

MOTORIZED SCOOTER

Background of the invention

5 The object of the present invention is a motor-driven scooter. In particular it finds application for practicing outdoor leisure activities or for trips over medium or long distances, in particular in an urban environment, for example within the scope of intermodality.

10 By intermodality, is meant the combination of different modes of transport, such as walking, cycling, scootering, metro, bus,... used on a single path.

Motor-driven scooters are known for which the power of the motor is controlled by a control unit actuated by the user.

15 Such a scooter is in particular proposed by document US 2002/170763, which describes a scooter including a frame, a front wheel and a rear wheel attached to the frame, a motor configured for driving the rear wheel into rotation, and a unit for controlling the motor.

By actuating the control unit, the user selects one of the predetermined powers of the motor, and subsequently the speed of the scooter.

20 Motor-driven scooters are also known for which the control unit includes a trigger for example positioned on the handlebar of the scooter.

By actuating the trigger, for example by pivoting it around the axis of the handlebar, the user modifies the power of the motor, in a similar way to the actuation of the control unit of a moped.

25 Nevertheless, such products do not satisfy the users who wish to benefit from assistance allowing reduction of muscular force for example in order to cover longer distances than with a usual scooter, while having the possibility of scootering in a traditional way, i.e. for example, by maintaining one foot on the frame of the scooter, while the other foot
30 applies pulses on the ground. Further, such products do not allow automatic adaptation of the power of the motor to the forces exerted by the user.

Object and summary of the invention

35 The object of the present invention is to solve, *inter alia*, the insufficiencies described above of existing motor-driven scooters, by

proposing a motor-driven scooter for which the power of the motor is controlled by the forces exerted by the user.

This object is achieved by the fact that the invention deals with a scooter for which the control unit includes:

- 5 - acceleration detection means for detecting an acceleration phase of the scooter;
- deceleration detection means for detecting a deceleration phase of the scooter;
- 10 - the control unit being configured for actuating the motor when a deceleration phase having a duration at least equal to a first pre-determined threshold has been detected by the deceleration detection means after detection of an acceleration phase by the acceleration detection means.

15 Thus, this device is configured so that the motor is actuated according to the forces exerted by the user.

By acceleration and deceleration of the scooter, is meant a phase during which the speed of the scooter increases and decreases respectively.

20 More particularly, the control unit is configured for actuating the motor after a muscular force has been exerted by the user.

By muscular force, is understood for example and in a non-limiting way, a pulse given by the user to the scooter allowing the scooter to be set or maintained in motion, the user applying, with one of his/her legs a pressure on the ground, while the other leg is maintained on the frame of the scooter, and more particularly on the platform positioned between the front and rear wheels.

25 The fact of conditioning the actuation of the motor to detection of a deceleration phase following the detection of an acceleration phase gives the possibility of not actuating the motor if the user exerts a pulse on the scooter, which would risk *inter alia* perturbing the traditional and manual use of the scooter by the user.

30 The control unit may therefore be disabled so that the motor-driven scooter according to the present invention does not suppress the possibility for the user of setting or maintaining the scooter in motion by means of traditional muscular forces.

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Moreover, the fact of conditioning the actuation of the motor to a detection of a sufficiently long deceleration phase gives the possibility of not actuating the motor when the user exerts a new pulse, substantially immediately after the acceleration detected by the acceleration detection means.

In other words, the control unit is configured so that, when the user exerts different consecutive pulses close to each other, for example in order to initiate the movement of the scooter after its immobilization, the motor is not actuated, so as not to perturb the forces exerted by the user.

By successive pulses close to each other in time, are meant pulses which are exerted by the user to have a duration elapsing between the end of the acceleration phase detected by the acceleration protection means at the end of the first pulse, and the beginning of the acceleration phase, also detected by the acceleration protection means, at the end of the next pulse, which is not greater than the first predetermined threshold. As stated otherwise, two successive pulses should occur within a delay less than the first predetermined threshold.

By end of the acceleration phase, is meant the moment which precedes the moment when the speed of the scooter begins to decrease, for example because of friction of the scooter on the road on which it runs.

When the user no longer exerts any new pulse on the scooter, the scooter describes a deceleration phase detected by the deceleration detection means; when the deceleration detection means detect a deceleration phase for which the duration is greater than the first predetermined threshold, the motor is actuated, so as to suppress deceleration of the scooter.

In other words, the control unit of the motor is configured in order to actuate the motor so as to supplement the muscular forces exerted by the user.

The invention is described hereafter in a series of alternative embodiments, which may be considered alone or in combination with one or more of the preceding ones.

Advantageously, the control unit is configured for actuating the motor after detection of said deceleration phase so that the speed of the scooter is maintained at a set speed value.

5 With this arrangement, the control unit is configured so that the motor is actuated in order to suppress the natural deceleration of the scooter for example inherent to the frictional forces.

Advantageously, the set speed value depends on the triggering speed. By triggering speed is meant the speed of the scooter when the motor is actuated.

10 The triggering speed may therefore correspond to the speed of the scooter at the end of the duration of the deceleration phase detected by the deceleration means; alternatively, it may correspond to a speed of less than the speed of the scooter at the end of the duration of the deceleration phase detected by the deceleration detection means, with the
15 assumption that the motor is not simultaneously actuated at the end of the duration of the detected deceleration phase, but slightly later on, the speed of the scooter, with this assumption, continuing to decrease.

Thus, the control unit is configured so that the assistance of the scooter depends on the forces exerted by the user which allow the
20 triggering speed to be reached. Therefore, it is understood that the control unit is configured so that the assistance generated by the actuation of the motor is exerted so as not to surprise the user, by a power of the motor which would be independent of the speed of the scooter, detected at the end of the deceleration phase detected by the
25 deceleration detection means for which the duration exceeds the first predetermined threshold.

Preferably, the set speed value is equal to the speed of the scooter upon actuation of the motor.

30 With this arrangement, the assistance generated by the actuation of the motor is particularly fluid and does not cause any sudden and abrupt acceleration or deceleration, able to surprise the user, or even destabilize him/her.

Advantageously, the control unit is configured for determining a speed at the end of said deceleration phase and for actuating the motor
35 after detection of said deceleration phase so that the speed of the scooter

is greater than the speed determined at the end of said deceleration phase.

With this arrangement, the assistance provided by the actuation of the motor gives the possibility of reducing, or even suppressing, the effects of the deceleration for the period substantially equal to the first predetermined threshold of the deceleration phase detected by the deceleration detection means. In other words, the control unit is configured so as to actuate the motor so that the speed of the motor-driven scooter gets closer to the target speed which the user wishes to impart to the scooter, at the end of the pulse(s) which he/she has exerted.

Advantageously, the control unit is configured for actuating the motor for a pre-determined period.

With this arrangement, the motor is not actuated continuously, thereby allowing alternation of manual propulsion phases for example by means of pulses exerted in a traditional way by the user, and assisted propulsion phases, by actuation of the motor. Further, with this arrangement, the assistance capability of the scooter, which thus combines different propulsion modes, is increased.

Preferably, the control unit is configured for stopping actuation of the motor when a new acceleration phase is detected while the motor is actuated.

With this arrangement, the use in a traditional way of the scooter, by means of pulses exerted by the user, is not prevented by the actuation of the motor.

Advantageously, the control unit is configured for again actuating the motor when a new deceleration phase having a period at least equal to the first predetermined threshold has been detected by the deceleration detection means after the new acceleration phase.

Thus, the assistance phases by actuation of the motor and the manual propulsion phases by the pulses exerted by the user may follow on from each other in a fluid and intuitive way, thus allowing association of the advantages of motor-driven assistance with the sports practice inherent to scootering. The user may therefore decide to increase the set speed value by giving a new pulse.

Advantageously, the scooter further includes a device for determining the speed of the scooter, and the control unit is configured for stopping the actuation of the motor when a positive variation of the speed of the scooter greater than a second predetermined threshold is detected.

Thus, when the speed of the scooter exceeds the set speed value of the scooter by more than the predetermined second threshold, or in other words, when the speed of the scooter increases by more than the second predetermined threshold relatively to the set speed value, the actuation of the motor is interrupted. With this arrangement, the safety of the user as well as that of persons moving near the scooter are not compromised by the device according to the present invention, the motor-driven assistance not being added to the effects of this increase in speed which may, for example and in a non-limiting way, be due to a downward slope of the road on which the scooter is running, to a new pulse exerted by the user, ...

Preferably, the control unit is configured for stopping the actuation of the motor when the positive variation of the speed of the scooter is greater than the second predetermined threshold, for a period greater than a third predetermined threshold.

With this arrangement, the actuation of the motor is not stopped by an acceleration greater than the second predetermined threshold, for a period of less than the third predetermined threshold. In other words, the assistance of the scooter is not stopped by a sudden but short acceleration; such an accidental acceleration may occur for example from irregularities of the road or from contact with the edge of a pavement.

By accidental acceleration is meant any acceleration distinct from an acceleration caused voluntarily by a pulse given by the user to the scooter.

Advantageously, the control unit is configured so as not to actuate the motor when the speed of the scooter is greater than a fourth predetermined threshold.

In other words, the maximum reachable speed by motorization is less than the fourth predetermined threshold.

With this arrangement, the scooter cannot be maintained, by actuation of the motor, at a speed greater than the fourth predetermined

threshold, so as not to compromise the safety of the user and of the other users of the space on which runs the scooter. This arrangement in particular gives the possibility of complying with customary practices in public spaces, for example when the scooter runs on a pavement.

5 Advantageously the control unit is configured so as not to actuate the motor when the speed of the scooter is less than a fifth predetermined threshold.

With this arrangement, the motor is not actuated untimely, for example when the user is walking beside the scooter.

10 Preferably, the scooter further includes a braking device and the control unit is configured for stopping the actuation of the motor when the braking device is actuated.

Thus, in a simple and intuitive way, the actuation of the motor is stopped, in order to allow the user to effectively and rapidly reduce the speed of the scooter and thus adapt to the encountered restrictions.

Short description of the drawings

Other features and advantages of the invention will become more clearly and completely apparent upon reading the description hereafter of a preferred embodiment, given as a non-limiting example and with reference to the following appended drawings wherein:

- Figs. **1A** and **1B** schematically represent an exemplary scooter according to the present invention; and
- Figs. **2A**, **2B** and **2C** schematically illustrate different examples of time-dependent changes in the speed of the scooter according to the present invention.

Detailed description of the invention

In the example illustrated in Figs. **1A** and **1B**, the scooter **10** according to the invention traditionally includes a frame **12**, a front wheel **20** and a rear wheel **22**.

The frame **12** of the scooter **10** includes a platform **14** positioned between the front **20** and rear **22** wheels, and a steering column **16** one end of which is attached to the front wheel **20**, the steering column **16** including a handlebar **18** at its opposite end.

Further, the scooter **10** according to the present invention includes a motor **24** configured for driving into rotation the front wheel **20** and a control unit **26** configured for controlling the motor **24**.

For example, and in a non-limiting way, the motor **24** of the scooter **10** is an electric motor mounted on the hub of the front wheel **20**, the scooter **10** further including a battery **28** positioned between the steering column **16** and the platform **14**.

Of course, it would be possible to design, and without departing from the scope of the present invention, any other motor type, such as a combustion motor, configured for driving into rotation either one of the front **20** and rear **22** wheels.

The scooter **10** moreover includes a braking device **30** which may, for example and in a non-limiting way, be actuated from the handlebar **18** of the scooter **10**, the braking device being configured so as to oppose rotation of the front wheel **20**.

The scooter **10** also includes a device for determining the speed of the scooter; for example and in a non-limiting way, the device for determining the speed is a sensor **11** mounted on the rear wheel **22** and configured so as to acquire at regular intervals, separated by a period **t₀**, the speed of the scooter **10**. This may also be a sensor for sensing the speed of rotation of one of the two wheels of the scooter.

Moreover, the control unit **26** in particular includes acceleration detection means **26a** and deceleration detection means **26b**, configured for detecting an acceleration phase and a deceleration phase of the scooter **10**, respectively.

The control unit **26** is configured for actuating the motor **24** and thus drives into rotation the front wheel **20** of the scooter **10**, if certain conditions, which will appear more clearly in the description of Figs. **2A**, **2B** and **2C**, are fulfilled.

Figs. **2A**, **2B** and **2C** schematically illustrate examples of time-dependent changes in the speed of the scooter **10** according to the present invention.

More particularly, Figs. **2A**, **2B** and **2C** represent the time-dependent changes of the speed of the scooter **10**, according to the actions exerted by the user of the scooter **10**, these actions may consist in

pulses **i0**, **i1**, **i2**, **i3**, **i4**, **i5** applied by the user onto the scooter **10**, or an actuation **f1** of the braking device **30**.

Figs. **2A**, **2B** and **2C** illustrate first **s1**, second **s2**, third **s3**, fourth **s4** and fifth **s5** predetermined thresholds which will be described in more detail in the following.

In this non-limiting example, the first predetermined threshold **s1** has a value of 200 ms; the second predetermined threshold **s2** has a value of 10 revolutions per minute; the third predetermined threshold **s3** has a value of 200 ms; the fourth predetermined threshold **s4** has a value of 400 revolutions per minute; the fifth predetermined threshold **s5** has a value of 100 revolutions per minute.

Moreover, Figs. **2A**, **2B** and **2C** represent, alternately in dotted lines and in solid lines, the phases during which the scooter respectively operates in a manual way, by means of the muscular forces exerted by the user, and with the assistance of the motor **24** actuated by the control unit **26**.

For the sake of clarity, the lower portion of Fig. **2A** illustrates the periods during which the motor **24** is actuated by the control unit **26**, the height of the different blocks depending on the speed at which the scooter **10** is maintained during different actuation phases of the motor **24**.

Traditionally, as the scooter **10** is initially at a standstill, in order to set it into motion, the user exerts a first pulse **i0**.

As illustrated in Fig. **2A**, the speed measurements periodically made by the sensor **11** every **t0** ms, with **t0** for example in a non-limiting way, having the value of 40 ms, are increasing; the acceleration detection means **26a** thus detect an acceleration phase.

The speed reached by the scooter **10** at the end of this first pulse **i0** is less than the fifth predetermined threshold **s5**.

The control unit **26** is configured so as not to actuate the motor **24** when the speed of the scooter **10**, determined by the speed determination device, is less than the fifth predetermined threshold **s5**; the motor **24** is therefore not actuated at the end of this first pulse **i0**.

After detection by the acceleration detection means **26a** of the control unit **26**, of the acceleration phase caused by the first pulse **i0**, the deceleration of detection means **26b** detect a deceleration phase during a period less than the first pre-determined threshold **s1**.

The control unit **26** is configured so as to actuate the motor **24** when a deceleration phase having a period greater than or equal to the first predetermined threshold **s1** has been detected by the deceleration detection means after detection of an acceleration phase by the acceleration detection means; the motor **24** is therefore not actuated during this deceleration phase.

The user then exerts a new pulse **i1**.

As illustrated in Fig. **2A**, following this pulse **i1**, the acceleration detection means detect acceleration of the scooter, during which its speed, determined by the speed determination device, exceeds the fifth predetermined threshold **s5** until it attains speed **vm1**, illustrated in Fig. **2B**.

For example, and in a non-limiting way, the acceleration detection means detect an acceleration phase of the scooter **10** when the speeds successively determined by the speed determination device, measured at regular intervals **t0**, are increasing.

The deceleration detection means detect, as for them, a deceleration phase of the scooter **10** when the speeds successively determined by the speed determination device, measured at regular intervals **t0**, are decreasing. In particular, between the instants **P1** to **P6**, illustrated in Fig. **2B**, the speed of the scooter **10** determined by the speed determination device is decreasing.

Of course it would be possible to design any other acceleration and deceleration detection means, without departing from the scope of the present invention.

As illustrated in Fig. **2B**, in which a deceleration phase follows an acceleration phase detected by deceleration detection means and acceleration detection means respectively, when the deceleration phase detected by the deceleration detection means has a period greater than the first predetermined threshold **s1**, the control unit **26** actuates the motor **24**.

In the non-limiting example illustrated in Fig. **2B**, the speed **vm1** represents the greatest value of the speed of the scooter **10** determined by the speed determination device, reached at instant **P1**; the instant **P1** corresponding to the measurement of the speed **vm1** therefore corresponds both to the end of the acceleration phase detected by the

acceleration detection means, and to the beginning of the deceleration phase detected by the deceleration detection means.

As illustrated in Fig. **2B**, the first predetermined threshold **s1** has a value, for example and in a non-limiting way, of 5 intervals **t0**, during which the speeds are determined by the speed determination device at instants **P2**, **P3**, **P4**, **P5** and **P6**; at the end of the fifth decreasing speed determined following the speed **vm1** by the speed determination device at instant **P6**, the motor **24** is actuated by the control motor, **26**.

The instant **P7** illustrated in Fig. **2B** therefore corresponds to the first speed determined by the speed determination device during actuation of the motor **24**.

In the illustrated example wherein 5 intervals of a duration of **t0** = 40 ms are considered during the deceleration phase detected by the deceleration detection means **26b**, the first predetermined threshold **s1** therefore has a value of 200 ms.

In other words, it is understood that the control unit **26** of the motor **24** detects, by its acceleration detection means, an acceleration phase of the scooter **10** followed by a deceleration phase of the scooter **10**, detected by its deceleration detection means. When the deceleration phase detected by the deceleration detection means has a duration at least equal to the first predetermined threshold **s1**, the control unit **26** actuates the motor **24**.

As in particular illustrated in Fig. **2A**, the control unit **26** is configured for actuating the motor **24** so that the speed of the scooter **10** is maintained at a set speed value **v1**, at the end of the pulse **i1**.

As illustrated in Fig. **2B**, the set speed value **v1** depends on the speed of the scooter **10** upon actuating the motor **24**. In this example, the said speed value **v1** has a constant value equal to about 180 revolutions per minute.

As this appears more clearly in the following of the description, the set speed value **v1**, at which the scooter **10** is maintained at the end of the pulse **i1** is greater than the speed **vd1** determined by the speed determination device at the end of the period **s1** of the deceleration phase detected by the deceleration detection means. For example, and in a non-limiting way, the control unit **26** applies a factor greater than 1 to the speed **vd1**, for example 1.05.

Of course, it will be possible to design, and without departing from the scope of the present invention, a control unit **26** configured for actuating the motor **24** so that the set speed value **v1** is equal to the speed **vd1** determined at the end of the duration **s1** of the deceleration phase detected by the deceleration selection means.

Alternatively, without departing from the scope of the present invention, the control unit **26** may be configured for actuating the motor **24** so that the set speed value **v1** is equal to one of the speeds determined by the speed determination device during the deceleration phase, before the instant when the speed **vd1** is reached.

As illustrated in Fig. **2A**, the control unit **26** is configured for actuating the motor **24** for a predetermined period **T**, for example equal to 60 seconds.

As this appears in Fig. **2A**, during the period **T** during which the motor **24** is actuated, slight variations of the speed of the scooter **10** may be determined by the speed determination device; the control unit **26** is configured so that, when these variations are not significant, the actuation of the motor **24** is not interrupted.

The meaning of the significance of the variations of speed of the scooter **10** as determined by the speed determination device when the motor **24** is actuated, will become more clearly apparent in the continuation of the description.

At the end of the predetermined period **T**, the control unit **26** interrupts the actuation of the motor **24**, thus causing a deceleration of the speed of the scooter **10**, related to the frictional forces applied to the scooter **10**.

As illustrated in Fig. **2A**, the user then applies a new pulse **i2**; the acceleration detection means thus detect a new acceleration phase.

As illustrated in Fig. **2A**, and similarly to the configuration described in the observation of Fig. **2B**, the control unit **26** of the motor **24** actuates the motor **24** when a deceleration phase with a duration greater than or equal to the first predetermined threshold **s1** has been detected by the deceleration detection means after detection of an acceleration phase by the acceleration detection means.

The control unit **26** thus actuates the motor **24**, so that the speed of the scooter **10** is maintained at a set speed value **v2**, in this example greater than **v1**, for example equal to 200 revolutions per minute.

In particular it is seen that the set speed values **v1** and **v2** at which the speed of the scooter **10** is maintained respectively after the pulses **i1** and **i2**, are different, insofar that they depend on the speed of the scooter **10** at the moment when the motor **24** is actuated by the actuating unit **26**.

As illustrated in Fig. **2A**, a new pulse **i3** is exerted by the user, while the motor **24** is actuated, during the period **T**.

As in particular illustrated in Fig. **2C**, following this pulse **i3** inserted by the user, the acceleration detection means detect a new acceleration phase, during which the speed of the scooter **10** increases, substantially exceeding the set speed value **v2**. More specifically, the positive variation of the speed of the scooter, considered from the set speed value **v2**, is greater than the second predetermined threshold **s2**.

As this appears upon observing Fig. **2C**, the control unit **26** is configured so that, when the speed of the scooter **10** determined by the speed determination device exceeds the set speed value **v2** by more than the second predetermined threshold **s2** for a duration greater than the third predetermined threshold **s3**, the actuation of the motor **24** is interrupted.

In other words, the control unit has detected a new pulse from the user and stops actuation of the motor.

At the end of the acceleration phase detected by the acceleration detection means caused by the pulse **i3**, and similarly to the behavior illustrated in Fig. **2A** at the end of pulses **i1** and **i2**, the deceleration detection means detect a deceleration phase for which the duration exceeds the first predetermined threshold **s1**, so that the actuation unit **26** actuates the motor **24**, giving the possibility of maintain the speed of the scooter **10** to a set speed value **v3** clearly greater than **v2**. In this example, **v3** has a value of about 360 revolutions per minute.

The user exerts a new pulse **i4**, during the actuation of the motor **24**, during the period **T**.

In a similar way to the behavior of the scooter **10** described with reference to Fig. **2C**, the control unit **26** interrupts the actuation of the

motor **24** when the positive variation of the speed of the scooter **10**, relatively to the said speed value **v3**, is greater than the second predetermined threshold **s2** during a period greater than the predetermined threshold **s3**.

5 As illustrated in Fig. **2A**, at the end of the acceleration phase detected by the acceleration detection means and caused by the pulse **i4**, the speed of the scooter **10** determined by the speed determination device is greater than the fourth threshold **s4**, which in this example is equal to 400 revolutions per minute.

10 As a safety step, the control unit **26** is configured so as not to actuate the motor **24** when the speed of the scooter **10** determined by the determination device is greater than the fourth threshold **s4**.

Subsequently, the motor **24** is therefore not actuated; the deceleration detection means then detect a deceleration phase during
15 which the speed of the scooter **10** decreases, until the user exerts a new pulse **i5**, as illustrated in Fig. **2A**.

Similarly to the behavior described earlier, a deceleration phase with a period greater than the first predetermined threshold **s1** being detected by the deceleration detection means after detection of an acceleration phase by the acceleration detection means, at the end of
20 pulse **i5**, the control unit **26** actuates the motor **24**.

The motor **24** is then actuated by the control unit **26** so that the speed of the scooter **10** is maintained at a set speed value **v5** at the end of the pulse **i5**, the set speed value **v5** being, similarly to the other
25 actuation phases of the motor **24** described earlier, a function of the speed of the scooter **10** determined by the speed determination device during actuation of the motor **24**. In this non-limiting example, the set speed value **v5** is slightly greater than the speed determined at the end of the deceleration phase; for example it has the value of 330 revolutions per
30 minute.

As illustrated in Fig. **2A**, during actuation of the motor **24** by means of which the speed of the scooter **10** is maintained at the set speed value **v5**, a short positive variation in the speed of the scooter **10** is determined by the speed determination device; unlike the behavior described with
35 reference to Fig. **2C**, the positive variation of the speed of the scooter **10**

is not greater than the second predetermined threshold **s2** during a period greater than the third predetermined threshold **s3**.

As described earlier, as the control unit **26** is configured so as to stop the actuation of the motor **24** when the positive variation of the speed of the scooter **10** is greater than the second predetermined threshold **s2** during a period greater than a third predetermined threshold **s3**, the actuation of the motor **24** is not stopped by the control unit **26** when the speed determination device detects said short positive variation in the speed of the scooter **10**.

In other words, the variation in the speed of the scooter **10** illustrated in Fig. **2A** during actuation of the motor **24** following the pulse **i5** being of an accidental nature and not caused by a new pulse exerted by the user, the control unit **26** does not interrupt the actuation of the motor **24**.

In order that a variation in the speed of the scooter **10** determined by the speed determination device be considered as significant by the control unit **26** and that it causes, as such, the interruption of the actuation of the motor **24**, it is therefore required on the one hand that it be greater than the corresponding set speed value by a value at least equal to the second predetermined threshold **s2**, and that on the other hand, the exceeding of the second predetermined threshold **s2** is determined by the speed determination device during a period greater than the third predetermined threshold **s3**.

After this accidental acceleration, and as illustrated with reference **f1** in Fig. **2A**, the braking device **30** is actuated by the user.

The control unit **26** is configured for stopping the actuation of the motor **24** when the braking device **30** is actuated by the user.

Subsequently, the deceleration detection means detect a new deceleration phase during which the speed of the scooter **10** decreases until it is less than the fifth predetermined threshold **s5**.

The control unit **26** of the scooter **10** according to the present invention may also include a parameterization device configured for allowing the user to modify the value of the predetermined thresholds **s1**, **s2**, **s3**, **s4** and **s5**.

The duration of the period **t0** for determining the speeds of the scooter **10** with the speed determination device may also, without

departing from the scope of the present invention, be modified by the parameterization device.

It would also be possible to design a control unit **26** configured for actuating the motor **24**, when the conditions described above are fulfilled,
 5 in an unlimited way.

As described with reference to Figs. **1**, **2A**, **2B** and **2C**, the scooter **10** according to the present invention is therefore configured for applying a motor-driven assistance method comprising:

- a step for detecting an acceleration phase of the scooter;
- 10 - a step for detecting a deceleration phase of the scooter;
- a step for measuring the duration of the deceleration phase; and
- a step for actuating the motor **24** when the deceleration phase has a duration at least equal to the first predetermined threshold **s1**.
- 15

The motor-driven assistance method also comprises a step consisting of detecting a new acceleration phase during the step for actuating the motor, and a step consisting of stopping the actuation of the motor.

20 Moreover, the motor-driven assistance method applied by the scooter **10** according to the present invention also comprises:

- a step consisting of detecting a positive variation of the speed of the scooter greater than the second predetermined threshold **s2** during actuation of the motor;
- 25 - a step consisting of measuring the duration during which the positive variation of the speed of the scooter is greater than the second predetermined threshold **s2**; and
- a step consisting of stopping the actuation of the motor **24** when the positive variation of the speed of the scooter is greater than the second predetermined threshold **s2** for a duration greater than the third predetermined threshold **s3**.
- 30

Finally, the motor driven assistance method also comprises a step consisting of detecting possible actuation of the braking device **30** while the motor is actuated, and a step consisting of stopping the actuation of
 35 the motor, in the case of detecting actuation of the braking device.

The description above is given as an example and is therefore not a limitation of the invention.

In particular, the invention, although particularly adapted to the field of scooters, may also equip any travelling means, such as a bicycle or
5 a skateboard so as to provide motor-driven assistance without preventing traditional operation of the travelling means.

CLAIMS

1. A scooter (10) including:
 - a frame (12);
 - 5 - a front wheel (20) and a rear wheel (22) attached to the frame;
 - a motor (24) configured for driving into a rotation at least one of the front and rear wheels;
 - a unit (26) for controlling the motor;

the scooter being characterized in that the unit for controlling the

10 motor includes:

 - acceleration detection means (26a) for detecting an acceleration phase of the scooter;
 - deceleration detection means (26b) for detecting a deceleration phase of the scooter;
 - 15 - the control unit being configured for actuating the motor when a deceleration phase having a period at least equal to a first predetermined threshold (s_1) has been detected by the deceleration detection means after detection of an acceleration phase by the acceleration detection means.

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2. The scooter (10) according to claim 1, characterized in that the control unit (26) is configured for actuating the motor (24) after detection of said deceleration phase so that the speed of the scooter is maintained at a set speed value (v_1 , v_2 , v_3 , v_5).
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3. The scooter (10) according to claim 2, characterized in that said speed value (v_1) depends on the speed (v_{d1}) of the scooter upon actuation of the motor.
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4. The scooter (10) according to claim 2 or 3, characterized in that the control unit (26) is configured for determining a speed (v_{d1}) at the end of said deceleration phase, and in that the control unit is configured for actuating the motor after detection of said deceleration phase so that the speed (v_1) of the scooter is greater
- 35 than the speed determined at the end of said deceleration phase.

5. The scooter (10) according to any of claims 1 to 4, characterized in that the control unit (26) is configured for actuating the motor for a predetermined period (T).
- 5 6. The scooter (10) according to any of claims 1 to 5, characterized in that the control unit is configured for stopping the actuation of the motor when a new acceleration phase is detected while the motor is actuated.
- 10 7. The scooter (10) according to claim 6, characterized in that the control unit is configured for again actuating the motor when a new deceleration phase having a period at least equal to the first predetermined threshold (s1) has been detected by the deceleration detection means after the new acceleration phase.
- 15 8. The scooter (10) according to any of claims 1 to 7, characterized in that the scooter further includes a device for determining the speed of the scooter, and in that the control unit is configured for stopping the actuation of the motor when a positive variation in the speed of the scooter greater than a second predetermined threshold (s2) is detected.
- 20 9. The scooter (10) according to claim 8, characterized in that the control unit is configured for stopping the actuation of the motor when the positive variation of the speed of the scooter is greater than the second predetermined threshold (s2) for a period greater than a third predetermined threshold (s3).
- 25 10. The scooter (10) according to any of claims 1 to 9, characterized in that it further includes a braking device (30), and in that the control unit is configured for stopping the actuation of the motor when the braking device is actuated.
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