CLAIMS

[Claim 1] An excavation status monitoring system for a tunneling machine, comprising:

a detecting portion (21–26) mounted on a cutter head (12) of the tunneling machine (1), including an accelerometer that detects a vibration or an acoustic sensor that detects a sound wave; ~~and~~

a sound output portion (42, 72) that outputs a signal detected by the detecting portion as sound; and

a data recording portion (33) arranged in the cutter head that is capable of performing prescribed internal network communication and records signals detected by a plurality of the detecting portions, wherein

the cutter head in which the detecting portions and the data recording portion are arranged is rotary.

[Claim 2] The excavation status monitoring system for a tunneling machine according to claim 1, wherein

the detecting portion includes a first detecting portion (22) for real-time diagnosis, and

a signal detected by the first detecting portion is transmitted to the sound output portion and is output as sound in real time.

[Claim 3] The excavation status monitoring system for a tunneling machine according to claim 1 or 2, wherein

a plurality of the detecting portions are arranged at different radial positions of the cutter head.

[Claim 4] The excavation status monitoring system for a tunneling machine according to claim 3, wherein

the plurality of detecting portions arranged at the different radial positions of the cutter head are arranged at different rotation angle positions of the cutter head.

[Claim 5] The excavation status monitoring system for a tunneling machine according to claim 1 or 2, further comprising:

~~a data recording portion (33) that is arranged in the cutter head, is capable of performing prescribed internal network communication, and records signals detected by a plurality of the detecting portions; and~~

an internal information terminal device (41) ~~that is~~ arranged in a portion of the tunneling machine behind the cutter head ~~and~~ that receives the signals detected by the plurality of detecting portions and transmitted through the internal network communication from the data recording portion, wherein

the signals detected by the detecting portions are

output as sound from the sound output portion through the internal information terminal device.

[Claim 6] The excavation status monitoring system for a tunneling machine according to claim 5, wherein

~~the cutter head in which the detecting portions and the data recording portion are arranged is rotary, and~~

the signals recorded in the data recording portion arranged in the cutter head that is rotary are transmitted through a signal transmission member (50) that transmits a signal from a rotating body to a stationary body when transmitted to the internal information terminal device arranged in a non-rotating portion of the tunneling machine behind the cutter head through the internal network communication, and the signals that are electrical through the internal network communication are converted to optical signals and are transmitted toward the internal information terminal device.

[Claim 7] The excavation status monitoring system for a tunneling machine according to claim 5, further comprising an external information terminal device (71) that is arranged outside the tunneling machine and receives the signals transmitted through external network communication by the internal information terminal device.

[Claim 8] The excavation status monitoring system for a tunneling machine according to claim 5, wherein

the detecting portions include a second detecting portion (21, 23-26) for post-event diagnosis, and

a signal detected by the second detecting portion is transmitted to the sound output portion through the internal information terminal device and is output as sound after being recorded in the data recording portion, and is capable of being diagnosed after an event on the basis of the signal detected by the second detecting portion and accumulated in the internal information terminal device.

[Claim 9] An excavation status monitoring system for a tunneling machine, comprising:

a detecting portion (21-26) mounted on a cutter head (12) of the tunneling machine (1), including an accelerometer that detects a vibration or an acoustic sensor that detects a sound wave;

a sound output portion (42, 72) that outputs a signal detected by the detecting portion as sound; and

a data recording portion (33) arranged in the cutter head that is capable of performing prescribed internal network communication and records signals detected by a

plurality of the detecting portions, wherein

the detecting portion includes a first detecting portion (22) for real-time diagnosis,

a signal detected by the first detecting portion is transmitted to the sound output portion and is output as sound in real time; and

the cutter head in which the detecting portions and the data recording portion are arranged is rotary.