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(54) Title: A SAFETY NET FOR LEISURE AND SPORT EVENTS

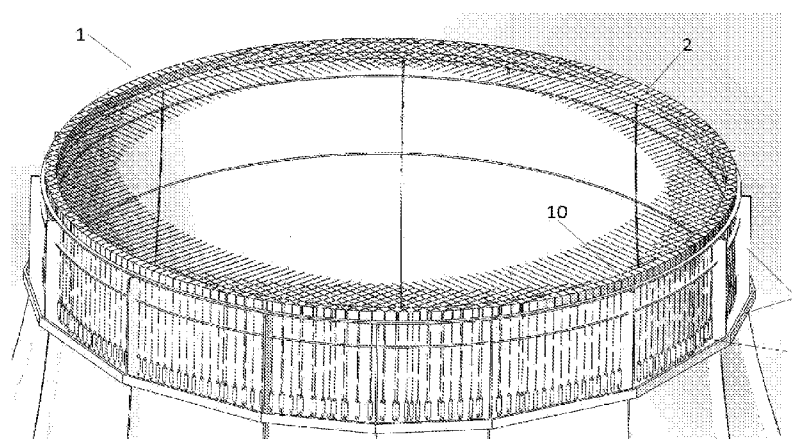


Fig. 6

(57) Abstract: Invention relates to safety nets for leisure, sport events as well as military training purposes. A safety net for leisure and sport events comprising a plurality of cables, a plurality of elastic members, wherein each elastic member with a one end is attached to the end of the cable and with a second end is attached to a structure member of the safety net. The safety net further comprises a guiding unit positioned at the edge of the net area and configured to bend the cables in such a way that a part of each cable is arranged longitudinally to the central axis of the safety net, whereby the elastic elements are positioned generally longitudinally to the central axis of the safety net.



## A SAFETY NET FOR LEISURE AND SPORT EVENTS

### FIELD OF THE INVENTION

5 Invention relates to safety nets for leisure, sport events as well as military training purposes. Said safety net can be installed in sky diving simulators also known as vertical wind tunnels or recirculating vertical wind tunnels.

### BACKGROUND OF THE INVENTION

10

Typical safety net is illustrated in US patent application No. 2013/0005537A1 disclosing a trampoline which includes a frame, a safety net which is hung on the frame by means of springs.

15 From the prior art of sky diving simulators it is known that a base for flying chamber is formed by a safety net. US patent No. 7,832,265 discloses a vertical wind tunnel, which levitates a flyer over a rotating fan. A steel mesh net is placed between the fan and the flyer so that the flyer does not fall into the rotating blades of the fan. In the mean time the steel mesh net works also as base surface for flying arena or chamber. The net is connected with  
20 framework by means of ropes forming a connection area. Usually safety nets for vertical wind tunnels are similar to leisure trampolines.

Another US patent No. 6,083,100 discloses vertical wind tunnel training device cable net and suspension system having springs.

25

Due to space restrictions vertical wind tunnels use relatively short and stiff springs which is satisfactory for normal use in vertical wind tunnels. However, if during the flying exercise vertical wind tunnel suddenly loses a power, the flyer falls directly onto the stiff metal cable net. Usually it ends up with different kind of injuries. Sometimes flyer can be as  
30 much as 10 to 15 m high above the net.

There has been some experiments to make a safety net much safer by installing longer, less stiff springs but it makes vertical wind tunnel or any other attraction much bigger losing its economical attractiveness. Another try especially for the wind tunnels was to improve an

emergency supply for rotating fan. Given solution is very complex and expensive and makes a vertical wind tunnel much bigger.

There is a need to find a new ways to improve a safety of vertical wind tunnels without  
5 decreasing its performance and increasing its size.

#### SUMMARY OF THE INVENTION

The above object is achieved according to the invention by the safety net for leisure and  
10 sport events comprising a plurality of elastic members forming a net area, a plurality of  
elastic members, wherein one end of the elastic member is attached to the end of the cable  
and a second end is attached to a structure member of the safety net. The safety net further  
comprises a guiding unit, positioned at the edge of the net area. The guiding unit is  
configured to bend the cables in such a way that a part of each cable is positioned  
15 longitudinally to the central axis of the safety net. Preferably, the cable is bent by 90  
degrees referring to the horizontal plane of the safety net. Accordingly, the elastic elements  
are also positioned generally longitudinally to the central axis of the safety net. Given  
design reduces dimensions of the safety net without sacrifice of performance and safety.

20 If it is necessary the cables can be bent by less than 90 degrees, for example by 45 degrees  
referring to horizontal plane of the safety net. The angle of bent depends on design of the  
safety net to be installed in the wind tunnel or any other attraction where the safety net is  
necessary.

25 The guiding element can be made in different configurations. For example, roller can serve  
as a guiding element, where cable runs around roller.

The safety net further comprises a suspension attached to the guiding unit allowing said  
guiding unit to move during the use of the safety net. Said suspension can be added if  
30 additional elasticity of the safety net system is necessary.

The safety net further comprises an additional resilient element that with one end is  
attached to the elastic elements and with other end is attached to the structural member of  
the safety net.

Additionally, the safety net can be provided with an activation unit configured to keep the additional resilient element in a retracted position and to release the additional resilient element in extended position when an activation signal is given.

5

The activation unit can comprise an extension means for extending said additional resilient element in a controllable manner. Said means give a control of a speed of extension of additional resilient element, therefore a resilient element can be released in a controllable manner. Said extension means can be spring-loaded or arbor reel system, that controls extension of additional resilient element in a predetermined manner. It is also possible to adjust a speed and load of extension means. Said extension means can be installed in the activation unit and connected to the elastic element or to the additional resilient elements. It can also be installed in the structure member of the safety net and connected to the elastic element or to the additional resilient elements as well as to the cable.

15

The activation unit can be installed to each elastic member or additional resilient element or cable. In other embodiment, the activation element is installed to the set of elastic members or additional resilient element or cable, therefore decreasing the complexity and amount of necessary activation units without compromising performance.

20

In one embodiment, all cables and their elastic members can form a set, wherein said set is connected to one activation unit and one additional resilient element. Said design decreases a complexity and improves reliability of the system without decreasing the performance and safety of the safety net.

25

The safety net comprises a control unit for controlling and activation of the activation unit, wherein the control unit triggers the activation unit in case of emergency or in case when a activation signal is received from an operator of the wind tunnel where the safety net is incorporated.

30

The safety net further comprises a sensor that detects a force applied to and/or a movement of the net area, the elastic member or the additional resilient element, wherein detected values of force or movement can be used to assess a condition of the safety net. The sensor can be installed in different positions according to the needs of design. It can be installed

near or on the cable, elastic member or additional resilient member. The sensor can be any sensor which is configured to register a movement or applied force.

5 Elastic element and auxiliary or additional resilient element can be made from elastic rope, a spring or from any other resilient material capable of elastic elongation according to the pre-set elasticity.

10 The elastic element attached to the cable is less elastic than the supplementary resilient element attached to the spring and the structural member of the vertical wind tunnel.

Given invention incorporates a method for operating a safety net for a vertical wind tunnel. The method contains activation or triggering of an activation unit, when an activation signal is received. The activation signal is an alarm signal that indicates the sudden loss of power for the vertical wind tunnel, especially the sudden loss of power for the power plant  
15 of the vertical wind tunnel. The activation signal can be also an alarm signal that indicates the manual trigger of an alarm switch by an operator of the wind tunnel.

According to the needs of the safety net user above mentioned elements can be added or excluded from the safety net installation. For example, guiding units can be interchanged  
20 from rollers to sliders or vice versa. If necessary, only one end of each cable can be provided with guiding unit, elastic element, additional resilient element and activation unit.

The present invention significantly improves the safety of flyers and decreases an unused space in a flying chamber.

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#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 illustrates a principal scheme of a safety net from the prior art installed in a vertical wind tunnel.

30 Fig. 2 illustrates a principal scheme of a safety net with guiding units **10** and elastic elements **3**.

Fig. 3 illustrates a principal scheme of alternate embodiment wherein guiding units **10** are rollers.

Fig. 4 illustrates a principal scheme of the safety net, which further comprises additional resilient element **11** and activation unit **12** and the safety net is in armed or retracted position.

Fig. 5 illustrates a principal scheme of the safety net, which further comprises additional resilient element **11** and activation unit **12** and the safety net is in activated or extended position.

Fig. 6 illustrates the safety net installed in vertical wind tunnel.

Fig. 7 illustrates the safety net **1** having elastic element **3** only on one side of a cable **2**.

10 Before explaining the disclosed embodiment of the present invention in detail, it is to be understood that the invention is not limited in its application to the details of the particular arrangements shown, since the invention is capable of other embodiments. In addition, the terminology used herein is for the purpose of description and not of limitation.

15 Referring to Figs. 2 – 7, a safety net for leisure and sport events comprising a plurality of cables **2**, wherein said cables **2** forming a net area **5**, a plurality of elastic elements **3** wherein each elastic elements **3** with a one end is attached to the end of the cable **2** and with a second end is attached to a structure member **4** of the safety net. The safety net further comprises a guiding unit **10**, positioned at the edge of the net area **5**, configured to  
20 bend the cables **2** in such a way that a part of each cable **2** is positioned longitudinally to the central axis **X** of the safety net. The elastic elements **3** are positioned generally longitudinally to the central axis **X** of the safety net.

In Fig. 2 and Fig. 6 the guiding unit **10** is a sliding element, about which the cable **2** slides  
25 over and turns by generally 90 degrees. In Fig. 3 the guiding unit **10** is a roller system, on which the cable **2** runs and turns by generally 90 degrees.

The safety net **1** optionally can comprise a suspension **13** (shown in Fig. 2) configured to suspend the guiding unit **10** giving additional elasticity to the safety net system.

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In Fig. 4 and Fig. 5 the safety net further comprises an additional resilient element **11** with one end attached to the spring **3** and with other end attached to the structural member **4** of the safety net. Additionally, an activation unit **12** is provided and configured to keep the

additional resilient element **11** in a retracted position and to release the additional resilient element **11** in extended position when activation signal is given.

5 Activation unit **12** comprises an extension means, not shown in figures, configured to extend said additional resilient element **11** in a controllable manner. The safety net further comprises a control unit, not shown in figures, for controlling the activation unit **12**, wherein the control unit triggers the activation unit **12** in case of emergency.

10 The safety net further comprises a sensor **20** that detects a force applied to and/or a movement of the net area **5**, the elastic member **3** or the additional resilient element **11**, wherein detected values of force or movement can be used to assess a condition of the safety net.

15 In Fig. 6 the safety net **1** is installed in the vertical wind tunnel. The safety net **1** having cables **2** with elastic members **3** that are attached to a structural member **4**. The structural member **4** can be any member of a vertical wind tunnel that is capable to withstand predetermined forces. The cables **2** are bent by the guiding unit **10**.

20 Referring to Fig. 7 the safety net **1** has elastic elements **3** attached to the one side of cables **2** not on both sides as in previous embodiments. Given embodiment is useful where it is necessary to reduce the elements of the safety net **1**. Additionally, said embodiment can be equipped with said additional resilient elements **11**, suspension **13** and other elements mentioned in the invention (not shown in the Fig. 7).

25 The invention has been described with reference to various specific and illustrative embodiments and techniques. However, one skilled in the art will recognize that many variations and modifications may be made while remaining within the scope of the invention as defined in the appended claims.

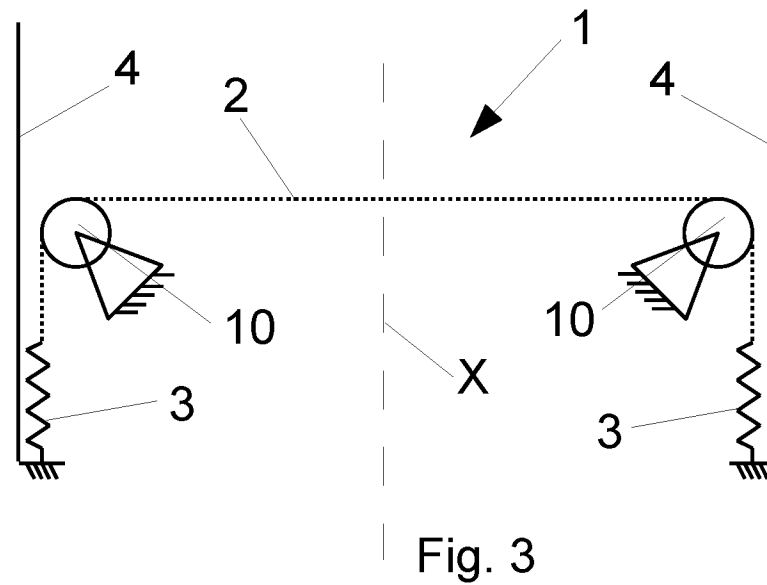
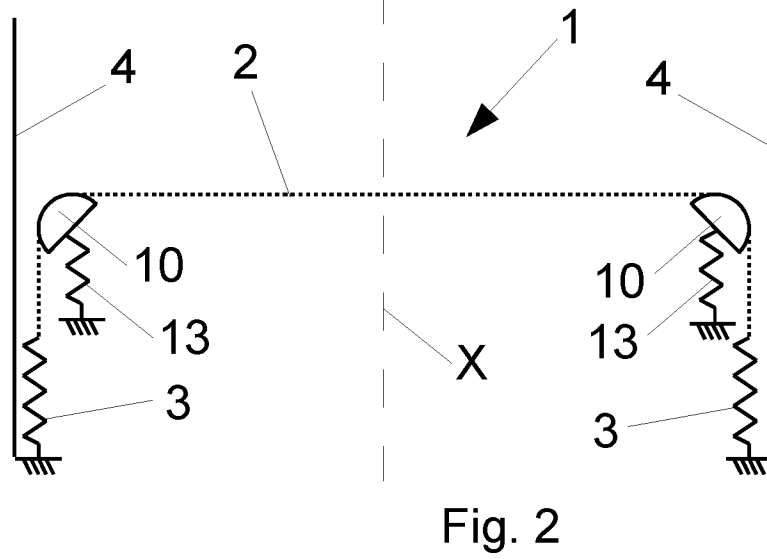
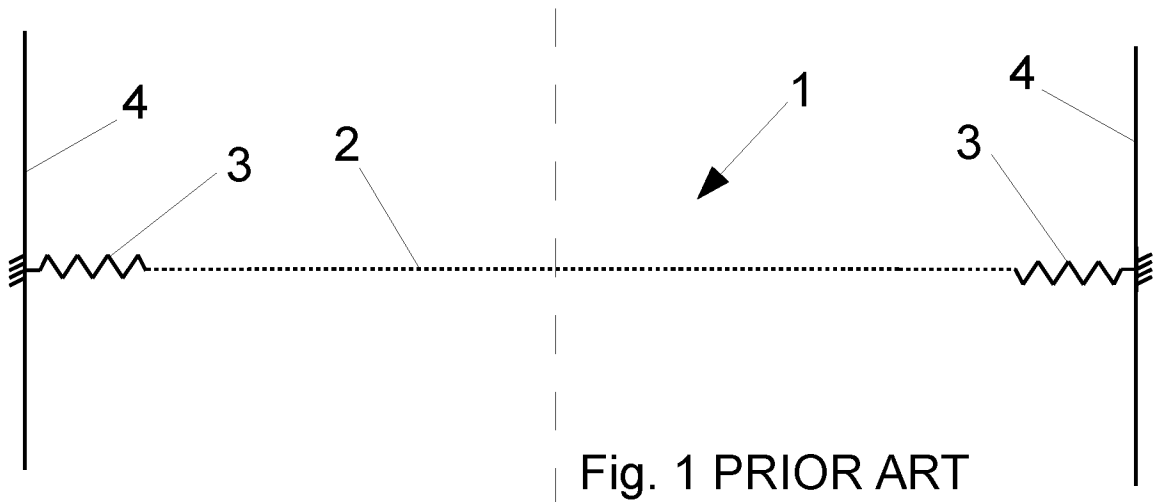
**CLAIMS**

1. A safety net for leisure and sport events comprising a plurality of cables (2) forming a net area (5), a plurality of elastic members (3), wherein each elastic member (3) with a one end is attached to the end of the cable (2) and with a second end is attached to a structure member (4) of the safety net, **characterized in that** it further comprises a guiding unit (10), positioned at the edge of the net area (5) configured to bend the cables (2) in such a way that a part of each cable (2) is arranged longitudinally to the central axis (X) of the safety net, whereby the elastic elements (3) are positioned generally longitudinally to the central axis (X) of the safety net.
2. The safety net (1) according to the claim 1 **characterized in that** it further comprises a suspension (13) attached to the guiding unit (10) allowing said guiding unit (10) to move during the use of the safety net.
3. The safety net (1) according to the claim 1 or 2 **characterized in that** it further comprises an additional resilient element (11) that with one end is attached to the elastic member (3) and with another end is attached to the structural member (4) of the safety net, and an activation unit (12) configured to keep the additional resilient element (11) in a retracted position and to release the additional resilient element (11) in extended position when activation signal is given.
4. The safety net (1) according to the claim 3 **characterized in that** the activation unit (12) comprises an extension means configured to extend said additional resilient element (11) in a controllable manner.
5. The safety net (1) according to the claim 3 or 4 **characterized in that** the safety net comprises a control unit for controlling the activation unit (12), wherein the control unit triggers the activation unit (12) in case of emergency.
6. The safety net (1) according to any of the preceding claims **characterized in that** it further comprises a sensor (20) that detects a force applied to and/or a movement of the net area (5), the elastic member (3), the additional resilient element (11) or



suspension (13), wherein detected values of force or movement can be used to assess a condition of the safety net.

7. A method for operating a safety net for a vertical wind tunnel according to the claim 1, **characterized by** activation or triggering of an activation unit (12) when an  
5 activation signal is received, wherein the activation signal is an alarm signal, that indicates the sudden loss of power of the vertical wind tunnel, especially the sudden loss of power of a power plant for the vertical wind tunnel.
- 10 8. The method according to the claim 7 **characterized in that** the activation signal is a signal, that indicates the manual trigger of an alarm switch.



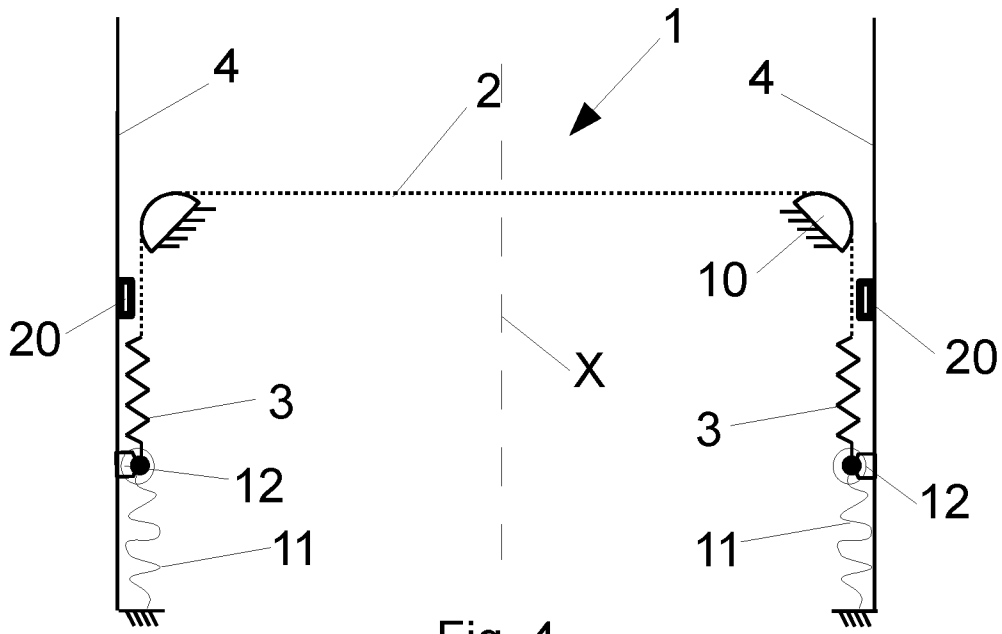


Fig. 4

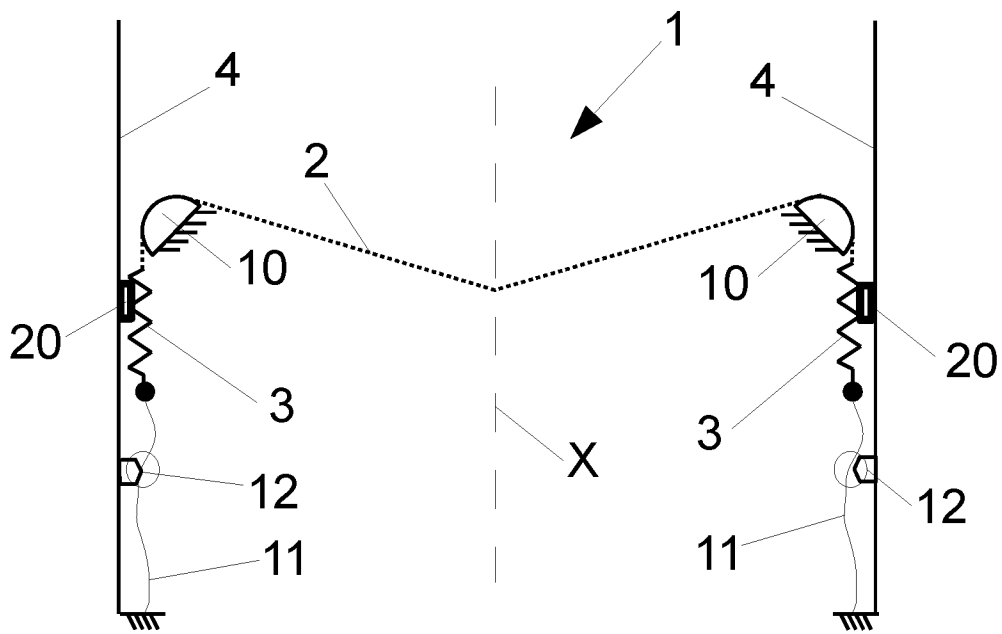


Fig. 5

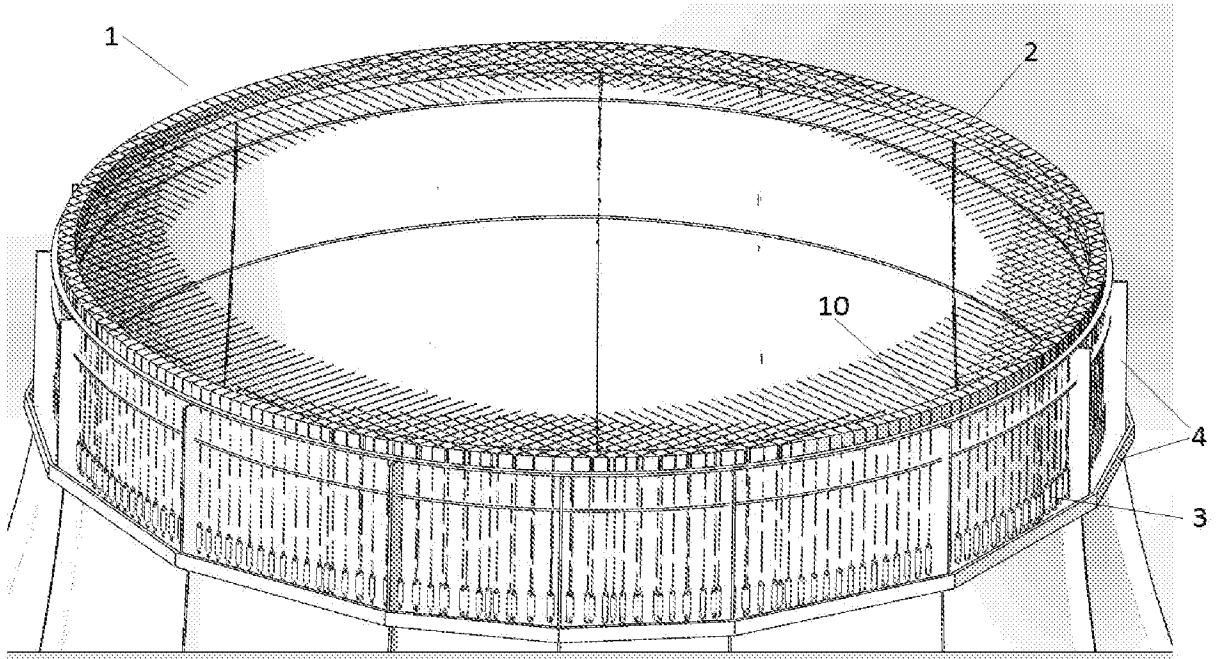


Fig. 6

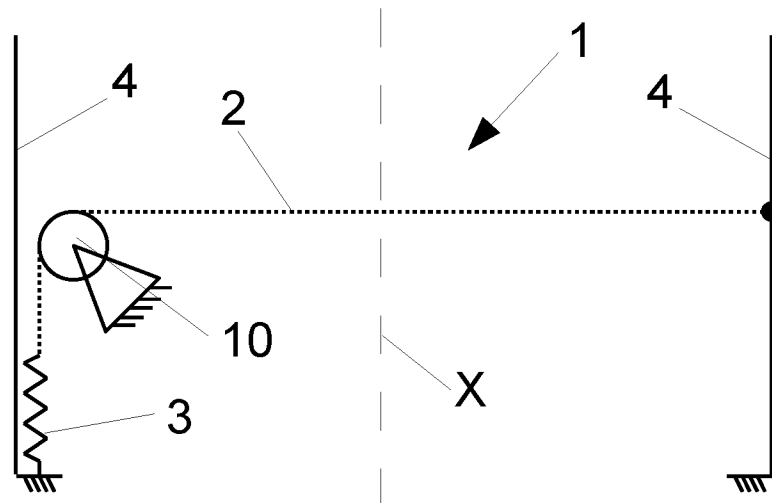


Fig. 7

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB 2015/050577

A. CLASSIFICATION OF SUBJECT MATTER		
<i>A63B 5/11 (2006.01)</i>		
According to International Patent Classification (IPC) or to both national classification and IPC		
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
Espacenet, PatSearch (RUPTO internal)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SU 1653793 A1 (STAVROPOLSKIY GOSUDARSTVENNY PEDAGOGICHESKIY INSTITUT) 07.06.1991	1-8
D, A	US 7832265 B1 (GONG STEWART) 16.11.2010	1-8
A	CN 103432710 A (SUZHOU HIGH TEN SPORTS EQUIPMENT CO LTD.) 11.12.2013	1-8
A	LV 14269 B (WIND TUNNEL TECHNOLOGIES SIA) 20.05.2011	1-8
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
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Date of the actual completion of the international search	Date of mailing of the international search report	
12 August 2015 (12.08.2015)	20 August 2015 (20.08.2015)	
Name and mailing address of the ISA/RU: Federal Institute of Industrial Property, Berezhkovskaya nab., 30-1, Moscow, G-59, GSP-3, Russia, 125993 Facsimile No: (8-495) 531-63-18, (8-499) 243-33-37	Authorized officer  A. Situshkin  Telephone No. (495)531-64-81	