United States Patent [19]

Cudmore

[11] **3,885,804**

[45] **May 27, 1975**

[54] **ROLLER SKATE**

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[22] Filed: **June 13, 1973**

[21] Appl. No.: **369,759**

[52] **U.S. Cl.** **280/11.2;** 280/11.23

[51] **Int. Cl.** **A63c 17/14**

[58] **Field of Search** ..... 280/11.1 R, 11.25, 11.23, 280/11.2, 11.3, 11.24

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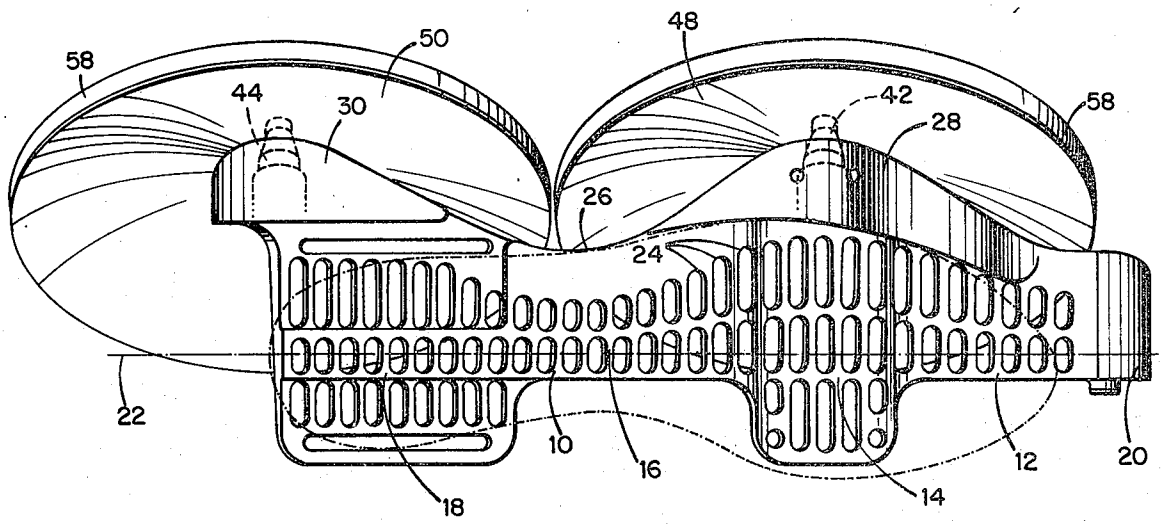
Primary Examiner—Philip Goodman

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[57] **ABSTRACT**

A roller skate having a sole plate, a boot and two large canted equal sized wheels mounted on axles extending outwardly from the sole plate. 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 and a portion of the sole plate extends into the wheel concavities to permit the sole plate to be positioned very close to the ground.

12 Claims, 4 Drawing Figures



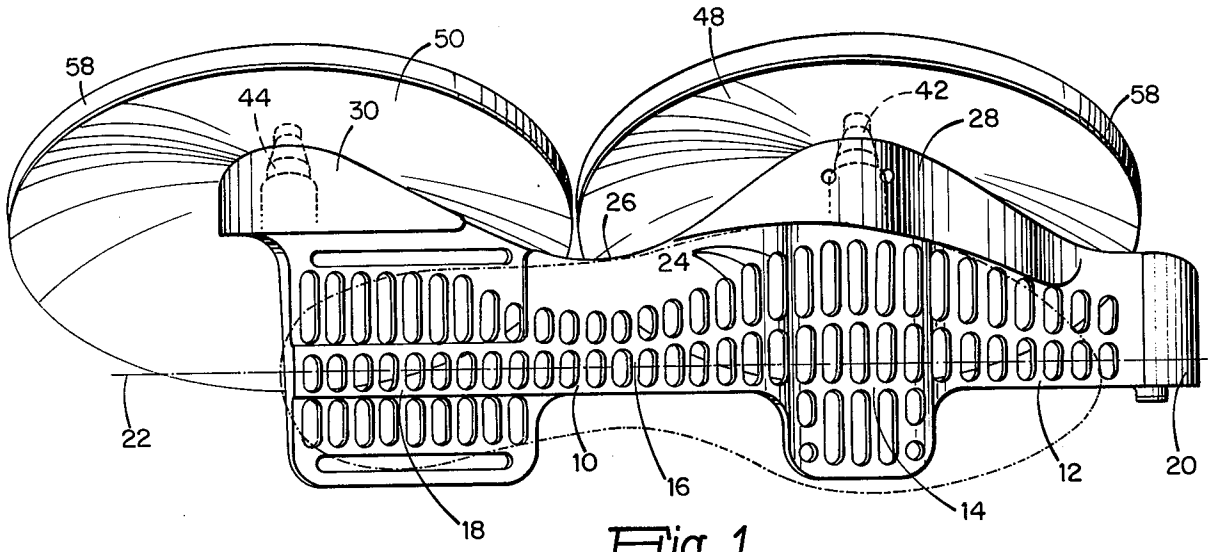


Fig. 1.

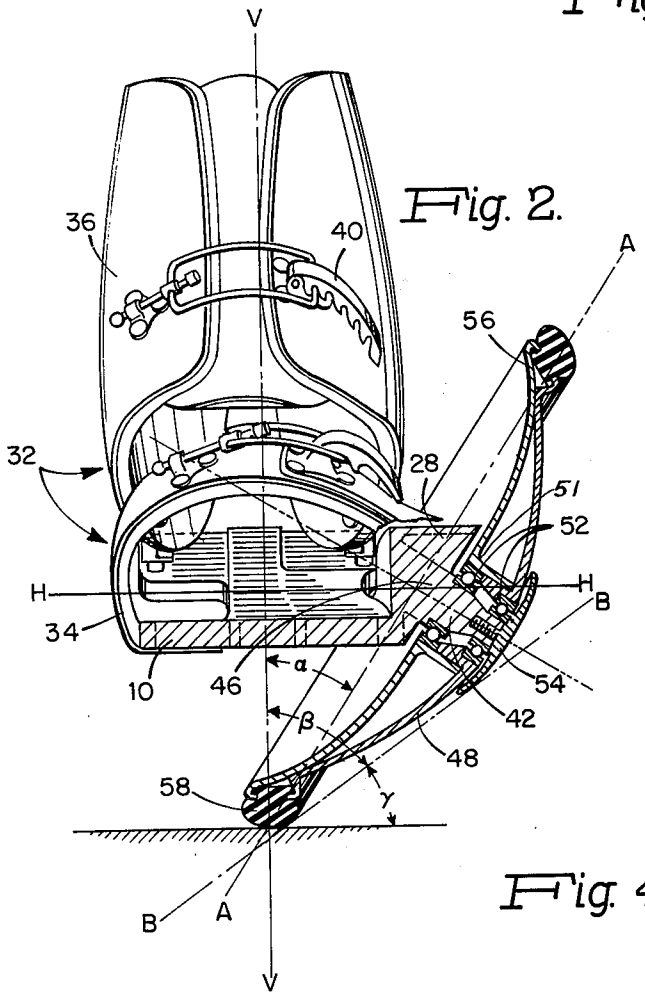


Fig. 2.

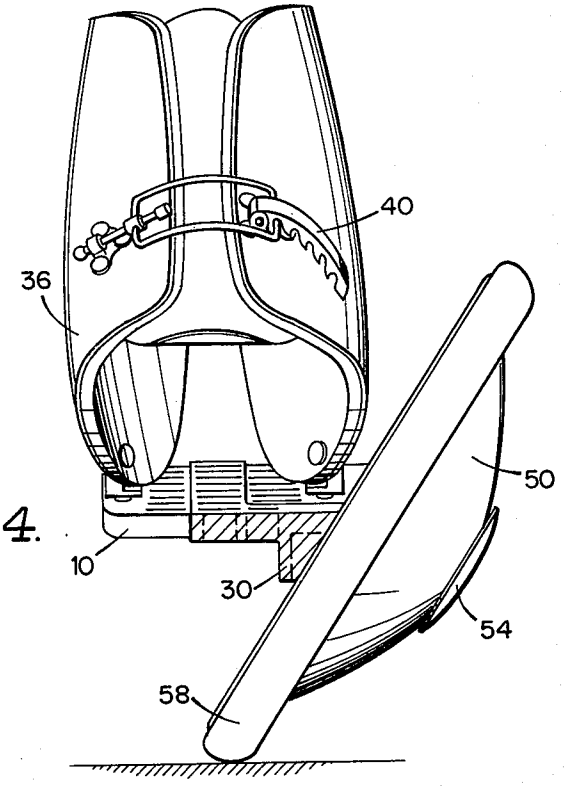


Fig. 4.

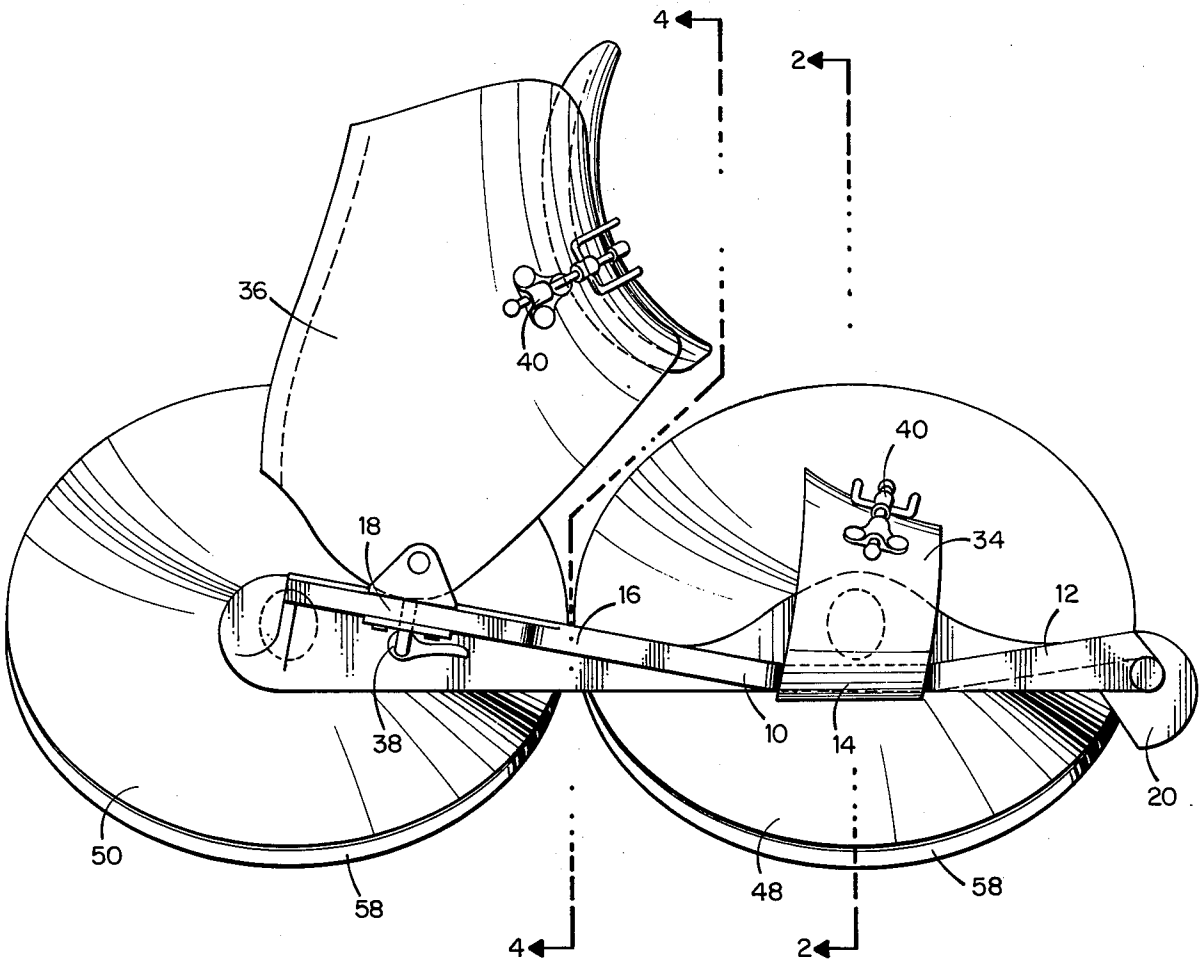


Fig. 3.

ROLLER SKATE

BACKGROUND OF THIS INVENTION

In the past, there have been many attempts to construct a roller skate which has a pair of large wheels mounted outboard of the sole plate. The advantages of such an arrangement over the conventional four wheeled roller skate include (a) sharper turns can be made; (b) higher speeds can be attained; (c) fewer shocks are transmitted to the skater's legs; and (d) skating can be done on surfaces which are not perfectly smooth.

However, one problem which has not previously been solved is how to construct such a roller skate which does not produce undue strain on and discomfort to the skater's ankle. Also, another problem is how to construct such a roller skate which is stable and which does not have a pronounced tendency to tip to either side. It is the object of this invention to solve these problems.

SUMMARY OF THE INVENTION

The roller skate of this invention has several unusual features which cooperate to produce superior skating characteristics while providing comfort to the skater's feet and legs. The skate has a sole plate and an attached boot or other foot engaging means to grip the skater's foot. Two axles extend to the outside of the sole plate and are angled downwardly. Two equal sized wheels are mounted on the axles and are canted so that their tires roll on the ground vertically beneath the center line of the sole plate. This ensures that there is no strain applied to the skater's ankle under normal conditions.

Furthermore, the sole plate is positioned as close to the ground as possible. In the preferred embodiment, this is accomplished by dishing the wheels with their concave sides facing inwardly toward the sole plate. The sole plate is mounted so that it extends into the concave front wheel and, optionally, into the rear wheel as well. This permits the sole plate to be located in an extremely low position.

Thus, when the skater's ankles are straight, there is virtually no lateral strain applied to them. Also, when the skater bends his ankles during skating turns, because the sole plate is so low the torque forces applied to the ankles are likewise low.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of the left roller skate of this invention showing the sole plate and wheels, the boot being removed for purposes of clarity.

FIG. 2 is a sectional view taken along line 2—2 of FIG. 3, the lower portion of the boot being shown in full.

FIG. 3 is a side elevational view taken from the inner side of the roller skate. The skater's foot or shoe is shown in dotted.

FIG. 4 is a sectional view taken along line 4—4 of FIG. 3, the rear portion of the boot being shown in full.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, FIG. 3 shows the left roller skate which is a mirror image of the right roller skate. For that reason, only the shown left skate need be described in this application.

The roller skate has a sole plate **10** which is substantially horizontal. This means that it may be precisely horizontal, or it may be somewhat raised in the heel portion as shown in FIG. **3**, or it may be slightly angled otherwise to comply with other design criteria.

The sole plate, as viewed from above in FIG. **1**, has a shape suitable to support the skater's left shoe or foot (shown in dotted). In the shown preferred embodiment, it will be assumed that the skater is wearing sneakers. The sole plate **10** has a toe portion **12**, a wide ball portion **14**, a narrow arch portion **16**, and a heel portion **18**. Attached to the front tip of the sole plate toe portion is a rubber toe stop **20** which is useful as in aid in stopping, starting, and executing abrupt maneuvers. An imaginary sole plate center line **22** runs front to rear or longitudinally. In order to lighten the sole plate without sacrificing its rigidity, perforations **24** are cut in a regular pattern throughout the sole plate.

Sole plate **10** has an outer margin **26** which runs along the outer edge of the sole plate. Outer margin **26** has considerable size and strength and serves three functions. First, it strengthens the sole plate itself against bending or twisting. Second, it provides an outer wall to restrain at least the outside of the ball of the shoe or boot. Third, and most important, it forms the foundation in which the two axles (to be described later) are rigidly mounted. In the shown preferred embodiment, the outer margin **26** extends upwardly in the sole plate ball portion **14** and extends downwardly in the sole plate heel portion **18**. This can be appreciated by comparing ball portion margin **28** in FIG. **2** with heel portion margin **30** in FIG. **4**.

In order to skate with the roller skates, the skater must first affix the skates to his shoes or feet. This can be accomplished in many conventional ways, such as with straps running around the skater's shoes or with skate-held boots which the skater wears on his feet. In the preferred embodiment, semiboots **32** are employed to grip the skater's sneakers. FIG. **3** shows a front gripper **34** which is applied across the ball of the foot and also shows a rear gripper **36** which is applied around the ankle. Front gripper **34** is fixed to the sole plate to lock the ball of the foot in a single longitudinal position relative to the front wheel axle, as shown in FIG. **1**. In contrast, rear gripper **36** is provided with cam means **38** which cooperates with the sole plate to adjustably position rear gripper **36** along the sole plate to accommodate various shoe sizes.

The semi-boot **32** has conventional closure means in the manner of ski boot clasps **40**. The shown clasps are adjustable so as to regulate snugness. It will be understood that the shown semi-boot is simply one form of foot engaging means which is attached to the sole plate and which is adapted to grip and securely maintain the skater's foot or shoe against the upper surface of the sole plate.

As previously mentioned, a pair of identical axles are mounted on the sole plate. Front axle **42** is mounted in the ball portion **28** of outer margin **26**, and rear axle **44** is mounted in the heel portion **30** of outer margin **26**. Referring to FIG. **2**, it will be seen that each axle has a shaft **46** which is firmly anchored at its upper and inner end in outer margin **26**. The shaft is shaped at its lower and outer end to carry a ball bearing assembly which will be described subsequently. Both axles are mounted so that they extend outwardly and downwardly at an angle of approximately 30° to 33° relative

to the horizontal, and both axles are parallel to each other.

The roller skate is provided with two equal-sized wheels. Front wheel **48** and rear wheel **50** are preferably approximately 8 inches in diameter and have a hub **51** into which a ball bearing assembly **52** is press-fit. The wheels are mounted on axles **42** and **44** by means of a retaining bolt **54,** as shown in FIG. **2,** so that the wheels can rotate freely in either direction on their ball bearings. However, it should be understood that a less expensive roller skate construction utilizing this invention could substitute another type of bearing arrangement and still achieve satisfactory results.

The identical wheels are dished, as can best be seen in FIG. **2,** each with its concave side facing inwardly. Each wheel has a peripheral rim **56** which is preferably offset at an angle to the plane of the wheel periphery. Tires **58** (made of hard rubber or other similar material) are mounted on rims **56** and, because of the canted offset rims, roll squarely on the ground.

It should be understood that the provision of dished wheels is highly desirable to the efficient functioning of this invention, although not absolutely mandatory. Dished wheels permit the wheels to be mounted in a more upright position which significantly reduces the amount of torque applied to the ball bearing assemblies. High torque causes friction and binding whereas low torque causes smooth running of the bearings. Dished wheels also produce a roller skate which has a narrower front profile. This is a desirable feature because it reduces the likelihood of catching the wheels on obstacles to the side. Finally, dished wheels, which are more upright, roll more easily and with less friction than severely canted wheels which roll on their sides.

Referring to FIG. **2,** it will be seen that tire **58** contacts the ground directly under the center line of sole plate **10.** This is shown by vertical line V—V. Also, line A—A has been drawn through the plane of tire **58** and line B—B has been drawn from tire **58** tangent to the outermost portion of wheel **48.**

A design limitation of the roller skate of this invention relates to the fact that as the skater turns, his inside skate leans in the direction of the turn. As the turn becomes sharper, the inside skate leans further. At some lean angle, the skate can lean no further because the retaining bolt will contact the ground and the tire will rise up off of the ground causing all traction to be lost. The skate will then slide out from under the skater and the skater will fall. Ideally, the skater should be able to lean his skates as much as he desires, but in skates having outboard wheels this is not possible. It will be seen in FIG. **2** that the preferred embodiment can lean through an angle γ or approximately 36° before all traction is lost. Actually, effective traction is lost at a slightly smaller angle. Obviously, the more upright the wheel is (i.e. the greater angle γ is), the more the skate can be leaned into a turn. This permits increasingly sharp turns to be taken.

However, as the wheel is mounted in an increasingly upright position to maximize the permissible angle of lean, another design criterion comes into play. This design criterion is the desire to locate the sole plate as close to the ground as possible to reduce lateral strain on the skater's ankle which occurs when the ankle is being bent or being straightened. Lateral ankle strain is caused by the torque moment which is the product of the horizontal force component times the vertical distance between the applied force and the pivot. Obviously, if the vertical distance is reduced by shortening the distance between the sole plate and the ground, the torque produced by any given horizontal force component will be proportionately reduced. Therefore, if the sole plate is located quite close to the ground, it is easy for the skater to bend and straighten his ankles. But, if the sole plate is located quite high off of the ground, it is difficult and even painful for the skater to bend and straighten his ankles.

In accommodating these two design criteria, i.e. upright wheels and a low sole plate, it was found that they were in substantial opposition. That is, in order for the center line of the sole plate to be positioned vertically over the tireground contact point, the height of the sole plate above the ground increased as the wheels became more upright. Therefore, to lower the position of the sole plate, the wheels had to be canted more. But this reduced the permissible lean angle.

The preferred embodiment is not merely a compromise solution, but actually accomplishes the chief objectives of both design criteria by dishing the wheels. That is, the dished wheel has all of the narrow profile, improved bearing operation, and reduced rolling friction advantages of an upright flat wheel lying in the plane of line A—A. Also, the dished wheel has all of the low sole plate advantages of a more steeply angled flat wheel lying in the plane of line B—B. In other words, the dished wheel combines the advantages of an upright flat wheel which is canted at an angle α or 33°, and a more steeply angled flat wheel which is canted at an angle β or 54°.

In order to lower the sole plate location in the dished wheel, the sole plate outer margin **26,** and specifically ball portion margin **28,** are dropped into the concavity below the level of the plane of the front wheel tire **58,** as shown in FIG. **2.** It can be seen that if front wheel **48** were flat (i.e. in the plane of line A—A), instead of being dished, sole plate **10** could not be mounted as low as it is in FIG. **2.** This is the advantage of the dished wheel configuration. It is a feature of this invention that sole plate **10,** in the ball portion especially, is mounted below the level of the point of intersection of the axis of the front wheel axle **42** with the plane A—A of the front wheel tire **58,** which is indicated by horizontal line H—H. Furthermore, the sole plate upper surface has portions which are spaced above the ground a distance which is less than 40% of the wheel diameter.

Several other features of the sole plate will now be described. Referring to FIG. **1,** sole plate **10** will be seen to have a width which beginning at the front or toe is first narrow, then wide, then narrow, and finally wide. This configuration, which is shaped on the wheel side by outer margin **26,** permits the tires of the dished wheels to rotate very closely to each other adjacent to the narrow arch portion margin **16** of the sole plate. It also permits the skater's shoe itself (as well as ball portion margin **28**) to be accommodated within the concavity of dished front wheel **48.** Finally, the sole plate preferably has a raised rear portion which corresponds to the high heel of a figure skate used on ice. This high heel feature enables the skater to perform more graceful maneuvers than he could without it.

In use, the skate of this invention can be used on many surfaces and combines many of the best features of both ice skates and conventional roller skates. It can be manufactured in expensive sophisticated versions or

in inexpensive simple versions. It is believed to be a marked improvement over previous efforts to design and construct a comfortable roller skate which is also a high performance roller skate.

The above description obviously suggests many possible variations and modifications of this invention which would not depart from its spirit and scope. It should be understood, therefore, that the invention is not limited in its application to the details of structure specifically described or illustrated and that within the scope of the appended claims, it may be practiced otherwise than as specifically described or illustrated.

I claim:

1. A roller skate comprising:

a. a sole plate having a ball portion and a heel portion on its upper surface to accommodate the corresponding parts of a skater's foot or shoe thereon, said sole plate having rigid front and rear axle mount portions along its outer margin at locations laterally aligned with said sole plate ball and heel portions, respectively;

b. foot engaging means affixed to said sole plate for gripping and securely maintaining the skater's foot or shoe against the upper surface of said sole plate;

c. a front axle and a rear axle mounted in and extending downwardly from said front and rear axle mount portions, respectively, said axles being parallel to each other and being angled downwardly in excess of 28° with respect to the horizontal;

d. a front wheel and an equal diameter rear wheel mounted for rotation on the outer ends of said front axle and said rear axle, respectively, said wheels having ground contacting points positioned vertically beneath the approximate front to rear center line of said sole plate; and

e. a toe stop mounted on the front end of said sole plate, said top stop extending forward of said front wheel periphery;

f. the point of intersection of the axis of said front wheel axle with the plane of said front wheel periphery being located in a horizontal plane which is above the upper surface of said sole plate ball portion;

g. the point of intersection of the axis of said rear wheel axle with the plane of said rear wheel periphery being located in a horizontal plane which is below the upper surface of said sole plate heel portion;

h. said front wheel periphery and said rear wheel periphery being spaced apart at their points of closest proximity by a distance which is less than 10% of the combined diameters of said wheels.

2. The roller skate of claim 1 wherein said front wheel is dished toward said sole plate, said sole plate outer margin extending into the concave dished portion of said front wheel.

3. The roller skate of claim 2 wherein the lateral horizontal distance between the sole plate center line and said outer margin is greater across said sole plate ball portion and across said sole plate heel portion than is the lateral horizontal distance between the sole plate center line and said outer margin across the sole plate arch portion.

4. The roller skate of claim 3 wherein said rear wheel is dished in the identical shape of said front wheel.

5. The roller skate of claim 1 wherein said foot engaging means is adjustably affixed to said sole plate to permit adjustment thereof to accommodate differing foot or shoe sizes.

6. The roller skate of claim 1 wherein said sole plate upper surface has portions thereof which are spaced a distance above the ground which is less than 40% of the diameter of said wheels.

7. The roller skate of claim 1 wherein said sole plate upper surface has portions thereof which are spaced a distance above the ground which is less than the greatest width of said sole plate.

8. The roller skate of claim 1 wherein tires are mounted on said wheels at an angle which is the same as the angle which said wheels form with the vertical, said tires rolling squarely on the ground.

9. The roller skate of claim 1 wherein said sole plate is a one piece integral structure having sufficient strength to accommodate the applied static and dynamic loadings.

10. The roller skate of claim 1 wherein said foot engaging means acts to position and continuously urge the skater's foot or shoe against said sole plate outer margin.

11. The roller skate of claim 2 wherein the skater's foot or shoe extends into the concave dished portion of said front wheel.

12. The roller skate of claim 2 wherein the plane of said front wheel periphery forms an angle within the range of 30° to 33° relative to the vertical.

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