CLAIMS

1. A portable examination apparatus for microorganisms for estimating an allowable population of microorganisms contained and living in ballast water discharged from a ship from a number of microorganisms present in ballast water contained in a sample container and taken as a sample, and determining whether or not the number of microorganisms contained in the ballast water meets ballast water discharge standards, the apparatus comprising:

stirring and mixing means comprising a sample container formed of a material allowing light to pass through, for stirring and mixing the sample solution in the sample container;

an excitation light source that irradiates the sample container with excitation light,

light receiving means for detecting light and converting the light into an electric signal;

light reception range setting means for setting a predetermined range of light to be received;

filtering means between the light receiving means and the control means;

counting means for converting the light received by the light receiving means into electric signals and counting a number of luminescences occurring when microorganisms pass through the predetermined light reception range set by the light reception range setting means; and

control means for calculating the amount of the microorganisms contained in a sample in the sample container and determining whether or not ballast water

discharge standards are met from the number of luminescences counted by the counting means,

wherein the sample solution is prepared by adding a fluorescent staining reagent that stains the microorganisms to the sample,

the light receiving means detects a fluorescent emission from the sample solution resulting from irradiation with the excitation light from the excitation light source, and

wherein the control means is capable of detecting a definite ridge in a waveform of the electric signal from the light receiving means indicating presence of microorganisms in the sample in an amount exceeding a predetermined threshold and an obscure ridge indicating presence of microorganisms in an amount not exceeding the threshold in the sample,

wherein the filtering means filters out noise of a low frequency component and a noise of a high frequency component contained in the electric signal from the light receiving means,

wherein an operation section including a plurality of operating buttons is electrically connected to the control means,

wherein the operation section includes a setting button that enables switching between different sizes of microorganisms to be measured,

the stirring and mixing means, the excitation light source, the light receiving means, the filtering means, and the control means combined in a single integrated circuit.

2. The examination apparatus for microorganisms according to claim 1, wherein the filtering means is a band

pass filter with a high pass filter and a low pass filter coupled together.

3. The examination apparatus for microorganisms according to claim 1, wherein the excitation light source is disposed so as to irradiate the sample container with the excitation light in such a manner that the excitation light is orthogonal to the sample container, and

the light receiving means is disposed so as to receive the fluorescent emission at an angle orthogonal to the excitation light from the excitation light source.

4. The examination apparatus for microorganisms according to claim 1, wherein a slit member is provided between the light receiving means and the sample container.

5. The examination apparatus for microorganisms according to claim 1, wherein parallel-light converting means for converting light from the excitation light source into parallel light is provided between the excitation light source and the sample container.

6. The examination apparatus for microorganisms according to claim 5, wherein the parallel-light converting means is formed by drilling a threaded hole in a flat plate.

7. The examination apparatus for microorganisms according to claim 5, wherein the parallel-light converting means is formed of a convex lens.

8. A method of estimating an allowable population of microorganisms contained and living in ballast water

discharged from a ship from a number of microorganisms present in ballast water contained in a sample container and taken as a sample, and determining whether or not the number of microorganisms contained in the ballast water meets ballast water discharge standards using a portable examination apparatus that combines stirring and mixing means, an excitation light source, a light receiving means, filtering means, and control means in a single integrated unit, the method comprising:

a stirring and mixing step of stirring and mixing, in the sample container, the sample solution in which a fluorescent staining reagent that stains the microorganisms is added to a sample;

an excitation step of irradiating the sample container with excitation light;

a light receiving step of detecting a fluorescent emission from the sample container resulting from the irradiation with the excitation light and signal;

a light reception range setting step of setting a predetermined range of light to be received;

a filtering step of filtering out noise of a low frequency component and noise of a high frequency component contained in the electric signal resulting from the conversion in the light receiving step;

a counting step of converting the light received by the light receiving means into electric signals and counting a number of luminescences occurring when microorganisms pass through the predetermined light reception range set in the light reception range setting step; and

a microorganism number estimating step of calculating the amount of the microorganisms contained in a sample in

the sample container from the number of luminescences counted in the counting step,

wherein the control means is capable of detecting a definite ridge in a waveform of the electric signal from the light receiving means indicating presence of microorganisms in the sample in an amount exceeding a predetermined threshold and an obscure ridge indicating presence of microorganisms in an amount not exceeding the threshold in the sample.