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(54) **LIFELINE SYSTEM**

(57) The invention relates to a lifeline system, to be used in adventure parks, where the supports for anchoring the cable comprise a hollow cylinder with tapered ends, one body, three or more pushers and a neck with a smaller thickness than the outer diameter of the hollow cylinder. The means for joining the anchoring elements comprise first and second surfaces that form an angle of 35°. The sliding devices comprise a casing, two grooved

rollers, a cable guide channel which has larger dimensions than the outer diameter of the hollow cylinder, a longitudinal opening with an axis forming an angle of 35 degrees with the plane of symmetry of the wheels, an opening at the bottom of the casing for inserting a carabiner, and a cam between said opening and the cable guide channel, which has one or more magnets at the bottom thereof.

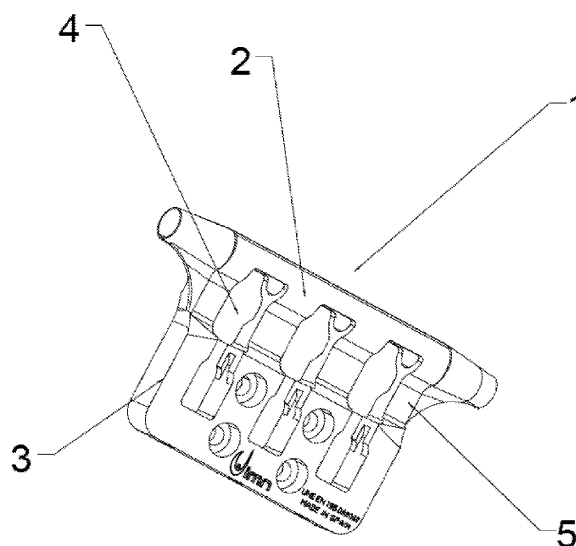


Figure 1

Description**Object of the invention**

[0001] The object of the present invention is a novel horizontal lifeline that allows the passage of the sliding elements through the supports for anchoring the cable and provides an also new security system that prevents the sliding elements from accidentally detaching from the pulley.

BACKGROUND OF THE INVENTION

[0002] Lifeline means those anchoring devices that can be found in places where there is a risk of falling. They are intended to allow a user, who must be equipped with a fall arrest harness and an individual protection equipment, to slide along the anchoring device, being always connected to it in anticipation of falls. Therefore, they allow the performance of multiple activities in height in a safe manner, including construction industry or maintenance work or recreational activities such as zip-lines.

[0003] The usual components of a lifeline are:

- Initial anchorage support: this is where the lifeline starts.
- Terminal anchorage support: this is where the lifeline ends.
- Line: is the cable, rope or similar element arranged between the initial and the terminal anchorage.
- Tensioner: it is the element that enables the cable to be properly tensioned
- Absorber: is the device that absorbs the energy produced by a fall
- Intermediate anchorage support: anchorage that fixes the line to a support in areas between the initial and the terminal anchorage, which either serve as support and guide to the cable or anchor it maintaining the cable tension in the different sections.
- Sliding device: device that allows connection to the lifeline, the user's harness is usually connected, by means of an anchor lock, which is usually a rope or tape, to the sliding device.

[0004] The use of horizontal lifelines, whose intermediate anchoring supports do not allow the sliding device to pass through it, but must be unhooked and reconnected, is dangerous and annoying for the people using them. Likewise, this type of safety systems does not allow certain work or leisure activities to be carried out, such as sliding while hanging from them.

[0005] The present invention refers to a lifeline system that maintains the tension of the cable in the intermediate sections of the lifeline, allows the passage of the sliding devices through the anchorage supports and prevents said sliding devices from accidentally detaching from the cable, and is therefore suitable when the user wishes to move a certain distance along the lifeline either by walk-

ing or hanging from it.

Description of the invention

[0006] The lifeline system, which is the object of the present invention, is one of those horizontal lifelines comprising a cable or the like, preferably a metal cable of 12 mm in diameter, a plurality of cable anchorage supports, a plurality of means for joining said anchorage supports to an external vertical surface and at least one sliding device intended to move along said cable and to which the user will be secured by means of a carabiner or similar element to which the harness is fixed by means of an anchor lock, which is usually a rope or tape.

[0007] Each of the supports for anchoring the cable, which are fixed to an external vertical surface by means of their corresponding joining means, comprises:

- a hollow cylinder, which is intended to receive the above-mentioned cable in its interior, and whose ends are tapered in the form of a funnel,
- a body, which has a plane of longitudinal symmetry, and which has three or more cable pushers operated at will, and which have means of blocking at will, said pushers are intended to press the cable against the inner surface of the hollow cylinder preventing it from sliding inside to maintain the proper tension for each of the uses to be given to the lifeline,
- a neck connecting the hollow cylinder to the body, such that the longitudinal plane of symmetry of the neck comprises the axis of revolution of the hollow cylinder. The thickness of said neck is smaller than the outer diameter of the hollow cylinder.

[0008] The joining means comprise a first surface intended to be fixed to the above mentioned external vertical surface and a second surface intended to be joined to the body of one of the anchoring supports, such that the first and second surfaces form an angle of 35 degrees.

[0009] Each of the sliding devices comprises:

- a housing that supports the rest of its elements,
- two grooved rollers arranged in the upper area of the housing for rolling over the cable, the diameter of the groove is the same as the inside diameter of the hollow cylinder of the anchoring support,
- A cable guide channel located immediately below the wheels and intended for the cable and the hollow cylinder of the anchoring support pass through, the dimensions of which are greater than the outer diameter of the hollow cylinder, said guide channel disposes of a longitudinal opening in its lateral area such that the width of its opening is greater than the diameter of the cable, the theoretical plane comprising the longitudinal axis of the guide channel and the axis of the opening forms an angle of 35 degrees with the plane of symmetry of the wheels perpendicular-

ular to their axes of rotation, the surfaces of the above-mentioned openings converge towards the outside of the sliding device,

- a hole provided in the lower part of the housing to insert a carabiner or similar element therein,
- a cam disposed between said hole and the cable guide channel, which rotates when the cable is introduced reducing the size of the opening of said cable guide channel, what prevents the sliding device from detaching from the cable when the carabiner or similar is introduced in the above-mentioned hole.

[0010] Firstly, because the supports for anchoring the cable are inclined at 35° from the vertical and that the opening of the sliding devices forms the same angle with the vertical when sliding on the cable, secondly, because the inner diameter of the guide channel is larger than the outer diameter of the hollow cylinder, thirdly, because the opening of the guide channel passes through the neck of the anchoring support, and fourthly, because the diameter of the grooved rollers are the same as the diameter of the hollow cylinder interior section, the sliding devices can move along the entire lifeline continuously, without interruption and without the need to touch the sliding device by hand.

Brief description of the figures

[0011]

Figure 1: shows a perspective view of the anchoring support.

Figure 2: shows a perspective view of a pusher.

Figure 3: shows a perspective view of a wedge.

Figure 4: shows a perspective view of an arm.

Figure 5: shows a perspective view of the housing of a sliding device.

Figure 6: shows a perspective view of the cam.

Preferred embodiment

[0012] Figures 1-6 show a preferred embodiment of the present invention. In figure 1 an anchoring support (1) of the cable without the pushers (6) is shown, showing the body (3) and the hollow cylinder (2) joined by a neck (5), the housings (4) of the pushers are also shown, which have grooves and a stop that limits the tightening of the pusher (1) on the cable to avoid damaging it and is the end of the groove. The lower part of the body (3) has threaded holes to accommodate the screws which operate said pushers (6), the screws are locked in the position that provides the predetermined cable tightening by

means of a locknut that presses against the lower part of the body. The shape and dimensions of the clamping system allow a triple pressure of up to 50 Nm without producing deformations in any of the elements of the invention, it prevents the sliding of the cable for loads much higher than 20,000 N, which allows spans between anchoring supports of up to 120 m, for example, free flight zip-lines without intermediate anchoring supports of up to 120 m.

[0013] In order to reduce rattling, when the sliding element passes through the hollow cylinder (2), the ends of said hollow cylinder are tapered, funnel-shaped, and the cam has one or more magnets in its lower part that completely eliminate the rattling and further prevents small impacts, which greatly improves the ease, accuracy and infallibility of the passage of the sliding element through the anchoring support.

[0014] The pushers (6) shown in Figure 2, are shaped in such a way that once mounted on the body they are flush on it, and have the corresponding complementary guides with the said grooves. The shape of the upper part of the pushers is concave to obtain total contact and friction with the cable.

[0015] Once mounted the supports for anchoring the cable on an external vertical surface, for example, the lateral faces of a pole, must be separated from the external vertical surface so that this vertical surface does not interfere, and have to form an angle of 35 ° with the vertical so that the neck (5) of the cable anchoring support can pass through the opening of the sliding element, since this opening has the appropriate dimensions and shape, also an angle of 35 ° with the vertical when it is in its working position, that is, vertical.

[0016] What is set forth in the previous paragraph is achieved by a joining means that have a first surface (12) intended to be fixed to the external vertical surface, for example, by means of a plug and screw or a screwed or welded union, and a second surface (13) which is intended to be joined to the body (3) of the support for anchoring the cable. Both surfaces form the above-mentioned angle of 35 °, which is achieved by two preferred embodiments of these joining means, which are described below.

[0017] The first preferred embodiment is a wedge (11), as shown in figure. 3, and the second preferred embodiment is a plate (14) that by means of two folds achieves the 35 ° angle between the first surface (12) and the second surface (13).

[0018] The sliding element, whose housing (10) is shown in figure 5, has two sheaves, to facilitate its rolling on the cable, in its upper portion, and a cable guide channel whose diameter is larger than the diameter of the hollow cylinder of the anchoring support. On one side of said cable guide channel there is an opening which is wider than the width of the neck of the anchoring support and is situated at 35 ° angle with the vertical.

[0019] The casing has a hole in its lower part for introducing a carabiner or a similar element therein. Between the hole and the guide channel there is a cam (7), whose

concave shape upper end (9), is forced to rotate by the introduction of the carabiner in the hole of the housing that shifts the lower end (8) of the cam, so that the upper end when it rotates, it reduces the diameter of the guide channel, preventing the cable from accidentally being detached, which gives the system total security by completely preventing the sliding device from detaching from the cable once the cable has been inserted, since the size of the hole, when the cam is mounted on the housing, is smaller than that of the carabiner, whenever it is inserted, it makes the cam to rotate.

[0020] To prevent damage on the vertical surfaces where the cable start and end are located, shock absorbers, preferably made of rubber, can be arranged at the ends of the housing.

[0021] The combination of the technical characteristics of each of the pieces of the lifeline system, which is the object of the present invention, makes that its preferred use is in adventure parks since it has a series of advantages over the existing lifelines in the market, among which we wish to highlight the following:

- It is a very safe, "anti-slip" system and ideal for small children where the participant cannot get off the cable at any time, as it is a continuous lifeline due to the fact that the passage of the sliding devices through the elements of anchoring the cable to the poles is automatic, i.e. the participants do not have to touch or manipulate the sliding devices to perform that step, since the sliding device cannot be accidentally unhooked from the cable due to the existence of the cam.
- The unhooking of the cable sliding device is very fast and does not require the use of any tool, because just by moving the cam in a certain way the decoupling is done. This is very useful for rescue of participants and facilitates its operation; However, accidental uncoupling is impossible and autonomous unhooking by participant is also impossible and can only be done by a monitor.
- Versatility of use with other systems already assembled previously and / or from other manufacturers: It allows the use of any existing zip line braking system on the market, as the sliding device does not have to go through the braking system and only requires a certain movement of the cam to remove it from the cable, which makes the operation very fast.
- The impact of the sliding devices with the stops of any braking system is reduced by the shock absorbing elements that they incorporate, a quality also lacking in any other model on the market, which is achieved by the design of the pulley morphology, which allows both the coupling of the shock absorbers, and that the impacts will not damage its structure.
- The passage of the sliding devices through the cable anchoring elements to the poles is very smooth and easy due to the morphological design of the grooves

of the sheaves, the existence of magnets on the cams and the morphological design of the anchoring element neck and the longitudinal opening (funnel) of the guide channel of the sliding devices.

- The sliding devices can be used in other lifelines and/or zip lines that have types of cable anchoring elements to the poles other than those of the invention.

Claims

1. Lifeline system, of those comprising a cable or the like, a plurality of supports for anchoring the cable, a plurality of means for joining said anchoring supports to an external vertical surface and at least one sliding device intended to move through said cable, **characterized in that:**

◦ each one of the supports for anchoring the cable comprises:

- a hollow cylinder, which is intended to receive said cable in its interior, and whose ends are tapered in the form of a funnel,
- a body, which has a plane of longitudinal symmetry, and which has three or more cable pushers driven at will and which have locking means at will, said pushers are intended to press the cable against the inner surface of the hollow cylinder,
- a neck that joins the hollow cylinder with the body, such that the longitudinal plane of symmetry of said neck comprises the axis of revolution of the hollow cylinder, and its thickness is smaller than the outer diameter of the hollow cylinder;

◦ each one of the joining means comprises a first surface intended to be fixed to said external vertical surface and a second surface intended to be joined to the body of one of the anchoring supports, so that the first and second surfaces form an angle of 35 degrees;

◦ each one of the sliding devices comprises:

- a housing that supports the rest of the elements,
- two sheaves arranged in the upper area of the casing for rolling over the cable, the diameter of the grooves of the sheaves is equal to the inner diameter of the hollow cylinder of the anchoring support,
- a cable guide channel located immediately below the wheels for the passage of the cable and whose dimensions are larger than the outer diameter of the hollow cylinder, said guide channel has in its side area a

longitudinal opening such that the width of its opening is greater than the diameter of said hollow cylinder, the theoretical plane comprising the longitudinal axis of the guide channel and the axis of the opening forms an angle of 35 degrees with the plane of symmetry of the wheels perpendicular to their axes of rotation, the surfaces of said opening are converging toward the outside of the hollow cylinder,

- a hole provided in the lower part of the housing to insert a carabiner or similar element therein
- a cam disposed between said hole and the guide channel of the cable, which rotates when the cable is introduced reducing the diameter of said cable guide channel, which has at its lower part one or more magnets.

2. Lifeline system, according to claim 1, **characterized in that** at least one of the joining means between the body of the support for anchoring the cable and an external vertical surface comprises a wedge, one of its inclined surfaces is intended to join the aforementioned external vertical surface and its other inclined surface is intended to join the aforementioned body.
3. Lifeline system, according to claim 1, **characterized in that** at least one of the joining means is a plate provided with at least two folds such that the first and second surfaces located at both ends form an angle of 35 degrees.
4. Lifeline system, according to any of the preceding claims, **characterized in that** the pushers are driven by a threaded screw to the lower part of the body.
5. Lifeline system, according to claim 4, **characterized in that** the means for blocking the drive of the pushers is a locknut.
6. Lifeline system, according to any of the preceding claims, **characterized in that** the ends of the housing of each of the sliding devices have respective shock absorbers elements.

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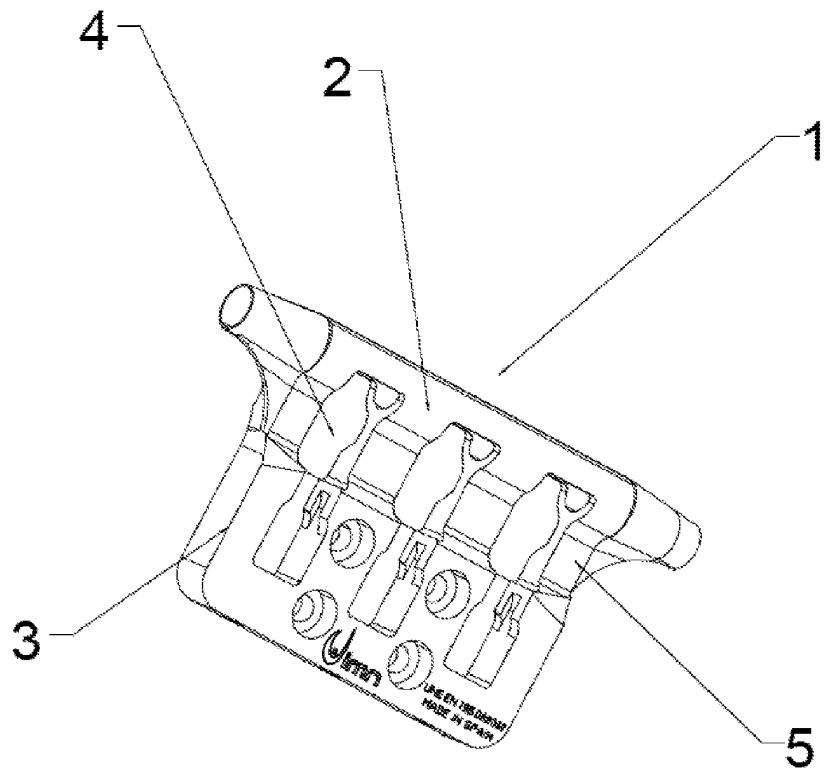


Figure 1

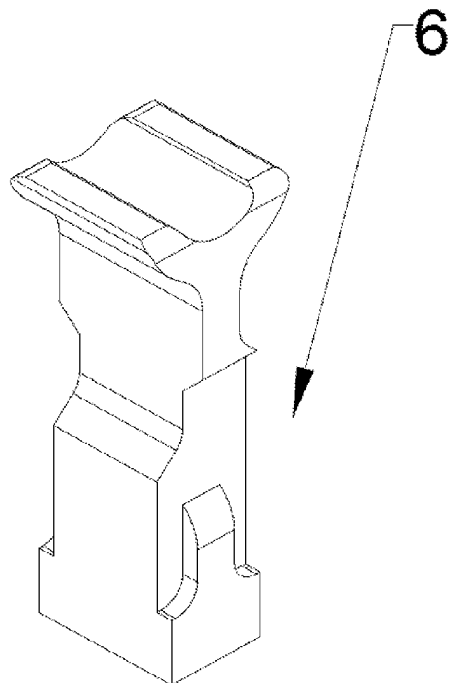


Figure 2

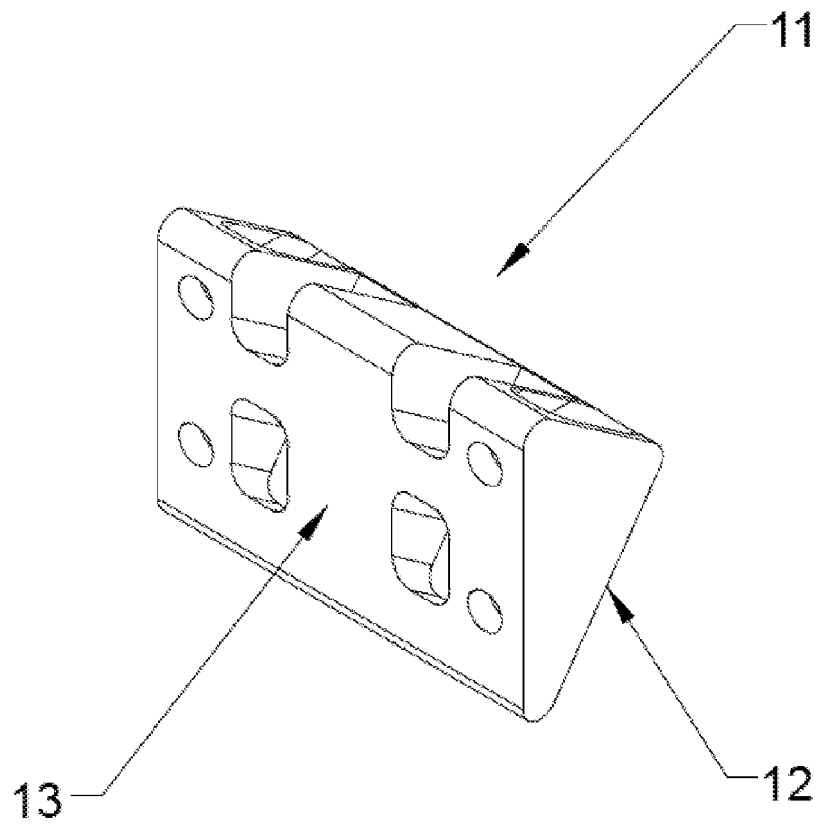


Figure 3

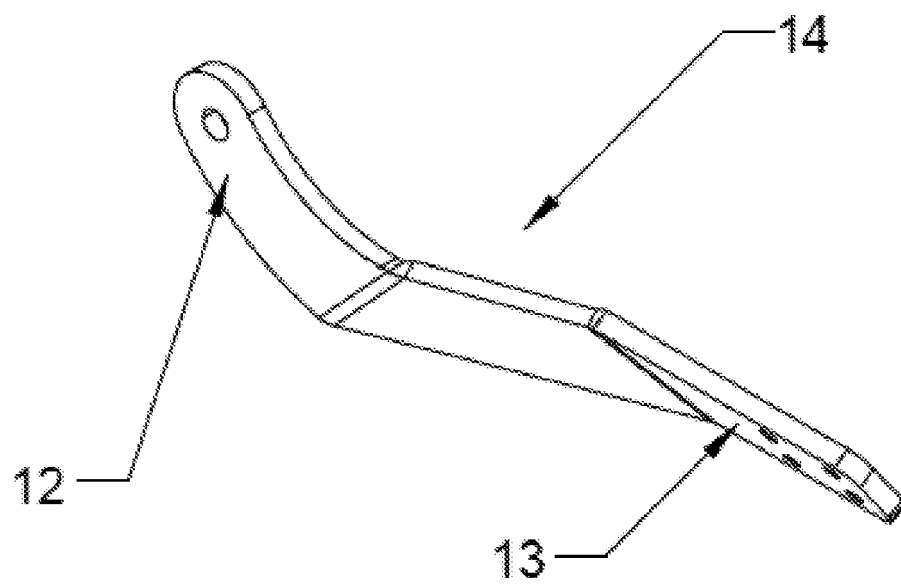


Figure 4

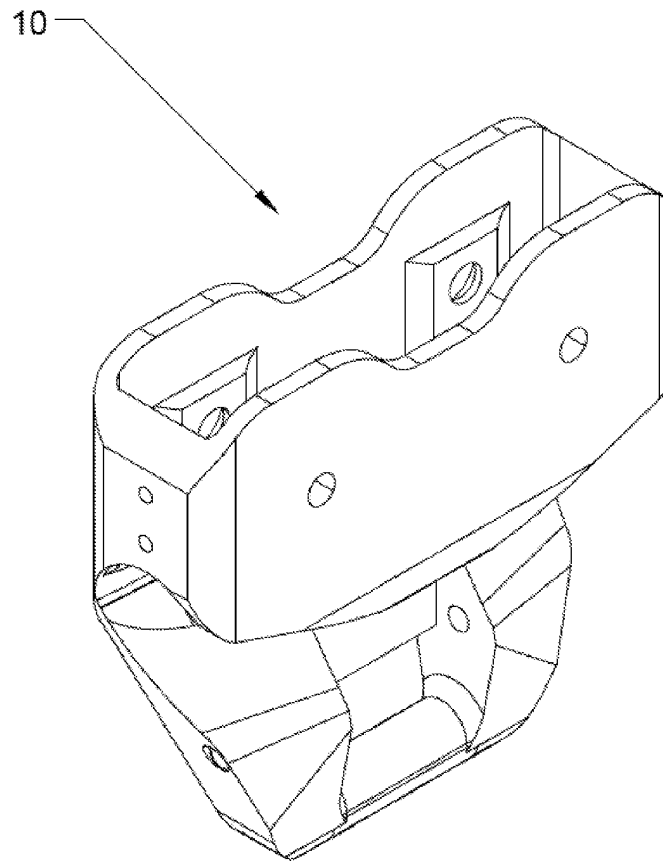


Figure 5

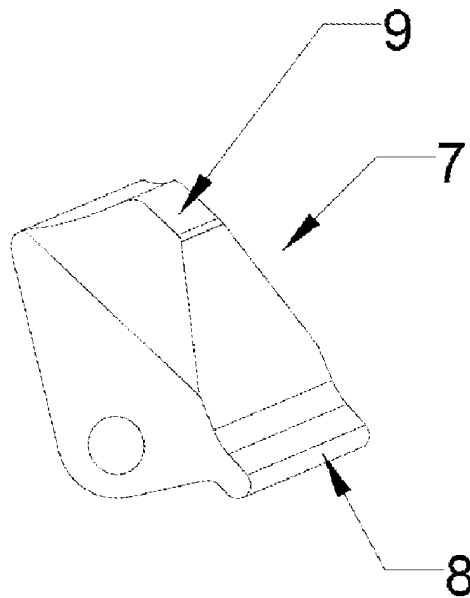


Figure 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2018/070576

5	A. CLASSIFICATION OF SUBJECT MATTER	
	A62B35/00 (2006.01)	
	According to International Patent Classification (IPC) or to both national classification and IPC	
10	B. FIELDS SEARCHED	
	Minimum documentation searched (classification system followed by classification symbols) A62B	
	Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched	
15	Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)	
	EPODOC, INVENES	
	C. DOCUMENTS CONSIDERED TO BE RELEVANT	
20	Category*	Relevant to claim No.
	A	ES 2379472T T3 (XPONENT CHALLENGE TECHNOLOGY COOPERATIEVE VENNOOTSCHAP MET BEEPERKTE AANSPRAKELIJKHEID ET AL.) 26/04/2012, Pages 9-10; figures 1-11
25	A	ES 2250138T T3 (LATCHWAYS PLC) 16/04/2006, Pages 9-10; figures 1-13
30	A	EP 2407211 A1 (TRACTEL S A S) 18/01/2012, Pages 7-9; figures 1-10
35	A	ES 2361076T T3 (FALLPROTEC S A) 13/06/2011, Page 6; figures 1-5
40	☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.	
45	* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance. "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure use, exhibition, or other means. "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family
50	Date of the actual completion of the international search 21/11/2018	Date of mailing of the international search report (27/11/2018)
55	Name and mailing address of the ISA/ OFICINA ESPAÑOLA DE PATENTES Y MARCAS Paseo de la Castellana, 75 - 28071 Madrid (España) Facsimile No.: 91 349 53 04	Authorized officer J. Hernández Cerdán Telephone No. 91 3495339

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International application No.
PCT/ES2018/070576

C (continuation).	DOCUMENTS CONSIDERED TO BE RELEVANT	
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A	ES 2187491T T3 (DALLOZ FALL PROT SA) 16/06/2003, Page 4; figures 1-4	1
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