Claims

1. An arrangement for providing a vehicle (81) with electric energy, wherein the arrangement comprises a receiving device (85) adapted to receive the magnetic component of an alternating electromagnetic field and to produce an alternating electric current by magnetic induction, wherein the receiving device (85) comprises at least one phase line (U, V, W), each phase line (U, V, W) being adapted to carry a phase of the alternating electric current,
wherein
the at least one phase line (U, V, W) is/are arranged to form a line arrangement which extends in a longitudinal direction transversely to a flux line direction, in which magnetic flux lines of the electromagnetic field penetrate the line arrangement, so that the line arrangement comprises a first end and a second end, which are~~the ends being located at~~ opposite to each other ~~ends of the line arrangement in~~ with respect to the longitudinal direction,
wherein
the line arrangement is tapered, having a conical outline or the outline of a frustum of a cone, towards the first end and/or the second end~~a width of the line arrangement, which width can be measured in a width direction extending transversely to the flux line direction and transversely to the longitudinal direction, gradually decreases along the extension of the line arrangement towards the first end and/or towards the second end~~.

2. The ~~An~~ arrangement of claim 1,~~for providing a vehicle (81) with electric energy, wherein the arrangement comprises a receiving device (85) adapted to receive the magnetic component of an alternating electromagnetic field and to produce an alternating electric current by magnetic induction, wherein the receiving device (85) comprises at least one phase line , each phase line being adapted to carry a phase of the alternating electric current,~~
wherein
- each phase line forms at least one coil (C),
- each coil (C) consists of at least one turn of the phase line ,
- the at least one turn is turning around a central axis of the coil,
- ~~—~~the coil or the coils (C) is/are arranged to form a coil arrangement which is the line arrangement and which extends in the~~a~~ longitudinal direction transversely to the central axis of the coil or transversely to the central axes of the coils (C) of the

coil arrangement., ~~so that the coil arrangement comprises a first end and a second end, the ends being located at opposite ends of the coil arrangement in the longitudinal direction,~~

- ~~a width of the coil arrangement, which width can be measured in a width direction extending transversely to the central axis/axes and transversely to the longitudinal direction, gradually decreases along the extension of the coil arrangement towards the first end and/or towards the second end.~~

3. The arrangement of ~~the preceding~~ claim 2, wherein the coil arrangement comprises a plurality of the coils (C) which are arranged in the longitudinal direction in a consecutive sequence and/or overlapping each other and wherein at least one of the coils (GCL, RCL, BCL, GCR, RCR, BCR) of the coil arrangement at the first and/or second end is tapered along the extension of the coil arrangement towards the respective end.

4. The arrangement of ~~the preceding~~ claim 3, wherein at least two of the coils (C) of the coil arrangement are coils of the same phase line which are consecutively arranged in the longitudinal direction thereby defining at least one border zone, where a first and a second of the at least two coils (C) of the same phase line border on each other, optionally with a gap or overlapping each other, wherein the first coil (GCL, RCL, BCL, GCR, RCR, BCR) is an end coil located at the first end or at the second end of the coil arrangement and wherein – due to its tapered configuration along its extension towards the first end or towards the second end – the first coil covers a smaller area per unit length in the longitudinal direction in an end region at the first end or second end compared to a border region at the border zone.

5. A vehicle (81) comprising the arrangement of one of ~~the preceding~~ claims 1 to 3, wherein the arrangement is located at the bottom of the vehicle (81), so that the central axes of the coils (C) extend in vertical direction, provided that the vehicle (81) travels on a horizontal underground or horizontal track.

6. An arrangement for providing a vehicle (81) with electric energy, wherein the arrangement comprises a generating device adapted to generate an alternating electromagnetic field for producing an alternating electric current by magnetic induction in a corresponding receiving device (85), wherein the generating device comprises at least one phase line (U, V, W), each phase line (U, V, W) being adapted to carry a phase of an alternating electric current,

wherein

- the at least one phase line (U, V, W) is/are arranged to form a line arrangement which extends in a longitudinal direction transversely to a flux line direction, in which magnetic flux lines of the electromagnetic field penetrate the line arrangement, so that the line arrangement comprises a first end and a second end, which are ~~the ends being located at~~ opposite to each other with respect to ~~ends of the line arrangement in~~ the longitudinal direction,

wherein

- the line arrangement is tapered, having a conical outline or the outline of a frustum of a cone, towards the first end and/or the second end.~~a width of the line arrangement, which width can be measured in a width direction extending transversely to the flux line direction and transversely to the longitudinal direction, gradually decreases along the extension of the line arrangement towards the first end and/or towards the second end~~.

7. The arrangement of ~~the preceding~~ claim 6, wherein at least one phase line (U, V, W) of the line arrangement meanders in the longitudinal direction, wherein this phase line (U, V, W) comprises first sections (1) which extend transversely to the longitudinal direction and second sections (2) connecting in each case two first sections (1), the second sections (2) extending substantially in the longitudinal direction, and wherein the lengths of the first sections (1) gradually decrease along the extension of the line arrangement towards the first end and/or towards the second end.

8. The arrangement of claim 6, wherein the arrangement is a coil arrangement comprising a plurality of coils (C) which are arranged in the longitudinal direction in a consecutive sequence and/or overlapping each other and wherein at least one of the coils (GCL, RCL, BCL, GCR, RCR, BCR) at the first end and the second end of the coil arrangement is tapered along the extension of the coil arrangement towards the respective end of the coil arrangement.

9. The arrangement of ~~the preceding~~ claim 8, wherein at least two of the coils (C) of the coil arrangement are coils of the same phase line which are consecutively arranged in the longitudinal direction thereby defining at least one border zone, where a first and a second of the at least two coils (C) of the same phase line border on each other, optionally with a gap or overlapping each other, wherein the first coil (GCL, RCL, BCL,

GCR, RCR, BCR) is an end coil located at the first end or at the second end of the coil arrangement and wherein – due to its tapered configuration along its extension towards the first end or towards the second end – the first coil covers a smaller area per unit length in the longitudinal direction in an end region at the first end or second end compared to a border region at the border zone.

10. A method of manufacturing an arrangement for providing a vehicle (81) with electric energy, wherein a receiving device (85) of the arrangement is manufactured which is adapted – during operation – to receive the magnetic component of an alternating electromagnetic field and to produce an alternating electric current by magnetic induction, wherein the receiving device (85) is equipped with at least one phase line (U, V, W), each phase line (U, V, W) being adapted to carry – during operation – a phase of the alternating electric current,

wherein

- the at least one phase line (U, V, W) is/are arranged to form a line arrangement which extends in a longitudinal direction transversely to a flux line direction, in which magnetic flux lines of the electromagnetic field penetrate the line arrangement, so that the line arrangement comprises a first end and a second end, which are ~~the ends being located at~~ opposite to each other with respect to ~~ends of the line arrangement in~~ the longitudinal direction,

wherein

- the line arrangement is formed in such a manner that it is tapered, having a conical outline or the outline of a frustum of a cone, towards the first end and/or the second end.~~a width of the line arrangement, which width can be measured in a width direction extending transversely to the flux line direction and transversely to the longitudinal direction, gradually decreases along the extension of the line arrangement towards the first end and/or towards the second end.~~

11. ~~A~~The method of claim 10, ~~manufacturing an arrangement for providing a vehicle (81) with electric energy, in particular the arrangement of one of claims 1 – 4, wherein a receiving device (85) of the arrangement is manufactured which is adapted – during operation – to receive the magnetic component of an alternating electromagnetic field and to produce an alternating electric current by magnetic induction, wherein the receiving device (85) is equipped with at least one phase line, each phase line being adapted to carry – during operation – a phase of the alternating electric current,~~

wherein

- at least one coil (C) is formed by each phase line,
- each coil (C) is formed by at least one turn of the phase line,
- the at least one turn is turning around a central axis of the coil,
- ~~—~~the coil or the coils (C) is/are arranged to form a coil arrangement which is the line arrangement and which extends in a longitudinal direction transversely to the central axis of the coil or transversely to the central axes of the coils (C) of the coil arrangement., ~~so that the coil arrangement comprises a first end and a second end, the ends being located at opposite ends of the coil arrangement in the longitudinal direction,~~
- ~~the line arrangement is formed in such a manner that a width of the coil arrangement, which width can be measured in a width direction extending transversely to the central axis/axes and transversely to the longitudinal direction, gradually decreases along the extension of the coil arrangement towards the first end and/or towards the second end.~~

12. The method of ~~the preceding~~ claim 11, wherein the coil arrangement is formed by a plurality of the coils (C) which are arranged in the longitudinal direction in a consecutive sequence and/or overlapping each other and wherein at least one of the coils (GCL, RCL, BCL, GCR, RCR, BCR) of the coil arrangement at the first and/or second end is tapered along the extension of the coil arrangement towards the respective end.

13. A method of manufacturing a vehicle (81), wherein the method of claim 11 or 12 is performed and the line arrangement ~~of one of claims 1 – 4~~ is arranged at the bottom of the vehicle (81), so that the central axes of the coils (C) extend in vertical direction, provided that the vehicle (81) travels on a horizontal underground or horizontal track.

14. A method of manufacturing an arrangement for providing a vehicle (81) with electric energy~~, in particular the arrangement of one of claims 6 – 9~~, wherein a generating device of the arrangement is manufactured which is adapted – during operation – to generate an alternating electromagnetic field for producing an alternating electric current by magnetic induction in a corresponding receiving device (85), wherein at least one phase line (U, V, W) is provided for the generating device (85), wherein each phase line (U, V, W) is adapted to carry – during operation – a phase of an alternating electric current,

wherein

- the at least one phase line (U, V, W) is/are arranged to form a line arrangement which extends in a longitudinal direction transversely to a flux line direction, in which – during operation – magnetic flux lines of the electromagnetic field penetrate the line arrangement, so that the line arrangement comprises a first end and a second end, the ends being located at opposite ends of the line arrangement in the longitudinal direction,

wherein

- the line arrangement is formed in such a manner that it is tapered, having a conical outline or the outline of a frustum of a cone, towards the first end and/or the second end.~~a width of the line arrangement, which width can be measured in a width direction extending transversely to the flux line direction and transversely to the longitudinal direction, gradually decreases along the extension of the line arrangement towards the first end and/or towards the second end.~~

15. The method of ~~the preceding~~ claim 14, wherein at least one phase line (U, V, W) of the line arrangement is arranged to meander in the longitudinal direction, so that this phase line (U, V, W) comprises first sections (1) which extend transversely to the longitudinal direction and second sections (2) connecting in each case two first sections, the second sections extending substantially in the longitudinal direction, and wherein the lengths of the first sections gradually decrease along the extension of the line arrangement towards the first end and/or towards the second end.