US 20200001165A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2020/0001165 A1**

KESSLER et al. (43) **Pub. Date: Jan. 2, 2020**

(54) **BALL FOR A SKATING DEVICE**

(71) Applicant: **AGORA INVESTMENT AG**, Wollerau (CH)

(72) Inventors: **Roland KESSLER**, Wollerau (CH); **Arthur Guy ERDMAN**, New Brighton, MN (US); **Brennan John OLSON**, Apple Valley, MN (US); **Bryant John UNTZ**, Andover, MN (US); **Daniel Lee RYKS**, Elkhart Lake, WI (US); **Enrique CERVANTES**, Adelanto, CA (US); **Evan Patrick COSGRIFF**, Saint Paul, MN (US); **Jeong Yong KIM**, Minneapolis, MN (US); **Kunal Sudam GARDE**, Minneapolis, MN (US); **Murid AMINI**, Woodbury, MN (US); **Vlad GOLDENBERG**, Plymouth, MN (US)

(21) Appl. No.: **16/530,231**

(22) Filed: **Aug. 2, 2019**

Related U.S. Application Data

(63) Continuation of application No. PCT/EP2018/052962, filed on Feb. 6, 2018.

(30) **Foreign Application Priority Data**

Feb. 7, 2017 (EP) 17155053.6

Publication Classification

(51) **Int. Cl.**

A63C 17/24 (2006.01)

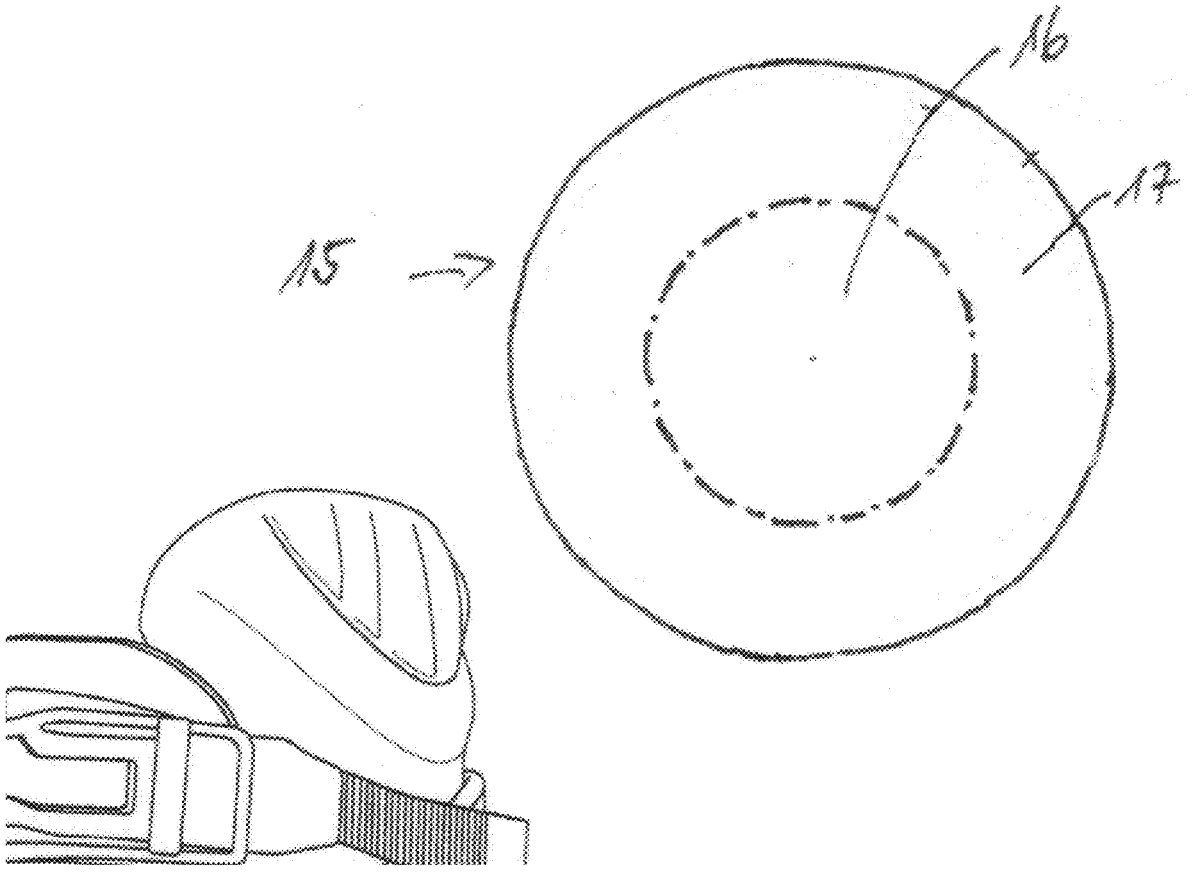
A63C 17/06 (2006.01)

(52) **U.S. Cl.**

CPC ***A63C 17/24*** (2013.01); ***A63C 17/06*** (2013.01)

(57) **ABSTRACT**

A ball comprising a first material having an elastic modulus of at least E=0.60 GPa, preferably at least E=0.70 GPa and more preferably at least E=0.73 GPa and/or a maximum elastic modulus of E=5 GPa, preferably at most E=3 GPa, more preferably at most E=1 GPa and even more preferably at most E=0.74 GPa, the first material defining at least an outermost section of the ball.



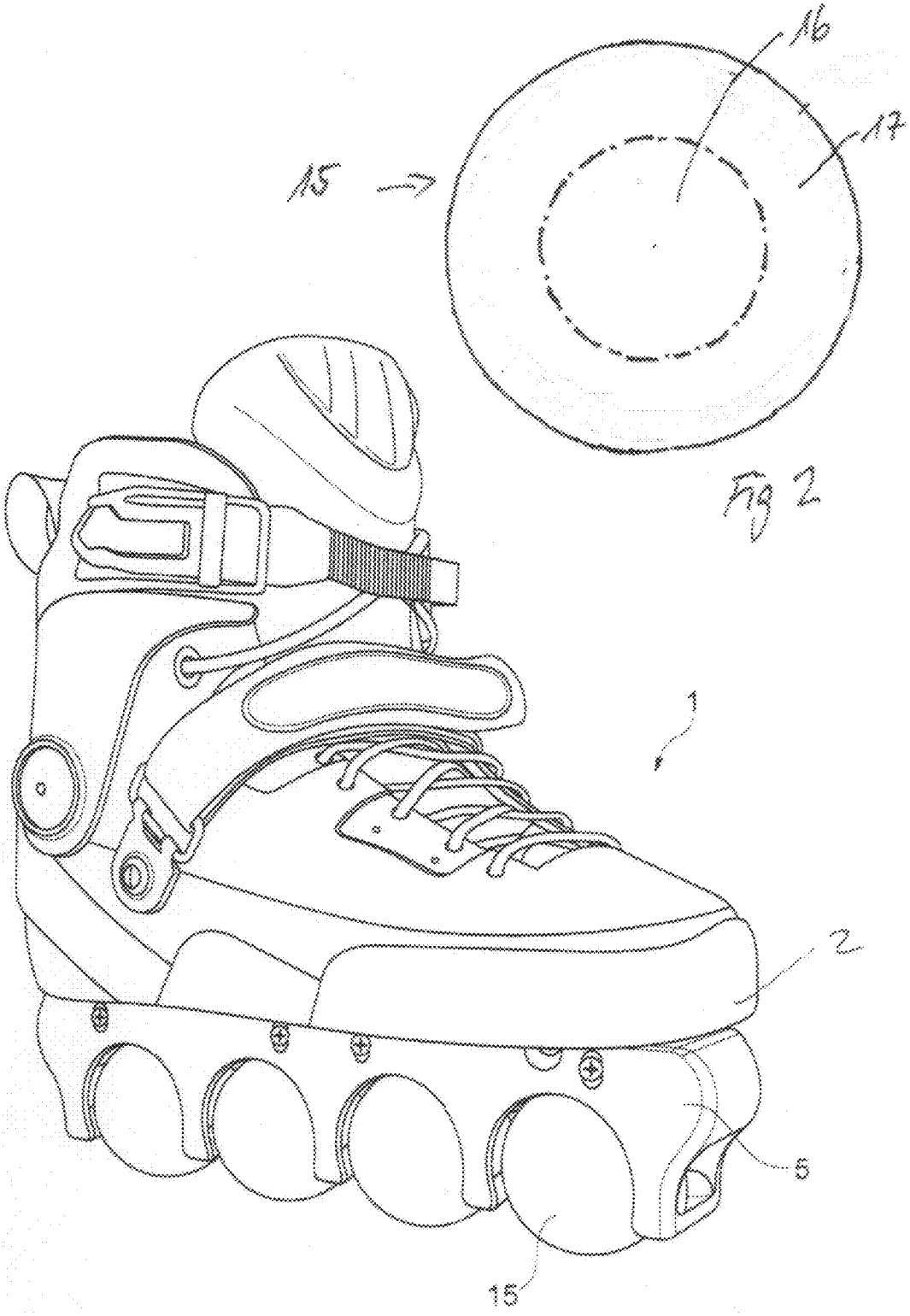


Fig 2

Fig. 1

BALL FOR A SKATING DEVICE

RELATED APPLICATIONS

[0001] This application is a continuation of PCT/EP2018/052962, filed Feb. 6, 2018, claiming priority to EP17155053.6, filed Feb. 7, 2017, the entire contents of each which are hereby fully incorporated herein by reference for all purposes.

FIELD

[0002] Ice skating has been known for centuries and known as a preferred leisure, sport, and fitness activity. Roller skating was created to simulate ice-skating on a solid ground. First models of rollers skates were so called quad skates. They had four wheels placed in two lines. Quad skates were not as fast and maneuverable as ice skates, but still became very popular among people in the 60s and 70s. The new age of skating began in the 90s when inline outdoor roller skates were introduced to the general public. The inline skates are faster and more maneuverable than the quad skates, but the experience is still not completely similar to ice skating. Inline skates have no opportunity to use the hockey stop and side slide breaking. Breaking has anyhow been a challenge for inline skate users.

[0003] Several attempts were made to further improve inline skates.

[0004] U.S. Pat. No. 6,508,335 (B2) features an omni-directional wheel which includes a frame having an upper portion for affixing the frame to an under-side of a weight bearing surface, at least two side walls, and a central cavity defined by the side walls for receiving at least one spherical wheel, at least two wheel bearings connected in axial alignment to the side walls for rotation of the wheel about a fixed axis, at least two wheel seats each having one side in axial connection to the wheel bearings and an opposite conical face wherein the conical faces are disposed in opposite axial alignment for mounting the wheel between the faces and a force of static friction is exerted relative to the conical faces and the wheel when the wheel is rotating about the fixed axis and a force of kinetic friction is exerted relative to the conical faces and the wheel when the wheel is rotating about an axis perpendicular to the fixed axis, and an upper load bearing connected to the frame which bias against an upper surface of the wheel.

[0005] U.S. Pat. No. 5,397,138 (A) features an in-line roller skate including an elongate base plate having a top side to which a boot is secured, and an underside that mounts four wheel assemblies, the front wheel assembly having a fixed orientation and the remaining assemblies each having a caster-like construction. Springs bias each of the caster-like assemblies in a straight-ahead orientation, and first and second near-vertically extending fixed brake surfaces are spaced on opposite sides of the rearward most wheel such that the wheel frictionally engages a brake surface whenever the wheel is substantially turned to one direction or the opposite direction.

[0006] U.S. Pat. No. 5,685,550 (A) features a shaft extending in the skating directions supported by stanchions depending from a boot plate. Spherical wheels formed by hemispherical segments are rotatably secured to the shaft in fixed axial position by a ring member having wing axles extending transversely the shaft axis, the ring member being rotatable about bearing members secured to the shaft. One of the bearing members has a braking cam with a pair of oppositely positioned recesses which mate with a corresponding braking detent mechanism mounted in each wing axle. Each wheel segment is independently rotatably secured to a wing axle for rotation in the skating directions. The wing axles rotate with the wheels about the shaft in response to a stopping action transverse to the skating directions to provide a braking resistance in response to the detent mechanism riding against the cam surface. Different spring loads and springs are provided to allow for different skating stroke and stopping forces.

[0007] US application 2006/0214394 (A1) features the multi-directional skates with each skate being an assembly having a skate boot, at least four roller assemblies, and a skid plate. The skate boot is a traditional in-line/aggressive skate-type boot including an upper shoe portion and a sole portion. The roller assemblies each include a substantially spherical roller or ball that act as rolling surfaces for skate, allowing it to create movement in any direction, not just forward and backward, but also sideways and complete 360-degree movement. The number and alignment of the roller assemblies may be modified according to the desires of the individual skater, but they are intended to be aligned such that each skate is capable of balancing itself it an upright position.

[0008] U.S. Pat. No. 6,491,308 (B1) features a roller skate which includes a frame, a structure for fixing the frame to a person's foot, and at least two balls, which are freely rotatably supported by concave rollers. Axes of rotation of the rollers extend in a horizontal direction, transversely to the longitudinal direction of the frame. A roller is located between the two balls which are arranged side by side. The roller bears against both balls during operation. This document is hereby incorporated by reference.

[0009] U.S. Pat. No. 4,076,263 (A) features skates employing balls as the primary rolling elements which may be used in lieu of roller skates for street hockey or indoors on wood floors, concrete or other hard surfaces. In the preferred form the skate includes two balls, preferably of semi-hardened rubber, metal, wood, plastic or the like, one in the front and one at the rear of the skate. Each ball is supported by a set of rolling supports which allow the ball to rotate freely in a forward or backward direction but inhibits rotation of the ball in other directions. The supports include at least two transverse shafts on which are mounted spaced rollers or rings of different diameters and contoured to mate with the upper portion of the ball. The different size rollers are independently rotatable on the shaft to compensate for the different surface speeds of the ball as it rolls forwards or backwards. Since the rollers can rotate only about the transverse axis of the shaft, the friction produced between the ball and the supports in a direction other than forwards and backwards inhibits sidewise movement of the skate. A pusher block is provided at the forward end of the skate allowing the wearer to push himself forwardly either by tipping the block against the skating surface or by a sidewise pushing motion much like an ice skate.

[0010] U.S. Pat. No. 5,486,011 (A) features a braking device for in-line skates including a resiliently biased, pivotally mounted load bearing wheel. The resilient element prevents contact between the wheel and a skate mounted braking surface during normal skating movements. The braking device is activated by exerting sufficient downward force on the load bearing wheel to overcome the resilient

bias and thereby making frictional contact between the load bearing wheel and the braking surface.

[0011] U.S. Pat. No. 6,899,344 (B1) features a multidirectional roller skate device and an associated method of using the device. The device includes a foot platform having a plurality of rolling units attached to the bottom of the foot platform. The foot platform may be either a boot for use as a roller skate or a board for use as a skate board. Each rolling unit includes a wheel, an axle, a fork, and a steering housing. The fork has a top ring; two opposing arms attached to the top ring of the fork; a first flange attached to the top ring of the fork; and a second flange attached to the top ring of the fork The steering housing has: a top plate attached to the foot platform and pivotally attached to the fork; an anchor shaft attached to the top plate; a first coil spring having a first and a second end, the first end of the first coil spring is attached to the first flange of the fork, the second end of the first coil is attached to the anchor shaft of the steering housing; a second coil spring having a first and second end, the first end of the second coil spring is attached to the second flange of the fork, the second end of the second coil is attached to the anchor shaft of the steering housing; and a rectangular bearing set attached to the steering housing and attached to the fork. The method of using the device includes the steps of balancing, bending, contacting, lifting, obtaining, placing, pushing, repeating, and standing.

[0012] U.S. Pat. No. 6,065,762 (A) features a multidirectional in-line roller skate comprising a boot to receive a foot of a skater. The boot has a sole. A frame is provided. A facility is for securing the frame to a bottom surface of the sole of the boot. A plurality of spherical wheel assemblies is also provided. A subassembly is for mounting each spherical wheel assembly in a removable manner to a bottom surface of the frame centrally along a common place, so that each spherical wheel assembly can rotate horizontally along a riding surface. An assemblage is for revolving each spherical wheel assembly vertically three hundred and sixty degrees in a clockwise and counterclockwise direction upon the riding surface, to allow the skater to perform tight figure skating maneuvers on the riding surface.

[0013] U.S. Pat. No. 6,293,565 (B1) features a skate assembly that allows a skater forward/backward motion as well as side-to-side motion. Various aspects of the skate assembly can be adjusted to fit the size and weight of the skater, the skill level of the skater, the skating or playing style of the skater, and the various surfaces to which it might come into contact. In one configuration the skate assembly is comprised of a plurality of linearly aligned roller assemblies. The skate assembly includes at least one friction plate mounted on the inside edge of the skate frame that provides a push-off area used by the skater to initiate motion, accelerate, or stop. In another configuration the skate assembly is comprised of at least one roller assembly interposed between a pair of conventional wheels. The pair of conventional wheels provides stability when the skater is moving in either a forward or backward direction since these two wheels are confined to rotation in a single plane. When the skater wishes to move laterally he or she tilts the skates, for example by inwardly angling both knees, causing the conventional wheels to be raised from the rolling surface and placing all of the skater's weight on the omni-directional, i.e., substantially spherical, rollers. At this point lateral skate motion is as easy as linear skate motion. The roller within each of the roller assemblies can be mounted between two sets of bearings mounted on either side of the roller; between an upper bearing set and a set of bearings that surrounds the roller; or within a roller cavity that has been coated with a low friction coating.

SUMMARY

[0014] The present invention provides a new and/or alternate device and/or method to allow a user rolling over a substantially even surface. The present invention particularly provides a ball with advantageous properties. The elasticity can provide a more comfortable travel for a user while at the same time limiting noise during use. At the same time a suitable hardness can limit abrasion, increase comfort, control breaking and prolong lifetime.

[0015] The ball according to the present invention is directed to find use in a skating device.

[0016] A ball for use in a skating device can comprise a first material having an elastic modulus of at least E=0.60 GPa, preferably at least E=0.70 GPa and more preferably at least E=0.73 GPa. Further it can have a maximum elastic modulus of E=5 GPa, preferably at most E=3 GPa, more preferably at most E=1 GPa and even more preferably at most E=0.74 GPa, the first material defining at least an outermost section or layer of the ball.

[0017] The ball presented according to the invention can further comprise a core having a second material being less elastic than the first material and can be circumferenced by at least one concentric outer section or layer comprising the properties of the first material.

[0018] A core can have the function to reduce elasticity to the ball under certain circumstances, as could be if the skating device is used under varying conditions. The core may also be provided to adjust for the ball to adjust weight and/or to adjust inertia.

[0019] The disclosed ball can have a minimum Poisson's ratio of μ=0.30, preferably at least μ=0.35, and more preferably at least μ=0.39.

[0020] Further a maximum Poisson's ratio of the outer layer can be μ=0.50, preferably at most μ=0.45, and more preferably at most μ=0.41. The Poisson's ratio is defined as the signed ratio of transverse strain to axial strain.

[0021] The ball as a whole or in part can be constructed to have a specific weight of the first material is at least 0.9 g/cm^3, preferably at least 1.0 g/cm^3, more preferably at least 1.05 g/cm^3. Further the specific weight of the first material is at the most 1.3 g/cm^3, preferably at the most 1.2 g/cm^3, more preferably at the most 1.1 g/cm^3.

[0022] The preferred diameter of the ball can have a minimum diameter of 20 mm, preferably at least 30 mm, and more preferably at least 40 mm and at most 55 mm. Further the maximum diameter of the ball can be 100 mm, preferably at most 90 mm, more preferably at most 85 mm. Most preferable can be a diameter of between 58 mm and 80 mm. Between these values the best results for the users are achieved.

[0023] The hardness properties of the disclosed ball can be governed by the shore D scale and have at least 40 D, preferably at least 60 D, more preferably at least 70 D. Further the hardness after the shore D scale can be at most 90 D, preferably at most 80 D, more preferably at most 70 D and most preferably 65 D. Shore hardness is understood to be a dynamically determined measure.

[0024] Further to the described physical properties of the ball, the surface of the ball can comprise a pattern used to

adjust the coefficient of kinetic friction, durability, color, and/or to comprise a design and/or a text.

[0025] The described ball is dedicated to be used for a skating device. At least one ball can be arranged at or in the skating device, preferably at least two balls, more preferably at least three balls, most preferably four balls. They can be equally or unequally be distanced.

[0026] The skating device can comprise at least one ball and further comprise a chassis and/or a support for fixing a boot.

[0027] A method for manufacturing one or a plurality of ball(s) for a skating device particularly according to the prior and/or following description is disclosed, providing a minimum elastic modulus of 0.60 GPa, preferably at least 0.70 GPa and more preferably at least 0.73 GPa.

[0028] Further a maximum elastic modulus of the ball can be 5 GPa, preferably at most 3 GPa, more preferably at most 1 GPa, and even more preferably at most 0.74 GPa, the first material defining at least an outermost section of the ball.

[0029] The method for manufacturing the ball can provide a minimum Poisson's ratio and/or the outer portion or layer to be μ=0.30, preferably at least μ=0.35, and more preferably at least μ=0.39. Further the maximum Poisson's ratio of the outer layer can provide a maximum Poisson's ratio of μ=0.50, preferably at most μ=0.45, and more preferably at most μ=0.41. The Poisson's ratio is defined as the signed ratio of transverse strain to axial strain.

[0030] The method for manufacturing the ball shall provide a specific weight of the first material of at least 0.9 g/cm^3, preferably at least 1.0 g/cm^3, more preferably at least 1.05 g/cm^3. Further the specific weight of the first material is at the most 1.3 g/cm^3, preferably at the most 1.2 g/cm^3, more preferably at the most 1.1 g/cm^3. The value can vary with the hardness of the first material.

[0031] The method for manufacturing the ball can provide a minimum diameter of the ball of 20 mm, preferably at least 30 mm, more preferably at least 40 mm and at most 55 mm. Further a maximum diameter of the ball can be 100 mm, preferably at most 90 mm, more preferably at most 85 mm and most preferably between 58 mm and 80 mm.

[0032] The method for manufacturing the ball can comprise a multi-layer structure wherein at least one layer is made from a different material.

[0033] The method for manufacturing the ball adapting the surface of the ball may comprise a pattern. Thus an adjustment of coefficient(s) for kinetic friction, adhesion and/or durability can be achieved. Further, color variations and/or integration of a design or a text can be applied to the surface of the ball.

[0034] The method for manufacturing a skating device according to the prior or following descriptions can comprise at least one ball, preferably at least three balls, and more preferably at least four balls. However, the smaller the diameter of the ball is preferred by the manufacturer, the higher the number of balls can be adapted to integrate in the skating device.

[0035] The method for manufacturing the skating device can comprise the at least one ball, further comprise a chassis and a support for fixing a boot.

BRIEF DESCRIPTION OF THE DRAWINGS

[0036] The drawings, described below, are for illustration purposes only. The drawings are not intended to limit the scope of the present teaching in any way.

[0037] FIG. **1** exemplifies a schematic view of a skating device comprising balls **15** according to an embodiment of the invention.

[0038] FIG. **2** exemplifies a cross section of an embodiment of a ball **15**, according to the invention.

DESCRIPTION OF VARIOUS EMBODIMENTS

[0039] In the following, exemplary embodiments of the invention will be described, referring to the figures. These examples are provided to give further understanding of the invention, without limiting the scope.

[0040] In the following description, a series of elements is described. The skilled person will appreciate that unless specified by the context, the number or the position of elements is not critical for the resulting configuration and its effect.

[0041] FIG. **1** shows a schematic view of a skating device **1** comprising balls **15** according to an embodiment of the invention. The skating device **1** can be adapted to provide a skater an experience to some extent comparable to the one of ice-skating and/or roller skating. To achieve this kind of experience, the device is adapted to allow balls **15** to rotate in all directions where friction depends on the direction of rotation of the ball, where the minimal friction can be in the forward/backward direction of a skating device **1**, and the maximal friction is in the direction perpendicular to the forward/backward one.

[0042] FIG. **2** The ball **15** can consist of one single material. However, the ball **15** can also comprise a core **16**. Core **16** can or cannot be made of the same material as the rest of the ball **15** as a whole. Various materials can be provided to achieve special properties which may differ for distinct applications. A high performance user might prefer other properties of the balls **15** than an average user. Nevertheless, an outermost portion **17** can be further provided and can consist of a material hard enough to withstand abrasion and/or environmental effect as could be the influence of environmental chemicals and/or UV rays etc. The outermost surface may also be adapted to special necessities as could be a higher adhesion to the ground for instance in a gymnasium or on walkways.

Embodiments

[0043] While the disclosure has been illustrated and described in detail in the drawings and foregoing description, such illustration and description are to be considered illustrative or exemplary and non-restrictive; the disclosure is thus not limited to the disclosed embodiments. Variations to the disclosed embodiments can be understood and effected by those skilled in the art and practicing the claimed disclosure, from a study of the drawings, the disclosure, and the appended claims.

[0044] As used herein, including in the claims, singular forms of terms are to be construed as also including the plural form and vice versa, unless the context indicates otherwise. Thus, it should be noted that as used herein, the singular forms "a," "an," and "the" include plural references unless the context clearly dictates otherwise.

[0045] The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to fulfill aspects of the present invention. The present technology is also understood to encompass the exact terms, features,

numerical values or ranges etc., if in here a relative term, such as "about", "substantially", "ca.", "generally", "at least", "at the most" or "approximately" is used in this specification, such a term should also be construed to also include the exact term. That is, e.g., "substantially straight" should be construed to also include "(exactly) straight". In other words, "about 3" shall also comprise "3" or "substantially perpendicular" shall also comprise "perpendicular". Any reference numerals in the claims should not be considered as limiting the scope.

[0046] In the claims, the terms "comprises/comprising", "including", "having", and "contain" and their variations should be understood as meaning "including but not limited to", and are not intended to exclude other components. Furthermore, although individually listed, a plurality of means, elements or method steps may be implemented. Additionally, although individual features may be included in different claims, these may possibly advantageously be combined, and the inclusion in different claims does not imply that a combination of features is not feasible and/or advantageous. In addition, singular references do not exclude a plurality.

[0047] Whenever steps were recited in the above or also in the appended claims, it should be noted that the order in which the steps are recited in this text may be the preferred order, but it may not be mandatory to carry out the steps in the recited order. That is, unless otherwise specified or unless clear to the skilled person, the order in which steps are recited may not be mandatory. That is, when the present document states, e.g., that a method comprises steps (A) and (B), this does not necessarily mean that step (A) precedes step (B), but it is also possible that step (A) is performed (at least partly) simultaneously with step (B) or that step (B) precedes step (A). Furthermore, when a step (X) is said to precede another step (Z), this does not imply that there is no step between steps (X) and (Z). That is, step (X) preceding step (Z) encompasses the situation that step (X) is performed directly before step (Z), but also the situation that (X) is performed before one or more steps (Y1), . . . , followed by step (Z). Corresponding considerations apply when terms like "after" or "before" are used.

[0048] It will be appreciated that variations to the foregoing embodiments of the invention can be made while still falling within the scope of the invention can be made while still falling within scope of the invention. Features disclosed in the specification, unless stated otherwise, can be replaced by alternative features serving the same, equivalent or similar purpose. Thus, unless stated otherwise, each feature disclosed represents one example of a generic series of equivalent or similar features.

[0049] Use of exemplary language, such as "for instance", "such as", "for example" and the like, is merely intended to better illustrate the invention and does not indicate a limitation on the scope of the invention unless so claimed. Any steps described in the specification may be performed in any order or simultaneously, unless the context clearly indicates otherwise.

[0050] All of the features and/or steps disclosed in the specification can be combined in any combination, except for combinations where at least some of the features and/or steps are mutually exclusive. In particular, preferred features of the invention are applicable to all aspects of the invention and may be used in any combination.

We claim:

1. A ball for a skating device, the ball comprising a first material having an elastic modulus in a range E=0.60 GPa to E=5 GPa, the first material defining at least an outermost section of the ball.

2. The ball according to claim **1**, wherein the first material has an elastic modulus of about E=0.73 GPa to about E=0.74 GPa.

3. The ball for a skating device according to claim **1**, further comprising a core having a second material being less elastic than the first material, circumferenced by at least one concentric outer layer comprising the elastic modulus of the first material.

4. The ball for a skating device according to claim **1**, wherein a Poisson's ratio of the ball and/or of an outer layer is in a range μ=0.30 to μ=0.50.

5. The ball according to claim **4**, wherein the Poisson's ratio of the ball and/or the outer layer is about μ=0.41.

6. The ball for a skating device according to claim **1**, wherein a diameter of the ball is in a range of 20 mm to 100 mm.

7. The ball according to claim **6**, wherein the diameter of the ball is in the range 58 mm and 80 mm.

8. The ball for a skating device according to claim **1**, wherein a hardness of the ball and/or an outer layer is in a range 40 D to 90 D.

9. The ball according to claim **8**, wherein the hardness is about 65 D.

10. The ball for a skating device according to claim **1**, further comprising a pattern on a surface of the ball, said pattern configured to adjust a coefficient of kinetic friction, durability, color, or to comprise one of a design or a text.

11. A skating device comprising a three to eight balls according to claim **1**.

12. The skating device comprising a ball according to claim **1**, further comprising one of a chassis or a support for fixing to a boot.

13. A method for manufacturing a ball for a skating device particularly according to claim **1**, providing a ball with a minimum elastic modulus in a range from E=0.60 GPa to E=5 GPa, the first material defining at least an outermost section of the ball.

14. The method of claim **1**, providing the ball with a minimum elastic modulus of about E=0.73 GPa to about E=0.74 GPa, the first material defining at least the outermost section of the ball.

15. The method of claim **13**, providing the ball with a minimum Poisson's ratio and/ or an outer layer to be in a range μ=0.30 to μ=0.50.

16. The method of claim **15**, wherein the ball and/or the outer layer has a minimum Poisson's ratio of about μ=0.41.

17. The method of claim **13**, the method comprising:
providing a diameter of the ball in a range of 20 mm to 100 mm.

18. The method of claim **17**, wherein the diameter of the ball is in the range 58 mm to 80 mm.

19. The method for manufacturing a skating device comprising at least one ball according to claim **13**.

20. The method for manufacturing the skating device comprising the ball according to claim **13**, providing the skating device to further comprise a chassis and a support for fixing to a boot.

* * * * *