field measurement sensor; however, even when the desired temperature is reached, current applied to the transparent film heaters **118** is left constantly on. When the desired temperature is reached, the reference sensor is made to operate, thereby monitoring the variation of the resonance frequency of a magnetooptical resonance signal caused due to a magnetic field from the transparent film heaters **118**. The output signal from the loop filter **132** obtained at this time, the signal exhibiting the variation of the resonance frequency, is input to the coil current source **128** for the magnetic field measurement sensor as a correction signal (error signal) to correct a deviation of the magnetooptical resonance signal occurring during current applied to the transparent film heaters being on when the temperature of the vapor cell **119** for the magnetic field measurement sensor is controlled in a pulsed manner, thereby changing the strength of the magnetic field applied to the vapor cell **119** to correct the deviation of the resonance frequency.

EXAMPLE 4

Example 4 of the present invention will be described using FIG. **5**. For determining an optimum heat retention temperature for retaining the heat of the vapor cell **119** using the aforementioned cell heat retention system **135**, a magnetooptical resonance signal obtained by sweeping the frequency of a RF magnetic field is used. Of two output signals from the phase comparator **131**, a magnetooptical resonance signal, which is one of the output signals is an X-Signal, and the other output signal is a Y-Signal in a dispersed form, which is obtained by first derivation of the X-Signal. There exhibited a characteristic in that at the frequency that resonates with that of a RF magnetic field (hereinafter, referred to as “resonance frequency”), the output of the X-Signal exhibits a peak value (hereinafter, referred to as “S”), and the output value of the Y-Signal becomes zero. After detecting the magnetooptical resonance signal, the frequency of the output signal from the voltage-controlled oscillator **133** is set to the resonance frequency, and the fluctuations of the output of the Y-Signal in a state in which there is no magnetic field from the measurement target **138** is measured, and the average value of the fluctuations is made to be N. Also, the line width Δf (half width at half maximum or full width at half maximum) of the obtained magnetooptical resonance signal is calculated, and the cell heat retention temperature when the value of $\Delta f/(S/N)$ becomes minimum is determined to be an optimum temperature condition. As a result of defining an optimum temperature condition in this manner, the advantage of being able to perform stable measurement can be obtained. This reflects that as the (S/N) is larger, the more efficiently alkali metal atoms in the cell are absorbed into the laser light, and also reflects that as $1/\Delta f$ is larger, the longer the time during which the modulation of the laser light due to a RF magnetic field after passing through the cell can **119** be retained is, and thus exhibits the effect to achieve a high sensitivity in the optically pumped magnetometer. In other words, the value of $\Delta f/(S/N)$ reflects the degree of the detection sensitivity of the optically pumped magnetometer. Based on these matters, the magnetic field measurement signal during current applied to the transparent film heaters being on is corrected by comparing the $\Delta f/(S/N)$ during the current being on and the $\Delta f/(S/N)$ during the current being off when the current is switched on/off in a pulsed manner.

The vapor cell heat retention system **135** according to the present invention serves to enhance the sensitivity of magnetic field detection by an optically pumped magnetometer, and can be used for enhancing the performances of various magnetic field measurements such as geomagnetic monitoring, metal detection, biomagnetic measurement and magnetic immunological tests. Also, it can be used for an atomic clock using a vapor cell, and is involved in performance enhancement of technologies requiring highly-accurate timing, such as satellite communication, GPS, cellular phone and radar. Furthermore, it can be used for performance evaluation of a vapor cell produced for use in the aforementioned applied technologies.

What is claimed is:

1. An optically pumped magnetometer comprising:

A first glass cell with an alkali metal enclosed therein, the first glass cell having a conductive window part through which laser irradiation light applied to the first glass cell passes;

a temperature detector measuring a temperature of the first glass cell;

a control part that applies current onto the conductive window part in order to retain and control heat in the conductive window part, based on the temperature measured by the temperature detector; and

a magnetic field measurement part that performs magnetic field measurement.

2. The optically pumped magnetometer according to claim **1**, wherein the conductive window part is made of conductive glass.

3. The optically pumped magnetometer according to claim **1**, wherein the conductive window part includes a film heater that is transparent to the laser irradiation light.

4. The optically pumped magnetometer according to claim **1**, wherein the control part receives from the temperature detector a signal indicating when that the first glass cell has reached a set temperature, and switches the current applied to the conductive window part in a pulsed on/off manner in order to make the magnetic field measurement part perform magnetic field measurement when the current is switched off.

5. The optically pumped magnetometer according to claim **4**, further comprising:

a beam splitter that splits the laser irradiation light into first and second laser irradiation lights, the first laser irradiation light being applied to the first glass cell; and

a correction part including a second glass cell into which the second laser irradiation light split by the beam splitter is applied, the second glass cell having a conductive window part through which the second laser irradiation light applied to the second glass cell passes, the correction part correcting a deviation of a frequency of a magnetooptical resonance signal, the deviation being caused by a magnetic field generated during the application of the current to the conductive window part of the second glass cell, by controlling the current applied to the conductive window part of the second glass cell to be constantly on.

6. The optically pumped magnetometer according to claim **1**, wherein the control part sets a cycle of a temperature control signal to be longer than a feedback control cycle of magnetic field measurement, the feedback control cycle being determined by the combination of a phase comparator, a loop filter, a voltage-controlled oscillator and a frequency divider included in the magnetic field measurement part.

7. The optically pumped magnetometer according to claim **4**, wherein the magnetic field measurement part corrects a magnetic field detection sensitivity while the current is being applied to the conductive window part of the first glass cell with the pulse control switch being on, based a ratio between a line width of a magnetooptical resonance signal obtained by sweeping a frequency of an RF magnetic field from an RF coil