CLAIMS

[Claim 1]

An ultrasonic inspection device for inspection of a packaged semiconductor device, comprising:

an ultrasonic transducer configured to output ultrasonic waves to the semiconductor device;

a medium holding unit configured to hold a medium through which the ultrasonic waves are propagated between the ultrasonic transducer and the semiconductor device;

a reflection detection unit configured to detect reflected waves of the ultrasonic waves reflected by the semiconductor device;

a stage configured to move a position of the semiconductor device relative to the ultrasonic transducer;

a stage control unit configured to control driving of the stage; and

an analysis unit configured to analyze a reaction of the semiconductor device in accordance with an input of the ultrasonic waves by the ultrasonic transducer,

wherein the medium holding unit is slidably provided at an end of the ultrasonic transducer and has a tubular member configured to form a holding space of variable volume to hold the medium, and

the stage control unit controls a distance between the semiconductor device and the ultrasonic transducer on the basis of a peak appearing in a time waveform of the reflected waves detected by the reflection detection unit.

[Claim 2]

The ultrasonic inspection device according to claim 1, wherein the stage control unit controls the distance between the semiconductor device and the ultrasonic transducer so that the peak of the time waveform is maximized.

[Claim 3]

The ultrasonic inspection device according to claim 1 or 2, wherein the stage control unit controls the distance between the semiconductor device and the ultrasonic transducer on the basis of any one of peaks after a second peak which appear in the time waveform.

[Claim 4]

The ultrasonic inspection device according to any one of claims 1 to 3, wherein the stage control unit sets a detection window for the time waveform on the basis of package information in the semiconductor device and detects the peak.

[Claim 5]

The ultrasonic inspection device according to any one of claims 1 to 4, further comprising:

a power supply device configured to apply a constant voltage or a constant current to the semiconductor device, and

a reaction detection unit configured to detect a current or a voltage of the semiconductor device in accordance with input of the ultrasonic waves in a state in which the constant voltage or the constant current is applied,

wherein the analysis unit generates an analysis image on the basis of a detection signal from the reaction detection unit.

[Claim 6]

The ultrasonic inspection device according to claim 5, further comprising a signal generation unit configured to input a driving signal to the ultrasonic transducer and output a reference signal corresponding to the driving signal,

wherein the analysis unit generates the analysis image on the basis of the detection signal and the reference signal.

[Claim 7]

The ultrasonic inspection device according to claim 5 or 6, wherein the analysis unit generates a reflection image on the basis of a detection signal from the reflection detection unit.

[Claim 8]

The ultrasonic inspection device according to claim 7, wherein the analysis unit generates a superimposed image in which the analysis image and the reflection image are superimposed.

[Claim 9]

An ultrasonic inspection method which allows inspection of a packaged semiconductor device, comprising:

a holding a medium through which ultrasonic waves are propagated between an ultrasonic transducer and the semiconductor device,

an adjusting a focal position of the ultrasonic waves output from the ultrasonic transducer with respect to the semiconductor device; and

an analyzing a reaction of the semiconductor device in accordance with input of the ultrasonic waves,

wherein, in the holding, a volume of a holding space configured to hold the medium through which the ultrasonic waves are propagated is adjusted by a tubular member slidably provided at an end of the ultrasonic transducer, and

in the adjusting, reflected waves of the ultrasonic waves reflected by the semiconductor device is detected, and a distance between the semiconductor device and the ultrasonic transducer is adjusted on the basis of a peak appearing in a time waveform of the reflected waves.

[Claim 10]

The ultrasonic inspection method according to claim 9, wherein, in the adjusting, the distance between the semiconductor device and the ultrasonic transducer is adjusted so that the peak of the time waveform is maximized.

[Claim 11]

The ultrasonic inspection method according to claim 9 or 10, wherein, in the adjusting, the distance between the semiconductor device and the ultrasonic transducer is adjusted on the basis of any one of peaks after a second peak which appear in the time waveform.

[Claim 12]

The ultrasonic inspection method according to any one of claims 9 to 11, wherein, in the adjusting, a detection window for the time waveform is set on the basis of package information in the semiconductor device, and the peak is detected.