CLAIMS

Claim 1. A magnetic marker system including a plurality of magnetic markers laid in or on a traveling road so as to be detectable by a magnetic detecting part attached to a vehicle, the system comprising:

vehicles each of which outputs, when detecting any one magnetic marker of the plurality of magnetic markers, detection information including marker identifying information capable of uniquely identifying the magnetic marker; and

a server apparatus which acquires the detection information outputted from each of the vehicles, wherein

the server apparatus includes a state estimating part which estimates a state of said one magnetic marker based on the plurality of the detection information outputted from each of the vehicles regarding said one magnetic marker.

Claim 2. The magnetic marker system in claim 1, wherein the state estimating part estimates the state of said one magnetic marker based on result of statistical process on a marker-detected count which is the number of times when said one magnetic marker is detected.

Claim 3. The magnetic marker system in claim 1 or 2, wherein the state estimating part identifies a marker-detected count which is the number of times when said one magnetic marker is detected and a passing count which is the number of times when the vehicles pass over said one magnetic marker, and estimates the state of said one magnetic marker based on a detection ratio obtained by dividing the marker-detected count by the passing count.

Claim 4. The magnetic marker system in any one of claims 1 to 3, wherein the server apparatus includes a maintenance information generating part which generates maintenance information indicating maintenance work required for said one magnetic marker based on the state of said one magnetic marker.

Claim 5. The magnetic marker system in any one of claims 1 to 4, wherein

the state estimating part is capable of estimating the state of the magnetic detecting part based on the state of the plurality of magnetic markers, and

the server apparatus includes a sensor information providing part which provides sensor state information indicating the state of the magnetic detecting part to a vehicle side.

Claim 6. The magnetic marker system in claim 5, wherein

the server apparatus includes a marker identifying part which identifies magnetic markers on a route of the vehicle and a storage part which stores detected magnetic markers detected by the vehicle, and

the state estimating part estimates the state of the magnetic detecting part by performing a process of comparing the magnetic markers on the route with the detected magnetic markers, and

wherein optionally the state estimating part is capable of estimating quality levels of the state of the magnetic markers on the route, and the state estimating part estimates, in the process of comparing, the state of the magnetic detecting part by using different indexes in accordance with quality levels of the state of the magnetic markers on the route estimated by the state estimating part.

Claim 7. The magnetic marker system in claim 5 or 6, wherein the server apparatus includes a vehicle information generating part which generates vehicle information indicating a state of the each of the vehicles and a vehicle information providing part which provides the vehicle information to a corresponding vehicle side,

the state estimating part is capable of detecting a change in mount height in the each of the vehicles as the state of the magnetic detecting part, and

the vehicle information generating part detects a change in ground clearance of the each of the vehicles in accordance with the change in mount height of the magnetic detecting part in the each of the vehicles and generates the vehicle information corresponding to the change in ground clearance for the each of the vehicles.

Claim 8. The magnetic marker system in claim 7, wherein

the detection information outputted by the each of the vehicles includes a magnetic measurement value,

the state estimating part identifies a magnetic level of said one magnetic marker based on the plurality of the detection information regarding said one magnetic marker, and

the state estimating part detects the change in ground clearance of the vehicle by using an index indicating a correlation between the magnetic level of the magnetic marker and the magnetic measurement value of the magnetic marker measured by the magnetic detecting part.

Claim 9. The magnetic marker system in any one of claims 1 to 8, wherein said one magnetic marker holds a wireless tag capable of outputting the marker identifying information, and

the detection information, which is outputted by the

vehicle when the vehicle detects said one magnetic marker, includes the marker identifying information acquired from the wireless tag held by said one magnetic marker.

Claim 10. The magnetic marker system in claim 9, wherein the wireless tag forms a sheet shape and is disposed on a surface of said one magnetic marker.

Claim 11. The magnetic marker system in any one of claims 1 to 10, wherein the server apparatus has a storage part which stores operation data indicating an operation status of the plurality of magnetic markers and, in the storage part, the operation data is stored so as to be manageable for each group allotted to the plurality of magnetic markers.

Claim 12. The magnetic marker system in claim 11, wherein the state estimating part performs statistical process regarding the operation data for the each group and estimates the state of each of the plurality of magnetic markers based on result of the statistical process.

Claim 13. The magnetic marker system in any one of claims 1 to 10, wherein the server apparatus has a storage part which stores operation data indicating operation status of the plurality of magnetic markers and, in the storage part, the operation data is stored so as to be manageable for each road type in or on which the plurality of magnetic markers are laid.

Claim 14. The magnetic marker system in claim 13, wherein the state estimating part performs statistical process regarding the operation data for the each road type and estimates the state of each of the plurality of magnetic markers based on result of the

statistical process.

Claim 15. The magnetic marker system in any one of claims 1 to 14, wherein the server apparatus includes a determining part which determines, of two pieces of detection information chronologically previously and subsequently acquired from any one vehicle, after one chronologically-preceding piece of detection information is outputted and until another piece of detection information is outputted, whether a magnetic marker not detected by said one vehicle is present.