CLAIMS

[Claim 1] A polishing apparatus comprising:

a polishing table configured to support a polishing pad;

a polishing head configured to press a workpiece against a polishing surface of the polishing pad;

a dresser configured to dress the polishing surface of the polishing pad;

a detection sensor configured to detect friction between the dresser and the polishing pad, the detection sensor being fixed to the dresser; and

a wear monitoring device configured to determine a wear index value from a plurality of output values of the detection sensor and generate an alarm signal when the wear index value is smaller than below a predetermined lower limit,

wherein the wear monitoring device is configured to apply Fourier transform to the plurality of output values arranged along a time axis to create a power spectrum, and

determine the wear index value which is a first peak value of the power spectrum.

[Claim 2] A polishing apparatus comprising:

a polishing table configured to support a polishing pad;

a polishing head configured to press a workpiece against a polishing surface of the polishing pad;

a dresser configured to dress the polishing surface of the polishing pad;

a detection sensor configured to detect friction between the dresser and the polishing pad, the detection sensor being fixed to the dresser; and

a wear monitoring device configured to determine a wear index value from a plurality of output values of the detection sensor and generate an alarm signal when the wear index value is smaller than below a predetermined lower limit,

wherein the wear monitoring device is configured to calculate a plurality of relative output values by subtracting the plurality of output values from a plurality of reference values, respectively, apply Fourier transform to the plurality of relative output

values arranged along a time axis to create a power spectrum, and determine the wear index value which is a first peak value of the power spectrum.

[Claim 3] The polishing apparatus according to claim 2, wherein the plurality of reference values are a plurality of output values of the detection sensor obtained when the dresser dressed the polishing pad for the first time.

[Claim 4] The polishing according to claim 1 or 2, wherein the wear monitoring device is configured to detect abnormality of the polishing pad when a second peak value of the power spectrum is larger than a predetermined upper limit.

[Claim 5] The polishing apparatus according to any one of claims 1 to 4, wherein the detection sensor comprises one of an acceleration sensor, an acoustic emission sensor, and a strain sensor.

[Claim 6] The polishing apparatus according to any one of claims 1 to 5, further comprising:

a polishing progress detector configured to generate a polishing index value indicating progress of polishing of the workpiece; and

an operation controller configured to monitor the polishing index value, the operation controller being configured to correct the polishing index value based on the wear index value.

[Claim 7] A method of determining a time to replace a polishing pad used in a polishing apparatus for a workpiece, comprising:

detecting friction between a dresser and the polishing pad by a detection sensor fixed to the dresser while dressing a polishing surface of the polishing pad by the dresser;

applying Fourier transform to a plurality of output values of the detection sensor

arranged along a time axis to create a power spectrum;

determining a wear index value which is a first peak value of the power spectrum; and

generating an alarm signal when the wear index value is smaller than a predetermined lower limit.

[Claim 8] A method of determining a time to replace a polishing pad used in a polishing apparatus for a workpiece, comprising:

detecting friction between a dresser and the polishing pad by a detection sensor fixed to the dresser while dressing a polishing surface of the polishing pad by the dresser;

calculating a plurality of relative output values by subtracting a plurality of output values of the detection sensor from a plurality of reference values, respectively, and applying Fourier transform to the plurality of relative output values arranged along a time axis to create a power spectrum;

determine a wear index value which is a first peak value of the power spectrum; and

generating an alarm signal when the wear index value is smaller than a predetermined lower limit.

[Claim 9] The method according to claim 8, wherein the plurality of reference values are a plurality of output values of the detection sensor obtained when the dresser dressed the polishing pad for the first time.

[Claim 10] The method according to claim 7 or 8, further comprising detecting abnormality of the polishing pad when a second peak value of the power spectrum is larger than a predetermined upper limit.

[Claim 11] The method according to any one of claims 7 to 10, wherein the detection

sensor is one of an acceleration sensor, an acoustic emission sensor, and a strain sensor.

[Claim 12] The method according to any one of claims 7 to11, further comprising correcting a polishing index value indicating progress of polishing of the workpiece based on the wear index value.