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(54) **SPRING ENCLOSURE TRAMPOLINE**

(57) A spring enclosure trampoline includes a trampoline bed (15) connected across a horizontal frame member (30). The trampoline bed (15) is supported by a plurality of springs. Trampoline legs (54) support the horizontal frame member (30) above a ground surface. A trampoline enclosure supports a trampoline enclosure net (52) from a spring enclosure netting support (40). The trampoline enclosure surrounds the trampoline bed (15) and the trampoline enclosure is supported on a trampoline pole. The spring enclosure netting support (40) is formed as a leaf spring. The leaf spring is flexible in a horizontal direction and in a vertical direction. A leaf spring vertical dimension (41) is greater than the leaf spring horizontal dimension (42). A horizontal spring constant of the leaf spring, and a vertical spring constant of the leaf spring are different.

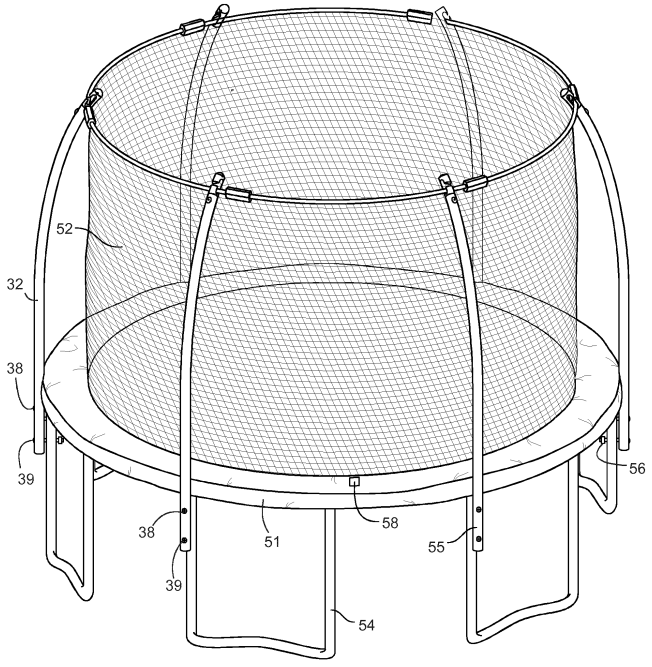

Fig. 1

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Description

FIELD OF THE INVENTION

[0001] The present invention is in the field of trampoline enclosures.

DISCUSSION OF RELATED ART

[0002] A variety of different trampoline enclosures can retain users within a trampoline enclosure. The trampoline enclosure is typically supported by trampoline poles that hold up a trampoline enclosure support. Trampoline enclosure supports have been framed from fiberglass rods, such as plastic wrapped fiberglass rods. Additionally, trampoline wires have provided for both substantially inflexible supports and substantially flexible supports. An inflexible support has improved strength for retaining a user, but a flexible support has improved safety when a user contacts the enclosure support during a jump.

SUMMARY OF THE INVENTION

[0003] An object of the present invention is to provide a spring connection between trampoline enclosure poles to improve dynamic catching of users that fall onto trampoline enclosure netting while at the same time providing a flexible support in case a user contacts the enclosure support during a jump.

[0004] A spring enclosure trampoline includes a trampoline bed connected across a horizontal frame member. The trampoline bed is supported by a plurality of springs. Trampoline legs support the horizontal frame member above a ground surface. A trampoline enclosure supports a trampoline enclosure net from a spring enclosure netting support. The trampoline enclosure surrounds the trampoline bed and the trampoline enclosure is supported on a trampoline pole. The spring enclosure netting support is formed as a leaf spring. The leaf spring is flexible in a horizontal direction and in a vertical direction. A leaf spring vertical dimension is greater than the leaf spring horizontal dimension. A horizontal spring constant of the leaf spring, and a vertical spring constant of the leaf spring are different.

[0005] The horizontal spring constant is less than the vertical spring constant so that the leaf spring is resiliently flexible in a vertical direction and in a horizontal direction, but is more stiff in a vertical direction. An enclosure sleeve of the trampoline enclosure supports the trampoline enclosure net, which is suspended from the enclosure sleeve.

[0006] Preferably, the leaf spring is formed from multiple sections connected together at a leaf spring connector. The leaf spring has a pair of leaf spring openings that receive bolts secured by nuts. The pair of leaf spring openings can include a leaf spring first opening and a leaf spring second opening. The leaf spring has a leaf spring cover fitted over at least an upper edge of the leaf spring. The leaf spring retainer can be attached to the trampoline pole. The leaf spring retainer has a retainer slot that clips the leaf spring to limit rotation of the leaf spring within the retainer slot. The spring enclosure trampoline may also have a leaf spring cover laminated over at least a portion of the leaf spring.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007]

Figure 1 is an environmental perspective view of a trampoline.

Figure 2 is a cross-section view of the trampoline frame, springs and trampoline pad connection.

Figure 3 is a close-up view of a spring enclosure netting support showing a connection between different sections of the leaf spring.

Figure 4 is a cross-section view of a first leaf spring section and a second leaf spring section bolted together inside a plastic connector.

Figure 5 is a cross-section view of the enclosure sleeve fitting over the leaf spring.

Figure 6 is an exploded view of the present invention showing construction of the leaf spring.

[0008] The following call out list of elements can be a useful guide in referencing the element numbers of the drawings.

10	Pad
15	Bed
30	Horizontal Frame Member
32	Enclosure Poles
38	First Enclosure Pole Connector
39	Second Enclosure Pole Connector
40	Spring Enclosure Netting Support
41	Leaf Spring Vertical Dimension
42	Leaf Spring Horizontal Dimension
43	Leaf Spring Connector
44	Leaf Spring First Opening
45	Leaf Spring Second Opening
46	First Bolt
47	Second Bolt
48	First Nut
49	Second Nut
51	Trampoline Frame
52	Net
53	Upper Enclosure Support
54	Trampoline Leg
55	Enclosure Pole Connection
56	Enclosure Pole Connection Nut
58	Spring Cover

60 Leaf Spring Cover
61 Tacky Film
62 Leaf Spring Retainer
63 Retainer Slot
64 Enclosure Sleeve

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0009] A trampoline generally has a trampoline frame 51 having a ring of horizontal members. The trampoline frame 51 is connected to multiple trampoline legs 54. The trampoline legs 54 are U-shaped and connected to the trampoline frame 51 to support the trampoline frame 51 above the ground. The trampoline legs have enclosure poles 32 connected to them. The enclosure poles 32 are connected to the trampoline legs at an enclosure pole connection 55. The enclosure pole connection 55 includes a first enclosure pole connector 38 and a second enclosure pole connector 39 which can be formed of a screw or bolt for example. The enclosure pole connection nut 56 can thread to the enclosure pole connectors when the enclosure pole connectors are formed as bolts. The enclosure poles 32 support an upper enclosure support 53. The upper enclosure support 53 has a net 52 suspended from the upper enclosure support. The net 52 retains users bounding on the trampoline bed. The trampoline bed is connected to the trampoline frame 51 at a plurality of springs that are covered by spring cover 58. The trampoline enclosure surrounds the trampoline bed along a circumferential periphery and has a top portion open.

[0010] The trampoline frame supports the bed 15, pad 10, springs and user. The trampoline frame is commonly circular when seen from a top plan configuration and made of horizontal tubular members, having a number of vertical support legs attached to the horizontal tubular members. The trampoline frame can also be rectangular. The trampoline frame retains a plurality of springs that in turn retain the trampoline surface. The trampoline frame is formed of vertical members and horizontal members 30. The vertical and horizontal members 30 travel around the periphery of the trampoline bed 15. Horizontal members 30 are supported by vertical members. The horizontal members connect to vertical members at a T joint connector provided for interconnecting adjacent ends of each top member section. The vertical members support the T joint connectors.

[0011] The trampoline enclosure has an upper enclosure support 53 that can be formed as a spring enclosure netting support 40. The spring enclosure netting support 40 is formed as one or more leaf springs connected to each other in a circular or oval shape. The leaf spring has a vertical dimension 41 and a horizontal dimension 42. The vertical dimension is greater than the horizontal dimension. Preferably, the vertical dimension or height of the leaf spring is about 10-12 mm while the horizontal dimension is about 1-2 millimeters. The spring enclosure netting support is held within a sleeve of the enclosure net that conforms to the circular or oval shape of the leaf spring when seen from the top view.

[0012] Although described as a leaf spring, the spring can also be described as a plate spring. The leaf spring has a pair of ends such as a first end and a second end.

[0013] When only a single leaf spring is used, the single leaf spring can have the first end connected to the second end to form a loop such as a circular or oval shaped loop.

[0014] The leaf spring can be connected by a leaf spring connector 43 such as a clamp. The clamp can have a pair of set screws or securing connectors that pass through a surface of the leaf spring. The leaf spring first end and the leaf spring second end can both have an opening for receiving a pair of bolt connectors. The leaf spring can have a leaf spring first opening 44 adjacent to a leaf spring second opening 45. The leaf spring first opening 44 and the leaf spring second opening 45 are preferably parallel to each other along a median line of the leaf spring. The leaf spring can be formed in sections such as in four sections.

[0015] As seen in Fig. 4, the first bolt 46 can insert through the leaf spring first opening 44 and the second bolt 47 can insert through the leaf spring second opening 45. The first nut 48 connects to the first bolt 46 and the second nut 49 connects to the second bolt 47. The leaf spring also has a leaf spring cover 60. The leaf spring cover is preferably made of a plastic sheathing that covers the leaf spring along its periphery. The plastic sheathing can be made as a polypropylene tubing that has either a circular cross-section or a cross-section that conforms to the flat leaf spring shape.

[0016] The leaf spring is substantially flexible along its entire length and provides support to the trampoline poles 32 to interconnect the trampoline poles 32 at upper ends of the trampoline poles. The upper ends of the trampoline poles 32 are flexibly interconnected to each other while remaining not free. From a top view, the flat leaf spring forms a leaf spring ring.

[0017] The leaf spring responds differently when receiving bias from a horizontal direction as compared to receiving bias from a vertical position. During regular jumping, the spring enclosure netting support 40 resiliently attenuates frame vibrations and can dampen cyclical stress between the upper ends of the trampoline enclosure poles 32. When a user lands on the enclosure net, the leaf spring flexes to catch the user. Because the leaf spring is connected to all of the trampoline poles at the upper ends of the trampoline poles, the leaf spring flexes to change the shape of its profile. The leaf spring receives a force in a downward direction causing the leaf spring to buckle.

[0018] The leaf spring has a first spring constant in the horizontal direction, also called a horizontal direction spring constant. The leaf spring also has a second spring constant in the vertical direction, also called a vertical direction spring constant. The spring constant in the horizontal direction is less than the spring constant in the

vertical direction.

[0019] After the trampoline enclosure catches the user, the user preferably does not contact the ground. The sleeve of the trampoline enclosure net preferably at least partially bears the weight of the user and preferably prevents the user from contacting the ground. The leaf spring flexibly restores the shape of the enclosure net to the original neutral position after the user is no longer biasing the trampoline enclosure net.

[0020] Optionally, the leaf spring is encapsulated within a laminate such as a plastic sheath formed as the leaf spring cover 60. The leaf spring cover 60 can be a high density plastic tube such as a polyethylene tube. The leaf spring cover 60 can be thermally laminated to the metal of the leaf spring with a tacky polyolefin film that acts as a double-sided adhesive tape when heated. The tacky film 61 can be introduced at an interface between the leaf spring cover 60 and the spring enclosure netting support 40. The leaf spring has a flat surface that can receive a strip of tacky film 61 on an inside and outside surface of the leaf spring.

[0021] A leaf spring retainer 62 can have a retainer slot 63. The retainer slot 63 can be formed on a plastic upper endcap covering an upper end of the trampoline enclosure pole 32. The leaf spring retainer can be formed of high density polyethylene with an ultraviolet inhibitor. The leaf spring retainer prevents rotation of the leaf spring and maintains the leaf spring in a vertically oriented position where the vertical height is greater than a horizontal width.

Claims

1. A spring enclosure trampoline comprising:

a. a trampoline bed (15) connected across a horizontal frame member (30), wherein the trampoline bed (15) is supported by a plurality of springs;
b. trampoline legs (54) supporting the horizontal frame member (30) above a ground surface;
c. a trampoline enclosure supporting a trampoline enclosure net (52) from a spring enclosure netting support (40), wherein the trampoline enclosure surrounds the trampoline bed (15) and wherein the trampoline enclosure is supported on a trampoline pole, wherein the spring enclosure netting support (40) is formed as a leaf spring, wherein the leaf spring is flexible in a horizontal direction and in a vertical direction, wherein a leaf spring vertical dimension (41) is greater than the leaf spring horizontal dimension (42); and
d. a horizontal spring constant of the leaf spring, and a vertical spring constant of the leaf spring, wherein the horizontal spring constant is less than the vertical spring constant so that the leaf spring is resiliently flexible in a vertical direction and in a horizontal direction, but is more stiff in a vertical direction; and
e. an enclosure sleeve (64) of the trampoline enclosure, wherein the trampoline enclosure net (52) is suspended from the enclosure sleeve (64).

2. The spring enclosure trampoline of claim 1, wherein the leaf spring is formed from multiple sections connected together at a leaf spring connector (43).

3. The spring enclosure trampoline of claim 1 or 2, wherein the leaf spring has a pair of leaf spring openings that receive bolts, wherein the pair of leaf spring openings includes a leaf spring first opening (44) and a leaf spring second opening (45).

4. The spring enclosure trampoline according to one of the previous claims, wherein the leaf spring has a leaf spring cover (60) fitted over at least an upper edge of the leaf spring.

5. The spring enclosure trampoline according to one of the previous claims, further including a leaf spring retainer (62) attached to the trampoline pole, wherein the leaf spring retainer (62) has a retainer slot (63) that clips the leaf spring to limit rotation of the leaf spring within the retainer slot (63).

6. The spring enclosure trampoline according to one of the previous claims, further including a leaf spring cover (60) laminated over at least a portion of the leaf spring.

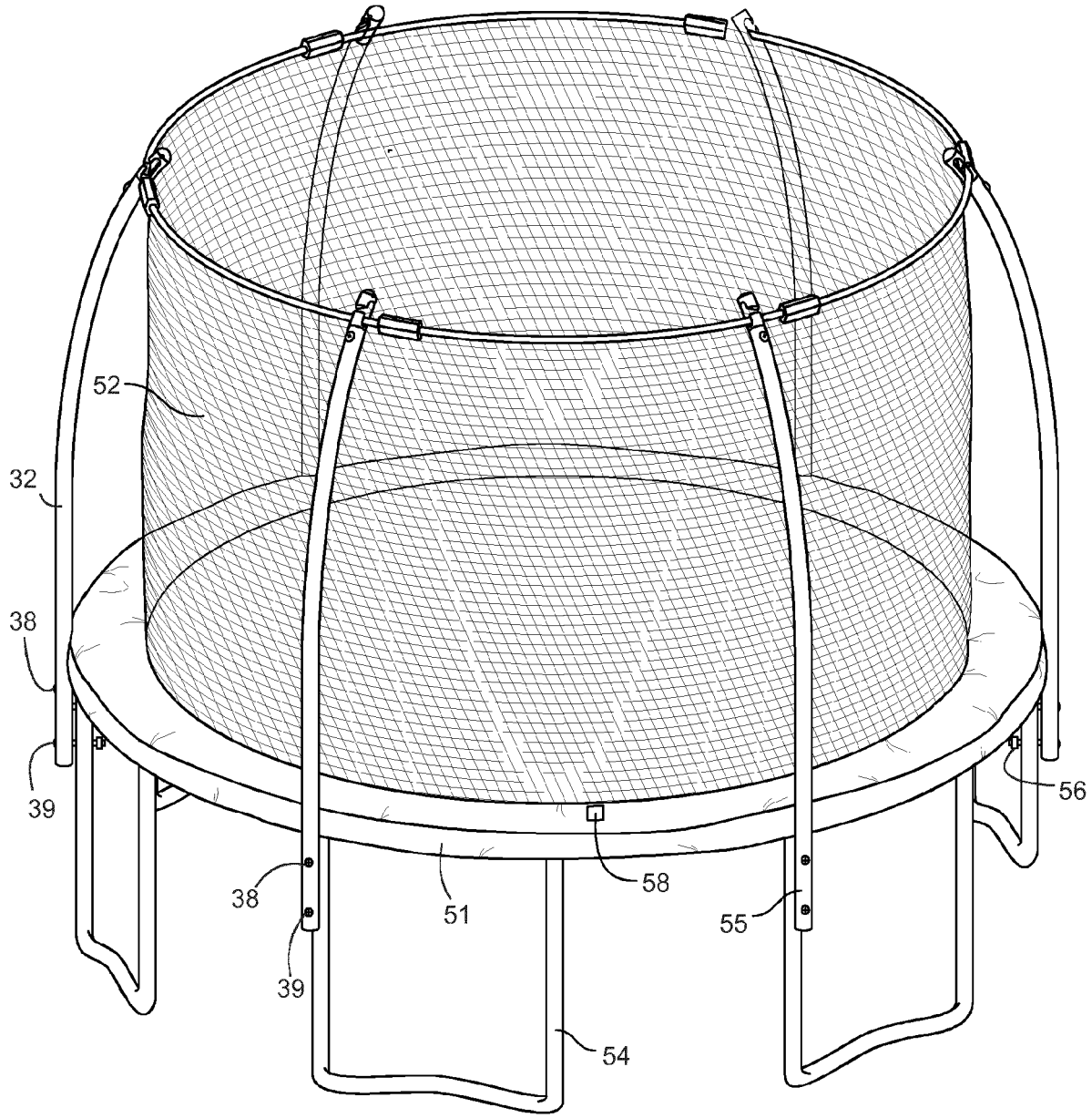

Fig. 1

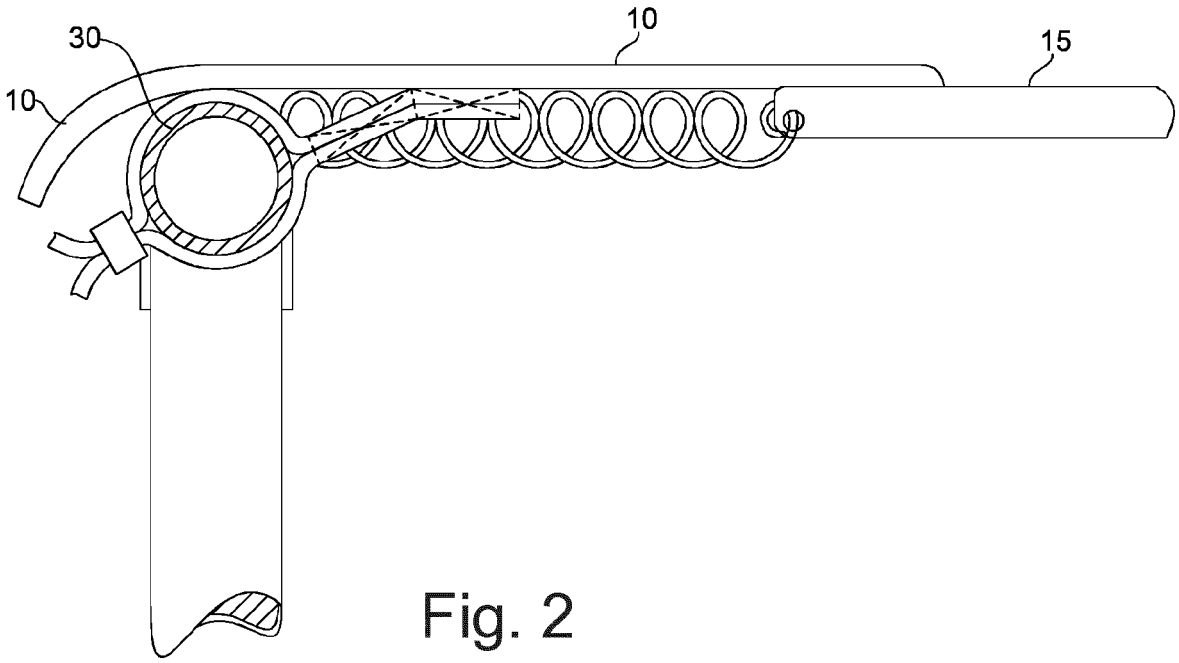

Fig. 2

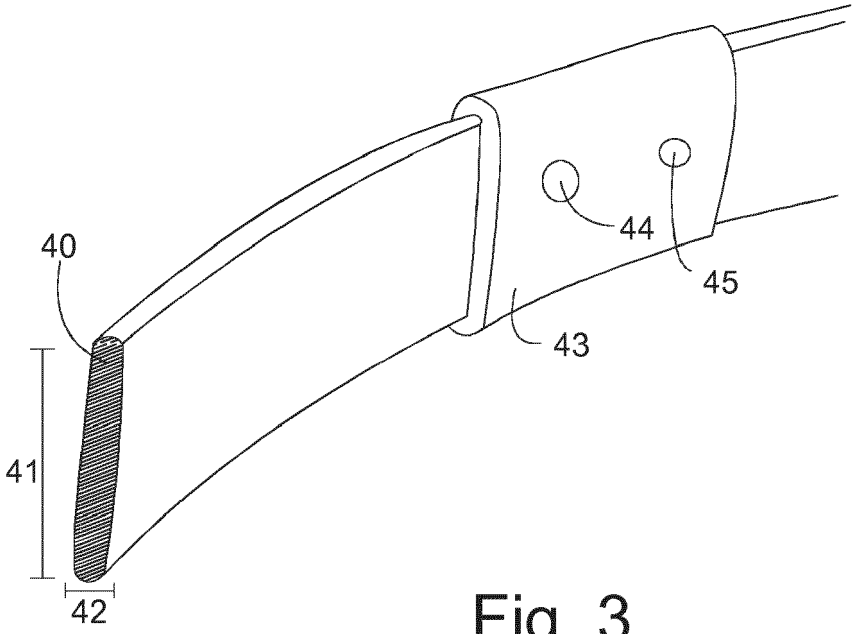

Fig. 3

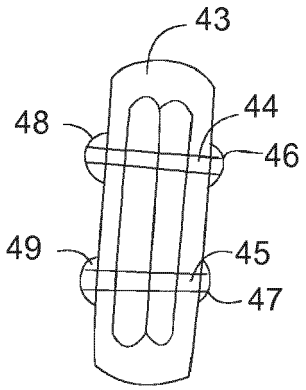

Fig. 4

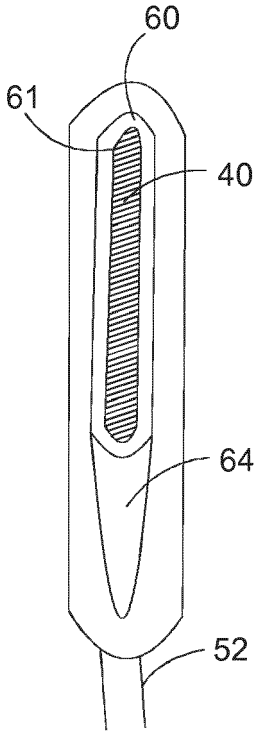

Fig. 5

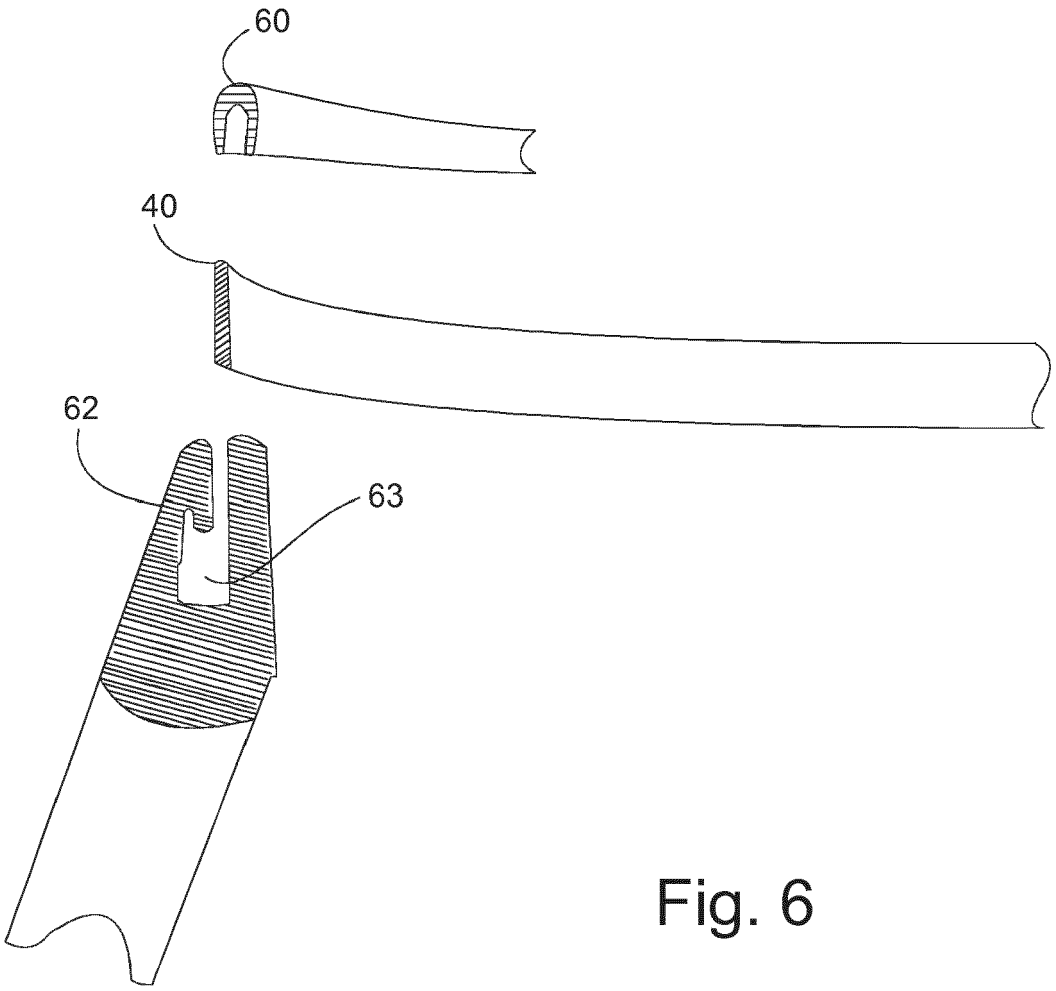

Fig. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 16 18 4460

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TECHNICAL FIELDS SEARCHED (IPC)

A63B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	15 September 2017	Jekabsons, Armands

CATEGORY OF CITED DOCUMENTS

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