Claims

1. A system for transferring energy to a vehicle, in particular a track bound vehicle (162), such as a light rail vehicle, wherein
   - the system comprises an electric conductor arrangement (17) adapted to produce an electromagnetic field which can be received by the vehicle thereby transferring the energy to the vehicle and which produces an electric voltage by induction,
   - the system comprises electric and/or electronic devices (1) which are adapted to operate the electric conductor arrangement (17), wherein at least one of the devices comprises switches (147, 148, 149, 150), which are repeatedly switched on and off during operation to produce a desired alternating current in the conductor arrangement, wherein the devices (1) produce heat while operating the conductor arrangement (17) and – therefore – are to be cooled,
   - a cooling arrangement of the system comprises
     - a structure (12) having a cavity (144) in which at least one of the devices (1) to be cooled is located,
     - wherein the structure (12) comprises a cover (25) limiting the cavity (144) at the top, wherein the device(s) to be cooled is/are located at a distance to the cover (25)
     - wherein the structure (12) is integrated in the ground (4) at the path of travel of the vehicle in such a manner that the cover (25) forms a part of the surface of the ground (4),
     - wherein the structure (12) is embedded in an outer shell of a solid material having a higher heat capacity per surface area of the structure (12) than the material of the structure (12).

2. The system of claim 1, wherein at least one of the device(s) in the cavity (144) is located at the bottom of the cavity (144).

3. The system of the preceding claim, wherein the device or devices (1) at the bottom of the cavity (144) is/are placed on
   - a heat conducting material extending downwardly through a bottom region material of the structure (12), or
   - a bottom region material of the structure (12), wherein a heat conducting material (3) extends downwardly from the bottom region material (7),

   wherein the heat conducting material (3) having the same or a higher heat conductivity than the bottom region material.

4. The system of one of the preceding claims, wherein the structure (12) is sealed against transfer of air into and out of the cavity (144).

5. The system of the preceding claims, wherein the structure (12) is adapted to prevent intrusion of particles and/or water into the cavity (144).

6. A method of operating a system for transferring energy to a vehicle, in particular to a track bound vehicle, such as a light rail vehicle, wherein
   - an electric conductor arrangement (17) of the system is used to produce an electromagnetic field which can be received by the vehicle thereby transferring the energy to the vehicle and which produces an electric voltage by induction,
   - electric and/or electronic devices (1) of the system is/are used to operate the electric conductor arrangement (17), wherein at least one of the devices (1) comprises switches (147, 148, 149, 150), which are repeatedly switched on and off during operation to produce a desired alternating current in the conductor arrangement, wherein the devices (1) produce heat while operating the conductor arrangement (17) and – therefore – are to be cooled,
   - at least one of the devices (1) to be cooled is operated within a cavity (144), while the cavity (144) is covered by a cover (25) limiting the cavity (144) at the top, wherein the device(s) to be cooled is/are located at a distance to the cover (25), wherein the cavity (144) is located in the ground (4) at the path of travel of the vehicle in such a manner that the cover (25) forms a part of the surface of the ground (4),
   - the cavity (144) is formed by a structure (12) which is located in an outer shell of a solid material having a higher heat capacity per surface area of the structure (12) than the material of the structure (12).

7. The method of the preceding claim, wherein at least one of the device(s) in the cavity (144) is located at the bottom of the cavity (144) while the device(s) is operated.

8. The method of the preceding claim, wherein the device or devices (1) at the bottom of the cavity (144) is/are operated on
   - a heat conducting material extending downwardly through a bottom region material of the structure (12), or
   - a bottom region material of the structure (12), wherein a heat conducting material (3) extends downwardly from the bottom region material (7),

wherein the heat conducting material (3) having the same or a higher heat conductivity than the bottom region material (7).

9. The method of one of claims 6 to 8, wherein the device(s) within the cavity (144) is/are operated while the cavity (144) is sealed against transfer of air into and out of the cavity (144).

10. The method of one of claims 6 to 9, wherein the device(s) within the cavity (144) is/are operated while the cavity (144) is sealed against intrusion of particles and/or water into the cavity (144).

11. A method of manufacturing a system for transferring energy to a vehicle, in particular to a track bound vehicle, such as a light rail vehicle, the method comprising:
    - providing an electric conductor arrangement (17) adapted to produce an electromagnetic field which can be received by the vehicle thereby transferring the energy to the vehicle and which produces an electric voltage by induction,
    - providing electric and/or electronic devices (1) which are adapted to operate the electric conductor arrangement (17), wherein at least one of the devices comprises switches (147, 148, 149, 150), which are repeatedly switched on and off during operation to produce a desired alternating current in the conductor arrangement, wherein the devices (1) produce heat while operating the conductor arrangement (17) and - therefore - are to be cooled,
    - providing a cooling arrangement which comprises
        - a structure (12) having a cavity (144) in which at least one of the devices (1) to be cooled is located,
        - wherein a cover (25) is provided which limits the cavity (144) at the top, wherein the device(s) to be cooled is/are located at a distance to the cover (25),
        - wherein the structure (12) is integrated in the ground (4) at the path of travel of the vehicle in such a manner that the cover (25) forms a part of the surface of the ground (4),
        - wherein the structure (12) is embedded in an outer shell of a solid material having a higher heat capacity per surface area of the structure (12) than the material of the structure (12).

12. The method of claim 11, wherein at least one of the device(s) in the cavity (144) is located at the bottom of the cavity (144).

13. The method of the preceding claim, wherein the device or devices (1) at the bottom of the cavity (144) is/are placed on
    - a heat conducting material extending downwardly through a bottom region material of the structure (12), or
    - a bottom region material of the structure (12), wherein a heat conducting material (3) extends downwardly from the bottom region material (7),

    wherein the heat conducting material (3) having the same or a higher heat conductivity than the bottom region material (7).

14. The method of one of claims 11 to 13, wherein the structure (12) is sealed against transfer of air into and out of the cavity (144).

15. The method of one of claims 11 to 14, wherein the structure (12) is adapted to prevent intrusion of particles and/or water into the cavity (144).

Claims

1. A system for transferring energy to a vehicle, in particular a track bound vehicle (162), such as a light rail vehicle, wherein
   - the system comprises an electric conductor arrangement (17) adapted to produce an electromagnetic field which can be received by the vehicle thereby transferring the energy to the vehicle and which produces an electric voltage by induction,
   - the system comprises electric and/or electronic devices (1) which are adapted to operate the electric conductor arrangement (17), wherein at least one of the devices comprises switches (147, 148, 149, 150), which are repeatedly switched on and off during operation to produce a desired alternating current in the conductor arrangement, wherein the devices (1) produce heat while operating the conductor arrangement (17) and – therefore – are to be cooled,
   - a cooling arrangement of the system comprises
     - a structure (12) having a cavity (144) in which at least one of the devices (1) to be cooled is located,
     - wherein the structure (12) comprises a cover (25) limiting the cavity (144) at the top, wherein the device(s) to be cooled is/are located at a distance to the cover (25)
     - wherein the structure (12) is integrated in the ground (4) at the path of travel of the vehicle in such a manner that the cover (25) forms a part of the surface of the ground (4),
     - wherein the structure (12) is embedded in an outer shell of a solid material having a higher heat capacity per surface area than the material of the structure (12).

2. The system of claim 1, wherein at least one of the device(s) in the cavity (144) is located at the bottom of the cavity (144).

3. The system of the preceding claim, wherein the device or devices (1) at the bottom of the cavity (144) is/are placed on
   - a heat conducting material extending downwardly through a bottom region material of the structure (12), or
   - a bottom region material of the structure (12), wherein a heat conducting material (3) extends downwardly from the bottom region material (7),

   wherein the heat conducting material (3) having the same or a higher heat conductivity than the bottom region material.

4. The system of one of the preceding claims, wherein the structure (12) is sealed against transfer of air into and out of the cavity (144).

5. The system of the preceding claims, wherein the structure (12) is adapted to prevent intrusion of particles and/or water into the cavity (144).

6. A method of operating a system for transferring energy to a vehicle, in particular to a track bound vehicle, such as a light rail vehicle, wherein
   - an electric conductor arrangement (17) of the system is used to produce an electromagnetic field which can be received by the vehicle thereby transferring the energy to the vehicle and which produces an electric voltage by induction,
   - electric and/or electronic devices (1) of the system is/are used to operate the electric conductor arrangement (17), wherein at least one of the devices (1) comprises switches (147, 148, 149, 150), which are repeatedly switched on and off during operation to produce a desired alternating current in the conductor arrangement, wherein the devices (1) produce heat while operating the conductor arrangement (17) and – therefore – are to be cooled,
   - at least one of the devices (1) to be cooled is operated within a cavity (144), while the cavity (144) is covered by a cover (25) limiting the cavity (144) at the top, wherein the device(s) to be cooled is/are located at a distance to the cover (25), wherein the cavity (144) is located in the ground (4) at the path of travel of the vehicle in such a manner that the cover (25) forms a part of the surface of the ground (4),
   - the cavity (144) is formed by a structure (12) which is located in an outer shell of a solid material having a higher heat capacity per surface area than the material of the structure (12).

7. The method of the preceding claim, wherein at least one of the device(s) in the cavity (144) is located at the bottom of the cavity (144) while the device(s) is operated.

8. The method of the preceding claim, wherein the device or devices (1) at the bottom of the cavity (144) is/are operated on
   - a heat conducting material extending downwardly through a bottom region material of the structure (12), or
   - a bottom region material of the structure (12), wherein a heat conducting material (3) extends downwardly from the bottom region material (7),

wherein the heat conducting material (3) having the same or a higher heat conductivity than the bottom region material (7).

9. The method of one of claims 6 to 8, wherein the device(s) within the cavity (144) is/are operated while the cavity (144) is sealed against transfer of air into and out of the cavity (144).

10. The method of one of claims 6 to 9, wherein the device(s) within the cavity (144) is/are operated while the cavity (144) is sealed against intrusion of particles and/or water into the cavity (144).

11. A method of manufacturing a system for transferring energy to a vehicle, in particular to a track bound vehicle, such as a light rail vehicle, the method comprising:
    - providing an electric conductor arrangement (17) adapted to produce an electromagnetic field which can be received by the vehicle thereby transferring the energy to the vehicle and which produces an electric voltage by induction,
    - providing electric and/or electronic devices (1) which are adapted to operate the electric conductor arrangement (17), wherein at least one of the devices comprises switches (147, 148, 149, 150), which are repeatedly switched on and off during operation to produce a desired alternating current in the conductor arrangement, wherein the devices (1) produce heat while operating the conductor arrangement (17) and - therefore - are to be cooled,
    - providing a cooling arrangement which comprises
        - o a structure (12) having a cavity (144) in which at least one of the devices (1) to be cooled is located,
        - o wherein a cover (25) is provided which limits the cavity (144) at the top, wherein the device(s) to be cooled is/are located at a distance to the cover (25),
        - o wherein the structure (12) is integrated in the ground (4) at the path of travel of the vehicle in such a manner that the cover (25) forms a part of the surface of the ground (4),
        - o wherein the structure (12) is embedded in an outer shell of a solid material having a higher heat capacity per surface area than the material of the structure (12).

12. The method of claim 11, wherein at least one of the device(s) in the cavity (144) is located at the bottom of the cavity (144).

13. The method of the preceding claim, wherein the device or devices (1) at the bottom of the cavity (144) is/are placed on
    - a heat conducting material extending downwardly through a bottom region material of the structure (12), or
    - a bottom region material of the structure (12), wherein a heat conducting material (3) extends downwardly from the bottom region material (7),

    wherein the heat conducting material (3) having the same or a higher heat conductivity than the bottom region material (7).

14. The method of one of claims 11 to 13, wherein the structure (12) is sealed against transfer of air into and out of the cavity (144).

15. The method of one of claims 11 to 14, wherein the structure (12) is adapted to prevent intrusion of particles and/or water into the cavity (144).