Journal of Physical Education and Sport ® (JPES), 17 Supplement issue 5, Art 254, pp. 2329 - 2332, 2017
online ISSN: 2247 - 806X; p-ISSN: 2247 – 8051; ISSN - L = 2247 - 8051 © JPES

Original Article

Portable Climbing Simulator

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Published online: November 24, 2017
(Accepted for publication November 15, 2017
DOI:10.7752/jpes.2017.s5254

Abstract : This research refers to a portable climbing simulator, aimed at being used in gymnasia in the process of initiating, consolidating and improving climbing skills for students of all ages.
Starting from the premise that modern man develops less and less the utilitarian applicative skill of climbing, the research proposes a pliable device which could be used during physical education classes in schools, being able to be adapted, through variable inclination, to a wide range of needs and individual capacities of the beneficiary students. The research carries out a critical analysis of other global inventions, of the devices used by man to practice climbing and it presents the advantages of the invention patented by the author at the Romanian State Office for Inventions and Trademarks under number 129759.
Key words: simulator, climbing, pliable, students, skills.

Introduction

Climbing is an older-than-man physical and motor manifestation, which has accompanied him throughout the steps of his evolution from the stage of primate to the current stage of modern man. The history of primates can be traced back million years, in the groups of animals that survived to the cataclysms which led to the extinction of dinosaurs. Than man stood in two legs, replacing tree climbing with biped walking. That moment, human species' capacity to climb with a view to move, look for food and defend started to gradually deteriorate, being compensated, among others, by the capacity to walk in two legs. Anthropology shows that in this evolutionist approach, human species have started to be more and more different from the monkey species that kept unaltered their climbing capacities over millions of years.

The degradation of the climbing capacity has accompanied modern man as he had less and less reasons to climb, due to the fact that technologies have managed to successfully replace almost all such needs. Nowadays, very few people climb as an effect of practicing some jobs (utilitarian alpinist, builder, firefighter, etc…) and to a greater extent as an effect of the desire to practice climbing sports, such as rock or ice climbing (alpinism), or climbing on artificial structures.

If during the childhood of those who have the same age as the author of this article, tree climbing represented fairly often one of the ways of playing, nowadays, children are no longer encouraged to have such a preoccupation, out of personal safety reasons. Therefore, noting that this skill is on the verge of extinction, researchers and passionate sportsmen have developed a wide range of infrastructures, installations and specialized equipment in order to facilitate the development of climbing skills, starting with preschoolers. These infrastructures and installations display a high level of complexity and difficulty, since they are aimed at a host of categories of young people and adults.

Research aim

This research refers to a pliable device for gymnasia, aimed at developing climbing skills in children and young people.

Climbing as motor skill

Climbing represents a utilitarian-applicative motor skill which is necessary to man in order to move on ascending surfaces with the help of limbs and sometimes even with the help of other body parts. It can also be considered a form of human locomotion, as well as animal locomotion, admitting the fact that in the specific effort, the use of limbs tries to minimize the metabolic cost. Climbing is a complex activity in which locomotion is coupled with movement precision. The most frequent aspect of climbing is the costly and useless isometry, as well as the concentric strength, especially at the level of the upper limbs, of the fingers which support much of the body weight; the practitioners learn to avoid it naturally, by increasing the movement speed (Rosponi et al., 2012); concentric movements interrupted by short periods of rest. Climbing is often considered to be relevant in testing the body's general coordination.

Sports that promote climbing

Practicing climbing sports is associated with the following main problems: safety, emotions management, interesting combination of all basic motor qualities in order to meet specified requirements.

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Alpinism, climbing is an ideal sport to teach children, young people and sportsmen to reflect, to accept limit difficulties and to manage their emotions in healthy ways. The manifestation of man's desire to climb has generated over the years specific sports such as: free climbing, sports escalade, traditional escalade, ice escalade, artificial escalade and alpinism. The majority of these sports are practiced in rocky, mountainous areas, not easily accessible, with particular inclination characteristics, with difficulties created by the rocks structure or by the length or difficulty of the route. It is well-known the fact that in sport, there is an important segment represented by alpinism, which refers to ascending by climbing various rocky mountainous objectives, not easy to reach. Contemporary reality shows that most citizens do not have access to a mountainous area which enables them to practice this sport in their residential area. On the other hand, traditional alpinism is an elitist sport, little accessible to large masses of people, with considerable accidents risks-taking, being prohibitive quite often. Under these circumstances, artificial ways of practicing climbing have been invented, in indoor spaces, which limit up to annihilation the possibility that the practitioners get injured.

Devices and specialised equipment to develop climbing capacity

The necessity to train climbing skills has led to the appearance of some artificial structures, preponderantly in urban areas, represented by various machines, devices or simulators, particularly in gymnasia. In this respect, invention patents literature presents a fairly interesting range of technical solutions.

In US 3782718 (1974) patent it is presented a rope climbing device which uses only the force of the arms. US 4685666 (1987) patent refers to a device meant to simulate climbing, made out of an inclined surface, foreseen with two gliding rails, which has two hydraulic cylinders as a base, on which there are fixed some holds for the feet. In the document US 5125877 (1992) it is presented a climbing simulator, endless type band, which functions based on a chain structure. In a relatively similar way, the US 6231482 (2001) invention patent presents a climbing training system, with the possibility of spinning/ turning the surface to be climbed, which is also made out of segments, with adjustable movement and inclination speed by means of some electronic devices. In the US 7727118 (2010) patent, it is presented a climbing simulation device, carried out mainly of a rotating disc, fitted with climbing handholds, whose rotational speed can be modified, whether in the sense of decreasing or increasing the user's climbing speed. In the US 20020169052 (2002) patent, it is presented a portable simulation device, made out of a climbing wall, and the device is easy to assemble, use, disassemble and transport. The climbing device allows carrying out multiple orientation configurations of the climbing wall, and it has various adjustable support structures. Another climbing simulation device can be found in the US 20070254779 (2007) patent which refers to an endless band device, with adjustable speed and inclination.
In general, these solutions have the disadvantage of being costly and not being part of mass schools resources with a view to initiate and train children for climbing.

Patent number 129759 by Romanian State Office for Inventions and Trademarks – Portable climbing simulator

This invention removes the disadvantages presented above, since it is characterised by simplicity, constructive robustness and economic accessibility.

This invention solves a technical problem and the solution is represented by carrying out a portable climbing simulator, transportable, easy to use and mainly aimed at initiating and training students of all ages.
The portable climbing simulator, according to the invention, is created out of a mobile platform with four wheels that can be blocked by a fixing-on-the-ground system through four extensible arms; it also has two lateral triangular frames, left-right, vertical and parallel between each other.

Between the two lateral frames, there are two climbing panels which can be folded due to some hinges, and the panels can be rotated with a view to place one as a prolongation of the other. The rotation of the two panels is carried out through a shaft horizontally disposed between the two lateral frames, by means of two bearings, fixed in some nuts welded by the latter. The adjustment of the inclination angle is carried out in stages, through two sets of discs foreseen with symmetrically drilled holes. The inclination angle of the climbing panels is carried out with some screws with butterfly nuts, adequate to the drilled holes.
Legend :
- In figure a. the device is presented in a folded position. In this position, it can be stored or placed at the edge of gymnasia, or in specially designed areas. The movement of the device is facilitated by the existence of four transporter wheels, which can be seen under the mobile platform. The device also holds a system for fixing it on the soil, through some extensible arms. The device can also be used in folded form, for young students, since it has a climbing platform of only 2 m, being able to bend more or less, depending on the necessities.
- In figure b. the device is unfolded for climbing in a vertical position and a platform with a height of approximately 4 m can be used;
- In position c. the device is unfolded for climbing in a relatively oblique-positive position, climbing being therefore rendered easier; the angle that facilitates climbing is adjusted depending on the necessities and it can be bigger or smaller;

- In figure d. the device is unfolded for climbing in a relatively oblique - negative position, the climbing being thus rendered more difficult; the angle of facilitating climbing is adjusted according to necessities and it can be bigger or smaller;
- Figure e represents a perspective view of the nut - fixed disc subassembly;
- Figure f. represents a detail concerning the assembling by welding of the rotation axis on the main panel frame.

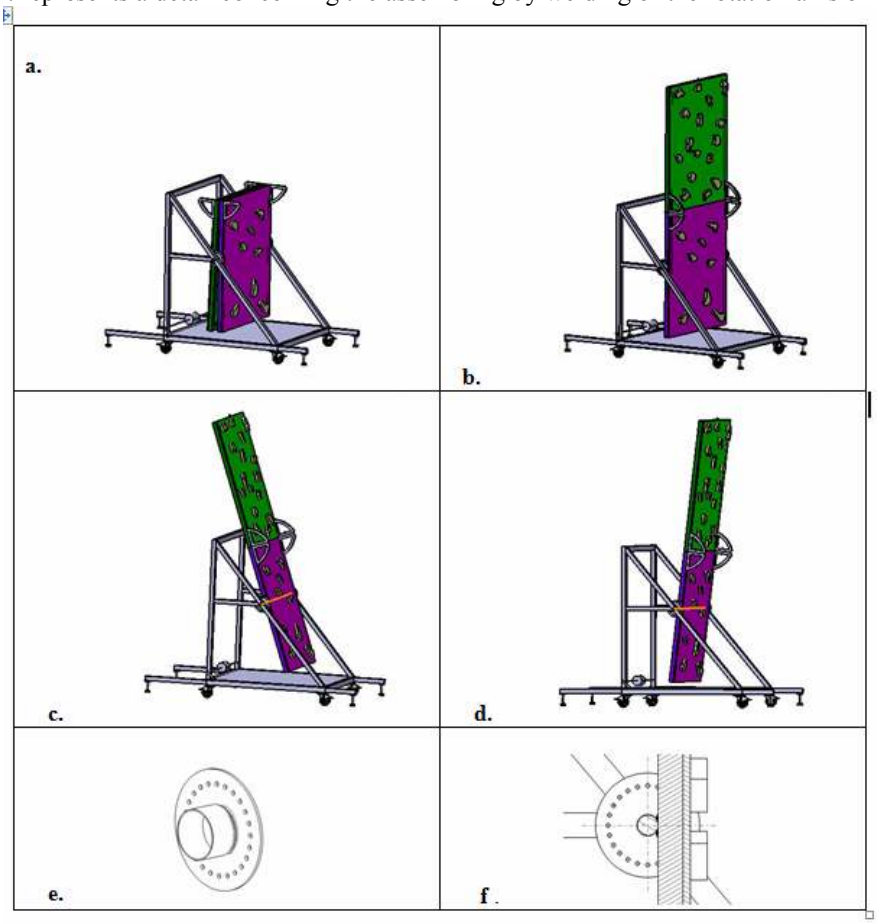

Figure 1. Patent OSIM 129759 (2017), Portable climbing simulator

The advantages of the invention (fig. 1) are the following:

- Simplicity and constructive robustness;
- It allows being carried out from standardised materials, compatible with series, low-cost manufacturing;
- It allows easy transport and assembling of the component parts on the scene ;
- It allows a sufficiently discreet adjustment of the inclination angle of the panels in various positions for climbing on a slant, for vertically climbing or overhanging climbing;
- It is accessible to activities carried out in sports enclosures, such as physical education school lessons and escalade sports training;
- It allows carrying out initiation lessons on the device folded in various downhill positions, vertically or overhanging.
- It does not require over-skilled personnel for maintenance

Conclusions

People's daily life tends to exclude the climbing type of human movement and the effects include a reduction of human motor capacity. With a view to avoid this state of affairs, sports that promote climbing have appeared in recent times. Traditionally, these sports train climbing capacity in a natural environment, frequently a rocky one, with an elitist access, limited by human capacities, specialised equipment, specialty knowledge and a high degree of dangerousness that practicing them entails. With a view to mitigate these conditions and increase people's access to practicing climbing, various infrastructures, devices, installations and specialized equipment have appeared over time, being mainly used indoors where more and more performant safety systems can be created.

This research presents a portable climbing simulator which can be used in gymnasia in the process of initiating, consolidating and improving climbing skills for students of all ages. The research presents both the advantages of this invention as compared to other global inventions, as well as the general functionality of the patent no. 129759 issued by the Romanian State Office for Inventions and Trademarks (OSIM).

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