Abstract:
In the technical field of trampoline tensioning, a tensioning apparatus and method of tensioning a trampoline jumping mat is provided. A plurality of pulleys circumextend the jumping periphery of the jumping mat. Each pulley has a wheel having an axle ultimately connected to the trampoline supporting frame and a cable or belt engaging surface along its circumference that is located above or in the same horizontal plane of the jumping mat. The wheel engages with a cable or belt at the cable or belt engaging surface. The cable or belt has a tensioner largely or exactly vertically oriented. Each pulley and tensioner applies tension to the jumping mat in the form of a force applied to the jumping periphery of the jumping mat in a direction away from the jumping mat.
TRAMPOLINE EQUIPMENT AND METHODS

Technical Field

[0001] The present invention relates to a trampoline, and more particularly to tensioners for trampolines.

5 Background Art

[0002] A trampoline, at its essence, comprises: a jumping mat connected via tensioners to a frame, which frame is connected to the ground either directly or through legs.

[0003] Standard above-ground trampolines are suspended above the ground by legs attached to the frame. In-ground trampolines have little or no distance between the bouncing mat and the ground.

[0004] In-ground trampolines typically have the frame connected directly to the ground, but in some instances, an above-ground trampoline can simply be placed in a hole dug to a depth such that the jumping mat is level with the ground. In both above-ground trampolines and in-ground trampolines, the use of safety enclosure nets is becoming commonplace.

[0005] Tensioners have traditionally been helical springs laid axially between the jumping mat and the frame. Helical springs are still widely used in trampolines in this configuration.

[0006] Helical springs have problems in that they have spaces between them and this can result in limbs of a user falling between the springs. This often results in injury. Also, when the springs contract while a person's exposed skin is against the spring, this results in pinching injuries. To ameliorate this, padding that covers the springs and mat-engaging enclosures have been used. Unfortunately, padding can shift and the enclosures can fail over time or be incorrectly installed, both of which can lead to injury. These safety items also add to the cost of the trampoline.

[0007] Other tensioners are also known. For example elastomeric bands can be used instead of helical springs, such as described in Australian patent no. 2010291951. They also have similar safety issues to those found in helical springs. They additionally typically degrade more quickly than helical springs and are also typically only used in trampolines for lightweight users.
[0008] One problem with traditional trampolines is that the jump mat area is reduced by the tensioners that are used as the tensioners take up space. This has been solved by the use of rods and leaf-spring plates that do not require a substantial axial area to be used for them.

[0009] Fibreglass rods, such as those described in US patent 6,319,174, have also been used to replace helical springs. These rods are diagonally arranged around the trampoline jumping mat and resiliency collapse down when a user jumps on the jumping mat. The rods have potential disadvantages in that they have a gap between rods that reduces when the user jumps on the trampoline that can cause an observer who has a limb between two of the diagonal rods to be to be closed in upon when the rod gap is reduced. Another potential issue is that if a user is bouncing near the periphery of the jumping mat, the jumping characteristics of the jumping mat change from that in the centre, which is disagreeable for some users. A further issue is that some users have reported that the jumping performance of this type of tensioning system is sub-par compared to helical spring-based trampoline jumping performance. Some users have also reported premature degradation of the fibreglass rods.

[0010] Leaf spring plates have also been employed, such as described in WO2012/167313. Leaf springs have the disadvantage that they are relatively heavy compared with rods or helical springs and are also generally more expensive to produce. Another technical issue is that if the connection between the jumping mat and the leaf spring fails or becomes detached then the leaf spring can become a generally upright spear-like projection that poses a safety hazard.

[0011] It would be desirable to have a trampoline that ameliorates at least some of the above-mentioned disadvantages or at least provides the public with a useful choice.

[0012] Nothing above should be read as necessarily falling within the common general knowledge.

Definitions

[0013] In this specification, unless the context indicates otherwise:

1. "above" means located on a horizontal plane elevated above another location on a lower horizontal plane. This does not necessarily require that the positions being compared to be directly above (i.e. not necessarily at the same horizontal position on parallel horizontal planes);
2. "beneath" means located on a horizontal plane lower than another location on a higher horizontal plane. This does not necessarily require that the positions being compared to be directly beneath (i.e. not necessarily at the same horizontal position on parallel horizontal planes);

3. "connected" means directly connected as well as indirectly connected;

4. "axle" means any wheel support, whether or not it transmits power and motion. To be clear, this definition is intended to also include axles that are shafts;

5. "jumping periphery" means the outermost border of a jumping mat that a trampoline user has access to while still being inside the usable area of the jumping mat;

6. "circumextending" means surrounding the periphery of another object in a closed loop. In the context of a trampoline, the jumping periphery of the jumping mat is typically surrounded. The object that is surrounded can be of any shape, such as circular, rectangular and polygonal;

7. "tensioner" means any resiliently deformable member that allows the jumping mat to deform from its resting configuration when a user jumps on the jumping mat with sufficient force and then forces the jumping mat to resiliently return towards its resting configuration to apply sufficient force in conjunction with other tensioners on a trampoline to the user such that the user is propelled upwards to become briefly airborne;

8. "pulley" is a combination of a wheel on an axle that is designed to support movement and change of direction of a taut cable or belt along its circumference.

9. "proximal" or "proximate" means situated at or near a defined location;

10. "rest" in the context of a tensioner is when the jumping mat is not being jumped on;

11. "comprise", or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated element, integer or step, or group of elements, integers or steps, but not the exclusion of any other element, integer or step, or group of elements, integers or steps.

[0014] The art-skilled worker will appreciate that the above definitions can and should, with suitable consideration for context, apply to the singular and the plural, and also to the tense of verbs, nouns, adjectives and adverbs derived from the above terms.

Summary of the invention

[0015] In a first aspect, the present invention provides a trampoline comprising:
a) a jumping mat having a jumping periphery, an upper surface and lower surface;
b) a supporting frame located proximal but not directly engaging with the jumping periphery of the jumping mat;
c) a plurality of pulleys circumextending the jumping periphery;
d) each of the plurality of pulleys comprising:
i. a wheel having an axle;
ii. the axle engaging with a trampoline supporting frame connector, the connector being connected to a trampoline supporting frame;
iii. the wheel having a cable or belt engaging surface along its circumference that is located in the same general horizontal plane as the jumping mat;
iv. the wheel engaging with a cable or belt at the cable or belt engaging surface;
v. the cable or belt having a tensioner end connected at one end to an elongate tensioner and a mat end connected proximal the jumping periphery of the jumping mat;
vi. the tensioner being largely or exactly vertically oriented and connected to the cable or belt at one end thereof and to the trampoline frame at its free end;
e) each pulley and tensioner configured to apply tension to the jumping mat in the form of a force applied to the jumping periphery of the jumping mat in a direction away from the jumping mat.

In a further aspect, the present invention provides a pulley for a trampoline comprising:

a) a wheel having an axle;
b) the axle engaging with a trampoline supporting frame connector;
c) the wheel having a cable or belt engaging surface along its circumference that is located in the same general horizontal plane as a trampoline jumping mat;
d) the wheel engaging with a cable or belt at the cable or belt engaging surface;
e) the cable or belt having a tensioner end connected at one end to an elongate tensioner and a mat end for connecting to the jumping periphery of the trampoline jumping mat;
f) the tensioner being largely or exactly vertically oriented and connected to the cable or belt at one end thereof and to the trampoline frame at its free end; and
g) each pulley and tensioner configured to apply tension to a trampoline jumping mat in the form of a force applied to a jumping periphery of the jumping mat in a direction away from the jumping mat.

[0017] In a still further aspect, the present invention provides a method of tensioning a trampoline jumping mat comprising:

a) providing a trampoline having a jumping mat having a jumping periphery, an upper surface and lower surface;

b) the trampoline having a supporting frame located proximal but not directly engaging with the jumping periphery of the jumping mat;

c) providing a plurality of pulleys circumextending the jumping periphery;

d) each of the plurality of pulleys comprising:

i. a wheel having an axle;

ii. the axle engaging with a trampoline supporting frame connector, the connector being connected to a trampoline supporting frame;

iii. the wheel having a cable or belt engaging surface along its circumference that is located in the same general horizontal plane as the jumping mat;

iv. the wheel engaging with a cable or belt at the cable or belt engaging surface;

v. the cable or belt having a tensioner end connected at one end to an elongate tensioner and a mat end connected proximal the jumping periphery of the jumping mat;

vi. the tensioner being largely or exactly vertically oriented and connected to the cable or belt at one end thereof and to the trampoline frame at its free end;

e) wherein each pulley and tensioner applies tension to the jumping mat in the form of a force applied to the jumping periphery of the jumping mat in a direction away from the jumping mat.

Brief description of the drawings

[0018] The invention is described below with reference to non-limiting drawings in which:

[0019] Fig. 1 is a perspective view of a single pulley attached to a trampoline frame;
[0020] Fig. 2 is a cross-sectional side view through a pulley connected to a trampoline; and

[0021] Fig. 3 is a perspective view of a trampoline fitted with pulleys.

Detailed description of the invention

[0022] Tensioners in the industry cover a variety of tensioning devices, most of which are generally elongate. A generally elongate tensioner when used in the invention should not be oriented generally horizontally.

[0023] A single tensioner per pulley is currently preferred, but multiple tensioners per pulley are also contemplated. If multiple tensioners are employed then these are preferably arranged in an arc splaying at one end thereof from the pulley at the tensioner attachment and attached at the opposite end thereof spaced apart to the frame. More preferably, the multiple tensioners should be bilaterally symmetrically arranged to minimise differential lateral forces on the pulley. In one embodiment, two tensioners per pulley are provided. In an alternative embodiment, three tensioners are provided per pulley.

[0024] In a currently preferred embodiment, the tensioner is a helical steel spring. However, other tensioners known in the art can equally be employed, such as elastomeric bands, for example as described and illustrated in WO 201 1/032173 (incorporated in its entirety by reference).

[0025] Each pulley cable should permit movement of the belt or cable in one vertical plane only, more preferably in a vertical plane perpendicular to the periphery of the mat nearest the jumping mat connection. It is most preferred for the belt or pulley to be practically moveable exclusively in one plane only.

[0026] It is currently preferred for the wheel to be closest to the jumping periphery of the jumping mat when the jumping mat is at rest (not being jumped on).

[0027] Preferably, the tensioner is attached at one end thereof directly to the supporting frame. It is preferred for the supporting frame to comprise an upper support bar and a lower support bar. Preferably, the tensioner is attached to the lower support bar.

[0028] In a currently preferred embodiment, the upper bar is horizontally offset from the lower bar in the direction of the jumping mat.
[0029] It is currently preferred for the wheel comprise a bearing, more preferably that the wheel is connected to the supporting frame through the bearing. The bearing in a currently preferred embodiment is integrally moulded into the wheel. Preferably, the wheel is connected through the bearing to the upper support bar.

[0030] If an engineering thermoplastic polymer is used to manufacture the wheel, it should preferably have the properties of high stiffness, low friction and excellent dimensional stability.

[0031] Conveniently, this can be achieved using a polyoxymethylene (POM) polymer. Friction can be reduced further using a polytetrafluoroethylene (PTFE) additive to form a copolymer. More preferably, the PTFE should comprise about 2% of the total polymer.

[0032] Other polymer options are available in the industry that are suited to this type of application and will be well-known to plastics manufacturers include, but are not limited to: composite phenolics, nylon (especially glass-filled, graphite and molybdenum disulphide filler varieties), PTFE (especially when filled with fiberglass, graphite or other inert materials), ultrahigh-molecular-weight polyethylene (UHMWPE) and polyamide (especially incorporating graphite). Polysulfone and polyphenylene sulphide are also useful as a bearing surface coatings.

[0033] While plastics are the preferred material for the wheel, other materials known in the art can equally be used, such as metal (e.g. cast steel).

[0034] In a currently preferred embodiment, belt/cable-engaging and axle-engaging surfaces of the wheel are preferably made of a friction-reducing polymer, as described above.

[0035] The cable or belt is preferably a belt, more preferably a belt that is not stretchable and is typically reinforced by multiple lines of elongate stitching. A non-stretchable material is preferred so as not to degrade tensioner performance. Unless protected by a cover or is purely for indoor use, the belt should be UV resistant. To increase strength, multiple layers of this material should ideally be used to form the belt but not so many layers that flexibility of the material is compromised. A currently preferred embodiment is re-enforced polyester webbing.

[0036] Other belts that are commonly used in pulleys are also usable. Typically, these consists of one or more layers of material. Many belts in general material handling have two layers. An under layer of material is typically used to provide linear strength and shape (called a "carcass") and an over layer (called the "cover"). For use in the present invention, the carcass is preferably a woven
fabric having a warp and weft. Typically, the carcass material is polyester or nylon. The cover is preferably a rubber or plastic compound that provides UV and water resistance.

[0037] Alternatively, a belt of metal braid, preferably steel metal braid can be used. Further alternatively, a steel cable, nylon rope or para-aramid synthetic fibre rope can be used.

[0038] If nylon, para-aramid synthetic fibre or polypropylene materials are used on trampolines exposed to the elements, care should be taken to protect these materials from the elements by covering them with a UV-protective cover, such as polyethylene or by using a UV treatment in their production to prevent premature ageing and failure.

[0039] Conveniently, the axle can be a metal (preferably steel, more preferably stainless steel) shaft.

[0040] Preferably, the cable or belt mat end is connected to the jumping periphery of the jumping mat through a jumping mat connector attached proximate the periphery of the jumping mat.

[0041] The jumping mat connector is currently preferred to be on the lower surface of the jumping mat. In one embodiment, the jumping mat connector is a formation on the lower surface of the jumping mat with a complementary engaging formation attached to the mat end of the cable or belt, more preferably wherein the formation on the lower surface of the jumping mat is a hook and the complementary engaging formation is an eyelet grommet.

[0042] Preferably, the upper end of the supporting frame is located beneath the jumping mat. Preferably, the upper surface of the wheel is located beneath or in-line with the jumping mat, more preferably immediately beneath the jumping mat.

[0043] In a currently preferred embodiment, the tensioner and pulley are protected by a cover, preferably a plastics cover. This can help to preserve the tensioner and also helps to prevent a user from contacting the tensioner and thereby helps to minimise injuries. More preferably, the cover is trampoline padding, most preferably axial (horizontally extending) trampoline padding with a downward-extending fabric flap at the periphery of the trampoline padding.

[0044] Preferably, between 30 and 60 pulleys are arranged and evenly spaced around the jumping mat of a trampoline, depending on the size of the trampoline and the required bounce performance. The larger the trampoline, the more pulleys will be required. Competitive bounce performance
will also require more pulleys. The considerations for determining the number of pulleys are well-known to art-skilled workers for trampolines already used in the industry and the same considerations apply in the present invention.

[0045] The present invention permits the use of longer spring tensioners than in conventional trampolines with the tensioners being located horizontally between the jumping mat and the trampoline frame without expanding the horizontal size of the trampoline. The present invention permits the use of stronger spring tensioners as a result. In a conventional trampoline with a horizontal spring set-up, the length of the spring reduces the size of the jumping mat for a given mat diameter.

10 Examples

[0046] The invention is described below with reference to examples. The examples are only preferred embodiments of one or more ways that the invention can be carried out and should not be read as limiting the scope of the invention.

[0047] With reference to Fig. 1 and Fig. 2, a pulley, generally indicated as 100, has a wheel 110 composed of polyoxymethylene (POM) with a 2% polytetrafluoroethylene (PTFE) copolymer. A steel pin shaft 120 passes through the centre of the wheel 110.

[0048] The shaft is held in a supporting frame connector 130 of 30% glass fibre reinforced nylon. The frame connector 130 is attached to an upper bar 140 of a trampoline frame, generally indicated as 145, by a fixing 135.

[0049] The wheel 110 has a belt groove 150. A belt 160 rests on top the belt groove 150. The belt is composed of 6 multiply sewed layers of UV resistant re-enforced polyester webbing.

[0050] The material that the wheel 110 is composed of makes it able to be used as a low-friction bearing surface both in the belt groove 150 and in its surface engaging with the steel pin shaft 120.

[0051] The belt 160 has a tensioner end 170 and a mat end 180. The tensioner end 160 has a tensioner eyelet grommet 190 that receives a belt engaging hook 200 of a tensioner 210 that is an elongate extension spring. At the opposite end of the tensioner 210 is a frame-engaging hook 220 that is hooked through a vertical slot 230 in a lower bar 240 of the trampoline frame 145 so the tensioner 210 is substantially vertically oriented in its normal operating orientation.
The upper bar 140 is offset from the lower bar 240 in the direction of a trampoline jumping mat 250.

The belt 160 has a mat eyelet grommet 260 proximal its mat end 180. The jumping mat has a jumping periphery 270 where an enclosure net attachment 280 is secured to the jumping mat 250.

Proximal the jumping periphery 270 on an underside 290 of the jumping mat 250 a jumping mat connector, generally indicated as 300, comprises a fabric loop 310 and a hook 320. The fabric loop 310 is sewn to the underside 290 of the jumping mat 250. The hook 320 passes through the fabric loop 310 and is, in use, hooked through the mat eyelet grommet 260 to secure the jumping mat 250 to the pulley 100.

Tension in the tensioner 210 retains the belt 160 in position and ensures that the jumping mat 250 is above or in line with the top of the wheel 110 when jumping mat 250 is in its resting position (not being jumped on).

The upper surface of the pulley between it and the jumping mat is covered in a conventional trampoline pad (not shown). The edge of the pad furthest from the jumping mat 250 has a downward extending flap (not shown) of polypropylene that extends to beneath the lower bar 240.

The lever 100 is one of a plurality of 42 identical levers acting in concert when installed on a trampoline as shown in Fig. 3.

With reference to Fig. 3, a trampoline, generally indicated as 100, has the trampoline frame, generally indicated as 145, consisting of the upper bar 140 and the lower bar 240, supported and spaced apart by a plurality of legs (only some are shown).

Enclosure supports 450, 460, 470, 480, 490, 500 (only some are shown) extend upwards from the base of the legs (as depicted in relation to legs 410, 420, 430 and 440) and support a safety enclosure net 510 that has a door flap 520. The base of safety enclosure net 520 is attached to the jumping mat (not shown in Fig. 3 but shown as 250 in Figs. 1 and 2) at the enclosure net attachment (only shown as 280 in Fig. 2).

42 evenly spaced identical pulleys 100 (only one is marked in the interests of decluttering the drawing and only selected features are listed in the interests of providing context - refer to Fig.
1 and Fig. 2 for detailed features) connect the trampoline frame 145 to the jumping mat (not shown in Fig. 3 but shown as 250 in Figs. 1 and 2) by use of the belt 140 extending over the wheel, attached to the tensioner 210 attached to the lower bar 240.

[0061] Each of the 42 pulleys 100 is configured to apply tension to the trampoline jumping mat (not shown in Fig. 3 but shown as 250 in Figs. 1 and 2) in the form of a force applied against its jumping periphery 270 away from the jumping mat.

[0062] With reference to Fig. 1, Fig. 2 and Fig. 3, in use, a user (not shown) enters the trampoline 400 through the door flap 520 and bounces down thereby transferring kinetic energy to the jumping mat 250. This applies a lateral and downward force to the jumping periphery 270, drawing the jumping periphery 270 towards the centre of the jumping mat 250. This force is transmitted in sequence through: the fabric loop 310, the mat eyelet grommet, the belt 160, the tensioner eyelet grommet 190 and into the tensioner 210 through its belt engaging hook 220.

[0063] Tensioner 210 expands longitudinally from its resting configuration to an expanded configuration permitting the belt to move over the wheel 110 (causing it to rotate) and permits the belt to move towards the centre of the jumping mat 250 at the mat end.

[0064] The belt groove 150 and the action of the wheel 110 permit the force to be transmitted substantially in one vertical plane per pulley.

[0065] When the user's kinetic energy has been exhausted, the tension in the tensioner 210 causes it to contract, which draws the jumping mat periphery back towards the pulley. This contraction is transmitted through the jumping mat 250 to the user and exerts an upwards force against the user, in concert with each of the other 42 pulleys 100, to permit the user to become briefly airborne.

[0066] Gravity arrests the user's motion and returns the user to the jumping mat 250 where the process begins again, thereby permitting a repetitive bounce motion to be established by the user.

[0067] It will be appreciated that the invention broadly consists in the parts, elements and features described in this specification, which when compared to prior art relating to the field, should serve to illustrate the novelty of the invention described herein.
Industrial Applicability

[0068] The present invention is applicable to the trampoline manufacturing industry and to the construction and maintenance of trampolines.
What we claim is:

1. A trampoline comprising:
   a) a jumping mat having a jumping periphery, an upper surface and lower surface;
   b) a supporting frame located proximal but not directly engaging with the jumping periphery of the jumping mat;
   c) a plurality of pulleys circumextending the jumping periphery;
   d) each of the plurality of pulleys comprising:
      i. a wheel having an axle;
      ii. the axle engaging with a trampoline supporting frame connector, the connector being connected to a trampoline supporting frame;
      iii. the wheel having a cable or belt engaging surface along its circumference that is located in the same general horizontal plane as the jumping mat;
      iv. the wheel engaging with a cable or belt at the cable or belt engaging surface;
      v. the cable or belt having a tensioner end connected at one end to an elongate tensioner and a mat end connected proximal the jumping periphery of the jumping mat;
      vi. the tensioner being largely or exactly vertically oriented;
   e) each pulley and tensioner configured to apply tension to the jumping mat in the form of a force applied to the jumping periphery of the jumping mat in a direction away from the jumping mat.

2. A trampoline as claimed in claim 1, wherein the tensioner is generally elongate.

3. A trampoline as claimed in claim 1 or claim 2, wherein the tensioner is a helical steel spring.

4. A trampoline as claimed in any one of claims 1 to 3, wherein there is a single tensioner per pulley.

5. A trampoline as claimed in any one of claims 1 to 4, wherein each pulley cable permits movement of the belt or cable in one vertical plane only.

6. A trampoline as claimed in claim 5, wherein each pulley cable permits movement of the belt or cable in a vertical plane perpendicular to the periphery of the jumping mat nearest the jumping mat connection.
7. A trampoline as claimed in any one of claims 1 to 6, wherein the wheel is closest to the jumping periphery of the jumping mat when the jumping mat is at rest (not being jumped on).

8. A trampoline as claimed in any one of claims 1 to 7, wherein the tensioner is attached at one end thereof directly to the supporting frame.

9. A trampoline as claimed in any one of claims 1 to 8, wherein the supporting frame comprises an upper support bar and a lower support bar, and the tensioner is attached to the lower support bar.

10. A trampoline as claimed in claim 9, wherein the upper bar is horizontally offset from the lower bar in the direction of the jumping mat.

11. A trampoline as claimed in any one of claims 1 to 10, wherein the wheel comprises a bearing.

12. A trampoline as claimed in claim 11, wherein the wheel is connected to the supporting frame through the bearing.

13. A trampoline as claimed in claim 11 or claim 12, wherein the bearing is integrally moulded into the wheel.

14. A trampoline as claimed in claim 12 or claim 13, wherein the wheel is connected through the bearing to the upper support bar.

15. A trampoline as claimed in any one of claims 1 to 14, wherein the wheel comprises an engineering thermoplastic polymer having the properties of high stiffness, low friction and excellent dimensional stability.

16. A trampoline as claimed in claim 15, wherein the wheel comprises a polyoxymethylene (POM) polymer.

17. A trampoline as claimed in claim 16, wherein the wheel further comprises a polytetrafluoroethylene (PTFE) additive to form a copolymer.

18. A trampoline as claimed in claim 17, wherein the PTFE comprises about 2% of the total polymer.

19. A trampoline as claimed in any one of claims 1 to 18, wherein the cable or belt is a belt of a UV resistant, re-enforced polyester webbing, reinforced by multiple lines of elongate stitching.

20. A trampoline as claimed in claim 19, wherein the belt comprises multiple layers of material.
21. A trampoline as claimed in any one of the previous claims, wherein the between 30 and
60 pulleys are arranged and evenly spaced around the jumping mat of a trampoline.

22. A pulley for a trampoline comprising:
   a) a wheel having an axle;
   b) the axle engaging with a trampoline supporting frame connector;
   c) the wheel having a cable or belt engaging surface along its circumference that is
      located in the same general horizontal plane as a jumping mat;
   d) the wheel engaging with a cable or belt at the cable or belt engaging surface;
   e) the cable or belt having a tensioner end connected at one end to an elongate
      tensioner and a mat end for connecting to the jumping periphery of the trampoline
      jumping mat;
   f) the tensioner being largely or exactly vertically oriented in use; and
   g) each pulley and tensioner configured to apply tension to the trampoline jumping
      mat in the form of a force applied to a jumping periphery of the jumping mat in a
      direction away from the jumping mat.

23. A method of tensioning a trampoline jumping mat comprising:
   a) providing a trampoline having a jumping mat having a jumping periphery, an upper
      surface and lower surface;
   b) the trampoline having a supporting frame located proximal but not directly engaging
      with the jumping periphery of the jumping mat;
   c) providing a plurality of pulleys circumextending the jumping periphery;
   d) each of the plurality of pulleys comprising:
      vii. a wheel having an axle;
      viii. the axle engaging with a trampoline supporting frame connector, the connector
            being connected to a trampoline supporting frame;
      ix. the wheel having a cable or belt engaging surface along its circumference that
           is located in the same general horizontal plane as the jumping mat;
      x. the wheel engaging with a cable or belt at the cable or belt engaging surface;
      xi. the cable or belt having a tensioner end connected at one end to an elongate
           tensioner and a mat end connected proximal the jumping periphery of the
           jumping mat;
      xii. the tensioner being largely or exactly vertically oriented;
e) wherein each pulley and tensioner applies tension to the jumping mat in the form of a force applied to the jumping periphery of the jumping mat in a direction away from the jumping mat.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

A63B 5/11 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC.

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database consulted during the international search (name of data base and, where practicable, search terms used)

WPIAP & EPDOC: IPC/CPC A63B5/11 (keywords: mat, surface, bed, above, over, atop, upon, elevated, lift, raised, higher, on top, frame, base, foundation, underneath, beneath, below, lower, upward, vertical, upright, erect, spring, bias, tension, means, member, elastic, resilient, restore, flex, torsion, suspension, soft-edge, bottom, top, upper, second, dual, twin, double, multi, plural, additional, supplemental, intermediate, middle, in-between, spaced apart, rail, support means, pulley, roller, reel, wheel, block, tackle, winch, hoist, sheave and similar words).

Espacenet: Applicant/Inventors name(s); Applicant/Inventors name(s) also searched in internal databases (INTESS & NOSE) provided by IP Australia.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category*</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Documents are listed in the continuation of Box C</td>
<td></td>
</tr>
</tbody>
</table>

| X | Further documents are listed in the continuation of Box C | X | See patent family annex |

* Special categories of cited documents:
  "A" document defining the general state of the art which is not considered to be of particular relevance
  "B" earlier application or patent 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 such documents, such combination being obvious to a person skilled in the art
  "&" document member of the same patent family

Date of the actual completion of the international search: 3 May 2017
Date of mailing of the international search report: 03 May 2017

Name and mailing address of the ISA/AU

AUSTRALIAN PATENT OFFICE
PO BOX 200, WODEN ACT 2606, AUSTRALIA
Email address: pct@ipaustralia.gov.au

Authorised officer

Lejla Abaz
AUSTRALIAN PATENT OFFICE
(ISO 9001 Quality Certified Service)
Telephone No. 0262256137

Form PCT/ISA/210 (fifth sheet) (July 2009)
<table>
<thead>
<tr>
<th>Category</th>
<th>Citation</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>EP 282 1111 B1 (EUROTRAMP TRAMPOLINE - KURT HACK GMBH) 14 October 2015 Whole document, in particular English language claims, Figures 1-2, paragraphs [0004]-[0048]; (machine translation available from Espacenet.)</td>
<td>1-23</td>
</tr>
</tbody>
</table>
This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Publication Number</td>
<td>Publication Date</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>CN 105307732 A</td>
<td>03 Feb 2016</td>
</tr>
<tr>
<td>KR 101423568 B1</td>
<td>01 Aug 2014</td>
</tr>
<tr>
<td>US 9586072 B2</td>
<td>07 Mar 2017</td>
</tr>
<tr>
<td>EP 2821 111 B1</td>
<td>14 Oct 2015</td>
</tr>
</tbody>
</table>

End of Annex