is responsive to a corresponding one or more of the visible light, UV light, and/or IR light. In regard to another alternative embodiment, the light detector is responsive to light emitted from the ROI due to either a phosphorescence or a fluorescence.

[0019] Either a spectrophotometer or a spectrum analyzer are preferably coupled to the light detector for use in determining a condition of the ROI. Optionally, a thermal detector (which may be an optical type of detector) is coupled to one of the proximal and distal ends of the light guide for use in monitoring a temperature in the ROI.

[0020] The apparatus also preferably includes means adapted for guiding and maneuvering the distal end of the light guide to the ROI within a patient. In some cases where it is necessary to stabilize the distal end of the light guide, a balloon disposed adjacent to the distal end of the light guide is inflated in a cavity or passage within a patient's body.

BRIEF DESCRIPTION OF THE DRAWINGS FIGURES

[0021] The foregoing aspects and many of the attendant advantages of this invention will become more readily appreciated as the same becomes better understood by reference to the following detailed description, when taken in conjunction with the accompanying drawings, wherein:

[0022] **FIG. 1A** (Prior Art) is a schematic view of the distal end of a non-scanning flexible endoscope in which each detector is a single image pixel;

[0023] **FIG. 1B** (Prior Art) is a schematic view of a cantilevered scanning optical fiber that detects each pixel in a time series sequence;

[0024] **FIG. 1C** is a schematic view of a scanning point-source illuminator with time-series photon detectors and imaging lenses in accord with the present invention;

[0025] **FIG. 1D** is a schematic view of a scanning optical beam illuminator with a scan lens and detectors, in accord with the present invention;

[0026] **FIG. 2** is a block diagram illustrating the functional flow of signals in a system that is usable with an optical fiber for imaging, monitoring, rendering diagnoses, and providing therapy, in accord with the present invention;

[0027] **FIGS. 3A and 3B** illustrate components of a rectilinear scanning optical fiber capable of selectively scanning in either or both of two transverse directions;

[0028] **FIGS. 3C and 3D** illustrate two alternative embodiments for actuators for driving the scanning optical fiber of **FIGS. 3A and 3B**, with an imaging lens and a scan lens, respectively;

[0029] **FIGS. 4A, 4B**, and 4C respectively illustrate a top plan view, a side elevational cross-sectional view taken along section line 4B-4B in **FIG. 4A**, and an end view taken along section line 4C-4C in **FIG. 4A**, of a first embodiment of a thin film, rectilinear illuminator that is similar in scanning function to the embodiment of **FIGS. 3A and 3B**;

[0030] **FIG. 4D** illustrates an end elevational view of a second embodiment that includes a pair of thin film parallel cantilevers for illumination of an ROI;

[0031] **FIGS. 5A and 5B** illustrate a distal end of a conventional optical fiber that has been micro-fabricated to form a taper, and the extreme linear or oval deflection of the distal end at resonance is shown in **FIG. 5B**;

[0032] **FIG. 5C** illustrates the relative PSF for three different tip profiles of a scanning optical fiber;

[0033] **FIG. 5D** illustrates the variable radius circular, or spiral scanning mode of a tapered optical fiber in accord with the present invention;

[0034] **FIG. 5E** illustrates a propeller scan mode motion in which an optical fiber can be driven;

[0035] **FIG. 5F** is a schematic diagram of an optical fiber probe fitted with a ball lens and moving in a second mode of mechanical resonance;

[0036] **FIG. 5G** illustrates the three-dimensional (3D) PSF for the optical fiber configuration of **FIG. 5F**;

[0037] **FIG. 5H** is a schematic illustration of an optical fiber on which a ball lens used for collimating light has been mounted;

[0038] **FIG. 6A** is a schematic diagram showing the configuration of distal optical fiber position sensors and proximally disposed photon detectors with proximal optical fiber light collectors that are capable of pseudo-stereo image acquisition;

[0039] **FIGS. 6B and 6C** are schematic diagrams respectively showing an alternative configuration for proximal photon filtration and detection using a bundle of optical fibers and a single concentric core optical fiber, the latter being incapable of pseudo-stereo image acquisition;

[0040] **FIGS. 6D and 6E** schematically illustrate distal photon red, green, blue (RGB) filtration and detection using stereo-paired geometry and the ability to subtract background scatter using forward and side-facing spatial arrangements of detectors, respectively shown in a side elevational view and in an end view;

[0041] **FIGS. 6F and 6G** schematically illustrate distal photon polarized filtration and detection using stereo-paired geometry and the ability to enhance signals from superficial tissue using forward and side-facing spatial arrangements of detectors, respectively shown in a side elevational view and in an end view;

[0042] **FIG. 7A** is a schematic diagram of an optical fiber system that employs radiation from visible and UV laser sources combined with dichroic filters;

[0043] **FIG. 7B** is a schematic diagram of an optical fiber system that employs radiation from visible and IR laser sources combined with fiber optic combiners connected in series;

[0044] **FIG. 7C** is a schematic diagram of an optical fiber system that includes a tunable wavelength laser source and standard RGB imaging light sources combined with a tapered hollow tube;

[0045] **FIG. 8** is a block diagram illustrating the functional input and output components of an optical fiber system in accord with the present invention;