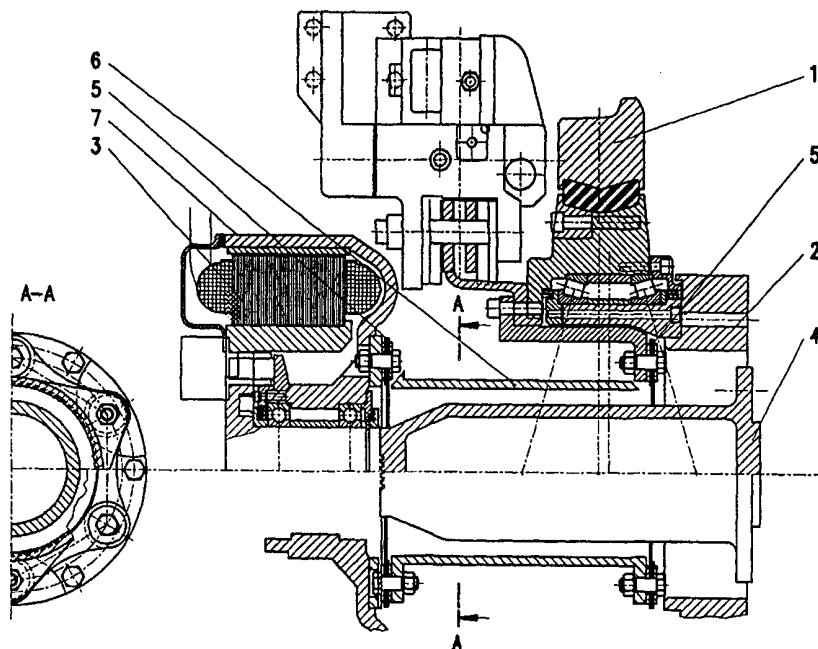




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/CZ98/00039 (22) International Filing Date: 13 October 1998 (13.10.98)</p> <p>(71) Applicants (for all designated States except US): FIAT FERROVIARIA S.P.A. [IT/IT]; Piazza Galateri, 4, I-12038 Savigliano (IT). VÚKV, a.s. [CZ/CZ]; Kartouzská 4, 150 21 Praha 5 (CZ).</p> <p>(72) Inventors; and (75) Inventors/Applicants (for US only): MALINSKÝ, Jan [CZ/CZ]; Točítá 358/25, 140 00 Praha 4 (CZ). BYSTRICKÝ, Antonín [CZ/CZ]; Novodvorská 1092, 142 00 Praha 4 (CZ).</p> <p>(74) Agent: LOSKOTOVÁ, Jarmila; Kartouzská 4, 150 21 Praha 5 (CZ).</p>		<p>(81) Designated States: AT, CH, DE, ES, GB, PT, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p><b>Published</b> With international search report. With amended claims.</p>

(54) Title: VEHICLE WHEEL WITH BUILT-IN ELECTRIC MOTOR, ESPECIALLY FOR RAIL-VEHICLES



## (57) Abstract

Vehicle wheel with built-in electric motor, especially for rail-vehicles, consists of a driving wheel (1), mounted to rotate on axle (2), connected by one elastic coupling (5) to shaft (6) that is in turn connected by another elastic coupling (5) to rotor (7) of the electric motor, that revolves around stator (3) of the electric motor, fastened rigidly to the electric motor carrier (4) that is a part of the spring cushioned truck of the vehicle.

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Vehicle wheel with built-in electric motor, especially for rail-vehicles

### Technical field

The invention concerns a vehicle wheel, especially for rail-vehicles, that has an built-in spring-mounted electric motor for direct drive of the vehicle.

### State of the art

Presently known constructions of vehicle wheels with built-in electric motor use, with respect to the mounting of the driving unit, two different solutions. In the first case the driving unit is connected rigidly with the driving wheel and thus is a part of the unsprung mass of the vehicle (e.g. patents DE 42 34 831 C1, EP 0 464 929 A3). A direct connection of the drive rotor with the driving wheel serves to transfer the driving and braking torque to the wheel. In the second case the motor is mounted separately from the driving wheel and is, with respect to the wheel, spring-cushioned. Rotation is transferred and relative movement between the driving unit and the driving wheel is equalised by couplings or mechanisms subjected to wear or ageing (e.g. EP O 760 305 A2, DE 196 00 420 C1). Thus the disadvantage of these solutions is either a high proportion of unsprung vehicle mass including the wheel drive and resulting negative dynamic effects of the moving vehicle on the vehicle itself and on the track, that lead to the necessity of a more massive construction with a higher safety coefficient with respect to destruction, and/or the use of parts expensive to procure, for the connection of the electric motor and the driving wheel, that require careful records, regular maintenance and replacements.

### Summary of the invention

The deficiencies given above are removed by a vehicle wheel with built-in electric motor, especially for rail-vehicles, the principle of which is that the stator of the electric motor is rigidly fastened to spring-cushioned parts of the vehicle by means of an electric motor carrier. The rotor of the electric motor is connected with the driving wheel, mounted on the axle in the usual way, through a shaft with a pair of angularly and axially elastic couplings. This arrangement allows the transfer of torques between the spring-cushioned electric motor and the unsprung driving wheel in both directions.

The spring-cushioning of the electric motor improves the ratio between spring-cushioned and unsprung masses and that influences the movement of the vehicle across uneven spots, e.g. across points, rail-connections, by reducing the influence of dynamic effects - impacts between the driving wheel and the track and by connected better safety and comfort and at the same time lower wear of the vehicle as well as of the track. Also the removal of electric motor vibration increases its longevity.

#### Brief description of the drawing

The adjoined drawing Fig.1 shows the construction of a vehicle wheel with built-in electric motor, especially for rail-vehicles.

#### Detailed description

The vehicle wheel with built-in electric motor, especially for rail-vehicles, shown by the adjoined drawing Fig. 1, consists of the driving wheel 1, mounted to rotate on axle 2, connected by one elastic coupling 5 to shaft 6 that is in turn connected by another elastic coupling 5 to rotor 7 of the electric motor, revolving about stator 3 of the electric motor that is rigidly mounted to the electric motor carrier 4, a part of the spring-cushioned truck of the vehicle.

While the vehicle is running, its movement is accelerated or decelerated by the effect of the built-in electric motor, functioning either as driving or as braking unit, on the driving wheel 1. The transfer of the driving and braking torque is realised from rotor 7 of the electric motor through shaft 6, provided with two elastic couplings 5 on both ends, to the driving wheel 1. When an unevenness on rails or points are being crossed, impacts to the driving wheel 1 are taken up by angularly and axially elastic couplings 5 and shaft 6 and do not affect the function of the electric motor that is a member of the spring-cushioned part of the vehicle truck.

Industrial application

The vehicle wheel with built-in electric motor, especially for rail-vehicles, will be used with an advantage for all newly produced vehicles with electrically driven wheels or a similar power transfer, because it decreases damage to the wheel unit and the track by suppressing dynamic effects by spring-mounting of the electric motor, that also improves the vehicle's safety of operation. The use of this solution is especially advantageous in construction of vehicles with low floors, because parts of the drive do not occupy inner space between wheels.

## CLAIMS

1. A vehicle wheel with built-in electric motor, especially for rail-vehicles, characterized by that the driving wheel /1/, mounted to rotate on axle /2/, is connected by one elastic coupling /5/ to shaft /6/, that is in turn connected by another elastic coupling /5/ to the rotor of electric motor /7/, that revolves around stator /3/ of the electric motor fastened rigidly to the electric motor carrier /4/, that is a part of the spring-cushioned vehicle truck.

**AMENDED CLAIMS**

[received by the International Bureau on 26 August 1999 (26.08.99);  
original claim 1 amended; new claim 2 added ; (1 page)]

1. A vehicle wheel of a rail-bound vehicle with spring-cushioned electric motor mounted in a rotational manner on an unsprung part of the running gear of the vehicle, e.g. on the bridge axle (2),  
characterised by that the motor is disposed outside the vehicle wheel (1), rotationally mounted on an unsprung part of the running gear, e.g. on the bridge axle (2), by being placed on a carrier (4) connected to the primary suspension section of the running gear, the torque due to the outside rotor (7) of the electric motor being transferred to the vehicle wheel (1) by means of a shaft (6) provided with two couplings (5) which are angularly and axially resilient and correspond to the travel of the primary suspension, the first coupling (5) being positioned between the rotor (7) of the electric motor and the shaft (6) and the second coupling (5) being positioned between the shaft (6) and the vehicle wheel (1).
2. A vehicle wheel of a rail-bound vehicle with a spring-cushioned electric motor as per claim 1,  
characterised by that the electric motor is connected to the carrier (4) by means of a centering front tooth system (8).

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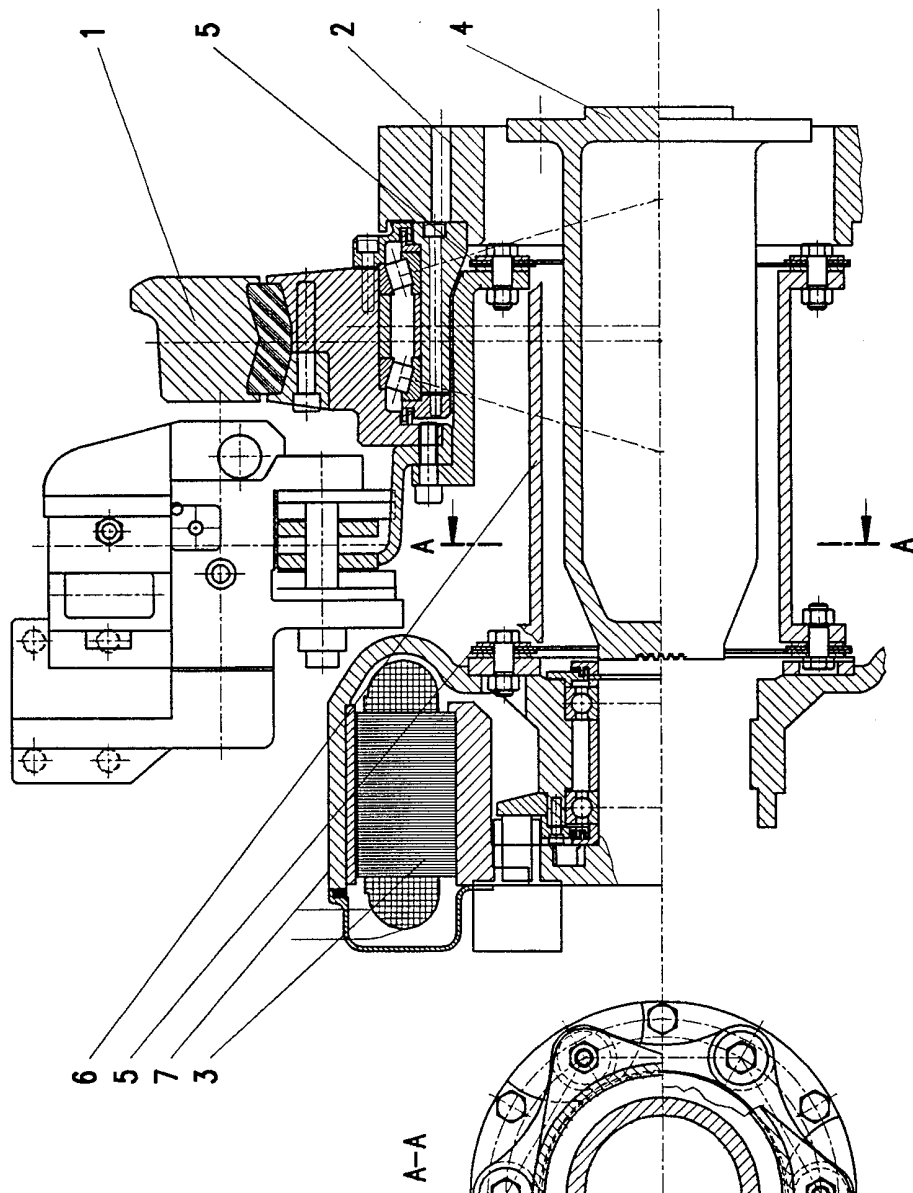


Fig. 1

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/CZ 98/00039

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC 6 B61C9/46 B61F3/16 B60K7/00

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B61C B61F B60K H02K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 44 45 407 C (SIEMENS AG) 22 February 1996 see column 1, line 68 - column 2, line 62; figures 1-3	1
A	---	
A	DE 196 50 913 A (SAB WABCO BSI VERKEHRSTECHNIK) 10 June 1998 see column 3, line 3 - line 55; figures 1-3	1
A	---	
A	DE 195 31 355 A (ZF HURTH BAHNTECHNIK GMBH) 27 February 1997 see column 2, line 15 - column 3, line 11; figures 1-3	1
A	---	
A	DE 39 31 912 A (EICKHOFF GEB) 4 April 1991 see column 2, line 47 - column 4, line 10; figures 1-4	1
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