
Motor-driven vehicle, in particular a two-wheeled vehicle

Description

The invention concerns a motor-driven vehicle, in particular a two-wheeled vehicle, with a chassis, a central unit comprising a drive unit and a seat carrier, having a cockpit structure with a steering mechanism, an operating unit, and wheel mounts front and back with a front wheel and a rear wheel fitted to the wheel mounts.

Compact, relatively lightweight motor-driven vehicles increasingly come into their own in urban traffic in particular not only due to the high volume of traffic and the associated risk of congestion but also due to their flexibility when travelling, for example. In particular, there is a great need for two-wheeled vehicles which can be folded into transportable units, and which are designed to be easy to handle and transport.

The object of the invention is to offer a new concept for such a motor-driven vehicle, in particular a two-wheeled vehicle, with regard to construction and, most importantly, with regard to weight, which brings about significant improvements compared to products which are already on the market.

The invention solves the aforementioned problem in that the wheels of such a two-wheeled vehicle, which are fitted to wheel mounts, are hublessly suspended by means of a roller bearing via a toroidal wheel bearing rim on a wheel bearing rim which can be attached to the wheel rim likewise in the shape of a ring.

The major advantages of such a design over known designs with hub wheels are, firstly, that considerable weight can be saved through the hubless design of the

wheels and, secondly, that moving the pivot points for the wheel suspension close to the support points of the wheel gives rise to advantages on the road during extension and compression. Furthermore, for such lightweight vehicles, this design has the advantage that the lower unsprung masses of the wheels significantly improve travelling comfort and road hold.

A solution according to the invention in which a torsion elastic suspension element, arranged on the wheel bearing rim by means of a mounting flange, preferably comprising an element housing, attached – in one piece or firmly splinted – to the mounting flange, in which at least one, preferably four evenly distributed rod-shaped torsion elastic suspension elements in the case of an element housing with a basic rectangular shape, are introduced under tension is particularly advantageous. In a preferred embodiment of the subject matter of the invention, the suspension element(s) can be arranged under tension in the element housing by means of an essentially rod-shaped suspension element. Via the suspension core element the suspension element can be attached to the wheel mount by means of a mounting flange on the side facing the wheel mount.

Damping or suspension can be selected or set via the arrangement of the rod-shaped suspension core element in relation to the wheel bearing ring – distance centre suspension core element for the attachment of the mounting flange on the wheel bearing = lever arm for the compression of the wheel – together with the degree of elasticity and the dimensions of the suspension element.

A solution according to the invention in which the steerable front wheel can be connected to the wheel mount, which is steerable via the steering mechanism, by way of a support element mounted on the toroidal wheel bearing rim on the rim side, such that the notional steering axis runs through the notional centre of the wheel, is particularly advantageous. Such a design ensures that, without significant cost, the same steering movements can be made with a hubless steerable wheel as, conventionally, can be made with hub-mounted steering wheels.

In the case of a vehicle according to the invention, as brake discs, toroidal brake elements can be connected to the wheel rim which interact with brake shoes, which can be attached to the wheel mounts, in an essentially conventional fashion.

The driven rear wheel can comprise a toroidal drive element, which is attached to the rim, and which can be directly or indirectly driven by means of the drive unit. The drive element attached to the rim is preferably driven by means of an oscillating gear construction to compensate for the movements of the rear wheel.

According to a specially preferred drive solution to the subject matter of the invention, the drive element on the rim side is a gear ring, which can be driven via a toothed belt. However, the drive element on the rim side can also be designed as a toroidal sprocket tooth, which is driven by the drive unit by means of a chain.

The advantages of the invention can be achieved in particular in a two-wheeled vehicle designed as a scooter. The weight advantages of the design according to the invention can be achieved in particular in the case of a folding two-wheeled vehicle, since, due to the special wheel design, the low weight offers the ideal prerequisites for such a vehicle to have a purely electrical drive.

To take full advantage of the weight advantages, it is appropriate to design the essential components of such a vehicle, e.g. chassis, central unit for accommodating the drive, cockpit structure as well as wheel mounts as a fibre reinforced structure.

A motor-driven two-wheeled vehicle assembled in accordance with the invention is shown in the drawing. The characteristics and details of the subject matter of the invention are explained in more detail below with the aid of this embodiment and its details.

In the drawing:

- Fig. 1 shows a side view of a motor-driven vehicle according to the invention;
- Fig. 2 shows the hubless front wheel of a motor-driven two-wheeled vehicle according to the invention with the front wheel mount;
- Fig. 3 shows the hubless rear wheel of a vehicle according to the invention with a drive unit and brake ring;
- Fig. 4 shows the arrangement of a torsion elastic suspension element on the wheel mount (front wheel).

The motor-driven two-wheeled vehicle 1 consists of a chassis 2, a central unit 3, comprising the drive unit 4 in the embodiment, and, as it is designed as an electric vehicle there, a battery box 5, a seat carrier 6 with a driver's seat 7, as well as a cockpit structure 8, comprising a steering device with handlebar 9 and operating unit. The rear wheel mount 10 and the front wheel mount 11 are pivoted on the chassis 2. In the embodiment shown, for reasons of weight the rear and the front wheel mounts 10, 11 are designed as single-arm structures. However, it is perfectly conceivable that both the rear and the front wheel mounts – or, possibly just one of the two – can be designed to overlap the wheel(s) like a fork.

The rear wheel 12 and the front wheel 13 are designed as hubless structures – as a structure in fundamental construction also known as a "Franco Sbarro centreless wheel". In the embodiment, wheel bearing is carried out by means of a wheel bearing rim 20 or 22 (not described in any more detail), which is attached to the wheel rim 14 or 15 in the shape of a ring. The wheel bearing rim 20, 22 is part of a bearing structure, which is well-known from automotive and/or mechanical engineering, known as a roller bearing (ball, roller, needle), where one of the rings of the roller bearing sits on the wheel rim and rotates with this, and the second ring is fixed to the wheel mount 10 or 11. With regard to this

bearing, the structural details for the rear wheel bearing and the front wheel bearing correspond completely or at least to a large extent.

The brake ring arranged on the rim 16 or 17, which interacts with brake shoes (not shown) attached to the wheel mounts 10 or 11, are likewise broadly the same in structural terms on the rear wheel 12 or the front wheel 13. The design of the brake shoes corresponds in essence to the current state of the art.

Fig. 2 shows in detail the front single-arm wheel mount 11 with the actual wheel bearing 18 attached to it, which bears the toroidal wheel bearing rim of the roller bearing, which interacts via the roller bearing elements with the, likewise toroidal, second wheel bearing rim 22 attached to the wheel rim for the actual wheel bearing. To make conventional steering of such a two-wheeled vehicle with such a hubless wheel design possible, the notional line X = the axle line of the handlebar 19 should run through the likewise theoretical centre Z in the front wheel 13.

Fig. 3 shows the driven rear wheel rim 14 (shown without tyres). Attached to the wheel rim 14 is a wheel bearing rim 20, which interacts via the roller bearing elements interacting with it with the corresponding wheel bearing rim, which is attached to the rear wheel mount 10 (Fig. 1).

Likewise attached to the wheel rim 14 are a brake ring 16 and a toroidal gear ring 21 with external teeth by means of which the rear wheel is driven, e.g. by means of a pinion 23 of a drive unit 4, by means of a toothed belt. The oscillating compressing and extending wheel movements of the rear wheel 12 can be compensated for by means of a belt tensioner 24.

Figures 2, 3 and 4 show the suspension or damping design to be used for the subject matter of the invention. By means of a mounting flange 25, 26 which is rigidly fixed to it, the wheel-bearing rim 20, 22 bears an element housing 29, 30, which is preferably attached to the mounting flange 25, 26 in one piece, having a basic rectangular shape and housing at least one torsion-elastic suspension element 27, 28. In the shown embodiment, in this element housing 29, 30 four

suspension elements 27 are arranged under tension evenly in the corners of the rectangle by means of a core element 31, which is likewise essentially rod-shaped and substantially rigid e.g. made of steel. On the side facing the wheel mount 10, 11, the suspension core element 31 is attached to the wheel mount 10, 11 by means of a mounting flange (not shown). The initial tension or the decreasing or increasing tension of suspension elements 27 and element housing 29 with the suspension core element bring about suspension or damping with relative movements of the wheel in relation to the wheel mount 11 as a result of torsion forces acting on the torsion-elastic suspension element. Damping or suspension of the wheel can be selected or set via the arrangement of the suspension core element 31 in relation to the wheel bearing rim 22 together with the degree of elasticity and the dimensions of the suspension element(s) 27.

It is easy for the person skilled in the art to understand that different design solutions for drive as well as for wheel suspension and a suspension solution can be taken into consideration without the basic idea underlying the invention being abandoned.

List of reference numerals

1	motor-driven two-wheeled vehicle
2	Chassis
3	Central unit
4	Drive unit
5	Battery box
6	Seat carrier
7	Driver's seat
8	Cockpit structure
9	Steering wheel
10	Rear wheel mount
11	Front wheel mount
12	Rear wheel
13	Front wheel
14	Rear wheel rim

15	Front wheel rim
16, 17	Brake ring
18	Wheel bearing
19	Handlebar
20	Rear wheel bearing rim
21	Toroidal gear ring
22	Front wheel bearing rim
23	Pinion
24	Belt tensioner
25	Front mounting flange
26	Rear mounting flange
27	Front suspension element
28	Rear suspension element
29	Front element housing
30	Rear element housing
31	Suspension core element
X	= notional steering axis
Z	= notional centre of the front wheel

Claims

1. A motor-driven vehicle, in particular a two-wheeled vehicle with a chassis (2), a central unit (3) comprising a drive unit (4, 23) and a seat carrier (6), with a cockpit structure (8) with steering mechanism (9, 19) and operating unit and with a front wheel (13) and/or rear wheel (12), carried on a rear wheel mount (10) and/or a front wheel mount (11),
characterized in that
the wheel mounts (10, 11) have a toroidal wheel bearing rim, the toroidal wheel bearing rim with a corresponding toroidal wheel bearing rim (20, 22), mountable to the wheel rim, carries the wheel (12, 13) rotatably via a roller bearing.
2. A motor-driven vehicle according to claim 1,
characterized in that
a torsion elastic suspension element (27, 28, 29, 30, 31) is arranged on the wheel bearing rim (20, 22) via a mounting flange (25, 26).
3. A motor-driven vehicle according to claim 2,
characterized in that
the torsion elastic suspension element (27, 28, 29, 30, 31) consists of an element housing (29, 30) attached to the mounting flange (25, 26), wherein at least one essentially rod-shaped formed torsion elastic suspension element (27, 28) is placed under tension in the element housing (29, 30).
4. A motor-driven vehicle according to claim 3,
characterized in that
the element housing (29, 30) is attached to the mounting flange (25, 26) in one piece.
5. A motor-driven vehicle according to claim 3,
characterized in that
the at least one torsion elastic suspension element (27, 28) is arranged under tension in the element housing (29, 30) by means of an essentially rod-like suspension core element (31).

6. A motor-driven vehicle according to claim 5,
characterized in that
on the side of the suspension element (27, 28) facing the wheel mount (10, 11) the suspension core element (31) is provided with a mounting flange for mounting the suspension core element (31) on the wheel mount (10, 11).
7. A motor-driven vehicle according to one of the preceding claims,
characterized in that
damping respectively suspension of the wheel is selectable respectively adjustable by way of the arrangement of the suspension core element (31) in relation to the wheel bearing rim (20, 22), along with the degree of elasticity and the dimensions of the suspension element(s) (27, 28).
8. A motor-driven vehicle according to claim 1,
characterized in that
the steerable front wheel (13) is attached to the wheel mount (11), which is steerable by way of the steering mechanism (9, 19), via a support element, mounted on the toroidal, rim-sided wheel bearing rim, the steerable front wheel (13) being attached in such a way, that a notional steering axis (X) runs through a notional centre of the wheel (Z).
9. A motor-driven vehicle according to claim 1,
characterized in that
a brake ring (16, 17) attached to the wheel rim (14, 15) is arranged as brake disc, the brake ring (16, 17) interacting with the brake-shoe, which is mountable to the wheel mount (10, 11).
10. A motor-driven vehicle according to claim 1,
characterized in that
the propelled rear wheel (12) has an essentially toroidal drive section (21), which is mountable on the rim side, and which is drivable by the drive unit (4, 23) directly or indirectly.
11. A motor-driven vehicle according to claim 10,
characterized in that

- the drive of the toroidal drive section (21) is carried out via a gearbox construction, which compensates oscillating movements of the rear wheel.
12. A motor-driven vehicle according to claim 10, characterized in that the drive section (21) is an essentially toroidal gear ring (21), which is drivable by the drive unit (4, 23) by way of a toothed belt.
 13. A motor-driven vehicle according to claim 10, characterized in that the drive section (21) is an essentially toroidal sprocket ring, which is drivable by the drive unit (4, 23) by way of a chain.
 14. A motor-driven vehicle according to one of the preceding claims, characterized in that the vehicle is a two-wheeled vehicle made in the way of a scooter.
 15. A motor-driven vehicle according to one of the preceding claims, characterized in that the two-wheeled vehicle is made to be foldable.
 16. A motor-driven vehicle according to one of the preceding claims, characterized in that the two-wheeled vehicle is drivable by a fully electric drive.
 17. A motor-driven vehicle according to one of the preceding claims, characterized in that the components relevant for the weight of the two-wheeled vehicle, such as chassis (2), central unit (3), cockpit structure (8), wheel mounts (10, 11) are made from fibre-reinforced plastics.