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DESCRIPTION**ELECTRONIC PUNCHING BAG SYSTEM PROVIDED WITH AN ANCHORING UNIT****FIELD OF THE APPLICATION**

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The present application is enclosed in the field of electronic punching bags adapted to measure impact parameters caused by a user striking the bag.

10 **PRIOR ART**

Currently, electronic punching bags including embedded measurement units are known, that, through accelerometer-type sensors, for example, allow measuring the intensity of the impact produced by a user's strike, among other impact parameters.

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However, a disadvantage of these systems is that the measurements obtained from the sensors are polluted by a noise signal associated with the punching bag's reaction movements to a strike inflicted by the user. Indeed, these reaction movements are also captured by the sensors, in the same way as the user's strikes, which increases the uncertainty in the determination of an impact parameter.

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To try to circumvent this issue, it is common for current electronic punching bags to use a sensory scheme that includes a greater number of sensors, or a particular arrangement for them, that takes into account these harmful bag reaction movements, which necessarily requires to increase the processing capacity needed to determine the desired impact parameters. However, considering only an increase in sensory and processing capacity, it is still not possible to prevent such harmful reaction movements of the bag to happen subsequently to a user's strike, so they will always be

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present in the reading obtained by the sensors, which can affect the efficiency and accuracy of determining an impact parameter.

The present solution intended to innovatively overcome such issues.

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SUMMARY OF THE APPLICATION

It is therefore an object of the present application an electronic punching bag provided with an anchoring unit projected to restrict the horizontal movements of the bag, produced in reaction to a strike inflicted by the user.

The anchoring unit is comprised by the following elements: a base module configured to anchor a first coupling section of the punching bag, an attachment module configured to anchor a second coupling section of the punching bag, and a supporting stand coupled to the attachment module, such that said supporting stand and the base module being adapted to vertically support the punching bag on at least a first supporting surface. More particularly, the base module and the attachment module of the anchoring unit are operable to prevent a punching bag's horizontal displacement in relation to the first supporting surface.

In this way, the reading of impact data carried out by the sensors is favoured, which is no longer polluted by the reaction movements of the bag, allowing to improve the efficiency and accuracy of impact parameter data.

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In an advantageous configuration of the system described in the present application, the supporting stand is a frame projected to connect directly the attachment module to the base module. Alternatively, the supporting stand comprises supporting means adapted to support the system to a second supporting surface. Said

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supporting surface can be parallel or perpendicular in relation to the first supporting surface.

It therefore provides an adaptation to the conditions of the scenario
5 where the electronic punching bag will be installed, guaranteeing the restriction of reaction movements of the punching bag, regardless of the installation configurations, in particular, the existing support surfaces.

In another advantageous mode of the system of the present application,
10 it further comprises a processing unit, configured to determine impact parameter data, a video camera unit configured to record a user's training session, and a display interface unit adapted to display impact parameter data determined by the processing unit.

15 **DESCRIPTION OF FIGURES**

Figure 1 – representation of an embodiment of the electronic punching bag system of the present application, where the numerical reference signs represent:

- 1 – punching bag;
- 20 2 – base module;
- 3 – attachment module;
- 4 – supporting stand;
- 6 – first supporting surface;
- 10 – user.

25 Figure 2 – representation of an embodiment of the electronic punching bag's elongated body, where the numerical reference signs represent:

- 1 – punching bag;
- 1.1 – first coupling section;
- 30 1.2 – second coupling section;
- 1.3 – punching surface section;

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5 – sensor.

Figure 3 – representation of an embodiment of the base module (2), where the numerical reference signs represent:

2.1 – anchoring mechanism;

5 2.2 – turntable layer.

Figure 4 – representation of a sectional view of an embodiment of the base module (2), where the numerical reference signs represent:

2.1 – anchoring mechanism;

10 2.2 – turntable layer;

2.3 – HPDE plastic material;

2.4 – outer layer;

2.5 – load cell;

2.6 – rubber layer.

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Figure 5 – representation of an embodiment of electronic punching system of the present application, illustrating the connection between the bag (2), the attachment module (3) and the supporting stand (4); the numerical reference signs represent:

1.2 – second coupling surface of the punching bag;

20 3 – attachment module;

3.2 – chassis mounting rubber;

3.3 – coupling element;

4 – supporting stand.

25 Figure 6 – representation of an embodiment of the coupling element (3.3), in the form of a circular cover plate; the numerical reference signs represent:

3.2 – chassis mounting rubber;

3.3.1 – circular cover plate;

3.3.2 – circular cover plate's rim.

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Figure 7 – representation of an embodiment of a self-standing electronic punching bag system, where the supporting stand connects the base and the attachment module; the numerical reference signs represent:

- 1 – punching bag;
- 5 2 – base module;
- 3 – attachment module;
- 4 – supporting stand;
- 6 – first supporting surface.

10 Figure 8 – representation of an embodiment of a wall-mounted electronic punching bag system, where the supporting stand provides connection to a wall; the numerical reference signs represent:

- 1 – punching bag;
- 2 – base module;
- 15 3 – attachment module;
- 4 – supporting stand;
- 4.1 – rubber layer;
- 6 – first supporting surface;
- 7 – second supporting surface.

20 Figure 9 – representation of an embodiment of the electronic punching bag system of the present application, where the numerical reference signs represent:

- 1 – punching bag;
- 2 – base module;
- 25 3 – attachment module;
- 4 – supporting stand;
- 6 – first supporting surface;
- 7 – second supporting surface;
- 8 – video camera unit;
- 30 9 – display interface unit;
- 10 – user.

DETAILED DESCRIPTION

The more general and advantageous configurations of the system are described in the Summary of the application. Such configurations are detailed below in accordance with other advantageous and/or preferred embodiments of implementation of the system developed.

The present application relates to an electronic punching bag system.

The system is comprised by a punching bag (1) having an elongated body and being arranged along a longitudinal axis, perpendicular to a first supporting surface (6) that is disposed along a horizontal plane. The system further comprises a sensory unit formed by a plurality of sensors (5) that are embedded in different location within the punching bag (1) and are adapted to measure impact parameter data resulting from a user striking a punching surface section (1.3) of the punching bag.

In one embodiment, the sensors (5) of the sensory unit are 3D accelerometers and the impact parameter data may relate to force of impact, direction of impact and/or location of impact.

The system further comprises an anchoring unit.

The anchoring unit is comprised by a base module (2), an attachment module (3) and a supporting stand (4). The base module (2) comprises an anchoring mechanism (2.1) configured to anchor a first coupling section (1.1) of the punching bag (1) to said base module (2). The attachment module (3) comprises an anchoring mechanism (3.1) configured to anchor a second coupling section (1.2) of the punching bag (1) to said attachment module (3), the supporting stand (4) being coupled to the attachment module (3). The arrangement between the base module (2) and the supporting stand (4) is adapted to vertically support the punching bag (1) at least on the

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first supporting surface (6). Additionally, the base module (2) and the attachment module (3) of the anchoring unit are operable to prevent a punching bag's horizontal displacement in relation to the first supporting surface (6).

5 In this way, through the creation of two stabilization points, provided by the base module (2) and the attachment module (3), it is possible to restrict the horizontal movements of the punching bag (1) produced in reaction to a strike inflicted by the user. Consequently, the reading of impact data carried out by the sensors (5) of the sensory unit is favoured, which is no longer polluted by the reaction movements of
10 the punching bag, allowing to improve the efficiency and accuracy of impact parameter data.

 In another embodiment of the system, the punching bag's elongated body has a cylindrical shape, being provided with a bottom and a top surface, parallel to
15 each other, and joined by a curved surface, defining at least the punching surface section (1.3). More particularly, the first coupling section (1.1) of the punching bag (1) may be on the bottom surface of the punching bag (1) and the second coupling section (1.2) of the punching bag (1) may be on the top surface of the punching bag (1).

20 With this particular configuration, not only the regular cylindrical format that the punching bag (1) has, but also the diametrically opposite arrangement, along the longitudinal plane, of each coupling section (1.1, 1.2) and, consequently of each stabilization point, allow, in a more efficient way restrict the reaction movements of the punching bag (1).

25 Furthermore, as the stabilization points are arranged at the ends of the punching bag (1), the user's punching surface section (1.3) is not reduced. Additionally, this arrangement of the stabilization points also allows for the creation of adequate resistance to approximate the reaction movement of the punching bag (1) to those of
30 an opponent when suffering a strike from the user.

In another embodiment, the anchoring mechanism (2.1) of the base module (2) is a thrust bearing. More particularly, the first coupling section (1.1) of the punching bag (1) is adapted to engage in the base module's thrust bearing. Additionally,
5 the base module (2) comprises a turntable layer (2.2) that is attached to the thrust bearing (2.1) and moving solidary with it, and being adapted to provide support to the punching bag's first coupling surface (1.1).

Even more particularly, the anchoring mechanisms (2.1, 3.1) of the base
10 and attachment modules and the first and second coupling sections (1.1, 1.2) of the punching bag (1) are operable to allow a longitudinal rotation of the punching bag (1) in relation to said modules (2, 3). The turntable layer (2.2) may be made of metal or wood and is adapted to support the whole weight of the punching bag (1), therefore making it easy for the user to rotate it when is needed, for example, when the punching bag
15 further comprises a second section provided with a plurality of mounting points, in addition to the user's punching surface section (1.3), that may be used for practising strength exercises.

In this context, and in another of the system, it further comprises a
20 locking mechanism operable to block the longitudinal rotation of the punching bag (1) in relation to the base module (2) and to the attachment module (3). More particularly the locking mechanism is installed in the base module (2), being adapted to block the rotation of the first coupling section (1.1) of the punching bag in relation to the base module's thrust bearing (2.1), while the user is using the bag (1) during a boxing
25 workout.

In another embodiment of the system, the base module (2) is made of HPDE plastic (2.3), which is an extremely impact resistant and durable material. Additionally, the base module (2) comprises an outer metal sheet (2.4) enveloping the

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plastic material, thus providing greater robustness to the body of the base (2), allowing to increase its longevity.

In another embodiment of the system, the base module (2) comprises a
5 rubber layer (2.6) on its bottom surface, providing contact with the first supporting surface (6). This layer (2.6) is a thick anti-vibration and anti-slip rubber matt that helps keep the base module (2) at the same place. In one embodiment, the rubber layer (2.6) is at least 4 mm thick.

10 Additionally, in another embodiment, for a more secure semi-permanent attachment, a double side vinyl stitcher can be applied between the first supporting surface (6) and the rubber layer (2.6).

In another embodiment of the system, the anchoring mechanism (3.1) of
15 the attachment module (3) comprises a chassis mounting rubber (3.2) to which a coupling element (3.3) is coupled.

The coupling element (3.3) is configured to engage the second coupling
section (1.2) of the punching bag (1) along a central longitudinal axis of the punching
20 bag (1). More particularly, the coupling element (3.3) is a circular cover plate (3.3.1) with an external diameter smaller than the external diameter of the punching bag's elongated body, and having a rim (3.3.2) with a radial width adapted to be inserted into the second coupling section (1.2) of the punching bag. The second coupling section (1.2) may be groove-shaped and is arranged on the punching bag's top surface centrally in
25 relation to central longitudinal axis of the punching bag (1), such that the circular cover plate's rim (3.3.2) fits into the said second coupling section (1.2). In this way, a safe and effective coupling is achieved between the punching bags' body and the attachment module (3).

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In this turn, the chassis mounting rubber (3.2) is positioned on top of the circular cover plate (3.3.1), along the central longitudinal axis of the punching bag (1), allowing flexion movements to the punching bag (1), which in this way does not acquire a rigid and fixed posture, and in addition, absorbing vibrations resulting from the impact
5 caused by the user's blow.

In another embodiment of the system, the supporting stand (4) is a frame projected to directly connect the attachment module (3) to the base module (2). More particularly, the frame has a first part whose first end connects to the base module (2)
10 and a second part whose first end connects to the attachment module (3). The second ends of the first and second parts of the frame are then connected to each other such that the first and the second parts are arranged to form an acute angle.

With this configuration, it is possible to create two stabilization points
15 with only the punching bag (1) having one supporting surface (6).

Alternatively, the supporting stand (4) comprises supporting means adapted to support the system to a second supporting surface (7).

20 In one embodiment, the second supporting surface (7) is parallel in relation to the first supporting surface (6).

In another embodiment, the second supporting surface (7) is perpendicular in relation to the first supporting surface (6). In this case, the supporting
25 stand (4) may comprise a layer of EVA foam (4.1), of at least 4 mm thick. This layer (4.1) contacts the second supporting surface (7) and allows to absorb and reduce vibrations transferred to it (7), resulting from the use of the punching bag (1).

This effect is exponentiated if the layer (4.1) is used in combination with the chassis mounting rubber (3.2).

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Additionally, the outer cover of the supporting stand (4) may be made of ABS plastic.

In another embodiment of the system, the base module (2) comprises at least one load cell (2.5) adapted to measure the weight of the punching bag (1), generating weight data, that is used for system calibration. For that purpose, the base module (2) may comprise an array of six load cells (2.5).

Additionally, the system further comprises a processing unit, a video camera unit (8) and a display interface unit (9).

The processing unit is configured to determine impact parameter data based on at least the impact measured by the sensory unit.

The video camera unit (8) is configured to record a user's training session (10), and it may be installed on the supporting stand (4).

The display interface unit (9) is adapted to display impact parameter data determined by the processing unit, said display interface unit (9) being, for example, a LCD touchscreen.

CLAIMS**1.** An electronic punching bag system comprising:

- a punching bag (1) with an elongated body arranged along a longitudinal axis,
5 perpendicular to a first supporting surface (6) disposed along a horizontal plane;
- a sensory unit comprising a plurality of sensors (5) embedded in the punching bag (1) and adapted to measure an impact parameter resulting from a user striking a punching surface section (1.3) of the punching bag;
- an anchoring unit comprising:
 - 10 — a base module (2), comprising an anchoring mechanism (2.1) configured to anchor a first coupling section (1.1) of the punching bag (1) to said base module (2);
 - an attachment module (3) comprising an anchoring mechanism (3.1) configured to anchor a second coupling section (1.2) of the punching bag
15 (1) to said attachment module (3);
 - a supporting stand (4) coupled to the attachment module (3); the base module (2) and the supporting stand (4) being adapted to vertically support the punching bag (1) at least on the first supporting surface (6);

and wherein,

- 20 the base module (2) and the attachment module (3) of the anchoring unit being operable to prevent a punching bag's horizontal displacement in relation to the first supporting surface (6).

2. The system according to claim 1, wherein the punching bag's elongated

- 25 body has a cylindrical shape, having a bottom and a top surface, parallel to each other, joined by a curved surface, defining at least the punching surface section (1.3); and wherein

- the first coupling section (1.1) of the punching bag (1) are on the bottom surface of the punching bag (1); and the second coupling section (1.2) of the punching bag (1)
30 are on the top surface of the punching bag (1).

3. The system according to claim 1 or 2, wherein the anchoring mechanism (2.1) of the base module (2) is a thrust bearing; the first coupling section (1.1) of the punching bag (1) being adapted to engage in the base module's thrust bearing.

4. The system according to claim 3, wherein the base module (2) comprises a turntable layer (2.2) attached to the thrust bearing (2.1) and moving solidary with the said thrust bearing; the turntable layer (2.2) being adapted to provide support to the punching bag's first coupling surface (1.1); optionally, the turntable layer (2.2) is made of metal or wood.

5. The system according to claim 4, wherein the anchoring mechanisms (2.1, 3.1) of the base and attachment modules and the first and second coupling sections (1.1, 1.2) of the punching bag are operable to allow a longitudinal rotation of the punching bag (1) in relation to said modules (2, 3); the system further comprising a locking mechanism operable to block the longitudinal rotation of the punching bag (1) in relation to the base module (2) and to the attachment module (3).

6. The system according to claim 5, wherein the locking mechanism is installed in the base module (2), being adapted to block the rotation of the first coupling section (1.1) of the punching bag in relation to the base module's thrust bearing (2.1).

7. The system according to any of the previous claims, wherein the base module (2) is made of HPDE plastic (2.3); optionally, the base comprises an outer metal sheet (2.4) enveloping the plastic material.

8. The system according to any of the previous claims, wherein the base module (2) comprises a rubber layer (2.6) on its bottom surface which provides contact

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with the first supporting surface (6); optionally, the rubber layer (2.6) is at least 4 mm thick.

5 **9.** The system according to any of the previous claims, wherein the anchoring mechanism (3.1) of the attachment module (3) comprises a chassis mounting rubber (3.2) to which a coupling element (3.3) is coupled; said coupling element (3.3) being configured to engage the second coupling section (1.2) of the punching bag (1) along a central longitudinal axis of the punching bag (1).

10 **10.** The system according claims 2 and 9, wherein:
the coupling element (3.3) is a circular cover plate (3.3.1) with an external diameter smaller than the external diameter of the punching bag's elongated body; the circular cover plate (3.3.1) having a rim (3.3.2) with a radial width adapted to be inserted into the second coupling section (1.2) of the punching bag;

15 the second coupling section (1.2) being groove-shaped and arranged on the punching bag's top surface centrally in relation to central longitudinal axis of the punching bag (1), such that the circular cover plate's rim (3.3.2) is adapted to fit into the said second coupling section (1.2); and wherein,

20 the chassis mounting rubber (3.2) is positioned on top of the circular cover plate (3.3.1), along the central longitudinal axis of the punching bag (1).

11. The system according to any of the previous claims, wherein the supporting stand (4) is a frame projected to connect the attachment module (3) to the base module (2);

25 the frame having a first part whose first end connects to the base module (2); and a second part whose first end connects to the attachment module (3); and wherein,

 the second ends of the first and second parts of the frame being connected to each other such that the first and the second parts are arranged to form
30 an acute angle.

12. The system according to any of the previous claims 1 to 10, wherein the supporting stand (4) comprises supporting means adapted to support the system to a second supporting surface (7).

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13. The system according to claim 12, wherein the second supporting surface (7) is parallel in relation to the first supporting surface (6).

14. The system according to claim 12, wherein the second supporting surface (7) is perpendicular in relation to the first supporting surface (6); and wherein, the supporting stand (4) comprises a layer of EVA foam (4.1), said layer contacting the second supporting surface (7); optionally, the EVA foam layer is at least 4 mm thick.

15. The system according to any of the previous claims wherein the sensors (5) of the sensory unit are at least 3D accelerometers; and wherein,

the base module (2) comprises at least one load cell (2.5) adapted to measure the weight of the punching bag (1), generating weight data; optionally, the base module (2) comprises an array of six load cells (2.5);

the system further comprising:

- a processing unit configured to determine impact parameter data based on at least the impact measured by the sensory unit; optionally, the impact parameter data relates to force of impact, direction of impact and/or location of impact;
- a video camera unit (8), adapted to record a user's training session (10); preferably, the video camera unit is installed on the supporting stand (4) and
- a display interface unit (9) adapted to display impact parameter data determined by the processing unit; optionally, the display interface unit is a LCD touchscreen.