NEW DEVICE TO WRESTLING SPORT TRAINING BASED ON THE FIGHTER MOVEMENT GEOMETRY

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ABSTRACT

The design presented in this paper refers to a portable device for training the musculature in the sport of wrestling. This device reproduces accurately geometrical and ergonomics conditions for the training of fighting exercises in this sport.

The machinery used for musculature training in the sport of wrestling doesn't adapt completely to fighter demands. Although there are certain machines at commercial level that make use of ropes to train the musculature, none of them fulfills the fighter requirements. Training machines don't allow variability in the required pulling force performing an accurate fighter training. This fact, condition and prevents the sportsman of their daily improvement. Additionally, training machines require a large space for their location, being not useful for small gyms.

In order to improve the training of the fighter, a new device has been designed. This new device aims to solve the safety problems related with rope climbing exercise and, the most important, to adapt the training exercise to the fighting requirements. This new device trains different body movements including variability in working angles and fixing the direction of the force vector during the whole exercise. The developed device based on the study of the geometry of the fighting movements improves the profile of training in wrestling sport.

KEYWORDS: Geometry of wrestling movements, sport-training improvement, ergonomics

1. INTRODUCTION

The design presented in this paper surpasses the designs existing up to date, since it avoids a randomly variation in the effort inclination made by the athlete during the movements training,

guarantying that the geometric conditions of the exercise will be carried out according to the requirements of the fight positions.

The device complements its performance allowing the practice of climbing rope. This exercise is usually practiced in the training of the sport of wrestling. The training using the new device is much safer because it prevents sportsman falls.

The developed device is adapted to the specific training of the fighting sport, allowing a variability with respect to the angle of rope traction, profiling in an accurately manner the set of muscles that are exercised in fight. In addition, it allows a portability and adaptability for several positions including rope pulling in horizontal position.

2. BACKGROUND AND RELATED WORKS

There are several patents US7387593, US5076574 referring to designs of devices for the exercise of the rope climbing, that develop the muscles by means of vertical or horizontal climbing exercises, more specifically adapted for climbing training than for wrestling. On the other hand most of the devices that incorporate a variable angle of inclination in force vector don´t fix the traction angle in an exact manner since the rope is fixed only by a pulley, being able to vary the angle of the rope when the sportsman pull of it. Other devices fix the traction angle by tightening the rope but do not allow variable position.

The invention proposed in the document improves the state of the art since it proposes a device for the training of the wrestling musculature that adapts to the specific training of the technique of fight, and allows a fixation of the angle of exercise in the development of the rope's traction, accurately profiling the set of muscles that are exercised in each position of the rope. In addition it allows a portability and adaptability for several positions including the position of pulling of the rope in horizontal manner.

3. METHODOLOGY

The device of the invention (Figure 1-2) has a base structure which makes it possible to lie down horizontally on it to perform the corresponding exercises, such as standing up. The base structure has two opposed vertical bars, one of them higher than the other does, and in both vertical bars, there is a rolling element that supports a traction element.

The bar of lower height is placed on guides that allow moving its position, according to the rest of the positional elements of the device. In this way, it is possible to obtain the geometric conditions suitable for the training and the appropriate angle. The front vertical bar of greater height has a friction element attached to the rolling element, whose function is to regulate and vary the intensity of the effort to be made by the athlete.

The invention relates to a device for musculature training which has a horizontal base structure for the support of a person in a horizontal or vertical position, on which a front vertical bar, and a rear vertical bar is positioned. The rear vertical bar is placed on guides that makes possible the translation of the vertical bar, being of greater height the vertical bar with respect to the rear one. The front vertical bar has a first rolling member, which supports a pulling element; the first rolling element is attached to a friction element. The rear vertical bar has a second rolling element that also supports a pullingelement.

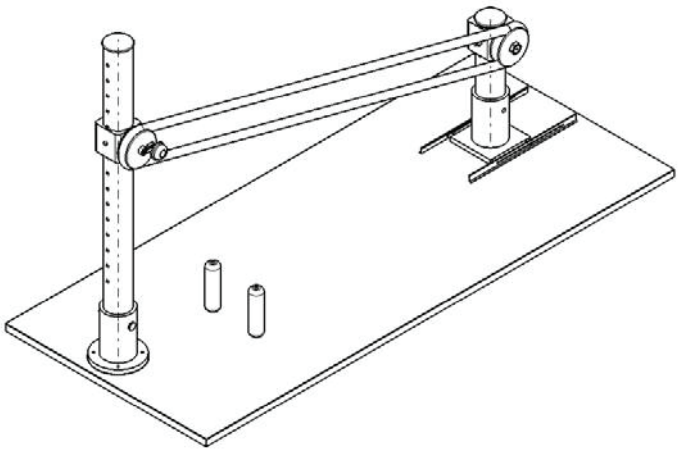

Figure 1. Preferred embodiment of the device in which a position of use of the machine is represented.

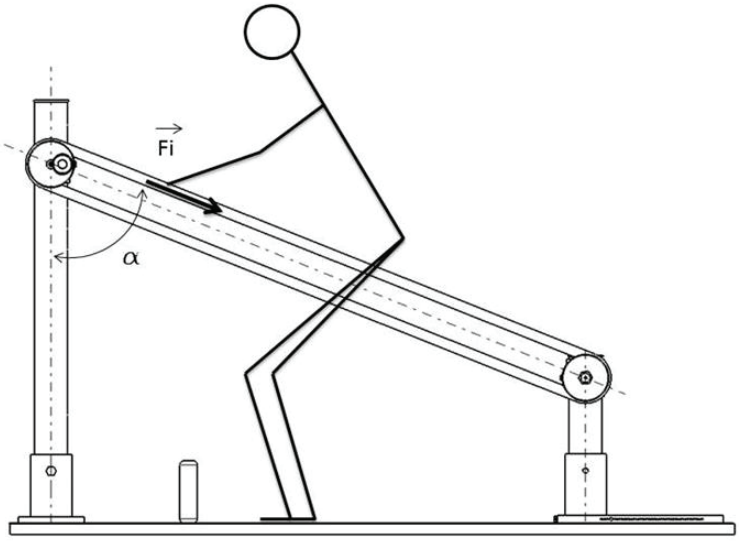

Figure 2. Reproduction of the jalón exercise in the developed device.

4. RESULTS OF THE RESEARCH LINE

This work has been supported by the University of Jaen through the project titled ‘‘Diseño de un dispositivo multifunción para ejercitar la musculatura en el deporte”. Plan Propio de investigación

de la Universidad de Jaén. Plan de apoyo a la I+D+I (2014-2015)- Acción20

-Main Researcher. Prof.Dr.Cristina Martin Doñate (University of Jaén).

-Research Team: Zafra-Morillas Antonio Jesús, Cortés- Jiménez José María, Rodriguez-Moral José Juán, Chica- Cobo David, Borrás-Rodriguez Carmen (University of Jaén)

4.1. PATENTS

1.- Dispositivo para el entrenamiento de la musculatura. Número de patente: ES2588949B2. Fecha: 17/04/2017. MARTÍN DOÑATE, Cristina, BORRÁS RODRÍGUEZ, Carmen; RODRÍGUEZ MORAL, José Juan, CORTÉS JIMÉNEZ, José María, ZAFRA MORILLAS, Antonio Jesús, CHICA COBO, David. Entidad titular: UNIVERSIDAD DE JAEN.

5. RESEARCH TEAM

Name: BORRÁS RODRÍGUEZ, Carmen; RODRÍGUEZ MORAL, José Juan, CORTÉS JIMÉNEZ, José María, ZAFRA MORILLAS, Antonio Jesús, CHICA COBO, David – University of Jaén **Category:** Engineering Degree Students .

Name: Prof. Dr. Cristina Martín-Doñate- University of Jaén, Spain**,** Engineering Graphics, Design and Projects Department **Category:** Universityteacher

6. REFERENCES

1. RYAN JOHN, DIGUGLIELMO JOSEPH J. US7387593 (B2). Fecha: 2008-06-17. Portable simulated pulling apparatus.
2. JOHNSON JR RAYMOND US5076574 (A) Fecha: 1991-12-31. Rope climbing exercise apparatus.

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NUEVOS MODELOS DE INVESTIGACIÓN Y COLABORACIÓN EN INGENIERÍA GRÁFICA

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Abstract

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Methodology

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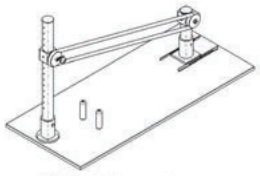

Fig 1.- Dispositivo de entrenamiento

Fig 2.- Construcción del prototipo

Fig 3.- Prototipo del dispositivo

The front vertical bar of greater height has a friction element attached to the rolling element, whose function is to regulate and vary the intensity of the effort to be made by the athlete.

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Fig 4.- Movimientos realizados en el combate de lucha libre

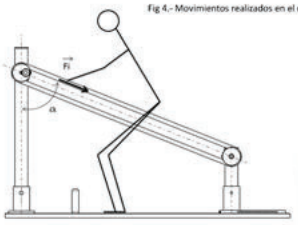

Fig 5.- Esquema de implementación de los movimientos en el dispositivo

Fig 6.- Realización del movimiento por un atleta

Results

Dispositivo para el entrenamiento de la musculatura. Número de patente: ES2588949B2. Fecha: 17/04/2017. Martín Doñate, Cristina,Borrás Rodríguez, Carmen; Rodríguez Moral, José Juan, Cortés Jiménez, José María, Zafra Morillas, Antonio Jesús, Chica Cobo, David.

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