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Design and Fabrication Floating Back Pack System

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Abstract*: A suspended load-bearing backpack is a device designed to capture the mechanical energy generated by the vertical oscillation of the load on the back during gait. The objective of this study was to evaluate the effect of a suspended load-bearing backpack system on specific temporal and kinetic parameters that describe gait. The purpose of this project is the design and development of a floating backpack. Our project proposes to design a backpack that allows the load to move relative to the user during walking and running, such that the large movements between the load and the user reduce fluctuations in the vertical motion of the load relative to the ground.*

Keywords: suspended-load, Floating bag, backpack, fatigue

I. INTRODUCTION

The Floating Backpack System is a revolutionary innovation designed to improve the comfort and efficiency of those carrying heavy loads. This system incorporates advanced suspension mechanisms, such as elastic or spring technology, that allow the backpack to move independently of the user's body. By reducing the impact forces generated when walking or running, the floating backpack minimizes stress on the back, shoulders, and joints, thereby improving user comfort.

Additionally, this design helps improve energy efficiency, allowing users to carry heavy loads with less fatigue. Ideal for military personnel, hikers, and travelers, the Floating Backpack System represents a significant advancement in ergonomic backpack technology, offering a practical solution to reduce physical strain when carrying loads for extended periods.

II. CONSTRUCTION PROCESS

Fig. Nut and bolts

Fig. pully

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Fig. shaft

Fig. elastic rope

Fig. spring

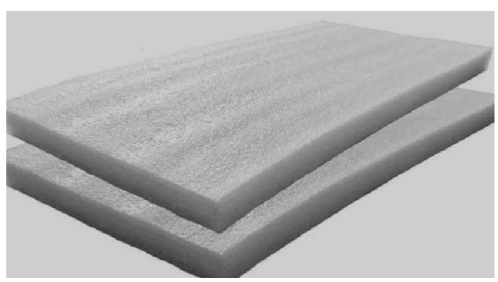

Fig. foam sheet

III. METHODOLOGY

The development of the Floating Backpack System follows a structured methodology to ensure maximum efficiency, comfort, and durability. The process begins with extensive research and analysis, examining existing backpack designs and biomechanical studies to identify common load- related issues such as strain, fatigue, and energy expenditure. Based on these findings, conceptual designs are created that incorporate lightweight, durable materials such as carbon fiber and high- strength polymers. The suspension mechanism is carefully designed to allow fluid movement with minimal impact on the wearer's body.

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Once the design is finalized, an initial prototype integrating the floating suspension system is built. Adjustable components are tested to determine the optimal level of flexibility and shock absorption. The prototype undergoes rigorous testing, both in controlled laboratory environments and in real- world conditions, to evaluate its performance on different terrains and with various load capacities. Motion analysis and user feedback are collected to assess the backpack's impact on comfort, stability, and energy efficiency.

After testing, the design is refined based on the data and feedback received. Adjustments are made to improve weight distribution, minimize pressure points, and optimize overall usability. Once optimized, the final version of the Floating Backpack System is prepared for mass production, ensuring it meets ergonomic and safety standards. This structured approach ensures the development of a backpack that effectively reduces physical strain, improves mobility, and optimizes carrying efficiency for users in a variety of applications.

IV. LITERATURE REVIEW

The comprehensive framework for design is based on systems engineering design and analysis methods. While focusing on the design process, an analysis of various methods and processes was conducted to design a reliable model for reducing the forces exerted by the box on the human body. Several research papers and research papers that form the basis of our model are cited. Some of these documents are as follows: Laurence C Rome, Andy L Ruina and others. [1] showed that a suspended load ergonomic-backpack has been developed that significantly reduces the active forces on the body (e.g., 82–86%) and thereby reduces the metabolic rate for carrying loads (e.g., 40 W for 60 lb loads), maximizing the cost of carrying loads (53 Kg more). Camilla Perez, Evan Campo and more. [2] showed that in military life, carrying supplies is an inevitable part of combat operations and thus the reason why soldiers often use military backpacks. Infantrymen often carry equipment that weighs more than 30% of their body weight. Joseph J Knapik, Katy L Reynolds, Everett Harman and others

[3] review historical and biographical accounts of military logistics. Before the 18th century, infantrymen rarely carried more than 15 kg while marching, but since then the load has increased. This weight increase is likely due to the weight of weapons and equipment that incorporate new technologies to increase protection, firepower, communications, and mobility**.**

LITERATURE GAP

The literature gap in flow background research generally refers to areas that have not been well studied or documented in existing studies.

Material Science : There may be limited research on new materials that enhance buoyancy while maintaining strength and lightweight properties.

User Experience : There may be a lack of research on the ergonomic aspects of floating backpacks, especially on how design affects user comfort and usability in the underwater environment.

Environmental impacts : Especially in unstable marine environments, there may be insufficient research on the environmental impacts of using floating backpacks.

Performance Evaluation : A systematic test procedure is required to evaluate the performance of floating backpacks under various conditions (e.g., flow, heavy loads).

Market Research : There may be little research on consumer preferences and market trends related to floating backpacks.6. Safety and Rescue Applications : There may be a lack of studies focusing on the effectiveness of floating backpacks in emergency situations such as rescue operations or lifesaving situations.

V. PRODUCTION AND DISTRIBUTION PROCESS

Design and Planning:

Tip: Explain the purpose, features and dimensions of the backpack.

Material Selection : Choose a lightweight, waterproof material (e.g., ripstop nylon, PVC).

Prototype : Create an initial prototype for testing.

Equipment preparation
Cutting : Cutting fabrics and other materials into specific shapes using patterns.
Preparing the float : Remove and cut the foam or floating materials to make it float.
Manufacturing Some Products
Foaming or Sweating : Creating suspended liquid particles, either by foaming or by sweating.
Rope and Fastener Manufacturing : Manufacturing of rope, fasteners, and other components from strong materials.

Assembly Process
I. Changes:
Secure the common components together to make them watertight.
Use double layers for added strength in high-stress areas. No. Flow combination:
Enclose and secure the floating containers in the designated containers.
Related Resources:
- Usually sew or attach straps, zippers and other accessories.
Fit and Functional Testing : Verify that all equipment fits correctly and functions as intended.

Quality Control
I. Inspection : Check for defects in the welding, equipment and overall construction. No. Waterproof test : Make sure the backpack is waterproof.
iii. Buoyancy Testing : Test the buoyancy of the backpack under weight.

Final Assembly
I. Add the final components:
Attach branding elements such as logos and labels.
Include additional accessories such as pockets or bright ribbons.

Packing : Fold and pack backpacks for storage or shipping, for protection in transit.

Fig. Floating Back Pack System

END OF HOT BACK-PACK SYSTEMS

Our product will address the physiological and musculoskeletal challenges faced by a serving soldier. With a double-frame and pulley system design, this bag pack reduces the impact forces on the body.

It helps in walking long distances with less strain on the body, as well as reducing the risk of overexerting injuries to the hips, spine, and knees.

In the future this could be further developed into small power plants and casualty evacuations.

VII. RESULT

Field Trials are an important part of a project. It doesn't just give career ideas project status, but we also come to know about the problem in the model and errors made so that they can be corrected

VIII. CONCLUSION

In the Indian Army, carrying supplies is an inevitable part of military operations which is why soldiers often use military backpacks. Infantrymen often carry equipment that weighs more than 30% of their body weight. When a soldier lifts a load, his energy expenditure increases, resulting in a decrease in performance.

The load carried has a similar motion to the stationary position of the center of gravity of the soldier as he walks. This significantly increases the acceleration force exerted by the mass on the body and thereby increases energy consumption.

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