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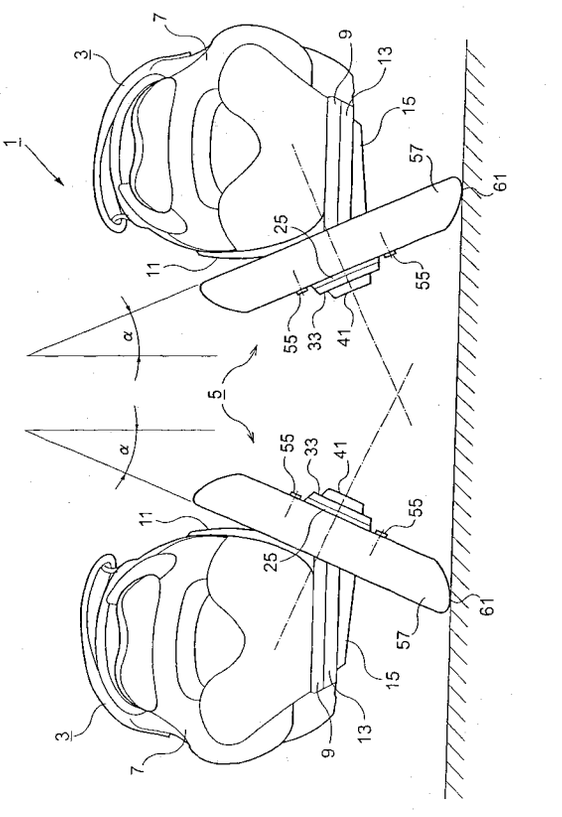
(54) ROLLER SKATE

(57) Roller skates 1 comprise: a pair of shoes 3 having a shoe body 7 and a sole 9; and a roller 5 disposed for each shoe. The roller 5 comprises: an axle 17 obliquely extending downward from the inner edge of the shoe body 7; and wheels 51 disposed rotatably about the axle 17. Each wheel 51 has a diameter larger than a distance between the sole 9 and the ground, and is angularly disposed over the inner edge of the shoe body 7 to underneath the sole 9 such that a ground engaging point of the wheel 51 is positioned approximately along the center line of the sole 9.

Fig. 4



EP 1 541 202 A1

Description

TECHNICAL FIELD

[0001] This invention relates to roller skates.

BACKGROUND ART

[0002] Roller skates conventionally have plural rollers evenly disposed and fixed to the sole of sports shoes. In contrast to that, in-line skates, plural rollers of which are in longitudinal alignment on the sole, are the recent trend.

[0003] The roller skates in practical use including in-line skates usually have rollers located underneath the sole, diameter of which cannot be very large in order to maintain the balance. Thus, this limits the skaters speed and flexibility of style.

DISCLOUSURE OF THE INVENTION

[0004] An object of the present invention is to provide roller skates having a completely different construction with larger wheels compared to those used for conventional roller skates, which allows high-speed skating.

[0005] In order to achieve the above object, a first aspect of the present invention is roller skates comprising: a pair of shoes having a shoe body and a sole; and a roller disposed for each shoe, wherein the roller comprises an axle obliquely extending downward from the inner edge of the shoe body and front and rear wheels disposed rotatably about the axle; and each wheel has a diameter larger than a distance between the sole and the ground, and is angularly disposed over the inner edge of the shoe body to underneath the sole such that a ground engaging point of the wheel is positioned approximately along the center line of the sole.

[0006] According to the first aspect of the present invention, it is possible to use wheels with a diameter larger than those used for conventional roller skates, so that a skater can enjoy high-speed roller skating. The angularly-disposed wheels can offer the skater a very smooth skating experience, which differs from conventional roller skates.

[0007] A second aspect of the present invention is the roller skates according to the first aspect, wherein each wheel is formed into a cup or grinding bowl shape with one of its sides, which opposes the shoe body, having a recess and the other side having a projection. According to the second aspect of the present invention, this allows a portion projecting from the inside edge of the shoe body to be covered when the wheel is attached. Therefore, the ground engaging portion of the wheel can be positioned approximately along the center line of the sole without canting the wheel at a large angle.

[0008] A third aspect of the present invention is the roller skates according to the first or second aspect, wherein the roller comprises a frame secured on the shoe body to the sole, and an axle bracket disposed on the frame; the axle protrudes from the axle bracket; the axle is formed into a cylindrical shape and has a screw insertion hole on the inner surface with a female thread, and a male thread on the outer surface; a hub bracket is disposed around the axle and plural balls are rollably provided between a bearing surface of the axle bracket and the bearing surface of the hub bracket; a ball retaining bracket is provided around the axle such that it covers over the hub bracket while being engaged with the male thread on the outer surface of the axle, and plural balls are rollably provided between another bearing surface formed on the opposite side of the bearing surface of the hub bracket, and a bearing surface of the ball retaining bracket; a bracket fixing screw is fitted into the female thread of the screw insertion hole of the axle to prevent removal of the ball retaining bracket; and the wheel is clamped to the hub bracket.

[0009] According to the third aspect of the present invention, the hub bracket can rotate due to the ball bearing effect, which allows the wheel to rotate.

[0010] A fourth aspect of the present invention is the roller skates according to the third aspect, wherein a bracket abutment portion is formed on the bracket fixing screw to abut the edge surface of the ball retaining bracket in order to prevent removal of the ball retaining bracket. According to the fourth aspect of the present invention, the bracket fixing screw screws into the screw insertion hole until the bracket abutment portion abuts the edge surface of the ball retaining bracket to prevent removal of the ball retaining bracket.

[0011] A fifth aspect of the present invention is the roller skates according to the third aspect, wherein on the outside edge of the screw insertion hole of the axle is formed a widened end which could be widened due to plural slits, and a small setscrew, which includes a screw portion and a larger diameter portion formed on the opposite end of the screw portion and having a diameter to become larger towards the end, can be fitted into the screw insertion hole.

[0012] According to the third embodiment, fitting the small setscrew into the screw insertion hole causes the widened end to be gradually widened outward, so that the male thread on the outer surface of the axle can be rigidly engaged with the female thread on the inner surface of the ball retaining bracket. This allows maintaining a constant state of the engagement of the axle with the ball retaining bracket.

[0013] A sixth aspect of the present invention is the roller skates according to any one of the third to fifth aspects, wherein the axle bracket for each front and rear wheel is respectively fixed to the frame, and either one or both of the front and rear axle brackets can slide in the longitudinal direction so as to change a distance between them.

[0014] According to the sixth aspect of the present invention, the distance between the front and rear wheels is adjustable by displacement of either one or both of

the front and rear axle brackets in the longitudinal direction. Thus, this allows changing the distance between the wheels as required, depending on shoes size or user's skating comfort.

[0015] A seventh aspect of the present invention is the roller skates according to any one of the third to sixth aspects, wherein the axle bracket for each front and rear wheel is respectively fixed to the frame in which either one or both of the front and rear axle brackets can be adjustably angled on the frame so as to subtly adjust the orientation of the wheel with respect to the skating direction.

[0016] According to the seventh aspect of the present invention, slightly changing the angle of the axle bracket allows subtle adjustments of the wheel angle with respect to the skating direction. Thus, this ensures that a user can more reliably skate in a straight line by subtle adjustments of the wheel orientation, which could not otherwise be achieved due to the angled wheels disposed over the inner edge of the shoe body to underneath the sole. Also, this permits a user to adjust the wheel angle as appropriate, depending on his/her skating comfort.

[0017] An eighth aspect of the present invention is the roller skates according to any one of the first to seventh aspects, wherein the rotation direction of the hub bracket when the roller skates move forward corresponds to the unscrewed direction of the ball retaining bracket. According to the eighth aspect of the present invention, this can prevent the balls from unnecessarily being pressed and locked by the ball retaining bracket which would be further engaged with the axle while the roller skates move forward.

[0018] A ninth aspect of the present invention is the roller skates according to any one of the first to eighth aspects, wherein the rotation direction of the hub bracket when the roller skates move forward corresponds to the direction in which the bracket fixing screw is screwed deeply into the screw insertion hole. According to the present invention, the bracket fixing screw is more rigidly engaged when the roller skates move forward, which ensures no accidental removal of the bracket fixing screw, and therefore no possible removal of the ball retaining bracket.

[0019] A tenth aspect of the present invention is the roller skates according to any one of the first to ninth aspects, wherein the cant angle of the wheel is 10 to 35 degrees.

[0020] The wheel canted by angle of 10 to 23 degrees relatively stands vertical, which moves the center of gravity higher while facilitating high-speed skating. Thus, the aforementioned angles are optimum for roller skating competitions. The wheel canted by angle of 23 to 35 degrees relatively stands horizontal, which maintain the balance. Thus, the aforementioned angles are optimum for fun roller skating.

[0021] An eleventh aspect of the present invention is the roller skates according to any one of the first to tenth aspects, wherein a tire is detachably or undetachably fixed to the outer edge of the wheel.

[0022] According to the eleventh aspect of the present invention, the tire, attached to the outer edge of the wheel, increases the contact friction of the skating surface such as the ground and therefore the grip, while absorbing shocks from small bumps and dips to help smooth skating.

[0023] The tire, designed to be detachable by a bracket for attaching/detaching the tire or the like, can be replaced with a tire suitable for the current skating surface condition, thereby ensuring optimum skating performance. Further, this can offer a wide variety of selections in terms of fashionability. For example, users can select bright-colored tires according to their liking.

[0024] A twelfth aspect of the present invention is the roller skates according to any one of the first to eleventh aspects, wherein the shoe body has a reinforcement made of relatively rigid material on its inside edge. According to the twelfth aspect of the present invention, the reinforcement can prevent the shoe body from deforming and frictionally contacting the wheel while the roller is rotating.

BRIEF DESCRIPTION OF DRAWINGS

[0025]

FIG. 1 is an exploded perspective view, showing rollers of a right foot roller skate of the present invention.

FIG. 2 is a side view of the right foot roller skate of the present invention.

FIG. 3 is a top view of the right foot roller skate of the present invention.

FIG. 4 is a back view of the roller skates of the present invention.

FIG. 5 is a sectional view of the roller of the roller skate of the present invention.

FIG. 6 is a back view of the roller skate of an embodiment according to the present invention, in which each axle bracket can be fixed to a frame slidably in the longitudinal direction.

FIG. 7 is a back view of the frame of the roller skate according to the present invention.

FIG. 8 is a back view of the roller skate of an embodiment according to the present invention, in which each axle bracket can be adjustably angled.

FIG. 9 is a sectional view, showing another embodiment according to the present invention in which a ball retaining bracket is secured to the axle.

BEST MODE FOR CARRYING OUT THE INVENTION

[0026] An embodiment of the present invention will be described below with reference to the drawings. FIG. 1 is an exploded perspective view of a roller of a roller skate according to the present invention. FIGs. 2 and 3

are side view and top view of the roller skate according to the present invention, respectively. The roller skates 1 of the present invention are constituted with a pair of the left and right skate shoes, which are symmetrical. However, FIGs. 1 through 3 only illustrate the right foot skate shoe for simplified description purposes.

[0027] The roller stake 1 has a shoe 3 and rollers 5. The shoe 3 has a shoe body 7 and a sole 9, constructions of which are essentially identical with those of sports shoes so that the detailed description thereof is omitted. The shoe body 7 has a reinforcement 11 made of relatively rigid material on its inside edge (which means the left side edge for the right foot shoe or the right side edge for the left foot shoe). The reinforcement can prevent the shoe body 7 from deforming and frictionally contacting an after-mentioned wheel while the roller 5 is rotating.

[0028] As shown in FIG. 5, as for the roller 5, an approximately flat-shaped circular axle bracket 15 is fixed to a frame 13 made of metal or aluminum. The frame has a cross-section corresponding to the cross-section of a curved surface between the shoe body 7 and the sole 9. A cylindrical axle 17 protrudes from the center of the axle bracket 15. A screw insertion hole 19 with female thread is formed on the inner surface of the axle 17. An annular groove 21 is formed around the outer periphery of the axle bracket 15. A concave bearing surface 23 is formed in the groove 21.

[0029] The outer surface of the axle 17 is provided with a hub bracket 25. As shown in FIG. 5, a concave bearing surface 27 is formed on the inner side of the hub bracket 25 or the area opposing the slot 21 of the axle bracket 15. On the other side of the hub bracket, a concave bearing surface 28 is formed. Plural balls 29 are provided between the bearing surface 23 of the axle bracket 15, and the bearing surface 27 of the hub bracket 25. An annular restriction projection 31 formed on the outer edge of the bearing surface 27 of the hub bracket 25 allows the balls 29 to be rollably retained between these bearing surfaces 23 and 27.

[0030] A ball retaining bracket 33 is provided around the axle 17 such that it covers over the hub bracket 25. A sleeve 35 is formed on the inner side of the ball retaining bracket 33, which passes through the inside of the hub bracket 25 with no contact therebetween. A female thread on the inner surface of the sleeve 35 is engaged with a male thread on the outer surface of the axle 17.

[0031] The ball retaining bracket 33 has a concave bearing surface 37 on the area opposing the bearing surface 28 of the hub bracket 25. Plural balls 39 are rollably retained between the bearing surface 37 and the bearing surface 28 of the hub bracket 25.

[0032] The screw direction for the female thread of the sleeve 35 to the male thread of the axle 17 is hereinafter described. The female thread of the sleeve 35 is screwed in the opposite direction of the rotation of the hub bracket 25 when the roller skates 1 move forward. In other words, this rotation direction corresponds to the unscrewed direction for the female thread of the sleeve 35 in which the ball retaining bracket 33 could be detached from the hub bracket 25. Such screw direction can prevent the balls 39 from unnecessarily being pressed and locked by the ball retaining bracket 33 which would be further engaged with the axle while the roller skates 1 move forward.

[0033] In addition, the external of the ball retaining bracket 33 is provided with a bracket fixing screw 41. The bracket fixing screw 41 is formed into an approximately T-shape in cross-section as shown in FIG. 5. It has a screw projection 43 at the center with a male thread formed on its outside surface. At the periphery of the bracket fixing screw 41, a bracket abutment portion 45 is formed. The bracket abutment portion extends in the same direction as the screw projection 43 to abut the edge surface 46 of the ball retaining bracket 33, in order to prevent removal of the ball retaining bracket 33. The male thread of the screw projection 43 screws into the female thread of the screw insertion hole 19 until the bracket abutment portion 45 abuts the edge surface 46 of the ball retaining bracket 33. This allows the ball retaining bracket 33 and the hub bracket 25 to remain attached to the axle 17.

[0034] The screw direction for the male thread of the screw projection 43 to the female thread of the screw insertion hole 19, and therefore the direction in which the male thread of the bracket fixing screw 41 is screwed deeply into the female thread, corresponds to the rotation direction of the hub bracket 25 when the roller skates 1 move forward. Such screw direction allows the bracket fixing screw 41 to be more rigidly engaged with the female thread when the roller skates 1 move forward. This ensures no accidental removal of the bracket fixing screw 41 when using the roller skates 1, and therefore no possible removal of the ball retaining bracket 33.

[0035] A flange 47 is provided on the outer periphery of the hub bracket 25, and has plural screw holes 49 with female thread. A wheel 51 is so disposed as to rotate about the axle 17 with a part of the wheel overlapping the flange 47. The wheel 51 has through holes 53 on its inner periphery in positions corresponding to the respective screw holes 49 of the flange 47. Fitting screws 55 into the screw holes 49 of the flange 47 via the through holes 53 allows the wheel 51 to be clamped to the hub bracket 25.

[0036] The wheel 51 is formed into a cup shape with one of its sides, which opposes the shoe body 7, having a recess and the other side having a projection. In place of the cup shape, the wheel may be alternatively formed into a shape of grinding bowl with a generally recessed conical inner face opposing the shoe body 7. As described above, the wheel 51 formed into a shape of cup or grinding bowl allows a portion projecting from the inside edge of the shoe body 7 (a most projecting part, relative to a recessed portion or the arch of the foot, on the forward inner edge of the shoe body) to be covered

when the wheel is attached. Therefore, a ground engaging portion of the wheel 51 can be positioned approximately along the center line of the sole 9 without canting the wheel at a large angle. In such case, the cant angle α of the wheel 51 (See FIG. 4) is adjustable depending on the applications, such as for fun skating or competitions. The cant angle is preferably set at 23 to 35 degrees for fun skating in contrast to 10 to 23 degrees for competitions.

[0037] A rubber tire 57 is provided around the outer edge of the wheel 51. The tire 57 may be fixed to the wheel 51 with plural screws 63 for securing a detachable bracket 64, or may be formed with the wheel 51 as a single unit. A ground engaging point 61 (See FIG. 4) of the tire 57 is adapted to be positioned approximately along the center line of the sole 9.

[0038] Generally, the aforementioned roller skates 1 can be used in the same manner as conventional roller skates. To be more specific, a skater with the roller skates 1 pushes one foot against the ground to generate a force for forward skating while putting the other foot forward on the ground. The hub bracket 25 with the wheel 51 therefore rotates about the axle 17 between the balls 29 and 39, which allows the tire 57 to rotate so that the location of the ground engaging portion of the tire 57 continuously varies. The skater with the roller skates can therefore move forward.

[0039] Another embodiment of the roller skates according to the present invention will be next described. In the embodiment shown in FIG. 6, axle brackets 15a and 15b for the front and rear wheels 51, respectively, are adapted to be fixed to a frame 13. Each axle bracket 15a, 15b has four elongated holes 65 extending in the skating direction. In turn the frame 13 has four screw holes 67 formed in positions corresponding to the four elongated holes 65. (See FIG. 7)

[0040] As shown in FIG. 6, in this embodiment, flanged screws 69 are fitted and screwed into the screw holes 67 of the frame 13 through the four elongated holes 65, such that each axle bracket 15a, 15b can be positioned at any position along the length of the elongated hole in the skating direction. The distance between the front and rear wheels 51 is therefore adjustable by changing the distance between the axle brackets 15a and 15b. This allows changing the distance between the front and rear wheels as required depending on shoes size or user's skating comfort. As an example of the variations of this embodiment, only one of the axle brackets 15a and 15b may be displaced in the longitudinal direction while the other may be fixed to the frame 13.

[0041] In addition, in the embodiment shown in FIG. 8, the axle brackets 15a and 15b for the front and rear wheels 51, respectively, are adapted to be fixed to the frame 13, similar to the embodiment shown in FIG. 6. Each axle bracket 15a, 15b of this embodiment has a swing pivot point or a pivot hole 71, two first elongated guide holes 73 formed forward and rearward of the pivot hole 71 and extending approximately perpendicular to the skating direction, and a second elongated guide hole 75 formed outward of the pivot hole 71 (on the little-toe side of the shoe) into an elliptical shape extending in the skating direction. Similar to the embodiment of FIG. 6, screw holes 67 are formed on the frame 13 as shown in FIG. 7 at their respective positions corresponding to the pivot hole 71, the two first elongated guide holes 73, and the second elongated guide hole 75.

[0042] In this embodiment, as shown in FIG. 8, flanged screws 69 are fitted into the screw holes 67 of the frame 13 through the pivot hole 71, the two first elongated guide holes 73, and the second elongated guide hole 75, respectively, such that each axle bracket 15a, 15b can be fixed to the frame 13 with a slight rotation about the pivot hole 71 in a clockwise or counterclockwise direction. This allows selective and subtle adjustments of the orientation of the front and rear wheels 51 by displacing them with respect to the skating direction by a given angle. Thus, this ensures that a user can more reliably skate in a straight line by the subtle adjustments, which could not otherwise be achieved due to the wheels angularly disposed over the inner edge of the shoe body to underneath the sole. Also, this permits a user to adjust the wheel angle as appropriate, depending on his/her skating comfort. In this embodiment also, only one of the axle brackets 15a and 15b may be adjustably angled while the other may be fixed to the frame 13.

[0043] FIG. 9 shows another embodiment in which the ball retaining bracket 33 is fixed to the axle 17. In this embodiment, the screw insertion hole 19 with female thread is formed on the inner surface of the axle 17. The outside edge of the screw insertion hole 19 is formed a widened end 80 which could be widened outward due to plural slits 79. The ball retaining bracket 33 with sleeve 35 is fitted on the outer surface of the axle 17, similar to the embodiment of FIG. 1. The screw insertion hole 19 is adapted to have a small setscrew 81 fitted thereinto. The small setscrew 81 includes a screw portion 83, a larger diameter portion 85 formed on the opposite end of the screw portion 83 and having a diameter to become larger towards the end, and a hexagonal hole 87 to engage a hexagonal wrench with the inner surface of the larger diameter portion 85.

[0044] Fitting the small setscrew 81 of this embodiment into the screw insertion hole 19 of the axle 17 by using the hexagonal wrench causes the widened end 80 to be gradually widened outward, so that the male thread on the outer surface of the axle 17 can be rigidly engaged with the female thread on the inner surface of the ball retaining bracket 33. The description of the embodiment of FIG. 1 refers to the relationship between the screw direction for the female thread of the sleeve 35 and the skating direction. However, the application of the aforementioned embodiment allows maintaining a constant state of the engagement of the axle 17 with the ball retaining bracket 33 even while the roller skates 1 move backward that is not specifically considered in

the embodiment of FIG. 1. This continues to provide a smooth and stable rotation of the wheel 51.

INDUSTRIAL APPLICABILITY

[0045] In accordance with the present invention, it is possible to use wheels with a diameter around 14cm, which are unknown in conventional roller skates, so that a skater can enjoy high-speed roller skating comparable to ice skating. The angularly-disposed wheels can offer the skater a very smooth skating experience, which differs from conventional roller skates.

[0046] Also, using a cup- or grinding bowl-shaped wheel allows a portion projecting from the inside edge of the shoe body to be covered when the wheel is attached. Therefore, the ground engaging portion of the wheel can be positioned approximately along the center line of the sole without canting the wheel at a large angle.

[0047] In addition, this can be expected to promote more extensive applications of the roller skates according to the present invention.

[0048] As described above, the roller skates of the present invention can offer high-speed skating comparable to ice skating. This enables dynamic speed skating competitions to be carried out in a rink, such as those used for cycling competitions, having a height between the top and bottom but having no lane directing the skating course, which differs from flat rinks used for ice skating.

[0049] The roller skates of the present invention also allow for skating with a single leg, using only either one of the wheels on the heel or toe, and therefore skating along a curved path such as figure skating and ice dancing. In other words, the roller skates of the present invention can offer a new type of skating with combined features of high-speed, smooth skating such as ice skating, and ease and convenience of conventional roller skates. Thus, it seems that there is a potential for the birth of a fun new trend in skating or a new competition such as what occurred in skate boarding to invigorate athletic culture.

Claims

1. Roller skates comprising: a pair of shoes having a shoe body and a sole; and a roller disposed for each shoe,

wherein the roller comprises: an axle obliquely extending downward from the inner edge of the shoe body; and front and rear wheels disposed rotatably about the axle, and

each wheel has a diameter larger than a distance between the sole and the ground, and is angularly disposed over the inner edge of the shoe body to underneath the sole such that a ground engaging point of the wheel is positioned approximately along the center line of the sole.

2. The roller skates according to Claim 1, wherein each wheel is formed into a cup or grinding bowl shape with one of its sides, which opposes the shoe body, having a recess and the other side having a projection.

3. The roller skates according to Claim 1 or 2, wherein the roller comprises:

a frame secured on the shoe body to the sole, and
an axle bracket disposed on the frame;
the axle protrudes from the axle bracket;
the axle is formed into a cylindrical shape and has a screw insertion hole on the inner surface with a female thread, and a male thread on the outer surface;
a hub bracket is disposed around the axle and plural balls are rollably provided between a bearing surface of the axle bracket and the bearing surface of the hub bracket;
a ball retaining bracket is provided around the axle such that it covers over the hub bracket while being engaged with the male thread on the outer surface of the axle, and plural balls are rollably provided between another bearing surface formed on the opposite side of the bearing surface of the hub bracket, and a bearing surface of the ball retaining bracket;
a bracket fixing screw is fitted into the female thread of the screw insertion hole of the axle to prevent removal of the ball retaining bracket; and
the wheel is clamped to the hub bracket.

4. The roller skates according to Claim 3, wherein a bracket abutment portion is formed on the bracket fixing screw to abut the edge surface of the ball retaining bracket in order to prevent removal of the ball retaining bracket.

5. The roller skates according to Claim 3, wherein on the outside edge of the screw insertion hole of the axle is formed a widened end which could be widened due to plural slits, and a small setscrew, which includes a screw portion and a larger diameter portion formed on the opposite end of the screw portion and having a diameter to become larger towards the end, can be fitted into the screw insertion hole.

6. The roller skates according to any one of Claims 3 to 5, wherein the axle bracket for each front and rear wheel is respectively fixed to the frame, and either one or both of the front and rear axle brackets can slide in the longitudinal direction so as to change a distance between them.

7. The roller skates according to any one of Claims 3 to 6, wherein the axle bracket for each front and rear wheel is respectively fixed to the frame in which either one or both of the front and rear axle brackets can be adjustably angled on the frame so as to subtly adjust the orientation of the wheel with respect to the skating direction.

8. The roller skates according to any one of Claims 1 to 7, wherein the rotation direction of the hub bracket when the roller skates move forward corresponds to the unscrewed direction of the ball retaining bracket.

9. The roller skates according to any one of Claims 1 to 8, wherein the rotation direction of the hub bracket when the roller skates move forward corresponds to the direction in which the bracket fixing screw is screwed deeply into the screw insertion hole.

10. The roller skates according to any one of Claims 1 to 9, wherein the cant angle of the wheel is 10 to 35 degrees.

11. The roller skates according to any one of Claims 1 to 10, wherein a tire is detachably or undetachably fixed to the outer edge of the wheel.

12. The roller skates according to any one of Claims 1 to 11, wherein the shoe body has a reinforcement made of rigid material on its inside edge.

Fig. 1

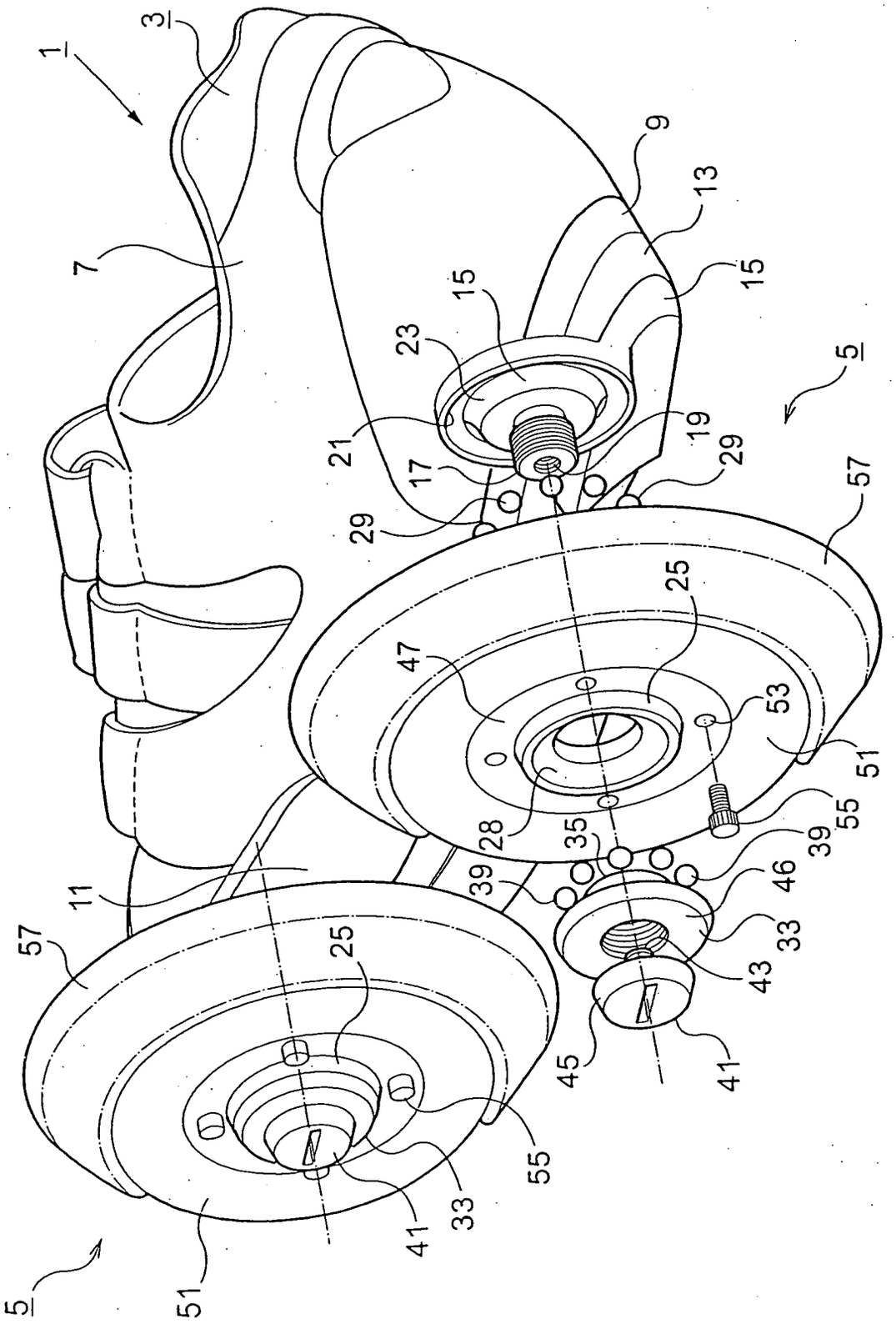

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Fig. 2

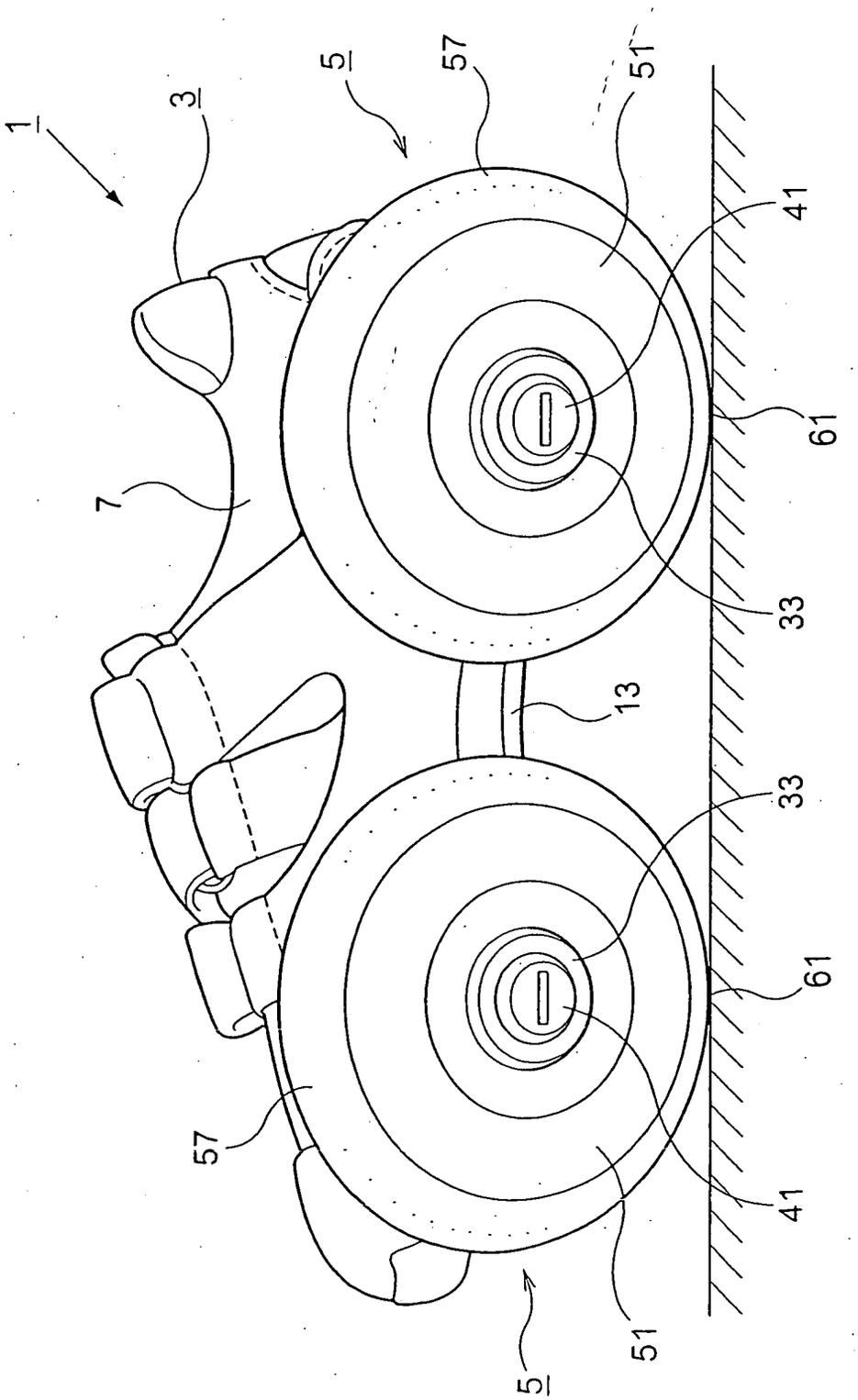

Fig. 3

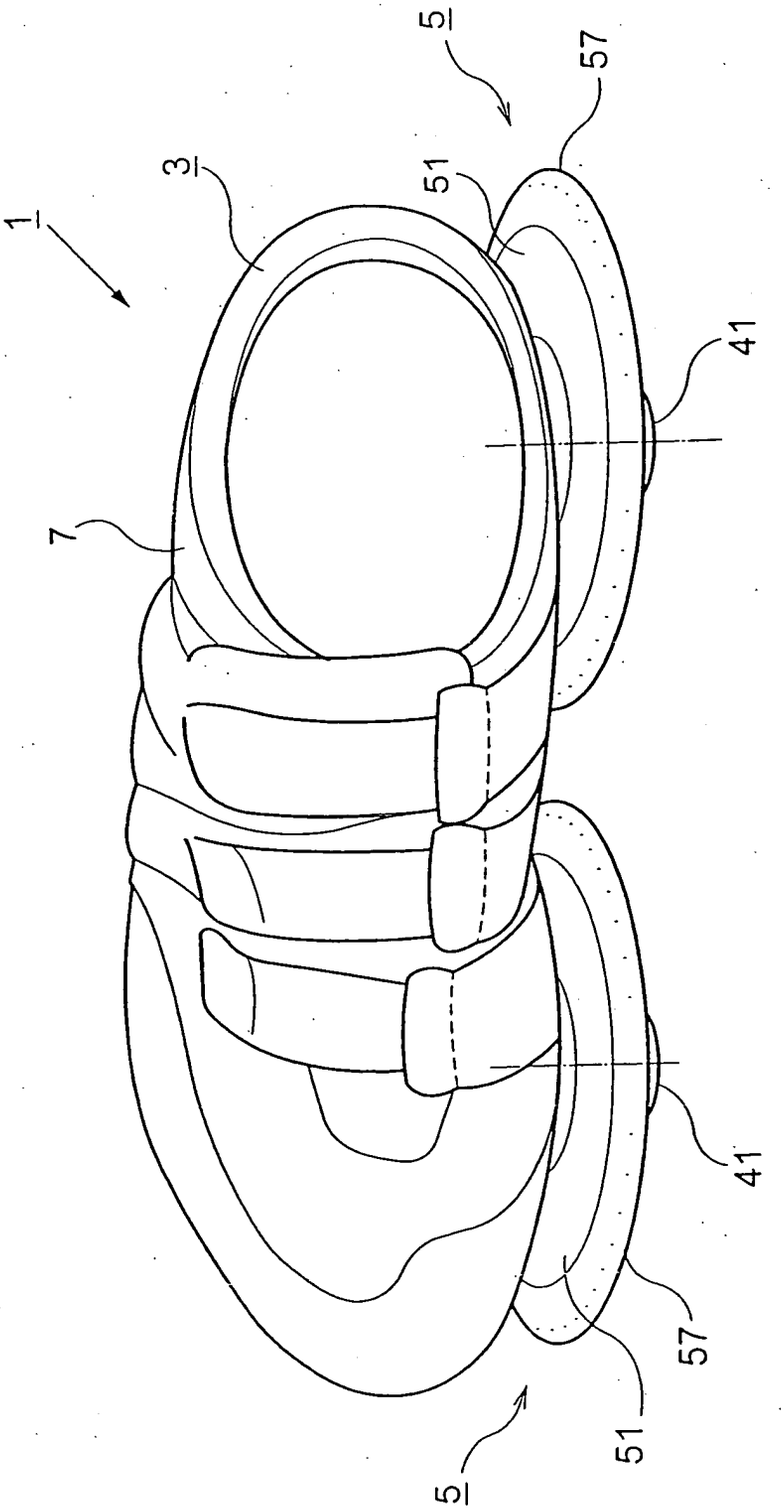

Fig. 4

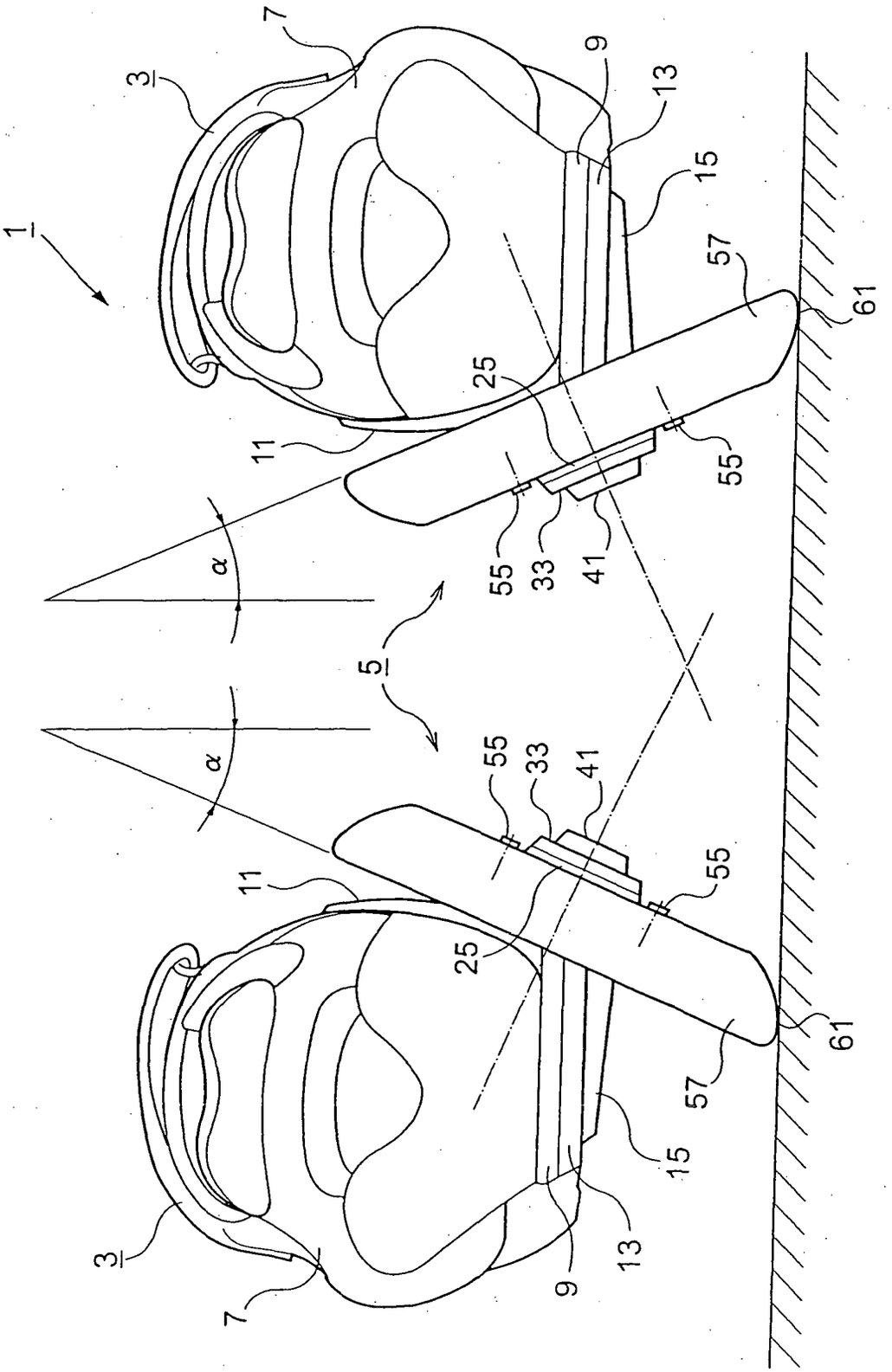

Fig. 5

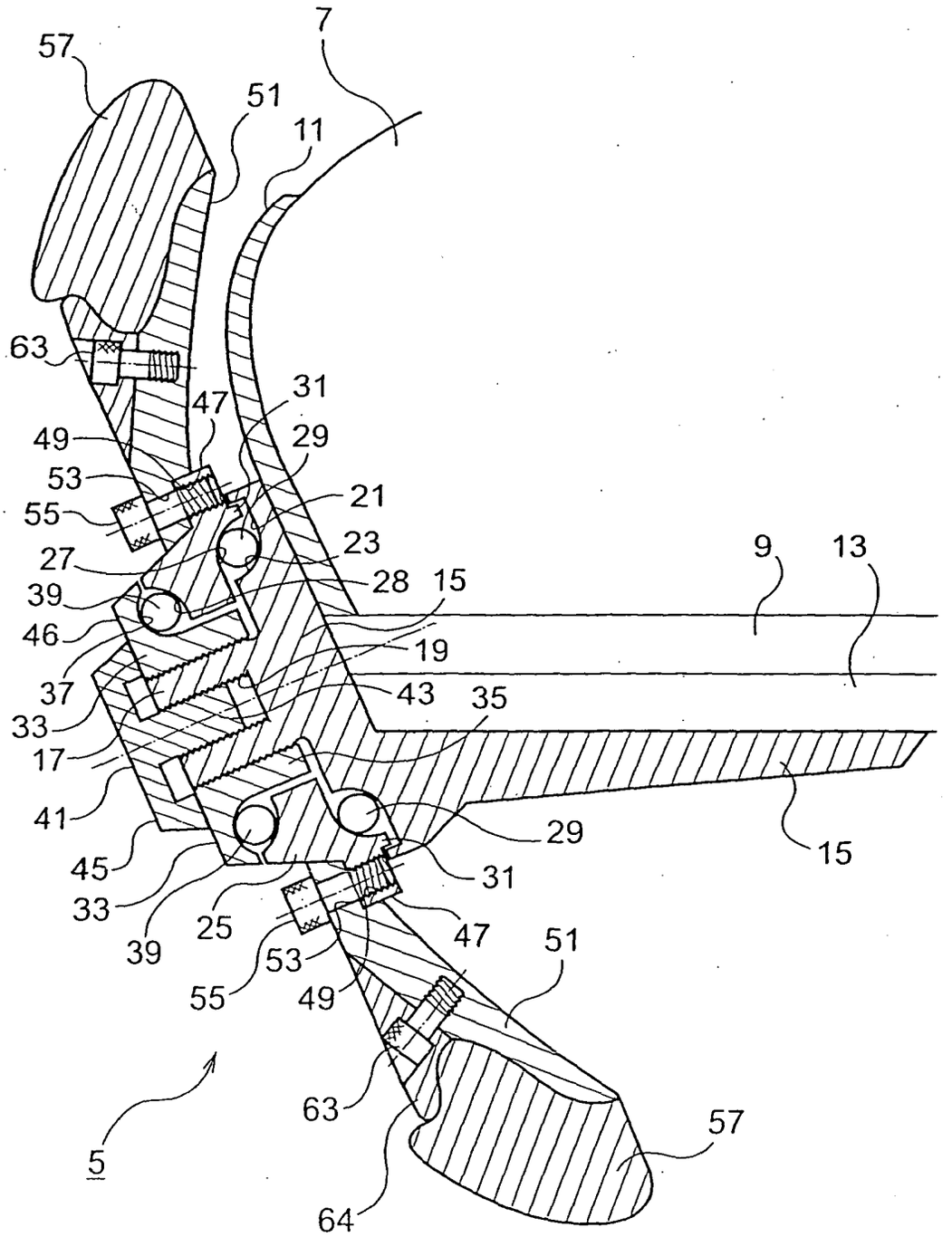
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Fig. 6

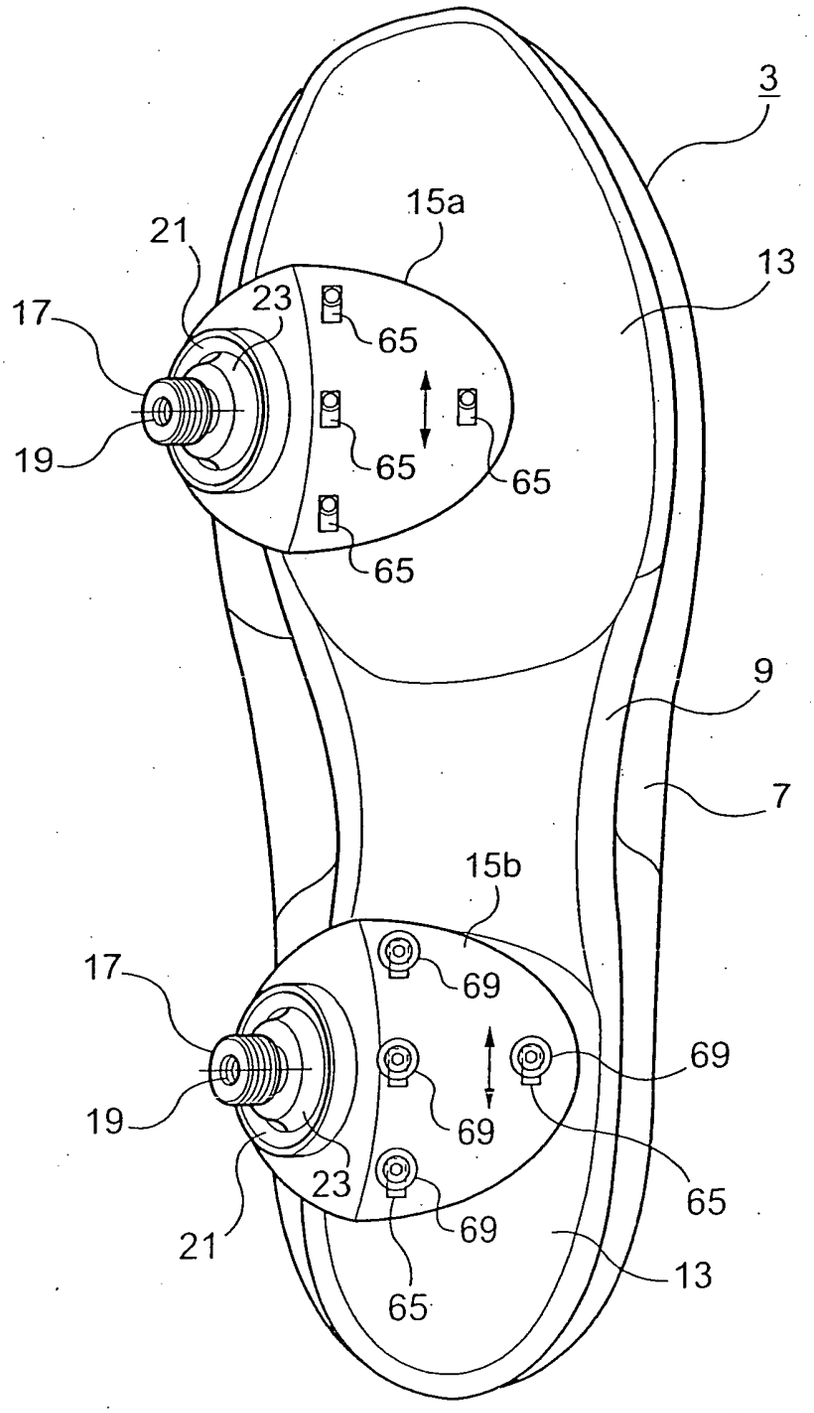


Fig. 7

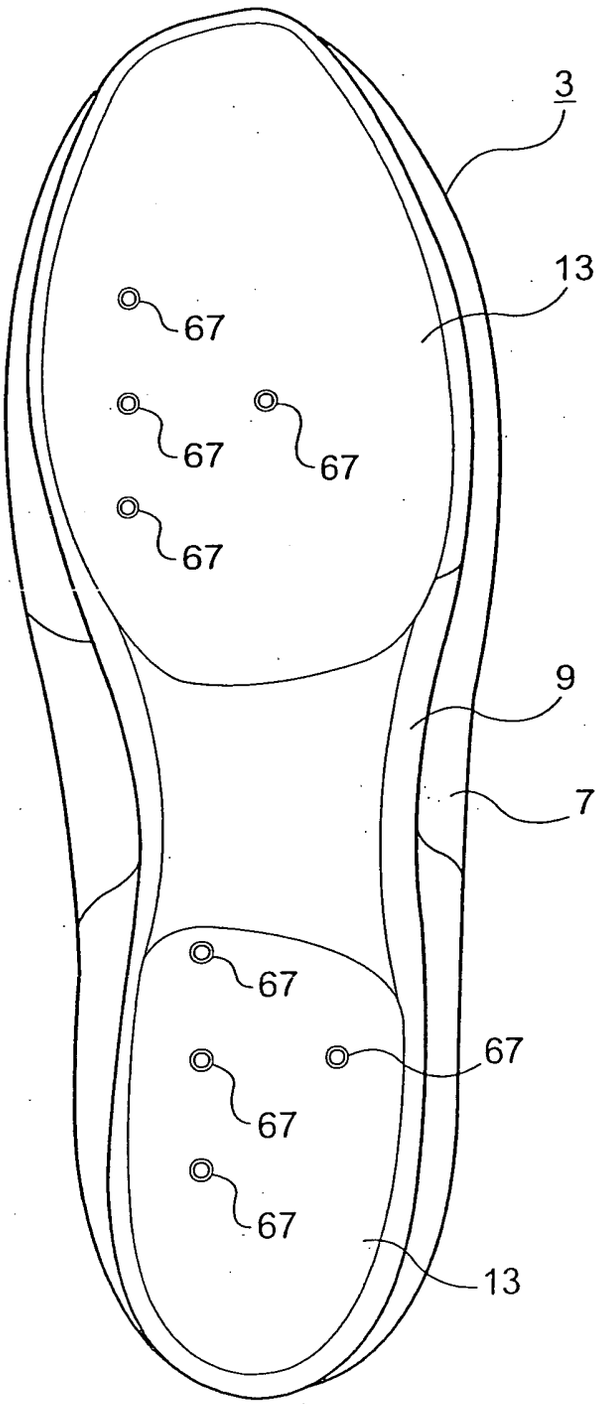


Fig. 8

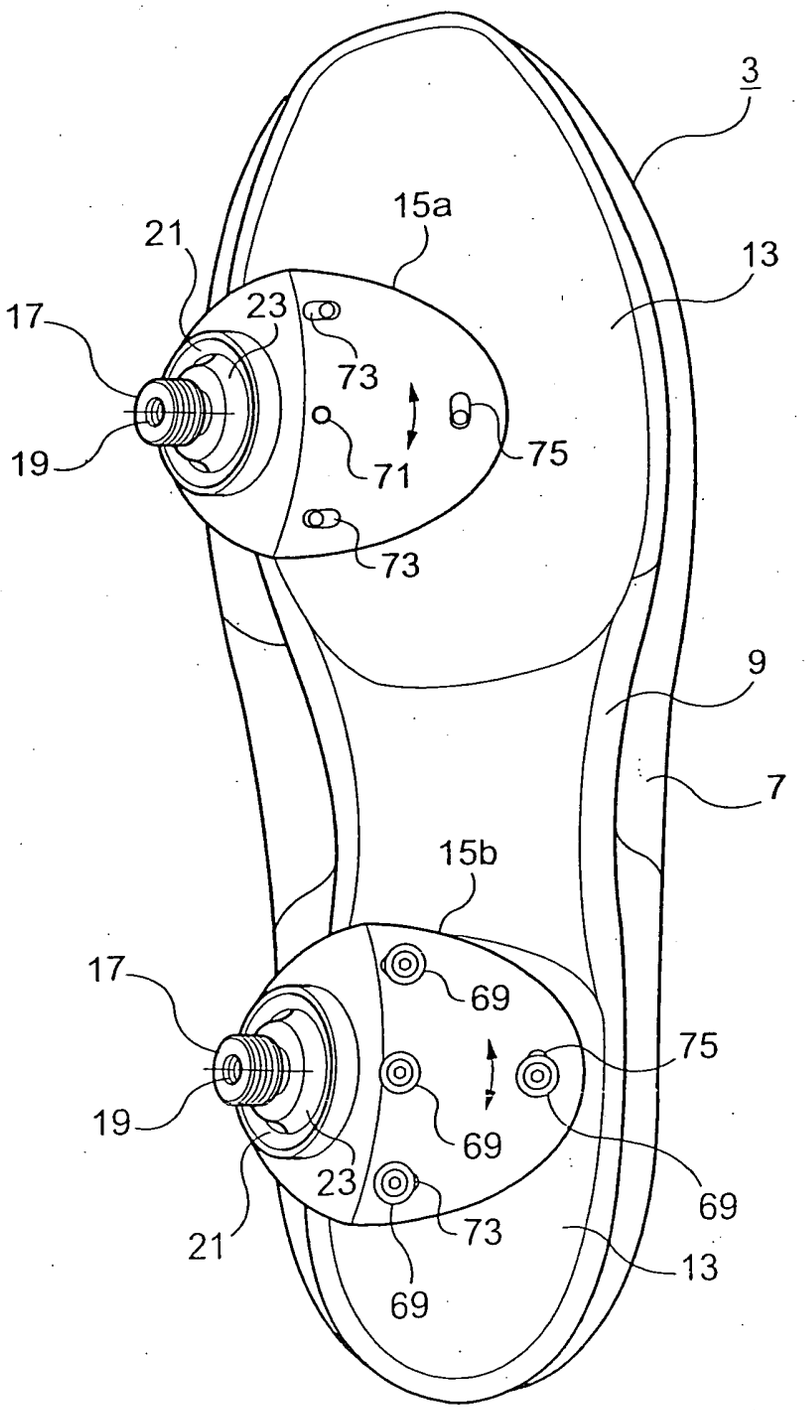
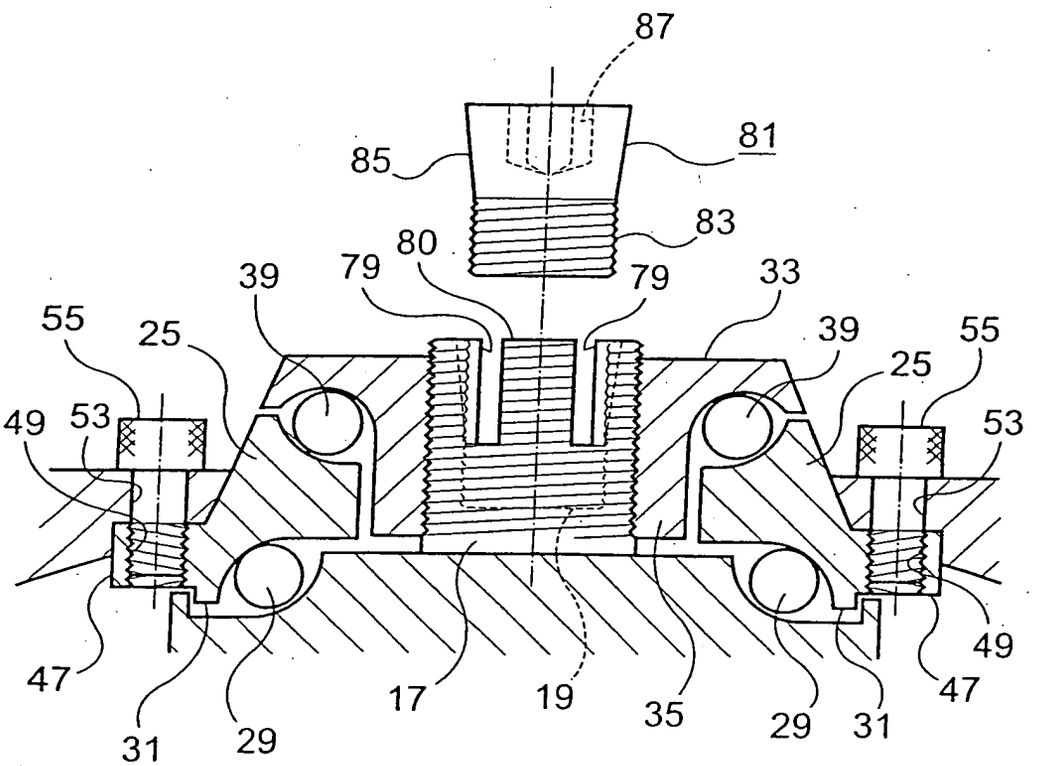


Fig. 9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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP03/05815

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] A63C17/06

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)
Int.Cl[7] A63C17/06

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

Jitsuyo Shinan Koho	1922-1996	Toroku Jitsuyo Shinan Koho	1994-2003
Kokai Jitsuyo Shinan Koho	1971-2003	Jitsuyo Shinan Toroku Koho	1996-2003

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 1975661 A (E.R. POWELL), 02 October, 1934 (02.10.34), Full text; all drawings Full text; all drawings (Family: none)	1-5,8-9,12 6-7,10-11
X Y	JP 2001-510718 A (Land Roller, Inc.), 07 August, 2001 (07.08.01), Full text; all drawings Full text; all drawings & AU 8579198 A & WO 99/004871 A1 & CA 2308145 A & US 5951028 A1 & EP 999882 A & CN 1270535 T & US 6273437 B1 & US 2001/54804 A1 & AU 747726 B	1,10-12 2-9

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
07 August, 2003 (07.08.03)	19 August, 2003 (19.08.03)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP03/05815

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	DE 215734 C (E. BUTZMANN), 03 November, 1909 (03.11.09), Full text; all drawings Full text; all drawings (Family: none)	1,10-11 2-9,12
Y	US 2212589 A (W.H. DECKER), 27 August, 1940 (27.08.40), Full text; all drawings (Family: none)	1-12
Y	US 4323259 A (R.J. BOUDREAU), 06 April, 1982 (06.04.82), Full text; all drawings (Family: none)	1-12
Y	JP 52-146360 U (Kiichiro UCHIDA), 07 November, 1977 (07.11.77), Full text; all drawings (Family: none)	6

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