ABSTRACT

A vehicle of a very low profile and very high stability, wherein an integral seat constitutes the vehicle frame. A pair of laterally spaced wheels are mounted on the rear of the seat, and an elongated arm is pivoted intermediate its ends to the front of the seat about a vertical axis, and a dirigible wheel is mounted on the arm rearwardly of the vertical axis. A footrest is secured to the arm forwardly of the vertical axis, whereby a rider can swing the arm to steer the vehicle and also cause propulsion thereof. A brake is pivotally mounted on the arm, with handle actuating means being provided therefor which can be employed to control the brakes and/or swinging movement of the arm. Alternate movement of the arms, legs, and body to the right and left of the desired steering direction coupled with twisting movement of the body results in effecting propulsion of the vehicle in a manner somewhat analogous to the propulsion of a boat by a sculling oar. One version of the vehicle includes a single U-shaped bar to constitute a footrest and handles, and this version includes provision for releasably latching the brake from its breaking condition.

38 Claims, 12 Drawing Figures
VEHICLE WITH COMBINATION STEERING, BRAKING AND PROPULSION MEANS

The present invention relates to new and useful improvements in vehicles, and more specifically the invention pertains to a three-wheeled vehicle having a pair of rear wheels and a front steering wheel, except for the steering wheel of the dirigible wheel is substantially forward of the axis of rotation of such wheel, and wherein the position and direction of rotation of the front wheel can be controlled by the hands and/or the feet of the vehicle rider.

An important object of the invention is to provide a vehicle useful in aeronautics as well as for small and large people for purposes of play, controlled downhill coasting, transportation and exercise that is safe in its operation (particularly as to dynamic stability), of great maneuverability, and which is small in size and weight for convenient storage and shipment.

Another important object of the invention is to provide a vehicle that can be occupant-propelled through the wheels thereof in the absence of any positive conventional drive such as chains, belts, gears, and the like, to rotate the wheels.

Another object of the invention is to provide a vehicle with an integral seat constituting the vehicle frame.

Another important object of the invention is to provide a vehicle with a self-energizing brake system, such that the brake is automatically applied when the vehicle is unoccupied, and wherein the brake and steering system have a common control for braking and/or steering simultaneously.

Yet another important object of the invention is to provide a vehicle with a brake system that tends to be self-energizing in operation, and which brake system can be latched by a fast releasing latch mechanism to prevent inadvertent or unintended brake operation.

A final object to be specifically set forth is to provide a vehicle in accordance with the preceding objects that will be education to the public and physics of its propulsion, attractive in appearance, and inexpensive while being very durable and rugged in use.

A broad aspect of the invention involves a vehicle comprising a frame having a central longitudinal axis, a pair of laterally spaced ground support wheels mounted on the frame for rotation about axes that are perpendicular to the longitudinal axis of the frame, a dirigible ground support wheel, means for mounting the dirigible wheel comprising an elongated arm pivotally connected to the frame for swinging movement about a generally vertical axis, said dirigible wheel being mounted on said arm for rotation about a horizontal axis transverse to the elongated arm and longitudinally spaced from the vertical axis, said vertical axis being disposed along the longitudinal axis of the frame, said dirigible wheel being longitudinally spaced from the pair of support wheels relative to the longitudinal axis of the frame when the arm is pivoted to swing into parallelism with the longitudinal axis of the frame, and means operable by a vehicle rider for swinging the arm.

Other objects and aspects of the invention as well as numerous novel features and advantages will become manifest in the light of the ensuing description of preferred embodiments of the invention, such description being made in conjunction with the accompanying drawings, wherein:

FIG. 1 is an isometric view of the vehicle from above and from the left front of the vehicle;
FIG. 2 is a side elevational view of the vehicle, an alternate position of the brake system being shown in dashed outline, with a fragmentarily illustrated push bar being shown in push position, and with hidden details of construction being shown in dotted lines;
FIG. 3 is an enlarged vertical transverse sectional detail view taken upon the plane of the section line 3-3 in FIG. 2;
FIG. 4 is an enlarged fragmentary side elevation, partially in section, illustrating in particular the structure and mounting of the dirigible wheel unit;
FIG. 5 is a vertical transverse sectional view taken upon the plane of the section line 5-5 in FIG. 1;
FIGS. 6 and 7 are fragmentary top elevational views of the steering and braking system with the forward portion of the seat being shown in dashed outline, with such views respectively showing in dashed outline the steering and brake system pivoted to effect turning to the left and to the right;
FIG. 8 is an enlarged fragmentary detail vertical sectional view in the medial plane of the rear end of the vehicle;
FIG. 9 is an isometric view, partially broken, of a modified form of the invention;
FIG. 10 is a side elevational view of the structure shown in FIG. 9, the same being shown in operative condition for movement, with a fragmentary showing of the push bar as applied in pushing, hidden details being shown in dashed outline;
FIG. 11 is an enlarged fragmentary side elevational view of the vehicle shown in FIG. 10 illustrating particularly the camming action of the brake latch member to an unlatched condition preparatory to brake application; and,
FIG. 12 is a view generally similar to FIG. 11 illustrating particularly the application of the brake after the brake latch member has been unlatched.

Referring to the drawings wherein like numerals designate like parts throughout the various views, and directing initial attention to the form of the invention shown in FIGS. 1 through 8, the reference numeral 10 designates the vehicle generally. The vehicle 10 comprises a frame 12 on which, adjacent the rear thereof, is mounted a pair of laterally spaced rear wheels 14 and 16.

A combination steering and braking assembly (inclusive of a dirigible front wheel unit) designated generally at 18 is pivotally mounted at 20 to the frame 12, adjacent the front thereof, for swinging movement about a vertical axis.

The combination steering and braking assembly 18, which as will be subsequently explained also serves as a propulsion means, comprises an elongated arm 22 (preferably formed from a length of steel channel stock) that is of an inverted U-shape in transverse section as defined by a horizontal web portion 24 integral with and joining depending side or flange portions 26 and 28. The pivotal connection 20 is intermediate the longitudinal extent of the arm 22, and a dirigible wheel unit 30 is secured to the arm 22 at a position spaced rearwardly of the vertical axis of the pivotal connection 20. The wheel unit 30 is dirigible by reason of the arm 22 being pivoted to the frame 12.

The dirigible wheel unit 30 is secured to the arm 22 at a position rearwardly of the pivotal connection 20, and a footrest bar 32 is, at its midportion, secured to the arm 22 at a position forwardly of the pivotal connection 20. The footrest 32 is transverse to the longitudinal extent of the arm 22, is preferably tubular steel or aluminum, and is provided with rubber end caps 34 to prevent the marring of or injury to objects contacted thereby.

The web 24 of the arm is provided with parallel pairs of longitudinally spaced openings 36, and the rest bar 32 is provided with an integral flange 38, having a pair of openings therethrough (not shown) which may be aligned with a selected pair of openings 36, and secured in such longitudinally adjusted or selected position by a pair of suitable threaded fastener means such as nut and bolt combinations 40 extending through the aligned openings.

The dirigible wheel unit 30 is preferably a dual wheel assembly, and is a conventional dual wheel truck unit of the type commonly employed in roller skates. The conventional roller skate-type truck unit employed preferably comprises a mounting plate 42 from which is suspended an axle 44 by a resilient or rubber bushing-type strut 46 and a swivelly secured strut 48. Such suspension of the axle 44 from the plate 42 permits a limited degree of resilient movement vertically of the axle 44 while resiliently restraining the axle 44 against angular movement about vertical and horizontal axes normal thereto. Except for minor and resiliently opposed angular movements permitted the axle 44 by the struts 46 and 48, the axle 44 is perpendicular in the horizontal plane to the longitudinal extent of the arm 22. As will be understood by those skilled in the art, the conventional resilient strut includes conventional adjustable means 50 whereby the degree of resilient freedom
The wheels 32 and 54 of the wheel unit are conventional roller skate wheels of the ball bearing type, such wheels 32 and 54 being mounted on the opposite ends of the axle 44 in the conventional manner. The peripheries 56 of the wheels 32 and 54 can be of any suitable material such as conventional in roller skate wheels, such as steel, hard rubber, or a high density and hard synthetic resin. The web of the arm 22 is provided with a series of openings 60 extending longitudinally of the arm 22, and the mounting plate 42 is seated against the underside of the web 24 and secured in selected longitudinal adjustment relative thereto by means of a pair of threaded nut and bolt combinations 62 that extend through the plate and a selected pair of the openings 60.

The steering and brake assembly 18 also includes braking means comprised of a brake shoe 64 secured, as by welding or the like, to the lower extremities of an inverted U-shaped bracket consisting of a web 68 connecting integral depending legs 70 and 72. The bracket, preferably of steel, is disposed in spaced relation over and about the arm 22 intermediate the footrest 32 and the pivotal connection 20, with the brake shoe 64 being disposed in spaced relation below the arm 22. The brake shoe 64 is of composite construction being comprised of an upper backing plate 74 of steel, with a pad 76 of neoprene or other suitable braking material secured to the underside of the plate 74. Conventional means, not shown, detachably secure the pad 76 to the plate 74 whereby the former can be replaced when worn out.

Rearwardly extending steel arms 78 and 80 are respectively secured, as by welding or the like, to the bracket legs 70 and 72, such arms 78 and 80 being pivotally connected adjacent their rear ends respectively to the flanges or legs 28 and 26 of the arm 22 as indicated at 82. The arrangement is such that the brake shoe 64 can be swung vertically between a ground engaging braking position to a relatively raised position. When the brake shoe is in its braking position (substantially coplanar with the plane defined by the bottom of the wheels 14, 16, 52, and 54), the plane of the bottom surface of the pad is in such plane, or if desired or deemed expedient, is inclined slightly upwardly and forwardly relative to such plane. For a reason to be presently explained, the web 68 limits downward movement of the brake shoe 64.

A transversely extending tubular steel handle bar 83 is centrally secured, as by welding or the like, to the top of the web 68, and the ends thereof are preferably provided with rubber end caps 64.

The frame 12 is of integral construction and of a generally isosceles triangular peripheral configuration in the horizontal plane with the apex or front of such shape being adjacent the pivotal connection and the base angles thereof being adjacent the wheels 14 and 16. In the preferred construction, the frame 12 is contoured in a seat-like configuration, the upper surface 90 thereof being appropriately of concave shape to accommodate the buttocks of a forwardly facing rider (not shown) seated thereon. The frame 12 can be fabricated in essentially complete form from steel stampings, cast from aluminum, or molded from laminated layers of Fiberglas in a synthetic resin matrix such as epoxy resins commonly employed in the making of boat hulls and the like.

The rear side portions and the rear of the seat constituting frame 12 includes an integral and continuous flange or skirt including side portions 94 and 96 connected by a rear portion 98. As best shown in FIG. 5, the coaxial wheels 14 and 16 are positioned respectively adjacent the inner faces of the skirt portions 94 and 96, and the axles 100 and 102 of such wheels are respectively secured in any suitable manner, such as being threaded tightly thereto, to such skirt portions 94 and 96. If desired, the skirt portions can be reinforced or thickened in the region of the connections of the aligned axles 100 and 102 thereto.

The wheels 14 and 16 can be rotatably mounted and retained on their respective axles 100 and 102 in any suitable manner as will be understood by those skilled in the art. The wheels 14 and 16 are of equal diameter, and can, if desired, be of the same diameter as the wheels of the unit 30. If deemed necessary or expedient, the wheels 14 and 16, like wheels of the unit 30, be of the ball bearing type. Similarly, the rolling peripheries of the wheels 14 and 16 can be steel, rubber or of synthetic resin. Preferably, the wheels 14 and 16 are of the same diameter as the wheels of the dirigible unit 30 in view of the general desirability of maintaining the center of gravity of the vehicle, both with and without its rider, as low as possible, and in further view of the desirability of the vehicle's having a low profile and minimal overall height.

As best shown in FIGS. 2 and 3, the seat constituting the frame 12 is somewhat upwardly and forwardly inclined at its forward end and terminates in a generally vertical tubular portion 110 that defines a generally vertical opening 112 therethrough.

The pivotal connection 20 is generally similar to and can be substantially identical to the pivotal connection of the front wheel fork to the frame in conventional bicycle construction, the pivot 20 being comprised of an upstanding tubular member 113 extending through the web 24 and a reinforcing plate 114 spaced below the web 24, such plate 114 being welded to the flanges or legs 26 and 28. A bearing cone 115 is disposed on the tubular pivot pin or spindle 113 immediately above the web 24 and is welded thereto.

Conventional bearing cups 116 and 117 are press fitted into the lower and upper ends of the opening 112, and the tubular spindle extends in spaced relation upwardly through the cups 116 and 117, with conventional ball bearings and retainer ring combination 118 being disposed or seated in the usual manner intermediate the cone 115 and the cup 116. An internally threaded cone 119 is threaded upon the upper threaded end of the spindle 113 with conventional ball bearings and retainer ring combination 120 being disposed or seated between the cup 117 and the cone 119. A retainer nut 121 is threaded on the top of the spindle to bear against the top of the cone 119 to retain the parts in assembled relation.

As best shown in FIGS. 1, 2, 5, and 6, the vehicle is optionally provided with structure enabling the vehicle to be ridden or coasted with dirigible wheel unit 30 elevated above the ground surface 130. Such structure comprises a frame member 132 detachably secured to the rear skirt portion 98 by a pair of threaded nut and bolt means 134 to extend or project upwardly and rearwardly from the rear end of the frame 12 in the medial vertical plane of the latter. The frame member 132 is provided with a hollow recess 136 adjacent the rear end thereof that opens through the underside thereof, and a wheel 138 is disposed in such hollow 136 to extend below the member 132 as shown. The wheel 138 is journaled for rotation on an axle 140 fixed through the member 132.

The wheel 138 is spaced above the plane defined by the bottom of the wheels 14, 16, 52, and 54, and the axle 140 is parallel to and spaced rearwardly of the coaxial axles 100 and 102.

The frame member 132 is also provided with a socket 144 adjacent the forward end thereof, such socket opening through the top thereof in a rearwardly inclined direction so as to removably receive the forward end of an elongated push bar 150.

The use of the vehicle 10 will now be described. A rider, not shown, seats himself on the seat constituting a frame 12 in a forwardly facing direction and places his feet on the opposite end portion of the footrest 32, his knees being bent and above the handle bar 83. The rider squats on the seat and hunches or hunkers forwardly and grasps the opposite end portions of the handle bar 83 with his hands, with his knees or thighs being disposed between his arms.

The rider may urge the brake shoe 64 downwardly into braking contact with the ground surface 130 if he desires to hold the vehicle stationary by pushing forwardly and downwardly on the handle bar 83, and conversely if he wants...
the vehicle 10 free to move. In the simplest use of the vehicle 10 perhaps best suited for tiny tots, the rider obtains the services of another person, not shown, to push the vehicle 10 by the push bar 150 with the forward end of the latter disposed in the recess. While being pushed and after the pushing by the other person has been discontinued (the other person removing the push bar 150 from the recess on discontinuance of pushing) the rider can control the direction of travel by turning the arm 22 by appropriate application of forces to the footrest 32 and/or the handle by the feet and/or arms.

It will be clear that the vehicle 10 will make a forward left turn when the arm 22 is pivoted from its full line to the dashed line position shown in FIG. 6, that is, when the forward end of the arm is swung to the left. Conversely, when the forward end of the arm 22 is swung from its full line position to the dashed line position shown thereof in FIG. 7, a right forward turn will be effected.

While coasting in a forward direction, the rider can throw his weight rearwardly in a sudden fashion to cause the dirigible vehicle unit 30 to rise from the ground surface 130 and force the rear medial wheel 138 into ground contact. This mode of support can be sustained if the rider rears backwardly sufficiently to displace the center of gravity of the vehicle-ride combination rearwardly of the rear wheels 14 and 16.

When the rider desires to stop the vehicle 10, assuming the vehicle 10 is in an attitude such that the dirigible vehicle unit 30 engages the ground surface 130, he merely pushes forwardly and downwardly upon the handle 83 to engage the brake shoe 64 with the ground surface 130. Very little force is required because the frictional forces acting on the brake shoe 64 from the ground surface 130 tends to produce a self-energizing effect. Such self-energizing effect merely aids the rider and does not take over control of the braking action. In other words, the rider can vary the braking or retarding action by increasing or reducing the forward and downward force he exerts on the handle bar 83. The relative locations of the footrest 32, the handle bar 83 and the frame seat 12 are such that the rider's arms are normally in some degree of tension, whereby the rider is largely precluded from unintentional application of brakes. This effect can be increased for any given size rider by rearward adjustment of the position of the footrest 32.

The vehicle 10 can be propelled forwardly on level ground and even up a slight grade without any outside assistance in a rather unique manner; this despite the fact that all of the wheels of the vehicle are free wheeling, that is, no chain, belt, gear, ratchet, crank or other positive drive means are connected to the wheels to cause rotation of the wheels and consequent propulsion thereof. Needing to say, the propulsion system here involved does not involve the rider contacting the ground with either his feet or hands, the only contact of the rider and the vehicle with ground being that of the wheels of the vehicle. While the manner in which the rider can operate and cause the vehicle 10 to be self propelling can be and is hereinafter described in detail, the actual mechanism or theory of operation may be or partially understood and may even be erroneous, and while such theory is set forth, it is not desired to be bound by such theory of operation, as it is possible to make, use, and enjoy the vehicle of this invention without knowledge of or understanding the correct theory of operation whatever it may be.

In order for the rider to cause the vehicle to perform its propelling function, the rider is seated on the frame seat 12, with his feet and hands on the footrest 32 and the handle bars 83 as previously set forth, and the rider then, through the use of his feet and hands, causes the arm 22 to alternately swing back and forth to the right and left such as between the dashed positions shown thereof in FIGS. 6 and 7. In the operation of the feet and hands to effect such swinging or pivotal motion of the arm 22, there is a tendency of the body of the rider to lean alternately to the left and right. It has been found that the propulsive effect tends to be more pronounced when the rider deliberately exaggerates the alternate twisting of his body, especially to the swiftness and extent of such twisting back and forth to the left and right in synchronism with the swinging of the arm 22. The alternate twisting or swinging of the body to the left and right may not be essential to propulsion and more in the nature of a catalyst, so to speak; however, the swinging of the arm 22 is essential to obtaining a propulsion effect.

A vehicle of essentially the same character as that depicted in the drawings and previously described has been built and tested. Such tests have involved such vehicle having been ridden by a large number of people of a great range in size and age. None of these persons has experienced any difficulty in riding and controlling the vehicle, and everyone of such persons without exception has mastered within a few minutes the technique of propelling the vehicle in the manner above described.

The conjectured operation is that the propulsion is dependent upon the same physical principles as are involved in propulsion in ice or roller skating, or in the use of a skating oar to propel a boat. It will be noted that the alternate swinging of the arm 22 entails the dirigible vehicle unit being swung alternately to the left and right with the force being in a direction at right angles the direction such unit is free to roll upon the ground. This seems to be analogous to forces applied to a skater to his skate, and even more analogous to the forces applied to a skating oar in relation to the direction of movement of least resistance of the oar through the water. The alternate twisting of the body to the left and right is thought to produce an inertial effect tending to increase the velocity of the vehicle.

It is believed most probable that the greatest torque given the arm 22 by the rider is when the latter is moving forward toward the median plane, rather than when moving outwardly therefrom, however, this is far from certain. In the tests mentioned above, it appears that each rider so quickly relates cause and the intended propulsive effect that it immediately becomes so natural to him that he does not describe or describes too well just what his actions are, and most riders simply would yield the use of the vehicle to a persistent questioner.

The self-propelling characteristic of the vehicle 10 can be employed in starting from a dead stop as well as when the vehicle 10 is moving swiftly, and even when negotiating a turn.

An outstanding characteristic of the vehicle 10 is its very great stability against overturning, even when negotiating a sharp turn and high speed. In the tests mentioned above, the vehicle never overturned despite a great and very conspicuous lack of caution by some of the riders, particularly the young riders. Rather than overturning, the vehicle would simply slide away.

The stability of the vehicle 10 is due not only to its very low profile and overall height, but also is due to the fact that the rider is seated at a very low height and is compelled to adopt a posture that lowers his center of gravity relative to his buttocks. The stability is also largely due to the fact that the dirigible vehicle unit 30 moves laterally outwardly from the center line in a direction opposite to the direction of the turn being negotiated. It is just as though a needed point of support is moved to a position needed and most effective to prevent overturning. This coupled with the rider twisting in the direction of the turn makes an overturn most unlikely; seemingly impossible on level terrain from the tests thus far made. The weight of the rider's legs and feet is moved inboard on a turn; and this further contributes to lateral stability.

As to the spacing of the rear wheels 14 and 16, it has been found that a spacing in the range of about 16 to about 20 inches OD is most suitable, with the wheels 14 and 16 having a diameter in the range of about 21/2 to about 4 inches. The longitudinal spacing of the center of gravity of the dirigible vehicle unit 30 from the pivotal connection 20 in relation to the longitudinal spacing of the pivotal connection 30 from the axis of rotation of the wheels 14 and 16 has been found to be quite important to the proper operation of the vehicle 10, and the former spacing should be within the range of 12 to 32 percent of the latter spacing, with a spacing of 18 to 22 percent being
especially preferred, it having been found that about 20 percent is an optimum spacing for overall vehicle performance.

The longitudinal spacing of the pivotal connection 30 from the axis of rotation of the wheels 14 and 16 in relation to the spacing of the wheels 14 and 16 is also of considerable, but of somewhat lesser, importance, and in this regard the isosceles triangle defined by the horizontal plane by the pivotal connection 30 and the centers of the wheels 14 and 16 should be such that the apex angle should lie in the range of about 45° to about 75°, with an angle of about 55° to about 65° being especially preferred, it having been found that about 60° seems to optimize overall vehicle performance.

The size of the wheels of the dirigible unit 30 are more or less dictated by the size of roller skate wheels in order to take advantage of the ready availability of replacement wheels as well as complete dual wheel truck units, as well as the low cost of such wheels and truck units. The invention is, of course, not limited to the use of skate wheels and/or the truck thereof, and any suitable wheel or wheels of about 2 1/2 to about 4 inches diameter can be used. While the dirigible wheel unit 30 includes dual wheels, it will be readily understood that the practice of and enjoyment of the instant invention does not require the use of dual wheels, and that a single wheel may be used in lieu of the illustrated dual wheels.

Attention is directed to the form of the invention shown in FIGS. 9 through 12 which is designated generally at 200. This form of the invention differs from the previously described vehicle 100 solely with respect to certain modifications of the combination steering and braking assembly 18.

The vehicle 200 includes a seat comprising a frame 202 that corresponds exactly to the previously described seat frame 12. The vehicle includes a frame member 204 identical to the previously described member 132, such member 204 being provided with a socket 206 and carrying a wheel 208 that correspond respectively to the previously described socket 144 and wheel 134.

The frame 202 is provided with laterally spaced rear wheels such as indicated at 210, such wheels 210 corresponding identically to the previously described wheels 14 and 16.

The forward end of the frame 202 includes a tubular portion 212 that corresponds identically to the previously described tubular portion 110. The vehicle 200 includes a combination steering and braking assembly 214, and such assembly 214 includes a steel channel member or arm 216 having an uppermost web 218 that is, intermediate the ends of the arm 216, pivotally connected to the tubular portion 212 of the frame in precisely the same manner that the web 24 is pivotally connected to the tubular portion 12 of the vehicle 16, such pivot connection in the vehicle 200 being about a spine 220 that corresponds to the previously described spine 113.

The arm 216 includes depending legs or flanges 222 and 224. A dual wheel dirigible wheel unit 226 is provided and is come to the arm 216 rearwardly of the pivotal connection 212 that corresponds identically to the previously described unit 30, and differs from the latter essentially solely in that the mounting plate of the roller skate truck constituting the unit 226 has upwardly directed lateral flanges 228 disposed on opposite sides of the arm 216, the legs 222 and 224 of the latter being received between the flanges 228. The legs 222 and 224 are provided with a series of openings 230 and the flanges 228 are secured to the legs by a pair of threaded nut and bolt means 232 extending therethrough, whereby the unit 226 can be secured to the arm 216 with selectable spacing from the pivotal connection established by the pivot pin or spindle 220.

A steel channel 234 having a web 236 and upwardly directed flanges 238 and 240 is provided, such channel 234 having its rear end received between the legs 222 and 224 of the arm 216 and being pivoted thereto for vertical swinging movement by a pivot pin 242. The arrangement is such that the forward end of the channel can be pivotally swung upwardly from the position shown thereof in FIGS. 9 and 10 through a small angle, and downwardly from such position through a relatively larger angle.

A forwardly projecting steel strap 250 has its rear end portion received in the channel 234 and is seated against the web 238 thereof. Means including a plurality of openings 252 in the strap 250 and a pair of threaded nut and bolt means 254 is provided to secure the strap 250 to the channel 234 in selected longitudinal extension thereof.

The forward end portion of the strap 250 is best to define a downwardly offset section 256, and a pad 258 of neoprene or of any other suitable friction of brake lining type material is detachably secured as by threaded fastening means 260 and 262 to extend about the underside of the offset section 256 in an arrangement wherein the offset section 256 and the pad 258 constitute in effect a brake shoe designated at 264.

A combined or integral footrest and handle bar means 266 is provided which is centrally secured to the forward upturned end of the strap 250 by the fastener means 262 which extend through the pad 258, the strap 250 and the central portion of the means 266 as shown.

The means 266 is symmetrical about the vertical medial plane of the vehicle 200, and the same extends transversely outwardly from the opposite sides to define footrest portions 270 and 272, and thence is bent rearwardly and upwardly at 274, and finally is bent rearwardly at 276 to define a pair of rearwardly extending handle bars 278 that are preferably provided with rubber hand grips 282 and 284. The means 266 can be conveniently formed of tubular aluminum or steel.

As thus far described, it will be evident that the arm constituted of the channel 234 and the strap 250 can be swung vertically to move the brake shoe 264 vertically between a ground surface 266 engaging or braking position (such as shown in FIG. 12) and a relatively raised position (such as shown in FIGS. 9 through 11).

Since it would tend to tire the arms of a rider to keep the brake shoe 264 raised continuously, particularly against the force of the feet bearing on the footrests 270 and 272, means is provided for releasably latching the brake shoe 264 in a raised position, that is, out of contact with the ground surface 266. Such latch means is designated generally at 290 and the same comprises an upwardly flange 292 fixed to the forward end of the web 218 of the arm 216, such flange 292 constituting a latchkeeper. An upwardly latching latch member 294 has its lower end received within the channel 234 adjacent the forward end of the arm 216, and such lower end of the latch member is pivoted to the flanges 222 and 224 of the channel 234 by a pivot pin 296 whereby the upper end of the member 294, while it is provided with a finger knob 298 is pivotally swingable forwardly and rearwardly relative to the arm 216 in the vertical plane.

The latch member 294 is provided with a recess 298 in which the latchkeeper 292 is received when the channel 234 is generally horizontal (as shown in FIGS. 9 and 10) and the latch member 294 is swung rearwardly. When the latch member 294 is thus engaged only the latchkeeper 292 is engaged because the latch member 294 is swung rearwardly. The latch member 294 is thus engaged because the latchkeeper 292 is swung rearwardly. When the latch member 294 is thus engaged only the latchkeeper 292 is engaged because the latch member 294 is swung rearwardly.

In order to effect a spring release of the latch means that does not require touching of the latch member 294, the latter is provided with a camming surface 300 that is engageable with the latchkeeper 292, whereby when the channel 234 is raised from its latched position of FIGS. 9 and 10 to the position shown thereof in FIG. 11, the force the latch member 294 forwardly to free the latchkeeper from the recess or notch 298. With the latch member cammed to the position shown in FIG. 11, the brake shoe 264 can be instantly lowered to the position shown in FIG. 12, whereby the rider by the use of the forces applied by his feet and hands, can accomplish the desired braking action.

In order to return the apparatus to the latched condition shown in FIGS. 9 and 10, the channel 234 is raised to the maximum permitted, and then is lowered while the knob 296 is manually pulled rearwardly.
The strap 250 may, if desired, be of modestly resilient character to provide a somewhat cushioned ride for the feet of the rider. The resiliency should be such that the flexibility of the strap 250 will not permit the brake shoe to engage the ground surface when the apparatus is in its latched condition.

The use and manner of riding, propelling and braking the vehicle 200 will be evident in the light of the previous description of the operation of the vehicle 10.

I claim:

1. A vehicle comprising a frame having a central longitudinal axis, a pair of laterally spaced ground support wheels mounted on the frame for rotation about axes that are perpendicular to the longitudinal axis of the frame, a dirigible ground support wheel, means for mounting the dirigible wheel comprising an elongated arm pivotedally connected to the frame for swinging movement about a generally vertical axis, said dirigible wheel being mounted on said arm for free rotation in both forward and reverse directions about a horizontal axis transverse to the elongated arm and longitudinally spaced along said arm from the vertical axis, said vertical axis being disposed along the longitudinal axis of the frame, said dirigible wheel being longitudinally spaced from the pair of support wheels relative to the longitudinal axis of the frame and said dirigible wheel also being substantially more closely spaced to the longitudinal axis of the frame than the ground support wheels when the arm is pivotally swung into parallelism with the longitudinal axis of the frame, the arrangement being such that the dirigible wheel moves relative to the frame, on swinging movement of said arm, in a direction that is relatively more parallel to than at right angles to said horizontal axis of rotation of the dirigible wheel, with the arrangement also being such that the dirigible wheel can be caused to traverse from one side to the other of the longitudinal axis of the frame on swinging movement of said arm, and vehicle rider accessible means mounted on and symmetrical with respect to said arm for enabling a vehicle rider to actuate swinging movement of the arm, whereby a vehicle rider can both steer and propel the vehicle by appropriately swinging the arm.

2. The combination of claim 1, wherein said frame is in part comprised of a seat.

3. The combination of claim 1, wherein said frame is in part comprised of a seat, said seat including rear and front portions, said rear portion of the seat being adapted to accommodate thereon the buttocks of a forwardly facing vehicle rider, with the front seat portion being relatively reduced in its lateral extent and adapted to project forwardly of the crotch of such vehicle rider, said pivotally connective means of the arm to the frame being adjacent the forward end of the front portion of the seat, said pair of support wheels being mounted on the frame adjacent the rear end of the rear portion of the seat, and said dirigible wheel being disposed longitudinally intermediate the vertical axis and the pair of wheels.

4. The combination of claim 3, including a rear support wheel mounted on the frame for rotation about a horizontal transverse axis, said rear wheel being disposed along the longitudinal axis at a location longitudinally rearwardly of the pair of wheels, and said rear wheel being spaced above a plane defined by the bottoms of the dirigible wheel and the pair of wheels.

5. The combination of claim 3, wherein the means for swinging the arm comprises the arm having a portion extending forwardly of its pivotal connection to the frame, and footrest means on the forwardly extending portion of the arm, with said vertical axis being intermediate the dirigible wheel and the footrest means along the extent of the elongated arm.

6. A vehicle comprising a frame having a central longitudinal axis, a pair of laterally spaced ground support wheels mounted on the frame for rotation about axes that are perpendicular to the longitudinal axis of the frame, a dirigible ground support wheel, means for mounting the dirigible wheel comprising an elongated arm pivotally connected to the frame for swinging movement about a generally vertical axis, said dirigible wheel being mounted on said arm for rotation about a horizontal axis transverse to the elongated arm and longitudinally spaced from the vertical axis, said vertical axis being disposed along the longitudinal axis of the frame, said dirigible wheel being longitudinally spaced from the pair of support wheels relative to the longitudinal axis of the frame when the arm is pivotally swung into parallelism with the longitudinal axis of the frame, means operable by a vehicle rider for swinging the arm, said frame being in part comprised of a seat, said seat including rear adapted to accommodate thereon the buttocks of a forwardly facing vehicle rider, with the front seat portion being relatively reduced in its lateral extent and adapted to project forwardly of the crotch of such vehicle rider, said vertical axis of the frame being adjacent the forward end of the front portion of the seat, said pair of support wheels being mounted on the frame adjacent the rear end of the rear portion of the seat, said dirigible wheel being disposed longitudinally intermediate the vertical axis and the pair of wheels, with the means for swinging the arm comprising the arm having a portion extending forwardly of its pivotal connection to the frame and footrest means on the forwardly extending portion of the arm, and means for releasably securing the footrest means to the forwardly extending portion of the arm at a plurality of positions of differing spacing from the pivotal connection of the arm to the frame.

7. The combination of claim 6, including brake means, said brake means comprising a ground engageable brake shoe pivotally secured to the arm for vertical swinging movement about an axis parallel to the axis of the dirigible wheel, and means operable by a vehicle rider for swinging the brake shoe between a ground engaging braking position and a relatively raised position.

8. The combination of claim 6, including an elongated push bar, and said frame having a rearwardly opening socket therein for removably receiving an end of the push bar, whereby the vehicle can be pushed.

9. The combination of claim 6, including brake means, said brake means comprising a ground engageable brake shoe pivotally secured to the arm for vertical swinging movement about an axis parallel to the axis of the dirigible wheel, means operable by a vehicle rider for swinging the brake shoe between a ground engaging braking position and a relatively raised position, an elongated push bar, and said frame having a rearwardly opening socket therein for removably receiving an end of the push bar, whereby the vehicle can be pushed.

10. The combination of claim 1, wherein the dirigible wheel is mounted on the arm by means for releasably mounting the dirigible wheel to the arm at a plurality of positions of differing spacing from the vertical axis.

11. The combination of claim 1, including a rear support wheel mounted on the frame for rotation about a horizontal transverse axis, said rear wheel being disposed along the longitudinal axis at a location longitudinally rearwardly of the pair of wheels, and said rear wheel being spaced above a plane defined by the bottoms of the dirigible wheel and the pair of wheels.

12. The combination of claim 1, wherein the means for swinging the arm comprises the arm having a portion extending forwardly of its pivotal connection to the frame, and footrest means on the forwardly extending portion of the arm, with said vertical axis being intermediate the dirigible wheel and the footrest means along the extent of the elongated arm.

13. The combination of claim 12, including means for releasably securing the footrest means to the forwardly extending portion of the arm at a plurality of positions of differing spacing from the pivotal connection of the arm to the frame.

14. The combination of claim 1, including brake means carried by the arm, said brake means comprising a ground engageable brake shoe, means pivotally connecting the brake shoe to the arm for vertical swinging movement about an axis parallel to the axis of the dirigible wheel, and means operable by a vehicle rider for swinging the brake shoe between a
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ground engaging braking position and a relatively raised position. 15. The combination of claim 14, including an elongated push bar, and said frame having a rearwardly opening socket therein for removably receiving an end of the push bar, whereby the vehicle can be pushed.

16. The combination of claim 1, including an elongated push bar, and said frame having a rearwardly opening socket therein for removably receiving an end of the push bar, whereby the vehicle can be pushed.

17. A vehicle comprising a frame having a central longitudinal axis, a pair of laterally spaced ground support wheels mounted on the frame for rotation about axes that are perpendicular to the longitudinal axis of the frame, a dirigible ground support wheel, means for mounting the dirigible wheel comprising an elongated arm pivotally connected to the frame for swinging movement about a generally vertical axis, said dirigible wheel being mounted on said arm for rotation about a horizontal axis transverse to the elongated arm and longitudinally spaced from the vertical axis, said vertical axis being disposed along the longitudinal axis of the frame, said dirigible wheel being longitudinally spaced from the pair of support wheels relative to the longitudinal axis of the frame when the arm is pivotally swung into parallelism with the longitudinal axis of the frame, said means operable by a vehicle rider for swinging the arm and the brake shoe to the arm for vertical swinging movement about an axis parallel to the axis of the dirigible wheel, said operable by a vehicle rider for swinging the brake shoe between a ground engaging braking position and a relatively raised position, said brake shoe being disposed forwardly of its pivotal connection to the arm, and said arm including a portion having a forward end disposed forwardly of the brake, whereby the brake shoe is engageable with the ground at a position intermediate the dirigible wheel and the forward end of the arm, and the said operable means comprising a transversely extending handle bar secured to the means that pivotally connects the brake shoe to the arm, and a transversely extending foot rest secured to the arm adjacent its forward end.

23. The combination of claim 14, wherein the brake shoe is disposed forwardly of its pivotal connection to the arm, and wherein the rider operable means comprises a footrest and handles secured to the means pivotally connecting the brake shoe to the arm.

24. A vehicle comprising a frame having a central longitudinal axis, a pair of laterally spaced ground support wheels mounted on the frame for rotation about axes that are perpendicular to the longitudinal axis of the frame, a dirigible ground support wheel, means for mounting the dirigible wheel comprising an elongated arm pivotally connected to the frame for swinging movement about a generally vertical axis, said dirigible wheel being mounted on said arm for rotation about a horizontal axis transverse to the elongated arm and longitudinally spaced from the vertical axis, said vertical axis being disposed along the longitudinal axis of the frame, said dirigible wheel being longitudinally spaced from the pair of support wheels relative to the longitudinal axis of the frame when the arm is pivotally swung into parallelism with the longitudinal axis of the frame, and brake means, said brake means comprising a ground engageable brake shoe, means pivotally connecting the brake shoe to the arm for vertical swinging movement about an axis parallel to the axis of the dirigible wheel, means operable by a vehicle rider for swinging the brake shoe between a ground engaging braking position and a relatively raised position, said brake shoe being disposed forwardly of its pivotal connection to the arm, and the rider operable means comprising a footrest and handles secured to the means pivotally connecting the brake shoe to the arm, and said arm including a portion having a forward end disposed forwardly of the brake, whereby the brake shoe is engageable with the ground at a position intermediate the dirigible wheel and the forward end of the arm, and the said operable means comprising a transversely extending handle bar secured to the means that pivotally connects the brake shoe to the arm, and a transversely extending foot rest secured to the arm adjacent its forward end.

25. A vehicle comprising a frame having a central longitudinal axis, a pair of laterally spaced ground support wheels mounted on the frame for rotation about axes that are perpendicular to the longitudinal axis of the frame, a dirigible ground support wheel, means for mounting the dirigible wheel comprising an elongated arm pivotally connected to the frame for swinging movement about a generally vertical axis, said dirigible wheel being mounted on said arm for rotation about a horizontal axis transverse to the elongated arm and longitudinally spaced from the vertical axis, said vertical axis being disposed along the longitudinal axis of the frame, said dirigible wheel being longitudinally spaced from the pair of support wheels relative to the longitudinal axis of the frame when the arm is pivotally swung into parallelism with the longitudinal axis of the frame, and brake means, said brake means comprising a ground engageable brake shoe, means pivotally connecting the brake shoe to the arm for vertical swinging movement about an axis parallel to the axis of the dirigible wheel, means operable by a vehicle rider for swinging the brake shoe between a ground engaging braking position and a relatively raised position, said brake shoe being disposed forwardly of its pivotal connection to the arm, and the rider operable means comprising a footrest and handles secured to the means pivotally connecting the brake shoe to the arm, and said arm including a portion having a forward end disposed forwardly of the brake, whereby the brake shoe is engageable with the ground at a position intermediate the dirigible wheel and the forward end of the arm, and the said operable means comprising a transversely extending handle bar secured to the means that pivotally connects the brake shoe to the arm, and a transversely extending foot rest secured to the arm adjacent its forward end.

26. A vehicle comprising a frame having a central longitudinal axis, a pair of laterally spaced ground support wheels
mounted on the frame for rotation about axes that are perpendicular to the longitudinal axis of the frame, a dirigible ground support wheel, means for mounting the dirigible wheel comprising an elongated arm pivotally connected to the frame for swinging movement about a generally vertical axis, said dirigible wheel being mounted on said arm for rotation about a horizontal axis transverse to the elongated arm and longitudinally spaced from the vertical axis, said vertical axis being disposed along the longitudinal axis of the frame, said dirigible wheel being longitudinally spaced from the pair of support wheels relative to the longitudinal axis of the frame when the arm is pivotally swung into parallelism with the longitudinal axis of the frame, and brake means, said brake means comprising a ground engageable brake shoe, means pivotally connecting the brake shoe to the arm for vertical swinging movement about an axis parallel to the axis of the dirigible arm, means operable by a vehicle rider for swinging the brake shoe between a ground engaging braking position and a relatively raised position, said brake shoe being disposed forwardly of its pivotal connection to the arm, and the rider operable means comprising a foot rest and handles secured to the means pivotally connecting the brake shoe to the arm, said frame formed in part comprised of a seat, said seat including rear and front portions, said rear portion of the seat being adapted to accommodate thereon the buttocks of a forwardly facing vehicle rider, with the front seat portion being relatively reduced in its lateral extent and adapted to project forwardly of the crotch of such vehicle rider, said pivotal connection of the arm to the frame being adjacent the forward end of the front portion of the seat, said pair of support wheels being mounted on the frame adjacent the rear end of the rear portion of the seat, and said dirigible wheel being disposed longitudinally intermediate the vertical axis and the pair of wheels.

27. The combination of claim 26, including a rear support wheel mounted on the frame for rotation about a horizontal transverse axis, said rear wheel being disposed along the longitudinal axis at a location longitudinally rearwardly of the pair of wheels, and said rear wheel being spaced above a plane defined by the bottoms of the dirigible wheel and the pair of wheels.

28. The combination of claim 26, including an elongated push bar, and said frame having a rearwardly opening socket therein for removably receiving an end of the push bar, whereby the vehicle can be pushed.

29. A vehicle comprising a frame having a central longitudinal axis, a pair of laterally spaced ground support wheels mounted on the frame for rotation about axes that are perpendicular to the longitudinal axis of the frame, a dirigible ground support wheel, means for mounting the dirigible wheel comprising an elongated arm pivotally connected to the frame for swinging movement about a generally vertical axis, said dirigible wheel being mounted on said arm for rotation about a horizontal axis transverse to the elongated arm and longitudinally spaced from the vertical axis, said vertical axis being disposed along the longitudinal axis of the frame, and brake means, said brake means comprising a ground engageable brake shoe, means pivotally connecting the brake shoe to the arm for vertical swinging movement about an axis parallel to the axis of the dirigible arm, means operable by a vehicle rider for swinging the brake shoe between a ground engaging braking position and a relatively raised position, and releasable latch means for securing the brake shoe against downward movement towards its ground engaging braking position upon initially moving the brake shoe upward.

30. The combination of claim 29, wherein said latch means includes coating elements carried by the arm and by the means pivotally connecting the brake shoe to the arm.

31. The combination of claim 30, wherein said means for camming by releasing the latch means in response to upward swinging movement of the brake shoe, whereby the brake shoe can be released for subsequent downward movement to its ground engaging braking position upon initially moving the brake shoe upward.

32. The combination of claim 30, wherein the means pivotally connecting the brake shoe to the arm comprises an elongated brake arm having a rear end pivoted to the first mentioned arm and having a front end portion fixed to the brake shoe, said brake arm extending forwardly of the forward end of the first mentioned arm, said latch means comprising an upstanding latch member having its lower end pivotally connected to the brake arm, a latchkeeper carried by the first mentioned arm, and said latch member having a recess therein for receiving the latchkeeper.

33. The combination of claim 33, including means for cammingly forcing pivotal movement of the latch member such as to move the latter from a position wherein the latchkeeper is received in the recess in response to upward swinging movement of the brake arm, said last means including the latch member having a camming surface engageable with the latchkeeper.

34. The combination of claim 33, wherein said pivotally operable means comprises a generally U-shaped member, said U-shaped member being connected to the arm at a position spaced along the arm from the dirigible wheel, said pivotal connection of the arm to the frame being at a location along the extent of the arm intermediate and spaced from both the dirigible wheel and the position of the connection of the U-shaped member to the arm, said U-shaped member comprising a pair of handle bars connected by a footrest, said footrest being transversely disposed relative to the arm and being centrally connected to the arm.

35. A vehicle comprising a frame having a central longitudinal axis, a pair of laterally spaced ground support wheels mounted on the frame for rotation about axes that are perpendicular to the longitudinal axis of the frame, a dirigible ground support wheel, means for mounting the dirigible wheel comprising an elongated arm pivotally connected to the frame for swinging movement about a generally vertical axis, said dirigible wheel being mounted on said arm for rotation about a horizontal axis transverse to the elongated arm and longitudinally spaced from the vertical axis, said vertical axis being disposed along the longitudinal axis of the frame, and brake means, said brake means comprising a ground engageable brake shoe, means pivotally connecting the brake shoe to the arm for vertical swinging movement about an axis parallel to the axis of the dirigible arm, means operable by a vehicle rider for swinging the brake shoe between a ground engaging braking position and a relatively raised position, and releasable latch means for securing the brake shoe against downward movement towards its ground engaging braking position upon inadvertently application of brakes can be avoided.

36. A vehicle comprising a frame having a central longitudinal axis, a pair of laterally spaced ground support wheels mounted on the frame for rotation about axes that are perpendicular to the longitudinal axis of the frame, a dirigible ground support wheel, means for mounting the dirigible wheel comprising an elongated arm pivotally connected to the frame for swinging movement about a generally vertical axis, said dirigible wheel being mounted on said arm for rotation about a horizontal axis transverse to the elongated arm and longitudinally spaced from the vertical axis, said vertical axis being disposed along the longitudinal axis of the frame, and brake means, said brake means comprising a ground engageable brake shoe, means pivotally connecting the brake shoe to the arm for vertical swinging movement about an axis parallel to the axis of the dirigible arm, means operable by a vehicle rider for swinging the brake shoe between a ground engaging braking position and a relatively raised position, said brake shoe being disposed forwardly of its pivotal connection to the arm, and the rider operable means comprising a foot rest and handles secured to the means pivotally connecting the brake shoe to the arm, said frame formed in part comprised of a seat, said seat including rear and front portions, said rear portion of the seat being adapted to accommodate thereon the buttocks of a forwardly facing vehicle rider, with the front seat portion being relatively reduced in its lateral extent and adapted to project forwardly of the crotch of such vehicle rider, said pivotal connection of the arm to the frame being adjacent the forward end of the front portion of the seat, said pair of support wheels being mounted on the frame adjacent the rear end of the rear portion of the seat, and said dirigible wheel being disposed longitudinally intermediate the vertical axis and the pair of wheels.
arm is pivotally swung into parallelism with the longitudinal axis of the frame, means operable by a vehicle rider for swinging the arm, said rider operable means comprising a generally U-shaped member, said U-shaped member being connected to the arm at a position spaced along the arm from the dirigible wheel, with said pivotal connection of the arm to the frame being at a location along the extent of the arm intermediate and spaced from both the dirigible wheel and the position of the connection of the U-shaped member to the arm, said U-shaped member comprising a pair of handle bars connected by a footrest, said footrest being transversely disposed relative to the arm and being centrally connected to the arm, said frame being in the form of a seat adapted to accommodate thereon the buttocks of a forwardly facing rider, said seat generally tapering forwardly in its transverse extent with said pivotal connection of the arm to the frame being adjacent the forward end of the seat, said arm and the dirigible wheel being disposed below the frame and the connection of the U-shaped member to the arm being forwardly of the frame when the arm is parallel to the longitudinal axis of the frame.

37. The combination of claim 36, wherein the support wheels are mounted on the frame at positions adjacent the rear end of the seat.

38. The combination of claim 36, wherein said dirigible wheel is comprised of a pair of laterally spaced wheels having aligned axes of rotation, with the lateral spacing of such wheels being substantially less than the lateral spacing of the support wheels.