



Industry & Invention
Patent

Patents: Orientation

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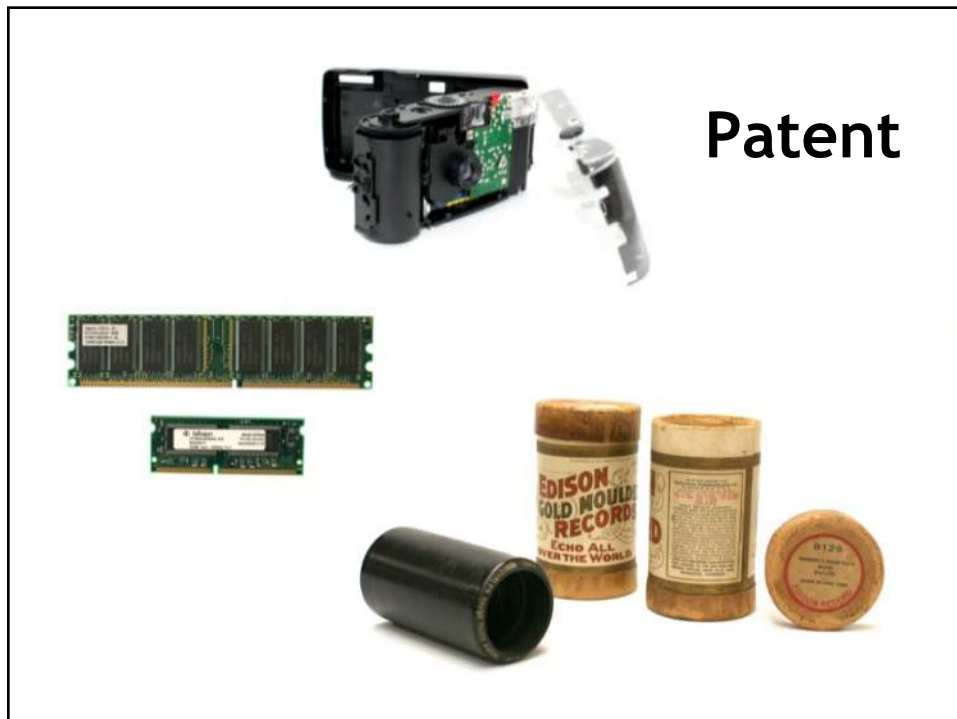


Konomark
Most rights sharable

Five requirements for a valid patent:

- Patentable subject matter
- Novelty
- Utility
- Nonobviousness
- Enablement

The following slides
you've seen before ...



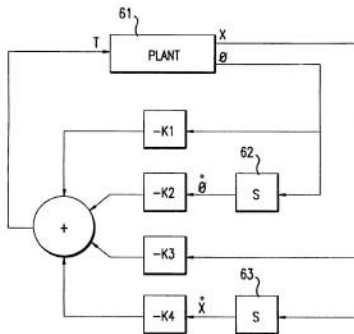


FIG. 3

PERSONAL MOBILITY VEHICLES AND METHODS

TECHNICAL FIELD

The present invention pertains to vehicles and methods for transporting individuals, and more particularly to balancing vehicles and methods for transporting individuals over ground having a surface that may be irregular.

BACKGROUND ART

A wide range of vehicles and methods are known for transporting human outputs. Typically, such vehicles rely upon static stability, being designed so as to be static under all foreseeable conditions of placement of their ground-contacting members. Thus, for example, the gravity vector acting on the center of gravity of an automobile passes between the points of ground contact of the automobile's wheels, the suspension keeping all wheels on the ground at all times, and the automobile is thus stable. Another example of a statically stable vehicle is the size-climbing vehicle described in U.S. Pat. No. 4,792,581 (Duchon et al.).

SUMMARY OF THE INVENTION

In one embodiment there is provided a vehicle for carrying a user. In this case, the user is a standing person. The vehicle of this embodiment includes:

- a. a ground-contacting module which supports a payload including the standing person, the ground-contacting module contacting an underlying surface substantially at a single region of contact; and
- b. a motorized drive arrangement, coupled to the ground-contacting module, the drive arrangement, ground-contacting module and payload constituting a system, the motorized drive arrangement causing, when powered, automatically balanced operation of the system.

In a related embodiment, the ground-contacting module includes a saddle.

In another embodiment, there is provided a vehicle for carrying a payload including a user. The vehicle of this embodiment includes:

- a. a ground-contacting module including two substantially opposed wheels;
- b. a platform supporting the user in a standing position substantially across both wheels; and
- c. a motorized drive arrangement, coupled to the ground-contacting module, the drive arrangement, ground-contacting module and payload constituting a system, the motorized drive arrangement causing, when powered, automatically balanced operation of the system.

In another embodiment, there is provided a vehicle for carrying a payload including a user, and the vehicle of this embodiment includes:

- a. a platform which supports the user;
- b. a ground-contacting module, to which the platform is mounted, which projects the user in desired motion over an underlying surface;
- c. a proximity sensor for determining the presence of the user on the device; and
- d. a safety switch, coupled to the proximity detector, for inhibiting operation of the ground-contacting module unless the proximity sensor has determined the presence of the user on the device.

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The proximity sensor may be a sensor, mechanically coupled to the safety switch, having an operating position and a non-operating position, wherein the member is in the non-operating position in the absence of the user from the device and the member is movable to the operating position when the user is on the device. The member may include a plate, disposed over the device, for receiving a foot of the user, wherein placement of the foot on the plate causes it to move into the operating position.

Alternatively, the proximity detector may be electronic and may include a sensor/switch device. In a further related embodiment, the device may include a motorized drive arrangement, coupled to the ground-contacting module, the motorized drive arrangement causing, when powered, automatically balanced and stationary operation of the device unless the proximity sensor has determined the presence of the user on the device.

In another embodiment, there is provided a vehicle for carrying a payload including a user. The vehicle of this embodiment includes:

- a. a platform which supports the user;
- b. a ground-contacting module, to which the platform is mounted, which projects the user in desired motion over an underlying surface;
- c. a motorized drive arrangement, coupled to the ground-contacting module, the drive arrangement, ground-contacting module and payload constituting a system, the motorized drive arrangement causing, when powered, automatically balanced operation of the system; wherein the motorized drive arrangement has a power source output and a specified maximum power output and, in operation, has balancing energy determined by the difference between the maximum power output and the present power output of the drive arrangement;

d. a balancing torque sensor, coupled to the motorized drive arrangement, for generating a signal characterizing the balancing torque; and

e. a control, coupled to the balancing torque sensor, for receiving the signal characterizing the balancing margin and for warning when the balancing margin falls below a specified limit.

The alert may include audible modulation of the power output of the motorized drive arrangement, and alternatively, or in addition, may be audible.

In still further embodiment there is provided a device for carrying a user, and the device includes:

- a. a platform which supports a payload including the user;
- b. a ground-contacting module, mounted to the platform, including at least one ground-contacting member and a sliding, low-friction plate;
- c. a motorized drive arrangement, coupled to the ground-contacting module, the drive arrangement, ground-contacting module and payload constituting a system, the motorized drive arrangement causing, when powered, automatically balanced operation of the system in an operating position that is unstable with respect to tipping; in at least a forward plane when the motorized drive arrangement is not powered; and
- d. a user input control that receives an indication from the user of a specified pitch of the device under conditions of operation at uniform velocity.

The user input control may include a thumb-wheel disposed upon a handle that is part of the device. A related embodiment

such as steers members and clamps of wheels are described in the prior application incorporated herein by reference, and the term "wheel" is used herein to refer to any such ground-contacting element without limitation.

The wheel 44 of vehicle embodiments of FIGS. 8 and 9 may be supplemented, as shown in FIG. 10, by a master wheel providing a pair of adjuster and control wheels 20. It can be seen that the vehicle of FIG. 10, like vehicles of various other embodiments disclosed in this description, when moving on wheels 20 for contacting the ground, is inherently unstable in the lateral direction with respect to a vertical z. While the vehicle of FIG. 10 is inherently stable in the lateral direction, vehicles of some other embodiments are unstable in both lateral and fore-aft directions. The motion of vehicle 10 may be controlled by subject 10 shifting his weight, and thus the center of mass (CM) of the loaded vehicle, in accordance with teachings described above.

Also, as described above, in addition to the direct effect of subject leaning, on the variables governing the torque applied to a motor for directing the vehicle, or as an alternate control strategy, user input may be separately incorporated into the control loop in a manner equivalent to variation of one or more of the input variables. Thus, for example, the user may provide an input by means of a user interface of any sort, the input being received by the control system representing a change, for example, in vehicle tilt. Such an interface may include, for example, a handwheel or a joystick mounted on the user 14.

Referring again to FIG. 10, steering of vehicle 10 may be provided by user 10 shifting his weight laterally on the VY, discussed with respect to wheel 20. The change in position of user 10 relative to the platform 12, and/or the corresponding lateral shift of the CM of the combination of user 10 and vehicle 10 may be sensed using any strategy. One example is the use of one or more forceplates disposed on the upper surface of platform 12 for supporting user 10, and one or more forceplates mounted on the seat may sense a shift in the weight of the user and thus generate a signal for controlling the velocity vector of the vehicle in response to user leaning.

As an alternate example, a tilt of platform 12 relative to the axis CY of rotation of wheel 20 may be sensed using an inclinometer, or one or more gyroscopes. Correction may be applied to the measured tilt of differential pressure to account for irregularities in the surface being traversed by vehicle 10, as determined by the measured tilt with respect to a plane perpendicular to gravity, of the axis CY of rotation of wheel 20. In accordance with yet further alternate embodiments of the invention, a force sensor may be provided within handle 16. In certain cases may be provided at pivot 40, other strategies for sensing leaning by the user and applying the sensed leaning as a user input to the control loop for governing vehicle operation.

In accordance with other embodiments of the present invention, leaning by user 12 may be used solely for governing fore-aft motion of vehicle 10, or, alternatively, leaning may be used solely for governing steering of the vehicle, or, for both functions.

A front perspective view of an alternate embodiment of the invention is shown in FIG. 11 where vehicle 10 has a single wheel 20 and user 12 leans, during normal operation of the vehicle, on platform 14 across wheel 20. An embodiment in which wheel 16 is rigidly attached to platform 14, in this case, via coupling 40.

FIG. 11 shows an embodiment of the invention wherein a vehicle 20 is controlled by leaning, as described above with respect to other embodiments, and no handle is provided, such that the entire support of user 10 is by standing on platform 12. Within the scope of the present invention, as described herein and as claimed in any appended claims, user 10 may be supported on platform 12 by standing with feet positioned along axis 56 of rotation of wheel 44, as shown in FIG. 11, or, alternatively, with feet positioned across axis 52 of rotation of wheel 44, as shown in FIG. 12 and FIG. 13. A handle 16 may also be provided in the case of a configuration of the invention in which wheel 44 is oriented transversely to the direction of travel by user 10 with handle 16 coupled to platform 12 via coupling 40, as shown in FIG. 14.

FIG. 15 shows an embodiment of a vehicle wherein the ground-contacting element is a wheel 151. Such a ball may be magnetically driven to a side direction and the vehicle stabilized in one or both of those directions in the manner as described above.

In addition to the personal mobility vehicles described and claimed above, in accordance with alternate embodiments of the invention, scaled down versions of any of the embodiments described herein may be employed for recreational or educational purposes, whether or not human subjects are connected thereto. Such toy versions may travel over various terrains while maintaining balance in the fore-aft plane.

The described embodiments of the invention are intended to merely exemplify and not necessarily limit the scope of the present invention as defined in the appended claims.

What is claimed is:
1. A vehicle for carrying a payload including a user, the vehicle comprising:

- a. a platform which supports the user;
 - b. a ground-contacting member, in which the platform is mounted, which permits the user to displace motion over an underlying surface;
 - c. a steered-drive arrangement, coupled to the ground-contacting member, the drive arrangement, ground-contacting member and payload comprising a system being controllable with respect to tilting when the steered drive is not powered, the steered drive arrangement comprising, when powered, a steered drive arrangement of the system wherein the vehicle has a present velocity and a maximum operating velocity, determined by a requirement of acceleration to maintain balance and, in operation, has a balancing strategy determined by the difference between the maximum operating velocity and the present velocity of the vehicle;
 - d. a balancing margin monitor, coupled to the ground-contacting member, for generating a signal characterizing the balancing margin; and
 - e. an alarm, coupled to the balancing margin monitor, for exceeding the signal characterizing the balancing margin and for warning when the balancing margin falls below a specific limit.
2. A device according to claim 1, wherein the alarm includes a type mechanism of the power output of the steered drive arrangement.
3. A device according to claim 1, wherein the alarm is audible.

Patent PAT.

Protects	machines, inventions
Requires	some level of cleverness (nonobviousness, inventive step)
Vests	after application, upon issuance by government
Sustained by	escalating maintenance fees
Lasts	up to 20 years
Theory	incentive to invent and disclose; public goods problem

Comparisons

What is protected?

©	Expression (text, images, recordings)
Pat.	Inventions (manmade)
TM	Indications of commercial source
Trade Secret	Transferrable commercial secrets
Right of Publicity	Indications of personal identity

What does it take to get it?

©	Fixation (immediate)
Pat.	Application, gov' t review
TM	Use in commerce, creating meaning
Trade Secret	<i>Nothing</i>
Right of Publicity	<i>Nothing</i> (fame, some places)

What does it take to keep it?

©	Nothing
Pat.	Payment of maintenance fees
TM	Continued use in business
Trade Secret	Keeping it secret
Right of Publicity	Nothing

How long does it last?

©	about 100 years
Pat.	about 20 years
TM	forever (if used)
Trade Secret	forever (if kept secret)
Right of Publicity	life + extra sometimes

How is it lost?

©	<i>Very difficult</i>
Pat.	Unpaid fees; successful challenge
TM	Failure to keep exclusive control
Trade Secret	The secret gets out
Right of Publicity	<i>Very difficult (?)</i>

Defenses include ...

©	Fair use, first-sale
Pat.	Invalidity, first-sale
TM	Non-trademark uses, fair uses, first-sale
Trade Secret	Reverse engineering
Right of Publicity	News, free speech, non-commercial

Remedies include ...

©	Injunctions; restitution (of D's wrongful gains); statutory damages up to \$150K per infringement
Pat.	Injunctions; royalties; treble damages
TM	Injunctions; punitive damages; treble damages
Trade Secret	Injunctions; restitution (of D's wrongful gains); punitive damages; royalties
Right of Publicity	Injunctions; punitive damages

Five requirements for a valid patent:

Review

- Patentable subject matter
- Novelty
- Utility
- Nonobviousness
- Enablement

Now, new slides ...

How might patents help society?

- Incentivize invention; assure appropriation of R&D costs through exclusivity.
- Incentivize commercialization; assure appropriation of commercialization costs of pre-existing inventions through exclusivity.
 - Arthur Twining Hadley, 1896
- Encourage the disclosure and enablement of new technologies
- Provide a record of technological progress (which may enable the use of technology and the efficient functioning of the patent system in the future)

What might patents do for patentees?

- Allow the making of money through licensing fees
- Allow the making of money through the charging of supracompetitive prices on patent-embodying products
- Signal achievement, talent, and skill
- Block latecomers from claiming novelty and trying to get a patent on the same invention
- Provide a bargaining chip to use in entering joint ventures, collaborations, pools, mergers, etc.
- Provide a credible threat of infringement counterclaims or counter lawsuits against potential plaintiffs suing for infringement of other patents

How might patents harm society?

- Raise prices for consumers above the efficient, competitively determined level.
- Disincentivize invention because of fear of infringement liability, litigation costs, and the introduction of uncertainty in those regards.
- Disincentivize economic growth because patents may help established players stay dominant in markets instead of encouraging disruptive innovation by upstarts and entrepreneurs.
- Waste resources through the introduction of various transaction costs (searching, prosecution of applications, litigation, hold-up costs, etc.)

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