Aug. 2, 1966 J. W. RYAN 3,264,011

ADJUSTABLE TRICYCLE

Filed Aug. 4, 1964 2 Sheets-Sheet 1

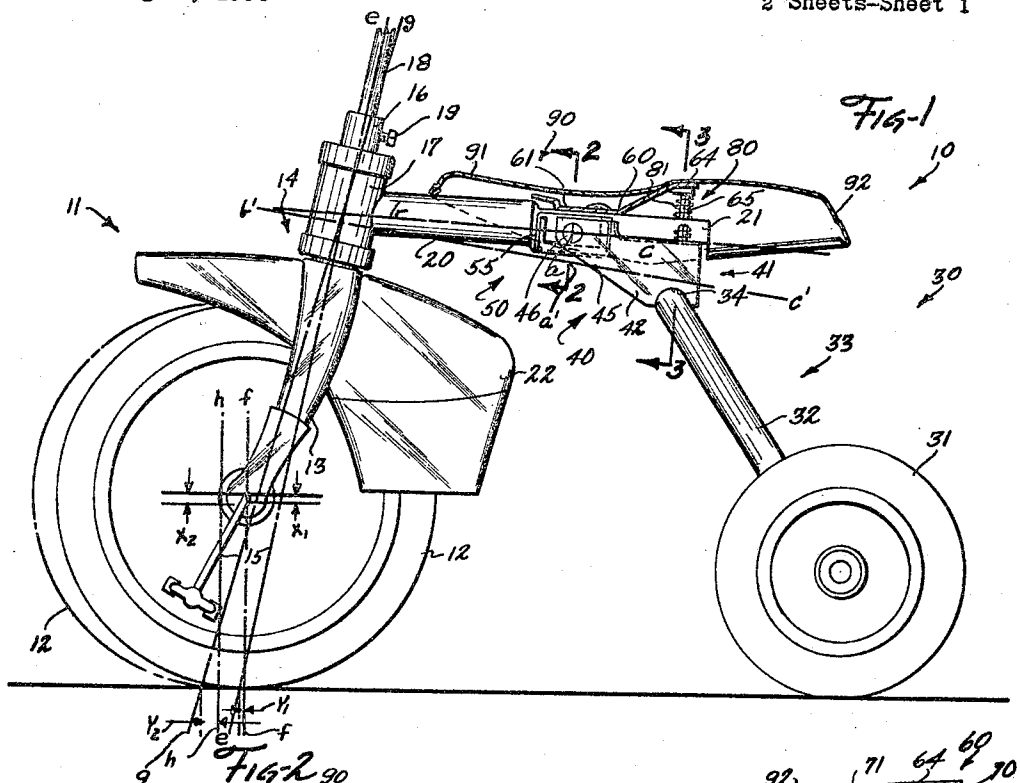


Fig-1

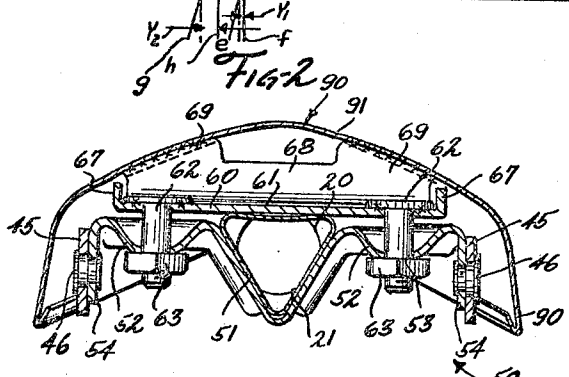


Fig-2

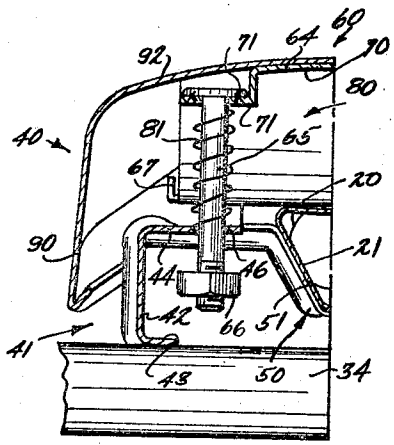


Fig-4

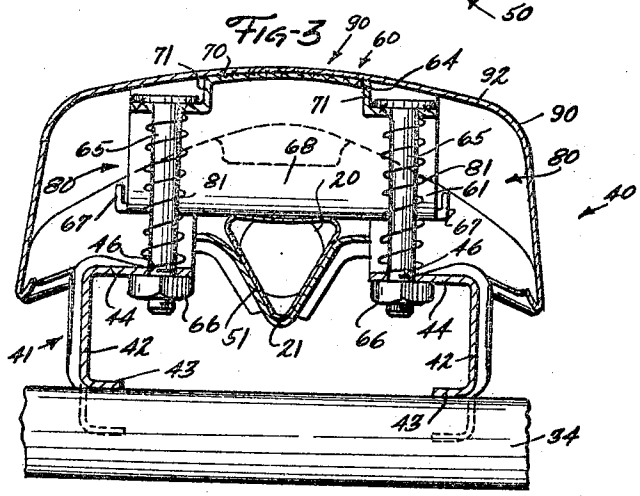


Fig-3

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ADJUSTABLE TRICYCLE

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FIG-5

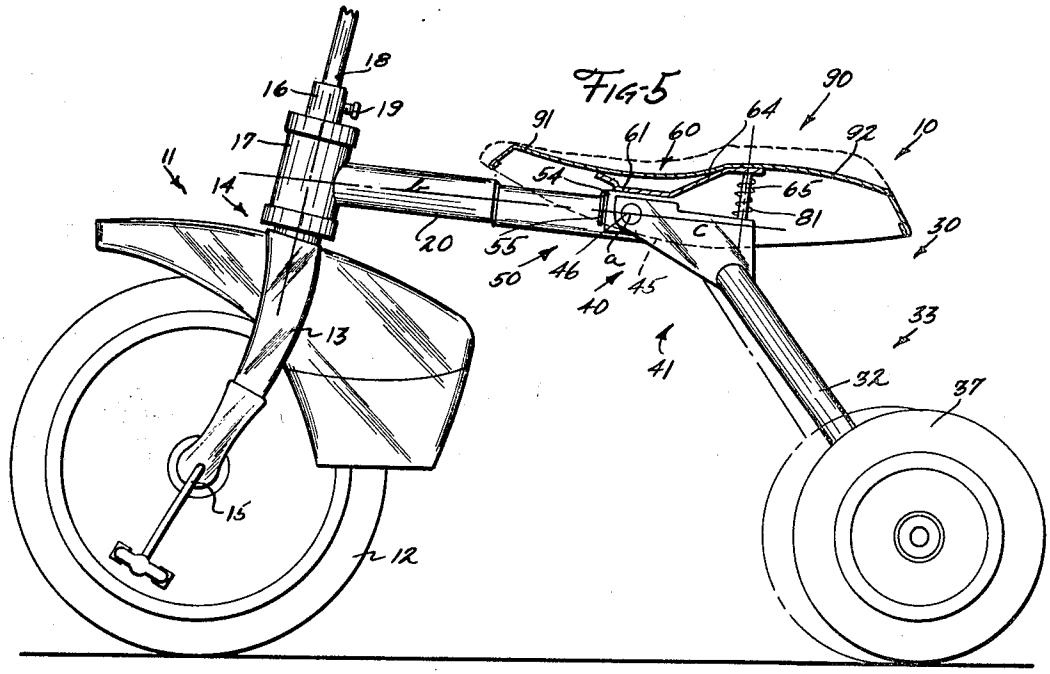
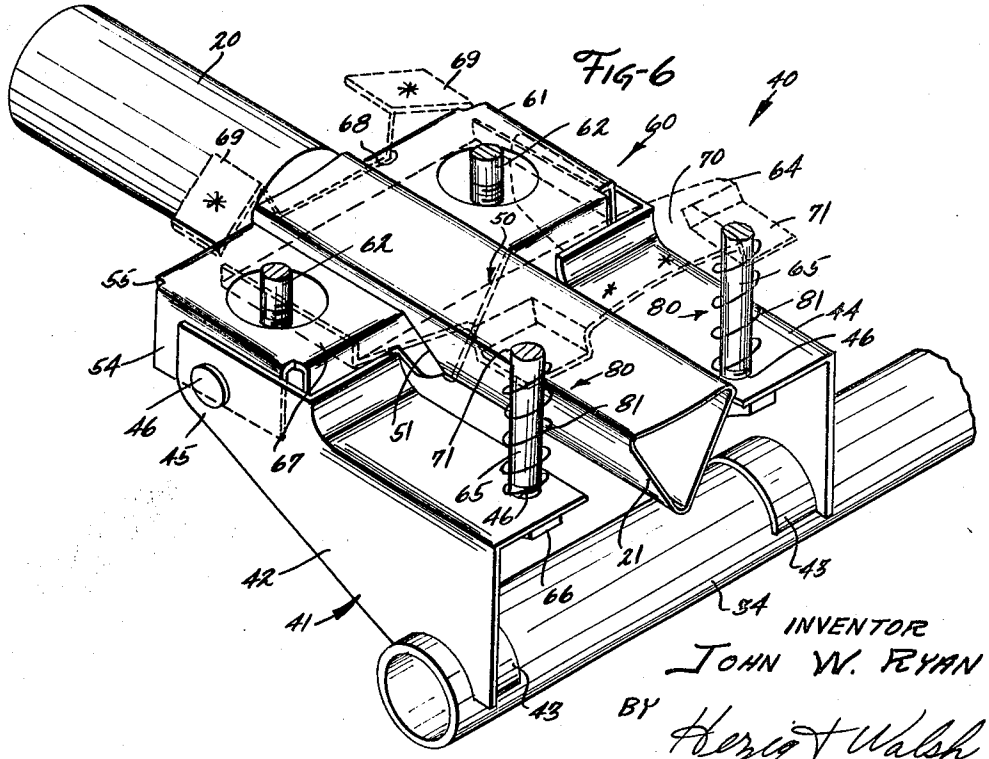


FIG-6



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ADJUSTABLE TRICYCLE

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In general, the present invention relates to a tricycle. More particularly, it involves a versatile, sturdy tricycle having an adjustable length and both an enlarged bouncing action and angular rocking motion.

Although a wide variety of tricycles has been known for many years, the usual tricycle construction has included a number of limitations which limited its usability and its play value. One such limitation has been that in order to have the tricycle usable by the child over a long period of time, it is necessary to have the distance between the tricycle seat and the pedals adjustable. Thus, when the child is younger, such distance may be short and as the child grows, the distance may be lengthened. However, such adjustability is normally achieved by mounting the seat of the tricycle on a vertically extending rigid post which is adjustably connected to the frame of the tricycle. Thus, as the child grows, the position of the seat may be raised to compensate for such growth. However, such expedient has the disadvantage that the base formed by the three wheels of the tricycle is fixed and as the seat is raised, the center of gravity of the combination of the child and the tricycle is also necessarily raised so that the tricycle is more easily tipped over during play, i.e., the stability of the toy is reduced. Another limitation present in the usual tricycle construction is that the seat normally is mounted on the tricycle frame by the use of independent spring means which permit the seat to move up and down while the tricycle frame remains rigid. Thus, the bouncing action of the child while riding on the tricycle seat is quite limited in amplitude and unrelated to the size of the tricycle. Furthermore, such bouncing action cannot achieve any additional movement, such as the angular rocking motion present in a toy, such as a rocking horse.

Consequently, an object of the present invention is a versatile, sturdy tricycle which permits adjustment of the distance between the tricycle seat and pedals and yet increases the stability of the tricycle when such distance is increased.

Another object of the present invention is a tricycle which has a pivoted spring connection between the front and rear wheels of the tricycle which permits an increased amplitude of bouncing action to the tricycle and permits relating the ride given by the tricycle to the size of the tricycle.

Still another object of the present invention is a tricycle having a pivoted spring connection between the front and rear wheels of the tricycle which permits an angular rocking motion of the tricycle when in use.

Still another object of the present invention is a pivoted spring connection which utilizes a triangular cross section adjoining the pivot axis to give a high resistance to bending at that point.

Other objects and advantages of the present invention will be readily apparent from the following description and drawings which illustrate a preferred exemplary embodiment of the present invention.

In general, the tricycle of the present invention involves a front wheel assembly including at least one longitudinal rearwardly extending tube and a rear wheel assembly including a spring connection means adapted to adjustably secure the free end of the front wheel assembly tube to the rear wheel assembly. The spring connection means is also adapted to increase the softness of the ride as the length of the tricycle is increased and to permit angular

motion of the front wheel assembly while controlling such angular motion by displacement of the spring means.

In order to facilitate understanding of the present invention, reference will now be made to he appended drawings of a preferred specific embodiment of the present invention. Such drawings should not be construed as limiting the invention which is properly set forth in the appended claims.

In the drawings:

FIG. 1 is a side elevation of the tricycle of the present invention shown in partial cross section.

FIG. 2 is a cross-sectional view of FIG. 1 taken along the lines 2—2 of FIG. 1.

FIG. 3 is a cross-sectional view of FIG. 1 taken along lines 3—3 of FIG. 1.

FIG. 4 is a view similar to a portion of FIG. 3 showing the movement of the tricycle when in use.

FIG. 5 is a view similar to FIG. 1 also showing the motion of the tricycle when in use and its appearance when lengthened.

FIG. 6 is an enlarged perspective view of the spring connection portion of the present invention.

Although the present invention can be used advantageously on bicycles, tricycles, velocipedes, and other wheeled vehicles, it is shown for purposes of illustration but not of limitation as involving a tricycle **10** having an adjustable length and both an enlarged bouncing action and an angular rocking motion. Tricycle **10** comprises a front wheel assembly **11** and a rear wheel assembly **30**. The front wheel assembly **11** includes a front wheel **12** rotatably mounted between arms **13** of a yoke **14** and adapted to be rotated by pedals **15**. Hollow stem **16** of the yoke **14** is rotatably received in a sleeve **17** and the stem **16** has handlebars **18** adjustably fixed thereto by a set screw **19**. Mounted on the sleeve **17** and extending rearwardly therefrom is a longitudinal tube **20** whose free end **21** has a triangular cross-section. Preferably, a fender **22** is mounted on the yoke **14** above the front wheel **12**.

The free end **21** of the front wheel assembly tube **20** is pivotally and adjustably secured to the rear wheel assembly **30**. The rear wheel assembly **30** includes a pair of rear wheels **31** rotatably mounted on the arms **32** of a U-shaped crossbar **33**. On the shank **34** of the crossbar **33** is mounted a spring connection means **40** which is adapted to pivotally and adjustably secure the free end **21** of the front wheel assembly tube **20** to the rear wheel assembly **30**. In addition, the spring connection means **40** is adapted to permit angular motion of the front wheel assembly **11** with respect to the rear wheel assembly **30** while controlling such angular motion by the displacement of spring means **80**. Spring connection means **40** comprises a pair of spaced support arms **41** formed out of a vertical panel **42** having a circular flange **43** by which it is attached to the shank **34**. Joined along the top edge of the panel **42** and extending inwardly therefrom is a horizontal panel **44** so that the support arm **41** has an L-shaped cross section over a major portion of its length adjacent the shank **34**.

Between the free ends **45** of the support arms **41** is pivotally connected a cradle plate **50** by means of a pair of pivot pins **46**. The cradle plate **50** has a centrally located V-shaped groove **51** which is adapted to receive the triangular-shaped free end **21** of the front wheel assembly tube **20**. Also, the cradle plate **50** has a spaced pair of recesses **52** separated by the groove **51** and having apertures **53** in their bottom. Cradle plate **50** also includes side flanges **54** along each side of the cradle plate **50** to which the pivot pins **46** are rotatably attached. Adjoining the side flanges **54** is a downwardly extending front flange **55**. Such construction of the cradle plate **50** with side flanges **54** and front flange **55** produces a

cradle plate **50** which is highly resistant to both longitudinal and lateral bending.

Clamping the free end **21** of the front wheel assembly tube **20** in the groove **51** of the cradle plate **50** is the first end **61** of a brace plate **60**. Brace plate **60** is mounted on the cradle plate **50** by a pair of cradle plate bolts **62** which are welded to the brace plate **60** at their head and extend through the apertures **53** in the recesses **52** of the cradle plate **50** and joined to the cradle plate **50** by nuts **63**. Thus, the flexing of the recesses **52** in the cradle plate **50** produces a locking action on the bolt **62** and nut **63** to securely hold the first end **61** of the brace plate **60** to the cradle plate **50** and securely clamp the free end **21** of the front wheel assembly tube **20** therebetween. The second end **64** of the brace plate **60** is connected to the horizontal plates **44** of the support arms **41** by a pair of support arm bolts **65** welded at their head end to the brace plate **60** and slidably received in holes **46** in the horizontal plates **44** of the support arms **41**. The support arm bolts **65** are held in the holes **46** of the horizontal plates **44** by nuts **66**. In addition, the second end **64** of the brace plate **60** is connected to the horizontal plates **44** of the support arms **41** by displaceable spring means **80** which control the angular motion of the front wheel assembly **11** with respect to the rear wheel assembly **30** by displacement thereof. The spring means **80** comprises coil springs **81** slidably received on the bolts **65** and braced at their upper ends against the base plate **60** and at their lower ends against the support arms **41**. The first end of the brace plate **60** also includes upwardly extending side flanges **67** along each of its sides and an upwardly extending front flange **68** which is surmounted by a pair of slanted ears **69** adapted to support the front end **91** of the seat **90**. Similar to the cradle plate **50**, the brace plate side flanges **67** and front flange **68** make the brace plate **60** highly resistant to both longitudinal and lateral bending. The second end **64** of the brace plate **60** includes a central ridge **70** formed by a pair of indentations **71** on opposite edges of the brace plate **60** and to which the heads of the bolts **65** are welded. The ridge **70** is adapted to support the rear end **92** of the seat **90** of the tricycle and in addition provides substantial resistance to longitudinal bending of the brace plate **60**.

The tricycle of the present invention is operated in a manner substantially similar to the usual tricycle except for advantageous features of the present invention. Thus, when the tricycle is to be first used by the child, it can be adjusted to give the proper distance between the seat **90** and the pedals **15** merely by loosening the nuts **63** and adjusting the position of the free end **21** of the front wheel assembly tube **20** in the groove **51** of the cradle plate **50**. Compare, for example, FIGS. 1 and 5. When the desired distance is attained, the nuts **63** may be merely retightened and because of the locking action of the recesses **52** in the cradle plate **50**, a tight clamping action is maintained on the free end **21** of the front wheel assembly tube **20** by the cradle plate **50** and the brace plate **60**. When the tricycle is used by the child, the spring connection **40** permits not only the usual bouncing action of the seat with respect to the frame due to the compression of the coil spring **81** between the brace plate **60** and the support arms **41**, but also permits an additional bouncing action due to the rotation of the front wheel assembly **11** with respect to the rear wheel assembly **30** so that the frame of the tricycle as a whole moves downwardly while the child bounces on the seat. Thus, an increased amplitude of bounce is achieved. In addition, the rotation of the front wheel assembly **11** with respect to the rear wheel assembly **30** permits the rear wheel assembly **30** to move forward in an angular rocking motion during the bouncing action which is similar to the rocking motion achieved by a rocking horse. More important, the length or size of the tricycle is related to the kind of ride produced by the tricycle, i.e., the type of the ride is in effect dependent on the size of the rider. Thus, as the length of the tricycle is increased, the softness of the ride is increased. Such effect is illustrated in FIGS. 1 and 5. Thus, in FIG. 1, the pivot pins **46** form a fulcrum *a* with front wheel assembly **11** forming one lever arm *b* and the brace plate **60** forming the other lever arm *c*. As illustrated in FIG. 5, the lever arm *b* is lengthened by the lengthening of the tricycle while the lever arm *c* remains fixed in length. Consequently, when the tricycle rider engages in bouncing action the frequency of the bouncing action, i.e., the spring action, is decreased. Thus, for larger children, the longer tricycle gives a softer ride, while for smaller children, a shorter tricycle gives a more stiff and stable ride.

A change in the weight of a rider on tricycle **10** will produce a change in its steering geometry. A young, light child will find the steering very easy, while an older, heavier child will find the steering harder. The hard steering has the advantage of greater stability for high-speed traveling which older children enjoy. Thus, in FIG. 1, the line *bac* and the phantom lines *e*—*e* and *f*—*f* represent the light load position of the associated parts with the wheel **12** in the solid line position. The phantom lines *b'a'c'*, *g*—*g* and *h*—*h* represent the heavy load position of the associated parts with the wheel **12** in the phantom line position. X_1 represents the height yoke **14** must rise for 90° of wheel turn under a light load, and Y_1 represents the distance between the pivot point and road contact of wheel **12** under a light load. X_2 represents the height yoke **14** must rise for 90° of wheel turn under a heavy load and Y_2 represents the distance between the pivot point and road contact of wheel **12** under a heavy load. As can be seen in FIG. 1, **X_2 and Y_2 are greater than X_1 and Y_1. Thus, steering** is harder under a heavy load because yoke **14** must be raised higher for a turn and the pivot point and road contact do not coincide, resulting in a scraping action.

Many other specific embodiments of the present invention will be obvious to one skilled in the art in view of the present disclosure. Thus, for example, a variety of shapes may be utilized for the support arms, cradle plate and brace plate of the spring connection between the front wheel assembly and the rear wheel assembly of the tricycle, as well as a variety of spring connections. Also, for example, the coil spring **81** may be mounted below the support arms **41** so that the bouncing action causes it to be extended initially, rather than compressed initially.

There are many features in the present invention which clearly show the significant advance it represents over the prior art. Consequently, only a few of the more outstanding features will be pointed out to illustrate the unexpected and unusual results attained by the present invention. One feature of the present invention is the adjustability of the length of the tricycle so that the distance between the tricycle pedals and the tricycle seat may be varied to accommodate the child's growth. Yet, as such distance is increased, it lengthens the tricycle and the stability of the tricycle is actually increased since the center of gravity of the combination of the child and the tricycle is not raised and the area enclosed by the front wheel and the two rear wheels is increased. In addition, such length adjustability feature permits easy replacement of a portion of the tricycle should it become severely damaged. Thus, for example, the front wheel assembly and the rear wheel assembly can be independently replaced merely by loosening a pair of bolts. Another feature of the present invention is the triangular cross-section of the free end of the front wheel assembly tube which adjoins the pivot axis of the pivot connection for the tricycle. Such structural features insure that the tricycle will have unusually high resistance to bending at the point where the greatest bending forces are applied.

Still another feature of the present invention is a piv-

oted spring connection between the front wheel assembly and the rear wheel assembly of the tricycle which permits increased amplitude of bouncing as well as an angular rocking motion to the tricycle. Thus, not only does the child when using the tricycle have the bouncing action normally associated with seat springs, but also the tricycle frame as a whole moves with respect to the ground. In addition, unlike the usual prior art tricycle, in use, the present tricycle can achieve an angular rocking motion similar to the motion of a rocking horse.

It will be understood that the foregoing description and examples are only illustrative of the present invention and it is not intended that the invention be limited thereto. All substitutions, alterations and modifications of the present invention which come within the scope of the following claims or to which the present invention is readily susceptible, without departing from the spirit and scope of this disclosure are considered part of the present invention.

The word "tricycle" is used herein for convenience and is defined to mean any velocipede or other wheeled vehicle which can incorporate the present invention.

What is claimed is:

1. A velocipede having an adjustable length and giving a ride related to the adjusted size of the velocipede comprising:

a front wheel assembly including at least one longitudinal, rearwardly extending tube; and

a rear wheel assembly including spring connection means for selectively connecting said rear wheel assembly to different positions along the length of said front wheel assembly tube to increase or decrease the length of the velocipede, said spring connection means being constructed and arranged to increase the softness of the ride as the length of the velocipede is so increased.

2. A velocipede as stated in claim **1**, wherein said spring connection means is adapted to pivotally secure said front wheel assembly tube to said rear wheel assembly and to permit angular motion of said front wheel assembly with respect to said rear wheel assembly while controlling said angular motion by the displacement of said spring connection means.

3. The velocipede as stated in claim **1** wherein said front wheel assembly tube has a triangular cross-section where it is connected to said rear wheel assembly.

4. A velocipede as called for in claim **1** wherein said front wheel assembly includes a wheel and at least one pedal for rotating said wheel to propel said velocipede and said rear wheel assembly includes a seat, the distance between said pedal and said seat being increased as the length of the velocipede is so increased.

5. A velocipede having an adjustable length and giving a ride related to the adjusted size of the velocipede comprising:

a front wheel assembly including at least one longitudinal, rearwardly extending tube; and

a rear wheel assembly including spring connection means adjustably connecting said front wheel assembly tube to said rear wheel assembly to increase the softness of the ride as the length of the velocipede is increased, said spring connection means is adapted to pivotally secure said front wheel assembly tube to said rear wheel assembly and to permit angular motion of said front wheel assembly with respect to said rear wheel assembly while controlling said angular motion by the displacement of said spring connection means, said spring connection means comprises a pair of spaced support arms having a cradle plate pivotally connected therebetween adapted to support said front wheel assembly tube, a brace plate having a first end mounted on said cradle plate and clamping said tube to said cradle plate and having a second end connected to said support arms by displaceable spring means.

6. A velocipede as stated in claim **5** wherein said front wheel assembly tube includes a portion having a triangular cross-section and said cradle plate has a V-shaped groove adapted to receive said portion of said tube.

7. A velocipede as stated in claim **5** wherein a projection of the major axis of said front wheel assembly into a road surface substantially coincides with the point of contact of said front assembly with said road surface when a light child rides said velocipede and moves forwardly of said point of contact when a heavy child rides said velocipede.

8. A velocipede comprising:

a front wheel assembly including a tubular member having first and second ends;

a yoke member having a stem rotatably mounted in said first end of said tubular member, said yoke member including a pair of spaced, parallel arms depending from said stem;

a front wheel rotatably mounted between said arms; and

a rear wheel assembly including spring connection means for selectively connecting said rear wheel assembly to different positions along the length of said tubular member to increase or decrease the length of the velocipede, said spring connection means being constructed and arranged to increase the softness of the ride as the length of the velocipede is so increased, said rear wheel assembly being pivotally connected to said tubular member near said second end in such a manner that a plane coinciding with the major axis of said yoke and a vertical plane passing through the rotatable mounting for said front wheel coincide at approximately the point where said wheel contacts a road surface when a light child rides said velocipede and do not coincide at said point when a heavy child rides said velocipede.

9. A tricycle comprising:

a front wheel assembly that includes a yoke assembly having parallel, spaced-apart arms depending from a stem;

a front wheel rotatably mounted between said arms;

a tube member having one end in which said stem is rotatably received;

a rear wheel assembly pivotally connected to the other end of said tube member to permit angular displacement of said front wheel with respect to said rear wheel assembly; and

spring means connected to said rear wheel assembly and to said tube member for controlling said angular displacement in such a manner that the major axis of said tube member will be inclined downwardly from a horizontal position and a plane coinciding with the major axis of said yoke will be displaced forwardly of a vertical plane passing through the point at which said front wheel is rotatably mounted when a child exceeding a predetermined weight rides said tricycle, whereby the pivot point and the road contact point for said front wheel do not coincide, said rear wheel assembly being selectively connectible to different positions along the length of said tube member to increase or decrease the length of the tricycle, said spring connection means being constructed and arranged to increase the softness of the ride as the length of the tricycle is so increased.

10. A tricycle comprising:

a front wheel assembly including a front wheel adapted to contact a road surface, said front wheel assembly including frame means rotatably receiving said front wheel and a rearwardly extending tube;

a rear wheel assembly pivotally connected to said front wheel assembly to permit angular displacement of said front wheel assembly with respect to said rear wheel assembly; and

spring means connected to said rear wheel assembly and said front wheel assembly for controlling said

angular displacement, whereby the projection of the major axis of said frame means and the vertical axis of said front wheel into the plane of said road surface intersect more approximately at said road surface when a light child rides said tricycle and become spaced relatively apart when a heavy child rides said tricycle, said rear wheel assembly being selectively connectible to different positions along the length of said tube member to increase or decrease the length of the tricycle, said spring connection means being constructed and arranged to increase the softness of the ride as the length of the tricycle is so increased.

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