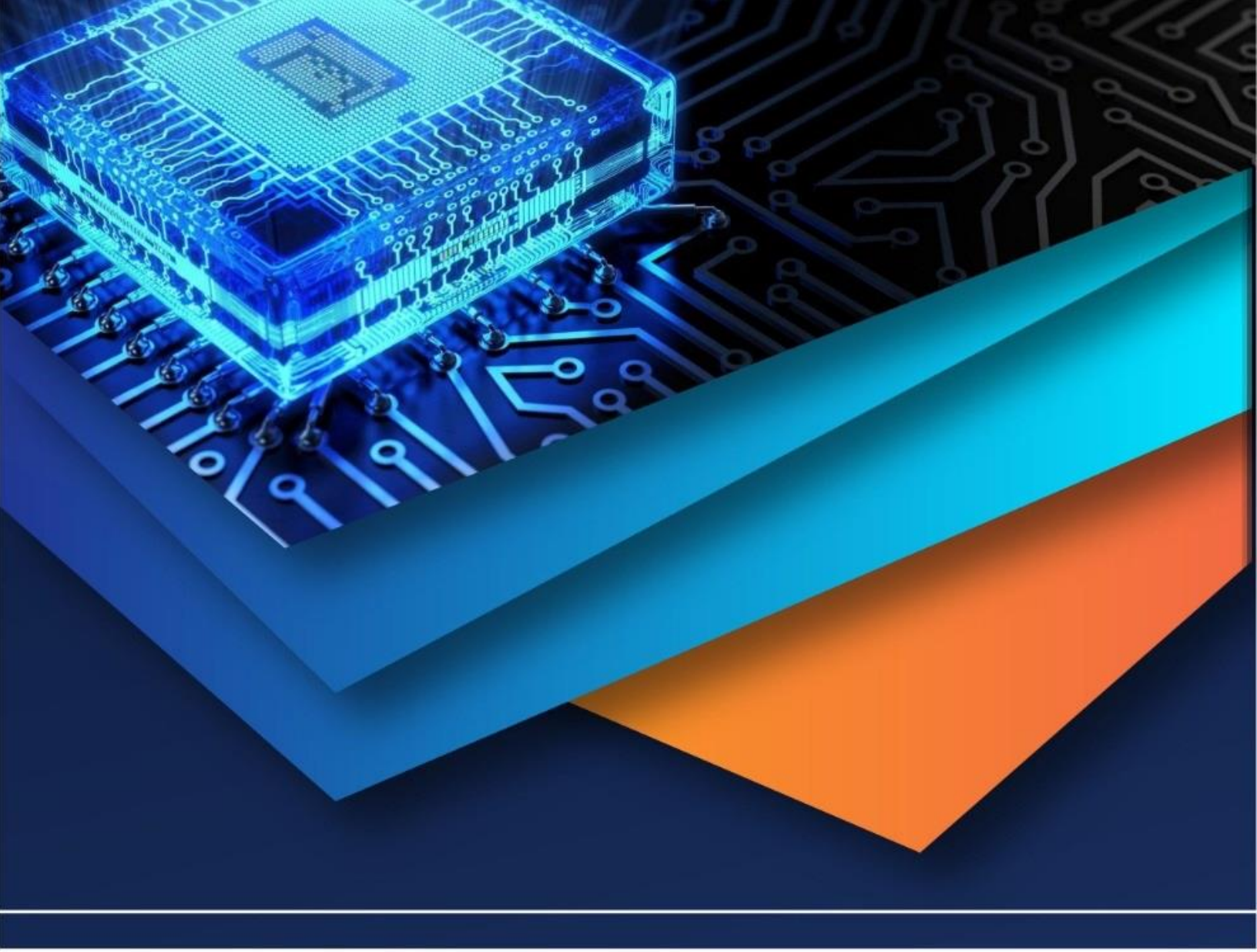
"Necessity is the mother of invention". A need or problem encourages creative efforts to meet the need or solve the problem. As we have observed in our day to day life that there is a requirement of a cost effective mechanical device for poor people having problem in walking. Hence we come up with a solution called walking support system. It is very useful for people suffering from various problems, which affect the proper walking of a person. It is an innovative and cost effective device which will be very beneficial for society. Although this project had some limitations regarding the automation and not suitability for people don't having at least one leg. Yet it is very useful for people having at least one leg or suffering from Osteoarthritis. It is light weight and can be transported easily everywhere.

As far the commercial aspects of this product are concerned, if this product can be fully automated and produced at a lower cost the acceptance will be unimaginable. At Present, there are no competitors for such a kind of product in our market.

If successful, this device could provide fearless independent walking to required people in home as well as in the workplace. Also, it is hoped that a walking support system will provide confidence to the user as he will be walking like a normal person without fear of falling.

REFERENCES

[1] John L Synge & Byron A Griffith (1949). Principles of Mechanics (2nd ed.). McGraw-Hill.
[2] Beer FP, Johnston ER, Mazurek DF, Cornell PJ, and Eisenberg, ER (2009). Vector Mechanics for Engineers: Statics and Dynamics (9th ed.). McGraw-Hill. p. 158.
[3] http://www.oandplibrary.org/popup.asp?frmItemId=8C06ACC9-D8C2-46C7-8185-D3E9BDC86250&frmType=image&frmId=1
[4] https://www.thefabricator.com/tubepipejournal/article/tubepipefabrication/tube-and-pipe-cutting-techniques-advantages-and-limitations
[5] Cary, Howard B.; Helzer, Scott C. (2005), Modern Welding Technology, Upper Saddle River, New Jersey: Pearson Education, ISBN 978-0-13-113029-6
[6] Todd, Robert H.; Allen, Dell K.; Alting, Leo (1994), Manufacturing Processes Reference Guide, Industrial Press Inc., pp. 43–48, ISBN 978-0-8311-3049-7.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY