US005984328A

United States Patent [19]

Tipton

[11] Patent Number: 5,984,328

[45] Date of Patent: *Nov. 16, 1999

[54] **TWO-WHEELED SKATEBOARD**

[76] Inventor: **David W. Tipton**, 1668 D. St., Andrews Air Force Base, Md. 20762-2145

[*] Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

[21] Appl. No.: **08/637,532**

[22] Filed: **Apr. 25, 1996**

[51] **Int. Cl.**[6] **A63G 17/04**

[52] **U.S. Cl.** **280/87.042**; 280/842; 280/7.14

[58] **Field of Search** 280/87.021, 87.041, 280/87.042, 11.23, 842, 7.12, 7.13, 7.14, 10, 11.28; 16/20, 23

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,203,706	8/1965	Boyden	280/87.041
3,283,358	11/1966	Merriam	16/20
4,460,187	7/1984	Shimizu	280/842
4,521,029	6/1985	Mayes	280/87.042
4,861,054	8/1989	Spital	280/87.042
5,125,687	6/1992	Hwang	280/842
5,183,277	2/1993	Tang	280/11.28
5,312,120	5/1994	Wiegner	280/11.28
5,397,138	3/1995	Mangelsdorf	280/11.28
5,544,919	8/1996	Tinkler	280/87.042

FOREIGN PATENT DOCUMENTS

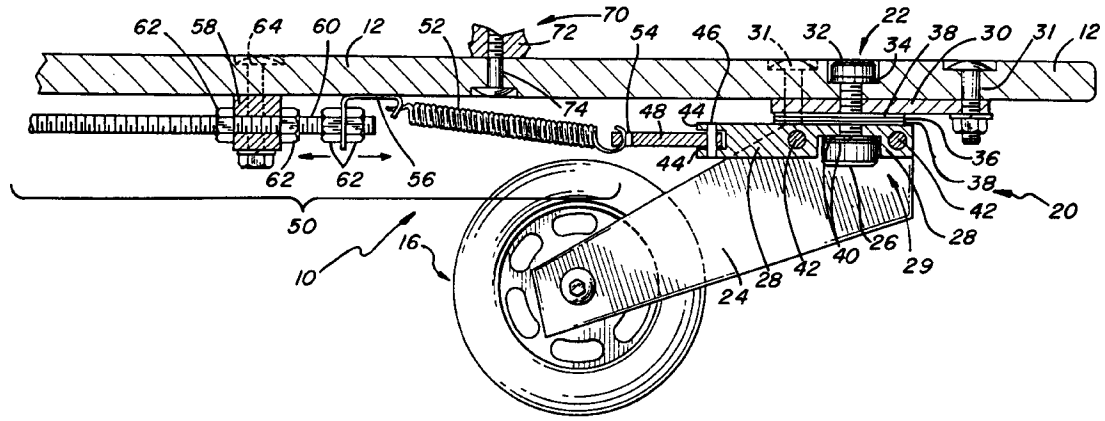
2420984	11/1979	France	280/7.13

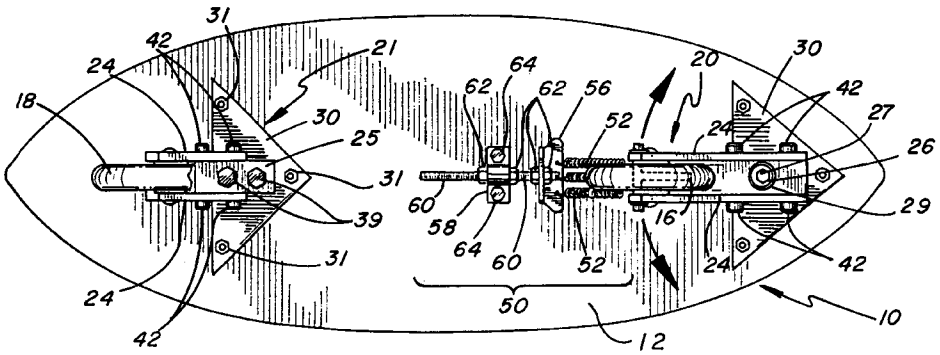
Primary Examiner—J. J. Swann
Assistant Examiner—Frank Vanaman

[57] **ABSTRACT**

A two-wheeled skateboard includes a board which is generally planar between a first position and a second position. A front wheel assembly is attached to the board at the first position and consists of a single front wheel. The front wheel assembly includes a front wheel support connected to the front wheel, a tension member connected to the wheel support and connected to the board at a connected position between the first position and the second position, and a rear wheel assembly attached to the board at the second load bearing position consisting of a single rear wheel. A clevis is connected to the tension member by a first clevis axis and connected to the wheel support by a second clevis axis such that a restoring tension is applied to the front wheel towards a longitudinal axis of the board through the first and second clevis axis while the front wheel assembly pivots with respect to the board. An adjustable member is connected to the elastic tension member and the board such that the amount of force exerted by the tension member on the front wheel support may be increased or decreased through adjustment thereof. The skateboard may optionally provide attachment for a blade assembly and a ski assembly.

29 Claims, 6 Drawing Sheets





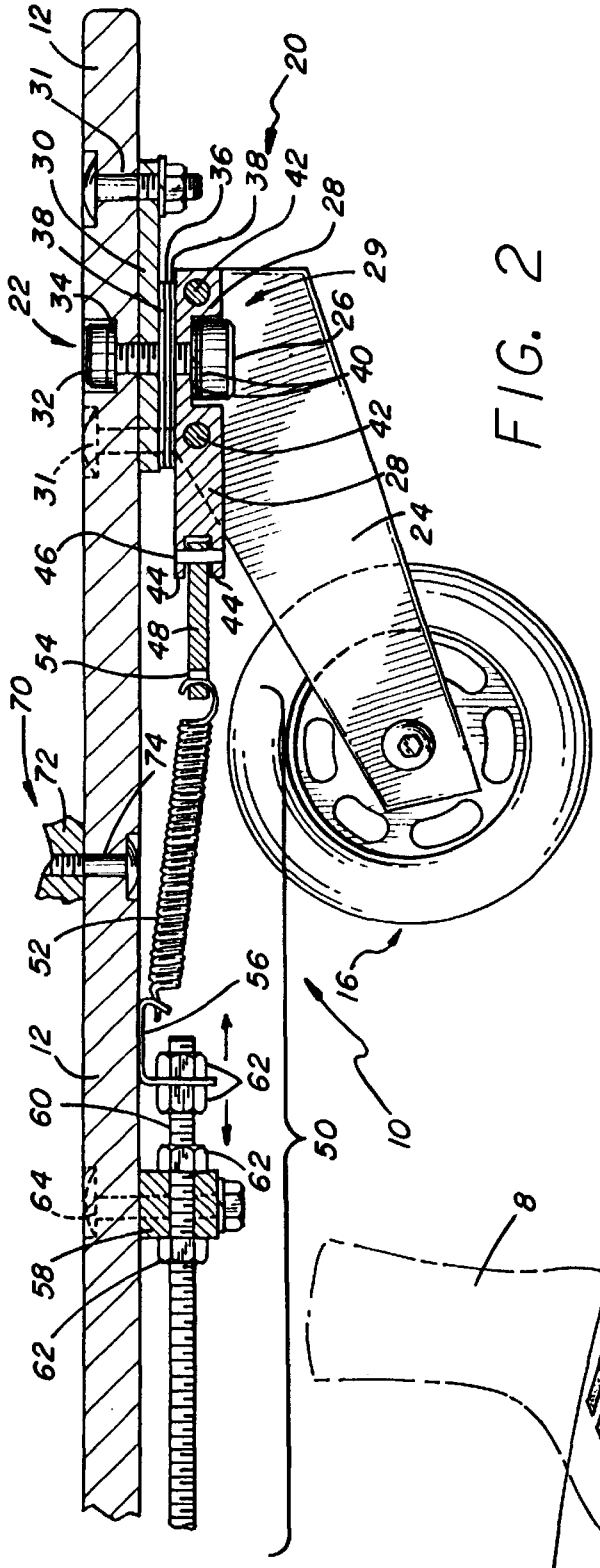

12
31
30
38
22
34
32
31
46
54
70
72
74
52
56
12
60
64
58
62
62
62
50
16
10
20
36
38
42
28
29
26
40
42
28
24
44
44
48

FIG. 2

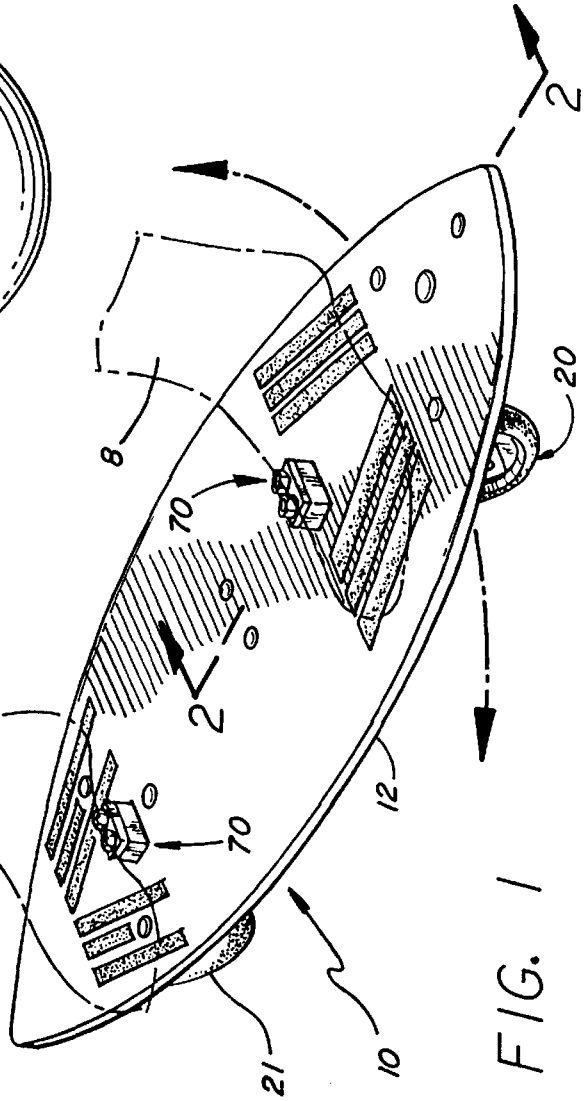

2
20
8
70
2
70
12
70
21
10

FIG. 1

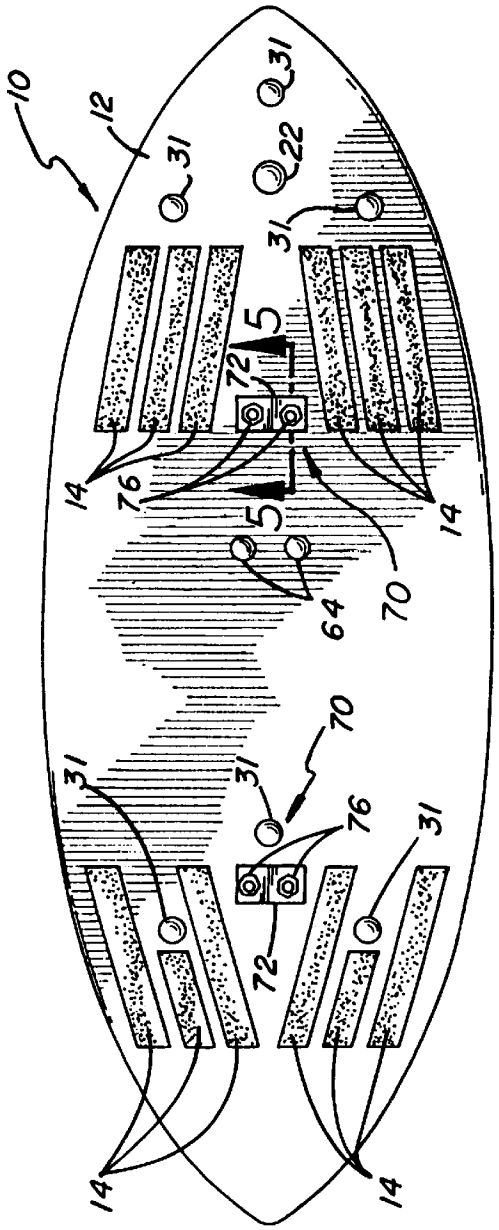


FIG. 3

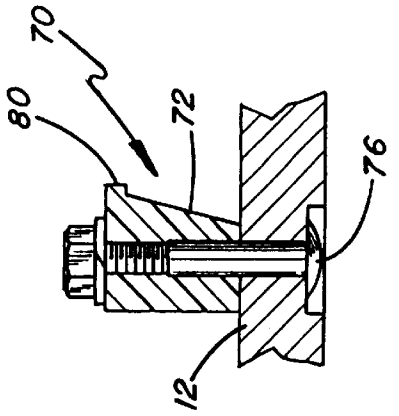


FIG. 5

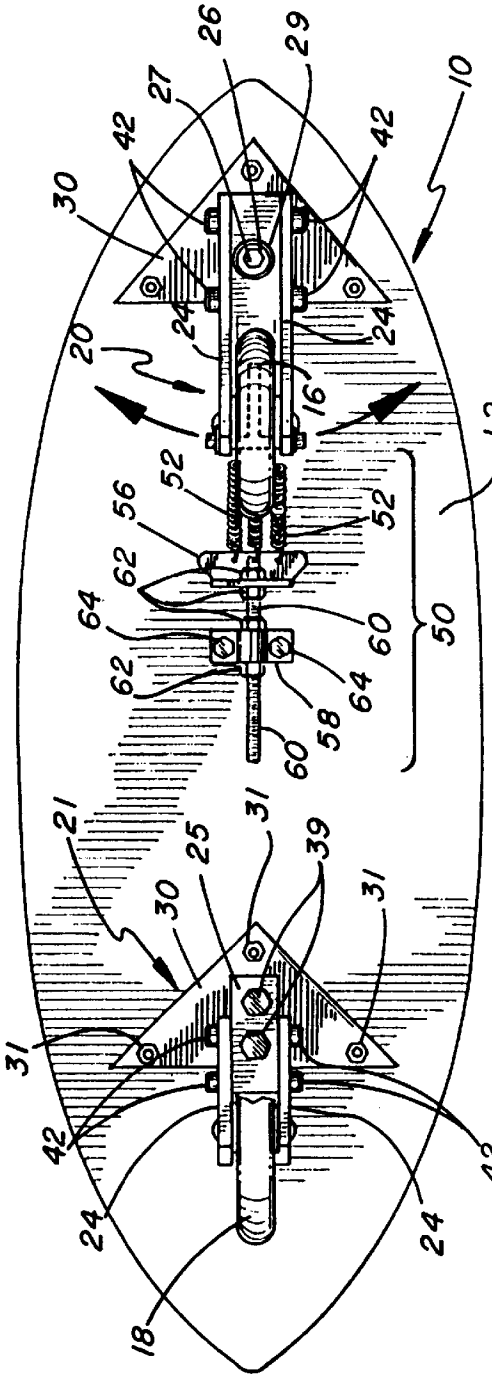


FIG. 4

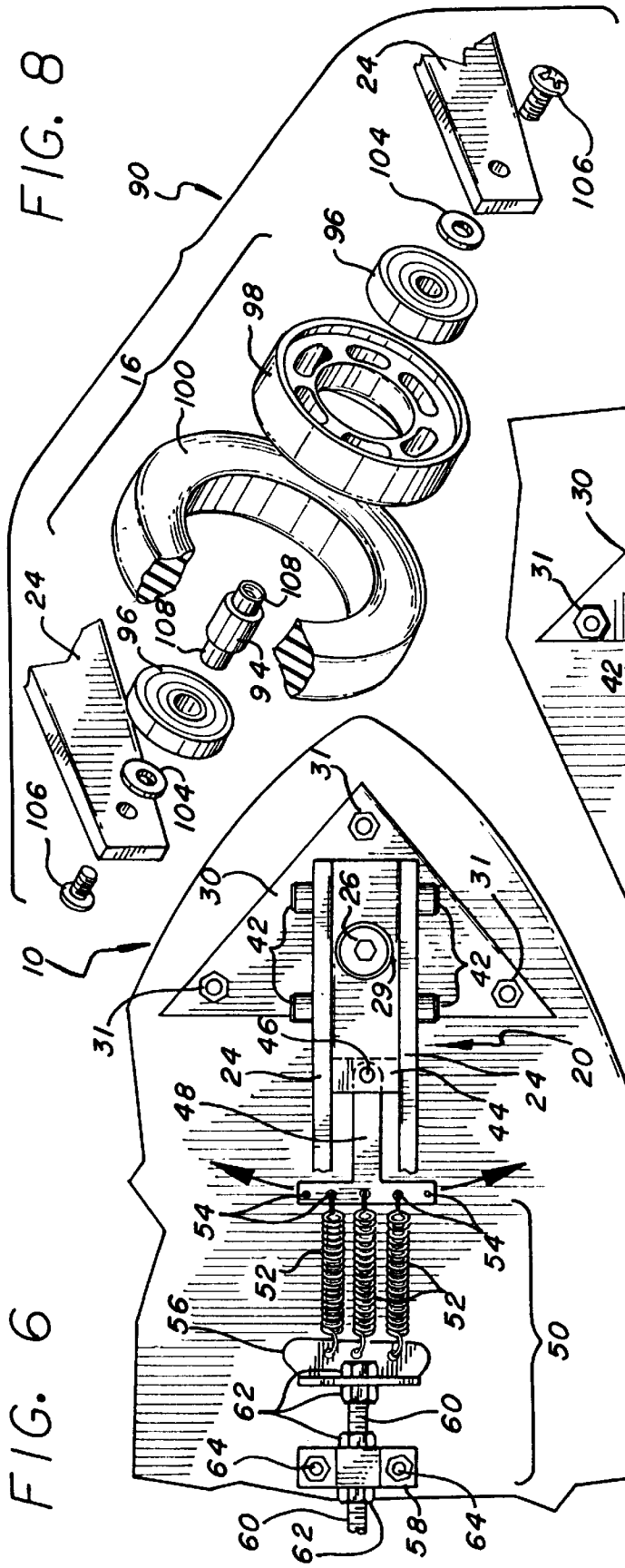


FIG. 8
90
16
24
104
106
96
98
100
108
94
10
30
31
26
42
29
46
24
48
44
20
54
52
56
50
62
60
64
58

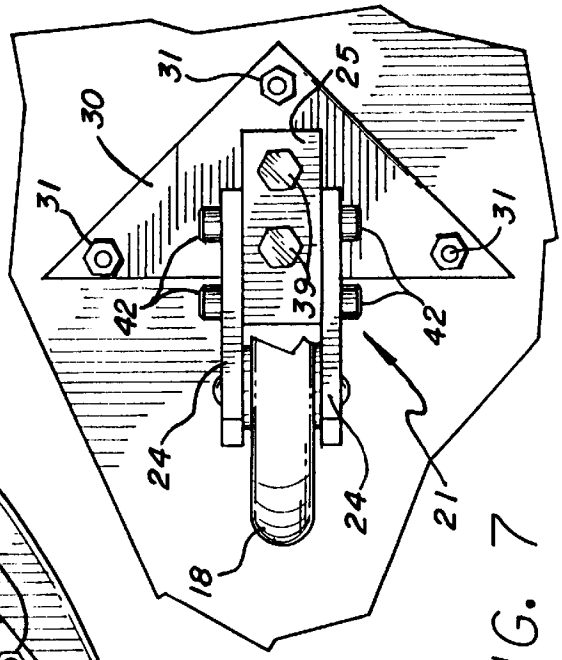


FIG. 7
31
30
25
42
39
24
18
21

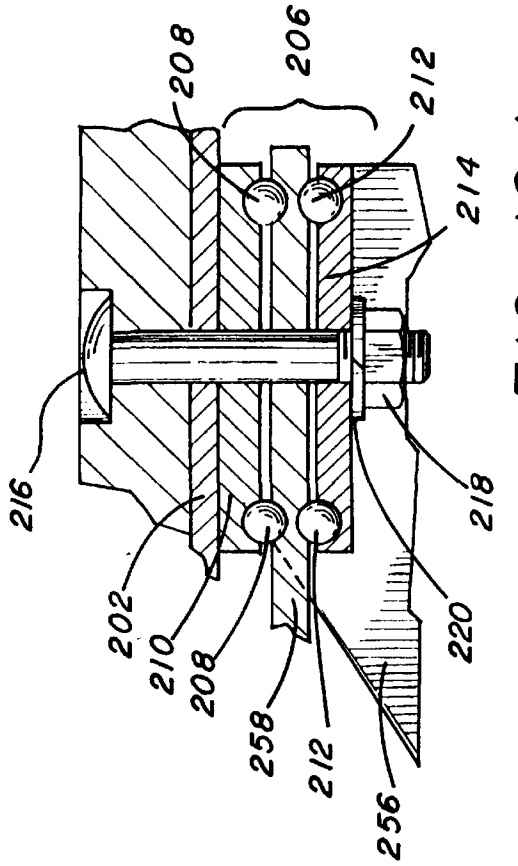


FIG. 10A

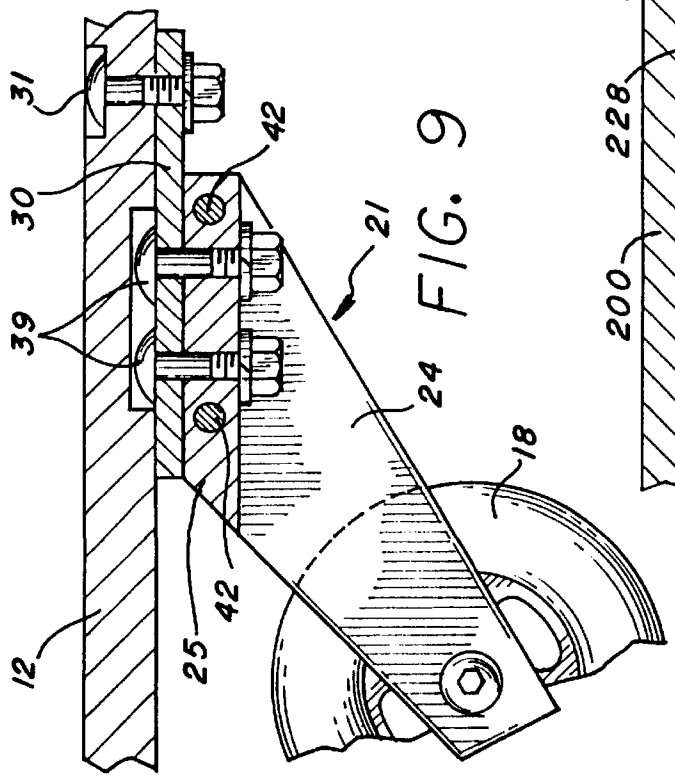


FIG. 9

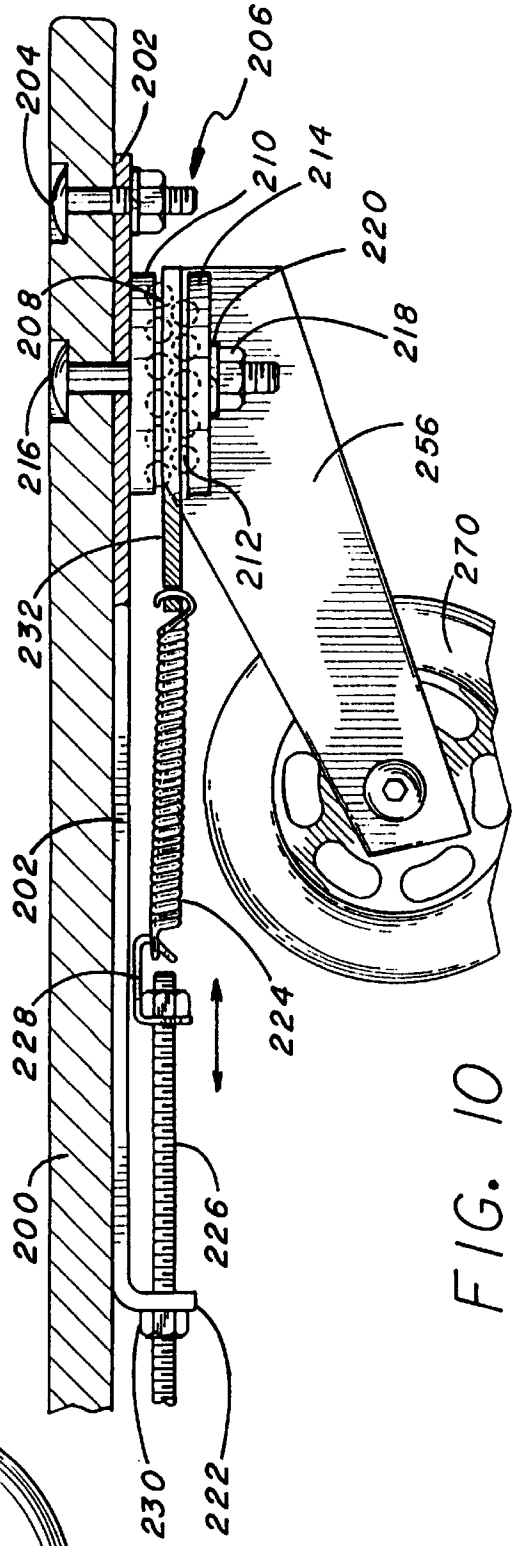


FIG. 10

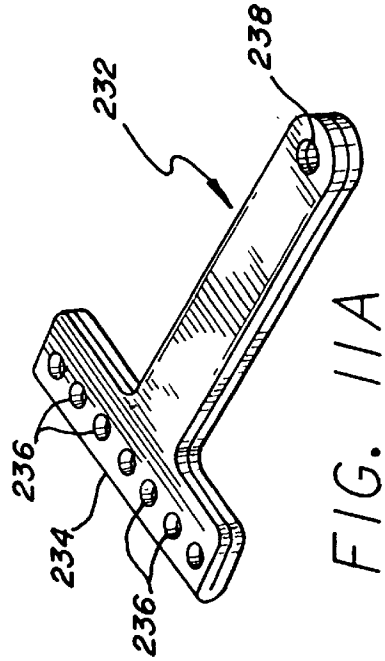


FIG. 11A

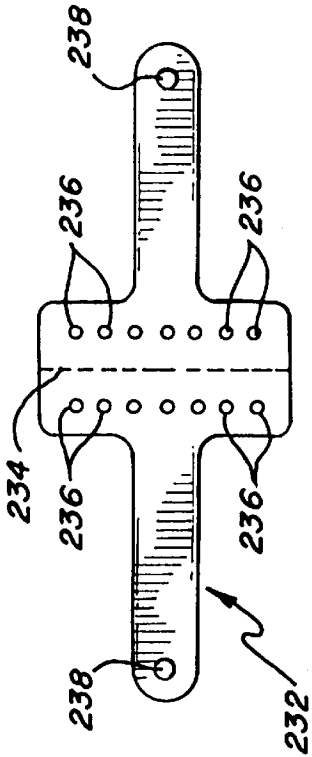


FIG. 11

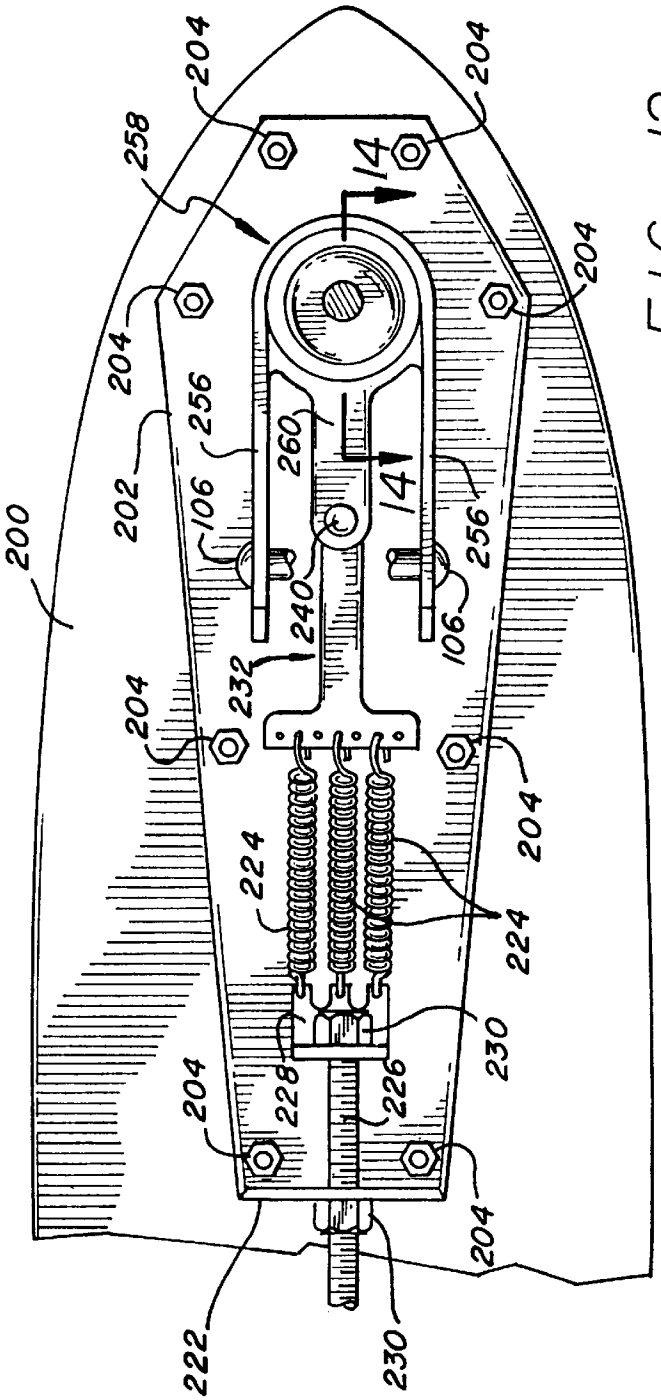


FIG. 12

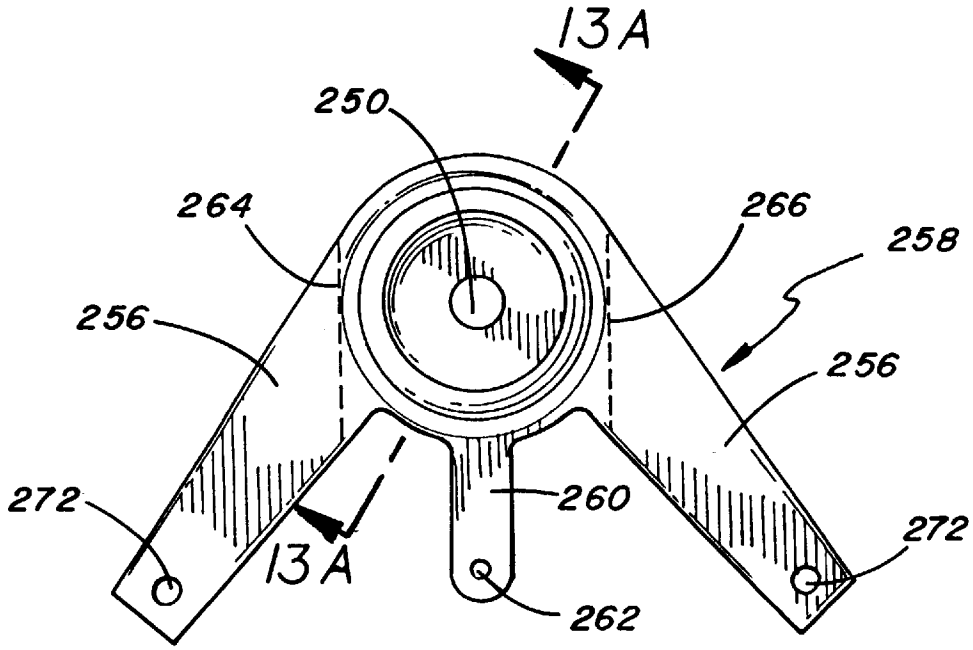


FIG. 13

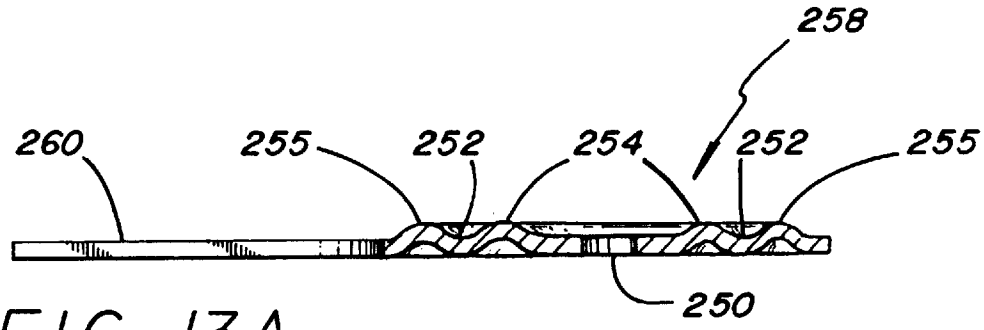


FIG. 13A

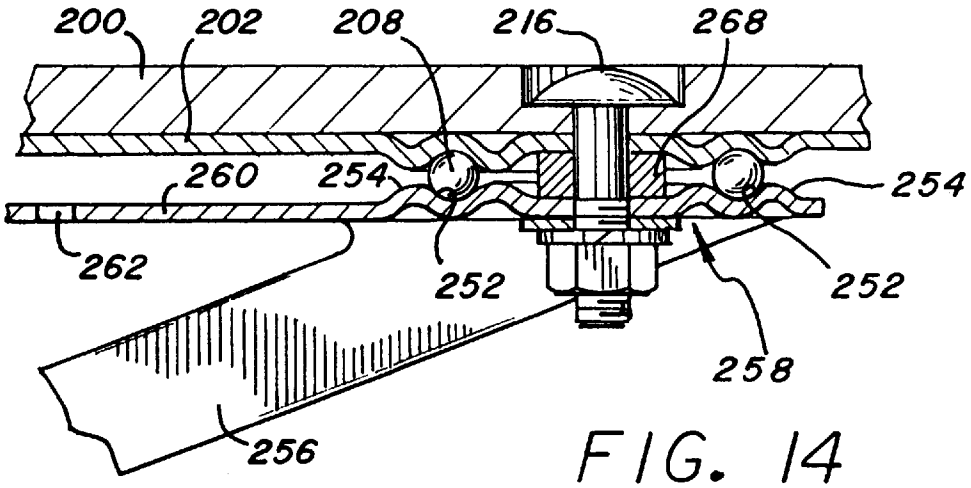


FIG. 14

TWO-WHEELED SKATEBOARD

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to the art of wheeled foot vehicles. More particularly, the present invention relates to the art of two-wheeled skateboards which do not require lifting of the rider's feet during operation thereof.

2. Description of the Related Art

A number of wheeled foot vehicles are well known in the art. For example, roller skates, roller skis, skateboards and the like are well known and have been enjoyed by countless generations. Wheeled foot vehicles, in the form of roller skates, were used by young children in the late eighteen hundreds. In fact, J. Forsyth patented an improvement in roller skates in 1878 with U.S. Pat. No. 200,186.

During the early nineteen hundreds, boys and girls alike enjoyed riding two-wheeled coasters about their neighborhoods. Youthful interest laid the ground work for invention and by 1918, C. H. Johnson received U.S. Pat. No. 1,274,889 for a coaster having a board, two wheels and a handlebar.

During the early 1960's a number of improvements were made to the conventional "coaster." Adolescents soon discovered that wheeled surfboards or "skateboards" could be constructed by combining a relatively short wooden board with roller skate wheels. The early "roller skate wheels" eventually evolved into modern skateboard wheels which generally incorporate a polyurethane outer surface and sealed bearings. A conventional skateboard is set forth by Brand et al., U.S. Pat. No. 4,181,316, wherein a front wheel mount and a rear wheel mount are permanently affixed to the same side of a generally flat board. A pair of wheels are rotatably affixed about each wheel mount such that the board rests upon four wheels. The four-wheeled construction of Brand et al. provides relative stability at slow velocities and while the skateboard is at rest.

Two-wheeled foot vehicles have existed since at least the 1970's, although they have not been as popular as the more traditional four-wheeled skateboards. Pantzar, U.S. Pat. No. 3,995,873, sets forth a "two-roller" skateboard having a flat board with a pair of steerable rollers disposed about an underside thereof. Each of the two rollers according to Pantzar's are quite substantial in width and at least as great as one half of the overall width of the skateboard. This wide pair of rollers offers stability to the rider at slower speeds and at rest.

Other skateboards have incorporated variations of the two-wheeled skateboard. Barachet, U.S. Pat. No. 5,160,155, sets forth a skateboard having two wheels mounted to an underside thereof. The rear wheel of Barachet is mounted with a fixed axis of rotation relative to the longitudinal axis of the skateboard. However, Barachet suffers from awkward foot placement because the rear wheel protrudes through the surface of the board. Barachet also requires wheels which are exceptionally wide to provide added support to the rider and requires a board which is not substantially planar between the wheel mounts.

Although a number of wheeled foot vehicles exist, young thrill seekers are continually searching for more aggressive and unique ways to develop their acrobatic skills. Further, young skateboard riders find conventional skateboards limiting due to a recurring need to remove the rider's feet from the skateboard in order to propel the skateboard forward.

As a further matter, skateboard technology has conventionally developed around the four-wheeled model.

Accordingly, conventional wheels are generally quite wide in order to provide increased support to the rider.

More recently, roller-skating itself has found renewed interest among young people in the form of "in-line" skating. In-line skating requires a series of in-line wheels rotationally disposed about the bottom of a pair of roller skate boots. This growing trend of in-line skating has increased the technology for in-line wheels and has also created a demand for improvements in two-wheeled skateboards.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a two-wheeled skateboard which is both aggressive and challenging to ride.

It is a further object of the present invention to provide a two-wheeled skateboard which may be self propelled by the rider without removal of the rider's feet therefrom.

It is a further object of the present invention to provide a two-wheeled skateboard which is both challenging to ride and economical to manufacture.

It is still a further object of the invention to provide a skateboard which remains stable at relatively high speeds.

Objects of the invention are achieved through a two-wheeled foot vehicle including a board which is generally planar between a first position and a second position with a front wheel assembly attached to the board at the first position and consisting of a single front wheel. The front wheel assembly includes a front wheel support connected to the front wheel, a tension member connected to the wheel support and connected to the board at a connected position between the first position and the second position, and a rear wheel assembly attached to the board at the second load bearing position and consisting of a single rear wheel.

Objects of the invention are further achieved through a clevis which is connected to the tension member by a first clevis axis and connected to the wheel support by a second clevis axis such that a restoring tension is applied to the front wheel towards a longitudinal axis of the board through the first and second clevis axis while the front wheel assembly pivots with respect to the board.

Additional objects of the invention are achieved through a caster which includes a plurality of washers or bearings to reduce rotational friction between a front wheel assembly and the board. A wheel durometer hardness is preferably between 84 A and 94 A. A pair of foot pegs extend upwardly from a top surface of the skateboard such that a rider may position the rider's feet adjacent thereto.

Moreover, objects of the invention are achieved by a front blade which is attached to the skateboard through a removable front blade assembly. A rear blade may also be attached to the board by way of a removable rear blade assembly connected to the rear blade and the rear assembly.

The aforementioned and other objects, features, and advantages of the present invention will become readily apparent from the following description of the preferred embodiment(s), as well as from the associated drawings, all of which merely illustrate the inventive concept, and are not in any way intended, nor should they be construed, to limit the scope of the instant invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a two-wheeled skateboard according to an embodiment of the present invention.

FIG. **2** is a sectional view of the two-wheeled skateboard taken along line **2**—**2** of FIG. **1**.

FIG. **3** is an elevated top view of a two-wheeled skateboard having optional foot pegs according to an embodiment of the present invention.

FIG. **4** is an elevated bottom view of a two-wheeled skateboard according to an embodiment of the present invention.

FIG. **5** is a cross sectional view of a skateboard foot peg according to an embodiment of the present invention.

FIG. **6** is an elevated bottom view of a skateboard with its front wheel removed according to an embodiment of the present invention.

FIG. **7** is an elevated bottom view of a rear wheel assembly of a two-wheeled skateboard according to an embodiment of the present invention.

FIG. **8** is a blown apart perspective view of a skateboard wheel according to an embodiment of the present invention.

FIG. **9** is a partial sectional view of a rear wheel assembly according to an embodiment of the present invention.

FIG. **10** is a sectional view of a front wheel assembly according to another embodiment of the present invention.

FIG. **10**A is a detailed sectional view of the front wheel assembly of FIG. **10**.

FIG. **11** an elevated top view of a clevis stamping according to an embodiment of the present invention.

FIG. **11**A is a perspective view of a manufactured clevis illustrated in FIG. **11**.

FIG. **12** is an elevated bottom view of a skateboard with a front wheel removed according to an embodiment of the present invention.

FIG. **13** is an elevated bottom view of a caster base according to an embodiment of the present invention.

FIG. **13**A is a cross sectional view of the caster base illustrated in FIG. **13**.

FIG. **14** is a detailed cross sectional view of a pivot assembly according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference now to the drawings and more particularly to FIG. **1**, a perspective view of rider **8** riding skateboard **10** is illustrated according to an embodiment of the present invention. Rider **8** positions his feet about respective outer sides of (optional) foot peg assemblies **70** during operation. Skateboard **10** requires greater skill during operation than a conventional four-wheeled skateboard because a minimum forward velocity is required to maintain balance. This aspect of the present invention is similar to a bicycle or scooter.

To ride skateboard **10**, rider **8** places one foot on top of platform **12** and pushes against the ground with the other foot to set skateboard **10** in motion. Once skateboard **10** is in motion, rider **8** places the second foot on platform **12** and steers by shifting balance back and forth, i.e. tacking.

Skateboard **10** includes pivoting front wheel assembly **20** and non-pivoting rear wheel assembly **21**. By shifting weight, rider **8** first moves the front of skateboard **10** sideways in a first direction with respect to rear wheel assembly **21**. Rider **8** then moves the front of skateboard **10** sideways in a direction reverse to the first direction to maintain forward movement. Front wheel assembly **20** and rear wheel assembly **21** remain on the ground during this forward tacking operation.

FIG. **2** is a cross sectional view of skateboard **10** illustrating front wheel assembly **20** taken along line **2**—**2** of FIG. **1**. FIG. **3** is an elevated top view of skateboard **10** while FIG. **4** is an elevated bottom view. Referring now to FIGS. **2**, **3**, and **4**, an in particular to FIG. **2**, front wheel assembly **20** includes a pair of front wheel supports **24** which are attached to rotatable block **28** by a plurality of securing bolts **42**. Rotatable block **28** is in turn connected to platform **12** by pivot assembly **22**. Pivot assembly **22** includes shoulder bolt **26**.

Shoulder bolt **26** passes through rotatable block **28**, triangular block **30**, and platform **12** before being secured by locking nut **32**. Locking nut **32** secures the distal end of shoulder bolt **26** such that rotatable block **28** may rotate with respect to triangular block **30** and platform **12**. Triangular block **30** is held securely to platform **12** by a plurality of bolts **31**. Referring in particular to the front of platform **12** in FIG. **2**, a first bolt **31** is illustrated by a section through platform **12**. A second bolt **31** is illustrated in outline form in platform **12**. Bolts **31** include a number of corresponding washers and nuts as illustrated.

Referring to FIG. **4**, shoulder bolt **26** includes hex shaft **27** disposed within the top thereof for receiving a standard Allen wrench during tightening of locking nut **32**. Shoulder bolt **26** may optionally screw into threads within triangular block **30** for extra support. As illustrated in FIG. **2**, washer **34** is disposed between platform **12** and locking nut **32**. Washer **34** is optionally a locking washer. In an alternative embodiment, the recess for shoulder bolt **26** in platform **12** may be enlarged such that locking nut **32** and washer **34** directly contact triangular block **30**. In this case, contact between pivot assembly **22** and platform **12** is eliminated. Triangular block **30** is secured to platform **12** by a plurality of bolts **31**.

Referring to FIG. **2**, pivot assembly **22** includes a number of washers interposed between triangular block **30** and rotatable block **28**. Primary washer **36** is disposed between a pair of containment washers **38**. All three washers are then disposed between triangular plate **30** and rotatable block **28**. According to a preferred embodiment, primary washer **36** is made from Teflon® and containment washers **38** are made from a polymer such as Nylon®. Primary washer **36** is made from Teflon® to provide a high resistance to heat and a relatively low frictional value. Containment washers **38** are made from Nylon®, because of its relatively low frictional value. However, all washers **36** and **38** could be made from Teflon®, or all from Nylon®. However, if all three washers are made from Nylon®, the performance characteristics will be reduced due to increased heat and friction. Containment washers **36** may also be manufactured from polypropylene, which has increased lubrication over Nylon®.

A pair of rotatable washers **40** are also disposed between shoulder bolt **26** and rotatable block **28**. Rotatable washers **40** may be made from conventional metal. Rotatable washers **40** and shoulder bolt **26** fit within circular recess **29** of rotatable block **28**. Rotatable washers **40** provide a number of lubricating surfaces between shoulder bolt **26** and rotatable block **28** to assist in rotation of rotatable block **28**. A relatively expensive washer such as primary washer **36** is not needed between rotatable washers **40** because the primary weight of platform **11** is supported by primary washer **36**. Although not shown, additional washers and spacers may be employed without departing form the inventive concept. Moreover, other washer configurations will become readily apparent to those skilled in the art.

With reference to FIGS. **2** and **4**, front wheel assembly **20** includes rotatable block **28** disposed between a pair of front wheel supports **24**. Rotatable block **28** includes a hole

through which shoulder bolt **26** passes. Rotatable block **28** rotates about shoulder bolt **26** during operation of rider **8**. Front wheel supports **24** are bolted onto rotatable block **28** by way of a plurality of securing bolts **42**. However, a number of other securing means will be readily apparent to those skilled in the art. Rotatable block **28** also includes a pair of projections **44** alternately projecting from the top and bottom thereof toward the rear of platform **12**. Projections **44** are preferably continuous projections from rotatable block **28**. Referring to FIG. **2**, pin **46** connects between projections **44**.

Pin **46** pivotally connects to rear tension assembly **50**. Tension assembly **50** provides a restoring force to front wheel assembly **20** after pivotal movement thereof.

FIGS. **2**, **4** and **6** respectively illustrate various views of tension assembly **50**. Tension assembly **50** includes a plurality of springs **52** which are preferably configured to removably attach to connecting member **48**. As illustrated in FIG. **6**, connecting member **48** is a "T" shape. Connecting member **48** includes a plurality of connecting holes **54** disposed therein. Springs **52** are removably attached to mounting plate **56** at a first end and are secured to connecting member **48** through connecting holes **54**. Springs **52** preferably have a tension value of 26.7 lb/in. Further, according to a preferred embodiment, three springs are used to provide an appropriate amount of tension. However, other spring combinations may be used and may be adjusted for the weight and skill of the rider.

Connecting member **48** is preferably a metal member which connects springs **52** with rotatable block **28**. Connecting member **48** pivots with respect to rotatable block **28** about pin **46**. The inventor has found that the distance between pin **46** and the pivot axis extending through shoulder bolt **26** is critical to optimum operation of the above invention. According to a preferred range, the inventor has found that the distance between pin **46** and shoulder bolt **26** is preferably between 1" and 4". More preferably the distance should be between 1.5" and 3" with the preferred distance being 2".

Tension assembly **50** also includes mounting plate **56**. Mounting plate **56** itself floats freely beneath platform **12**. Mounting plate **56** is attached to securing bracket **58** (which is secured to platform **12**) by threaded rod **60** and a plurality of locking nuts **62**. Threaded rod **60** may be adjusted with respect to securing bracket **58** by adjusting locking nuts **62**. Securing bracket **58** itself is fastened to platform **12** by a pair of bolts **64** and a pair of corresponding nuts as illustrated.

Tension assembly **50** provides a restoring force to skateboard **10** during pivoting or tacking of rider **8**. During operation, tension assembly maintains stability of front wheel assembly **20** thereby reducing "wobble" of front wheel **16**. Many factors cooperate for effective operation of tension assembly **50** including placement of pin **46**, tension of springs **52**, and the ability of springs **52** to slightly pivot with respect to mounting plate **56**. Additionally, springs **52** are allowed to pivot with respect to their connections to connecting member **48**. Accordingly, three main pivoting areas cooperate under tension to promote a stable ride at high speeds. It is noted, of course, that rotatable block **28** pivots with respect to shoulder bolt **46** while remaining aligned with wheel supports **24**. Tension assembly **50** cooperates with the angle of wheel supports **24** to provide further stability to the rider at high speeds.

FIGS. **1**, **3**, and **5** illustrate respective views of optional foot peg assemblies **70**. Skateboard **10** includes two foot peg assemblies **70** so that feet of rider **8** may find additional support for greater control. Foot peg assemblies **70** may be configured to assist the rider in gripping onto skateboard **10** during acrobatic stunts and maneuvers. Each foot peg assembly **70** includes foot peg **72** which is secured to platform **12** by a pair of securing bolts **76** and corresponding locking nuts and washers. A shoulder portion of securing bolt **74** is disposed within a circular recess in platform **12** to present a flush surface. Foot peg **72** is preferably made from a commercially available polymer, however a number of other materials may be used.

Foot peg **72** may include protrusion **80** for assisting a rider's foot grip during acrobatic stunts and maneuvers. By gripping both foot peg assemblies **70** with the feet, rider **8** may lift skateboard **10** off the ground. Because rider **8** will generally prefer to place his feet over the wheels of the skateboard, foot peg assemblies **70** are generally placed to complement the riders preferred foot placement thereon. It should be noted that foot peg assemblies **70** may be removed while the rider is learning to ride skateboard **10**, thereby reducing the possibility of injury during use.

FIGS. **1** and **3** also illustrate a plurality of optional abrasive sections **14**. Rider **8** places his feet upon abrasive sections **14** to reduce the possibility of slippage. Abrasive sections **14** may be made from adhesive tape which has an abrasive outer surface.

FIGS. **4**, **7** and **9** illustrate rear wheel assembly **21** attached to platform **12**. FIG. **7** illustrates a more detailed, elevated bottom view of rear wheel assembly **21**, while FIG. **9** illustrates a sectional view. Referring now to FIGS. **4** and **7**, rear wheel **18** is attached between wheel supports **24**. Wheel supports **24** are in turn attached to fixed plate **25** by way of a plurality of bolts **42**. Fixed plate **25** is attached to triangular block **30** by a pair of bolts **39**. Rear wheel assembly **21** does not pivot with respect to platform **12**.

FIG. **9** illustrates rear wheel assembly **21** according to an embodiment of the present invention. Rear wheel assembly **21** includes wheel **18** which is supported by a pair of rear wheel supports **24**. Rear wheel supports **24** do not pivot about an axis. Instead, rear wheel supports **24** are affixed to fixed plate **25**. Fixed plate **25** is similar to rotatable block **28**, however fixed plate **25** does not pivot. Rear wheel supports **24** are attached to fixed plate **25** by securing bolts **42**. Fixed plate **25** is securely affixed to triangular block **30** by bolts **39** and corresponding nuts and washers. Triangular block **30** is then affixed to platform **12** by a plurality of bolts **31** and accompanying locking nuts and washers.

Front wheel assembly **20** and rear wheel assembly **21** cooperate to provide motion to skateboard **10** as a result of tacking. The inventor has found through experimentation that forward movement is generated by providing a lateral force to rear wheel assembly **21**. Thus, rear wheel assembly **21** is continually subjected to oscillating lateral forces during operation of skateboard **10**. If rear wheel assembly **21** were allowed to pivot, the lateral fores applied thereto from the tacking motion of the front of skateboard **10** would be absorbed and forward motion would be severely reduced.

FIG. **8** illustrates a blown apart perspective view of wheel group **90**. Wheel group **90** forms a part of front wheel assembly **20** and rear wheel assembly **21**. Wheel group **90** is attached between front wheel supports **24** (illustrated FIGS. **2**, **4**, and **6**) and likewise between rear wheel supports **24** (illustrated in FIG. **7**). Wheel group **90**, as illustrated, includes front wheel **16**, spacer **94** and a pair of sealed bearings **96**. Wheel **16** further includes supporting disk **98** and solid tire **100**. Spacer **94** is configured and arranged to fit within the interior of supporting disk **98** without contact-

ing the surface thereof. Sealed bearings **96** fit over ends **108** of spacer **94** and directly contact the interior surface of interior supporting disk **98**.

A pair of washers **104** are alternately displaced on outer sides of sealed bearings **96**. Washers **104** then respectively contact wheel supports **24**. Securing bolts **106** respectively pass through holes within wheel supports **24** and washers **104**, then lock into respective threads disposed within the ends of spacer **94**.

The material of front wheel **16** and rear wheel **18** are very important to optimize the performance of skateboard **10**. Wheel **16** has a durometer hardness which is between 84 A and 94 A. A durometer hardness range between 86 A and 90 A is more preferably with a durometer hardness of 88 A being most preferred. If the wheel **16** is too hard, the wheel will not adequately grip the riding surface, i.e. the road. Moreover, if wheel **16** is too soft, there will be excessive wear. It should be noted, however, that some wear of each of wheels **16** and **18** is to be expected. Moreover, the inventor has found through experimentation that the rear wheel will experience more wear than the front wheel during operation. Thus, skateboard **10** may be provided with a rear wheel **18** which is slightly harder than the front wheel **16** to reduce the amount of wear.

FIGS. **10**, **10**A, and **12** illustrate a two-wheeled skateboard according to a second preferred embodiment of the present invention. FIGS. **10** and **10**A illustrate an embodiment wherein a number of components have been replaced by components which are more efficient, when compared with FIG. **2**, and may be specially produced in large quantity. From a manufacturing perspective, the second embodiment illustrated in FIG. **12** is more cost effective because many of the components may be stamped from sheet metal.

According to FIGS. **10**, **10**A, and **12**, the second embodiment of the present invention includes front plate **202** which is affixed to platform **200** by a plurality of securing means such as bolts **204**. A first plurality of bearings **208** forms a part of caster assembly **206** and is disposed between caster base **258** and first bearing retainer **210**. Caster **206** assembly rotates with respect to front plate **202** by way of the first plurality of bearings **208**. First bearing retainer **210** is disposed adjacent to and contacts front plate **202**.

A second plurality of bearings **212** forms a part of caster assembly **206** and is disposed between caster base **258** and second bearing retainer **214**. Caster assembly **206** pivots about central bolt **216** by way of first plurality of bearings **208** and second plurality of bearings **212**. Central bolt **216** is held in place by locking nut **218** and washer **220**. According to another embodiment of the invention, central bolt **216** may be replaced by a rivet which is well known in the art.

Referring now to FIG. **12**, front plate **202** includes curved rear portion **222** which serves as an anchor for threaded rod **226**. Threaded rod **226** is secured into curved rear portion **222** by adjustment nut **230**. A plurality of additional nuts and washers may also be used. Threaded rod **226** is secured into mounting plate **228** by another locking nut **230** but may also be secured by a plurality of nuts and washers. Mounting plate **228** is not directly attached to front plate **202** but floats freely underneath. Springs **224** are attached to mounting plate **228**. Adjustment nut **230** adjusts the spring tension of springs **224**. A plurality of adjustment nuts may also be used. Springs **224** are attached to caster assembly **206** by clevis **232**.

Clevis **232** is preferably a metal stamping as illustrated in FIGS. **11** and **11**A. Referring now to FIG. **11**A, clevis **232** is bent about axis **234**. Clevis **232** includes a plurality of spring holes **236** and a pair of fastener holes **238**. Rivet **240** extends through fastener holes **238** and fastens clevis **232** to caster **206**.

FIGS. **13** and **13**A illustrate caster base **258** after metal stamping but prior to orthogonal bending along first axis **264** and second axis **266**. Caster base **258** includes central hole **250** through which central bolt **216** passes. Central hole **250** is surrounded by bearing trough **252** about which inner bearing ridge **254** and outer bearing ridge **255** are disposed. Caster base **258** also includes a pair of wheel supports **256** which extend orthogonally therefrom. Caster base **258** also includes lip **260** and rivet hole **262** which is attached to fastener holes **238** in clevis **232** by way of rivet **240**. Front wheel **270** is affixed to wheel supports **256** in caster base **258** by mounting holes **272** as set forth in the first embodiment.

FIG. **14** illustrates pivot assembly **22** according to yet another embodiment of the present invention. According to FIG. **14**, pivot assembly **22** includes a stamped front plate **202** which includes bearing trough **252** therein. According to this embodiment, the need for a separate first bearing retainer **210** can be eliminated thereby reducing costs associated with manufacture. Wheel supports **256**, caster lip **260** and rivet hole **262** remain the same as illustrated in FIG. **10**A. According to the embodiment of FIG. **14**, a single row of bearings are required. In this case, caster base **258** forms the second bearing retainer to thereby secure bearings **208** in place. As illustrated in FIG. **14**, optional spacer washer **268** is disposed between front plate **202** and caster base **258**.

The foregoing is considered as illustrative only of the principles of the invention, and since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the present invention.

I claim:

1. A two-wheeled foot vehicle, comprising:

a board which is generally planar between a first position and a second position, said board defining a first planar section which is so configured and arranged to directly support the heel and ball of a first foot of a rider in a lateral direction of said board and said board defining a second planar section which is so configured and arranged to directly support the heel and ball of a second foot of the rider in the lateral direction of said board simultaneously with the first foot;

a front wheel assembly attached to said board at the first position, said front wheel assembly further comprising:

a front wheel support being rotationally pivotable with respect to said board about a wheel support pivot axis; and

a tension member connected to the front wheel support and connected to said board at a connected position between the first position and the second position; and

a rear wheel assembly attached to said board at the second position,

wherein the front wheel support is connected to a single front wheel disposed entirely below said board and the rear wheel assembly is connected to a single rear wheel disposed entirely below said board such that the two wheels do not extend beyond an outer perimeter of said board and the total number of wheels connected to the two-wheeled foot vehicle consists of two.

2. The two-wheeled foot vehicle according to claim 1, further comprising:

a clevis connected to the tension member by a first clevis axis and connected to the front wheel support by a second clevis axis such that a restoring tension is applied to the front wheel towards a longitudinal axis of the board through the first and second clevis axes while the front wheel assembly pivots with respect to said board.

3. The two-wheeled foot vehicle according to claim 1, said front wheel assembly further comprising a second tension member connected to the front wheel support and connected to said board between the first position and the second position,

wherein the two-wheeled foot vehicle is operable with the first foot of the rider supported at the first planar section and the second foot of the rider supported at the second planar section during operation thereof, and the two-wheeled foot vehicle is steerable by tilting said board with respect to a riding surface through said placement of said two wheels below said board and within the outer perimeter of said board.

4. The two-wheeled foot vehicle according to claim 1, wherein the diameter of the front wheel is less than the width of said board at the first position and the diameter of the rear wheel is less than the width of said board at the second position.

5. The two-wheeled foot vehicle according to claim 1, further comprising:

an adjustable member connected to the tension member and said board such that the amount of force exerted by the tension member on the front wheel support may be increased or decreased through adjustment.

6. The two-wheeled foot vehicle according to claim 1 wherein the wheel durometer hardness is between 84 A and 94 A.

7. The two-wheeled foot vehicle according to claim 6 wherein the wheel durometer hardness is between 86 A and 90 A.

8. The two-wheeled foot vehicle according to claim 7 wherein the wheel durometer hardness is 88 A.

9. The two-wheeled foot vehicle according to claim 1, wherein the two-wheeled foot vehicle is operable by the rider with the first and second foot in contact with said board such that a second board is not used.

10. The two-wheeled foot vehicle according to claim 1, further comprising:

a pair of foot pegs extending upwardly from the top surface of said board such that the rider may position the rider's feet adjacent to the pair of foot pegs.

11. The two-wheeled foot vehicle according to claim 1, further comprising:

a caster base attached to the front wheel support and pivoting with respect to said board about the wheel support pivot axis;

a front plate connected to said board and disposed between said board and the caster base; and

a rotatable bearing disposed between the caster base and the front plate thereby enhancing pivotal rotation therebetween.

12. The two-wheeled foot vehicle according to claim 1, further comprising a first abrasive section affixed to said board at the first position and a second abrasive section affixed to said board at the second position,

wherein the two-wheeled foot vehicle is operable with the first foot of the rider supported at the first planar position and the second foot of the rider supported at the second planar position during operation thereof.

13. The two-wheeled foot vehicle according to claim 1, wherein the two-wheeled foot vehicle is propellable by the rider without removing either of the first foot or the second foot from said board, such that the front of said board is adapted to move sideways in a first direction with respect to said rear wheel assembly in response to a shifting of the rider's weight in a first shifting direction, and the front of said board is adapted to move sideways in a second direction traverse to the first direction while the front wheel and the rear wheel remain in contact with a riding surface in response to a shifting of the rider's weight in a second shifting direction.

14. The two-wheeled foot vehicle according to claim 13, wherein said board is tiltable in a first tilting direction during the shift of weight in the first direction and is tiltable in a second tilting direction during the shift of weight in the second direction.

15. The two-wheeled foot vehicle according to claim 1, wherein said rear wheel assembly does not pivot with respect to said board and forward movement of said board is generatable by continually subjecting said rear wheel assembly to oscillating lateral forces with the rear wheel in contact with a riding surface.

16. The two-wheeled foot vehicle according to claim 1, wherein said board has a front end and a rear end, said board being generally planar between the first position and the front end and generally planar between the second position and the rear end.

17. The two-wheeled foot vehicle according to claim 1, said rear wheel assembly further comprising:

a rear wheel support which does not pivot with respect to said board, wherein the front wheel support is angled away from said board and toward the second position and the rear wheel support is angled away from said board and away from the first position.

18. A tiltable two-wheeled foot vehicle, comprising:

a board which is generally planar between a first position and a second position, said board defining a first planar section which is so configured and arranged to directly support the heel and ball of a first foot of a rider in a lateral direction of said board and said board defining a second planar section which is so configured and arranged to directly support the heel and ball of a second foot of the rider in the lateral direction of said board;

a connection member attached to said board;

a front wheel assembly attached to said board through connection to said connection member, said front wheel assembly pivotable about a front wheel support pivot axis, said front wheel assembly including:

a front wheel support connected to said connection member and rotationally pivotable about the front wheel support pivot axis;

a front wheel group of elements, grouped into a single front wheel which rotates with respect to the front wheel support, said front wheel including:

a front wheel support disk having a circular outer perimeter and defining a hole about a rotational axis of the front wheel support disk;

a front wheel first sealed bearing having an outer perimeter which is so configured and arranged to be removably received within the hole of the front wheel support disk, the front wheel first sealed bearing connected to the front wheel support and rotating about a rotational axis of the front wheel first sealed bearing;

a front wheel second sealed bearing having an outer perimeter which is so configured and arranged to be removably received within the hole of the front wheel support disk, the front wheel second sealed bearing connected to the front wheel support and rotating about a rotational axis of the front wheel second sealed bearing;

a front wheel spacer removably disposed within the hole of the front wheel support disk, the front wheel spacer being so configured and arranged to mate with the front wheel first sealed bearing and the front wheel second sealed bearing to maintain separation upon receipt within the hole of the front wheel support disk; and

a front wheel annular tire having a circular outer periphery and defining a hole about a rotational axis of the front wheel annular tire, the hole of the front wheel annular tire being so configured and arranged to mate with the outer perimeter of the front wheel support disk; and

a rear wheel assembly attached as part of the two-wheeled foot vehicle such that said rear wheel assembly does not pivot with respect to said board, said rear wheel assembly including:

a rear wheel support attached as part of the two-wheeled foot vehicle such that said rear wheel support does not pivot with respect to said board, said rear wheel support providing a rotational connection to a single rear wheel;

a rear wheel group of elements, grouped into the single rear wheel which rotates with respect to the rear wheel support about said rotational connection, said rear wheel including:

a rear wheel support disk having an outer perimeter and defining a hole about a rotational axis of the rear wheel support disk;

a rear wheel first sealed bearing having a circular outer perimeter which is so configured and arranged to be removably received within the hole of the rear wheel support disk, the rear wheel first sealed bearing connected to the rear wheel support and rotating about a rotational axis of the rear wheel first sealed bearing;

a rear wheel second sealed bearing having an outer perimeter which is so configured and arranged to be removably received within the hole of the rear wheel support disk, the rear wheel second sealed bearing connected to the rear wheel support and rotating about a rotational axis of the rear wheel second sealed bearing;

a rear wheel spacer removably disposed within the hole of the rear wheel support disk, the rear wheel spacer being so configured and arranged to mate with the rear wheel first sealed bearing and the rear wheel second sealed bearing to maintain separation upon receipt within the hole of the rear wheel support disk; and

a rear wheel annular tire having a circular outer periphery and defining a hole about a rotational axis of the rear wheel annular tire, the hole of the rear wheel annular tire being so configured and arranged to mate with the outer perimeter of the rear wheel support disk,

wherein the total number of wheels connected to the two-wheeled foot vehicle consists of two,

wherein said board is tiltable in a first tilting direction with respect to the ground and tiltable in a second tilting direction traverse to the first direction during operation thereof,

wherein the diameter of the front wheel is less than the width of said board between the first position and the second position and the diameter of the rear wheel is less than the width of said board between the first position and the second position, and

wherein the two-wheeled foot vehicle is operable by the rider with the first and second foot in contact with said board such that a second board is not used.

19. The two-wheeled foot vehicle according to claim **18**, wherein the wheel durometer hardness of the front wheel is between 84 A and 94 A and the wheel durometer hardness of the rear wheel is between 84 A and 94 A.

20. The two-wheeled foot vehicle according to claim **19**, wherein the wheel durometer hardness of the front wheel is between 86 A and 90 A and the wheel durometer hardness of the rear wheel is between 86 A and 90 A.

21. The two-wheeled foot vehicle according to claim **20**, wherein the front wheel support is angled with respect to the first planar section of said board.

22. The two-wheeled foot vehicle according to claim **19**, wherein the front wheel support is angled with respect to the first planar section of said board.

23. The two-wheeled foot vehicle according to claim **18**, wherein the front wheel support is angled with respect to the first planar section of said board.

24. The two-wheeled foot vehicle according to claim **18**, further comprising:

a tension assembly connected to said front wheel assembly and connected to said board at a connected position between the first position and the second position, said tension assembly including:

a clevis having a front portion defining a first clevis axis and having a rear portion defining a second clevis axis, said clevis rotatably connected to said front wheel assembly about the first clevis axis;

a mounting plate non-rotationally connected to said board, the mounting plate defining a mounting plate axis; and

an elastic tension member connecting the second clevis axis with the mounting plate axis, such that the elastic tension member provides a restoring tension to urge the front wheel toward a longitudinal axis of said board while said front wheel assembly pivots with respect to said board, the restoring tension being applied to the front wheel through the mounting plate axis, the first clevis axis, the second clevis axis, and the wheel support pivot axis.

25. A two-wheeled foot vehicle, comprising:

a board which is generally planar between a first position and a second position, said board defining a first planar section which is so configured and arranged to directly support the heel and ball of a first foot of a rider in a lateral direction of said board, and said board defining a second planar section which is so configured and arranged to directly support the heel and ball of a second foot of the rider in the lateral direction of said board, said board also defining an outer perimeter;

a front wheel assembly attached to said board at the first position, said front wheel assembly including a front wheel support rotationally pivotable with respect to said board about a wheel support pivot axis;

a tension assembly connected to said front wheel assembly and connected to said board at a connected position between the first position and the second position, said tension assembly including:

a clevis having a front portion defining a first clevis axis and having a rear portion defining a second clevis axis, said clevis rotatably connected to said front wheel assembly about the first clevis;

a mounting plate non-rotationally connected to said board, the mounting plate defining a mounting plate axis; and

an elastic tension member connecting the second clevis axis with the mounting plate axis, such that the elastic tension member provides a restoring tension applied to urge the front wheel assembly toward a longitudinal axis of said board while said front wheel assembly pivots with respect to said board, the restoring tension being applied to the front wheel through the mounting plate axis, the first clevis axis, the second clevis axis and the wheel support pivot axis; and

a rear wheel assembly attached to said board at the second position,

wherein the front wheel support is connected to a single front wheel and the rear wheel assembly is connected to a single rear wheel such that the total number of wheels connected to the two-wheeled foot vehicle consists of two wheels, and

wherein the single front wheel and the single rear wheel are disposed entirely below said board and disposed entirely within the outer perimeter of said board.

26. The two-wheeled foot vehicle according to claim **25**, wherein

the single front wheel includes:

a front wheel support disk having an outer perimeter and defining a hole about a rotational axis of the front wheel support disk;

a front wheel first sealed bearing having an outer perimeter which is so configured and arranged to be removably received within the hole of the front wheel support disk, the front wheel first sealed bearing connected to the front wheel support and rotating about a rotational axis of the front wheel first sealed bearing;

a front wheel second sealed bearing having an outer perimeter which is so configured and arranged to be removably received within the hole of the front wheel support disk, the front wheel second sealed bearing connected to the front wheel support and rotating about a rotational axis of the front wheel second sealed bearing;

a front wheel spacer removably disposed within the hole of the front wheel support disk, the front wheel spacer being so configured and arranged to mate with the front wheel first sealed bearing and the front wheel second sealed bearing to maintain separation upon receipt within the hole of the front wheel support disk; and

a front wheel annular tire having a circular outer periphery and defining a hole about a rotational axis of the front wheel annular tire, the hole of the front wheel annular tire being so configured and arranged to mate with the outer perimeter of the front wheel support disk; and

the single rear wheel includes:

a rear wheel support disk having an outer perimeter and defining a hole about a rotational axis of the rear wheel support disk;

a rear wheel first sealed bearing having an outer perimeter which is so configured and arranged to be removably received within the hole of the rear wheel support disk, the rear wheel first sealed bearing connected to the rear wheel support and rotating about a rotational axis of the rear wheel first sealed bearing;

a rear wheel second sealed bearing having an outer perimeter which is so configured and arranged to be removably received within the hole of the rear wheel support disk, the rear wheel second sealed bearing connected to the rear wheel support and rotating about a rotational axis of the rear wheel second sealed bearing;

a rear wheel spacer removably disposed within the hole of the rear wheel support disk, the rear wheel spacer being so configured and arranged to mate with the rear wheel first sealed bearing and the rear wheel second sealed bearing to maintain separation upon receipt within the hole of the rear wheel support disk; and

a rear wheel annular tire having a circular outer periphery and defining a hole about a rotational axis of the rear wheel annular tire, the hole of the rear wheel annular tire being so configured and arranged to mate with the outer perimeter of the rear wheel support disk.

27. The two-wheeled foot vehicle according to claim **25**, wherein the two-wheeled foot vehicle is propellable by the rider without removing either of the first foot or the second foot from said board, such that the front of said board is adapted to move sideways in a first direction with respect to said rear wheel assembly in response to a shifting of the rider's weight in a first shifting direction, and the front of said board is adapted to move sideways in a second direction traverse to the first direction while the front wheel and the rear wheel remain in contact with a riding surface in response to a shifting of the rider's weight in a second shifting direction; and

said board is tiltable in a first tilting direction during the shift of weight in the first direction and is tiltable in a second tilting direction during the shift of weight in the second direction.

28. The two-wheeled foot vehicle according to claim **25**, wherein

said rear wheel assembly does not pivot with respect to said board and forward movement of said board is generatable by continually subjecting said rear wheel assembly to oscillating lateral forces with the rear wheel in contact with a riding surface; and

said board has a front end and a rear end, said board being generally planar between the first position and the front end and generally planar between the second position and the rear end.

29. A two-wheeled skateboard, comprising:

a single board which is generally planar between a first position and a second position, such that a rider may continually operate the two-wheeled skateboard with the rider's first and second foot placed directly on said single board;

a front wheel assembly attached to said board at the first position, said front wheel assembly further comprising:

a front wheel support being rotationally pivotable with respect to said board about a wheel support pivot axis; and

a tension member connected to the front wheel support and connected to said board at a connected position between the first position and the second position; and

a rear wheel assembly attached to said board at the second position,

wherein the front wheel support is connected to a single front wheel and the rear wheel assembly is connected to a single rear wheel such that the total number of wheels connected to the two-wheeled skateboard consists of two.

* * * * *