endoscopic surgery can sometimes best be determined based upon the spectrum analysis provided by this instrumentation. In other respects, the components used for the alternative functions provided in **FIGS. 9B** are identical to those in **FIG. 9A**.

[**0155**] When using system **460'**, a medical practitioner again searches for tumors by moving the flexible tip of single scanning optical fiber while watching high resolution color monitor **464** that shows the visible wavelength (full-color) image. When a tumor is found, the scanning optical fiber is mechanically stabilized. Again, the ROI is centered within the FOV, and then magnified with the multi-resolution capability. However, if the surrounding tissue is moving so the acquired image is not stationary, a snapshot of the image is captured and transferred to the interactive computer workstation monitor, which is a touch screen type display. The boundary of the stationary ROI is outlined on the touch screen, and a volume of the tumor is estimated from a diameter measurement in pixels and a distance measurement between the scope and the tissue using IR optical phase detector for range finding **492**. An optical biopsy is taken with UV-visible biopsy light source **494**, which can be a fiber-coupled arc lamp for elastic scattering spectroscopy (ESS). If warranted for this tumor, the optical radiation exposure is calculated, and a treatment protocol is programmed into interactive computer workstation monitor **462**. For maintaining image stabilization, digital image processing algorithms can be calibrated for automatically segmenting this ROI or processing to eliminate motion artifacts from the acquired images in real-time, which may be equivalent or less than the display frame rate. The laser surgical treatment of cauterization can occur with high intensity laser **482** (IR) that is optically coupled with the visible optical sources. If the IR range finding option is not required, but an IR temperature monitor or laser monitor is desired, then the IR source can instead be used for these alternative monitoring functions. In a frame-sequential manner, both the IR and visible images are acquired during the laser surgery and cauterization. The IR image is either a mapping of the back scatter from the laser illumination as it scans the ROI or a thermal image of the ROI, which can be displayed on the interactive computer display as pseudo-color over a grayscale visible image. The medical practitioner monitors the progress of the IR radiation treatment by observing these acquired images on both the high resolution and touch screen display monitors.

[**0156**] Stabilization and Scanning without a Lens

[**0157**] Since rendering therapy and diagnosis, as well as imaging an ROI requires a relatively stable platform for the scanning optical fiber, it is sometimes important to provide a mechanism for stabilizing the scanning optical fiber within a body passage **510**, as shown in **FIG. 10**. In this view, an optical fiber assembly **500** includes an inflatable balloon **504**, which is inflated through a lumen (not shown) included within the optical fiber assembly. By inflating balloon **504** so that it contacts the sides of passage **510**, the disposition of optical fiber assembly **500** becomes fixed relative to the passage. An ROI **514** on a wall **512** of the passage can then be imaged. The scanning optical fiber can then image and render diagnostic, therapy, and/or monitoring functions in regard to the ROI without concern that the distal end of the optical fiber assembly may move substantially relative to the ROI. However, this method will not eliminate relative tissue motions, often produced by breathing and blood flow. An electronic method of stabilizing the ROI is to electronically freeze the image on an interactive touch-sensitive display screen, marking the boundary of the ROI on the touch-sensitive screen, and using image segmenting and processing algorithms to record threshold levels of this ROI. By running these algorithms on the acquired images and tracking the ROI, the boundary can be maintained during relative tissue motions for accurate therapeutic applications.

[**0158**] While the embodiments of the scanning optical fiber or light waveguide disclosed above have in each case included either an imaging or a scan lens, it is also possible to construct a scanning optical fiber that does not use either the imaging or scan lenses of these other embodiments. As shown in FIGS. **11**A-**11**C, a scanning waveguide **516** conveys light through optical fiber assembly **501** having a distal transparent glass window **502** so that light emitted by scanning waveguide **516** is directly transmitted through the window and onto wall **512** of the passage. The light thus is directed onto ROI **514**. The light emitted by scanning waveguide **516** that has a low angle of divergence or an extended range beam waist **518**. As indicated in **FIG. 11**B, waveguide **516** is caused to scan, either in a linear or 2D fashion such as one of the other modes that enables the light emitted by it to cover all of the surface of ROI **514**. Scanning optical fiber **516** includes a single mode optical fiber section **524**, to provide high optical quality input, and a multi-mode optical fiber **526** at its distal end, to provide a gradient index of refraction **528**, for reduced divergence, better focus, or collimation. Further details of the distal end of scanning waveguide **516** and of transparent glass window **502**, are illustrated in **FIG. 11C**.

[**0159**] Retrofitting a Rigid Endoscope with Scanning Optical Fiber System

[**0160**] It has been recognized that a scanning optical fiber in accord with the present invention can be implemented as a retrofit to existing high resolution rigid endoscope systems, such as an endoscope **540** shown in **FIG. 12**. As shown in **FIG. 12**, an optical fiber assembly **542** includes an actuator **544** (piezoelectric, piezoceramic, or other electromechanical device) used to cause the scanning motion of a scanning optical fiber **546**. Light emitted by the scanning optical fiber is reflected from a beam splitter **554**, which is a dichroic mirror and/or a polarization type device. The light is thus directed through a lens **556** that focuses the light into a relay lens system **558**. An objective lens **560** at the distal end of the relay lens system focuses the light onto tissue **562** at the ROI. At a time t_1, the light travels through objective lens **560** along a path as indicated by t_1, while at a time $t_2=t_1+\Delta t$, the light travels along a different path. Light from the ROI passes through objective lens **560** and relay lens system **558**, through lens **556**, and through beam splitter **554**. The light then is focused by a lens **564** into a charge coupled device (CCD) **566** (or to a video camera). The signal produced by the CCD or video camera is conveyed through a lead **568** externally to enable imaging of the tissue being illuminated. In addition to, or replacing an imaging camera, the illumination light can be combined with diagnostic and/or therapeutic light, which can be imaged or monitored in time-series by separate optical detectors. The imaging, diagnostic, and/or therapeutic light received from the tissue is directed by beam splitter **554** back through a lens **552** and onto photodiodes **548** and/or optical fibers (not shown). The