Claims

1. A steering drive system for a wheel side steered vehicle, the steering drive system comprising:

a coupling element configured to be coupled to output drives of the vehicle, which output drives are driven at a basic rotational speed by a traction drive system of the vehicle, such that, when an amount of a superposition rotational speed of the coupling element is greater than zero, the coupling element provides at the output drives a superposition rotational speed that is superposed on the basic rotational speed to thereby steer the vehicle;

at least one first electric machine having a rotational speed that is variably controllable;

a power summation and/or power branching unit;

a first connection of the power summation and/or power branching unit is coupled to a first shaft that is configured to be coupled to a shaft of the traction drive system;

a second connection of the power summation and/or power branching unit is coupled to the at least one first electric machine;

a third connection of the power summation and/or power branching unit is coupled to the coupling element;

wherein the steering drive system further comprises:

a power unit connected in parallel with the power summation and/or power branching unit, and configured to couple the first shaft in parallel with the power summation and/or power branching unit to the coupling element, such that:

in a first operating state of the power unit the first shaft and the power summation and/or power branching unit rotate in a first direction, and

in a second operating state of the power unit the first shaft and the power summation and/or power branching unit rotate in a second direction opposite the first direction;

and/or

a reversing gear arranged after a superposition of the power provided by the first shaft with the power provided by the at least one first electric machine; or a reversing gear connected between the coupling element and the power summation and/or power branching unit.

2. The steering drive system of claim 1, wherein at least one of:

the second connection of the power summation and/or power branching unit is coupled to the at least one first electric machine via a defined transmission ratio;

the first shaft is configured to be coupled to the shaft of the traction drive system via a defined transmission ratio; or

the third connection of the power summation and/or power branching unit is coupled to the coupling element via at least one defined transmission ratio.

3. The steering drive system of claim 1, wherein at least one of:

the steering drive system further comprises at least one first power electronics unit interacting with each at least one first electric machine and configured to regulate the speed of the respective first electric machine; or

the respective first electric machine is designed with electrically separate phases.

4. The steering drive system of claim 1, further comprising:

at least one second electric machine coupled to the first shaft to which the first connection of the power summation and/or power branching unit is also coupled.

5. The steering drive system of claim 1, further comprising at least a second electric machine coupled to the coupling element.

6. The steering drive system according to claim 5, wherein at least one of:

at least one second power electronics unit cooperates with the at least one second electric machine and is designed to regulate the speed of the respective second electric machine; or

the respective second electric machine is designed with electrically separate phases.

7. The steering drive system of claim 1, further comprising at least one second electric machine configured to at least one of:

supply the at least one first electric machine, in particular directly, with electrical energy in a regenerative mode; or

be supplied with electrical energy, in particular directly, by the at least one first electric machine in a motoring mode.

8. The steering drive system of claim 7, wherein

the steering drive system comprises at least two gear wheel tracks coupled to the coupling element such that:

a first gear wheel track is designed, in the first operating state of the power unit, to couple the first shaft to the coupling element in the first direction of rotation, and

a second gear wheel track is designed to couple the first shaft to the coupling element in the second operating state of the power unit in the second direction opposite the first direction.

9. The steering drive system of claim 1, wherein the power unit is configured as a rotation direction reversing unit with at least one gear wheel track coupled to the coupling element such that:

in the first operating state of the power unit the at least one gear wheel track rotates the coupling element in the first direction; and

in the second operating state of the power unit the at least one gear wheel track rotates the coupling element in the second direction opposite the first direction.

10. The steering drive system of claim 1, wherein

the power unit is arranged between the first electrical machine and the second connection of the power summation and/or power branching unit and wherein the power unit is designed to couple the first shaft to the power summation and/or power branching unit, in parallel with the first electrical machine.

11. The steering drive system of claim 10, wherein at least one of:

the power unit is designed to slip-couple the first shaft to the power summation and/or power branching unit; or

the power unit is designed to couple the first shaft to the second connection of the power summation and/or power branching unit.

12. The steering drive system of claim 1, wherein the reversing gear is configured to reverse a direction of rotation of the coupling element, wherein the reversing gear is one of:

integrated into the power summation and/or power branching unit; or

connected between the coupling element and the power summation and/or power branching unit.

13. The steering drive system of claim 12, wherein

the reversing gear comprises at least two gear wheel tracks coupled to the coupling element, wherein

a first gear wheel track is arranged to drive the coupling element through the power summation and/or power branching unit in a first direction of rotation in a first operating state of the reversing gear; and

a second gear wheel track is arranged to drive the coupling element through the power summation and/or power branching unit in a second direction of rotation opposite to the first direction of rotation in a second operating state of the reversing gear.

14. The steering drive system of claim 1, wherein:

the power summation and/or power branching unit is configured to couple, in a first operating state, the first connection and the second connection to the third connection in at least one superimposed operation; and

at least one of:

at least one of the first connection or the second connection is coupled to the third connection in at least one fixed transmission ratio mode in a second operating state,

the first connection is coupled to the third connection in a fixed transmission ratio, or

the first connection is coupled to the third connection in a fixed transmission ratio at least when the second connection is load-free.

15. The steering drive system of claim 14, wherein the power summation and/or power branching unit is designed to provide a mixed operation between the first and second operating states in a third operating state.

16. The steering drive system of claim 1, wherein the power summation and/or power branching unit comprises at least one of:

one or more planetary gear sets; or

one or more switching elements.

17. The steering drive system of claim 16, wherein the reversing gear is configured to reverse a direction of rotation of the coupling element, wherein at least one of:

at least two planetary sets and at least two switching elements form the reversing gear integrated in the power summation and/or power branching unit;

at least two gear wheel tracks, to each of which at least one switching element, in particular a clutch, is coupled, form the reversing gear connected between the power summation and/or power branching unit and the coupling element; or

at least two planetary sets and/or at least one switching element cooperate to provide different operating states of the power summation and/or power branching unit as a function of a switching position of the switching elements.

18. A wheel-side steered vehicle, comprising:

a traction drive system that includes at least one drive unit, a transmission, and a main power distribution unit; and

a steering drive system according to claim 1;

wherein at least one of:

the first shaft of the steering drive system is coupled to the main power distribution unit, or

the coupling element of the steering drive system is coupled to outputs of the vehicle.

19. The wheel-side steered vehicle of claim 18, wherein:

the traction drive system comprises a switchable clutch configured to couple the at least one drive unit to the main power distribution unit, and to uncouple the at least one drive unit from the main power distribution unit.

20. The wheel-side steered vehicle of claim 18, wherein:

the steering drive system includes at least one second electric machine coupled to the first shaft; and

the traction drive system comprises at least one third electric machine arranged to support functions of the steering drive system provided by the at least one second electric machine.