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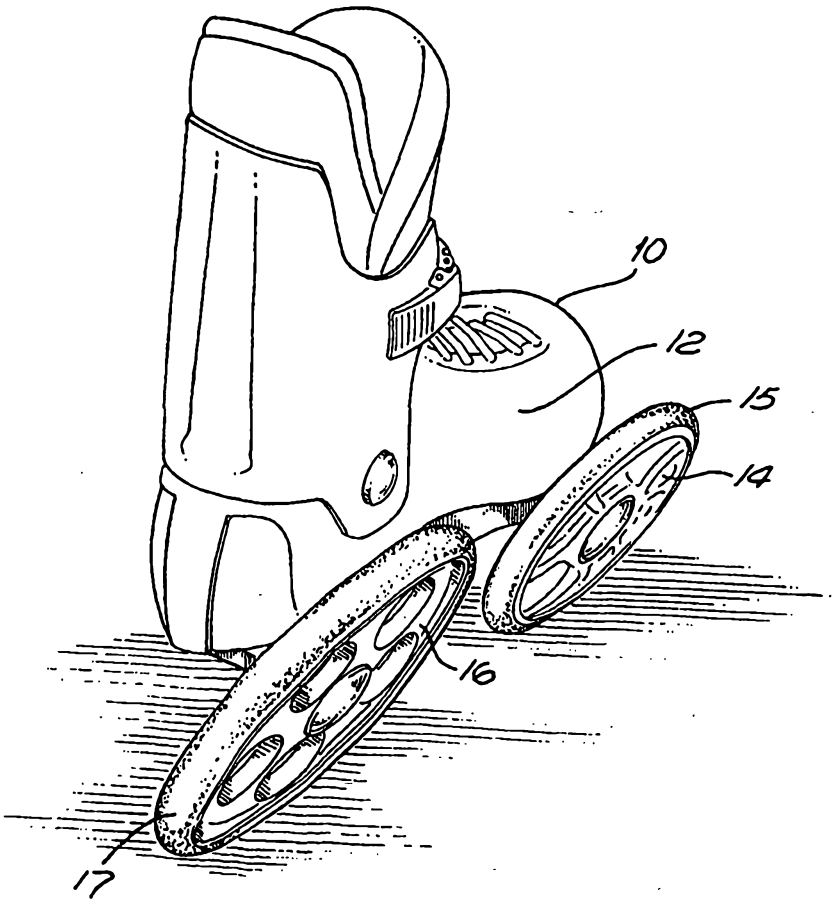
(57) Abstract

A two-wheeled roller skate with canted wheels has an axle for the forward wheel located well forward of the ball of the foot. The axle for the rear wheel is located at the rear of the skater's heel. The wheels are canted so that the front and rear wheels contact the ground on the opposite sides of the center line of the skater's foot. In plan projection, the axles are preferably non-parallel in order to provide steering correction. The amount of steering correction desirable will depend on the skater's skill and the nature of the skating activity. In alternative embodiments, the present invention incorporates novel braking mechanisms.



ROLLER SKATE

This invention relates to the field of roller skates and, particularly, to an improved skate with canted, large diameter wheels.

Various designs of roller skates have been developed over the years. At the present time, "in-line" skates are particularly popular. This type of skate has a plurality of small-diameter wheels aligned in a longitudinal direction beneath the sole of the skater's foot. A number of advantages are claimed for this design of a skate. However, the small diameter of the wheels inherently limits the speed that can be achieved and limits the use of the skates to relatively smooth surfaces.

Among alternative skate designs, skates with large-diameter wheels have been proposed for over a century. For example, U.S. Patent No. 89,833 proposes a skate with a single wheel of large diameter for use in skating on fields and other uneven surfaces. This skate, and many similar prior art designs, places the wheel to the outside of the skater's foot. While this allows a lower center of gravity than if the wheel were to be located entirely below the skater's foot, undue strain is placed on the skater's ankles because of the lateral offset between the center line of the skater's foot and the point of contact between the wheel and the ground. One solution to this problem is to mount the wheel at an angle with respect to vertical so that the point of contact with the ground will be directly below the skater's foot. Such a design for a single-wheeled skate is shown, for example, in U.S. Patent No. 2,931,012.

Single-wheeled skates are, of course, inherently unstable. A design for a skate with two large diameter wheels is shown in U.S. Patent No. 3,885,804 to Cudmore. In this design, two large, canted, equal-sized wheels are mounted on axles extending outwardly from a rigid sole-plate. As proposed by Cudmore, the canted wheels contact the ground directly beneath the center line of the sole-plate. The wheels are dished with their concave sides facing toward the sole-plate so that a portion of the sole-plate extends into the wheel concavities to permit the sole-plate to be positioned very close to the ground. Cudmore's design provides a reasonably stable skate in comparison to many of the prior art designs; however, improved stability and responsiveness is required over the design of Cudmore.

Furthermore, the dished wheels used by Cudmore to achieve a low center of gravity inherently limit the ability to turn sharply since the outside surfaces of the wheels will contact the ground when the skate lens in a sharp turn.

Accordingly, one aspect of the present invention provides a roller skate comprising:

a boot having a toe portion and a heel portion, both the toe and the heel portions being generally bisected in plan view by a longitudinal center line of the boot defining an inside direction and an outside direction;

a front wheel rotatably mounted to the toe portion of the boot and disposed to the outside thereof for rotation about a first axis inclined with respect to horizontal;

a rear wheel rotatably mounted to the heel portion of the boot and disposed to the outside thereof for rotation about a second axis inclined with respect to horizontal;

said front and rear wheels supporting the boot about a ground surface, said front and rear wheels contacting the ground surface along a line defining a roll axis that intersects the longitudinal center line.

Another aspect of the present invention provides a roller skate comprising:

a boot having a toe portion and a heel portion, both the toe and heel portions being generally bisected in plan view by a longitudinal center line of the boot defining an inside direction and an outside direction;

a front wheel rotatably mounted to the toe portion of the boot and disposed to the outside thereof for rotation about a first axis inclined with respect to horizontal;

a rear wheel rotatably mounted to the heel portion of the boot and disposed to the outside thereof for rotation about a second axis inclined with respect to horizontal;

wherein at least one of the first and second axes is at an oblique angle with respect to the centre line in plan view.

A further aspect of the present invention provides a roller skate comprising:

a boot having a toe portion, a ball portion and a heel portion;

a front axle mounted to the toe portion having a first axis inclined with respect to horizontal, said front axle disposed entirely forward of the ball portion;

a front wheel rotatably mounted on the front axle to an outside of the boot;

a rear axle mounted to the heel portion having a second axis inclined with respect to horizontal; and

a rear wheel rotatably mounted on the rear axle to the outside of the boot.

Another aspect of the present invention provides a roller skate comprising:

a boot having a sole, a toe portion, and a heel portion;

a front axle mounted to the toe portion having a first axis inclined with respect to horizontal, said front axle disposed entirely below the sole of the boot;

a front wheel rotatably mounted on the front axle to an outside of the boot;

a rear axle mounted to the heel portion having a second axis inclined with respect to horizontal; and

a rear wheel rotatably mounted on the rear axle to the outside of the boot.

A yet further aspect of the present invention provides a roller skate comprising:

a boot having a sole, a toe portion, and a heel portion;

a front axle mounted to the toe portion having a first axis inclined with respect to horizontal;

a front wheel rotatably mounted on the front axle to an outside of the boot;

a rear axle mounted to the heel portion having a second axis inclined with respect to horizontal, said rear axle disposed entirely about the sole of the boot; and

a rear wheel rotatably mounted on the rear axle to the outside of the boot.

In a preferred embodiment, the axle for the forward wheel is located well forward of the ball of the foot, approximately in line with the skater's toes. The axle for the rear wheel is located at the rear of the skater's heel. The wheels are canted so that the front wheel contacts the ground slightly outside of the center line of the skater's foot and the rear wheel contacts the ground slightly inside of the centre line. This contact geometry permits the use of a relatively small diameter front wheel and thereby allows the sole of the skate to be positioned close to the ground. In plan projection, the axles are preferably non-parallel in order to provide steering correction. The amount of steering correction desirable will depend on the skater's skill and the nature of the skating activity. In alternative embodiments, the present invention incorporates novel braking mechanisms.

With regard to limitations caused by the dished wheels proposed by Cudmore's design, preferred embodiments of the present invention overcome this disadvantage by positioning the wheels so that dishing is not necessary to achieve an acceptably low center of gravity.

Preferred embodiments of the present invention will now be described, by way of example only, with reference to the drawings as set out below.

Figure 1 is a perspective view of the roller skate constructed in accordance with a preferred embodiment of the present invention.

Figure 2 is a side elevational view of the roller skate of **Figure 1**.

Figure 3 is a partial bottom plan view of the roller skate of **Figure 1**.

Figure 4 is a partial front elevational view of the roller skate of **Figure 1**.

Figure 5 is a partial rear elevation view of the roller skate of **Figure 1**.

Figure 6 is a partial side elevation view of an alternative embodiment of the present invention illustrating a braking mechanism.

Figure 7 is a cross-sectional view taken along line 7-7 of **Figure 6**.

Figure 8 is a perspective view of another alternative embodiment of the present invention.

Figure 9 is a partial side elevational view of the roller skate of **Figure 8**.

Figure 10 is a side elevational view of yet another alternative embodiment of the present invention.

Figure 11 is a side elevational view of still another alternative embodiment of the present invention.

Figure 12 is a side elevational view of a further alternative embodiment of the present invention.

In the following description, for purposes of explanation and not limitation, specific details are set forth in order to provide a thorough understanding of the present invention. However, it will be apparent to one skilled in the art that the present invention may be practiced in other embodiments that depart from these specific details. In other instances, detailed descriptions of well-known methods and devices are omitted so as to not obscure the description of the present invention with unnecessary detail.

Figure 1 is a perspective view of a skate 10 constructed in accordance with a preferred embodiment of the present invention. Skate **10** comprises a boot **12** to which are attached a front wheel **14** and a rear wheel **16**. The front wheel **14** carries tire **15** and rear wheel **16** carries tire **17**. In a preferred embodiment, the outside diameter of front tire **15** is about five inches and that of rear tire **17** is about seven inches. The invention is not limited in this regard and other sized or equal-sized wheels/tires may be used. In some embodiments, such as illustrated in **Figure 12**, the front wheel/tire may have a larger diameter than the rear.

Skate **10** is intended for the right foot of the skater, thus wheels **14** and **16** are mounted to the outside of boot 12. It is to be understood that a corresponding skate is also provided for the left foot of the skater, which is generally a mirror image of skate **10**. As will be more apparent in the discussion that follows, wheels **14** and **16** are canted so that tires **15** and **17** contact the ground directly beneath boot **12** rather than to the outside thereof.

Boot **12** is generally constructed in the same manner as boots used with conventional in-line skates. Accordingly, details of boot **12** will not be discussed herein. Wheels **14** and **16** may be machined or cast using a suitable metal or plastic material. Tires **15** and **17** may be made of a natural or synthetic rubber material and may be solid, foam-filled or pneumatic. Tires **15** and **17** may also be made of urethane plastic as has become standard practice for in-line skate wheels.

Figure 2 is an inside elevation view of skate **10**. A sole plate or chassis **18** is attached to the bottom of boot **12** to provide structural support for wheels **14** and **16**. Alternatively, boot **12** and chassis **18** could be an integral structure. The axle supporting front wheel **14** is located well forward of the ball of the skater's foot, either

ahead of or in line with the skater's toes. The axle supporting rear wheel **16** is located generally below the skater's heel.

Referring now to **Figure 3**, chassis **18** is shown in bottom plan view. When projected in plan view, the axles of wheels **14** and **16** are generally perpendicular to the center line of the skate. It has been found, however, that superior skating performance is achieved with slight "toe-in" of the front wheel and/or "toe-out" of the rear wheel as indicated by the arrows in **Figure 3**. This provides a desirable steering correction to counteract the tendency of the skate to steer outwardly due to the offset geometry of the wheel-to-ground contact patches as described below. It has been determined that neutral handling (i.e., the situation where the skate tracks straight ahead while coasting) is best achieved with the rear wheel parallel to the skate center line and the front wheel toed in at about 2°.

For more experienced skaters, who desire power plus control and greater hill-climbing ability, a larger toe-in angle up to about 3° or 4° is preferred at the front wheel. This causes the left skate to steer slightly to the right and the right skate to steer slightly to the left and allows the skater to cover a greater distance with each push-off. The optimum configuration for all-around skating has been found to be a toe-out angle at the rear wheel of about 1-1.5° and an equal amount of toe-in angle at the front wheel.

Each skater, depending upon experience and the nature of the terrain to be traversed, may prefer a slightly different adjustment of wheel angles. Indeed, the desirable range of wheel angles extends from 0° to about 5°. Therefore, it may be useful to provide a manual adjustment for toe-in of the front wheel and/or toe-out of the rear wheel within this range.

Figures 4 and **5** are front and rear elevational views, respectively, of skate **10**. Projected in this plane, it can be seen that the axles of the front and rear wheels are substantially parallel. It is important to observe that front tire **15** contacts the ground to the outside of the center line of the skate, whereas rear tire **17** contacts the ground to the inside of the center line of the skate. The lateral offset of the front and rear contact patches is approximately equal at about 1/2 inch from the center line. In an alternative embodiment, such as that shown in **Figure 12**, the front contact patch may be inside of the center line and the rear contact patch to the outside of the center line. This would be the case particularly when the front wheel has a larger diameter than the rear wheel.

A line drawn through the front and rear contact patches defines the roll axis of the skate. Referring back to **Figure 3**, it can be seen that the roll axis is angled outwardly from the longitudinal center line of the skate. This geometry contributes to the stability of the skate at rest by distributing the skater's weight laterally with respect to the center line.

Figures 6 and **7** illustrate an optional braking mechanism for use with the present invention. Skate **30** includes rear wheel **32** and rear tire **33**. Wheel **32** includes an annular braking surface **34**. A lever **36** is pivotally connected to chassis **38** at pivot **40**. A relatively small diameter wheel **42** is mounted at the rear end of lever **36** and contacts the ground surface traversed by skate **30**. Alternatively, the rear end of lever **36** may have a simple skid for contacting the ground instead of wheel **42**.

The forward end of lever **36** operatively engages brake lever **44**, which is pivotally coupled to chassis **38** at pivot **46**. Brake shoe **48** is rigidly attached to brake lever **44** with rivets or other suitable fasteners. Brake lever **44** is biased away from braking surface **34** by means of spring **50**. To engage the brake while skating, the skater simply rotates the skate on which braking is desired about the axis of the rear wheel by shifting the skater's body weight. This causes lever **36** to rotate on pivot **40** and bear down on brake lever **44**. This, in turn, urges brake shoe **48** into contact with braking surface **34**. The amount of braking force applied is directly related to the amount by which skate **30** is rotated about the axis of rear wheel **32**. It should be noted that this braking mechanism also has a beneficial stabilizing effect on skate **30** since it inherently limits the amount by which the skate can rotate about the axis of the rear wheel and thus helps prevent the skater from falling backwards.

The braking system shown in **Figures 6** and **7** is not ideally suited to use on uneven terrain. An alternative braking system is illustrated in **Figure 8**. Here, brake actuation is effected by a pair of hand grips **60** coupled to respective skates **62**. Each of hand grips **60** communicates with its respective skate by means of cable **64**, which may be like a conventional bicycle brake cable for mechanical actuation of the brake. Alternatively, hand grips **60** may incorporate a hydraulic reservoir, in which case, hydraulic pressure is communicated through cable **64** to a hydraulic slave cylinder in skate **62**.

Figure 9 illustrates a hydraulic braking mechanism for skate **62**. Hydraulic cable **64** communicates with brake caliper **66**, which is rigidly mounted to chassis **68**.

Brake shoes (not shown) within caliper 66 exert a clamping force on brake disc 70 in a manner similar in operation to automotive disc brakes.

Figure 10 illustrates an alternative embodiment of the present invention. Skate 80 has a front wheel 82 similar to that of the previously discussed embodiments. However, rear wheel 84 is substantially larger in diameter, which is desirable for speed skating. In the illustrated embodiment, rear wheel 84 has a diameter of approximately 10 inches. To accommodate a wheel of this size, the axle is located behind the skater's heel, thereby obviating the need to elevate the skater's foot higher above the ground.

Figure 11 illustrates a further embodiment of the present invention that is a variation of the embodiment shown in Figure 10. Skate 90 has a large diameter rear wheel 94 as in the previously discussed embodiment. In this embodiment, however, front wheel 92 is located forward of the skater's toe, which is desirable for high speed skating. Front wheel 92 may have a fixed location on skate 90 or a manual adjustment may be provided so that the skater can locate the axle of the front wheel longitudinally at a desired position within a range of adjustment.

It will be recognized that the above described invention may be embodied in other specific forms without departing from the spirit or essential characteristics of the disclosure. Thus, it is understood that the invention is not to be limited by the foregoing illustrative details, but rather is to be defined by the appended claims.

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

The reference to any prior art in this specification is not, and should not be taken as, an acknowledgment or any form of suggestion that that prior art forms part of the common general knowledge in Australia.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A roller skate comprising:

a boot having a toe portion and a heel portion, both the toe and heel portions being generally bisected in plan view by a longitudinal center line of the boot defining an inside direction and an outside direction;

a front wheel rotatably mounted to the toe portion of the boot and disposed to the outside thereof for rotation about a first axis inclined with respect to horizontal;

a rear wheel rotatably mounted to the heel portion of the boot and disposed to the outside thereof for rotation about a second axis inclined with respect to horizontal;

said front and rear wheels supporting the boot above a ground surface, said front and rear wheels contacting the ground surface along a line defining a roll axis that intersects the longitudinal center line.

2. The roller skate of claim 1 wherein the rear wheel has an outside diameter larger than an outside diameter of the front wheel.

3. The roller skate of claim 2 wherein the outside diameter of the rear wheel is approximately seven inches and the outside diameter of the front wheel is approximately five inches.

4. The roller skate of claim 1 wherein the first and second axes are inclined approximately equally with respect to horizontal.

5. The roller skate of claim 1 wherein the first axis is at an oblique angle with respect to the center line in plan view.

6. The roller skate of claim 5 wherein the oblique angle is in the range of approximately 0.1° to 5°.

7. The roller skate of claim 6 wherein the oblique angle is adjustable.

8. The roller skate of claim 1 wherein the second axis is at an oblique angle with respect to the center line in plan view.

9. The roller skate of claim 8 wherein the oblique angle is in the range of approximately 0.1° to 5°.

10. The roller skate of claim 9 wherein the oblique angle is adjustable.

11. The roller skate of claim 1 wherein the front wheel is rotatably mounted on a front axle and said front axle is disposed entirely below a sole of the boot.

12. The roller skate of claim 1 wherein the first axis is located longitudinally forward of a ball portion of the boot.

13. The roller skate of claim 1 wherein the front wheel contacts the ground surface to the outside of the longitudinal center line and the rear wheel contacts the ground surface to the inside of the longitudinal center line.

14. The roller skate of claim 1 wherein the front wheel contacts the ground surface to the inside of the longitudinal center line and the rear wheel contacts the ground surface to the outside of the longitudinal center line.

15. The roller skate of claim 1 wherein the front wheel has an outside diameter larger than an outside diameter of the rear wheel.

16. A roller skate comprising:

a boot having a toe portion and a heel portion, both the toe and heel portions being generally bisected in plan view by a longitudinal center line of the boot defining an inside direction and an outside direction;

a front wheel rotatably mounted to the toe portion of the boot and disposed to the outside thereof for rotation about a first axis inclined with respect to horizontal;

a rear wheel rotatably mounted to the heel portion of the boot and disposed to the outside thereof for rotation about a second axis inclined with respect to horizontal;

wherein at least one of the first and second axes is at an oblique angle with respect to the center line in plan view.

17. The roller skate of claim 16 wherein the rear wheel has an outside diameter larger than an outside diameter of the front wheel.

18. The roller skate of claim 17 wherein the outside diameter of the rear wheel is approximately seven inches and the outside diameter of the front wheel is approximately five inches.

19. The roller skate of claim 16 wherein the first and second axes are inclined approximately equally with respect to horizontal.

20. The roller skate of claim 16 wherein said front and rear wheels support the boot above a ground surface, said front wheel contacting the ground surface to the outside of the longitudinal center line and said rear wheel contacting the ground surface to the inside of the longitudinal center line.

21. The roller skate of claim 16 wherein the front wheel is rotatably mounted on a front axle and said front axle is disposed entirely below a sole of the boot.

22. The roller skate of claim 16 wherein the first axis is at an oblique angle with respect to the center line in the range of approximately 0.1° to 5°.

23. The roller skate of claim 22 wherein the oblique angle is adjustable.

24. The roller skate of claim 16 wherein the second axis is at an oblique angle with respect to the center line in the range of approximately 0.1° to 5°.

25. The roller skate of claim 24 wherein the oblique angle is adjustable.

26. The roller skate of claim 16 wherein the first axis is located longitudinally forward of a ball portion of the boot.

27. A roller skate comprising:

a boot having a toe portion, a ball portion and a heel portion;

a front axle mounted to the toe portion having a first axis inclined with respect to horizontal, said front axle disposed entirely forward of the ball portion;

a front wheel rotatably mounted on the front axle to an outside of the boot;

a rear axle mounted to the heel portion having a second axis inclined with respect to horizontal; and

a rear wheel rotatably mounted on the rear axle to the outside of the boot.

28. A roller skate comprising:

a boot having a sole, a toe portion, and a heel portion;

a front axle mounted to the toe portion having a first axis inclined with respect to horizontal, said front axle disposed entirely below the sole of the boot;

a front wheel rotatably mounted on the front axle to an outside of the boot;

a rear axle mounted to the heel portion having a second axis inclined with respect to horizontal; and

a rear wheel rotatably mounted on the rear axle to the outside of the boot.

29. A roller skate comprising:

a boot having a sole, a toe portion, and a heel portion;

a front axle mounted to the toe portion having a first axis inclined with respect to horizontal;

a front wheel rotatably mounted on the front axle to an outside of the boot;

a rear axle mounted to the heel portion having a second axis inclined with respect to horizontal, said rear axle disposed entirely about the sole of the boot; and

a rear wheel rotatably mounted on the rear axle to the outside of the boot.

30. The roller skate of claim 1 wherein the roll axis is angled outwardly in a forward direction from the longitudinal center line.

31. The roller skate of claim 1, wherein the front and rear wheels contact the ground surface on opposite sides of the longitudinal center line.

32. A roller skate, substantially as described, with reference to the drawings and/or examples.

DATED this 22nd day of February, 2002

Land Roller, Inc.

By DAVIES COLLISON CAVE
Patent Attorneys for the Applicant

FIG. 1

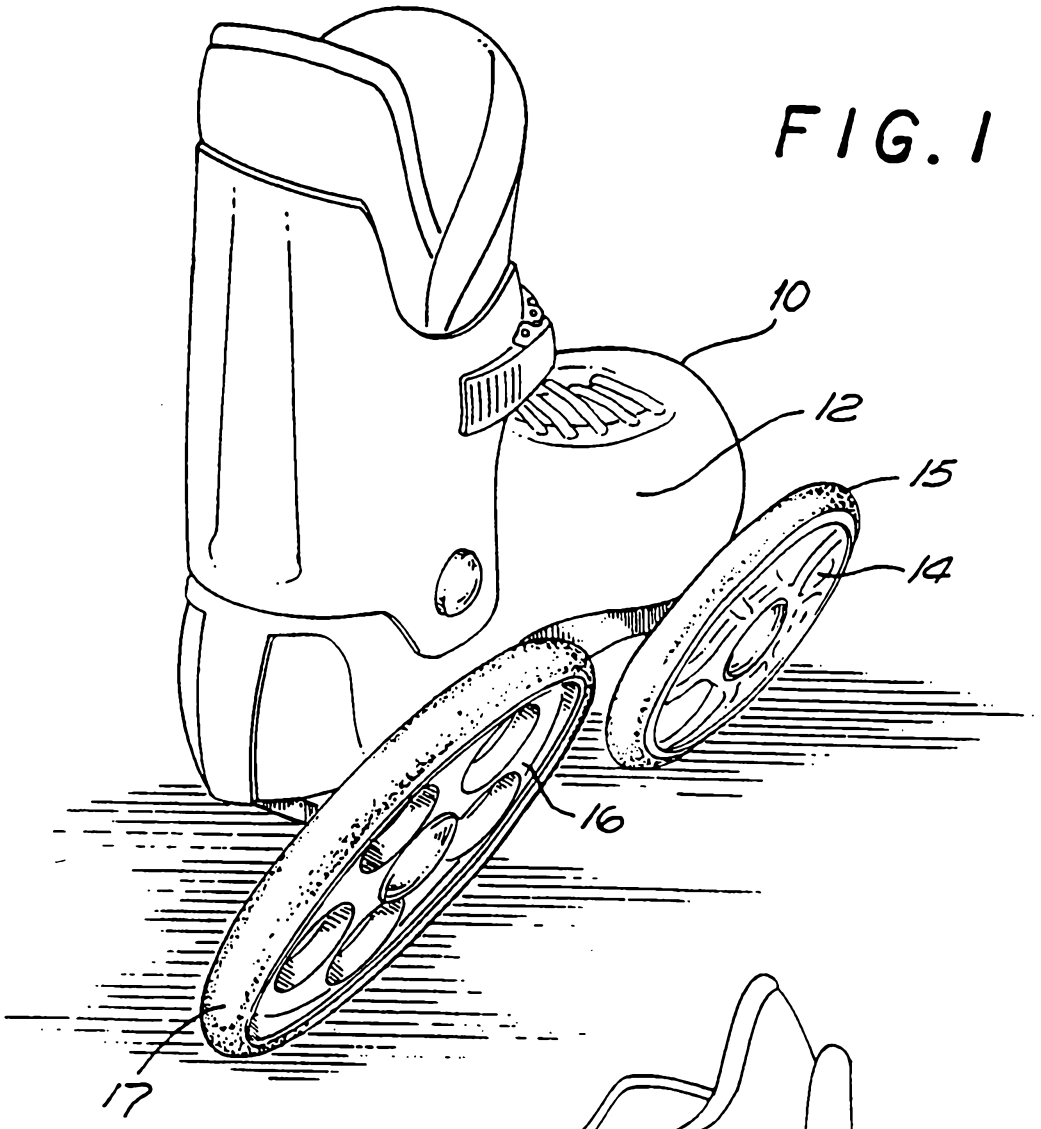
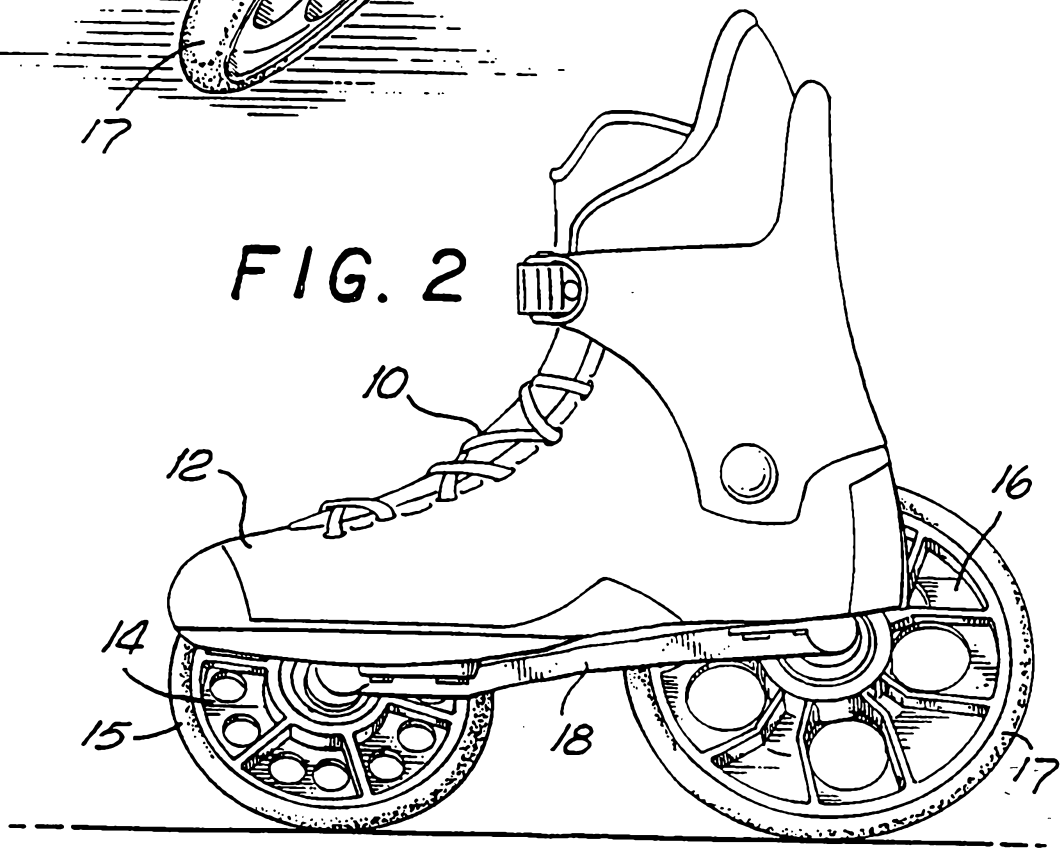


FIG. 2



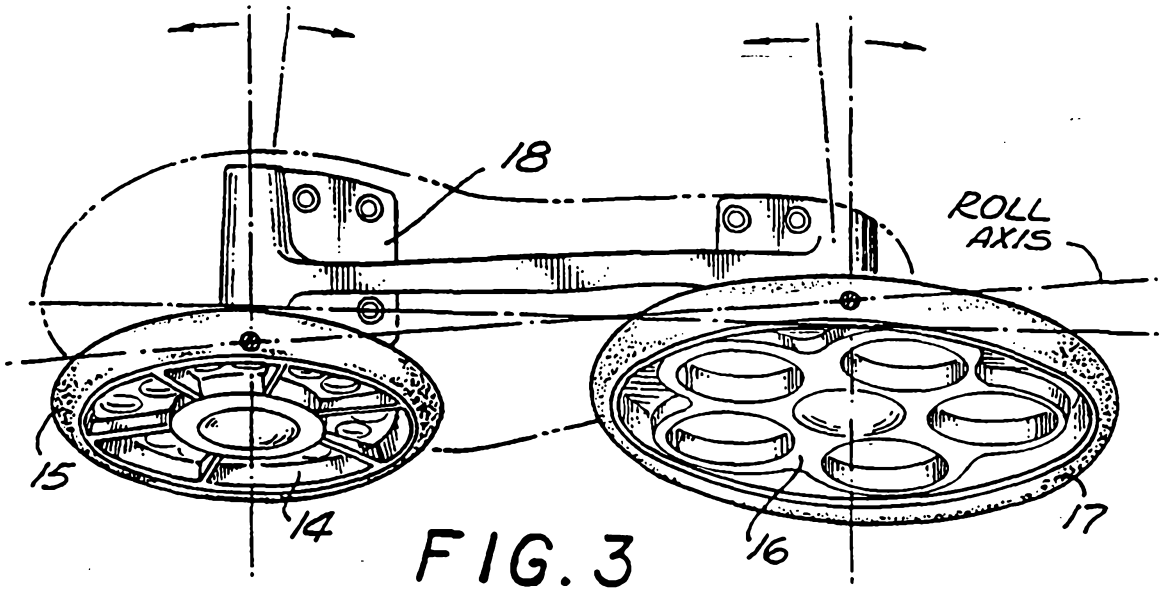


FIG. 3

FIG. 4

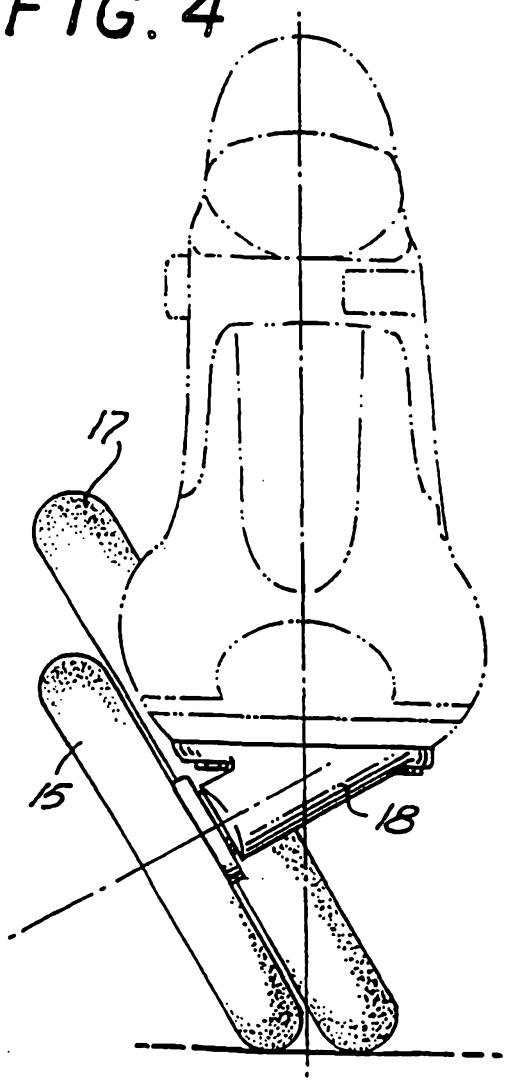
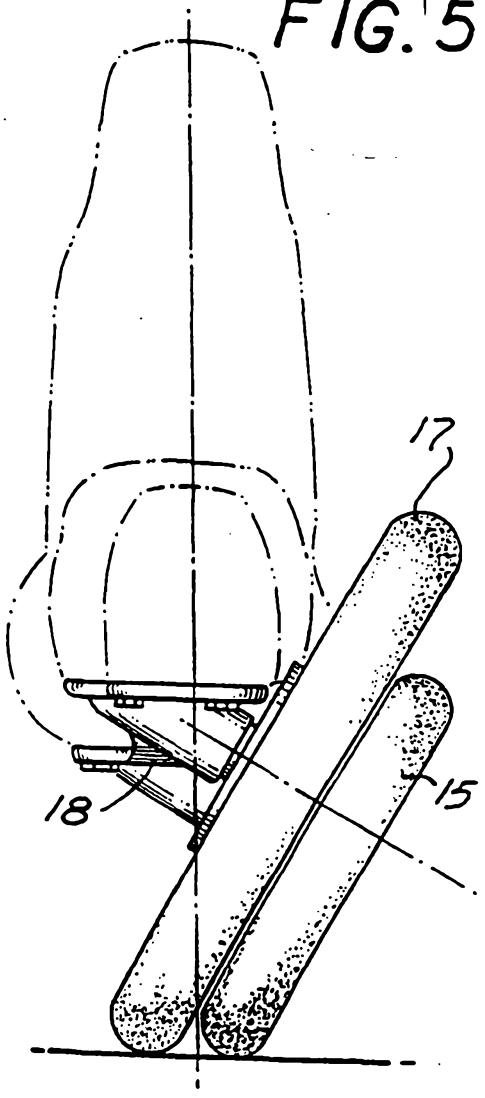


FIG. 5



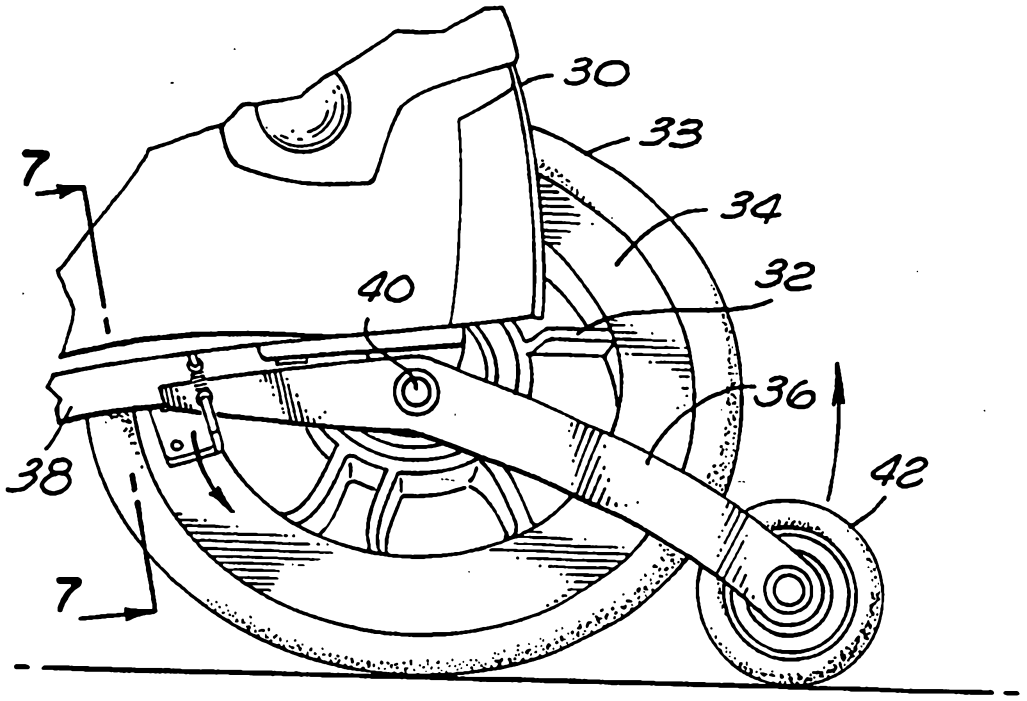


FIG. 6

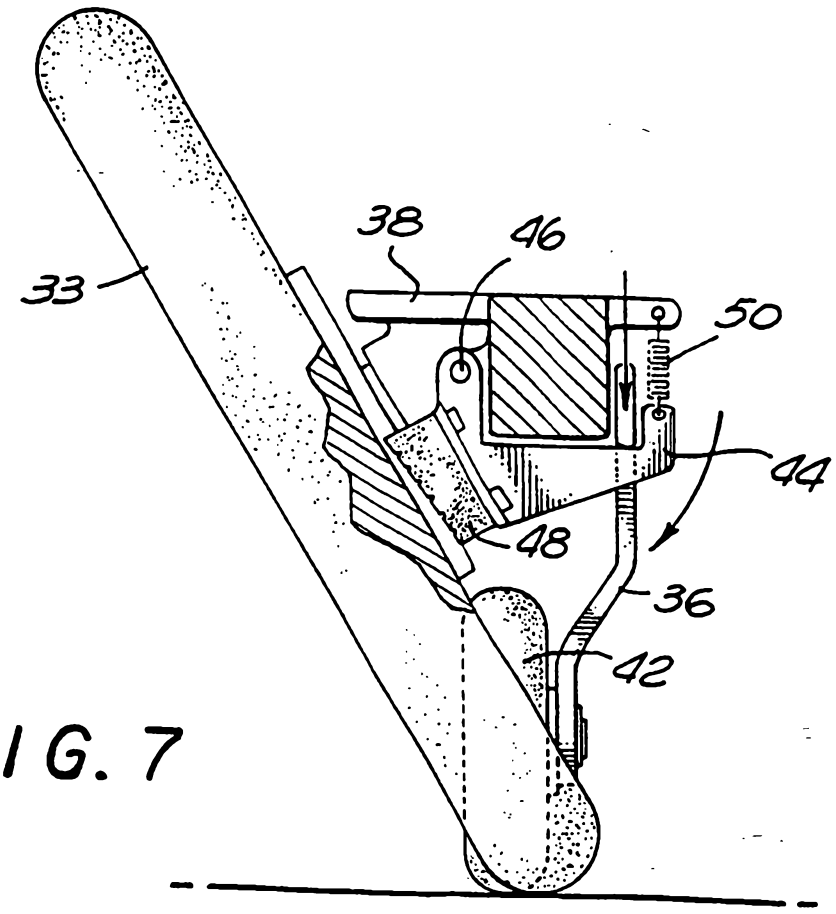


FIG. 7

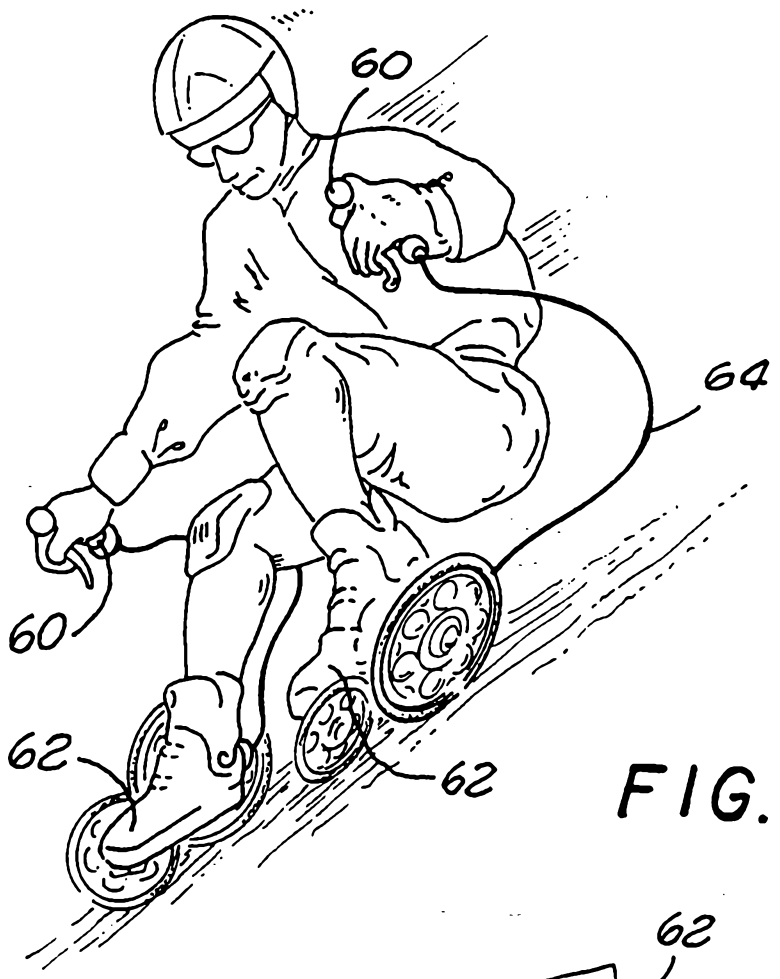


FIG. 8

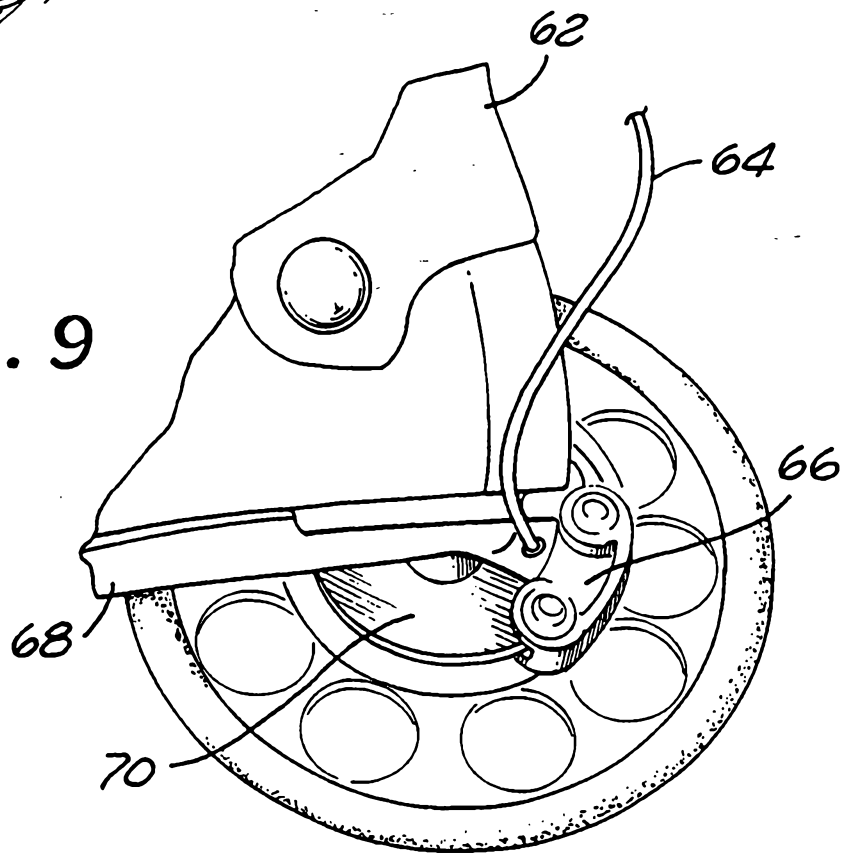


FIG. 9

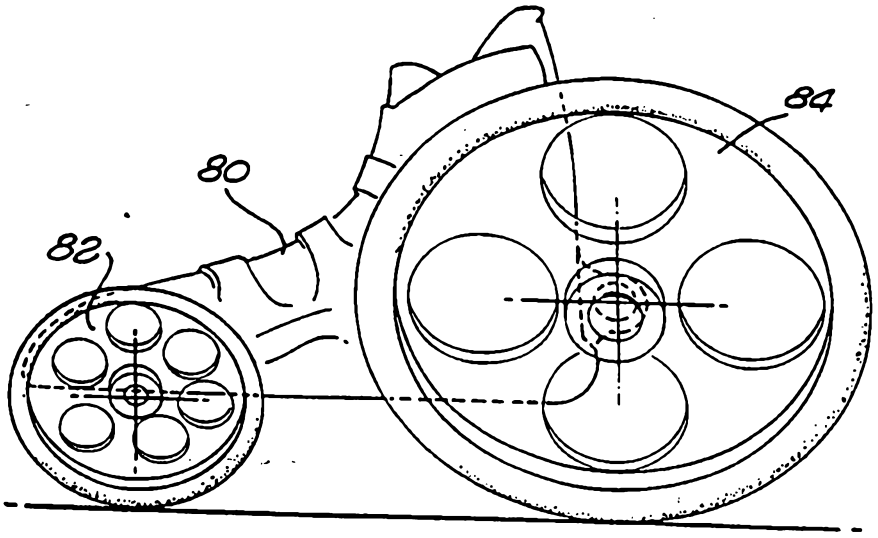


FIG. 10

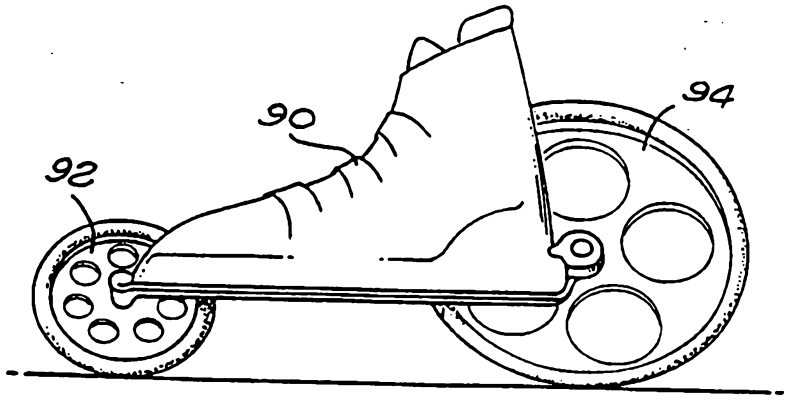


FIG. 11

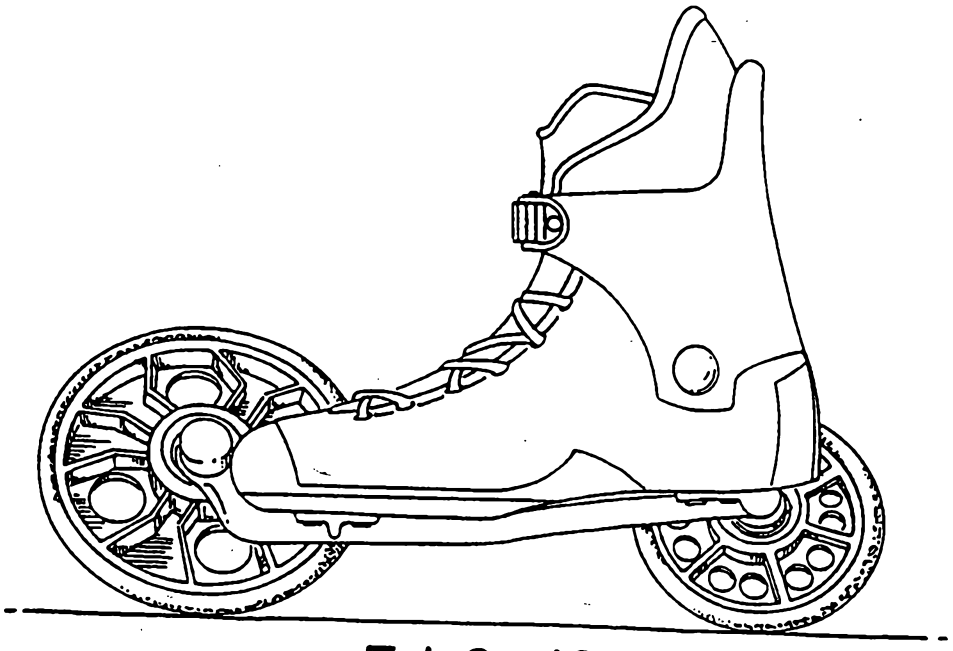


FIG. 12