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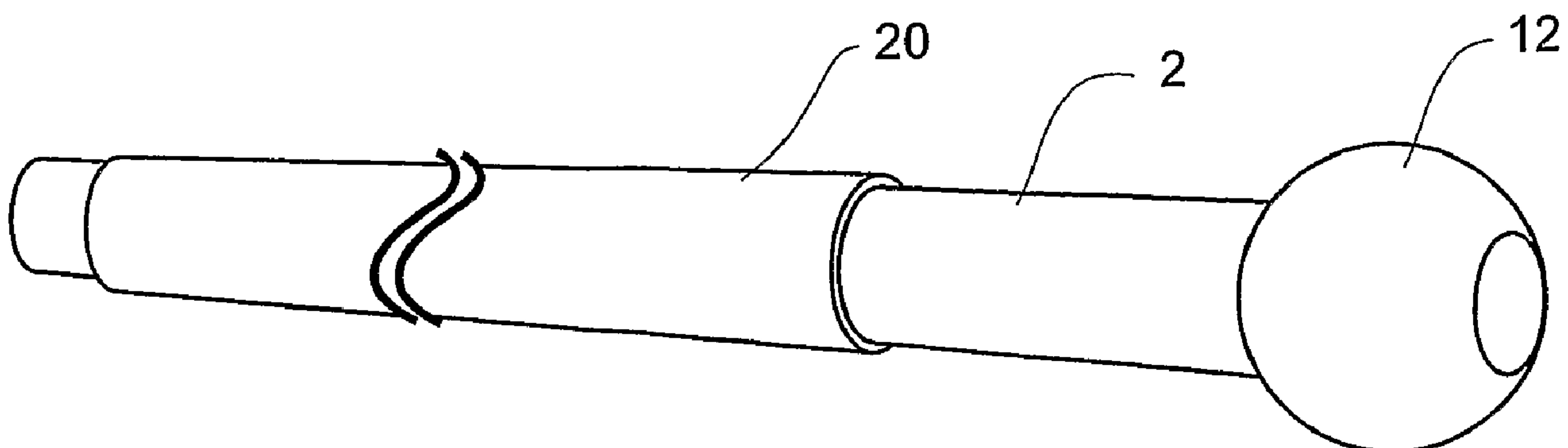
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(54) Titre : CONSTRUCTION DE TIGES AMELIOREES DESTINEES A DES TRAMPOLINES A BORDS SOUPLES  
(54) Title: IMPROVED ROD CONSTRUCTION FOR SOFT-EDGED TRAMPOLINES



(57) Abrégé/Abstract:

A trampoline includes: a flexible mat and a plurality of resiliently flexible rods each having a lower end retained in a frame of the trampoline and an upper end (12) coupled to the mat about a periphery of the mat, the rods being typically formed of a fibre-reinforced material (2), the rods having a protective layer (20) such as a plastics sleeve over the exterior surface thereof.

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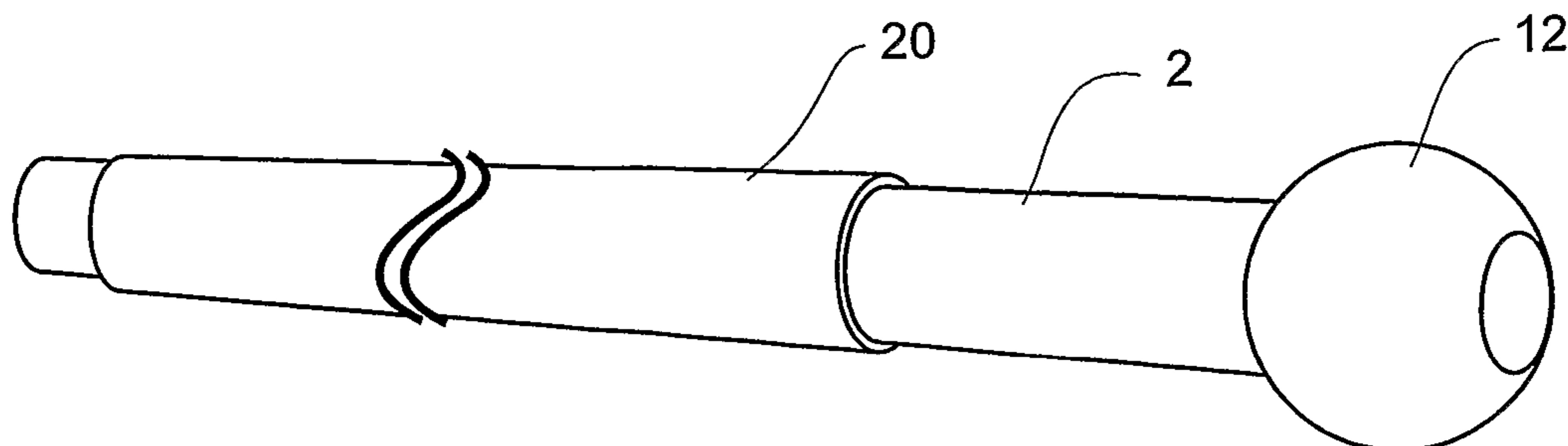
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(54) Title: IMPROVED ROD CONSTRUCTION FOR SOFT-EDGED TRAMPOLINES

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(57) Abstract: A trampoline includes: a flexible mat and a plurality of resiliently flexible rods each having a lower end retained in a frame of the trampoline and an upper end (12) coupled to the mat about a periphery of the mat, the rods being typically formed of a fibre-reinforced material (2), the rods having a protective layer (20) such as a plastics sleeve over the exterior surface thereof.

## IMPROVED ROD CONSTRUCTION FOR SOFT-EDGED TRAMPOLINES

### FIELD OF INVENTION

5 The invention relates to an improved rod construction for soft-edged trampolines namely trampolines which support the mat of the trampoline via a plurality of resiliently flexible rods.

### BACKGROUND

10 US patent 6,319,174 discloses a form of soft-edged trampoline in which the mat of the trampoline is supported by a plurality of resiliently flexible rods received in a frame of the trampoline at the lower ends of the rods and coupled to the periphery of the bouncing mat of the trampoline at their upper ends, and which avoids the need for a 15 solid frame about the exterior of the bouncing mat and exposed springs between the frame and periphery of the mat.

PCT patent publication WO 03/043704 relates to improved edge fittings for such soft-edged trampolines, for coupling the upper ends of the rods to the periphery of the mat.

20

### SUMMARY OF THE INVENTION

The invention provides an improved or at least alternative form of rod construction for a soft-edged trampoline.

25 In broad terms the invention comprises a trampoline including: a flexible mat, and a plurality of resiliently flexible rods each having a lower end retained in a frame of the trampoline and an upper end coupled to the mat about a periphery of the mat, the rods being formed of a fibre-reinforced material and having a protective layer over the 30 exterior surface thereof.

In broad terms in another aspect the invention comprises a trampoline and enclosure system including: a flexible mat; a plurality of resiliently flexible spring rods each having a lower end retained by a frame of the trampoline and an upper end coupled to the mat about a periphery of the mat; a barrier of a flexible material surrounding the mat

5 above the mat and having a lower peripheral part coupled directly or indirectly to the mat; and a plurality of resiliently flexible generally upright enclosure support rods which support the net above the mat at least the enclosure rods having a protective layer over the exterior surface thereof.

10 The fibre-reinforced material may be a glass-fibre reinforced material. Preferably the rods are formed of a pultruded fibreglass material.

In a preferred form the protective layer comprises a separately formed sleeve fitted over the exterior surface of each rod.

15 In this specification (including claims) the term "trampoline" is intended to extend to smaller trampolines commonly referred to as rebounders also, as well as larger trampolines of all sizes. Trampolines of the invention may be circular, square, rectangular, or of other shapes such as octagonally shaped in plan view for example.

20 For the avoidance of doubt, in this specification (including claims) the term "rod" is intended to include as well as longitudinally extending resiliently flexible elements having a solid cross-section, longitudinally extending elements having a tubular cross-section, and longitudinally extending resiliently flexible elements of non-circular as

25 well as circular cross-sectional shape.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

Preferred forms of trampoline are described with reference to the accompanying

30 drawings by way of example and without intending to be limiting, wherein:

Figure 1 is a perspective view of a preferred form trampoline,

Figure 2 is a side view of the trampoline of Figure 1 also with a surrounding enclosure,

Figure 3 is similar to Figure 1 but of one side of the trampoline only and showing a portion of the edge of the mat of the trampoline cut away, and

5 Figure 3a is an enlarged view of the cut away edge portion of the trampoline,

Figure 4 shows the trampoline and enclosure of Figure 2 in use,

Figure 5 shows a single spring rod of an embodiment of the invention,

Figure 6 is an end view of one form of sleeve for fitting to a rod, and

10 Figure 7 is a cross-section view of one end of a spring rod and a system for fixing the sleeve to the rod of another embodiment of the invention.

## DETAILED DESCRIPTION OF PREFERRED FORMS

Referring to Figures 1 to 3, a soft-edged trampoline typically comprises a flexible mat 1 on which users may bounce, a plurality of resiliently flexible rods 2, and a base frame 3. The preferred form trampoline shown is circular in shape but the trampoline could be of any other desired shape such as oval, square, rectangular or similar.

20 The base frame of the preferred form trampoline comprises a circular beam 4 typically formed of steel or aluminium for example, which may be supported from the ground by legs 5.

25 The lower ends of resiliently flexible rods 2 are retained by the base frame 3 and the upper ends of the rods connect to fittings 6, which are coupled to the mat 1 about the periphery of the mat. In the preferred form the lower ends of the rods 2 enter into tubular holders 7 fixed to the circular beam as shown, but the lower ends of the rods may be coupled to the circular beam, or a base frame of the trampoline of any other form, in any suitable way.

30 The mat 1 is typically heavy canvas or a woven synthetic material. A pocket 8 extends about the periphery of the mat. A number of the fittings 6 are positioned within this pocket in the peripheral edge of the mat as shown in Figure 3 in particular. The fittings

may be loosely captured within the pocket or alternatively may be stitched to the mat within the edge pocket, or mechanically fastened to the mat via rivets for example. The rods 2 have ball-shaped upper ends 12 which connect to the fittings 6. In use as the trampoline is bounced on by a user, this will cause flexing of the rods 2 to a greater or 5 lesser extent depending upon the size and energy of the user, and pivotal movement between the upper ends 12 of the rods 2 and the fittings 6 coupled to the mat.

Typically the trampoline is delivered to a purchaser in disassembled form. The purchaser inserts the lower ends of the rods into the trampoline base, loosely places the 10 mat over the trampoline base, and then bends each resilient rod as required to engage the upper ends 12 of the rods into the socket cavities of the fittings 6.

Referring to Figures 2 and 4, the trampoline may also comprise an enclosure system as shown. The enclosure system consists of a plurality of resiliently flexible generally 15 upright enclosure support rods 13. The enclosure system also comprises a barrier net 14. The enclosure rods 13 support the net 14 above the mat, and the lower edge of the barrier net 14 is preferably coupled directly or indirectly to the peripheral edge of the mat. The enclosure rods 13 are preferably positioned on the outside of the net 14 as shown and are coupled to the trampoline frame at the lower ends of the enclosure rods 20 and to the upper peripheral part of the net at or towards the upper ends of the enclosure rods. The upper ends of all of the enclosure rods 13 are preferably connected together so that all of the enclosure rods 13 and net 14 form a dynamic rebound surface. The enclosure system has a high degree of flexibility or deformability. This is illustrated in Figure 4 which shows a user leaning against the barrier net 14 and one enclosure rod 13, 25 and it can be seen that the enclosure rod deforms away from the trampoline. Typically when an average sized or weight user hits the enclosure so that the enclosure deforms, the impact energy absorbed by the enclosure will gently rebound the user back onto the trampoline mat. That is, a user impacting any side of the enclosure will cause all of the rods to deform to some extent.

30

Typically the spring rods 2 and the enclosure rods 13 are formed of a fibre-reinforced material and particularly a glass-fibre reinforced material such as fibreglass. Most

preferably the spring and enclosure rods are formed of a pultruded fibreglass material. In accordance with the invention the spring rods 2 and preferably also the enclosure rods 13 have a protective layer over the exterior surface thereof. Referring to Figures 5 to 7 in a preferred form the protective layer comprises a separately formed sleeve 20 which is fitted over the exterior surface of each of the rods. The sleeve extends for most or all of the length of the rod. Figure 5 shows a single spring rod 2 with a plastics sleeve 20 covering substantially all of the length thereof. The sleeve may be formed from a plastics material as an extruded or injection moulded plastics tube having an internal diameter matched to the external diameter of the rod. In manufacture the sleeve 10 is pushed onto the rod or visa versa so that the sleeve covers substantially all of the length of the rod. The enclosure rods 13 are also preferably covered with a longer sleeve in the same way.

Preferably the sleeve is a friction-fit to the rod to fix the sleeve to the rod. As shown in 15 Figure 6, the sleeve may have one or more internal protrusions or ribs 21 to assist in providing a friction fit between the sleeve and the rod. Figure 6 shows three ribs 21 but less or more ribs may be provided.

In an alternative embodiment the sleeve 20 may be extruded with a slight degree of 20 curvature so that when it is pushed onto a straight rod 2 or 13 there is a friction grip which holds the sleeve on the rod. Alternatively again the sleeve may be extruded with a slight non-circular cross-section so that the sleeve must distort to fit the sleeve to the rod, which again may provide a friction-fit between the sleeve and the rod. Alternatively again the sleeve may be formed of a heat shrink plastics material and heat 25 shrunk onto the rod after initially being slid over the rod. In a yet further embodiment a hole may be punched in the sleeve end so that the torn ends fold in and provide an extra obstruction to movement of the sleeve on the rod.

Alternatively a separate fastening component such as a spring metal clip, or a flat ring 30 crimped about the sleeve and rod, at one or both ends of the rod may fix the sleeve to the rod.

Referring to Figure 7 the spring rods 2 may at the upper ends have fitted thereto a separate component 12 which provides an enlarged ball shaped end to the rods, which fits into sockets on the underside of the fittings 6. The end of the rod enters into a hollow interior of the end component 12. In addition a short tubular part 25 extends 5 from around the opening to the interior of the ball end and forms an annular clip integral with the ball end component 12, which when the end component 12 is fitted to the end compresses the sleeve end against the rod. An annular barb 26 or a series of barbs may be provided as shown which bite into the plastic sleeve, and a co-operating annular groove 27 may optionally be provided in the rod end.

10

Alternatively again the sleeve may be bonded to the rod using an industrial strength adhesive compound or adhesive tape.

In use of the trampoline the spring rods and also the enclosure rods are quite highly 15 stressed. The external plastic sleeve as in the embodiments described above encloses and protects a user from long sharp splinters of for example glass fibres, becoming exposed and forming a safety hazard where the rods become stressed to the extent that fracture of glass fibres at the external surface of the rods occurs, during normal use or as a result of overloading of the trampoline. Another advantage of providing the spring 20 rods 2 with the sleeve cover is that the spring rods are also protected where the rods bear heavily against the tubular holders 7 or equivalent into which the lower ends of the rods fit. After some period of use, the surface of the rods at the point of bearing can become bruised. If a rod is then removed, turned around and reinstalled, for example if the trampoline is disassembled and reassembled during a shift from one location to 25 another, the bruised rod section can then come under tension and in this state the rod is far more susceptible to fatigue failure, again exposing long sharp glass splinters which form a safety hazard. This can also occur where the enclosure rods enter into the holders 20.

30 Further in relation to the enclosure rods in particular, if a rod should fracture in use the plastic sleeve over the exterior thereof should prevent a jagged end or other part of the fractured rod from being exposed. If a rod should fracture this will be apparent to a

user, without the jagged end being exposed and potentially injuring the user jumping on the trampoline at the time that the rod brakes.

The invention protects the spring and enclosure rods, to either prevent injury should rod  
5 fracture occur, prevent bruising damage in normal use so that fatigue life is extended, and also prevent UV exposure so that surface “blooming” does not expose fibres, prevents fibres getting in a person’s hands during handling such as assembly or disassembly of the trampoline, and also protects the rods from accidental damage.

10 In other embodiments alternatively a protective layer may be provided on the exterior the rods by a coating, extruding or injection moulding a layer of for example a plastics material onto the exterior surface of the rods. For example a mould or die having a slightly larger diameter than the outer diameter of the rods may be used and a pultruded rod placed inside and a thermoplastic material then injected into the mould cavity to  
15 cover the rod with a thin plastics layer. Such an injection moulding process may also be used to provide both a coating as well as a ball end to the rod equivalent to the ball end component 12, in a single operation. Alternatively the rod may be passed through a plastics extrusion die which simultaneously extrudes a plastics coating over the length of the rod.

20

The foregoing describes the invention including preferred forms thereof. All alterations and modifications as will be obvious to those skilled in the art are intended to be incorporated within the scope hereof.

## Claims:

1. A trampoline including:
  - a flexible mat,
  - a plurality of resiliently flexible rods each having a lower end retained in a frame of the trampoline and an upper end coupled to the mat about a periphery of the mat, the rods being formed of a fibre-reinforced material, and
  - a protective layer fitted over the exterior surface of each of the rods.
2. A trampoline according to claim 1 wherein the fibre-reinforced material is a glass-fibre reinforced material.
3. A trampoline according to claim 2 wherein the rods are formed of a pultruded fibreglass material.
4. A trampoline according to any one of claims 1 to 3 wherein the protective layer comprises a separately formed sleeve fitted over the exterior surface of each of the rods.
5. A trampoline according to claim 4 wherein the sleeve is a friction-fit to the rod.
6. A trampoline according to claim 5 wherein the sleeve includes one or more internal protrusions to form the friction-fit between the sleeve and the rod.
7. A trampoline according to claim 6 wherein the one or more internal protrusions comprise at least one rib running longitudinally of the length of the interior of the sleeve.
8. A trampoline according to claim 5 wherein the rod has a substantially circular cross-section and the sleeve has a slight non-circular cross-section to thereby provide the friction-fit between the sleeve and the rod.

9. A trampoline according to any one of claims 4 to 8 including a mechanical fastener about at least one end of the sleeve to fix the sleeve to the rod.
10. A trampoline according to claim 9 wherein the mechanical fastener is integral with a rod end component which is separate from the rod and is fitted to an end of the rod.
11. A trampoline according to either one of claims 4 to 10 wherein said sleeve is formed from a plastic material.
12. A trampoline according to claim 4 wherein the sleeve is formed of a plastic material and is heat shrunk onto the rod.
13. A trampoline according to any one of claims 1 to 3 wherein the protective layer comprises a layer coated onto the exterior surface of the rod.
14. A trampoline according to any one of claims 1 to 3 wherein the protective layer comprises a layer extruded onto the exterior surface of the rod.
15. A trampoline according to any one of claims 1 to 3 wherein the protective layer comprises a layer injection-moulded onto the exterior surface of the rod.
16. A trampoline and enclosure system including:
  - a flexible mat;
  - a plurality of resiliently flexible spring rods each having a lower end retained by a frame of the trampoline and an upper end coupled to the mat about a periphery of the mat;
  - a barrier of a flexible material surrounding the mat above the mat and having a lower peripheral part coupled directly or indirectly to the mat;
  - a plurality of resiliently flexible generally upright enclosure support rods which support the barrier above the mat; and

a protective layer fitted over the exterior surface of each of the rods.

17. A trampoline according to claim 16 wherein the enclosure rods are formed of a fibre-reinforced material.

18. A trampoline according to claim 17 wherein the fibre-reinforced material is a glass-fibre reinforced material.

19. A trampoline according to claim 18 wherein the rods are formed of a pultruded fibreglass material.

20. A trampoline according to any one of claims 16 to 19 wherein the protective layer comprises a separately formed sleeve fitted over the exterior surface of each of the rods.

21. A trampoline according to claim 20 wherein the sleeve is a friction-fit to the rod.

22. A trampoline according to claim 21 wherein the sleeve includes one or more internal protrusions to form a friction-fit between the sleeve and the rod.

23. A trampoline according to claim 22 wherein the one or more internal protrusions comprise at least one rib running longitudinally of the length of the interior of the sleeve.

24. A trampoline according to claim 21 wherein the rod has a substantially circular cross-section and the sleeve has a slight non-circular cross-section to thereby provide the friction-fit between the sleeve and the rod.

25. A trampoline according to any one of claims 20 to 24 including a mechanical fastener about at least one end of the sleeve to fix the sleeve to the rod.

26. A trampoline according to claim 25 wherein the mechanical fastener is integral with a rod end component which is separate from the rod and is fitted to an end of the rod.
27. A trampoline according to either one of claims 20 to 26 wherein said sleeve is formed from a plastic material.
28. A trampoline according to claim 20 wherein the sleeve is formed of a plastic material and is heat shrunk onto the rod.
29. A trampoline according to any one of claims 16 to 19 wherein the protective layer comprises a layer coated onto the exterior surface of the rod.
30. A trampoline according to any one of claims 16 to 19 wherein the protective layer comprises a layer extruded onto the exterior surface of the rod.

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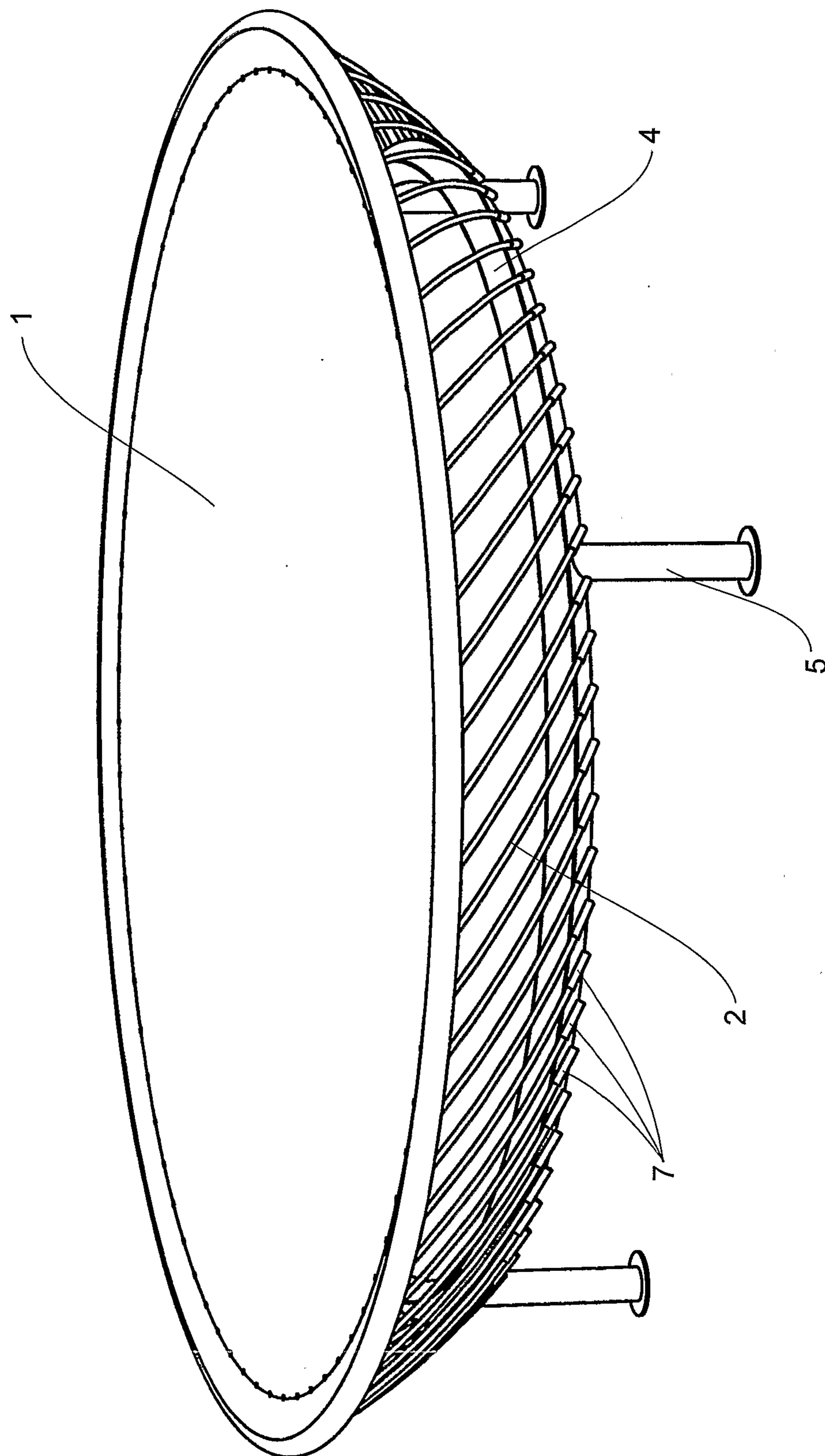


FIGURE 1

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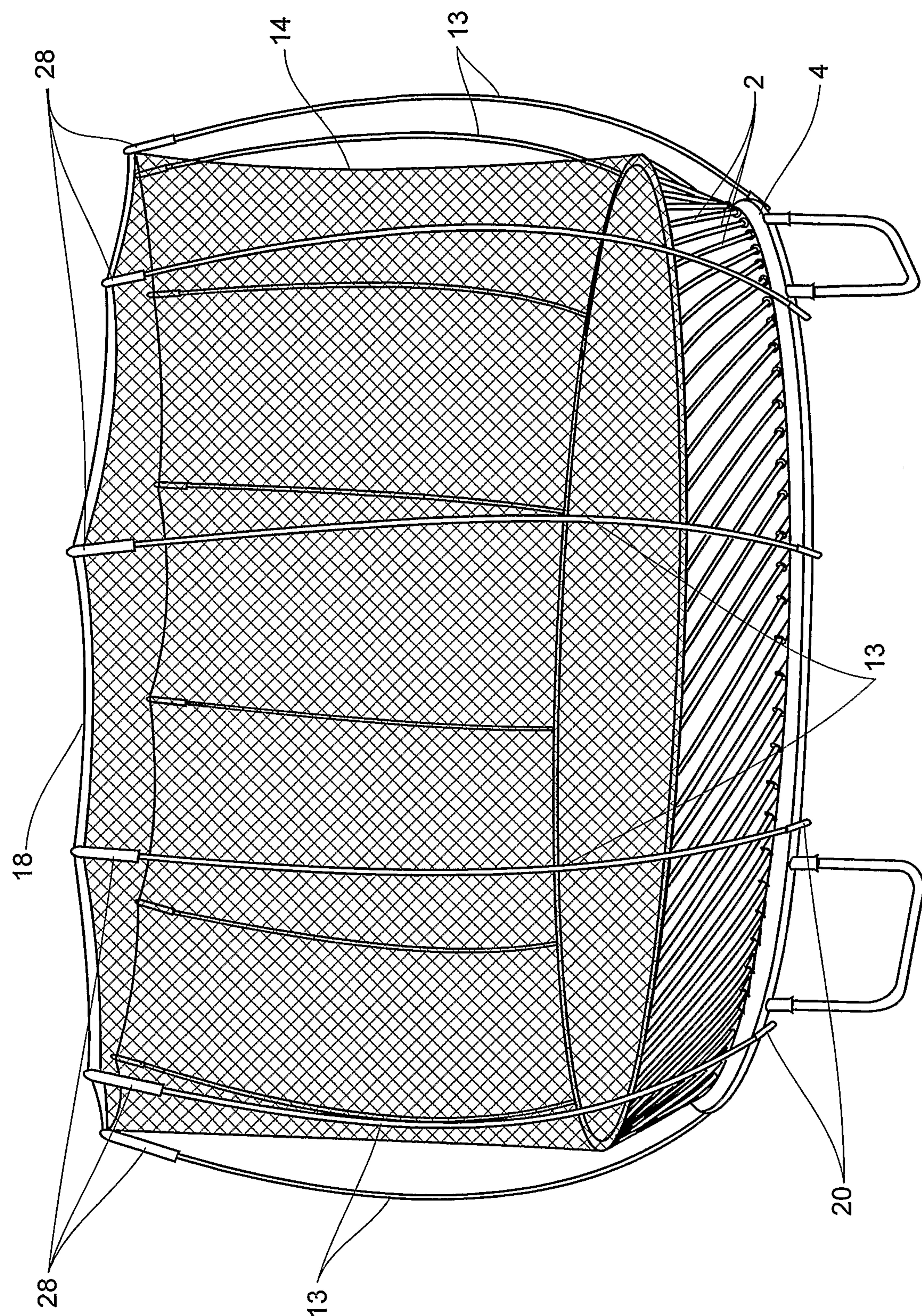
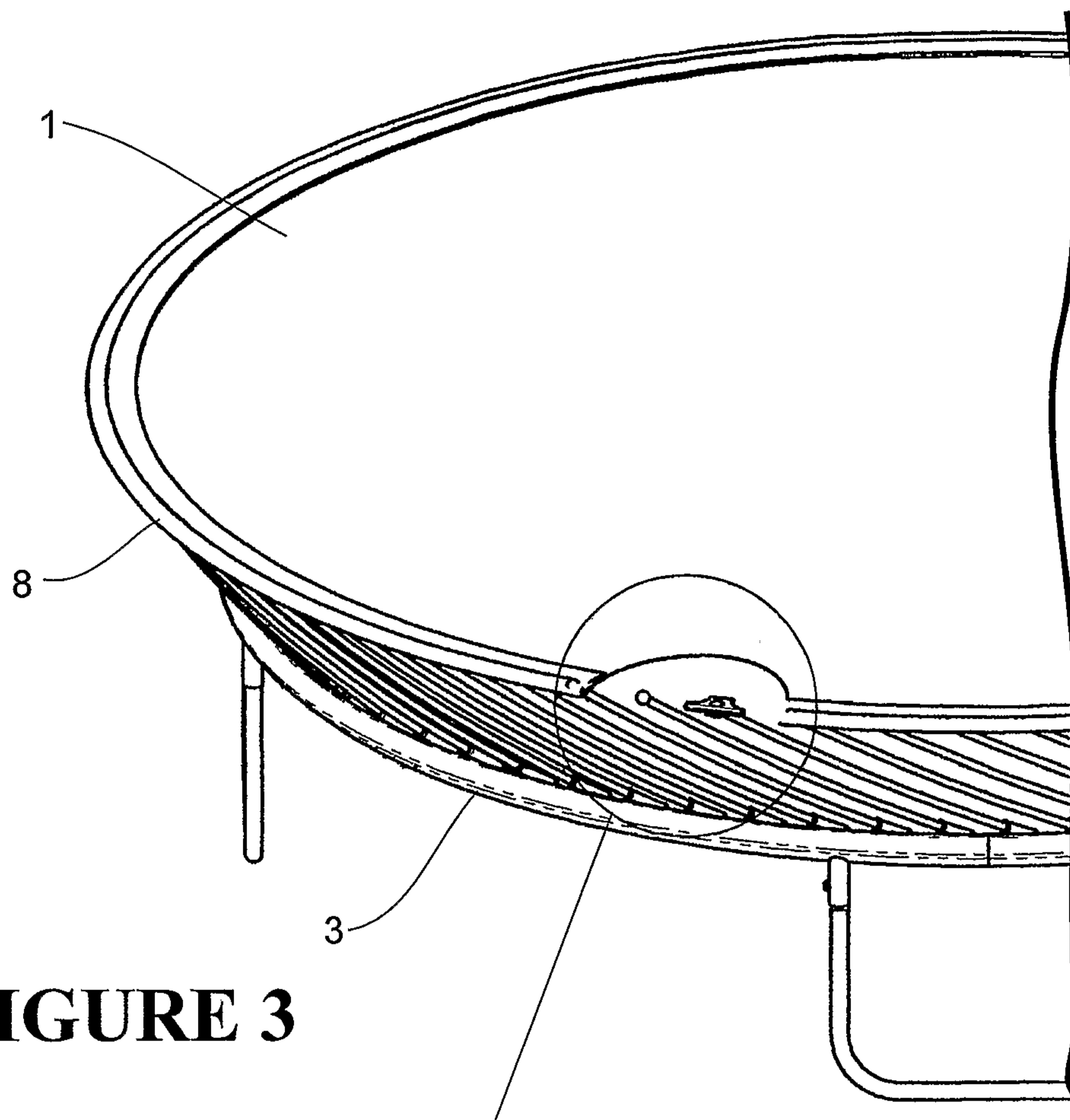
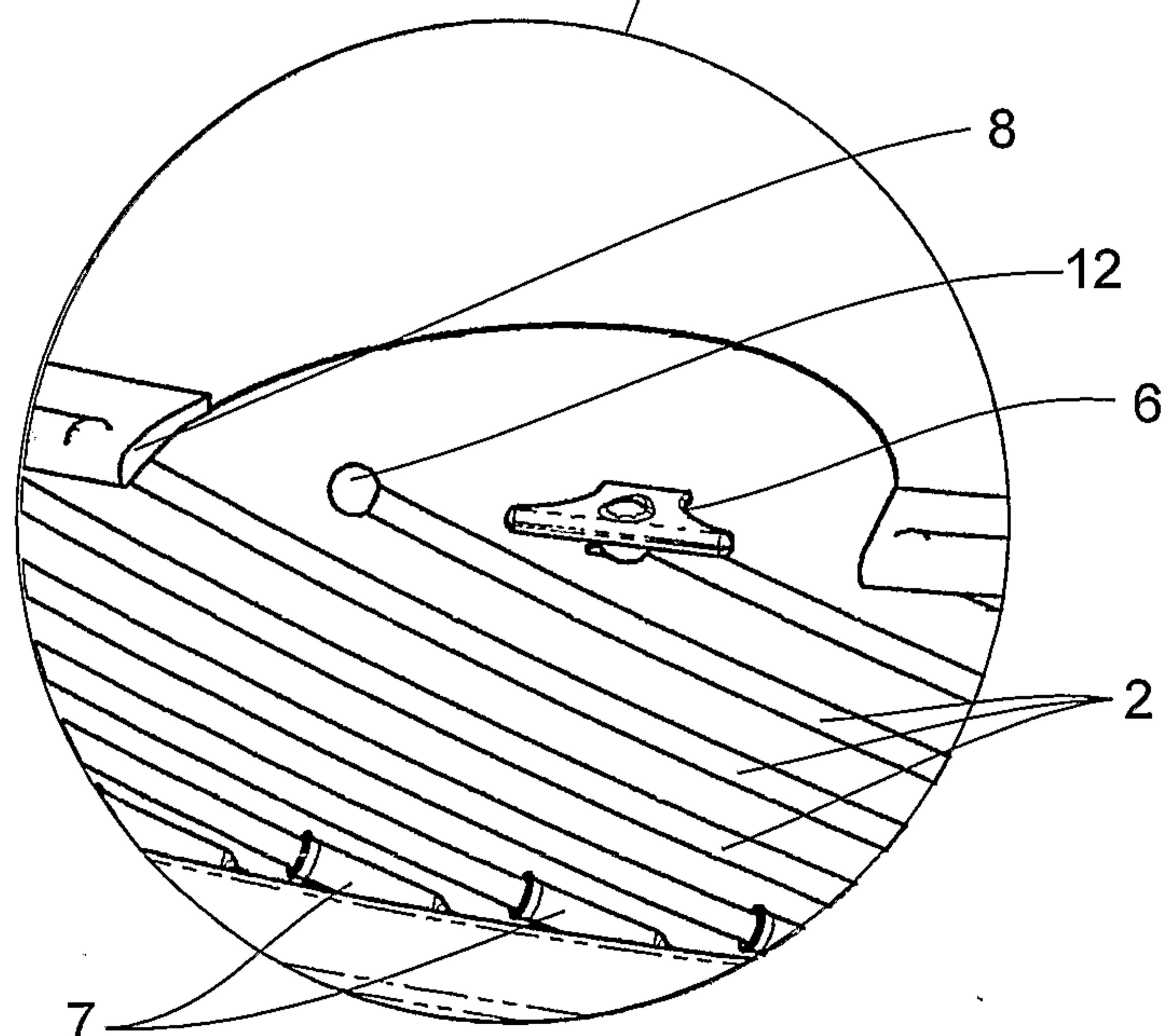
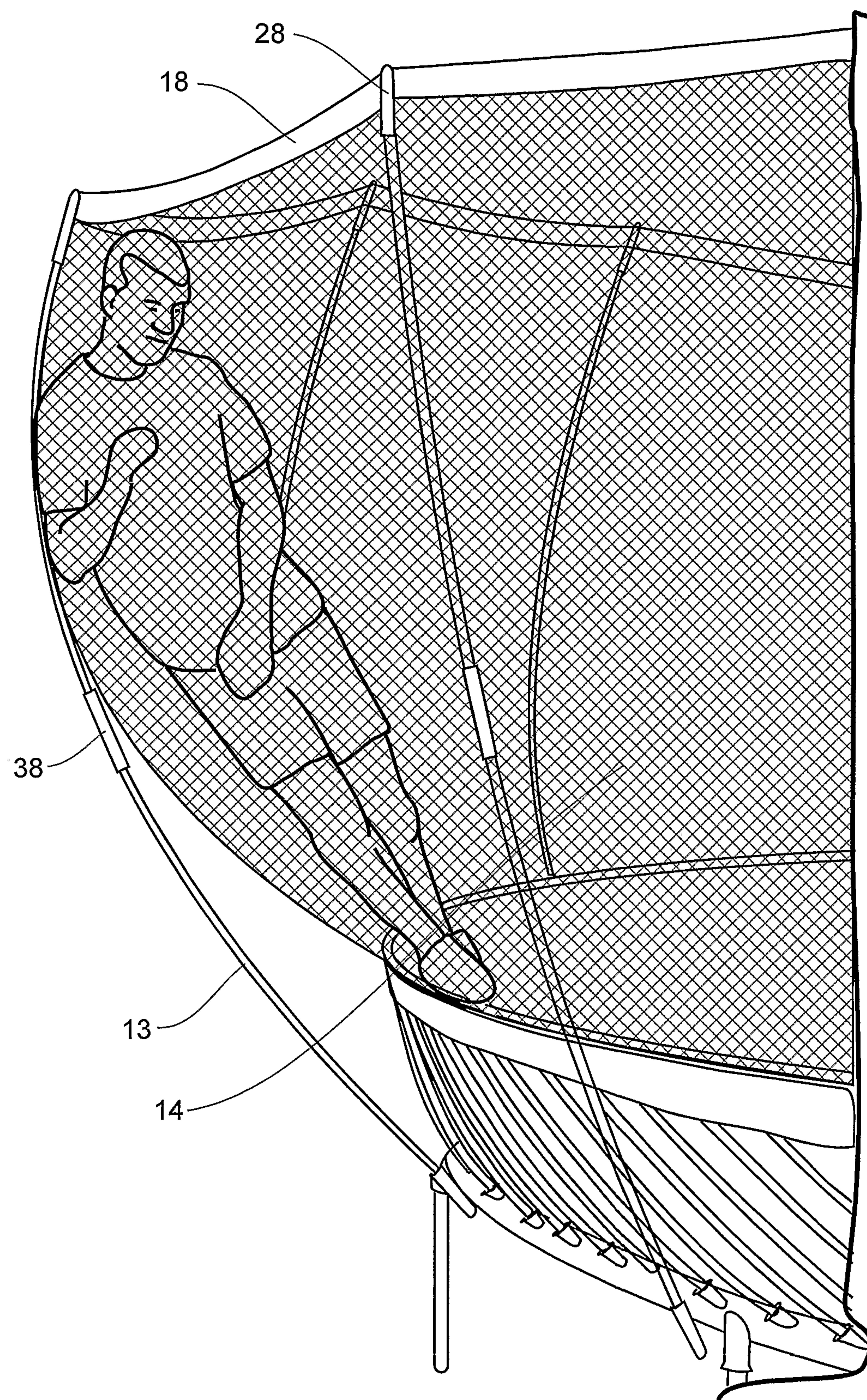


FIGURE 2

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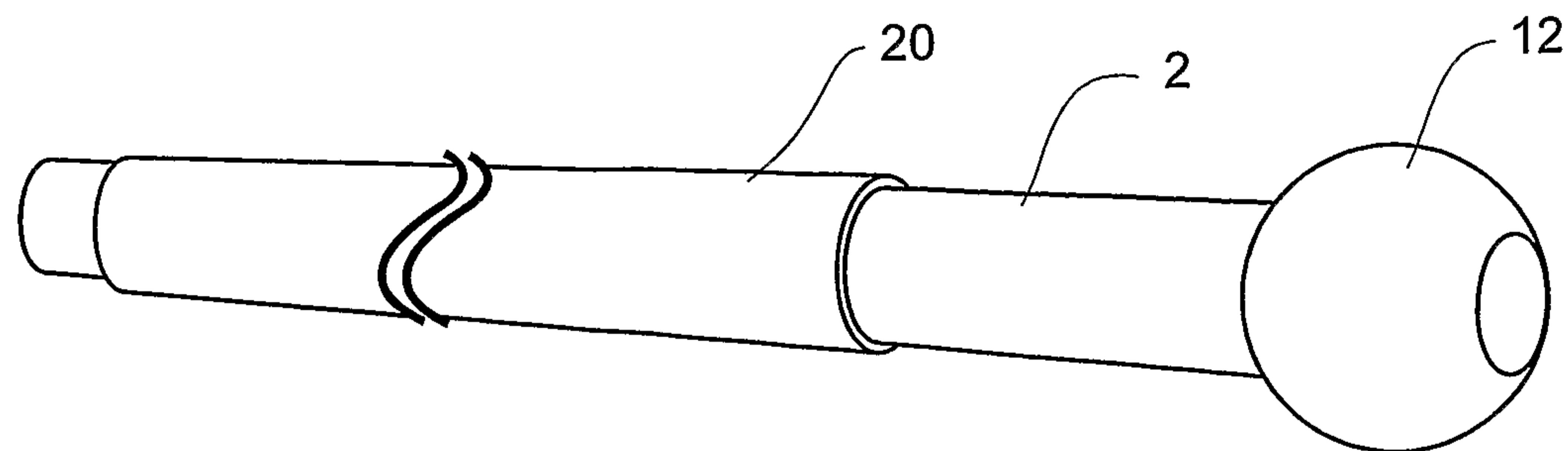
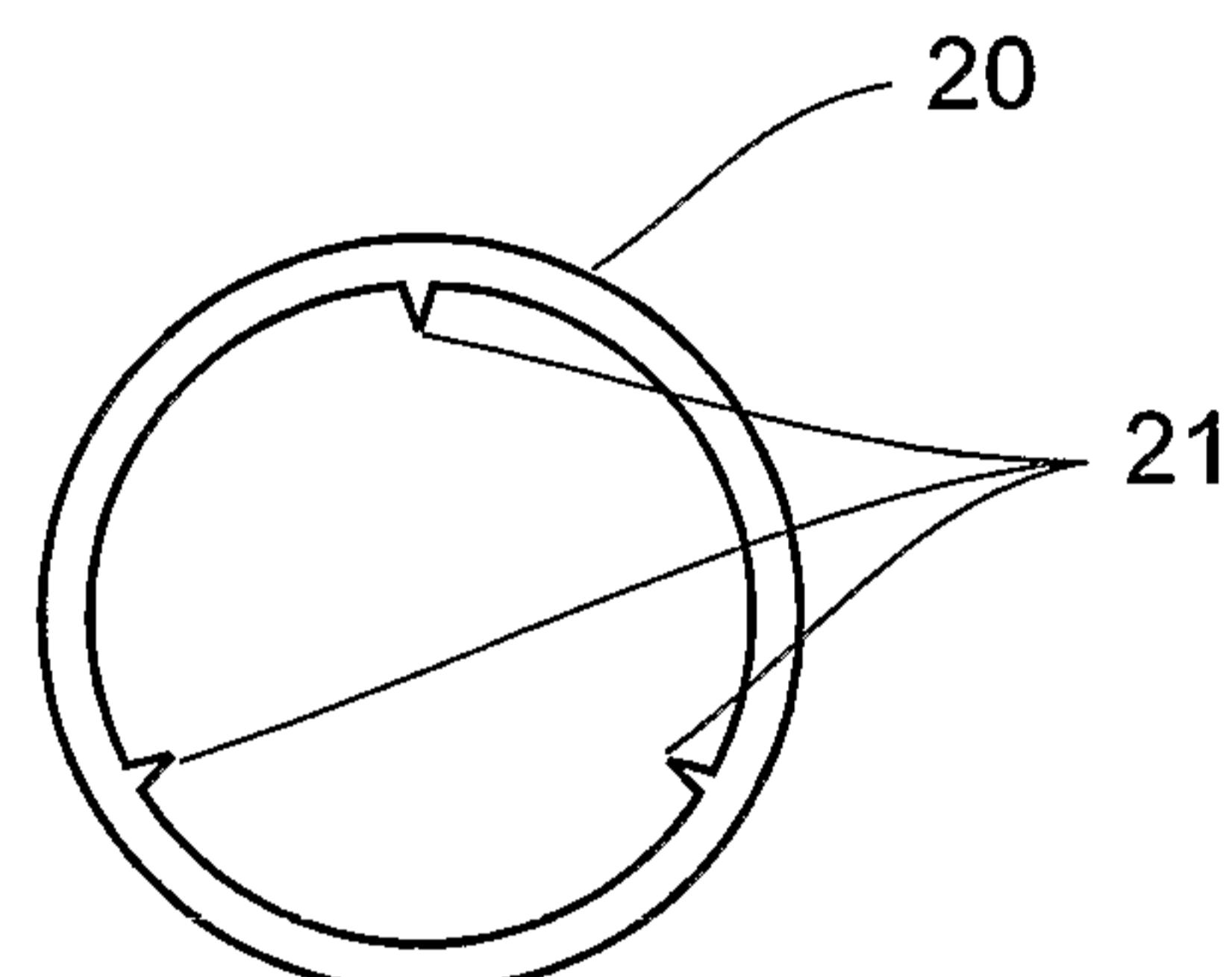
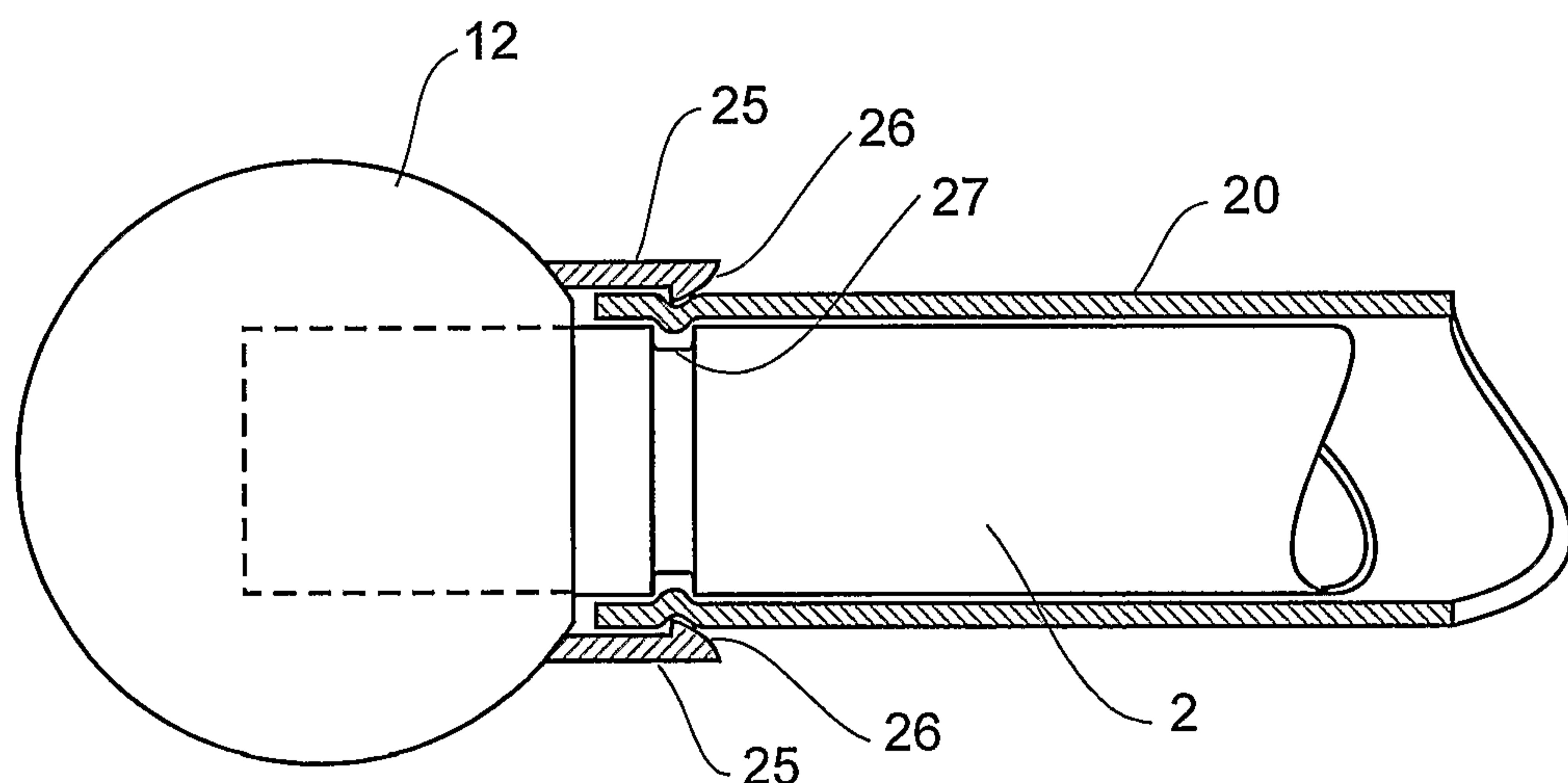
**FIGURE 3****FIGURE 3a**

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**FIGURE 4**  
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**FIGURE 5****FIGURE 6****FIGURE 7**

