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(71) Applicant (for all designated States except US): **SPECTRAL INSTRUMENTS IMAGING, LLC** [US/US];  
420 North Bonita Avenue, Tucson, Arizona 85745 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **NELSON, Michael B.** [US/US]; 420 North Bonita Avenue, Tucson, Arizona 85745 (US). **CABLE, Michael D.** [US/US]; 420 North Bonita Avenue, Tucson, Arizona 85745 (US).

(74) Agent: **DAHL, Bruce E.**; Fennemore Craig, P.C., 1700 Lincoln Street, Suite 2900, Denver, Colorado 80203 (US).

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(54) Title: **EXCITATION LIGHT SOURCE ASSEMBLY**

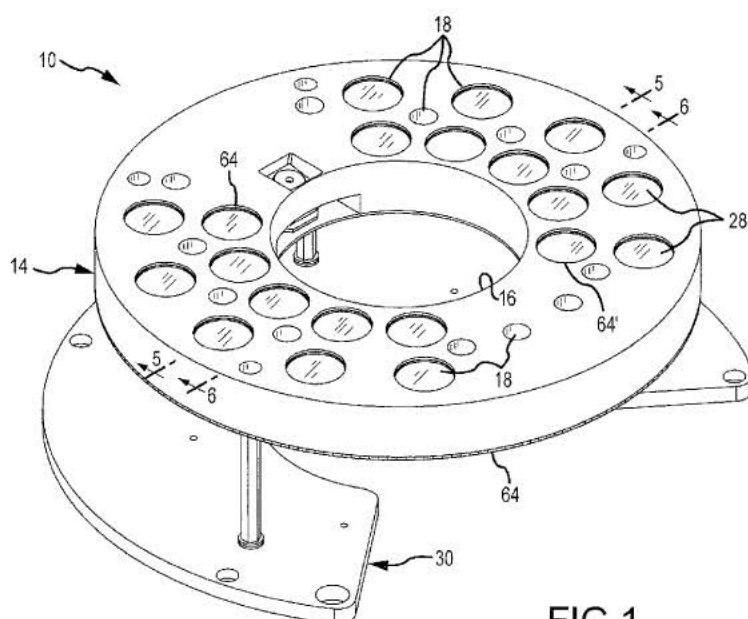


**FIG.1**

(57) Abstract: An excitation light source assembly includes a housing defining a central opening therein and a plurality of lamp receptacles surrounding the central opening. The housing is mountable to a support structure having a camera mounted thereto so that a field of view of the camera is substantially unobstructed by the housing. A light source is positioned within each of the plurality of lamp receptacles. A diffuser is positioned adjacent the light source in each of the plurality of lamp receptacles so that each of the diffusers diffuses light produced by each of the light sources. A control system operatively connected to each of the light sources operates selected ones of the light sources to provide a desired excitation illumination to an object within the field of view of the camera.

## EXCITATION LIGHT SOURCE ASSEMBLY

Cross-Reference to Related Application

This application claims the benefit of U.S. Provisional Patent Application No. 61/379,282, filed on September 1, 2010, which is hereby incorporated herein by reference for all that it discloses.

Technical Field

This invention relates in general to systems for exciting fluorescent materials and more particularly to systems for exciting fluorescent materials in molecular imaging applications.

Background Art

Molecular imaging systems are known in the art and are commonly used to capture various types or modes of images from an object or specimen being analyzed. The objects or specimens that are imaged may comprise any of a wide range of compositions and objects, as is well-known. Primarily, such imaging systems are configured to extremely low levels of light emitted by the specimen or object under study. The light emitted by the object or specimen may be generated by a bio-luminescence process, a fluorescence process, or by a combination thereof. Such imaging systems may also be capable of capturing reflected light images, in which light reflected by the object is captured by the imaging system camera. Such a reflected light image is often combined with one or more emitted light images to form a single, composite image. Such a composite image allows a user to more easily correlate features and attributes of the emitted light image(s) with physical locations on the specimen or other characteristics that are contained in the reflected light image.

As is known, light emission by fluorescence results from the prior or simultaneous exposure of the fluorescent material to excitation light of suitable wavelength. However, not all fluorescent materials fluoresce or emit light in response to excitation light of the same wavelength. Consequently, the wavelength of the particular excitation light must be selected so that it will excite the particular fluorescent material involved.

Because most molecular imaging systems seek to detect fluorescence from a wide range of fluorescent materials, most such imaging systems are provided with excitation light sources that can be operated to illuminate the fluorescent material with excitation light of the appropriate wavelength. Unfortunately, however, most excitation light sources tend to be expensive and/or

difficult to implement in use, and systems are constantly being sought that improve on existing systems.

### Disclosure of Invention

5 An excitation light source assembly according to one embodiment of the invention may include a housing defining a central opening therein and a plurality of lamp receptacles surrounding the central opening. The housing is mountable to a support structure having a camera mounted thereto so that a field of view of the camera is substantially unobstructed by the housing. A light source is positioned within each of the plurality of lamp receptacles. A diffuser is positioned adjacent the light source in each of the plurality of lamp receptacles so that each of the diffusers  
10 diffuses light produced by each of the light sources. A control system operatively connected to each of the light sources operates selected ones of the light sources to provide a desired excitation illumination to an object within the field of view of the camera.

Also disclosed is an excitation light source assembly that includes a housing and a first connector portion mounted to the housing. A lamp receptacle produces light in a first defined  
15 wavelength band. A second connector portion is mounted to the lamp receptacle so that the lamp receptacle can be removably engaged with the first connector portion mounted to the housing. The housing is mountable to a support structure so that a field of view of a camera also mounted to support structure is substantially unobstructed by the housing and by the lamp receptacle.

Another excitation light source assembly includes a base member that defines a central  
20 opening therein. A plurality of first connector portions are mounted to the base member at positions located around the central opening. The light source assembly also includes a plurality of lamp receptacles, at least some of which produce light in different wavelength bands. A second connector portion mounted to each of the plurality of lamp receptacles is releasably engagable with a corresponding one of the plurality of first connector portions mounted to the base member. The  
25 base member is mountable to a support structure so that the central opening is aligned with a camera mounted to the support structure and so that a field of view of the camera is substantially unobstructed by the base member and the lamp receptacles.

Also disclosed is an assembly that includes a support structure and a camera mounted to the support structure. An excitation light source assembly mounted to the support structure includes  
30 a housing that defines a central opening therein and a plurality of lamp receptacles that surround the central opening. The housing is mounted to the support structure so that the central opening is aligned with the camera and so that a field of view of the camera is substantially unobstructed by

the housing. At least one narrow-band light source is positioned within at least one of the plurality of lamp receptacles. A diffuser is positioned adjacent the narrow-band light source. A control system operatively connected to each of the narrow-band light sources operates selected ones of the narrow-band light sources to provide a desired excitation illumination to a fluorescent material within the field of view of said camera.

### Brief Description of the Drawings

Illustrative and presently preferred embodiments of the invention are shown in the accompanying drawing in which:

Figure 1 is a perspective view of an excitation light source assembly according to one embodiment of the present invention;

Figure 2 is a sectional view in perspective of a molecular imaging system having the excitation light source assembly of Figure 1 provided therein;

Figure 3 is a plan view of the support structure of the molecular imaging system of Figure 2 showing the relative positions of the excitation light source assembly and the lens assembly of the camera;

Figure 4 is an external view in perspective of the molecular imaging system of Figure 2;

Figure 5 is a sectional view in perspective of the excitation light source assembly taken along the plane 5-5 of Figure 1;

Figure 6 is a sectional view in perspective of the excitation light source taken along the plane 6-6 of Figure 1;

Figure 7 is fluorescent image of desert flora obtained with excitation light having a wavelength of about 465 nm and observed at a wavelength of about 550 nm;

Figure 8 is a fluorescent of the desert flora of Figure 7 but observed at a wavelength of about 735 nm;

Figure 9 is a perspective view of a second embodiment of an excitation light source assembly having a plurality of removable lamp modules;

Figure 10 is a sectional view in elevation of one of the plurality of removable lamp modules of the second embodiment of the excitation light source assembly of Figure 9;

Figure 11 is an exploded perspective view of one of the removable lamp modules of the second embodiment of the excitation light source assembly of Figure 9;

Figure 12 is a perspective view of a third embodiment of an excitation light source assembly; and

Figure 13 is a sectional view in elevation of the excitation light source assembly of Figure 12.

#### Best Mode for Carrying Out the Invention

One embodiment of an excitation light source assembly 10 is shown in Figures 1-3 as it could be used in, or comprise a portion of, a molecular imaging system 12 (also shown in Figure 4) of the type commonly used in molecular imaging applications. Briefly, the excitation light source assembly 10 may comprise a housing or main body member 14 that defines a central opening 16 therein. The housing or main body member 14 may also define a plurality of lamp receptacles 18 that are arranged around the central opening 16, as best seen in Figures 1 and 3. The various lamp receptacles 18 are configured to receive various light sources or lamps 20. More specifically, and as will be described in greater detail below, the light sources or lamps 20 may comprise one or more narrow band light sources 22 and/or one or more broad-band light sources 24, as best seen in Figures 5 and 6. Generally speaking, the narrow band light sources 22 are used in fluorescent imaging applications, whereas the broad-band light sources 24 are used in reflected light applications (e.g., to capture a visible light image), although this need not necessarily be the case.

Some of the lamp receptacles 18 may be provided with one or more diffusers 26 and/or one or more filters 28, as best seen in Figure 5. The diffusers 26 are used to diffuse or spread light produced by the lamps 20, whereas the filters 28 are used to filter or remove light of unwanted or undesirable wavelengths. In a typical application, those lamp receptacles 18 that are provided with narrow band light sources 22 may also be provided with diffusers 26 and filters 28, whereas those receptacles 18 that are provided with broad-band light sources 24 will not be provided with diffusers 26 and filters 28. Alternatively, other arrangements are possible, as will be described herein.

In an embodiment where in the excitation light source assembly 10 is to be used in conjunction with a molecular imaging system 12, it will be generally desirable to provide the excitation light source assembly 10 with the capability to generate or produce excitation light or illumination in a variety of individual bands or colors that extend over a comparatively large wavelength range (e.g., from about 430 nanometers (nm) to about 745 nm). However, other embodiments may extend this range to 800 nm or even 900 nm. In the particular embodiment shown and described herein, the excitation light source assembly 10 is capable of producing or generating ten (10) individual illumination bands or colors having comparatively narrow bandwidths (e.g., in the range of about 30-35 nm), although bandwidths having other ranges may

also be used. The ten (10) individual illumination bands or colors (i.e., having relatively narrow bandwidths of about 30-35 nm) thus may cover the large wavelength range of from about 430 nm to about 745 nm. In another embodiment, the wavelength range may be extended to about 900 nm by providing one or more additional illumination bands or colors having wavelengths that extend to 900 nm.

In addition to the ability to provide illumination via one or more narrow illumination bands, the excitation light source assembly 10 may also be used to provide broad-band (e.g., white light) illumination, which may be desirable in certain imaging applications.

In the particular embodiment shown and described herein, each individual illumination band or color is generated or produced by light sources 22 provided in lamp receptacles 18 that are located on opposite sides of the central opening 16. As will be described in greater detail below, this arrangement provides for more even illumination than would otherwise be the case if the individual illumination band or color were provided by only a single lamp receptacle 18.

In an application wherein the excitation light source assembly 10 is used in conjunction with a molecular imaging system 12, the housing or main body member 14 of the excitation light source assembly 10 may be mounted to a base member 30 that, in turn, may be mounted to a suitable support structure 32 associated with the imaging system 12. See Figures 2 and 3. More particularly, the excitation light source assembly 10 is mounted to the support structure 32 so that the central opening 16 of main body 14 is substantially aligned with (i.e., concentric to) a lens assembly 34 of a camera 36 associated with the imaging system 12. The arrangement is such that a field of view (represented schematically by lines 38) of camera 36 is substantially unobstructed by the housing 14 and/or central opening 16 of housing 14 of excitation light source assembly 10.

The excitation light source assembly 10 may be operatively connected to a control system 40 (Figure 2). Control system 40 may be used to operate selected ones of the various light sources 20 (e.g., narrow-band light sources 22 and broad-band light sources 24) provided in the excitation light source assembly 10 to provide a desired illumination to an object or specimen 42 located within the field of view 38 of camera 36. Camera 36 may then capture an image of fluorescing material in the object or specimen 42. It should be noted that different fluorescent materials in the specimen 42 may be excited or activated by illuminating the specimen 42 with light of various colors or wavelength bands. In addition, different fluorescent materials in the specimen 42 may fluoresce or emit light of different wavelengths even when illuminated with light of the same color or wavelength band. Images of the specimen 42 produced by light emitted in such different wavelengths may be captured by using an appropriate filter in conjunction with the camera 36.

For example, and with reference now to Figures 7 and 8, a first fluorescent image 44 of a specimen 42, in this case a cactus pad and flowers, may be obtained by using the control system 40 to activate those light sources 20 that emit light in an individual wavelength band or color that will excite the particular fluorescent material of interest in the specimen 42. In this particular example, the individual wavelength band or color comprised a middle or "center" wavelength of about 465 nm, with a bandwidth of about 30-35 nm. A 550 nm filter was used to capture the image 44 shown in Figure 7, which was then combined with a visible light image of the specimen 42. The emission at 550 nm reveals the fluorescence of the individual spines of the cactus. However, no fluorescence of the flower appears at this wavelength. In contrast, a second fluorescent image 46 of the specimen 42, depicted in Figure 8, but captured with a 735 nm filter, reveals emission from the leaves of the flowers as well as from the entire surface of the cactus pad.

A significant advantage of the excitation light source assembly of the present invention is that it may be used to illuminate an object or specimen with light in multiple narrow bands or colors, thereby allowing a single excitation light source assembly to be used in imaging applications involving a wide range of fluorescent materials that are excited over a wide range of wavelengths. Moreover, the excitation light of each individual wavelength band or color may be readily increased and decreased in brightness by controlling the number of light sources in each lamp receptacle that are illuminated or activated at any one time. Still further, the ability of the excitation light source assembly to also provide broad-band illumination allows for the ready capture of conventional reflected light images of the object or specimen, which are typically desired in most imaging applications.

Still other advantages are associated with the paring of the lamp receptacles on opposite sides of the central opening, in that such a paring allows for the more even illumination of the object or specimen than would otherwise be the case if the illumination were provided by only a single lamp receptacle.

Still yet other advantages are associated with embodiments having removable lamp receptacles. In such embodiments, the lamp receptacles can be readily removed and replaced in the field, thereby allowing users to conveniently and rapidly tailor the wavelength bands or colors that may be provided by the excitation light source assembly. The present invention also dispenses with the need to provide the illumination via fiber optic bundles, which is expensive and cumbersome. Moreover, such fiber optic bundles must also be carefully selected so that they do not contain materials or elements that themselves would fluoresce in use.

Having briefly described one embodiment of the excitation light source assembly of the

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present invention, as well as some of its more significant features and advantages, various exemplary embodiments of the excitation light source assembly will now be described in detail. However, before proceeding with the description, it should be noted that while the particular embodiments are shown and described herein as they could be used to provide illumination over certain wavelength ranges and in certain narrow illumination bands or colors having certain bandwidths, the particular wavelength ranges, numbers of illumination bands, as well as the bandwidths of the illumination bands may be varied depending on the any of a wide range of factors, including the requirements of the particular application. Consequently, the present invention should not be regarded as limited to the particular examples, ranges, wavelength bands, and applications shown and described herein.

Referring back now to Figures 1-4, an excitation light source assembly 10 according to one embodiment of the present invention is shown and described herein as it may be used in conjunction with a molecular imaging system 12 of the type commonly used in the molecular imaging field. In the particular embodiment shown and described herein, the imaging system 12 may comprise a generally rectangularly-shaped chassis or main enclosure 48 configured to house and support the various components and subsystems required to perform various types of molecular imaging processes. In addition, the main enclosure 48 also may be provided with various external finish panels 50 that cover or overlay the underlying chassis or main enclosure structure 48. In the particular embodiment shown and described herein, the imaging system 12 is designed or configured to be connected to separate computer system (not shown) to allow a user to operate the imaging system 12 and view images produced by the imaging system 12 on a suitable display system (also not shown).

The main enclosure 48 of imaging system 12 may be provided with an access door 52 that can be moved vertically between a closed position (shown in Figure 4) and an opened position (not specifically illustrated in the drawing figures) to allow the user to access an imaging compartment or chamber 54 defined by the main enclosure 48, as best seen in Figure 2. The imaging compartment 54 is sized to receive one or more objects or specimens 42 to be imaged. Objects or specimens 42 suitable for use with the imaging system 12 include samples that may be provided in a well plate 56, as well as living organisms (not shown). Other types of objects or specimens 42 may be imaged for other purposes as well, as would become apparent to persons having ordinary skill in the art after having become familiar with the teachings provided herein.

Referring now primarily to Figure 2, the imaging system 12 also may include an imaging system sub-assembly 58 having an object platform or stage 60, as well as a mounting or support

structure 32. The object platform 60 is moveably mounted to the sub-assembly 58 so that the object platform 60 can be moved vertically toward and away from the support structure 32, i.e., generally in the direction indicated by arrows 62. The support structure 32 is configured to receive camera 36, control system 40, as well as various other components and systems required for operation of the imaging system 12. However, because such various other components and systems that may be required or desired for the operation of the imaging system 12 are not required to understand or practice the present invention, such additional components and systems will not be described in further detail herein.

The excitation light source assembly 10 may comprise a housing or main body 14 that defines a central opening 16 therein, as best seen in Figure 1. The housing or main body member 14 may be mounted to a base member 30 to allow the excitation light source assembly 10 to be readily mounted to the support structure 32 of the imaging system 12, as best seen in Figures 2 and 3. As mentioned above, the excitation light source assembly 10 is mounted to the support structure 32 so that the central opening 16 of main body 14 is substantially aligned with the lens assembly 34 of camera 36. The arrangement is such that the field of view 38 of camera 36 is substantially unobstructed by the housing 14 and/or central opening 16 of housing 14.

Referring now primarily to Figures 3, 5, and 6, the main body member 14 of excitation light source assembly 10 also defines a plurality of lamp receptacles 18 therein that are arranged around the central opening 16. Each of the lamp receptacles 18 is sized or configured to receive one or more light sources or lamps 20 (Figures 5 and 6). In particular, the large diameter lamp receptacles 18 may be sized to receive one or more narrow-band light sources 22, as best seen in Figure 5, whereas the small diameter lamp receptacles 18 may be sized to receive a single broad-band light source 24, as best seen in Figure 6.

The various lamp receptacles 18 may be provided at locations on the main body member 14 so as to provide substantially uniform illumination to the object or specimen 42 provided on the imaging platform or stage 60. In the particular embodiment shown and described herein, the main body member 14 is provided with twenty (20) large diameter lamp receptacles 18, each of which is provided with a plurality of narrow-band light sources 22 and, optionally, diffusers 26, and filters 28. Moreover, and as will be described in further detail below, a given large diameter lamp receptacle 18 (such as receptacle 64), may be matched with a counterpart large diameter receptacle 18 (such as receptacle 64') on the opposite side of central opening 16. See Figure 1. Both the receptacle 64 and its counterpart receptacle 64' may be configured to emit light of the same color or wavelength range. Thus, when energized, each such receptacle 64 and counterpart receptacle 64'

will emit light of the same color or wavelength range. Because each such receptacle 64 and counterpart receptacle 64' are located on opposite sides of the central opening 16, the specimen 42 will be more evenly illuminated with this arrangement than would otherwise be the case if the light were emitted only by a single receptacle 18.

5 As briefly described above, each of the small diameter receptacles 18 may be provided with a single broad-band light source 24. The various small diameter receptacles 18 also may be provided in spaced-apart relation around the central opening 16 of body member 14 in order to provide substantially uniform illumination of the object 42 provided on the stage 60 when the broad-band light sources 24 are energized.

10 The housing or main body member 14 may be fabricated from any of a wide range of materials, such as metals or plastics, that would be suitable for the intended application. Generally speaking, it will be desirable to use a material that will not fluoresce in response to the illumination provided by the various light sources 20 provided therein, as such fluorescence of the material comprising the main body member 14 will degrade the performance of the imaging system 12. By  
15 way of example, in one embodiment, the housing or main body member 14 is fabricated from a polyoxymethylene thermoplastic material, such as Delrin®. Alternatively, other materials may also be used, as would become apparent to persons having ordinary skill in the art after having become familiar with the teachings provided herein. Consequently, the present invention should not be regarded as limited to a main body member 14 that is fabricated from any particular material.

20 With reference now primarily to Figure 5, each of the large diameter lamp receptacles 18 defined by the housing 14 of the excitation light source assembly 10 is sized or configured to receive at least one, and preferably three (3) narrow-band light sources 22 (only two of which are shown in Figure 5). As will be described in greater detail below, the individual narrow-band light sources 22 may be individually activated by control system 40 to provide illumination of three (3)  
25 different intensity levels by activating various ones of the three narrow-band sources 22 provided to each lamp receptacle. In contrast, each of the small diameter lamp receptacles 18 may be sized to receive a single broad-band light source 24. However, other arrangements are possible, as would become apparent to persons having ordinary skill in the art after having become familiar with the teachings provided herein. Consequently, the present invention should not be regarded as limited  
30 to any particular configuration with respect to the number of light sources 20 that may be provided to each lamp receptacle 18.

The various light sources 20, e.g., comprising narrow-band light sources 22 and broad-band light sources 24, may be mounted to a circuit board 64 which, in turn, may be mounted or affixed

to the main body 14, as best seen in Figures 1, 5, and 6. Circuit board 64 provides a means for physically supporting the various light sources 20 within the lamp receptacles 18 and for electrically connecting the light sources 20 to the control system 40. Circuit board 64 may also be provided with any of a wide range of ancillary systems and devices, such as light source drive circuits and connectors, to allow the light sources 20 to be activated by control system 40. However, because such devices and systems are well-known in the art and could be readily provided by persons having ordinary skill in the art after having become familiar with the teachings provided herein, the circuit board 64 that may be utilized in one embodiment of the present invention will not be described in further detail herein.

Each narrow-band light source 22 is suitable for producing excitation light having a wavelength band or color that comprises at least the wavelength or wavelengths required to excite or activate fluorescence in the particular material or specimen 42 to be imaged or studied. In addition, because it will be desirable to use the imaging system 12 to image a wide range of fluorescent materials, various ones of which may require excitation light having different colors or wavelength bands, in one embodiment, each of the larger diameter lamp receptacles 18 defined by the housing 14 will hold at least one, and preferably three (in one embodiment), narrow-band light source 22 that emits light having wavelengths (i.e., a wavelength band) that is slightly different from the wavelengths produced by the other narrow-band light sources 22 provided in others of the larger diameter lamp receptacles 18. Stated another way, the various lamp receptacles 18 may emit light of different colors. In this manner, then, the single housing 14 of excitation light source assembly 10 can be used to produce excitation light having wavelengths across any desired wavelength range.

In addition, and as was also mentioned above, each of the larger diameter lamp receptacles 18 (e.g., lamp receptacle 64, Figure 1) may be paired with a counterpart receptacle (e.g., lamp receptacle 64') on the opposite side of the central opening 16 in order to provide more even illumination of the specimen 42 provided on the imaging platform or stage 60. For example, if a particular lamp receptacle 64 is provided with a narrow-band light source 22 that is capable of emitting light having middle or center wavelength of about 465 nm, then its counterpart receptacle 64' should also be provided with a narrow-band light source 22 having a middle or center wavelength of about 465 nm.

In the particular embodiment shown and described herein, the excitation light source assembly 10 is capable of emitting excitation light in a plurality of individual bands or colors over a wavelength range from about 430 nm to about 745 nm. Therefore, it will be generally desirable to use for each light source 20 a comparatively narrow-band light source 22 that emits light having

wavelengths over a fairly narrow-band. By way of example, narrow-band light sources 22 having bandwidths in the range of about 30-35 nm can be used to advantage in the present invention. If such narrow-band light sources 22 are used, ten (10) such narrow-band light sources 22, properly selected, will be sufficient to cover the exemplary wavelength range. In accordance with this objective, then, the main body member 14 is provided with twenty (20) large diameter receptacles 18 that are arranged in ten pairs of two on opposite sides of the central opening 16. The corresponding receptacle pairs (e.g., 64 and 64', Figure 1) are then provided with narrow-band light sources 22 of the same wavelengths so that the excitation light source assembly 10 is capable of providing illumination in ten different narrow-band wavelength ranges or colors.

Alternatively, another embodiment of the invention may produce light having a wavelength of 800 nm by providing one or more light sources 22 capable of producing light having wavelengths of around 800 nm. In still another embodiment, the range could be extended to wavelengths of 900 nm or even longer by providing the excitation light source assembly 10 with light sources 22 capable of producing light having wavelengths of around 900 nm.

Each narrow-band light source 22 may comprise a light emitting diode (LED) that emits light in the desired wavelength band, and ideally, with the desired bandwidth (e.g., of about 30-35 nm). Light emitting diodes having such narrow bandwidths (e.g., about 30-35 nm) along the desired wavelength range (e.g., 430 nm to about 745 nm) are readily commercially available and can be used as the narrow-band sources 22. However, it should be noted that suitable LEDs that emit or produce light in each of the desired wavelength bands may not be available. If so, it may be necessary to use broader-band LEDs, i.e., that emit light having wavelengths outside the desired wavelength range. If so, such LEDs or broad-band light sources may be used in combination with a filter element 28 to filter or remove the undesired wavelengths, as will be described in greater detail below.

Regardless of the particular light source 22 that may be used, it is also generally preferred, but not required, to provide a diffuser 26 within each lamp receptacle 18. the diffuser 26 may be provided at any convenient position within lamp receptacle 18. In one embodiment, diffuser 26 is located at a position immediately adjacent the light source 20, as best seen in Figure 5. A sleeve 66 provided in the lamp receptacle 18 may be used to support diffuser 26, although other arrangements are possible. As its name implies, the diffuser 26 diffuses or spreads light produced by the light source 20, thereby generally providing for more even illumination than would be provided by the light source 22 alone.

The diffuser 26 may comprise any of a wide range of optical diffusers that are now known

in the art or that may be developed in the future that are or would be suitable for the particular application. However, because optical diffusers are well-known in the art and could be readily provided by persons having ordinary skill in the art after having become familiar with the teachings provided herein, the particular diffusers that may be used in one embodiment of the invention will not be described in further detail herein.

As mentioned above, the light output characteristics of the various light sources 20 (e.g., LEDs) that may be utilized in the excitation light source assembly 10 may be such that it may be required, or at least desirable, to further limit the wavelength range of excitation light produced by each light source 20. This may be the case regardless of whether the particular light source 20 involved is a narrow-band light source 22. Accordingly, in one embodiment, each of the large diameter lamp receptacles 18 (e.g., containing or housing the narrow-band light sources 22) may also be provided with a filter element 28. Filter element 28 may remove or filter undesired wavelengths produced by the light source 20, regardless of whether the light source 20 comprises a narrow-band light source 22. In the particular embodiment shown and described herein, each such filter may be positioned adjacent the diffuser 26, as best seen in Figure 5, although other arrangements are possible.

In the particular embodiment shown and described herein, each filter element 28 may comprise a “notch” type filter having a relatively narrow wavelength bandpass range of about 30 nm around the desired center wavelength or color. Such notch type filters are available over a wide range of wavelengths or colors. In one embodiment of the invention, a separate notch filter 28 is provided for each light source 22, and the notch filter wavelength is selected as appropriate for the particular light source 22 with which it is paired. Thus, when individually activated, each light source/filter combination will emit excitation light having a bandwidth of about 30 nm at a desired color or wavelength band within the desired overall wavelength range (e.g., from about 430 nm to about 745 nm).

Referring now primarily to Figure 6, the excitation light source assembly 10 may also be provided with a plurality of small diameter lamp receptacles 18 therein that are sized to receive a broad-band light source 24. In the particular embodiment shown and described herein, each small diameter lamp receptacle 18 receives a single broad-band light source 24, although other embodiments may be provided with a plurality of broad-band light sources 24 for each receptacle 18. Broad-band light source 24 may comprise any of a wide range of broad-band light sources now known in the art or that may be developed in the future that are, or would be, suitable for the intended application. By way of example, in one embodiment, each broad-band light source 24 may

comprise a “white” LED of the type that are readily commercially available. In another embodiment, one or more of the broad-band light sources 24 may be mounted at other locations within the imaging system 12.

Each of the various light sources 20, i.e., comprising narrow-band sources 22 and broad-band sources 24, provided in the various lamp receptacles 18 defined by the housing 14 may be operatively connected to a control system 40 (Figure 2) via the circuit board 64. Control system 40 may be used to operate or energize the various light sources 20 to turn them on and off. In one embodiment, each of the various light sources 20 (i.e., comprising narrow-band sources 22 and broad-band sources 24) may be individually controlled so that a single light source 20, emitting excitation light in a desired wavelength band or color, may be used to excite the desired fluorescent material contained in the object or specimen 42 being studied. Alternatively, other arrangements are possible. For example, in another embodiment, the control system 40 may operate two or more light sources 20 simultaneously.

The excitation light source 10 may be operated as follows to capture a fluorescent image of a specimen 42, for example a cactus pad and flowers. Once the specimen 42 has been properly positioned on the platform or stage 60 and the imaging system 12 otherwise prepared for operation,, the control system 40 may operate selected ones of the various light sources 20 (e.g., narrow-band light sources 22 and broad-band light sources 24) to illuminate the specimen 42 with a desired wavelength band or color. Camera 36 may then capture an image of fluorescing material in the object or specimen 42. As described earlier, different fluorescent materials in the specimen 42 may be excited or activated by illuminating the specimen 42 with light of various colors or wavelength bands. In addition, different fluorescent materials in the specimen 42 may fluoresce or emit light of different wavelengths even when illuminated with light of the same color or wavelength band. Images of the specimen 42 produced by light emitted in such different wavelengths may be captured by using an appropriate filter in conjunction with the camera 36.

For example, and with reference now to Figures 7 and 8, a first fluorescent image 44 of specimen 42 may be obtained by using the control system 40 to activate those light sources 20 that emit light having a middle or center wavelength of about 465 nm (and with a bandwidth of about 30-35 nm). Certain materials contained within the specimen 42 will fluoresce in response to this excitation illumination. However, the materials may not all fluoresce or emit light of the same wavelength. Different materials will fluoresce or emit light of different wavelengths, as is known. The particular fluorescent image 44 depicted in Figure 7 was captured with a 550 nm filter adjacent the camera 36 and is shown combined with a visible light image of the specimen 42. The emission

at 550 nm reveals the fluorescence of the individual spines of the cactus. However, no fluorescence of the flower appears at this wavelength. In contrast, the second fluorescent image 46 depicted in Figure 8, but captured with a 735 nm filter, reveals emission from the leaves of the flowers as well as from the entire surface of the cactus pad.

5 Other variations and configurations are possible for the excitation light source according to the present invention. For example, a second embodiment 110 of an excitation light source assembly according to the teachings of the present invention is illustrated in Figures 9-11. The second embodiment 110 differs from the first embodiment 10 in that the second embodiment 110 comprises a plurality of lamp receptacles 118 that are removable from corresponding main bodies  
10 114. The removable lamp receptacles 118 allow the excitation light source 110 to be readily configured (and reconfigured) to produce light of any desired wavelength band or color by simply removing one or more of the lamp receptacles 118 and replacing it or them with another lamp receptacle 118 that configured to produce light in the desired wavelength band or color.

The second embodiment 110 may comprise a base member 130 to which are mounted a  
15 plurality of main bodies 114. In the particular embodiment illustrated in Figures 9-11, the base member 130 comprises a C-shaped member having a central opening 116. Alternatively, the base member 130 could comprise other shapes and configurations, such as the circular shape of the first embodiment 110. The overall configuration of the C-shaped base member 130 is such that the central opening 116 thereof will be substantially aligned with the lens assembly 34 of camera 36  
20 when mounted to the support structure 32 of imaging system 12. See Figures 2 and 3. As was the case for the first embodiment 10, the arrangement of the second embodiment 110 is such that the field of view 38 of camera 36 is substantially unobstructed by the central opening 116 of base member 130, as well as the various light receptacles 118 associated with excitation light source assembly 110.

25 With reference now primarily to Figure 10, each main body 114 may be substantially identical to the others and may comprise an opening 115 therein sized to receive the corresponding removable lamp receptacle 118. Main body 114 may also be configured to receive a connector assembly 117 that is sized to removably receive a mating portion 119 provided in the removable lamp receptacle 118. The connector assembly 117 and mating portion 119 provide physical and  
30 electrical engagement with the removable lamp receptacle 118. Connector assembly 117 may be electrically connected to an electrical connector assembly 165 provided in the main body 114. See also Figure 9.

In the particular embodiment shown and described herein, each main body 114 has an

angled base portion 121 so that the each lamp receptacle 118 is angled inward, toward the central axis 151 of the housing 114, by an angle  $\theta$ , as best seen in Figure 10 (central axis 151 is shown in a displaced position in Figure 10 for clarity). Such an arrangement allows the excitation light produced by the various lamp receptacles 118 to roughly converge at a point on the image platform or stage 60 where the specimen 42 is to be located during the imaging operation. Alternatively, other arrangements for aiming or directing the lamp receptacles 118, thus excitation light emitted thereby, could also be used, as would become apparent to persons having ordinary skill in the art after having become familiar with the teachings provided herein.

The base member 130 and each of the main bodies 114 may be fabricated from any of a wide range of materials (e.g., metals and plastics) that would be suitable for the intended application. By way of example, in one embodiment the base member 130 may comprise aluminum. Each of the main bodies 114 may be fabricated from a polyoxymethylene thermoplastic material, such as Delrin®. Alternatively, other materials may also be used.

Connector assembly 117 and its mating portion 119 may comprise any of a wide range of connector assemblies that are now known in the art or that may be developed in the future that are, or would be, suitable for the particular application. However, by way of example, in one embodiment, connector assembly 117 and its mating portion 119 may comprise a type “FGG” connector assembly available from LEMO USA, Inc. of Rohnert Park, CA. Alternatively, other types of connectors may be used.

Referring now to Figures 10 and 11 simultaneously, each lamp receptacle 118 may be substantially identical to the others and may comprise first and second barrel sections 123 and 125 that may be connected or joined together by a threaded nipple or sleeve section 127. Sleeve section 127 is also configured to receive mating connector portion 119, as best seen in Figure 10. The upper barrel section 125 may be configured to receive one or more narrow-band light sources 122 (only a single narrow-band light source 122 is illustrated in Figures 10 and 11), which may be mounted to a circuit board 164 that is electrically connected to mating connector portion 119 via wires (not shown) or other suitable means. Barrel section 125 may also be configured to receive a diffuser 126 and/or a filter 128, as best seen in Figure 11. A sleeve 166 may be used to position the diffuser 126 and/or filter 128 with respect to the light source 122. A foam spacer 131 or other elastomeric material may be provided between circuit board 164 and sleeve 127, as best seen in Figure 10.

The upper and lower barrel sections 123 and 125 may be fabricated from any of a wide range of materials, such as metals or plastics, that would be suitable for the intended application.

Consequently, the present invention should not be regarded as limited to any particular material. However, by way of example, in one embodiment, the upper and lower barrel sections 123 and 125 are fabricated from aluminum. The aluminum may be provided with a suitable non-reflective coating.

5 Still other variations are possible. For example, and with reference now to Figures 12 and 13, a third embodiment 210 of the excitation light source assembly may comprise a "C"-shaped housing or main body 214 that defines a central opening 216. The housing 214 also defines a plurality of lamp receptacles 218 that are arranged around the central opening, as best seen in Figure 12. The housing 214 of the excitation light source assembly 210 is also configured to be mounted  
10 to the support structure 32 of imaging system 12, so that the lens assembly 34 of camera 36 is generally concentric with the central opening 216 defined by the housing 214. See Figures 2 and 3. As was the case for the other embodiments, the arrangement is such that the field of view 38 of the camera 36 is substantially unobstructed by the housing 214 and/or central opening 216 of housing 214 of the excitation light source assembly 214.

15 Referring now to Figure 13, each of the lamp receptacles 218 may be provided narrow-band light source 222 that, in one embodiment, may be mounted to a circuit board 266. A diffuser 226 may also be positioned within each of the lamp receptacles 218, generally at a position adjacent the light source 222. Each diffuser 226 diffuses light produced by the corresponding light source 222 and may be held in position by a sleeve 266. As was the case for the other embodiments, each lamp  
20 receptacle 218 may also be provided with a filter 228, if desired or required, to remove or filter any undesired light wavelengths that may be produced by the light source 222.

The C-shaped housing 214 of the excitation light source assembly 210 allows each of the lamp receptacles 218 provided therein to be conveniently angled (i.e., by an angle  $\theta$  with respect to the central axis 251 of housing 214), so that light from the light sources 222 may be directed to  
25 a desired area within the field of view 38 of camera 36.

The housing 214 for the excitation light source assembly 210 may be fabricated from any of a wide range of materials, such as metals or plastics, that would be suitable for the intended application. Consequently, the present invention should not be regarded as limited to housings made from any particular materials. However, by way of example, in one embodiment, the housing  
30 is fabricated as a single piece from any of a polyoxymethylene thermoplastic material, e.g., Delrin®.

Having herein set forth preferred embodiments of the present invention, it is anticipated that suitable modifications can be made thereto which will nonetheless remain within the scope of the invention. The invention shall therefore only be construed in accordance with the following claims:

## WHAT IS CLAIMED IS:

1. An excitation light source assembly, comprising:

a housing defining a central opening therein and a plurality of lamp receptacles surrounding the central opening, said housing being mountable to a support structure so that the central opening is aligned with a camera also mounted to the support structure so that a field of view of the camera is unobstructed by said housing;

a light source positioned within each of the plurality of lamp receptacles; and

a diffuser positioned adjacent said light source positioned within each of the plurality of lamp receptacles, each of said diffusers diffusing light produced by each of said light sources; and

a control system operatively connected to each of said light sources positioned within said plurality of lamp receptacles, said control system operating selected ones of said light sources to provide a desired excitation illumination to an object within the field of view of said camera.

2. The excitation light source assembly of claim 1 wherein at least one of said light sources comprises a narrow-band light source that emits light having a bandwidth of about 35 nm.

3. The excitation light source assembly of claim 2 wherein said at least one narrow-band light source comprises a light emitting diode.

4. The excitation light source assembly of claim 1, further comprising at least one filter positioned adjacent at least one diffuser in at least one of the lamp receptacles defined by said housing.

5. The excitation light source assembly of claim 4, wherein said at least one filter comprises a notch filter having a wavelength bandpass range of about 30 nm.

6. The excitation light source assembly of claim 1, wherein at least one of the light sources comprises a broad-band light source.

7. The excitation light source assembly of claim 1, wherein at least some of said plurality of lamp receptacles comprise opposed pairs of lamp receptacles on opposite sides of said

central opening, each opposed pair of lamp receptacles producing light of the same color.

8. The excitation light source assembly of claim 7, further comprising ten opposed pairs of lamp receptacles on opposite sides of said central opening.

9. An excitation light source assembly, comprising:

5 a housing;

a first connector portion mounted to said housing;

a lamp receptacle for producing light in a first defined wavelength band; and

10 a second connector portion mounted to said lamp receptacle so that said lamp receptacle can be removably engaged with said first connector portion mounted to said housing, said housing being mountable to a support structure so that a field of view of a camera also mounted to support structure is substantially unobstructed by said housing and by said lamp receptacle.

10. The excitation light source assembly of claim 9, wherein said lamp receptacle further comprises:

15 a first barrel section adapted to receive said second connector portion; and

a second barrel section; and

a light source mounted within said second barrel section.

11. The excitation light source assembly of claim 10, wherein said first and second connector portions comprise respective mating electrical connector sections, and wherein said light source is electrically connected to the electrical connector section of said second connector portion.

12. The excitation light source assembly of claim 10, further comprising a diffuser mounted within said second barrel section at a position adjacent said light source.

13. The excitation light source assembly of claim 10, further comprising a filter mounted within said second barrel section at a position adjacent said light source.

25 14. The excitation light source assembly of claim 10, wherein said housing comprises a main body portion and a base member portion.

15. The excitation light source assembly of claim 10, wherein said housing comprises a C-shaped member having a central aperture therein, said central aperture of said C-shaped member being substantially aligned with a lens assembly of the camera, so that the field of view of the camera is substantially unobstructed by said housing and said lamp receptacle.

5 16. An excitation light source assembly, comprising:

a base member defining a central opening therein;

a plurality of first connector portions mounted to said base member at positions around the central opening defined by said base member;

10 a plurality of lamp receptacles, at least some of said plurality of lamp receptacles producing light in different wavelength bands;

a second connector portion mounted to each of said plurality of lamp receptacles, said second connector portion being releasably engagable with a corresponding one of said plurality of first connector portions mounted to said base member, said base member being mountable to a support structure so that the central opening is aligned with a camera that  
15 is also mounted to the support structure, wherein a field of view of the camera is substantially unobstructed by said base member and said lamp receptacles engaged with said base member.

17. The excitation light source assembly of claim 16, further comprising a plurality of main body members, each of said main body members being mounted to said base member, each  
20 main body member being adapted to mount a corresponding one of said plurality of first connector portions, each main body member having an opening therein sized to receive a corresponding one of said plurality of lamp receptacles.

18. The excitation light source assembly of claim 16, wherein said base member comprises a C-shaped configuration.

25 19. An assembly, comprising:

a support structure;

a camera mounted to said support structure;

an excitation light source assembly mounted to said support structure, said excitation light source assembly comprising:

a housing defining a central opening therein and a plurality of lamp receptacles surrounding the central opening, said housing being mounted to said support structure so that the central opening is aligned with said camera and so that a field of view of said camera is substantially unobstructed by said housing;

5           at least one narrow-band light source positioned within at least one of the plurality of lamp receptacles; and

a diffuser positioned adjacent said narrow-band light source positioned within each of the plurality of lamp receptacles, each of said diffusers diffusing light produced by each of said narrow-band light sources; and

10           a control system operatively connected to each of said narrow-band light sources positioned within said plurality of lamp receptacles, said control system operating selected ones of said narrow-band light sources to provide a desired excitation illumination to a fluorescent material within the field of view of said camera.

15           20.     The assembly of claim 19, further comprising a light filter positioned adjacent each of the diffusers.

21.     The assembly of claim 19, wherein each of the lamp receptacles defined by said housing are angled with respect to a central axis of said housing so that light emitted from each of said narrow-band light sources is directed to a desired area within the field of view of said camera.

20           22.     The assembly of claim 19, wherein each of said narrow-band light sources is selected to provide desired number of illumination bands over a desired spectral range.

23.     The assembly of claim 22, wherein the desired spectral range is from about 430 nm to about 745 nm.

24.     The assembly of claim 22, wherein the desired number of illumination bands is 10.

25           25.     The assembly of claim 22, wherein each desired illumination band has a bandwidth ranging from about 30 nm to about 35 nm.

26.     The assembly of claim 19, wherein each of said narrow-band light sources comprises

a light emitting diode.

27. The assembly of claim 19, wherein said housing comprises a polyoxymethylene thermoplastic material.

5 28. The assembly of claim 22, wherein the desired spectral range is from about 430 nm to about 900 nm.

29. The assembly of claim 22, wherein the desired spectral range is from about 430 nm to about 800 nm.

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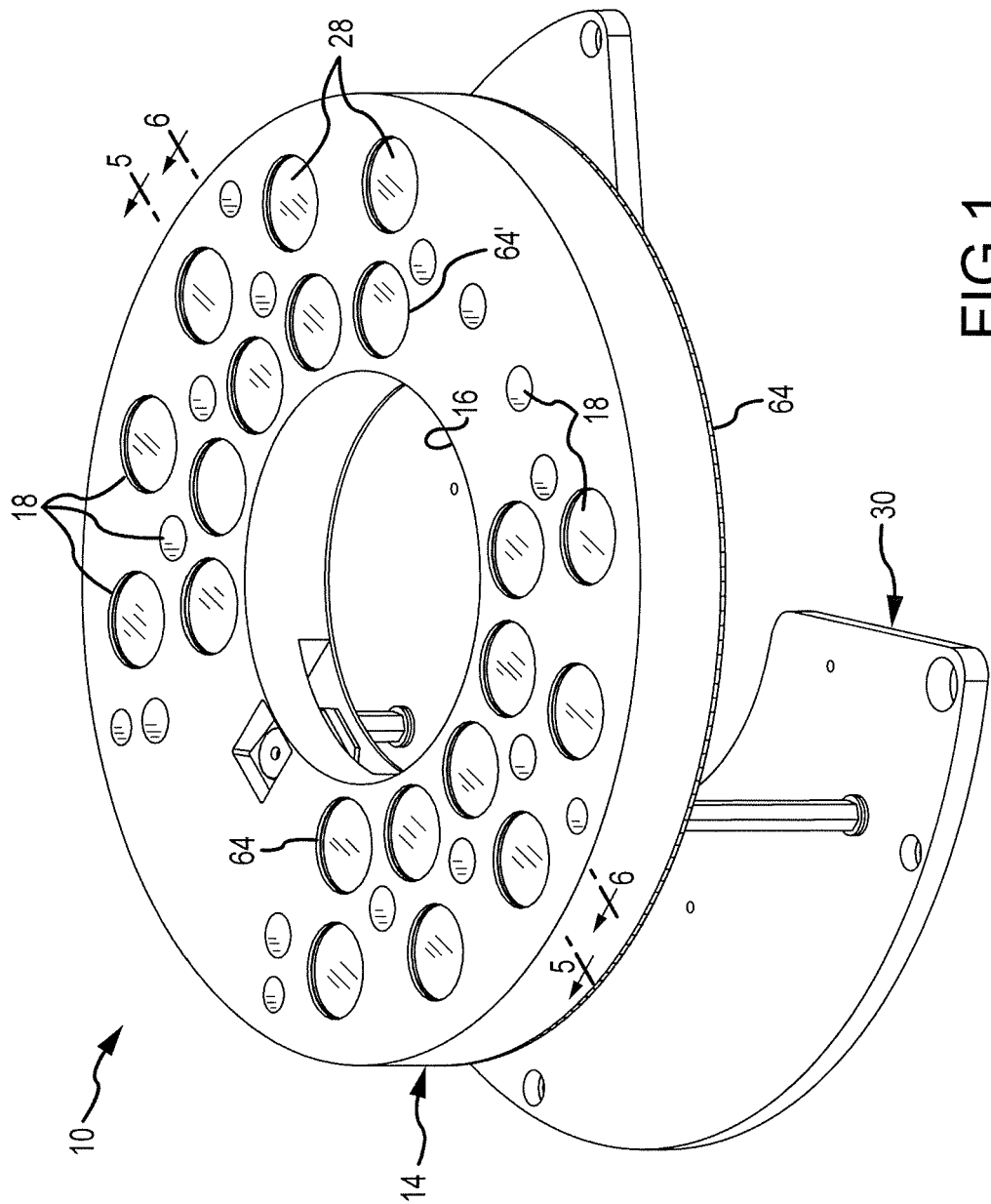


FIG. 1

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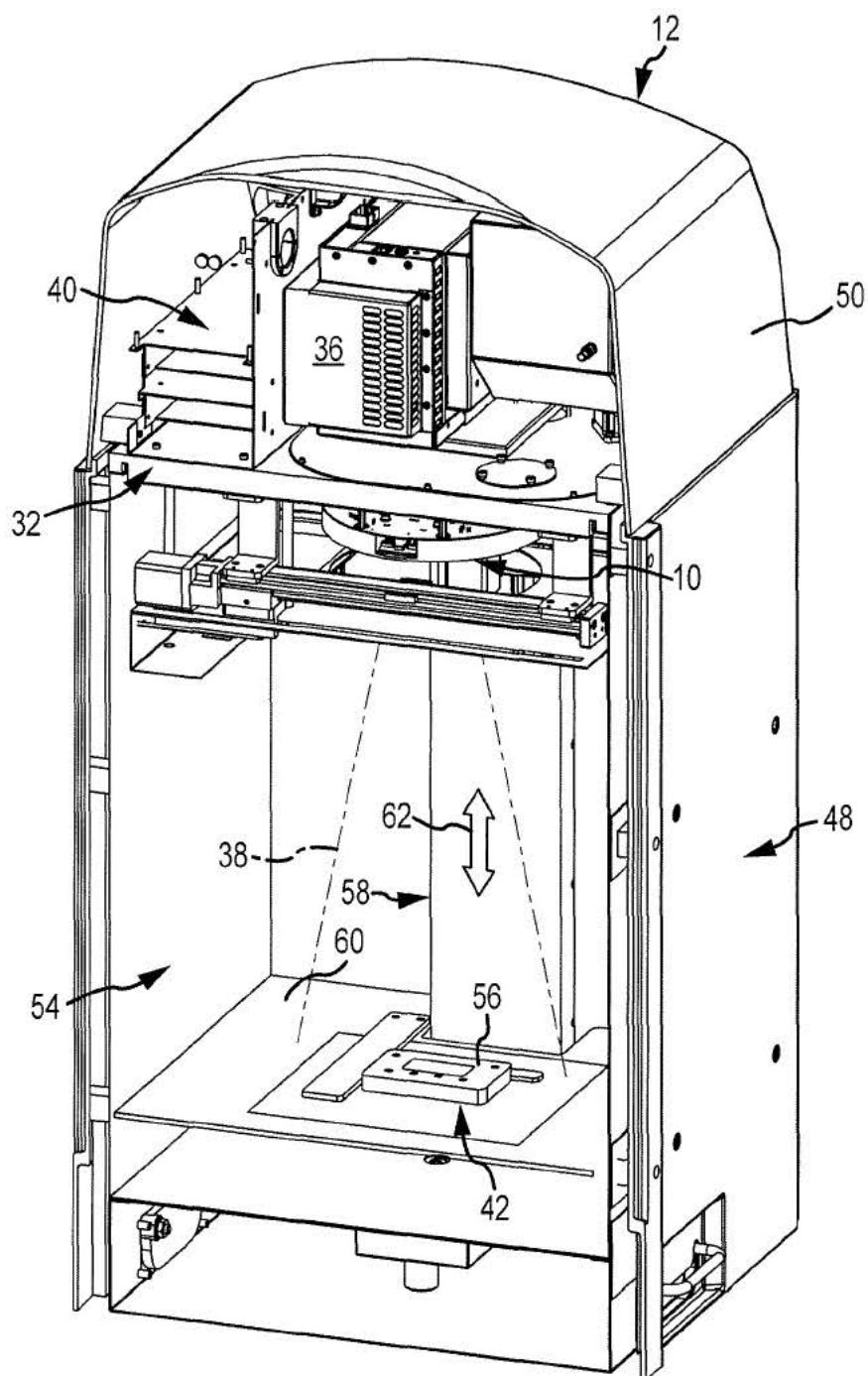


FIG.2

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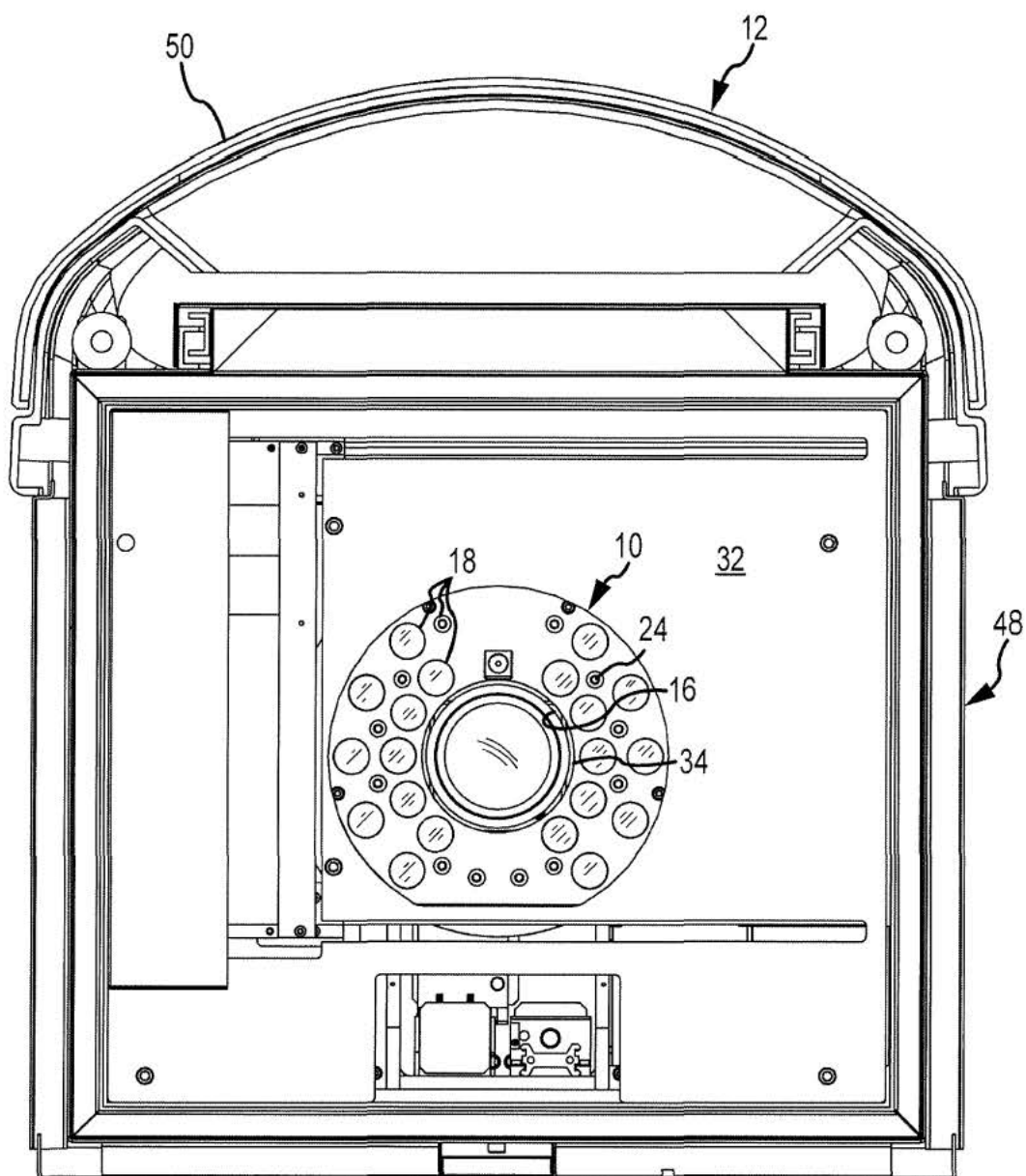


FIG.3

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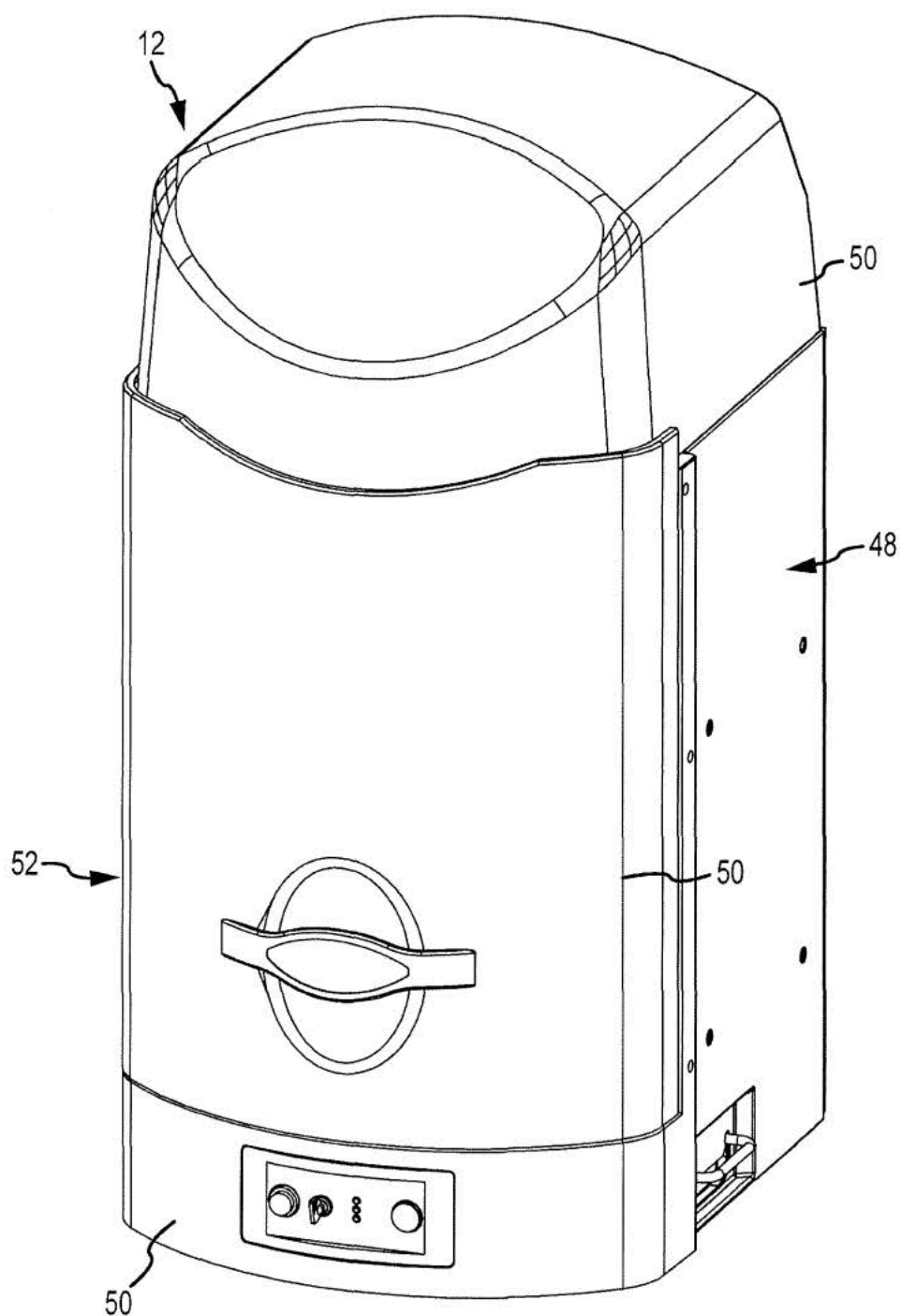


FIG. 4

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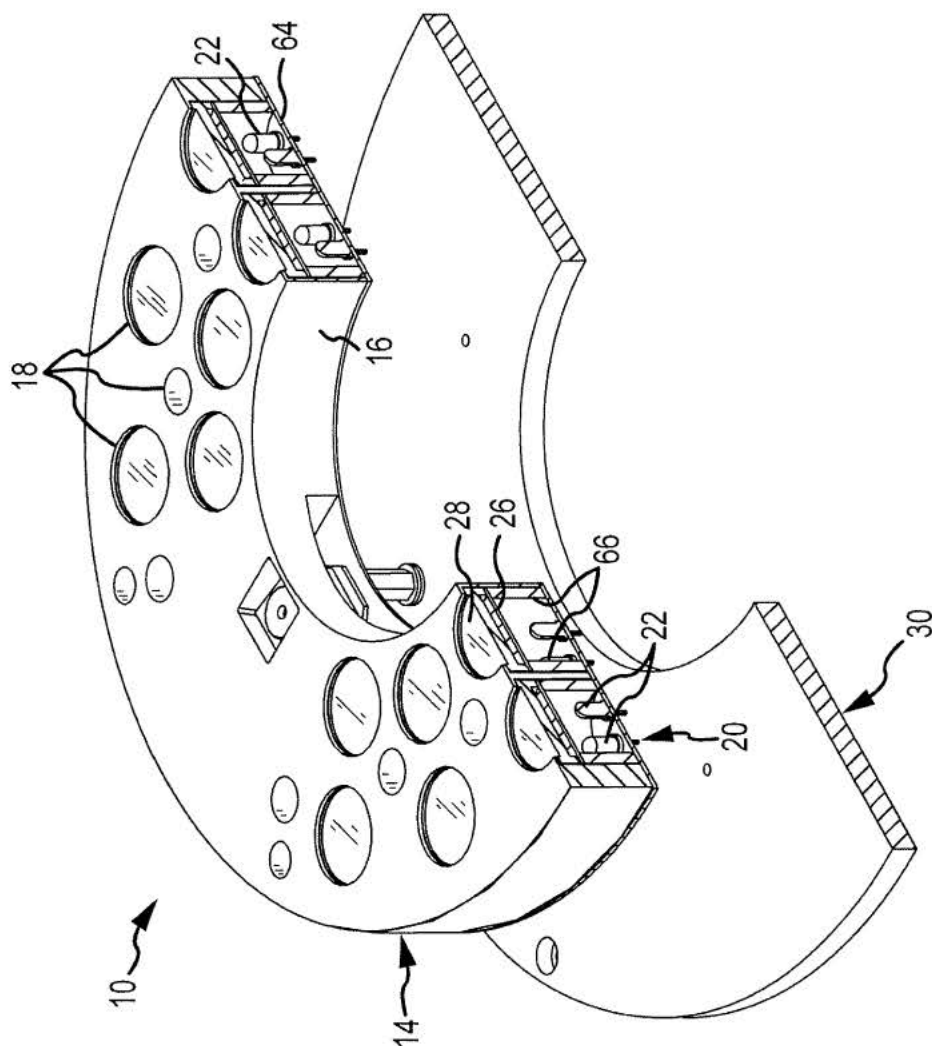


**FIG. 5**

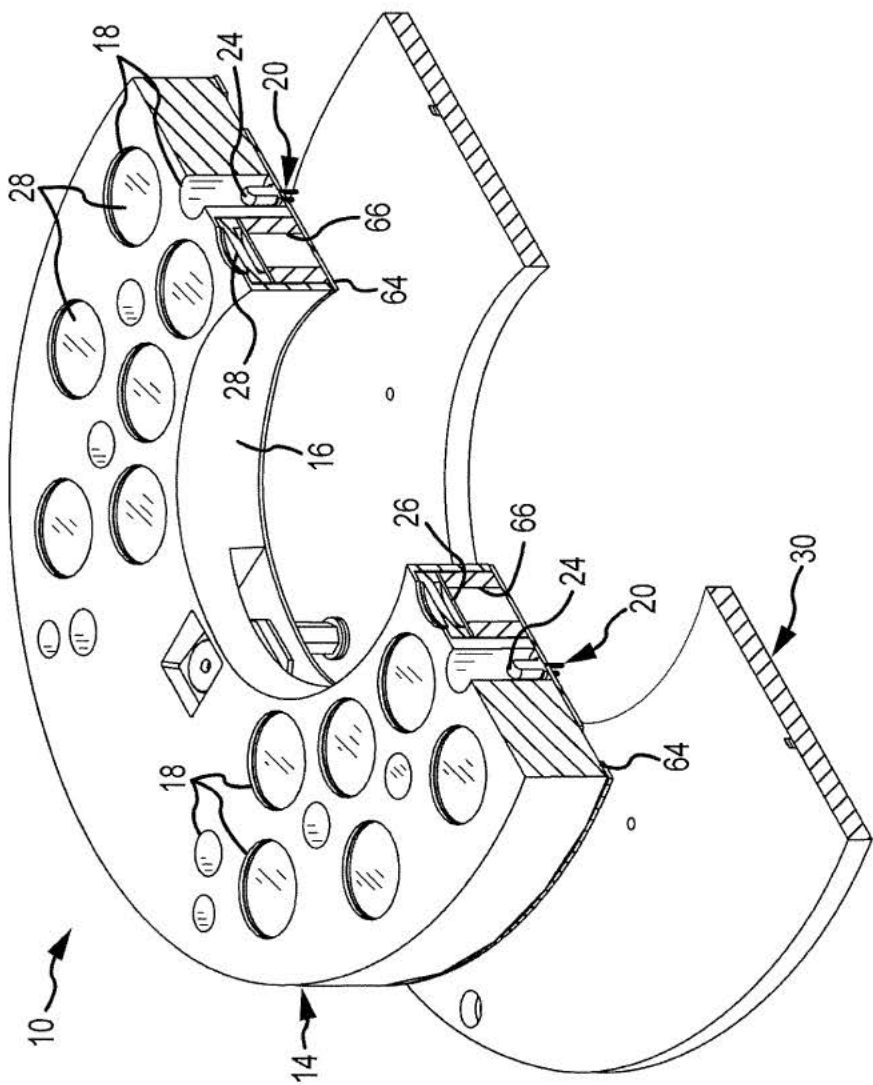


FIG.6

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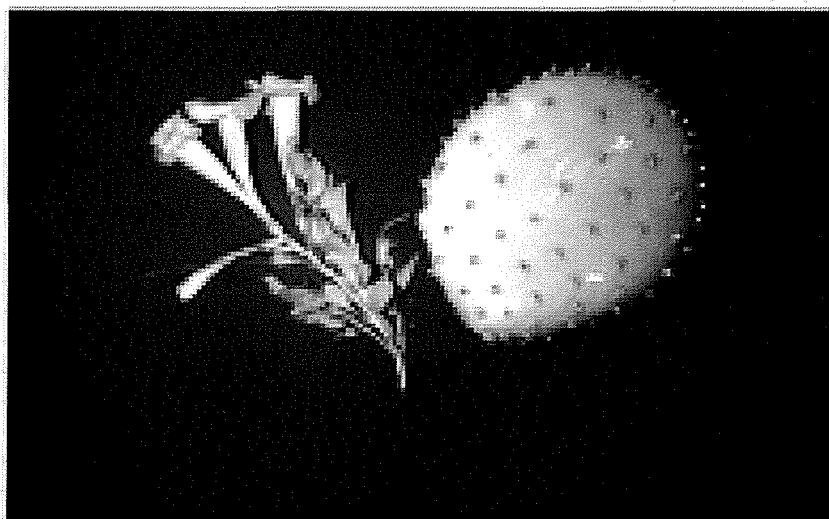


FIG. 7

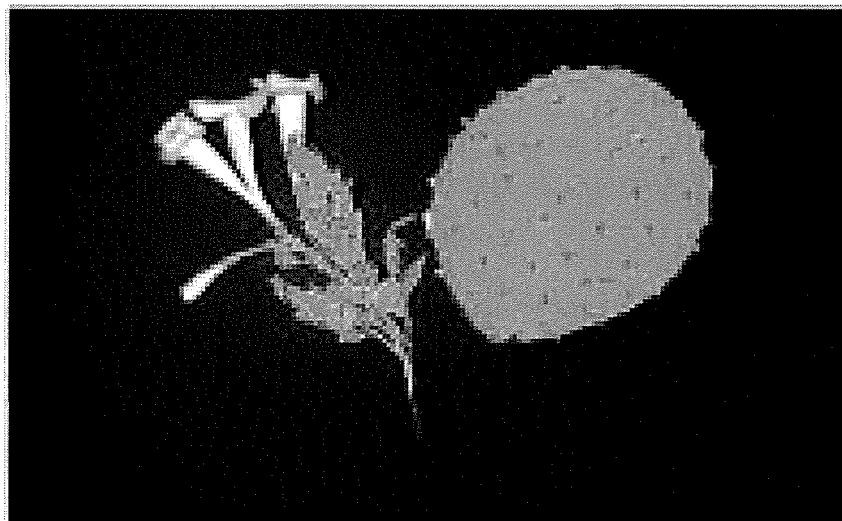


FIG. 8

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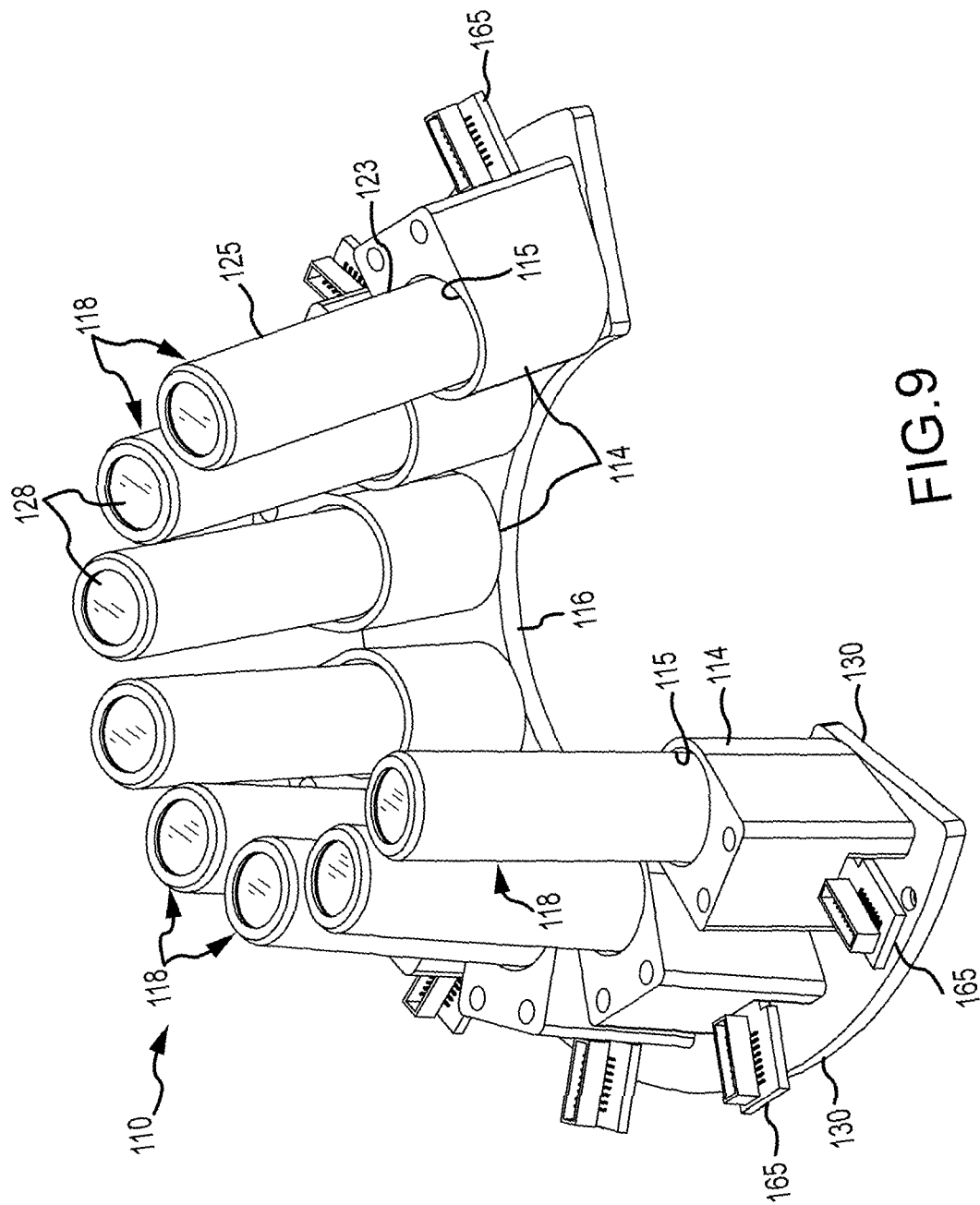


FIG. 9

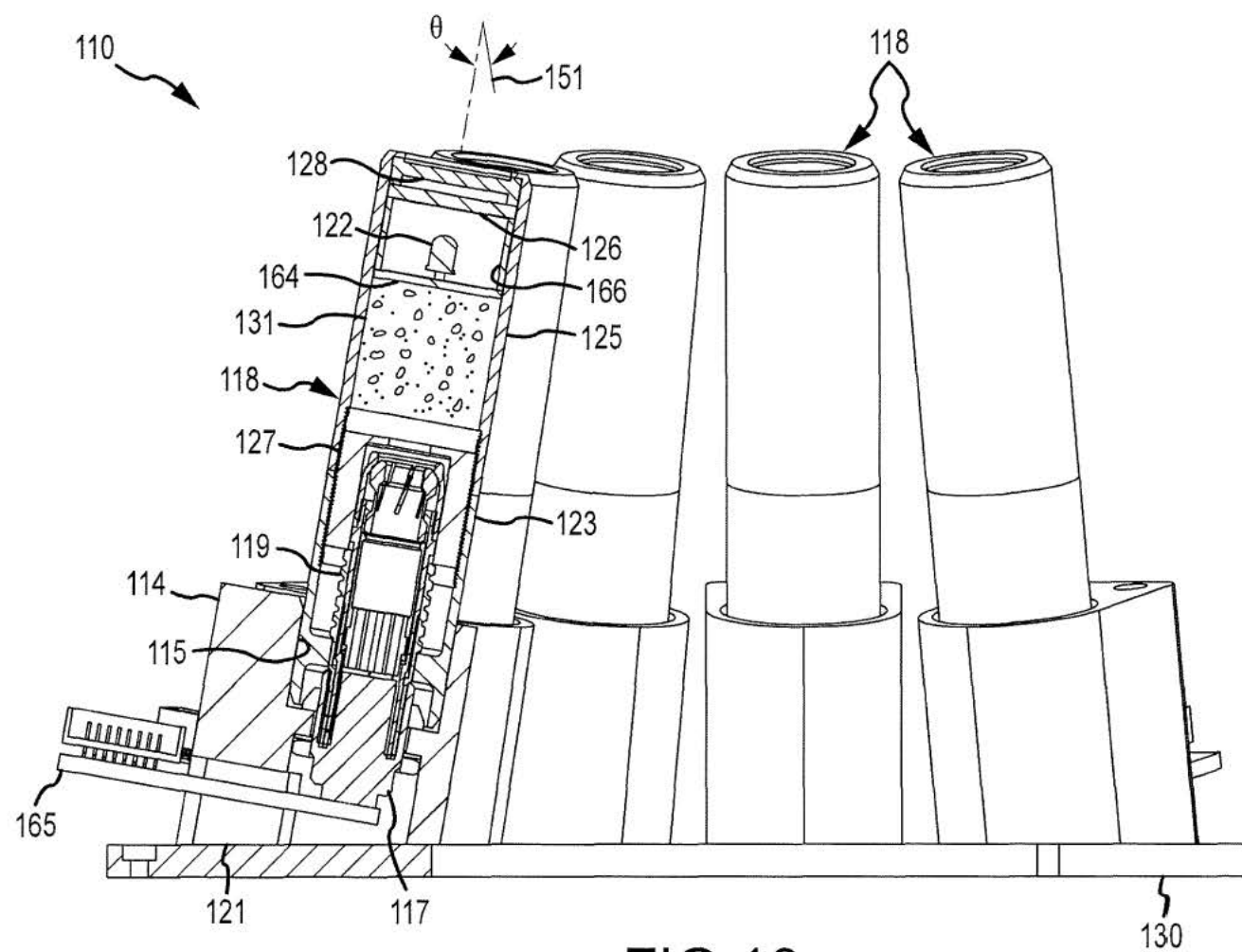


FIG.10

10/12

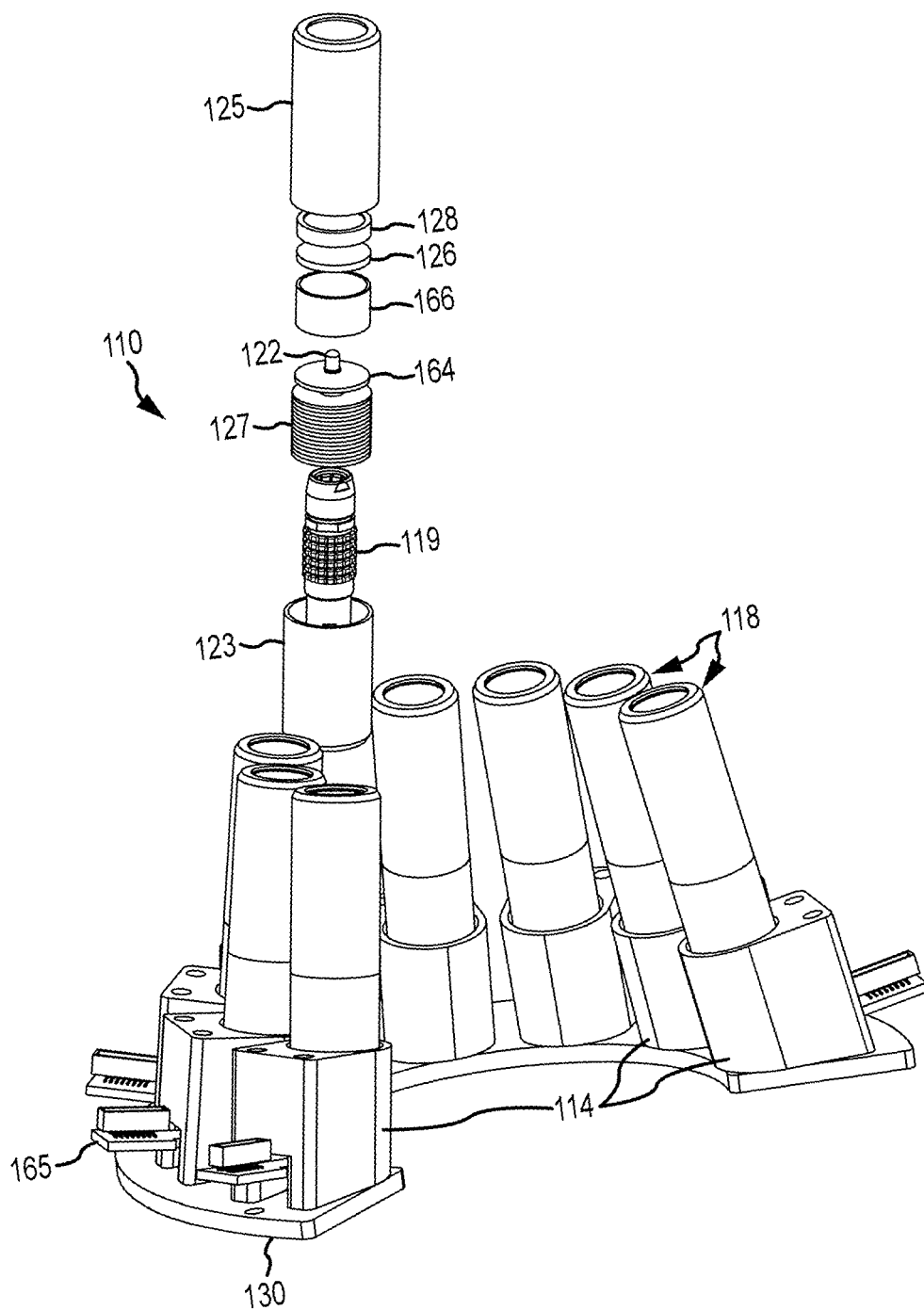


FIG. 11

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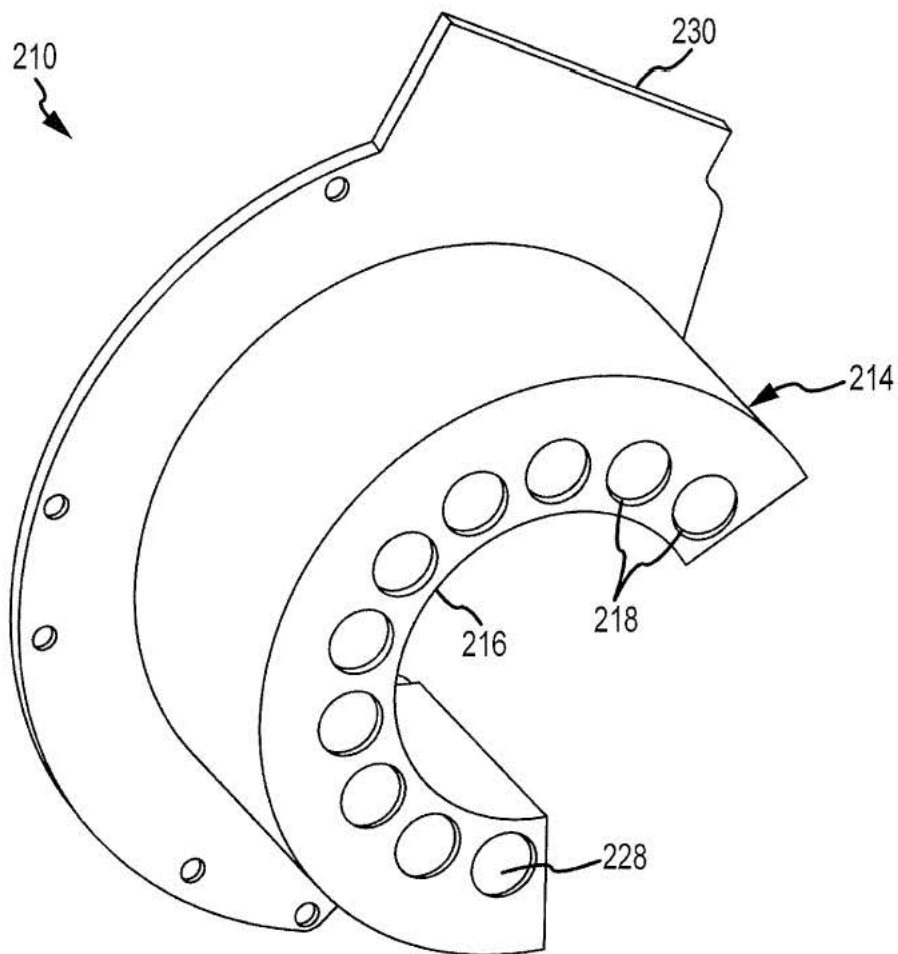


FIG. 12

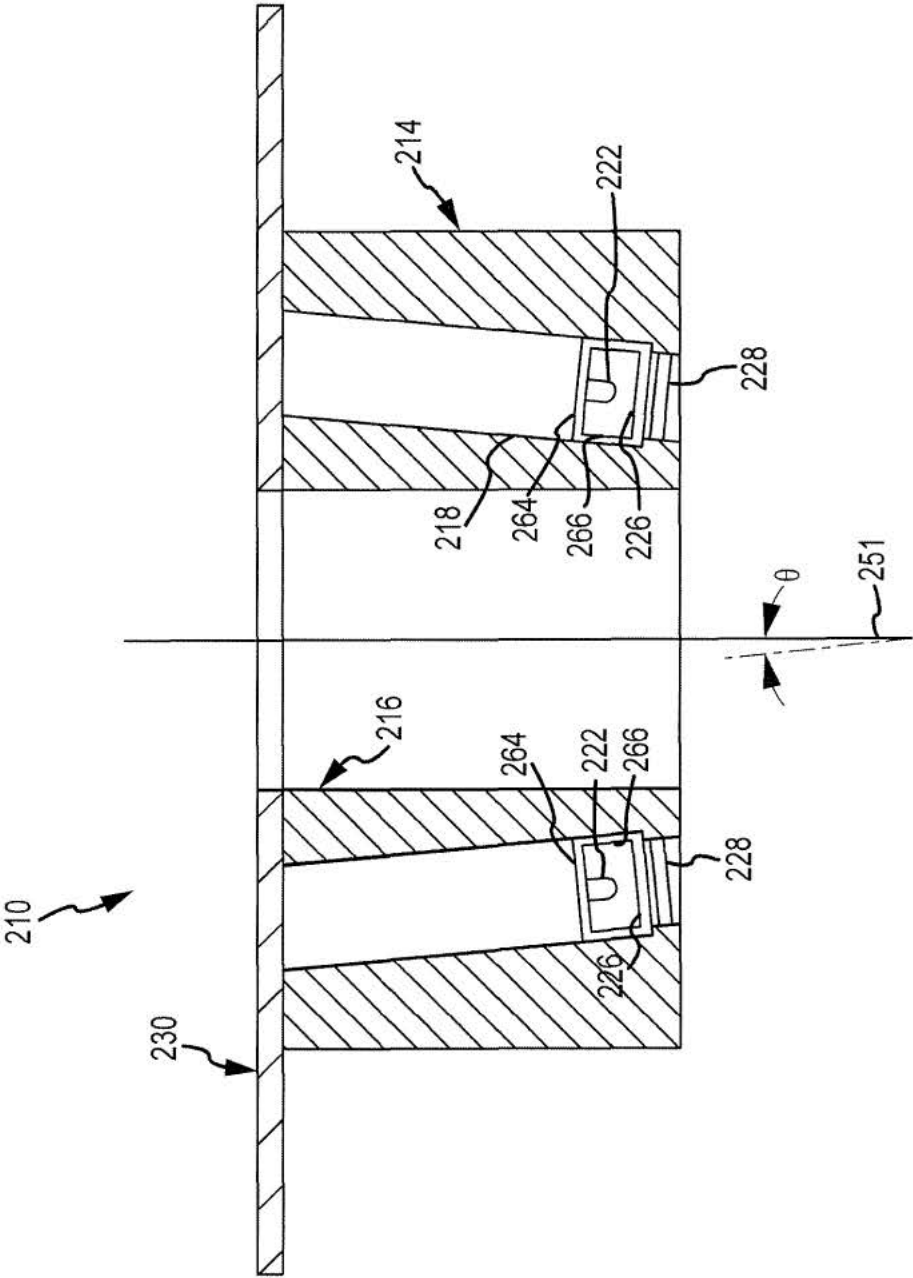


FIG.13

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2011/049998

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - G03B 15/02 (2011.01)

USPC - 362/11

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC(8) - F21V 1/00, 5/00; G03B 15/02 (2011.01)

USPC - 362/11, 235, 246

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

MicroPatent, Google Scholar

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|------------------------------------------------------------------------------------|-----------------------|
| Y         | US 2009/0268426 A1 (POHLERT et al) 29 October 2009 (29.10.2009) entire document    | 1-29                  |
| Y         | US 6,454,437 B1 (KELLY) 24 September 2002 (24.09.2002) entire document             | 1-15, 19-29           |
| Y         | JP 10-40330 A (NOMURA) 13 February 1998 (13.02.1998) abstract, figures 1, 5        | 1-29                  |
| Y         | US 2004/0247170 A1 (FURZE et al) 09 December 2004 (09.12.2004) entire document     | 5                     |
| Y         | US 2004/0121175 A1 (FLEXMAN et al) 24 June 2004 (24.06.2004) entire document       | 27                    |
| A         | US 5,089,895 A (FRAKER et al) 18 February 1992 (18.02.1992) entire document        | 1-29                  |
| A         | US 2005/0265024 A1 (LUK) 01 December 2005 (01.12.2005) entire document             | 1-29                  |

☐ Further documents are listed in the continuation of Box C.

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"&" document member of the same patent family

Date of the actual completion of the international search

12 December 2011

Date of mailing of the international search report

**22 DEC 2011**

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## **DOCUMENT MADE AVAILABLE UNDER THE PATENT COOPERATION TREATY (PCT)**

|                                              |                                                    |
|----------------------------------------------|----------------------------------------------------|
| International application number:            | <b>PCT/US2011/049998</b>                           |
| International filing date:                   | <b>31 August 2011 (31.08.2011)</b>                 |
| Document type:                               | <b>Certified copy of priority document</b>         |
| Document details:                            | Country/Office: <b>US</b>                          |
|                                              | Number: <b>61/379,282</b>                          |
|                                              | Filing date: <b>01 September 2010 (01.09.2010)</b> |
| Date of receipt at the International Bureau: | <b>10 September 2011 (10.09.2011)</b>              |

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a),(b) or (b-bis)

418593

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**APPLICATION NUMBER:** 61/379,282

**FILING DATE:** *September 01, 2010*

**RELATED PCT APPLICATION NUMBER:** *PCT/US11/49998*

**THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS CONVENTION, IS *US61/379,282***



Certified by

*David J. Kappas*

Under Secretary of Commerce  
for Intellectual Property  
and Director of the United States  
Patent and Trademark Office

**Provisional Application for Patent Cover Sheet**

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c)

**Inventor(s)**

Inventor 1

Remove

| Given Name | Middle Name | Family Name | City   | State | Country i |
|------------|-------------|-------------|--------|-------|-----------|
| Michael    | B.          | Nelson      | Tucson | AZ    | US        |

Inventor 2

Remove

| Given Name | Middle Name | Family Name | City   | State | Country i |
|------------|-------------|-------------|--------|-------|-----------|
| Michael    | D.          | Cable       | Tucson | AZ    | US        |

All Inventors Must Be Listed – Additional Inventor Information blocks may be generated within this form by selecting the **Add** button.

Add

**Title of Invention**

EXCITATION LIGHT SOURCE ASSEMBLY

Attorney Docket Number (if applicable)

SPEC US-4 PRV (27560-006)

**Correspondence Address**

Direct all correspondence to (select one):

☒ The address corresponding to Customer Number☐ Firm or Individual Name

Customer Number

27104

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☒ No.☐ Yes, the name of the U.S. Government agency and the Government contract number are:

**Entity Status**

Applicant claims small entity status under 37 CFR 1.27

☐ Yes, applicant qualifies for small entity status under 37 CFR 1.27☒ No**Warning**

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**Signature**

Please see 37 CFR 1.4(d) for the form of the signature.

|            |                 |           |      |                                         |            |
|------------|-----------------|-----------|------|-----------------------------------------|------------|
| Signature  | /Bruce E. Dahl/ |           |      | Date (YYYY-MM-DD)                       | 2010-09-01 |
| First Name | Bruce           | Last Name | Dahl | Registration Number<br>(If appropriate) | 33670      |

This collection of information is required by 37 CFR 1.51. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. This form can only be used when in conjunction with EFS-Web. If this form is mailed to the USPTO, it may cause delays in handling the provisional application.

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                  |                        |                          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|------------------------|--------------------------|
| <b>Application Data Sheet 37 CFR 1.76</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                  | Attorney Docket Number | SPEC US-4PRV (27560-006) |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                  | Application Number     |                          |
| Title of Invention                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | EXCITATION LIGHT SOURCE ASSEMBLY |                        |                          |
| <p>The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.</p> <p>This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.</p> |                                  |                        |                          |

## Secrecy Order 37 CFR 5.2

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| <input type="checkbox"/> | Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.) |
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## Applicant Information:

|                                                                                                                                                                                                                                       |            |                                                                |             |                                                             |    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------------------------------------------------------------|-------------|-------------------------------------------------------------|----|
| <b>Applicant 1</b>                                                                                                                                                                                                                    |            |                                                                |             |                                                             |    |
| Applicant Authority <input checked="" type="radio"/> Inventor                                                                                                                                                                         |            | <input type="radio"/> Legal Representative under 35 U.S.C. 117 |             | <input type="radio"/> Party of Interest under 35 U.S.C. 118 |    |
| Prefix                                                                                                                                                                                                                                | Given Name | Middle Name                                                    | Family Name | Suffix                                                      |    |
|                                                                                                                                                                                                                                       | Michael    | B.                                                             | Nelson      |                                                             |    |
| Residence Information (Select One) <input checked="" type="radio"/> US Residency <input type="radio"/> Non US Residency <input type="radio"/> Active US Military Service                                                              |            |                                                                |             |                                                             |    |
| City                                                                                                                                                                                                                                  | Tucson     | State/Province                                                 | AZ          | Country of Residence                                        | US |
| Citizenship under 37 CFR 1.41(b)                                                                                                                                                                                                      |            | US                                                             |             |                                                             |    |
| Mailing Address of Applicant:                                                                                                                                                                                                         |            |                                                                |             |                                                             |    |
| Address 1                                                                                                                                                                                                                             |            | 420 North Bonita Avenue                                        |             |                                                             |    |
| Address 2                                                                                                                                                                                                                             |            |                                                                |             |                                                             |    |
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| <b>Applicant 2</b>                                                                                                                                                                                                                    |            |                                                                |             |                                                             |    |
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| Prefix                                                                                                                                                                                                                                | Given Name | Middle Name                                                    | Family Name | Suffix                                                      |    |
|                                                                                                                                                                                                                                       | Michael    | D.                                                             | Cable       |                                                             |    |
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| Address 1                                                                                                                                                                                                                             |            | 420 North Bonita Avenue                                        |             |                                                             |    |
| Address 2                                                                                                                                                                                                                             |            |                                                                |             |                                                             |    |
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| <b>Application Data Sheet 37 CFR 1.76</b> |                                  | Attorney Docket Number | SPEC US-4PRV (27560-006) |              |
|                                           |                                  | Application Number     |                          |              |
| Title of Invention                        | EXCITATION LIGHT SOURCE ASSEMBLY |                        |                          |              |
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| Title of the Invention                  | EXCITATION LIGHT SOURCE ASSEMBLY |                                           |                          |
| Attorney Docket Number                  | SPEC US-4PRV (27560-006)         | Small Entity Status Claimed               | <input type="checkbox"/> |
| Application Type                        | Provisional                      |                                           |                          |
| Subject Matter                          | Utility                          |                                           |                          |
| Suggested Class (if any)                |                                  | Sub Class (if any)                        |                          |
| Suggested Technology Center (if any)    |                                  |                                           |                          |
| Total Number of Drawing Sheets (if any) | 7                                | Suggested Figure for Publication (if any) |                          |

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|                                           |                                  | Application Number     |                          |
| Title of Invention                        | EXCITATION LIGHT SOURCE ASSEMBLY |                        |                          |

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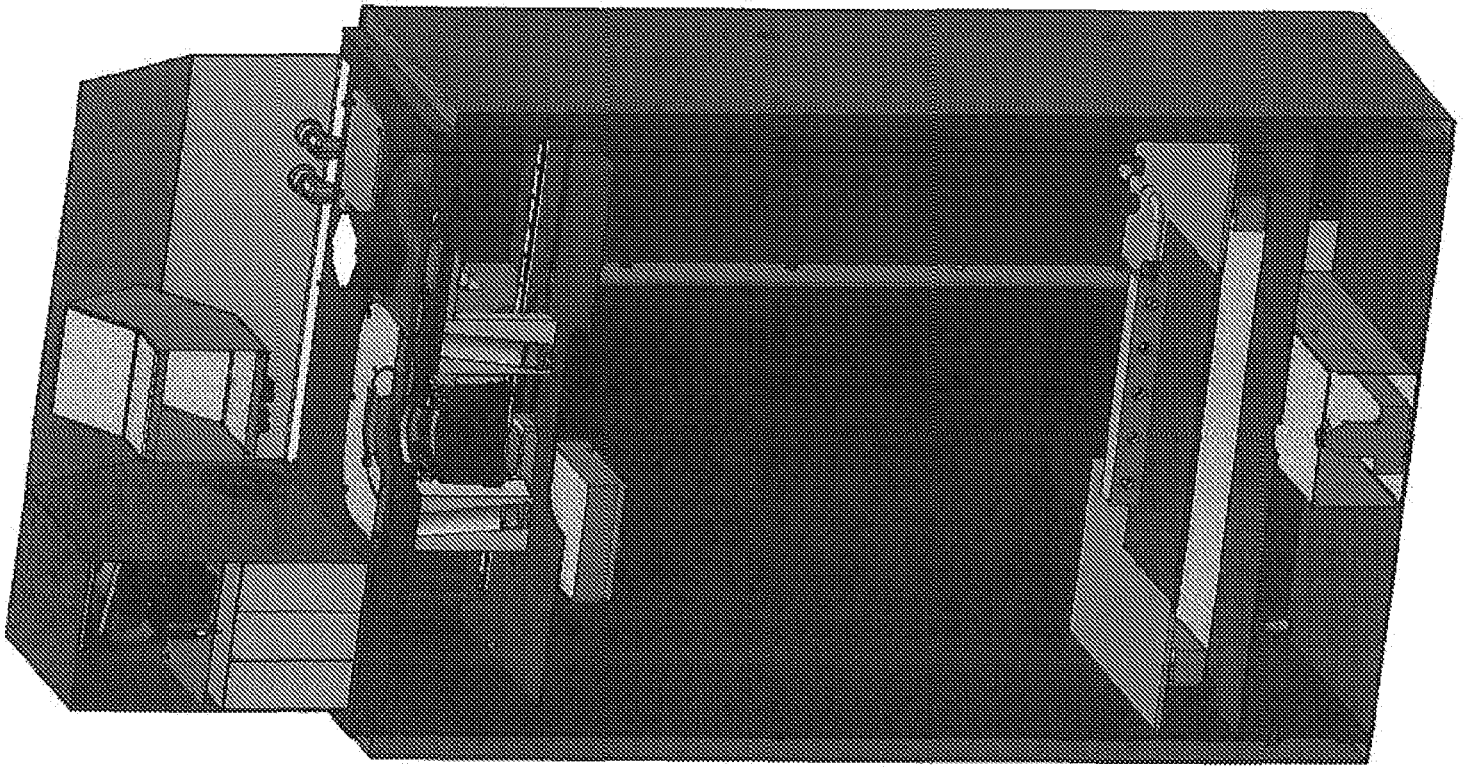
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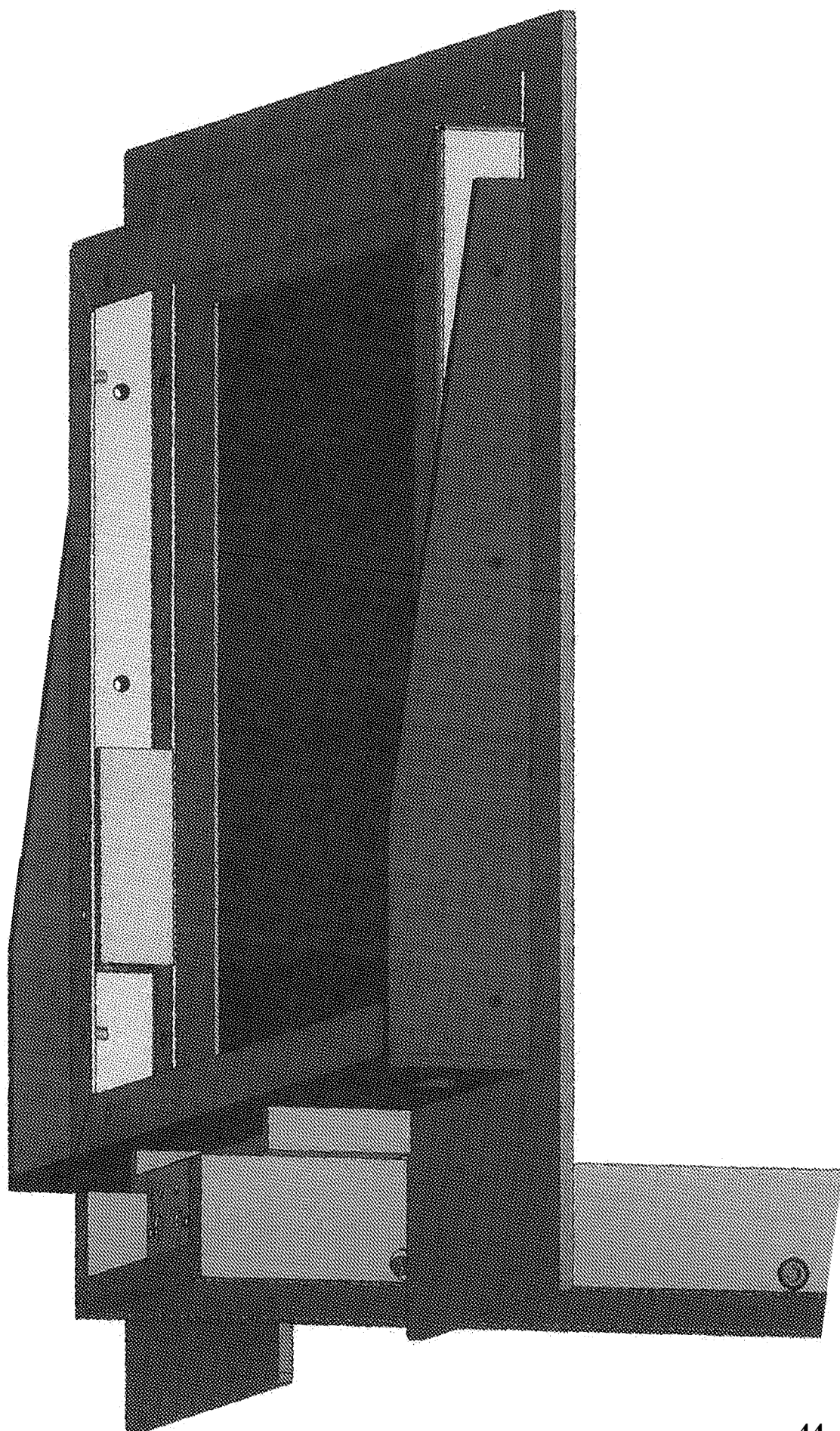
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| <b>Assignee 1</b>                                                                              |                                   |                |       |
| If the Assignee is an Organization check here. <input checked="" type="checkbox"/>             |                                   |                |       |
| Organization Name                                                                              | SPECTRAL INSTRUMENTS IMAGING, LLC |                |       |
| <b>Mailing Address Information:</b>                                                            |                                   |                |       |
| Address 1                                                                                      | 420 North Bonita Avenue           |                |       |
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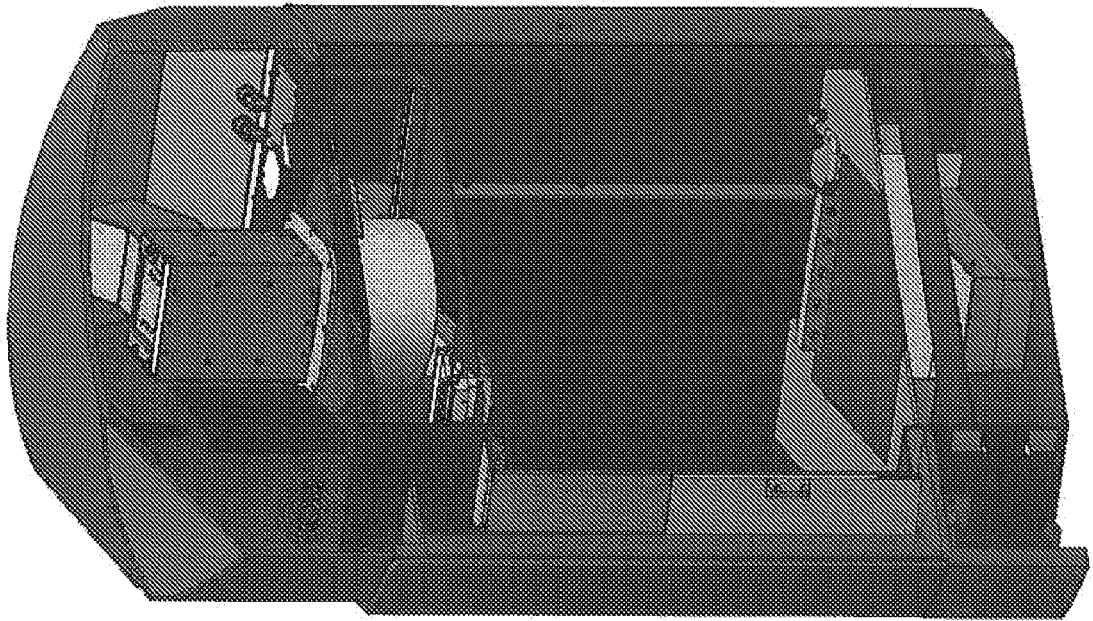
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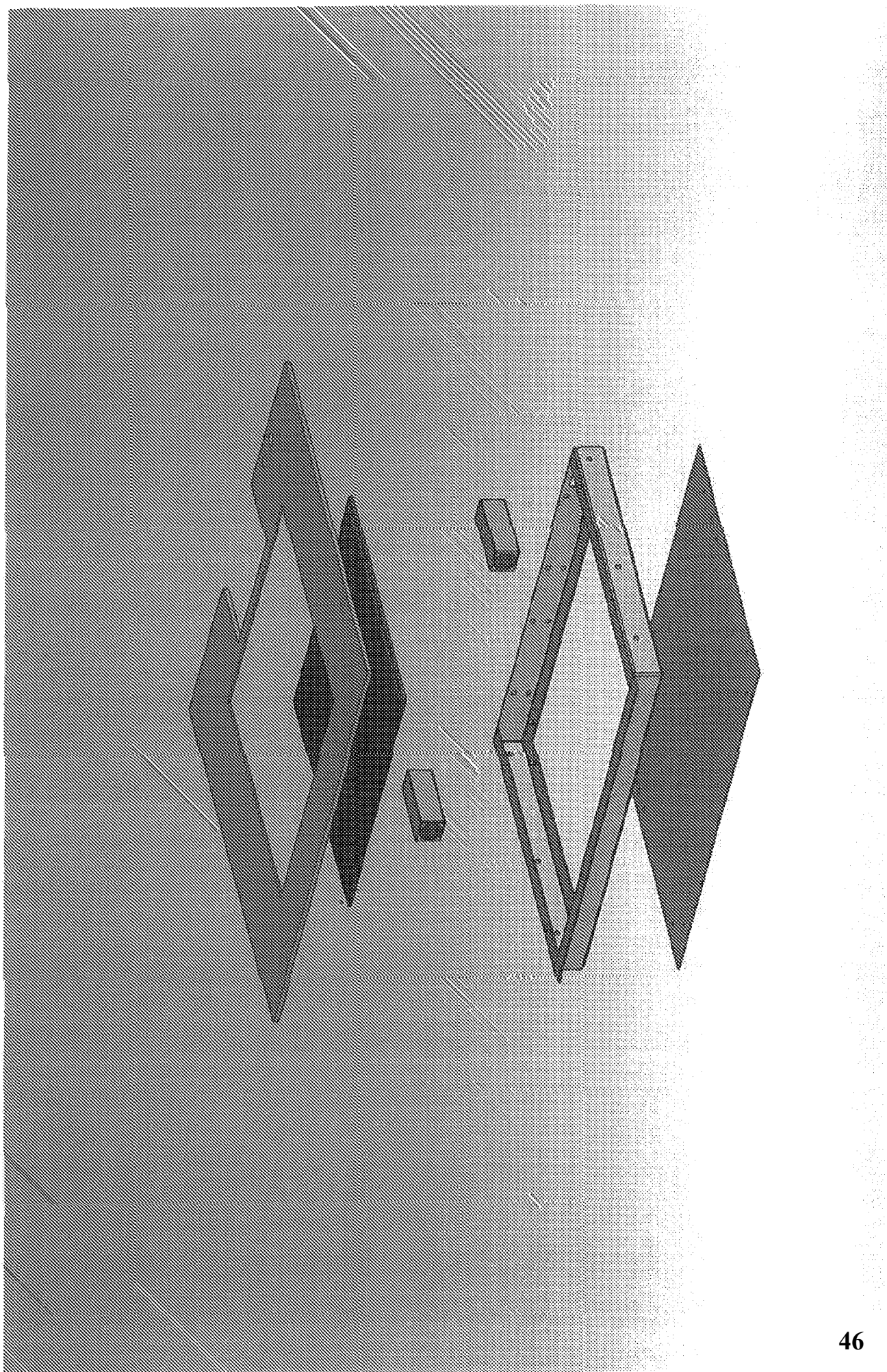
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| Signature                                                                                                                                                    | /Bruce E. Dahl/ |           |      | Date (YYYY-MM-DD)   | 2010-09-01 |
| First Name                                                                                                                                                   | Bruce           | Last Name | Dahl | Registration Number | 33670      |

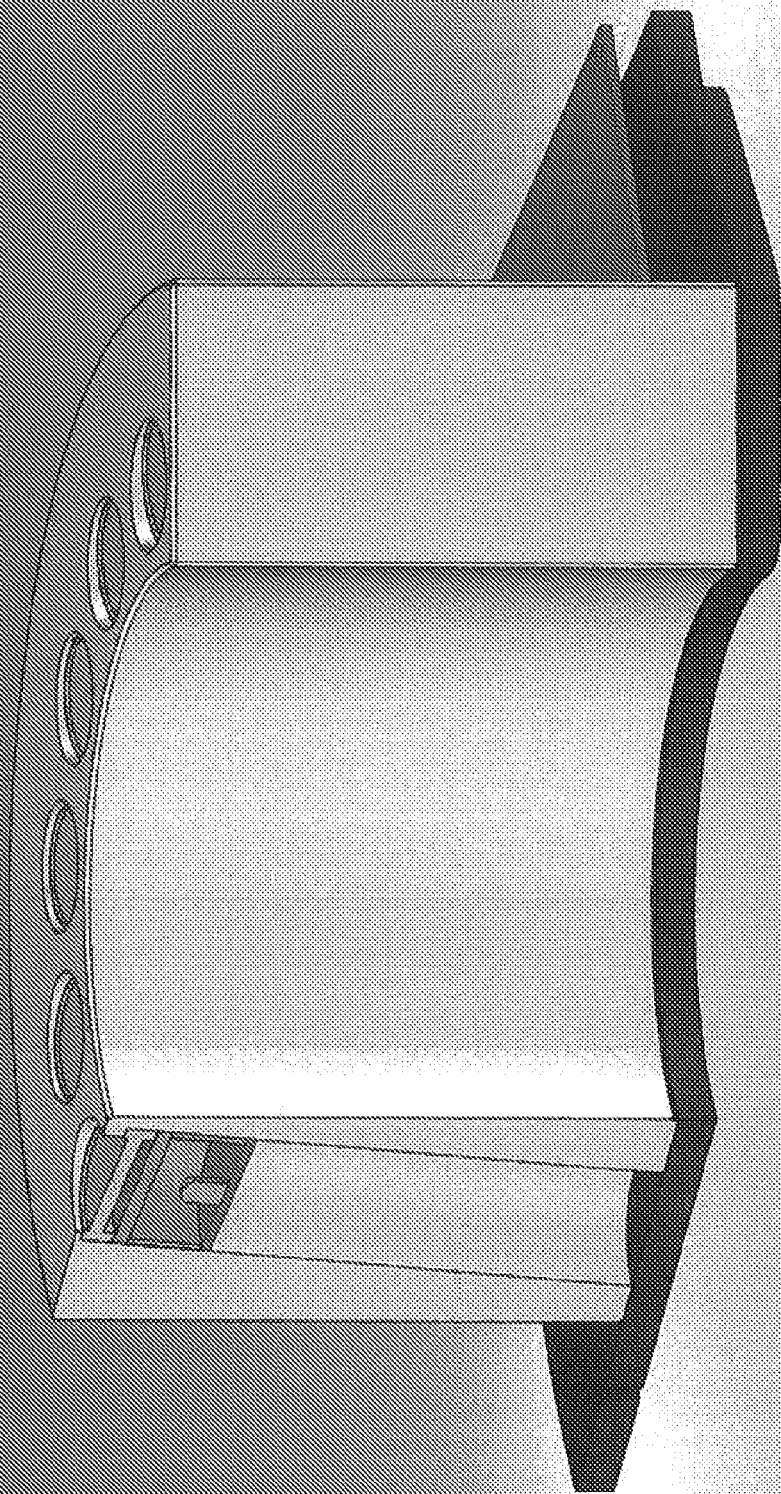
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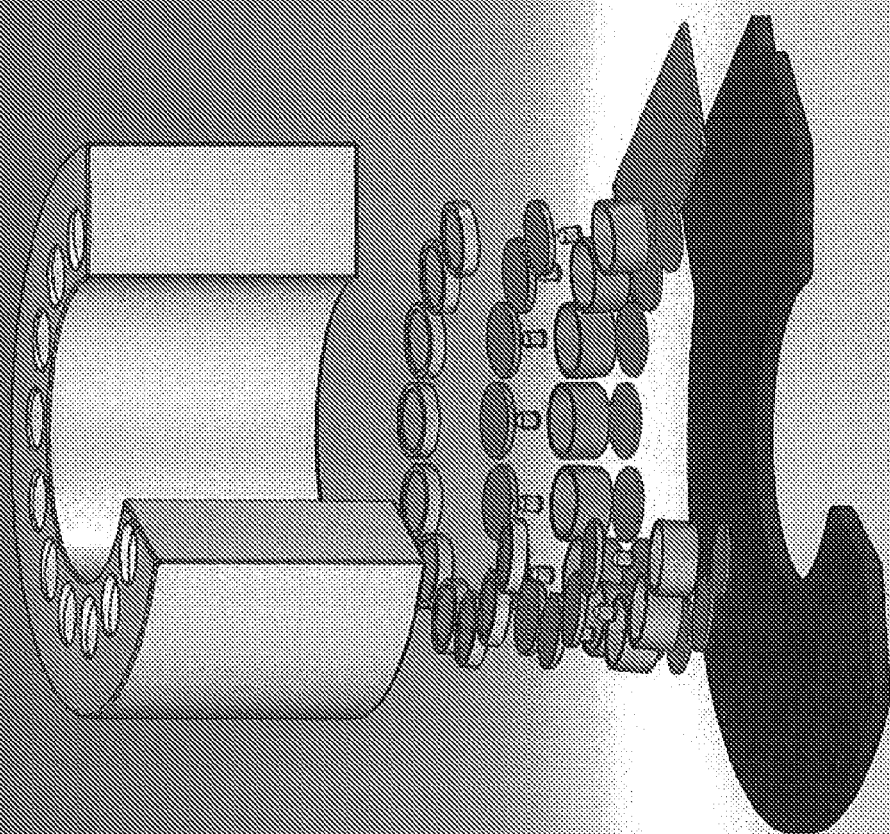


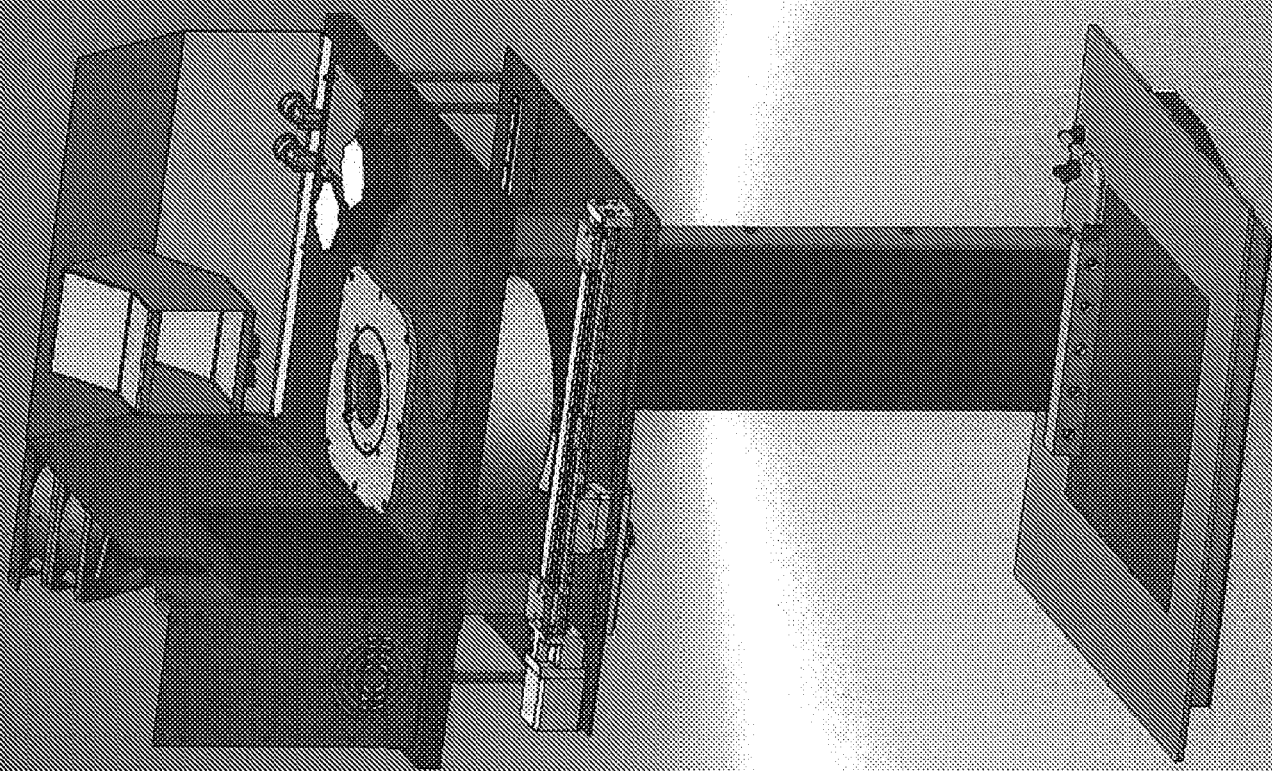


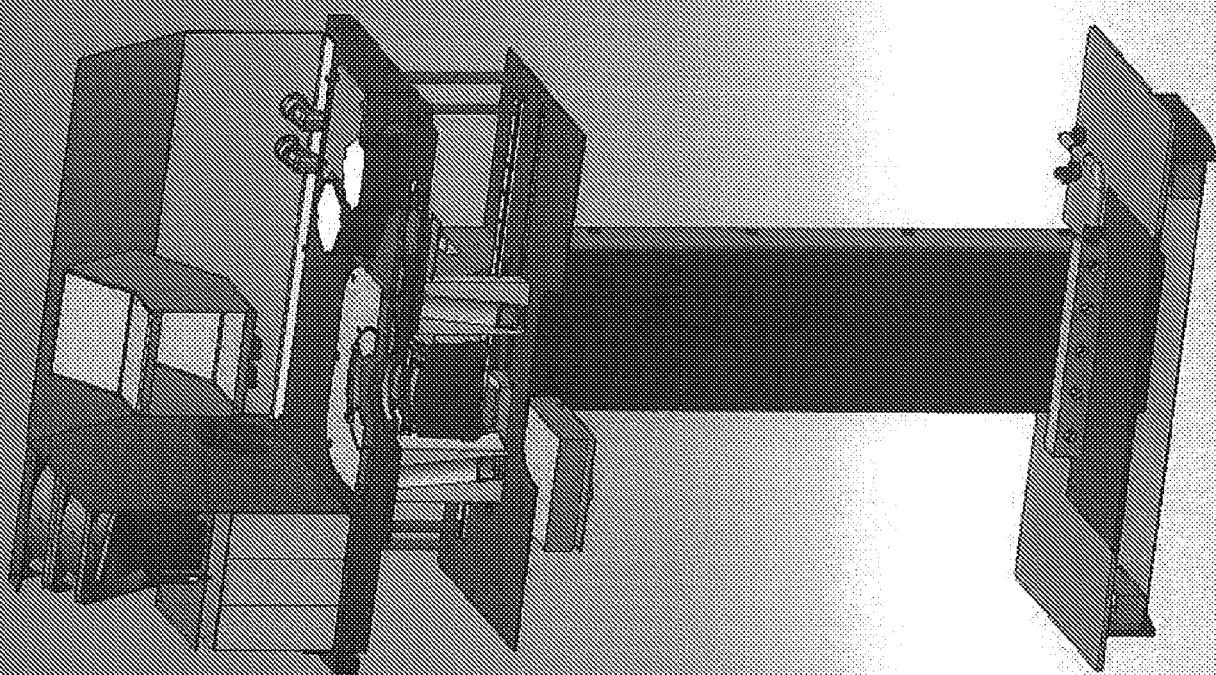


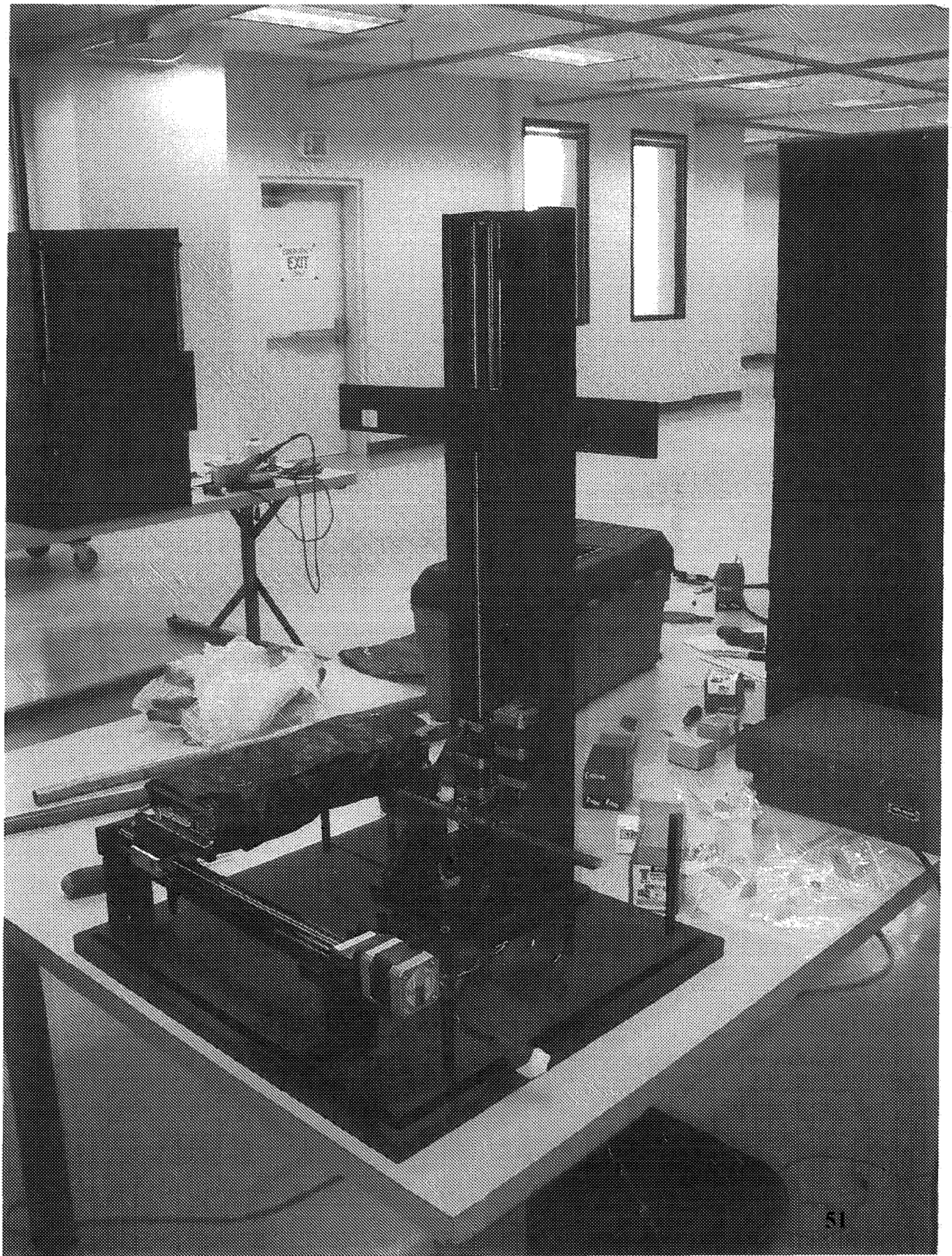


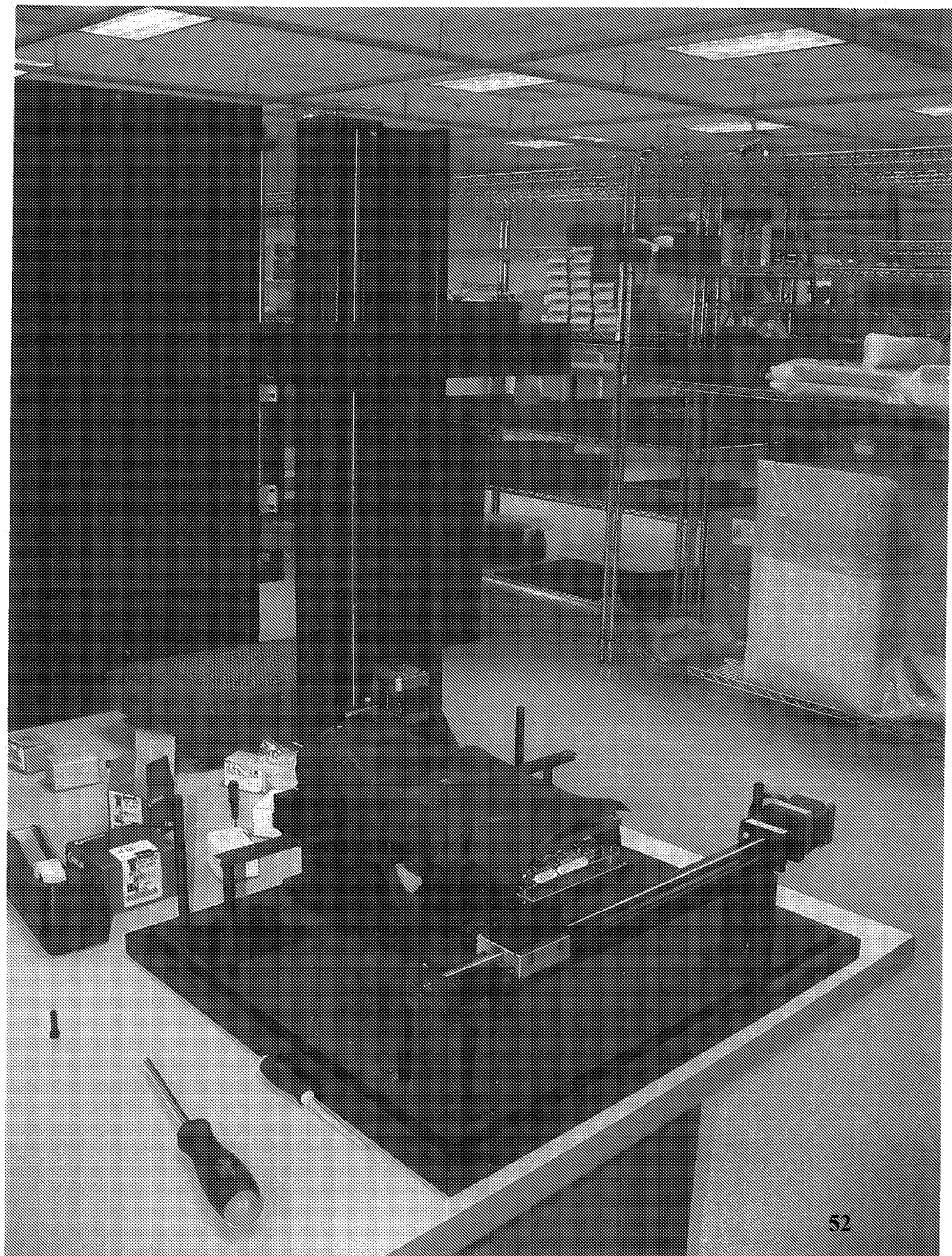


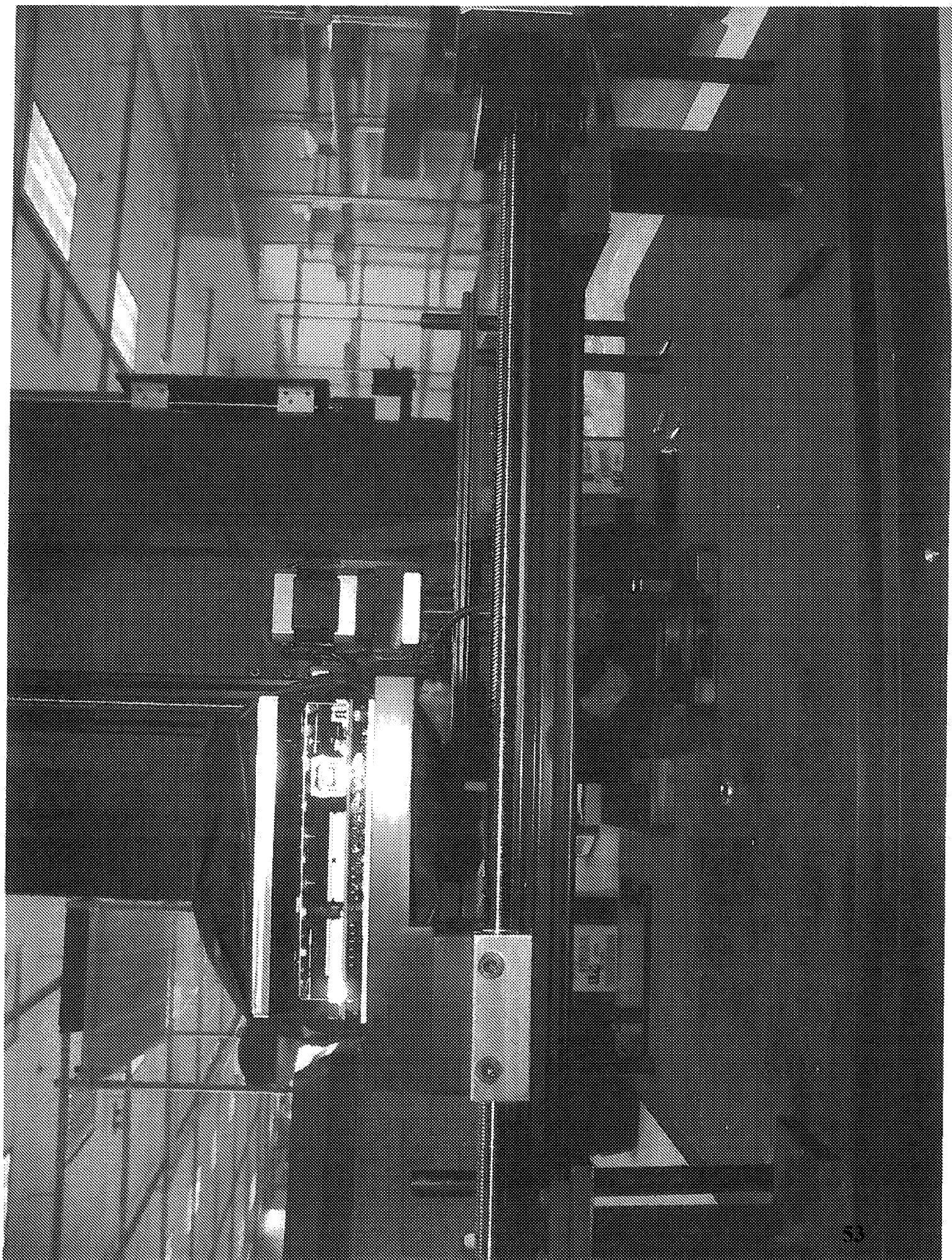


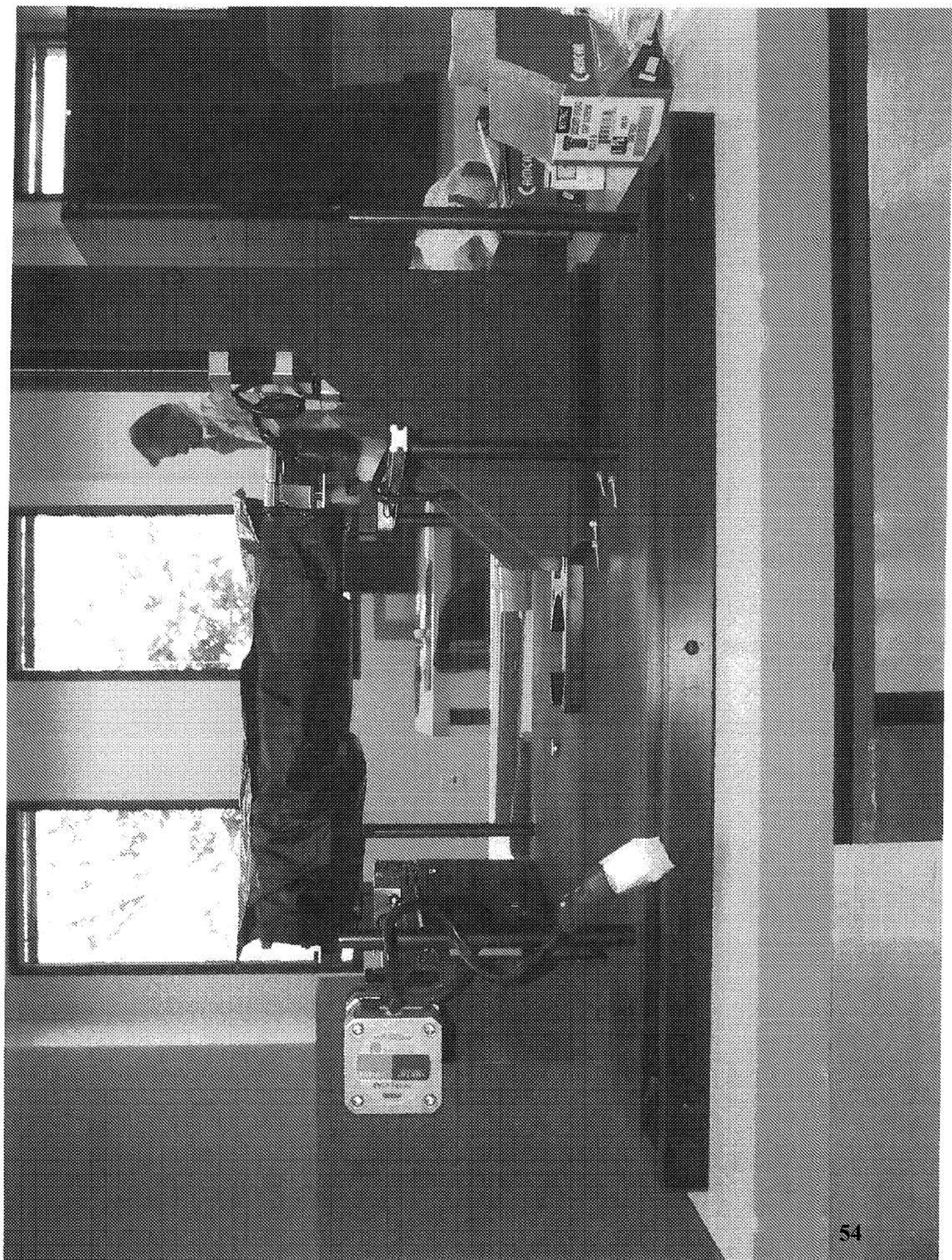


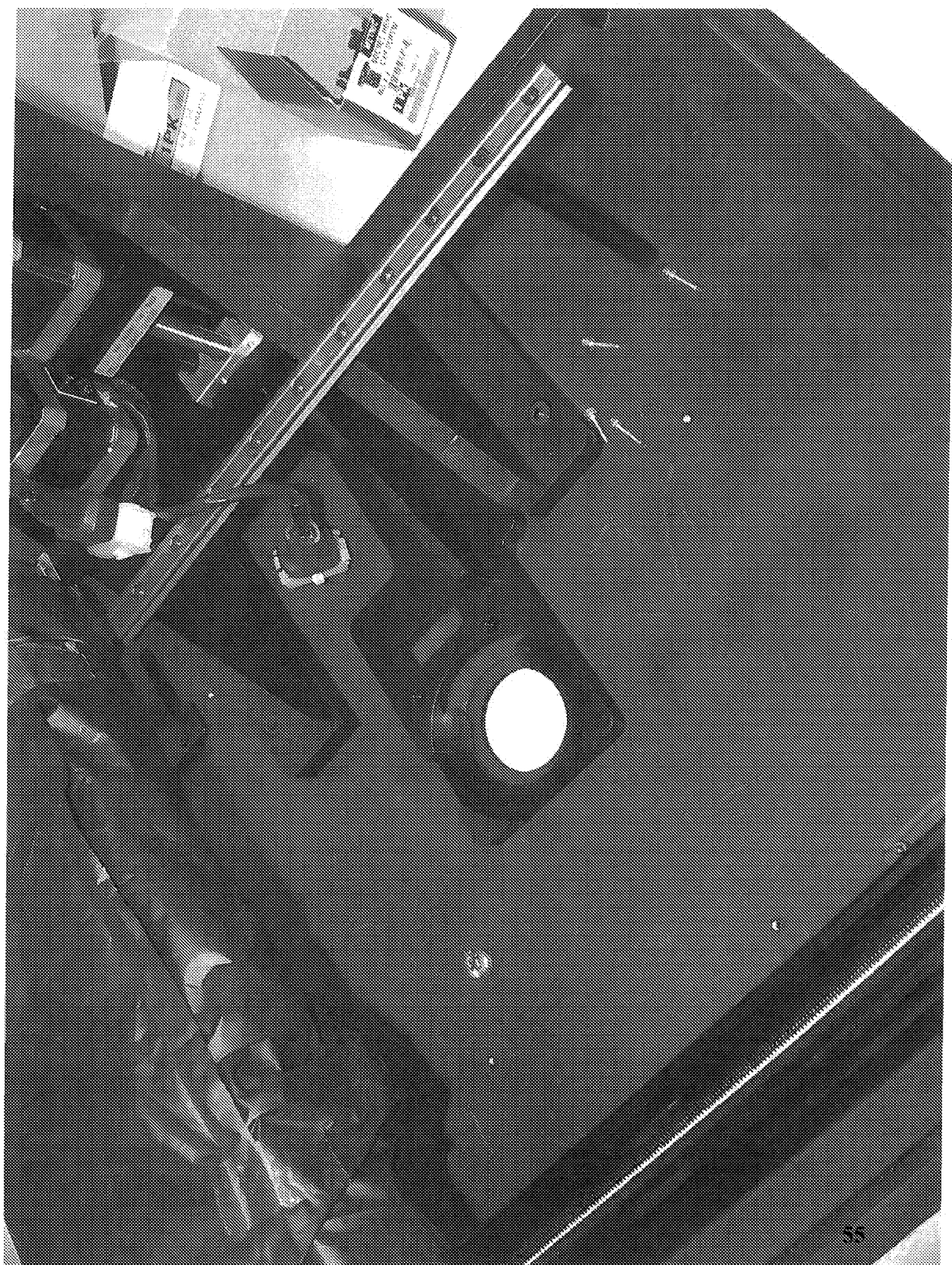


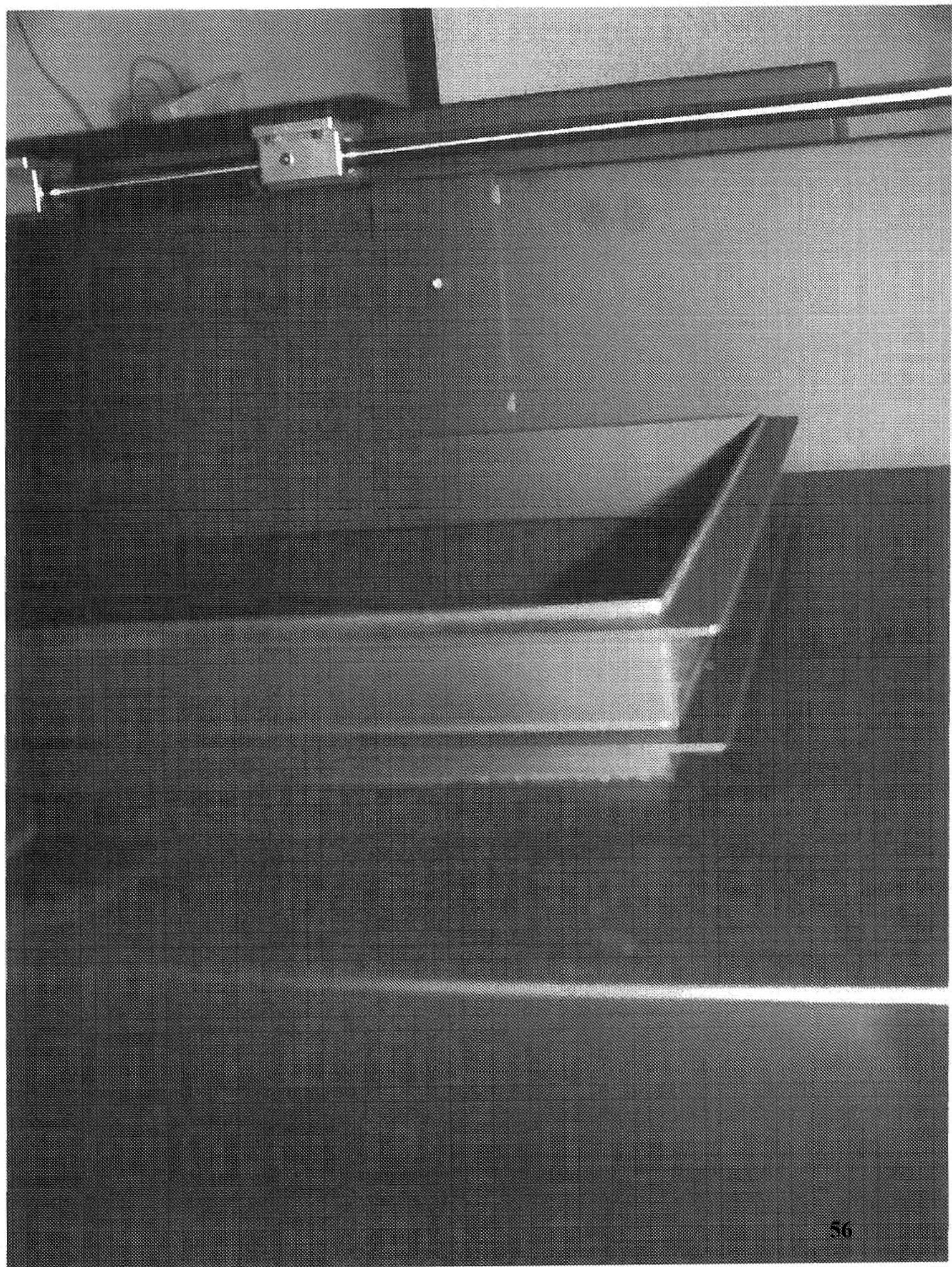


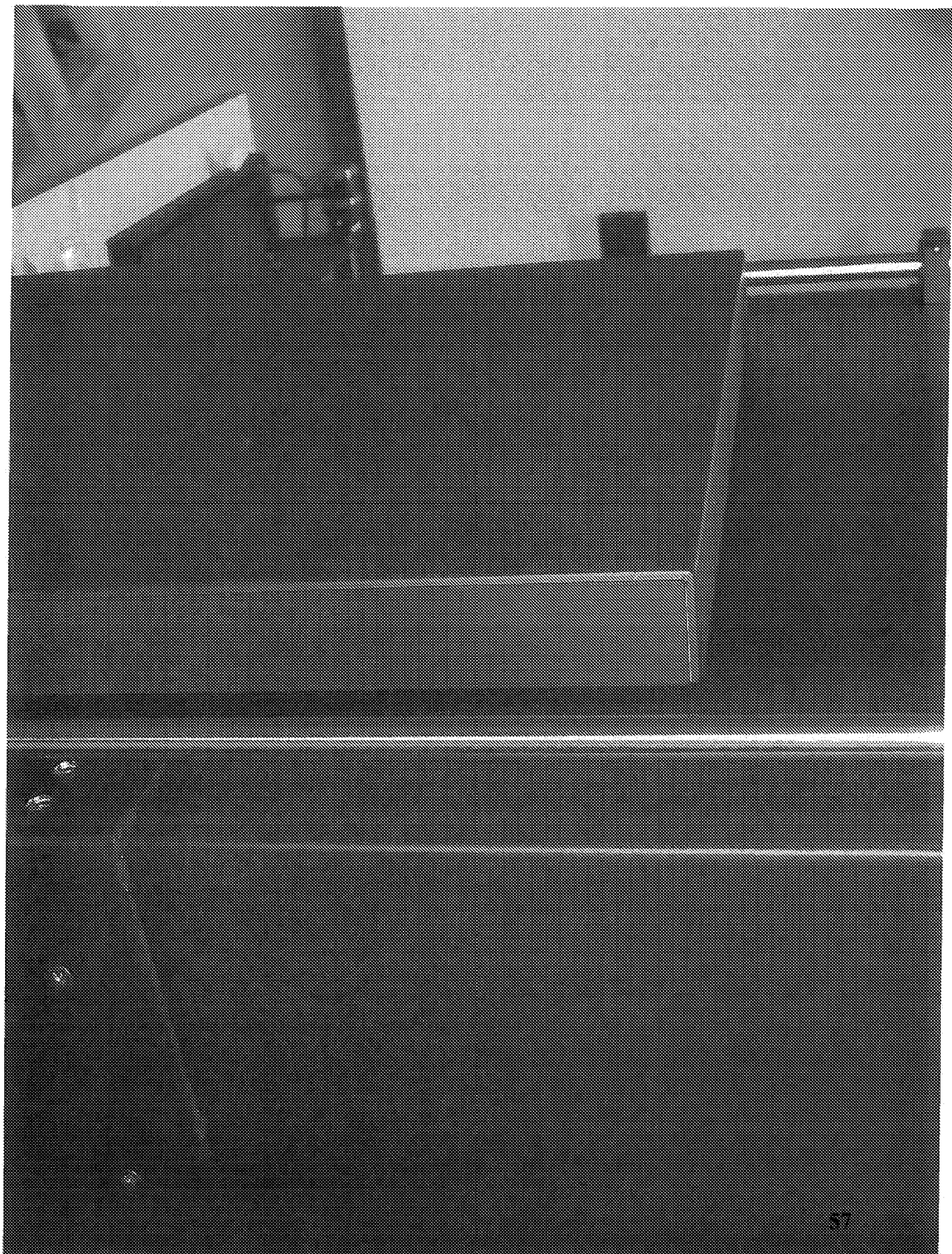


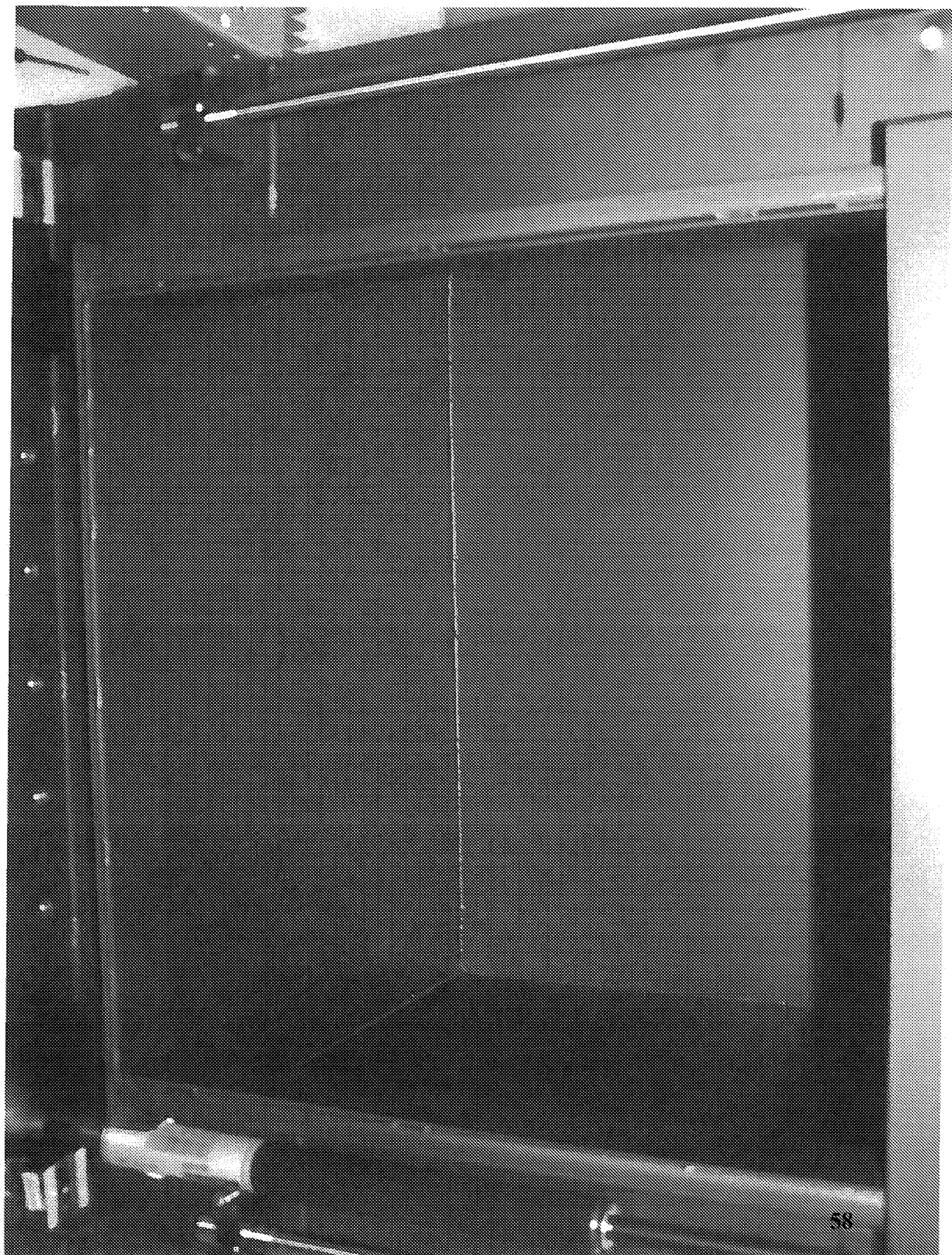


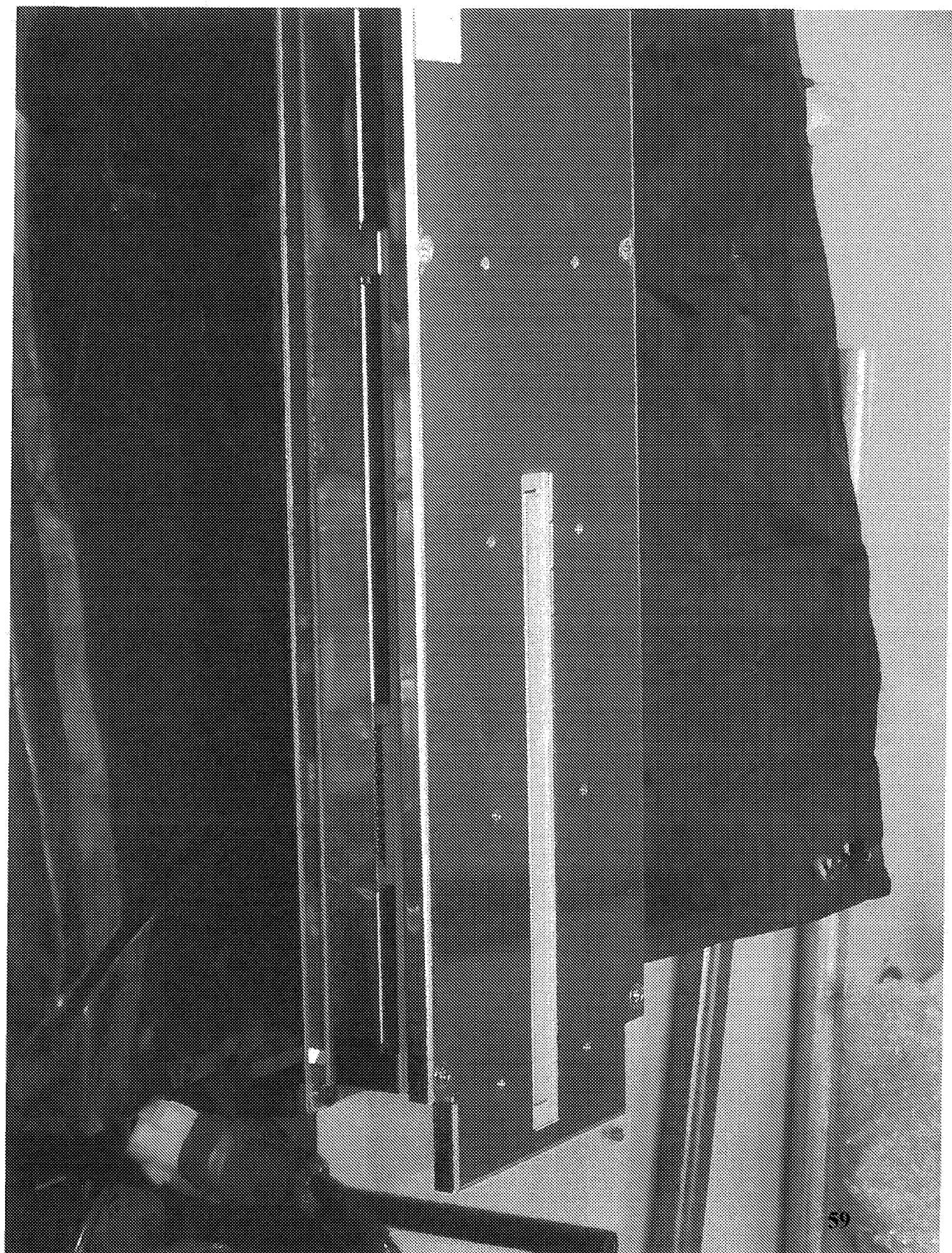












## EXCITATION LIGHT SOURCE ASSEMBLY

### Technical Field

[0001] The present invention relates in general to systems for exciting fluorescent materials and more particularly to systems for exciting fluorescent materials in biomedical imaging applications.

### Summary of the Invention

[0002] In one embodiment, a system for producing excitation light for exciting a fluorescent material may include a support structure having a camera mounted thereto for capturing an image of the fluorescent material. An excitation light assembly is also mounted to the support structure at a position adjacent the camera. The excitation light assembly includes a housing defining a central opening therein as well as a plurality of elongated holes surrounding the central opening. The housing is mounted to the support structure so that a field of view of said camera is unobstructed by the central opening in the housing. A narrow-band light source is positioned within each of the elongated holes provided within the housing. A diffuser positioned adjacent each of the narrow-band light sources diffuses light produced by the corresponding narrow-band light source. A control system operatively connected to each of the narrow-band light sources operates selected ones of the narrow-band light sources to provide a desired excitation illumination to the florescent material.

[0003] Also disclosed is an excitation light source assembly having a housing defining a central opening therein and a plurality of elongated holes surrounding the central opening. The housing is mountable to a support structure having a camera mounted thereto so that a field of view of the camera is unobstructed by the central opening in the housing. A light source is positioned within each of the plurality of elongated holes defined by the housing. A

diffuser positioned adjacent the light source within each of the plurality of elongated holes diffuses light produced by each of the light sources. A control system operatively connected to each of the light sources operates selected ones of the light sources to provide a desired excitation illumination to a fluorescent material within the field of view of the camera.

#### Brief Description of the Drawings

[0004] Illustrative and presently preferred exemplary embodiments of the invention are shown in the drawings in which:

[0005] Figure 1 is a perspective view of one embodiment of an imaging system that may be provided with an excitation light source assembly according to the teachings of the present invention;

[0006] Figure 2 is a front view in elevation of the imaging system of Figure 1 with the certain of the exterior and interior panels removed to show an interior imaging region and the excitation light source assembly of the present invention;

[0007] Figure 3 is a perspective view of the excitation light source assembly showing the alignment of the central opening of the housing with a camera of the imaging system;

[0008] Figure 4 is a front view of the excitation light source assembly showing the central opening and plurality of elongated holes for housing the various light sources;

[0009] Figure 5 is a perspective view of a portion of the support structure with the excitation light source assembly mounted thereto;

[0010] Figure 6 is a cross-sectional view in elevation of the housing of the excitation light source assembly showing the angled relationship of the various elongated holes with respect to the central axis of the housing; and

[0011] Figure 7 is an enlarged side view in elevation of one of the elongated holes in the housing showing the arrangement of the

light source, diffuser, and filter that may be utilized in one embodiment of the invention.

#### Detailed Description of the Preferred Embodiments

[0012] An excitation light source assembly according to one embodiment of the present invention is shown and described herein as it could be used in, or comprise a portion of, an imaging system of the type commonly used in biomedical imaging applications. Briefly, such biomedical imaging systems may be used to capture various types or modes of images from a biomedical object or specimen being analyzed. Common image types or modes that may be captured by such devices include visible light images, wherein visible light reflected by the object or specimen is captured by a camera associated with the imaging system. In another imaging mode, the visible light comprises light that is emitted by the object itself. In such cases, the emitted light may be generated by a bio-luminescence process, a fluorescence process, or by a combination thereof. As is known, light emission by fluorescence results from the prior or simultaneous exposure of the fluorescent material to excitation light of suitable wavelength. Not all fluorescent materials will fluoresce or emit light in response to excitation light of the same wavelength. Consequently, the wavelength of the particular excitation light must be selected so that it will excite the particular fluorescent material involved.

[0013] Because most biomedical imaging systems seek to detect fluorescence from a wide range of fluorescent materials, most such imaging systems are provided with excitation light sources that can be operated to illuminate the fluorescent material with excitation light of the appropriate wavelength. Unfortunately, however, most excitation light sources tend to be expensive and/or difficult to implement in use, and systems are constantly being sought that improve on existing systems.

[0014] Referring now primarily to Figures 1-5, an excitation light source assembly according to one embodiment of the present invention is shown and described herein as it may be used in conjunction with an imaging system of the type commonly used in the biomedical imaging field. In the particular embodiment shown and described herein, the imaging system may comprise a generally rectangularly-shaped housing that defines an imaging chamber therein that is configured to hold the object or specimen to be studied and imaged. In many instances, the object or specimen will contain one or more different kinds of fluorescent materials.

[0015] The housing may be provided with a door therein that may be moved between an opened and closed position. When in the opened position, the door will allow a user (not shown) to readily add or remove the object or specimen to or from an imaging platform or stage provided within the chamber. When the door is closed, it provides a light-tight seal that substantially prevents ambient or external light from entering the chamber. In the particular embodiment shown and described herein, the imaging system is provided with a camera that is mounted to a top plate or support structure associated with the imaging system. The camera defines a field of view (not illustrated in the drawing figures) that may be substantially coextensive with the imaging platform or stage, thereby allowing the camera to capture an image of the object or specimen and/or the fluorescent material associated with the object or specimen.

[0016] In the embodiment shown and described herein, the excitation light source assembly may also be mounted to the top plate or support structure of the imaging system. In one embodiment, the excitation light source assembly comprises a "C"-shaped housing that defines a central opening. The housing also defines a plurality of elongated holes that are arranged around the central opening, as best seen in Figures 3-6. The housing of the

excitation light source assembly is mounted to the support structure so that the camera is located within the central opening defined by the housing. The arrangement is such that the field of view of the camera is substantially unobstructed by the housing and/or central opening of the housing of the excitation light source assembly. As will be described in greater detail below, a light source (typically a narrow-band light source) may be positioned or mounted in each of the elongated holes provided in the housing. A diffuser may also be positioned within each of the elongated holes, generally at a position adjacent the light source. Each diffuser diffuses light produced by the corresponding light source. In addition, and as will be described in greater detail below, each elongated hole may also be provided with a filter, if desired or required, to remove or filter any undesired light wavelengths that may be produced by the light source or narrow-band light source.

[0017] Referring now primarily to Figure 6, the C-shaped housing of the excitation light source assembly allows each of the elongated holes provided therein to be conveniently angled (i.e., with respect to the central axis of the housing), so that light from the light sources may be directed to a desired area within the field of view of the camera--that is, directed to a desired area of the imaging platform or stage so that a desired portion of the object or specimen provided thereon (i.e., the fluorescent material) will be properly illuminated by the excitation light produced by the excitation light source assembly.

[0018] In the particular embodiment shown and described herein, each of the elongated holes defined by the housing are each angled inward, toward the central axis of the housing, by an angle  $\theta$ , as best seen in Figure 6. Such an arrangement allows the excitation light produced by the various light sources provided within the various holes to roughly converge at a point on the central axis

some distance "L" from the excitation light source assembly. The distance L will generally correspond to the position of the object being imaged. Alternatively, other arrangements for aiming or directing elongated openings, thus excitation light emitted thereby, could also be used, as would become apparent to persons having ordinary skill in the art after having become familiar with the teachings provided herein.

[0019] The housing for the excitation light source assembly may be fabricated from any of a wide range of materials, such as metals or plastics, that would be suitable for the intended application. Consequently, the present invention should not be regarded as limited to housings made from any particular materials. However, by way of example, in one embodiment, the housing is fabricated as a single piece from any of a polyoxymethylene thermoplastic material, e.g., Delrin®.

[0020] As mentioned above, each of the elongated holes defined by the housing of the excitation light source assembly is configured to receive a light source suitable for producing excitation light having a wavelength band that comprises at least the wavelength or wavelengths required to excite fluorescence in the particular fluorescent material to be imaged or studied. In addition, because it will be desirable to use the imaging system with a wide range of fluorescent materials, various ones of which will require excitation light having different wavelengths or wavelength bands, in one embodiment, each of the elongated holes defined by the housing will hold a narrow-band light source that emits light having wavelengths (i.e., a wavelength band) that is slightly different from the wavelengths produced by the other light sources. That is, the single housing of the excitation light source assembly can be used to produce excitation light having wavelengths across any desired band.

[0021] By way of example, in one embodiment, the excitation light source assembly is capable of emitting excitation light over a wavelength range from about 430 nanometers (nm) to about 745 nm. Therefore, it will be generally desirable to use for each light source a comparatively "narrow-band" light source that emits wavelengths over a fairly narrow band. Generally speaking, narrow-band light sources having wavelength bands in the range of about 30 nm to about 35 nm could be used to advantage in the present invention. If such narrow-band light sources are used, ten (10) such narrow-band light sources, properly selected, and positioned in the ten (10) elongated holes defined by the C-shaped housing will be sufficient to cover this excitation light range.

[0022] Still referring to Figure 6, each narrow-band light source provided in each elongated hole should be selected to cover a specific wavelength range or band within the desired overall wavelength range or band (e.g., 430-745 nm) desired to be covered by the excitation light source assembly. Generally speaking, light emitting diodes (LEDs) that emit light in various narrow wavelength bands (e.g., bands having widths of about 30-35 nm) are available. Accordingly, various narrow-band LED light sources may be selected to cover the desired wavelength range. However, in this regard it should be noted that suitable LEDs that emit or produce light in each of the desired wavelength bands may not be available. If so, it may be necessary to use broader-band LEDs, i.e., that emit light having wavelengths outside the desired wavelength range. If so, such LEDs or broad-band light sources may be used in combination with a filter element to filter or remove the undesired wavelengths, as will be described in greater detail below.

[0023] The various LEDs that may be used with the present invention may comprise any of a wide range of LEDs that are now known in the art or that may be developed in the future that produce light in the desired wavelength ranges. However, because

such LEDs are well-known in the art and could be readily provided by persons having ordinary skill in the art after having become familiar with the teachings provided herein, the particular LEDs that may be utilized in one embodiment of the invention will not be described in further detail herein.

[0024] It is also generally preferred, but not required, to provide a diffuser within each elongated opening, generally at a position immediately adjacent the light source. As its name implies, the diffuser diffuses light produced by the light source, thereby generally providing more even illumination of the object (i.e., fluorescent material) than that provided by the light source alone. The diffuser may comprise any of a wide range of optical diffusers that are now known in the art or that may be developed in the future that are or would be suitable for the particular application. However, because optical diffusers are well-known in the art and could be readily provided by persons having ordinary skill in the art after having become familiar with the teachings provided herein, the particular diffusers that may be used in one embodiment of the invention will not be described in further detail herein.

[0025] As briefly mentioned above, the light output characteristics of the various light sources (e.g., LEDs) that may be utilized in the excitation light source assembly may be such that it is required, or at least desirable, to further limit the wavelength range of excitation light produced by each light source. This may be the case regardless of whether the particular light source involved is a "narrow-band" light source. Accordingly, in one embodiment, each elongated hole defined by the housing may also be provided with a filter element therein that is configured to remove or filter undesired wavelengths produced by the corresponding light source. In the particular embodiment shown and described herein, each such filter may be positioned adjacent the

diffuser, as best seen in Figures 6 and 7. Alternatively, other arrangements are possible.

[0026] In the particular embodiment shown and described herein, each filter element comprises a "notch" type filter having a relatively narrow wavelength bandpass range of about 30 nm. Such notch type filters are available over a wide range of wavelengths. In one embodiment of the invention, a separate notch filter is provided for each light source, narrow-band or otherwise and the notch filter wavelength is selected as appropriate for the particular light source with which it is paired. Thus, when individually activated, each light source/filter combination will emit excitation light having a bandwidth of about 30 nm somewhere within the desired overall wavelength range (e.g., from about 430 nm to about 745 nm) desired to be covered by the excitation light source assembly.

[0027] Each of the various light sources provided in the elongated holes defined by the housing may be operatively connected to a control system (not shown) suitable for operating the various light sources, i.e., turning them "on" and "off." In one embodiment, the light sources may be individually controlled, so that a single light source, emitting excitation light in a single wavelength range or band, may be used to excite the desired fluorescent material contained in the object or specimen being studied. Alternatively, other arrangements are possible. For example, in another embodiment, the control system may operate two or more light sources simultaneously. Such an operational mode may be used to simultaneously excite two or more different kinds of fluorescent materials, which will then fluoresce. Still other arrangements and variations are possible, as would become apparent to persons having ordinary skill in the art after having become familiar with the teachings provided herein. Consequently, the present invention should not be regarded as limited to the

particular elements, applications, and methods shown and described herein.

[0028] Having herein set forth preferred embodiments of the present invention, it is anticipated that suitable modifications can be made thereto which will nonetheless remain within the scope of the invention. The invention shall therefore only be construed in accordance with the following claims:

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Immersible  
Assembly

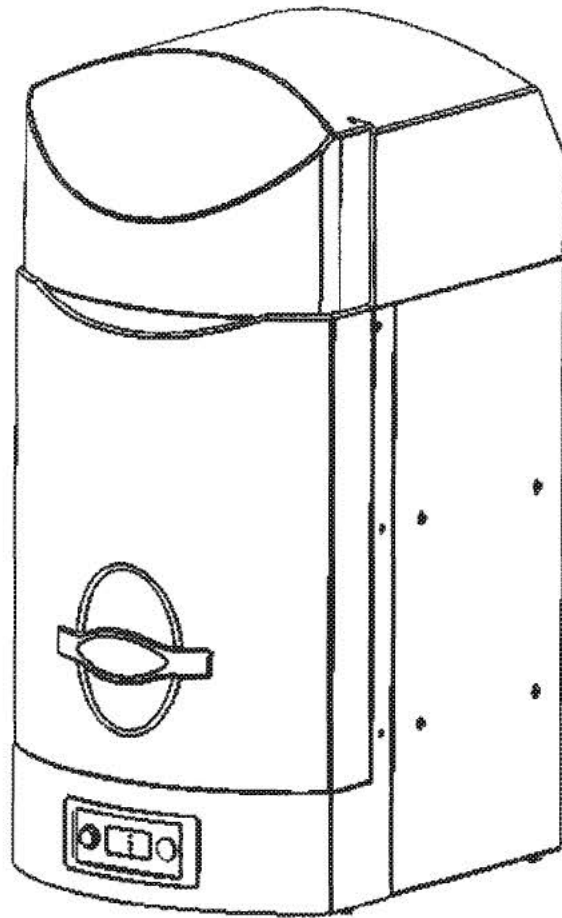


FIG. 1

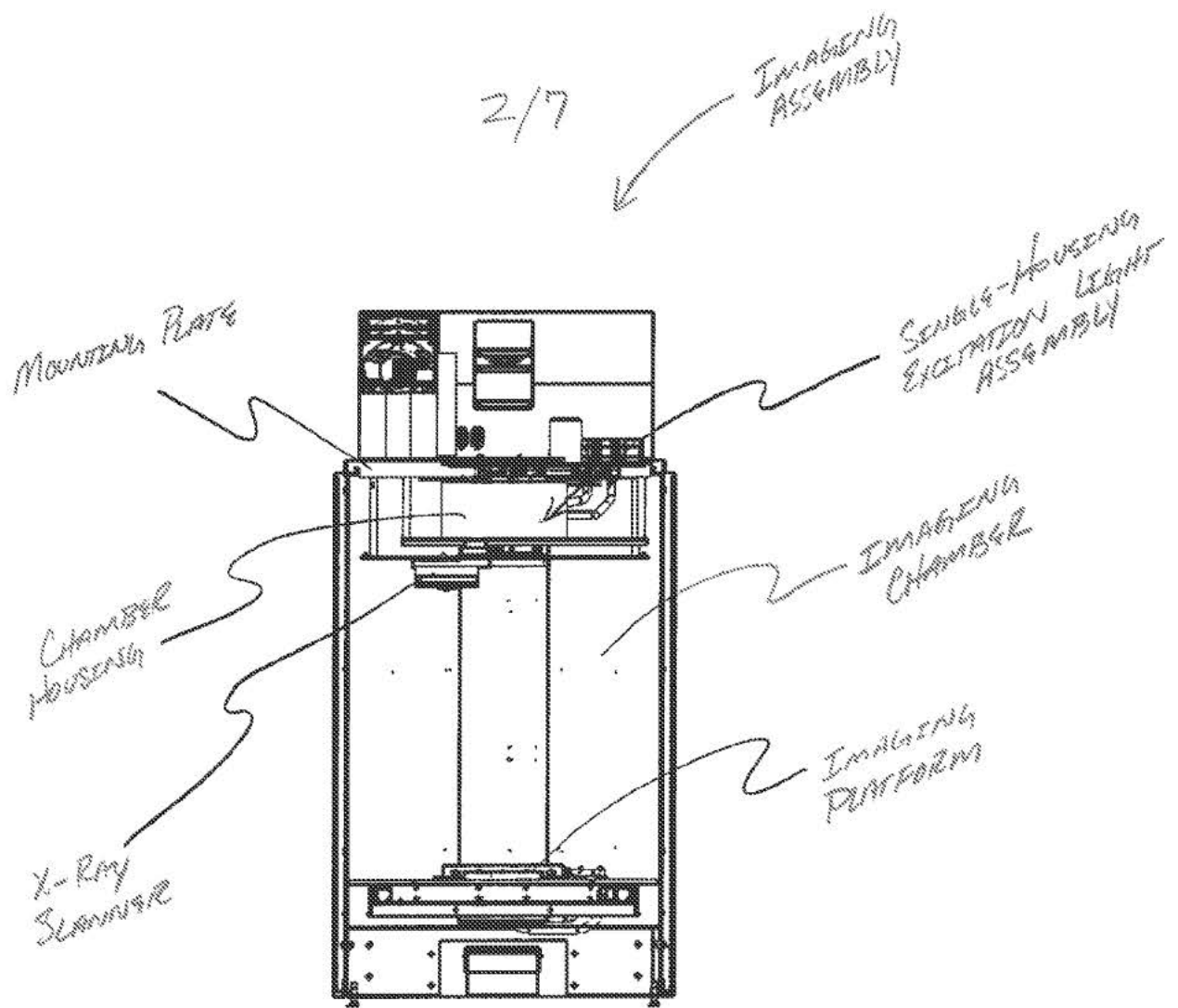


FIG. 2

3/7

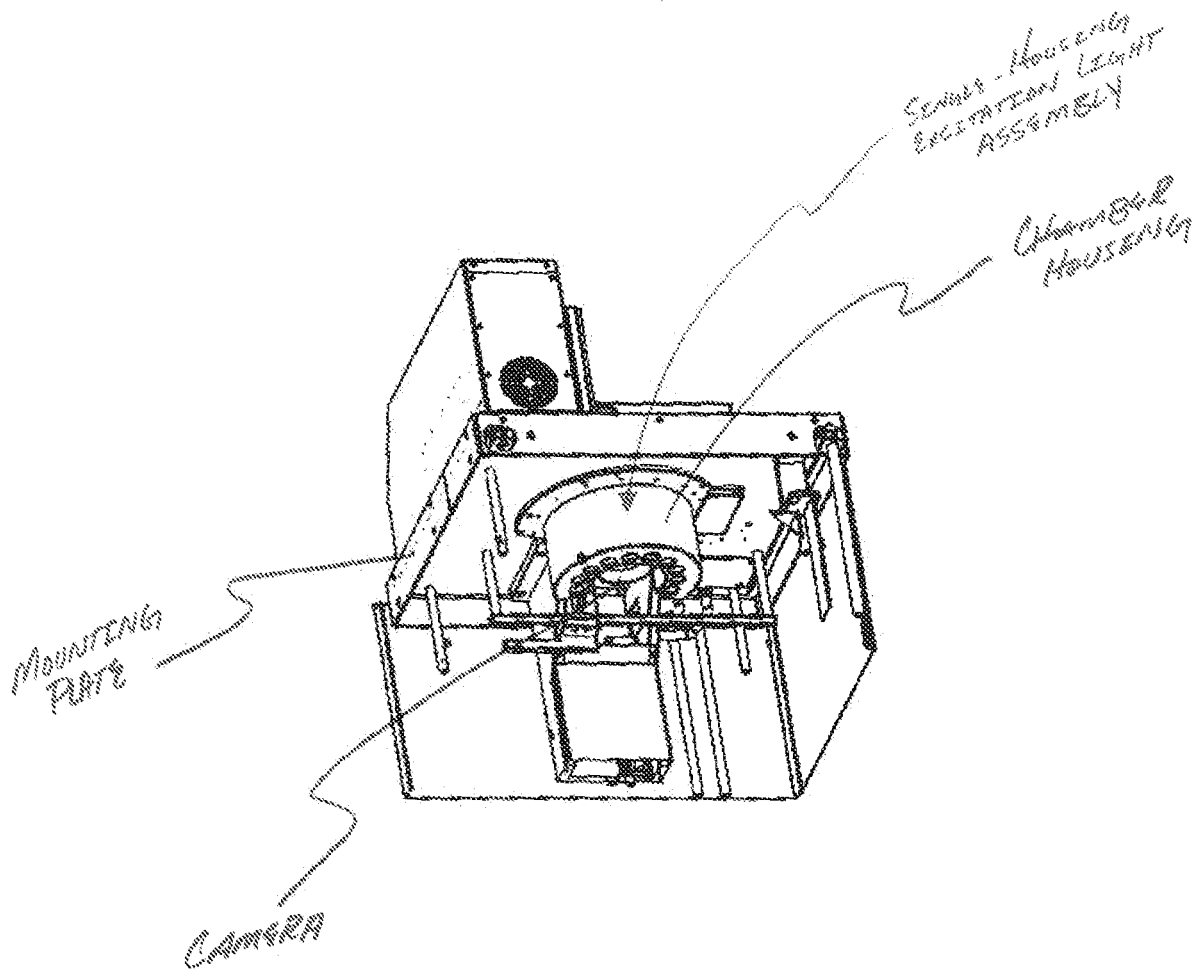


FIG. 3

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LED CHAMBER

Sensor-Housing  
Excitation Assembly  
Base Plate

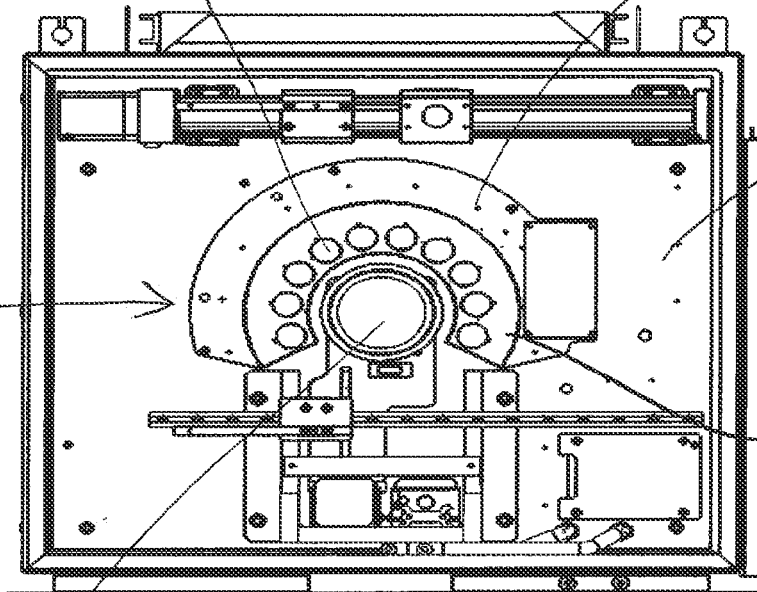
Mounting  
Plate

Camera  
Housing

Sensor-Housing  
Excitation Light  
Assembly

Camera

FIG. 4



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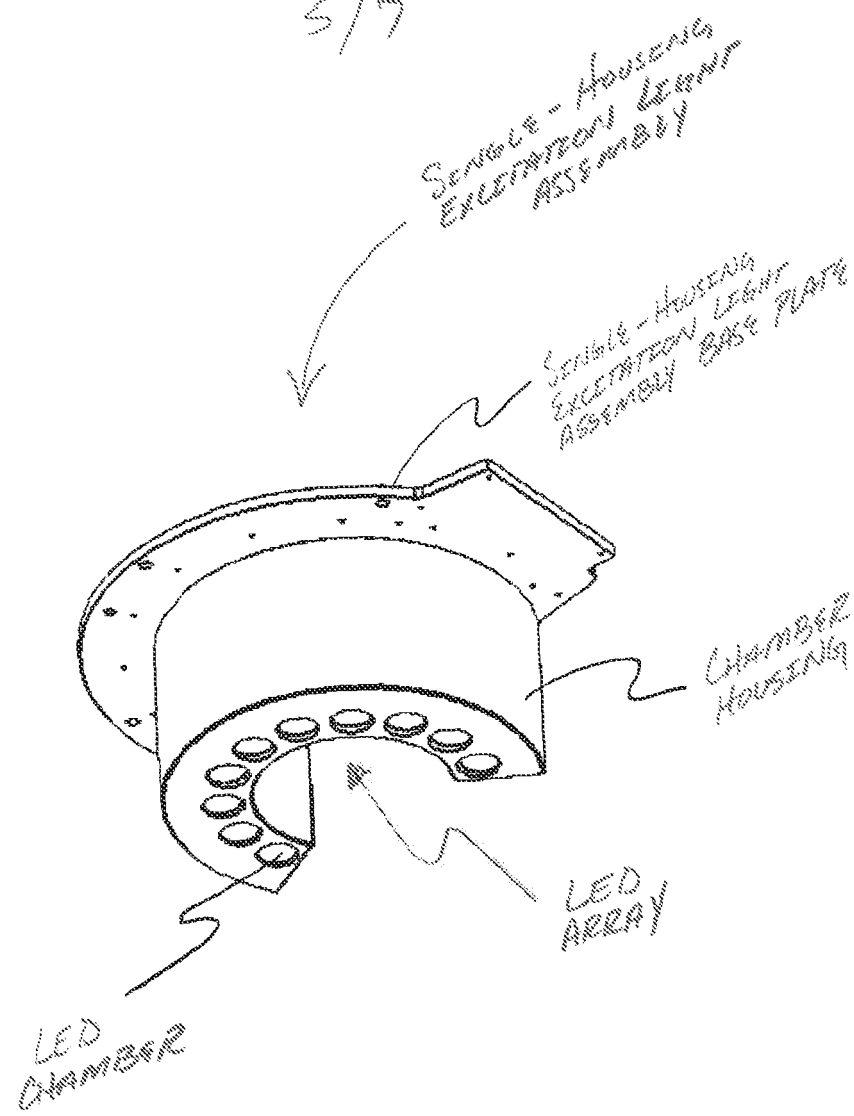


Fig. 5

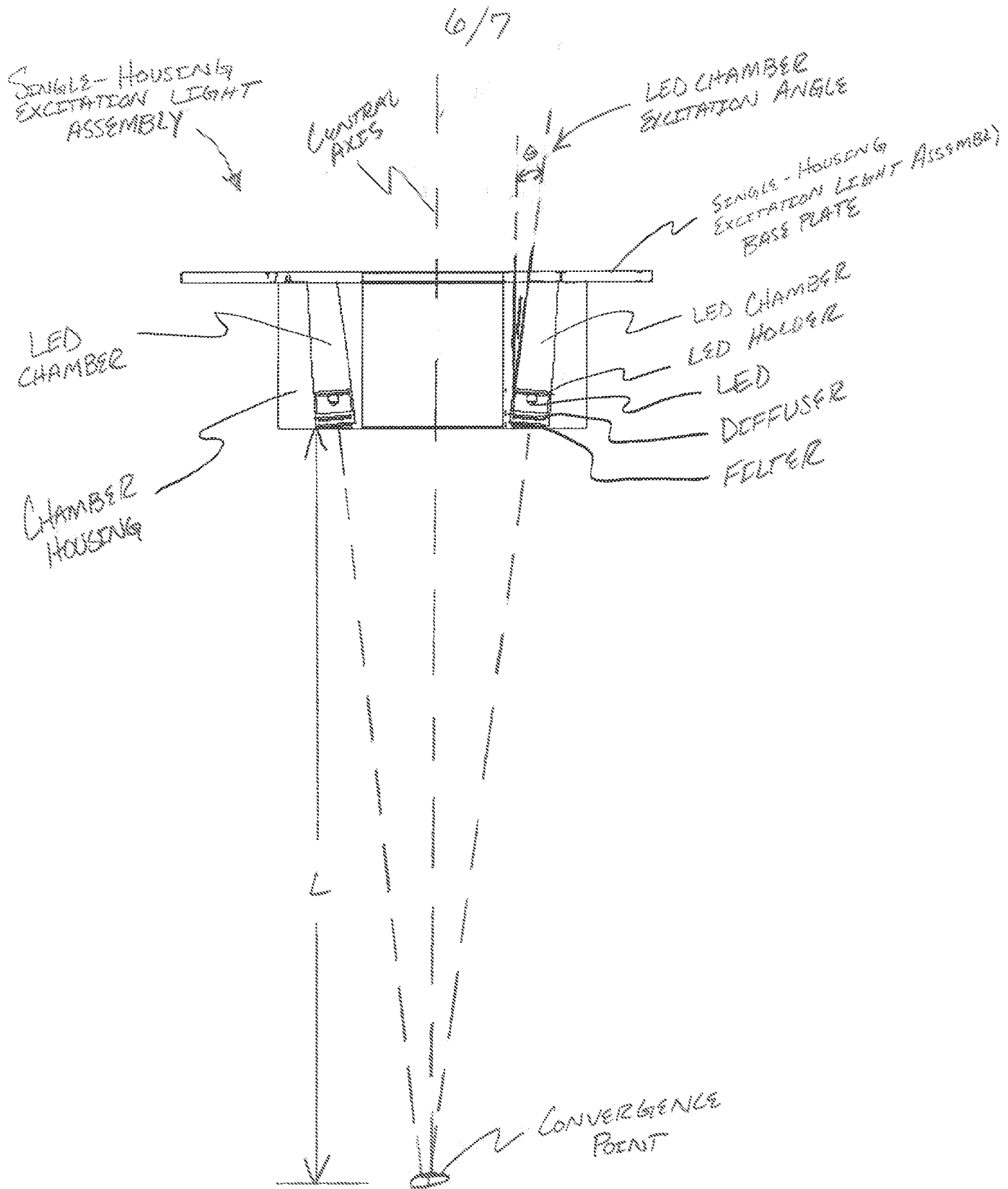


FIG. 6

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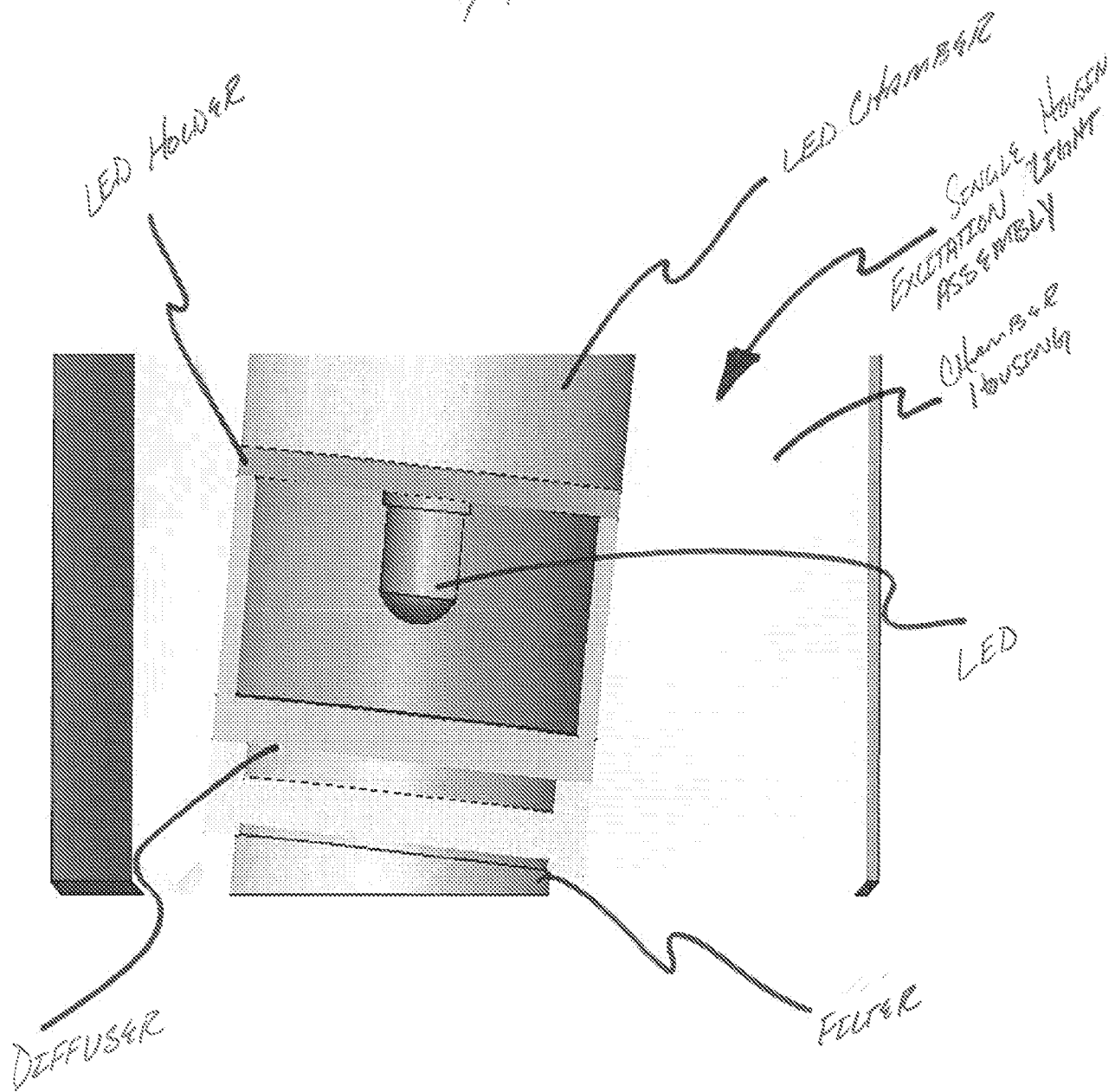


FIG. 7

## Electronic Acknowledgement Receipt

|                                             |                                  |
|---------------------------------------------|----------------------------------|
| <b>EFS ID:</b>                              | 8340660                          |
| <b>Application Number:</b>                  | 61379282                         |
| <b>International Application Number:</b>    |                                  |
| <b>Confirmation Number:</b>                 | 6512                             |
| <b>Title of Invention:</b>                  | EXCITATION LIGHT SOURCE ASSEMBLY |
| <b>First Named Inventor/Applicant Name:</b> | Michael B. Nelson                |
| <b>Customer Number:</b>                     | 27104                            |
| <b>Filer:</b>                               | Bruce E. Dahl/Cynthia Sullivan   |
| <b>Filer Authorized By:</b>                 | Bruce E. Dahl                    |
| <b>Attorney Docket Number:</b>              | SPEC US-4 PRV (27560-006)        |
| <b>Receipt Date:</b>                        | 01-SEP-2010                      |
| <b>Filing Date:</b>                         |                                  |
| <b>Time Stamp:</b>                          | 18:52:14                         |
| <b>Application Type:</b>                    | Provisional                      |

### Payment information:

|                                          |                 |
|------------------------------------------|-----------------|
| Submitted with Payment                   | yes             |
| Payment Type                             | Deposit Account |
| Payment was successfully received in RAM | \$ 220          |
| RAM confirmation Number                  | 17755           |
| Deposit Account                          | 060590          |
| Authorized User                          |                 |

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees) **77**

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

### File Listing:

| Document Number                                                                                                                                                                                            | Document Description                                | File Name    | File Size(Bytes)/<br>Message Digest       | Multi Part /.zip | Pages (if appl.) |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|--------------|-------------------------------------------|------------------|------------------|
| 1                                                                                                                                                                                                          |                                                     | PRV-4.PDF    | 2979083                                   | yes              | 43               |
|                                                                                                                                                                                                            |                                                     |              | 737841f10194154f46cbb620a6abeaf8ccf2e0cd  |                  |                  |
|                                                                                                                                                                                                            | Multipart Description/PDF files in .zip description |              |                                           |                  |                  |
|                                                                                                                                                                                                            | Document Description                                |              | Start                                     | End              |                  |
|                                                                                                                                                                                                            | Provisional Cover Sheet (SB16)                      |              | 1                                         | 2                |                  |
|                                                                                                                                                                                                            | Application Data Sheet                              |              | 3                                         | 5                |                  |
|                                                                                                                                                                                                            | Specification                                       |              | 6                                         | 19               |                  |
|                                                                                                                                                                                                            | Appendix to the Specification                       |              | 20                                        | 36               |                  |
|                                                                                                                                                                                                            | Drawings-only black and white line drawings         |              | 37                                        | 43               |                  |
| Warnings:                                                                                                                                                                                                  |                                                     |              |                                           |                  |                  |
| The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing |                                                     |              |                                           |                  |                  |
| Information:                                                                                                                                                                                               |                                                     |              |                                           |                  |                  |
| 2                                                                                                                                                                                                          | Fee Worksheet (PTO-875)                             | fee-info.pdf | 29746                                     | no               | 2                |
|                                                                                                                                                                                                            |                                                     |              | 20ecfae4ae18d03242bf1be1743820a886b95779c |                  |                  |
| Warnings:                                                                                                                                                                                                  |                                                     |              |                                           |                  |                  |
| Information:                                                                                                                                                                                               |                                                     |              |                                           |                  |                  |
| Total Files Size (in bytes):                                                                                                                                                                               |                                                     |              | 3008829                                   |                  |                  |

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

**New Applications Under 35 U.S.C. 111**

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

**National Stage of an International Application under 35 U.S.C. 371**

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

**New International Application Filed with the USPTO as a Receiving Office**

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

**CLAIMS:**

1. An assembly, comprising:
  - a support structure;
  - a camera mounted to said support structure;
  - an excitation light source assembly mounted to said support structure, said excitation light source assembly comprising:
    - a housing defining a central opening therein and a plurality of elongated holes surrounding the central opening, said housing being mounted to said support structure so that the central opening is aligned with said camera, so that a field of view of said camera is unobstructed by said housing;
    - a narrow-band light source positioned within each of the plurality of elongated holes; and
    - a diffuser positioned adjacent said narrow-band light source positioned within each of the plurality of elongated holes, each of said diffusers diffusing light produced by each of said narrow-band light sources; and
    - a control system operatively connected to each of said narrow-band light sources positioned within said plurality of elongated holes, said control system operating selected ones of said narrow-band light sources to provide a desired excitation illumination to a fluorescent material within the field of view of said camera.
2. The assembly of claim 1, further comprising a light filter positioned adjacent each of the diffusers.
3. The assembly of claim 1, wherein each of the elongated holes defined by said housing are angled with respect to a central axis of said housing so that light emitted from each of said

narrow-band light sources is directed to a desired area within the field of view of said camera.

4. The assembly of claim 1, wherein each of said narrow-band light sources is selected to provide desired number of illumination bands over a desired spectral range.

5. The assembly of claim 4, wherein the desired spectral range is from about 430 nm to about 745 nm.

6. The assembly of claim 4, wherein the desired number of illumination bands is 10.

7. The assembly of claim 4, wherein each desired illumination band has a spectral width ranging from about 30 nm to about 35 nm.

8. The assembly of claim 1, wherein each of said narrow band light sources comprises a light emitting diode.

9. The assembly of claim 1, wherein said housing comprises a polyoxymethylene thermoplastic material.

10. The assembly of claim 9, wherein said polyoxymethylene thermoplastic material comprises Delrin.

11. An excitation light source assembly, comprising:

a housing defining a central opening therein and a plurality of elongated holes surrounding the central opening, said housing being mountable to a support structure so that the central opening is aligned with a camera also mounted to

the support structure, so that a field of view of the camera is unobstructed by said housing;

a light source positioned within each of the plurality of elongated holes; and

a diffuser positioned adjacent said light source positioned within each of the plurality of elongated holes, each of said diffusers diffusing light produced by each of said light sources; and

a control system operatively connected to each of said light sources positioned within said plurality of elongated holes, said control system operating selected ones of said light sources to provide a desired excitation illumination to an object within the field of view of said camera.

12. The excitation light source assembly of claim 11 wherein at least one of said light sources comprises a narrow-band light source that emits light in a wavelength range of about 35 nm.

13. The excitation light source assembly of claim 12 wherein said at least one narrow-band light source comprises a light emitting diode.

14. The excitation light source assembly of claim 11, further comprising at least one light filter positioned adjacent at least one diffuser in at least one of the elongated holes defined by said housing.

15. The excitation light source assembly of claim 14, wherein said at least one light filter comprises a notch filter having a wavelength bandpass range of about 30 nm.

#### ABSTRACT OF THE DISCLOSURE

An excitation light source assembly having a housing defining a central opening therein and a plurality of elongated holes surrounding the central opening. The housing is mountable to a support structure having a camera mounted thereto so that a field of view of the camera is unobstructed by the central opening in the housing. A light source is positioned within each of the plurality of elongated holes defined by the housing. A diffuser positioned adjacent the light source within each of the plurality of elongated holes diffuses light produced by each of the light sources. A control system operatively connected to each of the light sources operates selected ones of the light sources to provide a desired excitation illumination to a fluorescent material within the field of view of the camera.



DAHL, Bruce E.  
Fennemore Craig, P.C.  
1700 Lincoln Street  
Suite 2900  
Denver, Colorado 80203  
ETATS-UNIS D'AMERIQUE

**For any questions about  
this communication:**

Tel.: +31 (0)70 340 45 00

Date

11.01.13

|                                                           |                                                                  |
|-----------------------------------------------------------|------------------------------------------------------------------|
| Reference                                                 | Application No./Patent No.<br>11822574.7 - 1240 PCT/US2011049998 |
| Applicant/Proprietor<br>Spectral Instruments Imaging, LLC |                                                                  |

### Entry into the European phase before the European Patent Office

The following information describes the procedural steps required for entry into the European phase before the European Patent Office (EPO). You are advised to read it carefully because failure to take the necessary action in due time can lead to a loss of rights.

1. The above mentioned international patent application has been given the **European application No. 11822574.7**.
2. Applicants **without a residence or their principal place of business** in an EPC Contracting State may themselves initiate European processing of their international applications, provided they do so before expiry of the 31st month from the priority date.

During the European phase before the EPO as designated or elected Office, however, such applicants **must** be represented by a professional representative (Art. 133(2) and Art. 134(1) and (8) EPC).

Where, at the expiry of the time period laid down in Rule 163(5) EPC, the requirements of Article 133(2) EPC have not been complied with, the European patent application will be **refused**, pursuant to Rule 163(6) EPC.

Please note that a professional representative authorised to act before the EPO and who acted for the applicant during the international phase does not automatically become the representative for the European phase. Applicants are therefore strongly advised to appoint in good time any representative they wish to initiate the European phase for them; otherwise the EPO has to send all communications directly to the applicant.

3. Applicants **with a residence or their principal place of business** in an EPC Contracting State are not obliged to appoint for the European phase a professional representative authorised to act before the EPO. However, in view of the complexity of the procedure it is recommended that they do so.
4. Applicants and professional representatives are also strongly advised to initiate the European phase using **EPO Form 1200**. It is available free of charge from the EPO or via the EPO website at **www.epo.org**. Similarly, it can be or generated with the Online Filing software, obtainable free of charge from the EPO (**www.epoline.org**) The use of the form is not compulsory.

- 
5. Where the EPO acts as designated or elected Office (Art. 22(1) and (3) and 39(1) PCT), to enter the European phase before the EPO, the **following acts** must be performed by the applicant within **31 months** from the date of filing of the international application or (where applicable) the earliest priority date:
- a) Supply a translation of the international application into an EPO official language, if the International Bureau did not publish the application in such language (Art. 22(1) PCT and R. 159(1)(a) EPC);
  - b) Specify the application documents, as originally filed or as amended, on which the European grant procedure is to be based (R. 159(1)(b) EPC);
  - c) Pay the filing fee and, where applicable, the additional fee for a European patent application comprising more than 35 pages (R. 159(1)(c) EPC, Art. 2, items 1, 1a Rules relating to Fees);
  - d) Pay the search fee where a supplementary European search report has to be drawn up (R. 159(1)(e) EPC);
  - e) Pay the designation fee if the time limit laid down in Rule 39(1) EPC (i.e. six months after publication of the international search report) has expired before the 31-month period pursuant to Rule 159(1) EPC (R. 159(1)(d) EPC);
  - f) File the written request for examination and pay the examination fee if the time limit laid down in Rule 70(1) EPC has expired before the 31-month period pursuant to Rule 159(1) EPC (R. 159(1)(f) EPC);
  - g) Pay the renewal fee in respect of the third year, if the fee has fallen due (see Rule 51(1) EPC) before expiry of the 31-month period pursuant to Rule 159(1) EPC (R. 159(1)(g) EPC);
  - h) File, where applicable, the certificate of exhibition referred to in Article 55(2) and Rule 25 EPC (R. 159(1)(h) EPC);
  - i) Pay the claims fees for the sixteenth and each subsequent claim when the application documents on which the European grant procedure is to be based comprise more than fifteen claims (R. 162(1) EPC). For applications entering the European phase on or after 1 April 2009, a higher amount is payable for the 51st and each subsequent claim (Decision of the Administrative Council of 14 December 2007 amending the Rules relating to Fees, OJ EPO 2008, 10).

If either the translation of the international application or the request for examination is not filed in time, or if the filing fee, the additional fee, the search fee, the designation fee or the examination fee is not paid in due time, the application shall be deemed to be withdrawn (R. 160(1) EPC).

## 6. Payment of fees

An up-to-date guidance for the payment of fees, expenses and prices and a list of the euro accounts of the European Patent Organisation are published in each issue of the Official Journal of the EPO. The guidance includes inter alia a reference to the latest version of the Schedule of fees and expenses where the amounts of fees are set out.

The Schedule of fees and expenses, published as a Supplement to the Official Journal of the EPO, is also available on the EPO website ([www.epo.org](http://www.epo.org)) and can be found under **[www.epo.org/schedule-of-fees](http://www.epo.org/schedule-of-fees)**, which allows the viewing, downloading and searching for individual fee amounts, both current and previous.

Applicants should always check the fee amounts applying at the time of payment.

Payments can be validly made by any person. Permissible methods of payment are laid down in Article 5 Rules relating to Fees. Please note that payment cannot be made by cheque sent to the EPO.

For information on the calculation of the additional fee for applications comprising more than 35 pages, see Notice from the European Patent Office dated 26 January 2009 concerning the 2009 fee structure (OJ EPO 2009, 118), Notice supplementing the notice from the European Patent Office dated 26 January 2009 concerning the 2009 fee structure (OJ EPO 2009, 338) and Guidelines for Examination in the EPO, April 2010, A-III, 13.2.

For an overview of search and examination fees, see Notice from the European Patent Office dated 8 February 2010 (OJ EPO 2010, 133). Fee information is also published on the EPO website under **[www.epo.org/fees](http://www.epo.org/fees)**.

## 7. Restoration of priority right

Where the international application contains a priority claim to an earlier application and it has been filed within two months from the expiration of the 12-month priority period, a request for restoration before the EPO as designated Office (R. 49ter.2 PCT) applies under the following circumstances:

- a) No request for restoration filed before the receiving Office (RO) during the international phase (R. 26bis.3 PCT)
- b) Negative decision by the RO irrespective of the criterion applied (due care/ unintentionality)
- c) Positive decision by the RO based on the unintentionality criterion.

For a request to be admissible, it must be filed and the requisite fee must be paid (R. 49ter.2(b)(iii) and R. 49ter.2(d) PCT) within one month from the applicable time limit under Article 22 PCT for entering the regional phase (R. 49ter.2(b)(i) PCT). The request for restoration also needs to state the reasons for the failure to file the international application within the priority period (Rule 49ter.2(b)(ii) PCT).

8. If the applicant had appointed a representative during the application's international phase, the present Form will be sent to the representative, asking him to inform the applicant accordingly.  
All subsequent communications will be sent to the applicant, or - if the EPO is informed of his appointment in time - to the applicant's European representative.
9. For more details about time limits and procedural acts before the EPO as designated or elected Office, see the EPO brochure "How to get a European patent", Guide for applicants - Part 2, PCT procedure before the EPO - "Euro-PCT".  
This brochure, the list of professional representatives before the EPO as well as Form 1200 are available on the Internet under **[www.epo.org](http://www.epo.org)**.

## Receiving Section



# Entry into the European phase (EPO as designated or elected Office)

To the European Patent Office

|                                                      |                   |
|------------------------------------------------------|-------------------|
| European application number                          | EP11822574.7      |
| PCT application number                               | PCT/US2011/049998 |
| PCT publication number                               | WO2012030981      |
| Applicant's or representative's reference            | P102377EP51       |
| International Filing Date                            | 31.08.2011        |
| International Searching Authority (ISA)              | US                |
| International Preliminary Examining Authority (IPEA) | not applicable    |

## 1. Applicant

Indications concerning the applicant(s) are contained in the international publication or were recorded by the International Bureau after the international publication.

Changes which have not yet been recorded by the International Bureau are set out here:



## 2. Representative

This is the representative who will be listed in the Register of European Patents and to whom notifications will be made

### Representative 1

Name: Clarke, Mr. Geoffrey

Company: Avidity IP

Address of place of business: Kestrel House  
Falconry Court  
Baker's Lane  
Epping, Essex, CM16 5DQ  
United Kingdom

Telephone: +44 (0)1992 561756

Fax: +44 (0)1992 561934

e-mail: mail@avidity-ip.com

### Representative 2

Name: Wilkinson, Dr. Marc

Company: Avidity IP

Address of place of business: Kestrel House  
Falconry Court  
Baker's Lane  
Epping, Essex, CM16 5DQ  
United Kingdom

Telephone: +44 (0)1992 561756

Fax: +44 (0)1992 561934

e-mail: mail@avidity-ip.com

## 3. Authorisation

An individual authorisation is attached.

A general authorisation has been registered under No:

A general authorisation has been filed, but not yet registered.

The authorisation filed with the EPO as PCT receiving Office expressly includes the European phase.



## 4. Request for examination

Examination of the application under Art. 94 EPC is hereby requested. The examination fee is being (has been, will be) paid.



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Request for examination in an admissible non-EPO language:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <input type="checkbox"/>                                                                                                                                                                                                  |
| The applicant waives his right to be asked under Rule 70(2) EPC whether he wishes to proceed further with the application.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <input type="checkbox"/>                                                                                                                                                                                                  |
| <b>5. Copies</b><br>Additional copies of the documents cited in the supplementary European search report are requested.<br>Number of additional sets of copies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <input type="checkbox"/>                                                                                                                                                                                                  |
| <b>6. Documents intended for proceedings before the EPO</b><br>Number of claims on entry into the European phase:<br><br>6.1 Proceedings before the EPO as designated Office (PCT I) are to be based on the following documents:<br>the application documents published by the International Bureau (with all claims, description and drawings), where applicable with amended claims under Art. 19 PCT<br>unless replaced by the amendments attached.<br><br><i>Where necessary, clarifications should be attached as 'Other documents'</i><br>6.2 Proceedings before the EPO as elected Office (PCT II) are to be based on the following documents:<br>the documents on which the international preliminary examination report is based, including any annexes<br>unless replaced by the amendments attached.<br><br><i>Where necessary, clarifications should be attached as 'Other documents'</i><br>If the EPO as International Preliminary Examining Authority has been supplied with test reports, these may be used as the basis of proceedings before the EPO.<br>6.3 A copy of the results of the search carried out by the authority with which the previous application(s) whose priority is claimed was (were) filed is attached (R. 141(1) EPC).<br>6.4 The applicant waives his right to the communication under Rules 161(1) or (2) and 162 EPC. | 10<br><br><input type="checkbox"/><br><input checked="" type="checkbox"/><br><br><input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/> |
| <b>7. Translations</b><br>Translations in one of the official languages of the EPO (English, French, German) are attached as crossed below:<br><br><i>* In proceedings before the EPO as designated or elected Office (PCT I + II):</i><br>Translation of the international application (description, claims, any text in the drawings) as originally filed, of the abstract as published and of any indication under Rule 13bis.3 and 13bis.4 PCT regarding biological material<br>Translation of the priority application(s) (to be filed only at the EPO's request, Rule 53(3) EPC)<br>It is hereby declared that the international application as originally filed is a complete translation of the previous application (Rule 53(3) EPC)<br><i>* In addition, in proceedings before the EPO as designated Office (PCT I):</i><br>Translation of amended claims and any statement under Art. 19 PCT, if the claims as amended are to form the basis for the proceedings before the EPO (see Section 6).<br><i>* In addition, in proceedings before the EPO as elected Office (PCT II):</i><br>Translation of annexes to the international preliminary examination report                                                                                                                                                                                     | <input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/><br><input type="checkbox"/>                          |
| <b>8. Biological material</b><br>The invention uses and/or relates to biological material deposited under Rule 31 EPC.<br>The particulars referred to in Rule 31(1)(c) EPC (if not yet known, the depositary institution and the identification reference(s)) [number, symbols, etc.] of the depositor) are given in the international publication or in the translation submitted in Section 7 on:<br>page(s) / line(s)<br>The receipt(s) of deposit issued by the depositary institution is (are) enclosed.<br>will be filed later.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <input type="checkbox"/><br><input type="checkbox"/><br><br><input type="checkbox"/><br><input type="checkbox"/>                                                                                                          |

Waiver of the right to an undertaking from the requester pursuant to Rule 33(2) EPC attached.

## 9. Nucleotide and amino acid sequences

The international application discloses nucleotide and/or amino acid sequences.

9.1 The sequence listing was filed under Rule 5.2(a) PCT, or furnished to the EPO as ISA under Rule 13ter.1(a) PCT, or is otherwise available to the EPO, in computer-readable format in accordance with WIPO ST.25.

9.2

The sequence listing is attached in computer-readable format in accordance with WIPO Standard ST.25

The sequence listing is attached in PDF format.

The sequence listing does not include matter which goes beyond the content of the application as filed.

## 10. Designation fees

All the contracting states party to the EPC at the time of filing of the international patent application and designated in the international application are deemed to be designated (see Article 79(1) EPC).

The following states, which were contracting states to the EPC at the time of filing of the international application, are designated:

AL AT BE BG CH&LI CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LT LU  
LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

## 11. Extension of the European patent

This application is deemed to be a request to extend the European patent application and the European patent granted in respect of it to all the non-contracting states to the EPC designated in the international application and with which extension agreements are in force on the date on which the international application is filed. However, the extension only takes effect if the prescribed extension fee is paid.

It is currently intended to pay the extension fee for the following states:

Note: Under the automatic debiting procedure, extension fees will only be debited for states indicated here, unless the EPO is instructed otherwise before expiry of the period for payment.

## 12. List of enclosed documents

|   | Description of document             | Original file name                 | Assigned file name |
|---|-------------------------------------|------------------------------------|--------------------|
| 1 | Combined Amendments                 | P102377EP51cl.pdf                  | AMSPECEPO-1.pdf    |
| 2 | Sheet of Additional Representatives | Additional Reps as at 21 02 13.pdf | OTHER-1.pdf        |
| 3 | Letter regarding amended claims     | P102377EP51L1.pdf                  | OTHER-2.pdf        |

13. Mode of payment: Debit from deposit account

Currency

The European Patent Office is hereby authorised, to debit from the deposit account with the EPO any fees and costs indicated on the fees page.

Deposit account number

Account holder

EUR

## Avidity IP

14. Any refunds should be made to the following EPO deposit account:

Number and account holder

Avidity IP, 28050142

## 15. Fees

| 15-1-2005 |                                                                                                         | Factor/reduction applied | Fee schedule | Amount to be paid |
|-----------|---------------------------------------------------------------------------------------------------------|--------------------------|--------------|-------------------|
| 15-1      | 002 Fee for a European search - Applications filed on/after 01.07.2005                                  | -190                     | 1 165.00     | 975.00            |
| 15-2      | 005e Designation fee - For all contracting States designated for applications filed on/after 01.04.2009 | 1                        | 555.00       | 555.00            |
| 15-3      | 006 Examination fee - For applications filed on/after 01.07.2005                                        | 1                        | 1 555.00     | 1 555.00          |
| 15-4      | 020 Filing fee - entry EP phase - online                                                                | 1                        | 115.00       | 115.00            |
| 15-5      | 520 Additional filing fee for the 36th and each subsequent page                                         | 0                        | 14.00        | 0.00              |

|                                                           |                                    |                                                                                                                        |          |
|-----------------------------------------------------------|------------------------------------|------------------------------------------------------------------------------------------------------------------------|----------|
| - entry into EP phase                                     | Total:                             | EUR                                                                                                                    | 3 200.00 |
| <b>16. Annotations</b>                                    |                                    |                                                                                                                        |          |
| 16-1. Note (for EPO) (EP Phase)                           |                                    | Additional Representatives<br>(Representative)<br>A list of additional<br>representatives is attached to<br>this form. |          |
| <b>17. Signature(s) of applicant(s) or representative</b> |                                    |                                                                                                                        |          |
| Place:                                                    | Cambridge, UK.                     |                                                                                                                        |          |
| Date:                                                     | 19 March 2013                      |                                                                                                                        |          |
| Signed by:                                                | GB, avidity IP, M. Wilkinson 27785 |                                                                                                                        |          |
| Capacity:                                                 | (Representative)                   |                                                                                                                        |          |

## Table for section 6 of Form 1200.3

In accordance with the Notice from the European Patent Office dated 26 January 2009 concerning the 2009 fee structure (OJ EPO 2009, 118, and Guidelines for Examination in the EPO, April 2009, A-III, 13.2), the amount of the additional fee (Art. 2, item 1a, Rules relating to Fees) for the pages of this European patent application is calculated as follows:

**Documents intended for proceedings before the EPO (R. 159 (1) (b) EPC) and for calculating the additional fee (Art. 2, item 1a, RFees):**

|                                                              | Page(s) from ... to ... | Number of pages |
|--------------------------------------------------------------|-------------------------|-----------------|
| <b>Description:</b> International application as published   | 1-16                    | 16              |
| <b>Claims:</b> Amendments filed on entry into European phase | 17-18                   | 2               |
| <b>Drawings:</b> International application as published      | 22-33                   | 12              |
| <b>Abstract:</b> Default count: one page                     |                         | 1               |
| <b>Total number of pages</b>                                 |                         | 31              |
| <b>Fee-exempt pages (Art. 2, item 1a, RFees)</b>             |                         | -35             |
| <b>Number of pages to be paid for</b>                        |                         | 0               |
| (x 14 EUR per page)                                          |                         |                 |
| <b>Total amount payable</b>                                  | EUR                     | 0               |

**Additional Sheet**

**Additional Representatives:-**

|                         |                           |
|-------------------------|---------------------------|
| BIZLEY, RICHARD EDWARD  | BLANCE, STEPHEN JOHN      |
| CLARKE, GEOFFREY HOWARD | COLE, WILLIAM GWYN        |
| CONNELL, MARK           | LAWRENCE, MALCOLM GRAHAM  |
| LEGG, JAMES CHRISTOPHER | LEONI, RICHARD PIETRO     |
| LONGLAND, EMMA LOUISE   | MOFFAT, JOHN ANDREW       |
| ROBERTS, SCOTT ANTHONY  | TURNBULL, ALEXANDER JAMES |
| WILDING, JAMES ROGER    | WILKINSON, MARC GEORGE    |

**All of:**

**Avidity IP  
Kestrel House  
Falconry Court  
Baker's Lane  
Epping  
Essex  
CM16 5DQ  
United Kingdom**

# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

|                                                                                                                                         |                                                                                           |                                                                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Applicant's or agent's file reference<br><b>SPEC-4PCT</b>                                                                               | <b>FOR FURTHER ACTION</b>                                                                 | See item 4 below                                                                 |
| International application No.<br><b>PCT/US2011/049998</b>                                                                               | International filing date ( <i>day/month/year</i> )<br><b>31 August 2011 (31.08.2011)</b> | Priority date ( <i>day/month/year</i> )<br><b>01 September 2010 (01.09.2010)</b> |
| International Patent Classification (8th edition unless older edition indicated)<br><b>See relevant information in Form PCT/ISA/237</b> |                                                                                           |                                                                                  |
| Applicant<br><b>SPECTRAL INSTRUMENTS IMAGING, LLC</b>                                                                                   |                                                                                           |                                                                                  |

|                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                 |           |                     |                          |            |          |                          |             |                                                                                                  |                          |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---------------------|--------------------------|------------|----------|--------------------------|-------------|--------------------------------------------------------------------------------------------------|--------------------------|------------|----------------------------|-------------------------------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------------|-------------------------|--------------------------|-------------|--------------------------------------------------|--------------------------|--------------|-------------------------------------------------------|
| 1.                                                                                                                                                                                                                | This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 bis.1(a).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                 |           |                     |                          |            |          |                          |             |                                                                                                  |                          |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| 2.                                                                                                                                                                                                                | This REPORT consists of a total of 8 sheets, including this cover sheet.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                 |           |                     |                          |            |          |                          |             |                                                                                                  |                          |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                 |           |                     |                          |            |          |                          |             |                                                                                                  |                          |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| 3.                                                                                                                                                                                                                | <p>This report contains indications relating to the following items:</p> <table style="width: 100%;"> <tr> <td style="width: 5%; text-align: center;"><input checked="" type="checkbox"/></td> <td style="width: 25%;">Box No. I</td> <td style="width: 70%;">Basis of the report</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. II</td> <td>Priority</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td>Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </table> | <input checked="" type="checkbox"/>                                                                                                                             | Box No. I | Basis of the report | <input type="checkbox"/> | Box No. II | Priority | <input type="checkbox"/> | Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability | <input type="checkbox"/> | Box No. IV | Lack of unity of invention | <input checked="" type="checkbox"/> | Box No. V | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement | <input type="checkbox"/> | Box No. VI | Certain documents cited | <input type="checkbox"/> | Box No. VII | Certain defects in the international application | <input type="checkbox"/> | Box No. VIII | Certain observations on the international application |
| <input checked="" type="checkbox"/>                                                                                                                                                                               | Box No. I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Basis of the report                                                                                                                                             |           |                     |                          |            |          |                          |             |                                                                                                  |                          |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| <input type="checkbox"/>                                                                                                                                                                                          | Box No. II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Priority                                                                                                                                                        |           |                     |                          |            |          |                          |             |                                                                                                  |                          |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| <input type="checkbox"/>                                                                                                                                                                                          | Box No. III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability                                                                |           |                     |                          |            |          |                          |             |                                                                                                  |                          |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| <input type="checkbox"/>                                                                                                                                                                                          | Box No. IV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Lack of unity of invention                                                                                                                                      |           |                     |                          |            |          |                          |             |                                                                                                  |                          |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| <input checked="" type="checkbox"/>                                                                                                                                                                               | Box No. V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |           |                     |                          |            |          |                          |             |                                                                                                  |                          |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| <input type="checkbox"/>                                                                                                                                                                                          | Box No. VI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Certain documents cited                                                                                                                                         |           |                     |                          |            |          |                          |             |                                                                                                  |                          |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| <input type="checkbox"/>                                                                                                                                                                                          | Box No. VII                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Certain defects in the international application                                                                                                                |           |                     |                          |            |          |                          |             |                                                                                                  |                          |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| <input type="checkbox"/>                                                                                                                                                                                          | Box No. VIII                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Certain observations on the international application                                                                                                           |           |                     |                          |            |          |                          |             |                                                                                                  |                          |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |
| 4.                                                                                                                                                                                                                | The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                 |           |                     |                          |            |          |                          |             |                                                                                                  |                          |            |                            |                                     |           |                                                                                                                                                                 |                          |            |                         |                          |             |                                                  |                          |              |                                                       |

|                                                                                                                                                                          |                                                                                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p style="text-align: center;">The International Bureau of WIPO<br/>34, chemin des Colombettes<br/>1211 Geneva 20, Switzerland</p> <p>Facsimile No. +41 22 338 82 70</p> | <p>Date of issuance of this report<br/><b>05 March 2013 (05.03.2013)</b></p> <hr/> <p>Authorized officer</p> <p style="text-align: center; font-size: 1.2em;"><b>Philippe Bécamel</b></p> <p>e-mail: pt01.pct@wipo.int</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

To: BRUCE DAHL  
FENNEMORE CRAIG, P.C.  
1700 LINCOLN STREET  
SUITE 2900  
DENVER, CO 80203

PCT

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing  
(day/month/year)

22 DEC 2011

Applicant's or agent's file reference  
SPEC-4PCT

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/US2011/049998

International filing date (day/month/year)

31 August 2011

Priority date (day/month/year)

01 September 2010

International Patent Classification (IPC) or both national classification and IPC  
IPC(8) - G03B 15/02 (2011.01)  
USPC - 362/11

Applicant SPECTRAL INSTRUMENTS IMAGING, LLC

## 1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

## 2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US  
Mail Stop PCT, Attn: ISA/US  
Commissioner for Patents  
P.O. Box 1450, Alexandria, Virginia 22313-1450  
Facsimile No. 571-273-3201

Date of completion of this opinion

12 December 2011

Authorized officer:

Blaine R. Copenheaver

PCT Helpdesk: 571-272-4300  
PCT OSP: 571-272-7774

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/US2011/049998

**Box No. I      Basis of this opinion**

1. With regard to the **language**, this opinion has been established on the basis of:
  - ☒ the international application in the language in which it was filed.
  - ☐ a translation of the international application into \_\_\_\_\_ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:
  - a. (means)
    - ☐ on paper
    - ☐ in electronic form
  - b. (time)
    - ☐ in the international application as filed
    - ☐ together with the international application in electronic form
    - ☐ subsequently to this Authority for the purposes of search
4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US2011/049998

**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

|                               |        |             |     |
|-------------------------------|--------|-------------|-----|
| Novelty (N)                   | Claims | <u>1-29</u> | YES |
|                               | Claims | <u>None</u> | NO  |
| Inventive step (IS)           | Claims | <u>None</u> | YES |
|                               | Claims | <u>1-29</u> | NO  |
| Industrial applicability (IA) | Claims | <u>1-29</u> | YES |
|                               | Claims | <u>None</u> | NO  |

**2. Citations and explanations:**

Claims 1-4, 6-8, 19-26, 28-29 lack an inventive step under PCT Article 33(3) as being obvious over Pohlert et al., hereinafter referred to as Pohlert, in view of Kelly and further in view of Nomura.

Regarding claim 1, Pohlert teaches a stand-mounted light panel for natural illumination in film, television or video (title) and further teaches a central opening (103, fig. 1; 303 figs. 4-5) having a plurality of lamp receptacles (lamp segment 306, fig. 4; panel frame or frame, abstract, fig. 47a, pars. 0179-0180, receives the LEDs; also see figs. 48a-50b) surrounding the central opening (303, fig. 4; 3803, fig. 38A), the structure being mountable to a support structure (330, fig. 3) so that the central opening being aligned with a camera (fig. 1 shows this aspect) also mounted to the support structure (330, fig. 3), so that the field of view of the camera is unobstructed, and a light source (lamps, fig. 2; LEDs or lamps 305, fig. 4; 4705 fig. 47a, para. 0180) positioned within each of the plurality of lamp receptacles (lamp segment 306, fig. 4; panel frame or frame, abstract, fig. 47a, pars. 0179-0180, receives the LEDs; also see figs. 48a-50b), a diffuser (5029, fig. 5a; 1205 fig. 12; 795, 876 in figs 7-8, teach that lens elements spreading the light; this is interpreted as meaning diffusing; paras 0119-0120) positioned adjacent the light source positioned within each of the plurality of lamp receptacles (figs. 4 shows a plurality of lamp segments 306 which contain a plurality of light sources 305; fig. 50a shows the a diffuser 5029 which locate within each lamp panel 4702, 4802, figs. 47a; 50a-50b), each of the diffusers diffusing light produced by each of the light sources (abstract, para. 0023 teaches the diffusion lens being integrated with the lighting panel (receptacle); 795, 876 in figs 7-8, teach that lens elements spreading the light; this is interpreted as meaning diffusing; paras 0119-0120), and a control system (212, fig. 2, para. 0094; and element 1052) operatively connected to each of the light sources (para. 0145, fig. 13, paras. 0091-0092, 0166) positioned within the plurality of lamp receptacles, the control system operating selected ones of the light source to provide a desired illumination to an object within the field of view of the camera (paras. 0091-0092, 0166).

However, Pohlert does not explicitly state a housing defining a central opening which contains the structure which holds a plurality of lamps, for connecting the camera to a central aperture.

Kelly teaches a ring lighting (title) and further teaches a housing (2, figs. 1-2) defining a central opening (3 figs. 1-2) which contains the structure which holds a plurality of lamps (6 figs. 1-2), for connecting the camera to a central aperture (abstract, figs. 1-2).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the stand-mounted light panel for natural illumination in film, television or video of Pohlert with the ring lighting of Kelly so as to have a housing defining a central opening which contains the structure which holds a plurality of lamps, for connecting the camera to a central aperture in order to protect the lights and lenses from the environment.

Pohlert also does not explicitly state the apparatus being used as an excitation light source.

Nomura teaches a fluorescent pattern detector and postal matter processor using the detector (title) and further an apparatus comprising a central hole aligned with a camera having a plurality of light sources surrounding the central aperture being used as an excitation light source (abstract, figs. 1, 5).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the stand-mounted light panel for natural illumination in film, television or video of Pohlert with the fluorescent pattern detector and postal matter processor using the detector of Nomura so as to have the apparatus used as an excitation light source in order to aid one in recognizing a fluorescent pattern of the object based on a detection signal.

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/US2011/049998

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Regarding claim 19, Pohlert teaches a stand-mounted light panel for natural illumination in film, television or video (title) and further teaches a support structure (330, fig. 3) a camera (140, fig. 1) mounted to the support structure (330, para. 0102), a light source assembly (302, figs. 4-5, para. 0102) mounted to the support structure, the light source assembly comprising, a central opening (103, fig. 1; 303 figs. 4-5) having a plurality of lamp receptacles (lamp segment 306, fig. 4; panel frame or frame, abstract, fig. 47a, pars. 0179-0180, receives the LEDs; also see figs. 48a-50b) surrounding the central opening (303, fig. 4; 3803, fig. 38A), the structure being mountable to a support structure (330, fig. 3) so that the central opening being aligned with a camera (fig. 1 shows this aspect) also mounted to the support structure (330, fig. 3), so that the field of view of the camera is unobstructed, and a light source (lamps, fig. 2; LEDs or lamps 305, fig. 4; 4705 fig. 47a, para. 0180) positioned within each of the plurality of lamp receptacles (lamp segment 306, fig. 4; panel frame or frame, abstract, fig. 47a, pars. 0179-0180, receives the LEDs; also see figs. 48a-50b), a diffuser (5029, fig. 5a; 1205 fig. 12; 795, 876 in figs 7-8, teach that lens elements spreading the light; this is interpreted as meaning diffusing; paras 0119-0120) positioned adjacent the light source positioned within each of the plurality of lamp receptacles (figs. 4 shows a plurality of lamp segments 306 which contain a plurality of light sources 305; fig. 50a shows the a diffuser 5029 which locate within each lamp panel 4702, 4802, figs. 47a; 50a-50b), each of the diffusers diffusing light produced by each of the light sources (abstract, para. 0023 teaches the diffusion lens being integrated with the lighting panel (receptacle); 795, 876 in figs 7-8, teach that lens elements spreading the light; this is interpreted as meaning diffusing; paras 0119-0120), and a control system (212, fig. 2, para. 0094; and element 1052) operatively connected to each of the light sources (para. 0145, fig. 13, paras. 0091-0092, 0166) positioned within the plurality of lamp receptacles, the control system operating selected ones of the light source to provide a desired illumination to an object within the field of view of the camera (paras. 0091-0092, 0166). Pohlert teaches at least one narrow-band light source positioned within at least one of the plurality of lamp receptacles (blue or green LEDs, paras. 0019, 0118). However, Pohlert does not explicitly state a housing defining a central opening which contains the structure which holds a plurality of lamps, for connecting the camera to a central aperture.

Kelly teaches a ring lighting (title) and further teaches a housing (2, figs. 1-2) defining a central opening (3 figs. 1-2) which contains the structure which holds a plurality of lamps (6 figs. 1-2), for connecting the camera to a central aperture (abstract, figs. 1-2). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the stand-mounted light panel for natural illumination in film, television or video of Pohlert with the ring lighting of Kelly so as to have a housing defining a central opening which contains the structure which holds a plurality of lamps, for connecting the camera to a central aperture in order to protect the lights and lenses from the environment.

Pohlert also does not explicitly state the apparatus being used as a excitation light source.

Nomura teaches a fluorescent pattern detector and postal matter processor using the detector (title) and further an apparatus comprising a central hole aligned with a camera having a plurality of light sources surrounding the central aperture being used as an excitation light source (abstract, figs. 1, 5).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the stand-mounted light panel for natural illumination in film, television or video of Pohlert with the fluorescent pattern detector and postal matter processor using the detector of Nomura so as to have the apparatus used as a excitation light source in order to aid one in recognizing a fluorescent pattern of the object based on a detection signal.

Regarding claim 2, Pohlert teaches at least one of the light sources comprising a narrow-band light source (para. 0019) that emits light having a bandwidth (blue or green LEDs, paras. 0019, 0118).

However, Pohlert does not explicitly state the bandwidth of the light source being about 35 nm.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have the bandwidth of the light source be about 35 nm, since discovering the optimum value of a result effective variable involves only routine skill in the art and in order to produce a narrow-band of light (Pohlert, para. 0019).

Regarding claim 3, Pohlert teaches at least one narrow-band light source comprising a light emitting diode (paras. 0019, 0118-0119).

Regarding claim 4, Pohlert teaches at least one filter (5010, fig. 50a) positioned adjacent at least one diffuser (5029, fig. 50a) in at least one of the lamp receptacles defined by the housing (para. 0187, figs. 50a-50b).

Regarding claim 6, Pohlert teaches at least one of the light sources comprises a broad-band light source (white LEDs, paras. 0098, 0118).

Regarding claim 7, Pohlert teaches at least some of said plurality of lamp receptacles comprise opposed pairs of lamp receptacles on opposite sides of said central opening (different light segments 306 fig. 4), each opposed pair of lamp receptacles producing light of the same color (paras. 0097; para. 0118 teaches that the LEDs can all be the same color).

Regarding claim 8, Pohlert teaches opposing pairs of lamps located in receptacles (lamp segments, figs. 30b-30c) on opposite side the central opening (para. 0097).

However, Pohlert does not explicitly state ten pairs of lamps surrounding the central aperture.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have ten pairs of lamps surrounding the central aperture, since a mere duplication of essential working parts of device involves only routine skill in the art, and in order to produce the desired amount and display of light.

Regarding claim 20, Pohlert teaches a light filter (5010, fig. 50a) positioned adjacent at each of the diffusers (5029, para. 0187, figs. 50a-50b).

Regarding claim 21, Pohlert teaches each of the lamp receptacles defined by said housing being angled with respect to a central axis of said housing so that light emitted from each of said narrow-band light sources is directed to a desired area within the field of view of said camera (paras. 0166, 0176).

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/US2011/049998

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Regarding claim 22, Pohlert teaches each of said narrow-band light sources being selected to provide desired number of illumination bands over a desired spectral range (paras. 0122, 0124).

Regarding claim 23, Pohlert teaches the desired spectral range being from about 430 nm to about 745 nm (paras. 0122, 0124; By teaching the LEDs being red, green, and blue, Pohlert has inferred the spectral range being from about 430 nm to about 745 nm).

Regarding claim 24, Pohlert teaches the use of different color LEDs (paras. 0122, 0124).

However, it does not explicitly state the number of illumination bands being 10.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have the number of illumination bands being 10, since discovering the optimum number of illumination bands needed to obtain a desired color distribution involves only routine skill in the art.

Regarding claim 25, Pohlert teaches each of the desired illumination bands having a bandwidth ranging from about 30 nm to about 35 nm (paras. 0122, 0124, by teaching the use green and blue LEDs, Pohlert has inferred the that the illumination bandwidth ranges from about 30 nm to about 35 nm).

Regarding claim 26, Pohlert teaches each of the narrow-band light sources comprising a light emitting diode (paras. 0118, 0156).

Regarding claim 28, Pohlert teaches the invention as shown above but lacks the explicit teaching of the desired spectral range being from about 430 nm to about 900 nm.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have the desired spectral range being from about 430 nm to about 900 nm, since where the general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art, and in order to produce the desired light emitting from the device.

Regarding claim 29, Pohlert teaches the desired spectral range being from about 430 nm to about 800 nm (paras. 0122, 0124; By teaching the LEDs being red, green, and blue, Pohlert has inferred the spectral range being from about 430 nm to about 800 nm).

Claim 5 lacks an inventive step under PCT Article 33(3) as being obvious over Pohlert et al., hereinafter referred to as Pohlert, in view of Kelly, Nomura and further in view of Furze et al., hereinafter referred to as Furze.

Regarding claim 5, Pohlert teaches the invention as shown above but lacks the explicit teaching of at least one filter comprises a notch filter having a wavelength bandpass range of about 30 nm.

Furze teaches the use of patterned structured light to detect and measure surface defects on a golf ball (title) and further teaches at least one filter comprises a notch filter having a wavelength bandpass range of about 30 nm (25 nm is viewed as being about 30 nm, para. 0023).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the stand-mounted light panel for natural illumination in film, television or video of Pohlert with the use of patterned structured light to detect and measure surface defects on a golf ball of Furze so as to have at least one filter comprises a notch filter having a wavelength bandpass range in order to allow only a narrow band of wavelengths to pass and thereby allow one to detect the defects in an object/material.

Claim 27 lacks an inventive step under PCT Article 33(3) as being obvious over Pohlert et al., hereinafter referred to as Pohlert, in view of Kelly, Nomura and further in view of Flexman et al., hereinafter referred to as Flexman.

Regarding claim 27, Pohlert as modified teaches the invention as shown above but lacks the explicit teaching of the housing comprising polyoxymethylene thermoplastic material.

Kelly teaches a ring lighting (title) and further teaches a housing (2, figs. 1-2) defining a central opening (3 figs. 1-2) which contains the structure which holds a plurality of lamps (6 figs. 1-2), for connecting the camera to a central aperture (abstract, figs. 1-2).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the stand-mounted light panel for natural illumination in film, television or video of Pohlert with the ring lighting of Kelly so as to have a housing defining a central opening which contains the structure which holds a plurality of lamps, for connecting the camera to a central aperture in order to protect the lights and lenses from the environment.

Pohlert does however teach the lighting frame being made of thermoplastic (para. 0095).

Flexman teaches layered articles having polyoxymethylene blend substrates with enhanced surface properties and at least one layer thereon and process for making the same (title) and further teaches the use of polyoxymethylene thermoplastic material (para. 0033).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the stand-mounted light panel for natural illumination in film, television or video of Pohlert with the layered articles having polyoxymethylene blend substrates with enhanced surface properties and at least one layer thereon and process for making the same of Flexman so as to have in order to increase the toughness and durability of the housing so that it is able to withstand the element and occasional drops.

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/US2011/049998

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Claims 16-18 lack an inventive step under PCT Article 33(3) as being obvious over Pohlert et al., hereinafter referred to as Pohlert, in view of Nomura.

Regarding claim 16, Pohlert teaches a stand-mounted light panel for natural illumination in film, television or video (title) and further teaches a base member (102, 302, figs. 1, 3-4) defining a central opening therein (103, 303, figs. 1, 3-4), a plurality of first connectors portions (3996 figs. 39-40; screws ) mounted to the base member (3802, 3902, 3900 fig. 38a, 39) at positions around the central opening defined by the base member (figs. 38a), a plurality of lamp receptacles (lamp segment 306, fig. 4; panel frame or frame, abstract, fig. 47a, paras. 0179-0180, receives the LEDs; also see figs. 48a-50b), at least some of the plurality of lamp receptacles producing light in different wavelength bands (different color LEDs, paras. 0098, 0118, 0122), a second connector (screw-in bases, para. 0180-0181, figs. 47a-48b, fig. 4) portion mounted to each of the plurality of lamp receptacles (lamp segment 306, fig. 4; panel frame or frame, abstract, fig. 47a, paras. 0179-0180, receives the LEDs; also see figs. 48a-50b), the second connector portion being releasably engagable with a corresponding one of the plurality of first connector portions mounted to the base member (paras. 0164, 0181), the base member being mountable to a support structure (330, fig. 3) so that the central opening is aligned with a camera that is also mounted to the support structure (330, fig. 3), wherein a field of view of the camera is substantially unobstructed by the base member and the lamp receptacles engaged with the base member (figs. 1, 3).

However, Pohlert does not explicitly state the light source assembly being an excitation lighting assembly.

Nomura teaches a fluorescent pattern detector and postal matter processor using the detector (title) and further the light source assembly being an excitation lighting assembly (abstract, figs. 1, 5).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the stand-mounted light panel for natural illumination in film, television or video of Pohlert with the fluorescent pattern detector and postal matter processor using the detector of Nomura so as to have the light source assembly being an excitation lighting assembly in order to aid one in recognizing a fluorescent pattern of the object based on a detection signal.

Regarding claim 17, Pohlert teaches a plurality of main body members (1560, 1592 printed circuit board, figs. 15a -15c) each having a main body members being mounted to the base member (1502), each main body member being adapted to mount a corresponding one of the plurality of first connector portions (screws), each main body member having opening therein sized to receive a corresponding one of the plurality of lamp receptacles (para. 0168, the heating rods also facilitate attachment; fig. 4 each light segment or light panel (306) will have a indentation below it on the base (302) for receiving the light panel; also see fig. 12, 15a-16b).

Regarding claim 18, Pohlert teaches the invention as shown above but lacks the explicit teaching of the base member comprising a C-shaped configuration.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have the base member comprise a C-shaped configuration, in order to make it easier for one to adjust/align the light assembly on the camera.

Claims 9-15 lack an inventive step under PCT Article 33(3) as being obvious over Pohlert et al., hereinafter referred to as Pohlert, in view of Kelly and further in view of Nomura.

Regarding claim 9, Pohlert teaches a stand-mounted light panel for natural illumination in film, television or video (title) and further teaches a first connector (3996 figs. 39-40; screws ) for mounting to a housing, a lamp receptacle (lamp segment 306, fig. 4; panel frame or frame, abstract, fig. 47a, paras. 0179-0180, receives the LEDs; also see figs. 48a-50b) for producing light in a first defined wavelength band (different color LEDs, paras. 0098, 0118, 0122), and a second connector (screw-in bases, para. 0180-0181, figs. 47a-48b, fig. 4) portion mounted to the lamp receptacle (lamp segment 306, fig. 4; panel frame or frame, abstract, fig. 47a, paras. 0179-0180, receives the LEDs; also see figs. 48a-50b), so that the lamp receptacle can be removably engagable with the first connector portion (paras. 0164, 0181), a support structure (330, fig. 3) for mounting the light assembly to the a housing, so that the field of view of the camera that is also mounted to the support structure (330, fig. 3), wherein a field of view of the camera is substantially unobstructed by the lamp receptacles engaged with the base member (figs. 1, 3).

However, Pohlert does not explicitly state a housing defining a central opening being connected to the device.

Kelly teaches a ring lighting (title) and further teaches a housing (2, figs. 1-2) defining a central opening being connected to the device (abstract, figs. 1-2).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the stand-mounted light panel for natural illumination in film, television or video of Pohlert with the ring lighting of Kelly so as to have a housing defining a central opening being connected to the device in order to protect the lights and lenses from the environment.

Pohlert also does not explicitly state the apparatus being used as an excitation light source.

Nomura teaches a fluorescent pattern detector and postal matter processor using the detector (title) and further an apparatus comprising a central hole aligned with a camera having a plurality of light sources surrounding the central aperture being used as an excitation light source (abstract, figs. 1, 5).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the stand-mounted light panel for natural illumination in film, television or video of Pohlert with the fluorescent pattern detector and postal matter processor using the detector of Nomura so as to have the apparatus used as an excitation light source in order to aid one in recognizing a fluorescent pattern of the object based on a detection signal.

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US2011/049998

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Regarding claim 10, Pohlert teaches the invention as shown above but lacks the explicit teaching of lamp receptacle further comprising a first barrel section adapted to receive said second connector portion, and a second barrel section, and a light source mounted within said second barrel section.

Kelly teaches the lamp receptacle further comprising a first barrel section adapted to receive the second connector portion (fig. 6, this is the section located below elements 5 and 51 in the figure), and a second barrel section (fig. 6 the section located above elements 51 and 5 in the figure), and a light source (6, in fig. 6) mounted within the second barrel section (fig. 2).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the stand-mounted light panel for natural illumination in film, television or video of Pohlert with the ring lighting of Kelly so as to have lamp receptacle further comprising a first barrel section adapted to receive said second connector portion, and a second barrel section, and a light source mounted within said second barrel section in order to aid one connecting the light sources to the house so that they may be protected from the environment.

Regarding claim 11, Pohlert teaches the first and second connector portions comprise respective mating electrical connector sections, and wherein said light source electrically connected to the electrical connector section of said second connector portion (fig. 15a-15c, paras. 0102, 0104, the screws for connectors and printed circuit boards, wires and cables for providing the electrical connection).

Regarding claim 12, Pohlert teaches the invention as shown above but lacks the explicit teaching of a diffuser mounted within said second barrel section at a position adjacent said light source.

Kelly teaches a lens (7, fig. 6) being located in the second barrel section at a position adjacent the light source (6, fig. 6). Kelly also teaches the lens diffuses the light (spreads, col. 3 lines 55-60, col. 4 lines 3-10, col. 5 lines 50-62).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the stand-mounted light panel for natural illumination in film, television or video of Pohlert with the ring lighting of Kelly so as to have a diffuser mounted within said second barrel section at a position adjacent said light source in order to provide a more uniform illumination of a given area.

Regarding claim 13, Pohlert teaches the invention as shown above but lacks the explicit teaching of a filter mounted within said second barrel section at a position adjacent said light source.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have a filter mounted within said second barrel section at a position adjacent said light source in order to allow one to illuminate an area with light having a different colors without having to change the actual light source.

Regarding claim 14, Pohlert teaches the invention as shown above but lacks the explicit teaching of the housing comprising a main body portion and a base member portion.

Kelly teaches the housing (2) comprising a main body portion (the shaded area of element 3 in fig. 6) and a base member portion (53, fig. 6).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the stand-mounted light panel for natural illumination in film, television or video of Pohlert with the ring lighting of Kelly so as to have the housing comprise a main body portion and a base member portion in order provide a stable and durable housing which will allow protect the light source from the outside environment.

Regarding claim 15, Pohlert teaches the invention as shown above but lacks the explicit teaching of the housing comprises a C-shaped member having a central aperture therein, said central aperture of said C-shaped member being substantially aligned with a lens assembly of the camera, so that the field of view of the camera is substantially unobstructed by said housing and said lamp receptacle.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have the housing comprises a C-shaped member having a central aperture therein, said central aperture of said C-shaped member being substantially aligned with a lens assembly of the camera, so that the field of view of the camera is substantially unobstructed by said housing and said lamp receptacle in order to aid one in imaging an object and make it easier for one to adjust/align the light assembly on the camera.

Claims 1-29 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

European Patent Office  
PB 5818 – Patentlaan 2  
2280 HV Rijswijk  
The Hague  
Netherlands

## FILED ONLINE

19<sup>th</sup> March 2013

Dear Sirs

Re: **European Patent Application No 11 822574.7**  
**(Corresponding to PCT Application No PCT/US/2011/049998)**  
**Spectral Instruments Imaging, LLC**  
**Our File P102377EP51**

The Applicant submits herewith sheets to replace pages 17 to 21 of the claims currently on file. Basis for the claims filed herewith can be found in the application as filed. Examples of where basis can be found are explained in the following table, although the Examiner will appreciate that the table is not exhaustive and other basis may be present. As amended, there are now 10 claims in total.

| Claims | PCT Claims |
|--------|------------|
| 1      | 1          |
| 2      | 2          |
| 3      | 4, 5       |
| 4      | 6          |
| 5      | 7          |
| 6      | 19         |
| 7      | 21         |
| 8      | 22         |
| 9      | 24, 25     |
| 10     | 28         |

For the avoidance of all doubt, any amendment made to the specification which results in deletion of scope or subject-matter is made without prejudice and with the express reservation of the right to reinstate such subject-matter or scope in this present application and with specific reservation of the right to file one or more divisional applications directed to such deleted subject-matter or scope.

Cont'd...

## Correspondence Address

Kestrel House  
Falconry Court  
Baker's Lane  
Epping, Essex  
CM16 5DQ  
United Kingdom

Tel: +44(0)1992 561 756  
Fax: +44(0)1992 561 934

email: [mail@avidity-ip.com](mailto:mail@avidity-ip.com)  
[www.avidity-ip.com](http://www.avidity-ip.com)

Avidity IP Ltd registered in England  
Registration no. 05697558

Registered office: Kestrel House  
Falconry Court, Baker's Lane  
Epping, Essex CM16 5DQ

Regulated by IPREG

The writer requests the opportunity of a telephone interview with the Examiner should the Examiner following this Response disagree that the application complies with EPC, but feel that an Article 94 Communication cannot be issued. Additionally or alternatively, the Representative requests on behalf of the Applicant the opportunity of an interview on a face-to-face basis. Furthermore, the Representative requests on behalf of the Applicant additionally or alternatively that Oral Proceedings should be appointed so that the Applicant may have the opportunity of being heard in this matter prior to issue of any refusal under Article 97(2) EPC.

Yours faithfully

/CLARKE, Geoffrey H./

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**CLARKE, Geoffrey H.**  
**Avidity IP**

NS/P102377EP51L1

## Claims

1. An excitation light source assembly, comprising:  
a housing defining a central opening therein and a plurality of lamp receptacles surrounding the central opening, said housing being mountable to a support structure so that the central opening is aligned with a camera also mounted to the support structure so that a field of view of the camera is unobstructed by said housing;  
a light source positioned within each of the plurality of lamp receptacles;  
and  
a diffuser positioned adjacent said light source positioned within each of the plurality of lamp receptacles, each of said diffusers diffusing light produced by each of said light sources; and  
a control system operatively connected to each of said light sources positioned within said plurality of lamp receptacles, said control system operating selected ones of said light sources to provide a desired excitation illumination to an object within the field of view of said camera.
2. The excitation light source assembly of claim 1 wherein at least one of said light sources comprises a narrow-band light source that emits light having a bandwidth of about 35 nm.
3. The excitation light source assembly of claim 1, further comprising at least one filter positioned adjacent at least one diffuser in at least one of the lamp receptacles defined by said housing, wherein said at least one filter comprises a notch filter having a wavelength bandpass range of about 30 nm.
4. The excitation light source assembly of claim 1, wherein at least one of the light sources comprises a broad-band light source.
5. The excitation light source assembly of claim 1, wherein at least some of said plurality of lamp receptacles comprise opposed pairs of lamp receptacles on opposite sides of said central opening, each opposed pair of lamp receptacles producing light of the same color.
6. An assembly, comprising:  
a support structure;  
a camera mounted to said support structure;  
an excitation light source assembly mounted to said support structure, said

excitation light source assembly comprising:

a housing defining a central opening therein and a plurality of lamp receptacles surrounding the central opening, said housing being mounted to said support structure so that the central opening is aligned with said camera and so that a field of view of said camera is substantially unobstructed by said housing;

at least one narrow-band light source positioned within at least one of the plurality of lamp receptacles; and

a diffuser positioned adjacent said narrow-band light source positioned within each of the plurality of lamp receptacles, each of said diffusers diffusing light produced by each of said narrow-band light sources; and

a control system operatively connected to each of said narrow-band light sources positioned within said plurality of lamp receptacles, said control system operating selected ones of said narrow-band light sources to provide a desired excitation illumination to a fluorescent material within the field of view of said camera.

7. The assembly of claim 6, wherein each of the lamp receptacles defined by said housing are angled with respect to a central axis of said housing so that light emitted from each of said narrow-band light sources is directed to a desired area within the field of view of said camera.

8. The assembly of claim 6, wherein each of said narrow-band light sources is selected to provide desired number of illumination bands over a desired spectral range.

9. The assembly of claim 8, wherein the desired number of illumination bands is 10 and wherein each desired illumination band has a bandwidth ranging from about 30 nm to about 35 nm.

10. The assembly of claim 8, wherein the desired spectral range is from about 430 nm to about 900 nm.

P102377EP51cI

## Acknowledgement of receipt

We hereby acknowledge receipt of the form for entry into the European phase (EPO as designated or elected Office) as follows:

|                                 |                                                                                                                                          |                                                                                                        |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| Submission number               | 2051370                                                                                                                                  |                                                                                                        |
| PCT application number          | PCT/US2011/049998                                                                                                                        |                                                                                                        |
| EP application number           | 11822574.7                                                                                                                               |                                                                                                        |
| Date of receipt                 | 19 March 2013                                                                                                                            |                                                                                                        |
| Receiving Office                | European Patent Office, The Hague                                                                                                        |                                                                                                        |
| Your reference                  | P102377EP51                                                                                                                              |                                                                                                        |
| Applicant                       |                                                                                                                                          |                                                                                                        |
| Country                         |                                                                                                                                          |                                                                                                        |
| Documents submitted             | package-data.xml<br><br>application-body.xml<br><br>AMSPECEPO-1.pdf\P102377EP51cl.pdf (2 p.)<br><br>OTHER-2.pdf\P102377EP51L1.pdf (2 p.) | ep-euro-pct.xml<br><br>epf1200.pdf (5 p.)<br><br>OTHER-1.pdf\Additional Reps as at 21 02 13.pdf (1 p.) |
| Submitted by                    | CN=M. Wilkinson 27785,O=avidity IP,C=GB                                                                                                  |                                                                                                        |
| Method of submission            | Online                                                                                                                                   |                                                                                                        |
| Date and time receipt generated | 19 March 2013, 18:36 (CET)                                                                                                               |                                                                                                        |
| Message Digest                  | 1B:63:EA:BB:8A:9A:5B:40:8D:8C:CE:86:95:9A:0D:06:CB:F1:4B:84                                                                              |                                                                                                        |

**Correction by the EPO of errors in debit instructions filed by eOLF**

Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated

software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

/European Patent Office/



NELSON, Michael B.  
420 North Bonita Avenue  
Tucson, Arizona 85745  
ETATS-UNIS D'AMERIQUE

**For any questions about  
this communication:**

Tel.: +31 (0)70 340 45 00

Date  
05.04.13

|                                                           |                                                                  |
|-----------------------------------------------------------|------------------------------------------------------------------|
| Reference                                                 | Application No./Patent No.<br>11822574.7 - 1560 PCT/US2011049998 |
| Applicant/Proprietor<br>Spectral Instruments Imaging, LLC |                                                                  |

#### Notification of the data mentioned in Rule 19(3) EPC

In the above-identified patent application you are designated as inventor/co-inventor.  
Pursuant to Rule 19(3) EPC the following data are notified herewith:

DATE OF FILING : 31.08.11

PRIORITY : US/01.09.10/ USP 379282

TITLE : EXCITATION LIGHT SOURCE ASSEMBLY

DESIGNATED STATES : AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE  
IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM  
TR

#### Receiving Section





CABLE, Michael D.  
420 North Bonita Avenue  
Tucson, Arizona 85745  
ETATS-UNIS D'AMERIQUE

**For any questions about  
this communication:**

Tel.: +31 (0)70 340 45 00

Date  
05.04.13

|                                                           |                                                                  |
|-----------------------------------------------------------|------------------------------------------------------------------|
| Reference                                                 | Application No./Patent No.<br>11822574.7 - 1560 PCT/US2011049998 |
| Applicant/Proprietor<br>Spectral Instruments Imaging, LLC |                                                                  |

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Pursuant to Rule 19(3) EPC the following data are notified herewith:

DATE OF FILING : 31.08.11

PRIORITY : US/01.09.10/ USP 379282

TITLE : EXCITATION LIGHT SOURCE ASSEMBLY

DESIGNATED STATES : AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE  
IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM  
TR

#### Receiving Section





Wilkinson, Marc George  
Avidity IP  
Kestrel House  
Falconry Court  
Baker's Lane  
Epping, Essex CM16 5DQ  
ROYAUME UNI

**For any questions about  
this communication:**

Tel.: +31 (0)70 340 45 00

Date

09.04.13

|                                                           |                                                                  |
|-----------------------------------------------------------|------------------------------------------------------------------|
| Reference<br>P102377EP51                                  | Application No./Patent No.<br>11822574.7 - 1560 PCT/US2011049998 |
| Applicant/Proprietor<br>Spectral Instruments Imaging, LLC |                                                                  |

## Communication pursuant to Rules 161(2) and 162 EPC

### 1. Amendment of the application (R. 161(2) EPC)

The above-mentioned international (Euro-PCT) application has entered the European phase.

Under Articles 28, 41 PCT and Rules 52, 78 PCT the application may be amended before a designated or elected Office.

In accordance with Rule 161(2) EPC, you may amend your application once within a **non-extendable period of six months** after notification of the present communication.

If filing amendments, you must identify them and indicate the basis for them in the application as filed. Failure to meet either requirement may lead to a communication from the Examining Division requesting that you correct this deficiency (R. 137(4) EPC).

The claims applicable on expiry of this period, i.e. those filed on entry into the European phase or in response to the present communication, will form the basis for the calculation of any claims fee to be paid (see page 2).

## 2 Claims fees under Rule 162 EPC

If the application documents on which the European grant procedure is to be based comprise more than fifteen claims, a claims fee shall be payable for the sixteenth and each subsequent claim within the period provided for in Rule 159(1) EPC.

- ☒ Based on the application documents currently on file, all necessary claims fees have already been paid (or the documents do not comprise more than 15 claims).
- ☐ All necessary fees will be/have been debited automatically according to the automatic debit order.
- ☐ The claims fees due for the claims ..... to ..... were not paid within the above-mentioned period.

Any outstanding claims fee, either based on the current set of claims or on any amended claims to be filed pursuant to Rule 161 EPC (see page 1), may still be validly paid within a **non-extendable period of six months** after notification of this communication (R. 162(2) EPC).

If a payment is made for only some of the claims, you must indicate for which claims it is intended. If a claims fee is not paid in due time, the claim concerned is deemed to be abandoned (R. 162(4) EPC).

If claims fees have already been paid, but on expiry of the above-mentioned period there is a new set of claims containing fewer fee-incurring claims than before, the claims fees in excess of those due under Rule 162(2), second sentence EPC will be refunded (R. 162(3) EPC).

You are reminded that the supplementary search carried out according to Article 153(7) EPC will relate only to the last set of claims applicable on expiry of the above period AND will be confined to those fee-incurring claims for which fees have been paid in due time.

### The claims fee is currently

**EUR 225 for the 16th and each subsequent claim up to the limit of 50**  
**EUR 555 for the 51st and each subsequent claim**

### Note to users of the automatic debiting procedure

Unless the EPO receives prior instructions to the contrary, the fees for all claims incurring fees will be debited on the last day of the period for payment. For further details see the Arrangements for the automatic debiting procedure, Supplement to OJ EPO 3/2009.

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Payments by cheque delivered or sent direct to the EPO are no longer accepted as from 1 April 2008 (see OJ EPO 2007, 626).

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M. 03.06.13avidity<sup>IP</sup>

European Patent Office  
Erhardtstrasse 27  
D-80298 München  
Germany

FAX 00 49 89 2399 4465

ATTN: Claudia Weber  
CDR Department

## Correspondence Address

Kestrel House  
Falconry Court  
Baker's Lane  
Epping, Essex  
CM16 5DQ  
United Kingdom

⇒ NEW ADDRESS

Tel: +44(0)1992 561 756  
Fax: +44(0)1992 561 934

email: mail@avidity-ip.com  
www.avidity-ip.com

3rd June 2013

Dear Sirs

Re: avidity IP Representative Details

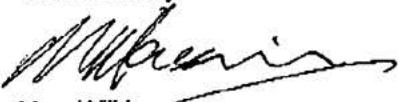
As requested in your telephone conversation with Tony Gray last week, please find below a list of the European Representatives currently employed at avidity IP:

Bizley, Richard Edward  
Blance, Stephen John  
Clarke, Geoffrey Howard  
Cole, William Gwyn  
Lawrence, Malcolm Graham  
Legg, James Christopher

Leoni, Richard Pietro  
Longland, Emma Louise  
Moffat, John Andrew  
Tumbull, Alexander James  
Wilding, James Roger  
Wilkinson, Marc George

As you know, avidity IP changed its address to that noted above in January.

Yours faithfully

  
Marc Wilkinson  
avidity IP

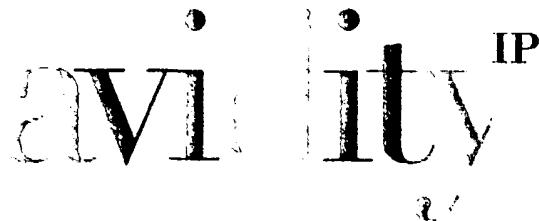
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Avidity IP Ltd registered in England  
Registration no. 05697558

Registered office: Kestrel House  
Falconry Court, Baker's Lane  
Epping, Essex CM16 5DQ

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**Correspondence Address**

Kestrel House  
Falconry Court  
Baker's Lane  
Epping, Essex  
CM16 5DQ  
United Kingdom

Tel: +44(0)1992 561 756  
Fax: +44(0)1992 561 934

email: [mail@avidity-ip.com](mailto:mail@avidity-ip.com)  
[www.avidity-ip.com](http://www.avidity-ip.com)

European Patent Office  
Erhardtstrasse 27  
D-80298 München  
Germany

FAX 00 49 89 2399 4465

21st January 2013

Dear Sirs

**Re: Change of Representative Address Details: avidity IP**

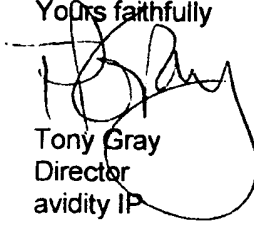
Please note that avidity IP has changed its address to the following:

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Falconry Court  
Baker's Lane  
Epping  
Essex  
CM15 5DQ  
United Kingdom

We therefore request amendment of our details in relation to all of the cases we are representative for before the EPO.

Please acknowledge receipt of this letter and its enclosures by returning the enclosed EPO Form 1037 in due course.

Yours faithfully

  
Tony Gray  
Director  
avidity IP

Avidity IP Ltd registered in England  
Registration no. 05697558

Registered office: Kestrel House  
Falconry Court, Baker's Lane  
Epping, Essex CM16 5DQ

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# avidity<sup>IP</sup>

**Correspondence Address**

Kestrel House  
Falconry Court  
Baker's Lane  
Epping, Essex  
CM16 5DQ  
United Kingdom

Tel: +44(0)1992 561 758  
Fax: +44(0)1992 561 934

email: [mail@avidity-ip.com](mailto:mail@avidity-ip.com)  
[www.avidity-ip.com](http://www.avidity-ip.com)

European Patent Office  
Erhardtstrasse 27  
D-80298 München  
Germany

FAX 00 49 89 2399 4465

21st January 2013

Dear Sirs

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Baker's Lane  
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CM15 5DQ  
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Please acknowledge receipt of this letter and its enclosures by returning the enclosed EPO Form 1037 in due course.

Yours faithfully

  
Tony Gray  
Director  
avidity IP

Avidity IP Ltd registered in England  
Registration no. 05697558

Registered office: Kestrel House  
Falconry Court, Baker's Lane  
Epping, Essex CM16 5DQ

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Wilkinson, Marc George  
avidity IP  
Kestrel House  
Falconry Court  
Baker's Lane  
Epping, Essex CM16 5DQ  
ROYAUME UNI

**For any questions about  
this communication:**

Tel.: +31 (0)70 340 45 00

Date

12.06.13

|                                                           |                                                                            |
|-----------------------------------------------------------|----------------------------------------------------------------------------|
| Reference<br>P102377EP51                                  | Application No./Patent No.<br>11822574.7 - 1560 / 2612200 PCT/US2011049998 |
| Applicant/Proprietor<br>Spectral Instruments Imaging, LLC |                                                                            |

#### **Communication of European publication number and information on the application of Article 67(3) EPC**

The provisional protection under Article 67(1) and (2) EPC in the individual Contracting States becomes effective only when the conditions referred to in Article 67(3) EPC have been fulfilled (for further details, see information brochure of the European Patent Office "National Law relating to the EPC" and additional information in the Official Journal of the European Patent Office).

Pursuant to Article 153(3) EPC the publication under Article 21 PCT of an international application for which the European Patent Office is a designated or elected Office takes the place of the publication of a European patent application.

The bibliographic data of the above-mentioned Euro-PCT application will be published on 10.07.13 in Section I.1 of the European Patent Bulletin. The European publication number is 2612200.

In all future communications to the European Patent Office, please quote the application number plus Directorate number.

#### **Receiving Section**





## Letter accompanying subsequently filed items

Representative:

**Mr. Geoffrey Clarke**

**Avidity IP**

**Kestrel House**

**Falconry Court**

**Baker's Lane**

**Epping Essex CM16 5DQ**

**United Kingdom**

**Phone: +44 (0)1992 561756**

**Fax: +44 (0)1992 561934**

**E-mail: mail@avidity-ip.com**

80298 Munich

Germany

Tel. +49(0)89 2399-0 | Fax -4465

P.O. Box 5818

NL-2280 HV Rijswijk

Netherlands

Tel. +31(0)70 340-2040 | Fax -3016

10958 Berlin

Germany

Tel. +49(0)30 25901-0 | Fax -840

The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number

11822574.7

Applicant's or representative's reference

P102377EP51

|   | Description of document                                 | Original file name | Assigned file name |
|---|---------------------------------------------------------|--------------------|--------------------|
| 1 | Letter relating to the search and examination procedure | L - EPO.pdf        | EPLETT-1.pdf       |
| 2 | Amended claims (clean copy)                             | Claims.pdf         | CLMS-1.pdf         |
| 3 | Drawings                                                | Drawings.pdf       | DRAW-1.pdf         |
| 4 | Document concerning search matters                      | Page 16.pdf        | SRCH-1.pdf         |

### Signatures

Place:

**Birmingham**

Date:

**17 October 2013**

Signed by:

**Geoffrey Clarke 34208**

Capacity:

**(Representative)**

## Correspondence Address

Kestrel House  
Falconry Court  
Baker's Lane  
Epping, Essex  
CM16 5DQ  
United Kingdom

Tel: +44(0)1992 561 756  
Fax: +44(0)1992 561 934

email: [mail@avidity-ip.com](mailto:mail@avidity-ip.com)  
[www.avidity-ip.com](http://www.avidity-ip.com)

European Patent Office  
Erhardstrasse 27  
D-80298  
Munich  
GERMANY

## FILED ONLINE

17 October 2013

Dear Sirs

**Re: European Patent Application No. 11822574.7**  
**Corresponding to PCT/US2011/049998)**  
**Spectral Instruments Imaging, LLC**  
**Our file: P102377EP51**

This letter is in reply to the Communication under Rule 161 dated 9 April 2013.

The Applicant files herewith amended set of claims 1-15.

Comments regarding the amended claims:

Claim 1 is amended to clarify that the diffuser is positioned within at least some of the lamp receptacles. Claim 1 is also amended to clarify the positional relationships between certain of the elements and clarify that the excitation light provided by the light sources causes the object to fluoresce.

Support for the amendments to claim 1 is found, either expressly or inherently, throughout the specification and claims as originally filed and more specifically at, for example, p. 4, l. 30 - p.5, l.3; p. 6, l. 8-20; p. 9, l. 21 - p. 10, l. 3; and p. 13, l. 3-11 of the PCT application. No new matter is added.

Claim 5 is amended to clarify that it is the light sources contained within opposed pairs of lamp receptacles that produce light of the same colour. Support for the amendments to claim 5 is found, either expressly or inherently, throughout the specification and claims as originally filed and more specifically at, for example, p. 5, l. 24-29; p. 11, l. 27 - p. 12, l. 17. No new matter is added.

Revised claims 6-10 depend from claim 1 and further specify certain details relating

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Falconry Court, Baker's Lane  
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to the light source and receptacle structure, as set forth in the new claims. Support for new claims 11- 15 is contained throughout the written description and drawings as originally filed and more specifically, at, for example, p. 6, 11. 12-20; p. 9, 1. 13 - p. 10, 1. 8; and p. 10, 1. 21 - p. 1 1, 1. 12 and Figures 1, 5, 6, 12, and 13. No new matter is added.

Revised claims 11-15 are identical to claims 9-13 of the originally-filed PCT patent application.

The Applicant has noticed that there was an error relating to reference numerals in the figures and text and requests that the corrections proposed herein be accepted. The Applicant believes the corrections are immediately obvious, as required by Rule 139 EPC. The error arises in that reference numeral 64 has been used twice to represent two different features. It is used to represent the receptacles 64, starting from the references on page 8. It has also been used to indicate a circuit board – see page 13, line 6. This is shown in Figures 1, 5 and 6. The Applicant wishes to correct this error and refer to the circuit board 68. The drawings have been amended accordingly and are enclosed.

The Applicant believes it is immediately obvious and clear that the two items 64 in Figure 1 are not and cannot describing the same integer. It is also immediately apparent that a receptacle 64 cannot be an apparently flat or planar article such as a PCB. The Applicant therefore requests the correction be allowed.

Also the description of figure 13, on page 16, line 16 integer circuit board is given the reference number 266, when clearly it should be 264. Clearly integer 264 is a flat circuit board, whereas integer 266 is later defined as a sleeve, and 266 is clearly sleeve shaped as shown in figure 13.

Also filed herewith are revised Figures 1, 5 and 6 and replacement page 16.

Yours faithfully

/CLARKE, Geoffrey H./

**CLARKE, Geoffrey H.**  
**AVIDITY IP**

1/12

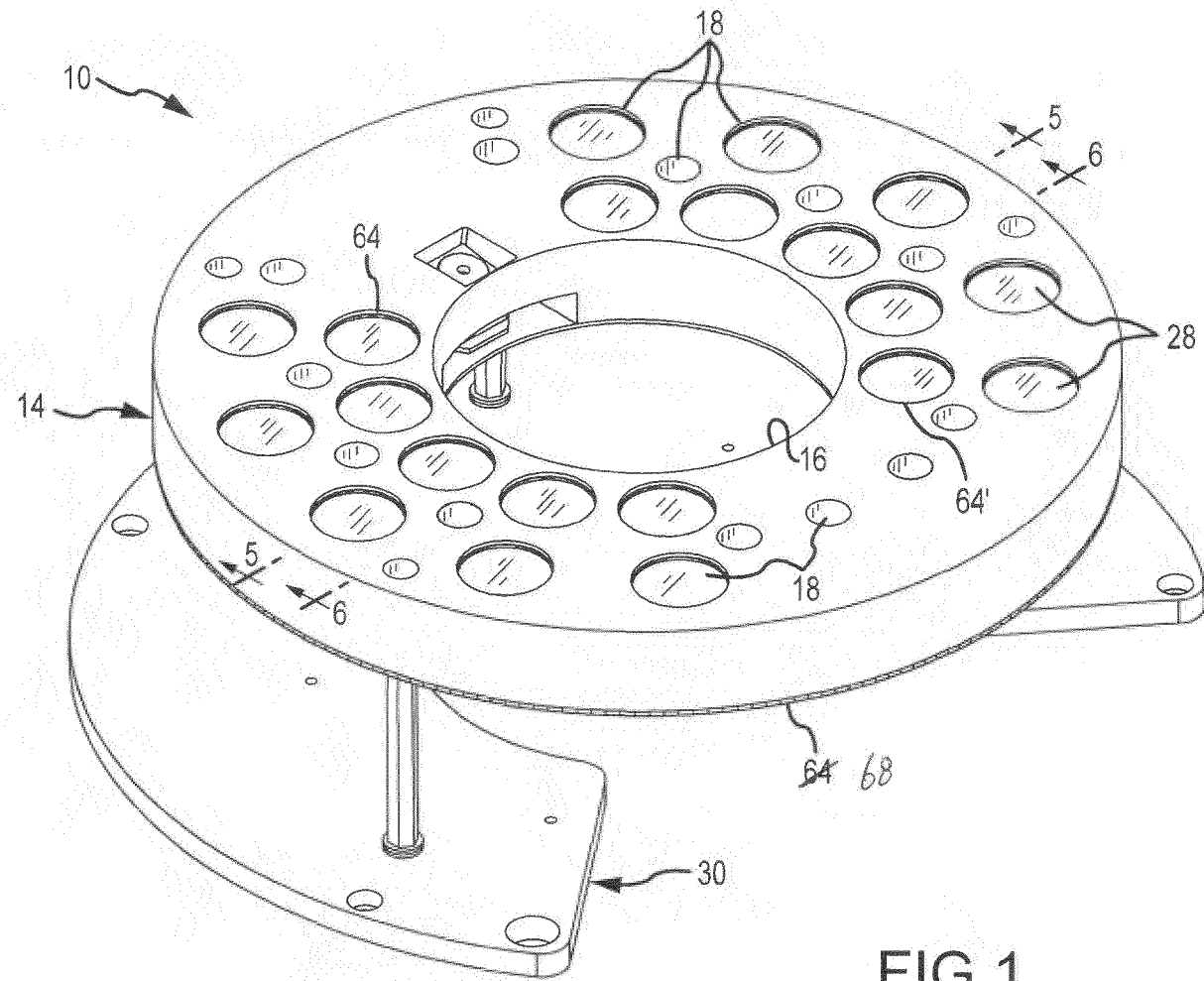


FIG. 1

5/12

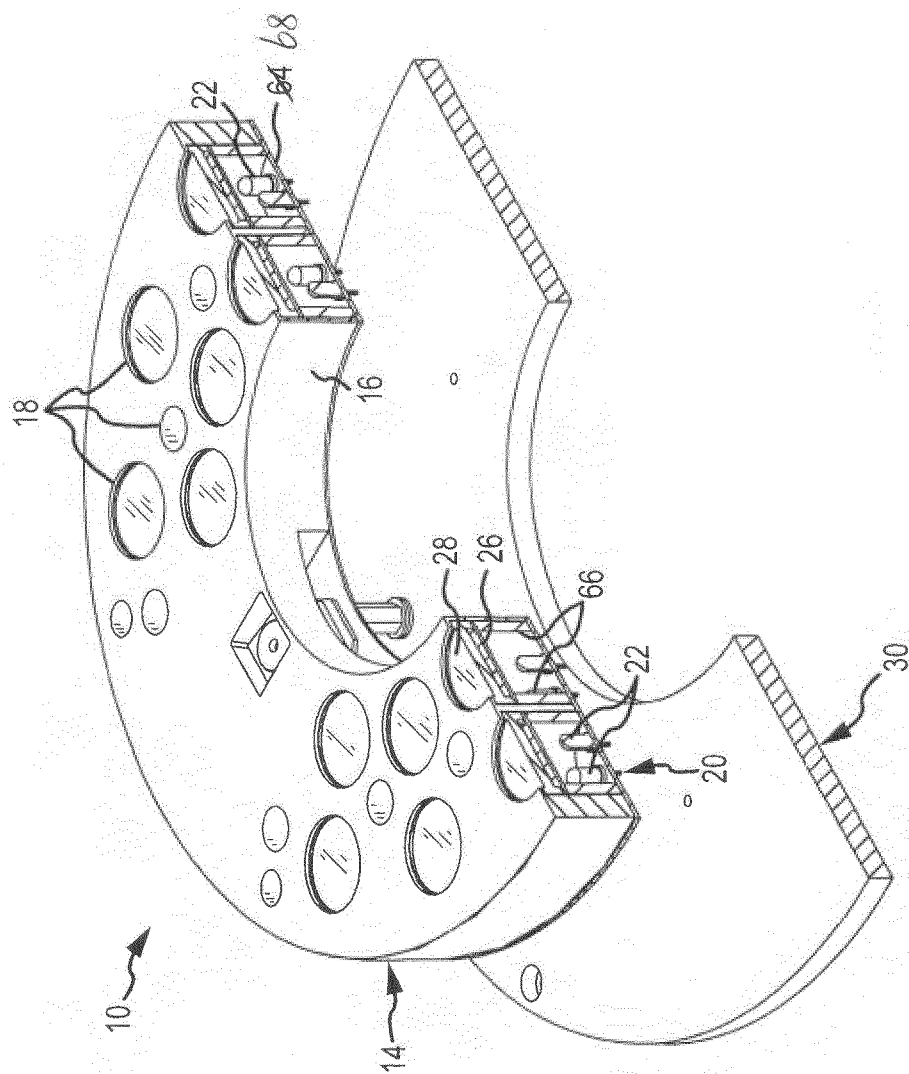


FIG. 5

6/12

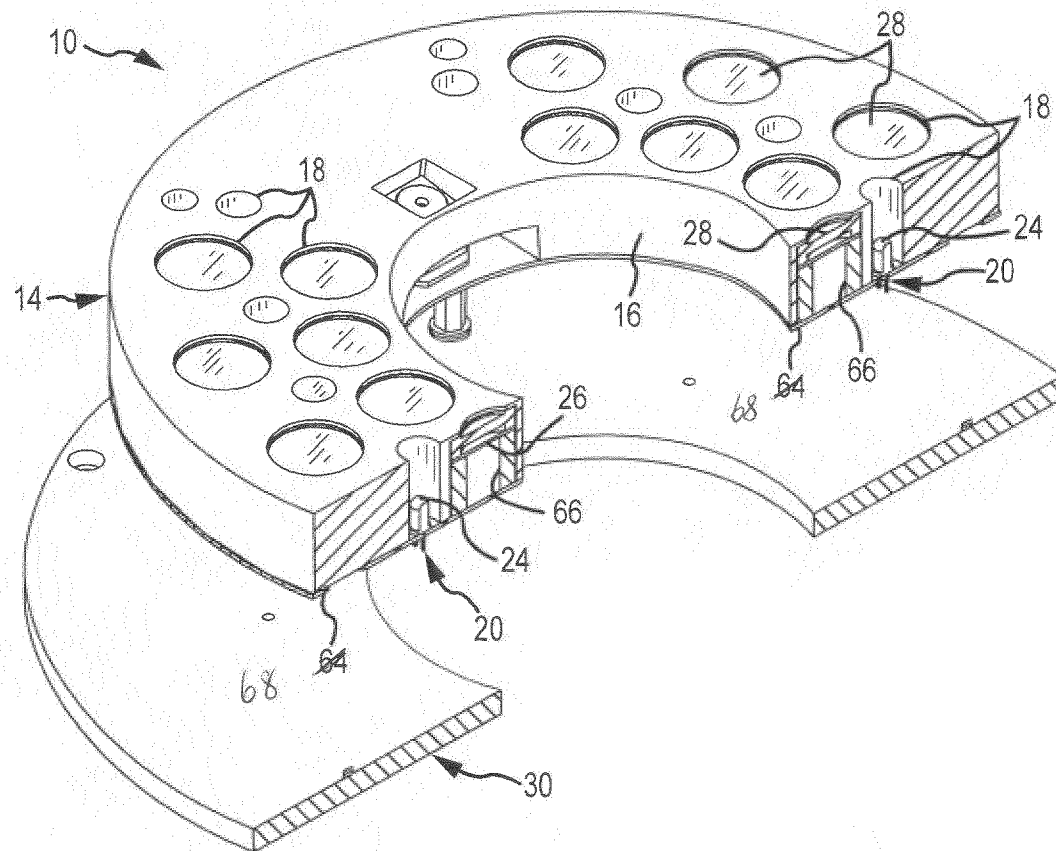


FIG. 6

Consequently, the present invention should not be regarded as limited to any particular material. However, by way of example, in one embodiment, the upper and lower barrel sections 123 and 125 are fabricated from aluminum. The aluminum may be provided with a suitable non-reflective coating.

5 Still other variations are possible. For example, and with reference now to Figures 12 and 13, a third embodiment 210 of the excitation light source assembly may comprise a "C"-shaped housing or main body 214 that defines a central opening 216. The housing 214 also defines a plurality of lamp receptacles 218 that are arranged around the central opening, as best seen in Figure 12. The housing 214 of the excitation light source assembly 210 is also configured to be mounted  
10 to the support structure 32 of imaging system 12, so that the lens assembly 34 of camera 36 is generally concentric with the central opening 216 defined by the housing 214. See Figures 2 and 3. As was the case for the other embodiments, the arrangement is such that the field of view 38 of the camera 36 is substantially unobstructed by the housing 214 and/or central opening 216 of housing 214 of the excitation light source assembly 214.

15 Referring now to Figure 13, each of the lamp receptacles 218 may be provided narrow-band light source 222 that, in one embodiment, may be mounted to a circuit board ~~266~~<sup>267</sup>. A diffuser 226 (264) may also be positioned within each of the lamp receptacles 218, generally at a position adjacent the light source 222. Each diffuser 226 diffuses light produced by the corresponding light source 222 and may be held in position by a sleeve 266. As was the case for the other embodiments, each lamp  
20 receptacle 218 may also be provided with a filter 228, if desired or required, to remove or filter any undesired light wavelengths that may be produced by the light source 222.

The C-shaped housing 214 of the excitation light source assembly 210 allows each of the lamp receptacles 218 provided therein to be conveniently angled (i.e., by an angle  $\theta$  with respect to the central axis 251 of housing 214), so that light from the light sources 222 may be directed to  
25 a desired area within the field of view 38 of camera 36.

The housing 214 for the excitation light source assembly 210 may be fabricated from any of a wide range of materials, such as metals or plastics, that would be suitable for the intended application. Consequently, the present invention should not be regarded as limited to housings made from any particular materials. However, by way of example, in one embodiment, the housing  
30 is fabricated as a single piece from any of a polyoxymethylene thermoplastic material, e.g., Delrin®.

Having herein set forth preferred embodiments of the present invention, it is anticipated that suitable modifications can be made thereto which will nonetheless remain within the scope of the invention. The invention shall therefore only be construed in accordance with the following claims:

## CLAIMS

1. (Amended) An excitation light source assembly, comprising:

a housing defining a central opening therein and a plurality of lamp receptacles surrounding the central opening, said housing being mountable to a support structure so that the central opening is aligned with a camera also mounted to the support structure so that a field of view of the camera is unobstructed by said housing;

a light source positioned within each of the plurality of lamp receptacles;

and

a diffuser positioned within at least some of the plurality of lamp receptacles, each of said diffusers diffusing light produced by each of said light sources; and

a control system operatively connected to each of said light sources, said control system operating selected ones of said light sources to provide a desired excitation illumination to an object within the field of view of said camera, the object fluorescing in response to the excitation illumination provided by said light sources.

2. (Original) The excitation light source assembly of claim 1 wherein at least one of said light sources comprises a narrow-band light source that emits light having a bandwidth of about 35 nm.

3. (Original) The excitation light source assembly of claim 1, further comprising at least one filter positioned adjacent at least one diffuser in at least one of the lamp receptacles defined by said housing, wherein said at least one filter comprises a notch filter having a wavelength bandpass range of about 30 nm.

4. (Original) The excitation light source assembly of claim 1, wherein at least one of the light sources comprises a broad-band light source.

5. (Amended) The excitation light source assembly of claim 1, wherein at least some of said plurality of lamp receptacles comprise opposed pairs of lamp receptacles on opposite sides of said central opening, each opposed pair of lamp receptacles receiving light sources that produce light of the same color.

6-10. (Canceled).

5 6. (New) The excitation light source assembly of claim 1, wherein the light source positioned within each of the plurality of lamp receptacles does not extend beyond the lamp receptacle.

10 7. (New) The excitation light source assembly of claim 1, further comprising a plurality of light sources positioned within at least some of the lamp receptacles so that the plurality of light sources do not extend beyond the lamp receptacles.

8. (New) The excitation light source assembly of claim 7, wherein said plurality of light sources is three light sources.

15 9. (New) The excitation light source assembly of claim 1, wherein the plurality of light receptacles defined by said housing comprise a plurality of large diameter receptacles and a plurality of small diameter receptacles.

20 10. (New) The excitation light source assembly of claim 1, wherein the plurality of light receptacles defined by said housing comprise generally cylindrically shaped openings having first and second open ends, said excitation light source assembly further comprising a circuit board mounted to a first side of said housing, said light sources being mounted to said circuit board so that said light sources extend through the first open ends of the generally cylindrically-shaped light receptacles.

11. (New) An excitation light source assembly, comprising:  
a housing;  
a first connector portion mounted to said housing;  
a lamp receptacle for producing light in a first defined wavelength band; and  
a second connector portion mounted to said lamp receptacle so that said lamp receptacle can be removably engaged with said first connector portion mounted to said housing, said housing being mountable to a support structure so that a field of view of a camera also mounted to support structure is substantially unobstructed by said housing and by said lamp receptacle.

12. (New) The excitation light source assembly of claim 15, wherein said lamp receptacle further comprises:

- a first barrel section adapted to receive said second connector portion; and
- a second barrel section; and
- a light source mounted within said second barrel section.

13. (New) The excitation light source assembly of claim 12, wherein said first and second connector portions comprise respective mating electrical connector sections, and wherein said light source is electrically connected to the electrical connector section of said second connector portion.

14. (New) The excitation light source assembly of claim 12, further comprising a diffuser mounted within said second barrel section at a position adjacent said light source.

15. (New) The excitation light source assembly of claim 12, further comprising a filter mounted within said second barrel section at a position adjacent said light source.

# Fax

# avidity<sup>IP</sup>

**Correspondence Address**

Kestrel House  
Falconry Court  
Baker's Lane  
Epping, Essex  
CM16 5DQ  
United Kingdom

Tel: +44(0)1992 561 756  
Fax: +44(0)1992 561 934

email: [mail@avidity-ip.com](mailto:mail@avidity-ip.com)  
[www.avidity-ip.com](http://www.avidity-ip.com)

|                 |                                                      |                                |             |
|-----------------|------------------------------------------------------|--------------------------------|-------------|
| <b>To:</b>      | Client Data Registration                             | <b>From:</b>                   | John Moffat |
| <b>Company:</b> | EPO                                                  | <b>Pages<br/>(Inc. Cover):</b> | 4           |
| <b>Fax:</b>     | 00 49 89 2399 4465                                   | <b>Date:</b>                   | 16/10/14    |
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**Correspondence Address**

Kestrel House  
Falconry Court  
Baker's Lane  
Epping, Essex  
CM16 5DQ  
United Kingdom

Tel: +44(0)1992 561 756  
Fax: +44(0)1992 561 934

email: [mail@avidity-ip.com](mailto:mail@avidity-ip.com)  
[www.avidity-ip.com](http://www.avidity-ip.com)

ATTN Client Data Registration  
European Patent Office  
Erhardtstrasse 27  
D-80298 München  
Germany

FAX 00 49 89 2399 4465

16<sup>th</sup> October 2014

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**Re: Change of Representative Address Details: Avidity IP**

Please note that Avidity IP has changed its address to the following:

Broers Building  
Hauser Forum  
21 J J Thomson Ave  
Cambridge  
CB3 0FA  
United Kingdom

FAX 0844 358 1756

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Yours faithfully

A handwritten signature in black ink, appearing to read "John Moffat".

John Moffat  
Avidity IP

Avidity IP Ltd registered in England  
Registration no. 05697558

Registered office: Kestrel House  
Falconry Court, Baker's Lane  
Epping, Essex CM16 5DQ

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80298 Munich  
Germany  
Tel. +49(0)89 2399-0 I Fax -4465

P.O. Box 5818  
2280 HV Rijswijk  
Netherlands  
Tel. +31(0)70 340-2040 I Fax -3016

10958 Berlin  
Germany  
Tel. +49(0)30 25901-0 I Fax -840

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80296 Munich  
Germany  
Tel. +49(0)89 2399-0 I Fax -4465

P.O. Box 5618  
2280 HV Rijswijk  
Netherlands  
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|---------------------------------------------------------------------------------------------------------|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. n/a                                                                                                  | Address Change (Cambridge)                       | Address Change (Cambridge)                                                                                                                                 |
| 2.                                                                                                      |                                                  |                                                                                                                                                            |
| 3.                                                                                                      |                                                  |                                                                                                                                                            |
| 4.                                                                                                      |                                                  |                                                                                                                                                            |
| 5.                                                                                                      |                                                  |                                                                                                                                                            |
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Date 16/10/2014

File no. n/a

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Baker's Lane  
Epping  
Essex CM16 5DQ, United Kingdom

80298 Munich  
Germany  
Tel. +49(0)89 2399-0 I Fax -4465

P.O. Box 5818  
2280 HV Rijswijk  
Netherlands  
Tel. +31(0)70 340-2040 I Fax -3016

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### Eingereichte Unterlagen

### Items filed

### Pièces produites

| Anmeldenummer/Patentnummer<br>Application Number/Patent Number<br>Numéro de la demande/numéro du brevet | Ihr Zeichen<br>Your reference<br>Votre référence | ggfs. Art und Datum der Unterlagen <sup>3</sup><br>Nature and date of items (optional) <sup>3</sup><br>Nature et date des pièces (facultatif) <sup>3</sup> |
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| 2.                                                                                                      |                                                  |                                                                                                                                                            |
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Application No.: 11822574.7

The search has started on 08.06.15 (see Notice from the European Patent Office dated 03/2013, OJ EPO 2013, 153).

**Receiving Section**

**SUPPLEMENTARY PARTIAL  
EUROPEAN SEARCH REPORT**

**under Rule 164, paragraph 1 of the European Patent  
Convention**

Application Number  
**EP 11 82 2574**

| <b>DOCUMENTS CONSIDERED TO BE RELEVANT</b>                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                       |                                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| Category                                                                                                                                                                                                                                                                     | Citation of document with indication, where appropriate,<br>of relevant passages                                                                                                                                                                                      | Relevant<br>to claim                                                                                                                                                                                                                                                                                  | CLASSIFICATION OF THE<br>APPLICATION (IPC) |
| X                                                                                                                                                                                                                                                                            | JP 2004 325174 A (OLYMPUS CORP)<br>18 November 2004 (2004-11-18)<br>* abstract *                                                                                                                                                                                      | 1-10                                                                                                                                                                                                                                                                                                  | INV.<br>G01N21/64                          |
| X                                                                                                                                                                                                                                                                            | -----<br>WO 2006/058161 A2 (IDEXX LAB INC [US];<br>MISENER GARLAND CHRISTIAN [US]; HARJU<br>PHILIP N [US] 1 June 2006 (2006-06-01)<br>* page 15, line 29 - page 16, line 20;<br>figures 7A, 7B *<br>* page 18, lines 2-17 *<br>* page 23, line 24 - page 24, line 3 * | 1-10                                                                                                                                                                                                                                                                                                  |                                            |
| A                                                                                                                                                                                                                                                                            | -----<br>US 2010/152050 A1 (GORDON STEVEN [US] ET<br>AL) 17 June 2010 (2010-06-17)<br>* paragraphs [0004] - [0007] *<br>* paragraph [0013] *                                                                                                                          | 1-10                                                                                                                                                                                                                                                                                                  |                                            |
| A                                                                                                                                                                                                                                                                            | -----<br>DE 10 2007 062367 A1 (KOREA ELECTRO TECH<br>RES INST [KR]) 31 July 2008 (2008-07-31)<br>* paragraphs [0002] - [0003] *<br>* paragraphs [0051] - [0053] *<br>* paragraphs [0088] - [0099]; figures<br>1,7,8 *<br>-----<br>-/--                                | 1-10                                                                                                                                                                                                                                                                                                  |                                            |
|                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                       | TECHNICAL FIELDS<br>SEARCHED (IPC)         |
|                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                       | G01N                                       |
| <b>LACK OF UNITY OF INVENTION</b>                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                       |                                            |
| <p>The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:</p> <p>see sheet B</p>                                          |                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                       |                                            |
| <p>The present partial supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims.</p>                                                                            |                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                       |                                            |
| Place of search<br><b>Munich</b>                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                       | Date of completion of the search<br><b>16 June 2015</b>                                                                                                                                                                                                                                               | Examiner<br><b>Huenges, Alexandra</b>      |
| <p><b>CATEGORY OF CITED DOCUMENTS</b></p> <p>X : particularly relevant if taken alone<br/>Y : particularly relevant if combined with another document of the same category<br/>A : technological background<br/>O : non-written disclosure<br/>P : intermediate document</p> |                                                                                                                                                                                                                                                                       | <p>T : theory or principle underlying the invention<br/>E : earlier patent document, but published on, or after the filing date<br/>D : document cited in the application<br/>L : document cited for other reasons<br/>-----<br/>&amp; : member of the same patent family, corresponding document</p> |                                            |

| DOCUMENTS CONSIDERED TO BE RELEVANT |                                                                                                                                     |                   | CLASSIFICATION OF THE APPLICATION (IPC) |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------|
| Category                            | Citation of document with indication, where appropriate, of relevant passages                                                       | Relevant to claim |                                         |
| A                                   | US 2008/144921 A1 (LIZOTTE TODD E [US] ET AL) 19 June 2008 (2008-06-19)<br>* paragraphs [0044] - [0047]; figures 3, 4<br>*<br>----- | 1-10              |                                         |
|                                     |                                                                                                                                     |                   | TECHNICAL FIELDS SEARCHED (IPC)         |
|                                     |                                                                                                                                     |                   |                                         |

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-10

Excitation light source assembly comprising a plurality of lamp receptacles each containing a light source and at least some of the lamp receptacles contain a diffuser. The excitation light source assembly further contains a control system for operating selected ones of the light sources.

---

2. claims: 11-15

Excitation light source comprising a housing and lamp receptacle, each of which are mounted to a connector portion to allow the lamp receptacle to be removably engaged with the connector portion mounted to the housing.

---

The search has been limited to the first subject.

The prior art has been identified as document US2008144921 (D4).

Regarding claim 1, document D4 discloses:

an excitation light source assembly (see D4, paragraph 46 and figure 3) comprising:

a housing (100, fig. 3 and paragraph 46 of D4) defining a central opening therein (the housing 100 contains a central opening for insertion of an imaging lens 50, see fig. 3 and paragraph 44 of D4)

and a plurality of lamp receptacles surrounding the central opening (light emitting diodes 101-103 in figure 3 implicitly contain lamp receptacles for placement into the ring illuminator 100, see also paragraph 46 of D4),

said housing being mountable to a support structure so that the central opening is aligned with a camera also mounted to the support structure so that a field of view of the camera is unobstructed by said housing (see fig. 4 of D4: the housing or ring illuminator 100 and the camera are mounted to the columnar arrangement 40, 60, 70; furthermore, the camera's field of view is unobstructed by the housing or ring illuminator 100)

a light source positioned within each of the plurality of lamp receptacles (light emitting diodes 101-103, fig. 3, D4).

Document D4 does not disclose a diffuser positioned within at least some of the plurality of lamp receptacles and a control system operatively connected to each of said light sources for operating selected ones of said light source to provide a desired excitation illumination.

It follows that these features of claim 1, i.e. a diffuser and a control system, make a contribution over the prior art and can be considered as a special technical feature within the meaning of Rule 44(1) EPC.

The above special technical feature is named STF1. The underlying technical problem solved by STF1 can be construed as the provision of a lighting system with homogeneous and selectable illumination.

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

The same analysis as performed above is applied to the second invention defined in independent claim 11.

Regarding the features of claim 11, the prior art document D4 discloses: an excitation light source assembly (see D4, paragraph 46 and figure 3), comprising:

a housing (100, fig. 3 and paragraph 46 of D4);

a first connector portion mounted to said housing (a light emitting diode such as depicted in figure 3 with reference numerals 101-103 need to be attached in some way to the housing 100; therefore, document D4 implicitly discloses a first connector portion mounted to the housing 100)

a lamp receptacle for producing light in a first defined wavelength band (light emitting diodes 101-103 are delivered in a lamp receptacle which is also implicitly disclosed);

said housing being mountable to a support structure so that a field of view of a camera also mounted to support structure is substantially unobstructed by said housing and by said lamp receptacle (see fig. 4 of D4: the housing or ring illuminator 100 and the camera are mounted to the columnar arrangement 40, 60, 70; furthermore, the camera's field of view is unobstructed by the housing or ring illuminator 100).

Document D4 does not disclose a second connector portion mounted to said lamp receptacle so that said lamp receptacle can be removably engaged with said first connector portion mounted to said housing. Figure 3 of D4 is not drawn with enough detail to derive therefrom the fact that the light emitting diode comprises a receptacle with a second connector portion for removably engaging with the first connector portion.

The special technical feature, representing the contribution over the prior art, of claim 11 is therefore a second connector portion mounted to the lamp receptacle so that the lamp receptacle can be removably engaged with the first connector portion mounted to the housing. This special technical feature is named STF2. The underlying technical problem of special technical feature STF2 can be construed as the provision of a specific fixation of the lamp receptacle to the housing.

When comparing the technical feature STF1 with the technical feature STF2 it becomes apparent that they are neither the same nor do they correspond to each other. The same is true for the underlying technical problems. Consequently, no relationship can be established between the subject-matter of claims 1 and 11, respectively (Rule 44 EPC).

In conclusion, the claims are not linked by common or corresponding special technical features and define two different inventions not linked by a single general inventive concept.

The application hence lacks unity within the meaning of Article 82 EPC.

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 11 82 2574

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

16-06-2015

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|-------------------------------------------|---------------------|----------------------------|---------------------|
| JP 2004325174 A                           | 18-11-2004          | NONE                       |                     |
| WO 2006058161 A2                          | 01-06-2006          | AU 2005309510 A1           | 01-06-2006          |
|                                           |                     | CA 2584529 A1              | 01-06-2006          |
|                                           |                     | EP 1828751 A2              | 05-09-2007          |
|                                           |                     | EP 2388571 A1              | 23-11-2011          |
|                                           |                     | JP 2008522160 A            | 26-06-2008          |
|                                           |                     | US 2006109475 A1           | 25-05-2006          |
|                                           |                     | WO 2006058161 A2           | 01-06-2006          |
| US 2010152050 A1                          | 17-06-2010          | CA 2677216 A1              | 14-08-2008          |
|                                           |                     | DE 112008000363 T5         | 12-05-2010          |
|                                           |                     | GB 2458855 A               | 07-10-2009          |
|                                           |                     | US 2010152050 A1           | 17-06-2010          |
|                                           |                     | US 2015159211 A1           | 11-06-2015          |
|                                           |                     | WO 2008097455 A1           | 14-08-2008          |
| DE 102007062367 A1                        | 31-07-2008          | DE 102007062367 A1         | 31-07-2008          |
|                                           |                     | JP 4521587 B2              | 11-08-2010          |
|                                           |                     | JP 2008183394 A            | 14-08-2008          |
|                                           |                     | US 2008180950 A1           | 31-07-2008          |
| US 2008144921 A1                          | 19-06-2008          | NONE                       |                     |

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Wilkinson, Marc George  
Avidity IP  
Broers Building  
Hauser Forum  
21 JJ Thomson Ave  
Cambridge CB3 0FA  
ROYAUME UNI

Date

24.06.15

|                                                           |                                                                            |
|-----------------------------------------------------------|----------------------------------------------------------------------------|
| Reference<br>P102377EP51                                  | Application No./Patent No.<br>11822574.7 - 1554 / 2612200 PCT/US2011049998 |
| Applicant/Proprietor<br>Spectral Instruments Imaging, LLC |                                                                            |

#### Communication pursuant to Rule 164(1) EPC

The partial supplementary European search report (R. 164 EPC) is enclosed.

The applicant is informed that if the supplementary European search report is also to cover inventions other than the invention(s) already searched and for which a meaningful search can be carried out, a further search fee must be paid for each of these inventions, in the present instance

#### 1 search fee(s)

within **two months** from the date of notification of this communication.

The amount payable for each further search is EUR 1285,00.

#### Note to users of the automatic debiting procedure

Unless the EPO receives prior instructions to the contrary, a search fee for (each of) the identified invention(s) will be debited on the last day of the period for payment. See the Arrangements for the automatic debiting procedure (supplementary publication 3 - OJ EPO 2015).

If applicable, a European search opinion covering those invention(s) for which a search fee has been paid will then be sent together with the supplementary European search report.

Copies of documents cited in the supplementary European search report are attached.

☒ 0 additional set(s) of copies of such documents is (are) enclosed as well.

**Important information concerning fee amounts**

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**Correspondence Address**

Broers Building, Hauser Forum  
21 J J Thomson Avenue  
Cambridge  
CB3 0FA  
United Kingdom

Tel: +44(0)1992 561 756  
Fax: +44(0)8453 847 001

email: [mail@avidity-ip.com](mailto:mail@avidity-ip.com)  
[www.avidity-ip.com](http://www.avidity-ip.com)

European Patent Office  
80298 Munich  
Germany

31 July 2015

**ON LINE**

Dear Sirs,

**Re: European Patent Application No. 11822574.7**  
**Spectral Instruments Imaging, LLC**  
**Our Ref: P102377EP51**

Further to your communication of 24 June 2015 we hereby request a further search for the above application.

The EPO is authorised to debit the amount of €1285 from deposit account number 28050142 in the name of Avidity IP Limited.

The appropriate forms are attached.

Yours faithfully,

/CLARKE, Geoffrey H./

**CLARKE, Geoffrey H.**  
**AVIDITY IP**



## Letter accompanying subsequently filed items

Representative:

**Mr. Geoffrey Clarke**  
**Avidity IP**  
**Broers Building**  
**Hauser Forum**  
**21 J J Thomson Ave**  
**Cambridge Cambridgeshire CB3 0FA**  
**United Kingdom**

**Phone: +44 (0)1992 561756**

**Fax: +44 (0)8453 847 001**

**E-mail: mail@avidity-ip.com**

80298 Munich

Germany

Tel. +49(0)89 2399-0 | Fax -4465

P.O. Box 5818

NL-2280 HV Rijswijk

Netherlands

Tel. +31(0)70 340-2040 | Fax -3016

10958 Berlin

Germany

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The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number

11822574.7

Applicant's or representative's reference

P102377EP51

|   | Description of document                                 | Original file name                       | Assigned file name |
|---|---------------------------------------------------------|------------------------------------------|--------------------|
| 1 | Letter relating to the search and examination procedure | Letter to EPO request further search.pdf | EPLETT-1.pdf       |

|      | Fees                                                                   | Factor applied | Fee schedule | Amount to be paid |
|------|------------------------------------------------------------------------|----------------|--------------|-------------------|
| 15-1 | 002 Fee for a European search - Applications filed on/after 01.07.2005 | 1              | 1 285.00     | 1 285.00          |
|      | <b>Total:</b>                                                          |                | <b>EUR</b>   | <b>1 285.00</b>   |

|   | Payment                                                                                                                                        |                            |
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|   | Account holder:                                                                                                                                | Avidity IP Limited         |
| 2 | Refund/Reimbursement                                                                                                                           |                            |
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|   | Account holder:                                                                                                                                | Avidity IP Limited         |

### Signatures

Place:

Stratford upon Avon

Date:

03 August 2015

Signed by:

Geoffrey Clarke 34208

P102377EP51

Representative name: **Geoffrey Clarke**  
Capacity: **(Representative)**

# SUPPLEMENTARY EUROPEAN SEARCH REPORT

Application Number  
EP 11 82 2574

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                             |                                                            |                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|------------------------------------------------|
| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Citation of document with indication, where appropriate, of relevant passages                                                                                                                                                                               | Relevant to claim                                          | CLASSIFICATION OF THE APPLICATION (IPC)        |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | JP 2004 325174 A (OLYMPUS CORP)<br>18 November 2004 (2004-11-18)<br>* abstract *                                                                                                                                                                            | 1-11,14,<br>15                                             | INV.<br>G01N21/64<br>G03B15/05                 |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | WO 2006/058161 A2 (IDEXX LAB INC [US];<br>MISNER GARLAND CHRISTIAN [US]; HARJU<br>PHILIP N [US] 1 June 2006 (2006-06-01)<br>* page 15, line 29 - page 16, line 20;<br>figures 7A, 7B *<br>* page 18, lines 2-17 *<br>* page 23, line 24 - page 24, line 3 * | 1-11<br><br>12,13                                          |                                                |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                             |                                                            |                                                |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | US 2010/152050 A1 (GORDON STEVEN [US] ET<br>AL) 17 June 2010 (2010-06-17)<br>* paragraphs [0004] - [0007] *<br>* paragraph [0013] *                                                                                                                         | 1-10                                                       |                                                |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | DE 10 2007 062367 A1 (KOREA ELECTRO TECH<br>RES INST [KR]) 31 July 2008 (2008-07-31)<br>* paragraphs [0002] - [0003] *<br>* paragraphs [0051] - [0053] *<br>* paragraphs [0088] - [0099]; figures<br>1,7,8 *                                                | 1-10                                                       | TECHNICAL FIELDS<br>SEARCHED (IPC)<br><br>G01N |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | US 2008/144921 A1 (LIZOTTE TODD E [US] ET<br>AL) 19 June 2008 (2008-06-19)<br>* paragraphs [0044] - [0047]; figures 3, 4<br>*                                                                                                                               | 1-10                                                       |                                                |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | US 2009/075519 A1 (DAILY CHRISTOPHER<br>GEORGE [US] ET AL)<br>19 March 2009 (2009-03-19)<br>* paragraph [0001] *<br>* paragraphs [0019] - [0020]; figures 1-3<br>*                                                                                          | 12,13                                                      |                                                |
| The supplementary search report has been based on the last set of claims valid and available at the start of the search.                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                             |                                                            |                                                |
| Place of search<br><b>Munich</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                             | Date of completion of the search<br><b>15 October 2015</b> | Examiner<br><b>Huenges, Alexandra</b>          |
| <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone<br/>Y : particularly relevant if combined with another document of the same category<br/>A : technological background<br/>O : non-written disclosure<br/>P : intermediate document</p> <p>T : theory or principle underlying the invention<br/>E : earlier patent document, but published on, or after the filing date<br/>D : document cited in the application<br/>L : document cited for other reasons<br/>.....<br/>&amp; : member of the same patent family, corresponding document</p> |                                                                                                                                                                                                                                                             |                                                            |                                                |

4

EPO FORM 1503 03.82 (P04C04)

### CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

### LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☒ All further search fees have been paid within the fixed time limit. The present (supplementary) European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present (supplementary) European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present (supplementary) European search report has been drawn up for those parts of the European patent application which relate to the first mentioned in the claims, namely claims:

**LACK OF UNITY OF INVENTION  
SHEET B**

Application Number  
EP 11 82 2574

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-10

Excitation light source assembly comprising a plurality of lamp receptacles each containing a light source and at least some of the lamp receptacles contain a diffuser. The excitation light source assembly further contains a control system for operating selected ones of the light sources.

---

2. claims: 11-15

Excitation light source comprising a housing and lamp receptacle, each of which are mounted to a connector portion to allow the lamp receptacle to be removably engaged with the connector portion mounted to the housing.

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# ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 11 82 2574

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

15-10-2015

| Patent document<br>cited in search report |    | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|-------------------------------------------|----|---------------------|----------------------------|---------------------|
| JP 2004325174                             | A  | 18-11-2004          | NONE                       |                     |
| WO 2006058161                             | A2 | 01-06-2006          | AU 2005309510 A1           | 01-06-2006          |
|                                           |    |                     | CA 2584529 A1              | 01-06-2006          |
|                                           |    |                     | EP 1828751 A2              | 05-09-2007          |
|                                           |    |                     | EP 2388571 A1              | 23-11-2011          |
|                                           |    |                     | JP 2008522160 A            | 26-06-2008          |
|                                           |    |                     | US 2006109475 A1           | 25-05-2006          |
|                                           |    |                     | WO 2006058161 A2           | 01-06-2006          |
| US 2010152050                             | A1 | 17-06-2010          | CA 2677216 A1              | 14-08-2008          |
|                                           |    |                     | DE 112008000363 T5         | 12-05-2010          |
|                                           |    |                     | GB 2458855 A               | 07-10-2009          |
|                                           |    |                     | US 2010152050 A1           | 17-06-2010          |
|                                           |    |                     | US 2015159211 A1           | 11-06-2015          |
|                                           |    |                     | WO 2008097455 A1           | 14-08-2008          |
| DE 102007062367                           | A1 | 31-07-2008          | DE 102007062367 A1         | 31-07-2008          |
|                                           |    |                     | JP 4521587 B2              | 11-08-2010          |
|                                           |    |                     | JP 2008183394 A            | 14-08-2008          |
|                                           |    |                     | US 2008180950 A1           | 31-07-2008          |
| US 2008144921                             | A1 | 19-06-2008          | NONE                       |                     |
| US 2009075519                             | A1 | 19-03-2009          | CN 101803125 A             | 11-08-2010          |
|                                           |    |                     | JP 2010539652 A            | 16-12-2010          |
|                                           |    |                     | US 2009075519 A1           | 19-03-2009          |
|                                           |    |                     | WO 2009035523 A2           | 19-03-2009          |

The examination is being carried out on the **following application documents**

**Description, Pages**

|      |                             |            |
|------|-----------------------------|------------|
| 1-15 | as published                |            |
| 16   | filed in electronic form on | 17-10-2013 |

**Claims, Numbers**

|      |                             |            |
|------|-----------------------------|------------|
| 1-15 | filed in electronic form on | 17-10-2013 |
|------|-----------------------------|------------|

**Drawings, Sheets**

|                          |                             |            |
|--------------------------|-----------------------------|------------|
| 2/12-4/12,<br>7/12-12/12 | as published                |            |
| 1/12, 5/12, 6/12         | filed in electronic form on | 17-10-2013 |

Reference is made to the following documents; the numbering will be adhered to in the rest of the procedure.

|     |                                                                                                                     |
|-----|---------------------------------------------------------------------------------------------------------------------|
| D1* | JP 2004 325174 A (OLYMPUS CORP) 18 November 2004 (2004-11-18)                                                       |
| D2  | WO 2006/058161 A2 (IDEXX LAB INC [US]; MISENER GARLAND CHRISTIAN [US]; HARJU PHILIP N [US) 1 June 2006 (2006-06-01) |
| D5  | US 2008/144921 A1 (LIZOTTE TODD E [US] ET AL) 19 June 2008 (2008-06-19)                                             |
| D6  | US 2009/075519 A1 (DAILY CHRISTOPHER GEORGE [US] ET AL) 19 March 2009 (2009-03-19)                                  |

\*see also the computer translation of document D1

## 1. Lack of unity

The Searching Authority has identified two groups of claims, namely **claims 1-10** and **claims 11-15** which are not linked by a single general concept according to Art. 82 EPC.

The application lacks unity for the following reasons.

The prior art has been identified as document US2008144921 (D5). Note that the numbering of US2008144921 has changed with respect to the reasoning of lack of unity in the Supplementary Partial European Search Report (in said reasoning of lack of unity document US2008144921 was denoted D4).

Regarding claim 1, document D5 (US2008144921) discloses:

an excitation light source assembly (see D5, paragraph 46 and figure 3) comprising:  
a housing (100, fig. 3 and paragraph 46 of D5) defining a central opening therein (the housing 100 contains a central opening for insertion of an imaging lens 50, see fig. 3 and paragraph 44 of D5)

and a plurality of lamp receptacles surrounding the central opening (light emitting diodes 101-103 in figure 3 implicitly contain lamp receptacles for placement into the ring illuminator 100, see also paragraph 46 of D5),

said housing being mountable to a support structure so that the central opening is aligned with a camera also mounted to the support structure so that a field of view of the camera is unobstructed by said housing (see fig. 4 of D5: the housing or ring illuminator 100 and the camera are mounted to the columnar arrangement 40, 60, 70; furthermore, the camera's field of view is unobstructed by the housing or ring illuminator 100)

a light source positioned within each of the plurality of lamp receptacles (light emitting diodes 101-103, fig. 3, D5).

Document D5 does not disclose a diffuser positioned within at least some of the plurality of lamp receptacles and a control system operatively connected to each of said light sources for operating selected ones of said light source to provide a desired excitation illumination.

It follows that these features of claim 1, i.e. a diffuser and a control system, make a contribution over the prior art and can be considered as a special technical feature within the meaning of Rule 44(1) EPC.

The above special technical feature is named STF1. The underlying technical problem solved by STF1 can be construed as the provision of a lighting system with homogeneous and selectable illumination.

The same analysis as performed above is applied to the second invention defined in independent claim 11.

Regarding the features of claim 11, the prior art document D5 discloses:

an excitation light source assembly (see D5, paragraph 46 and figure 3), comprising:  
a housing (100, fig. 3 and paragraph 46 of D5);

a first connector portion mounted to said housing (a light emitting diode such as depicted in figure 3 with reference numerals 101-103 need to be attached in some way to the housing 100; therefore, document D5 implicitly discloses a first connector portion mounted to the housing 100)

a lamp receptacle for producing light in a first defined wavelength band (light emitting diodes 101-103 are delivered in a lamp receptacle which is also implicitly disclosed);

said housing being mountable to a support structure so that a field of view of a camera also mounted to support structure is substantially unobstructed by said housing and by said lamp receptacle (see fig. 4 of D5: the housing or ring illuminator 100 and the camera are mounted to the columnar arrangement 40, 60, 70; furthermore, the camera's field of view is unobstructed by the housing or ring illuminator 100).

Document D5 does not disclose a second connector portion mounted to said lamp receptacle so that said lamp receptacle can be removably engaged with said first connector portion mounted to said housing. Figure 3 of D5 is not drawn with enough detail to derive therefrom the fact that the light emitting diode comprises a receptacle with a second connector portion for removably engaging with the first connector portion.

The special technical feature, representing the contribution over the prior art, of claim 11 is therefore a second connector portion mounted to the lamp receptacle so that the lamp receptacle can be removably engaged with the first connector portion mounted

to the housing. This special technical feature is named STF2. The underlying technical problem of special technical feature STF2 can be construed as the provision of a specific fixation of the lamp receptacle to the housing.

When comparing the technical feature STF1 with the technical feature STF2 it becomes apparent that they are neither the same nor do they correspond to each other. The same is true for the underlying technical problems. Consequently, no relationship can be established between the subject-matter of independent claims 1 and 11, respectively (Rule 44 EPC).

In conclusion, the independent claims 1 and 11 and their respective dependent claims are not linked by common or corresponding special technical features and define two different inventions not linked by a single general inventive concept.

The application hence lacks unity within the meaning of Article 82 EPC.

## 2. Lack of novelty of claim 1

The present application does not meet the requirements of Article 52(1) EPC because the subject-matter of claim 1 is not new within the meaning of Article 54(1) and (2) EPC.

Document D1 discloses the features of claim 1, namely

an excitation light source assembly (see the abstract of D1) comprising:  
a housing

(see the figure - accompanying the abstract - of D1: reference numeral 9 represents a housing)

defining a central opening therein

(see the figure D1: an objective lens 5 is depicted in the center of the housing 9; this objective lens 5 makes a central opening in the housing 9 necessary; consequently, the housing has a central opening.)

and a plurality of lamp receptacles surrounding the central opening

(see the figure of D1: housing 9 contains a plurality of holes 902 for receiving LED units 11)

said housing being mountable to a support structure so that the central opening is aligned with a camera also mounted to the support structure so that a field of view of the camera is unobstructed by said housing

(see the figure of D1: housing 9 is mounted to base 6 and the objective lens keeps the field of view of camera 24 unobstructed);

a light source positioned within each of the plurality of lamp receptacles

(LED light source units are positioned in each of the plurality of reception holes 902, see the translation of D1, paragraph 55);

and a diffuser positioned within at least some of the plurality of lamp receptacles, each of said diffusers diffusing light produced by each of said light sources

(see the computer translation of D1, paragraph 106: the LED source unit comprises a diffusion board 3104);

and a control system operatively connected to each of said light sources, said control system operating selected ones of said light sources to provide a desired excitation illumination to an object within the field of view of said camera

(see the computer translation of D1, paragraph 80),

the object fluorescing in response to the excitation illumination provided by said light sources

(as the object does not seem to be part of the apparatus, the fact that the object fluoresces in response to illumination is not an apparatus feature; however, as the apparatus of D1 is used for exciting and detecting fluorescence, the object 202 of D1 fluoresces in response to the excitation illumination provided by the light sources 11).

Concluding, document D1 anticipates the subject-matter of claim 1.

Likewise, document D2 discloses an excitation light source assembly comprising all features of claim 1. In particular, D2 discloses a housing 28 (see figure 7A of D2), a plurality of lamp receptacles each containing a light source (see D2, page 16, lines 15-19: a plurality of LEDs 2 are mounted to a printed circuit board; as an LED is always manufactured in a receptacle, a plurality of lamp receptacles is implicitly disclosed), a diffuser (see D2, page 18, lines 2-5 disclosing the use of diffused narrow viewing angle LEDs), a control system for operating individual LEDs (see D2, page 23, line 24 - page 24, line 3).

Document D2 discloses all features of claim 1.

The subject-matter of claim 1 is therefore not new in view of document D1 and in view of document D2, Art 54 EPC.

### 3. Lack of novelty of independent claim 11

The subject-matter of independent claim 11 is not novel for the following reasons, Art. 54 EPC.

The subject-matter of claim 1 is defined in such a broad way that document D1 can be read onto the claim:

Referring to claim 11, document D1 shows

an excitation light source assembly

(see the abstract of D1), comprising:

a housing

(see the figure accompanying the abstract of D1: reference numeral 9 represents a housing);

a first connector portion mounted to said housing

(the expression "connector portion" is interpreted as a part which enables connection with another part. Document D1 shows a plurality of LED source unit reception holes 902, see the figure accompanying the abstract of D1 and see paragraph [0055] of the computer translation of D1. The LED source unit reception holes 902 allow insertion of LED source units. Hence, the LED source unit reception holes enables connection with LED source units and are therefore consider connector portions. The LED source unit reception hole 902 is regarded a connector portion mounted to said housing);  
a lamp receptacle for producing light in a first defined wavelength band

(see figure 10 of document D1 showing an LED light source holder 3201; the LED light source holder 3201 represents a lamp receptacle for producing light in a wavelength band, see also paragraphs [0110] and [0111] of the computer translation of D1);

and a second connector portion mounted to said lamp receptacle

(see figure 10 of D1: the LED light source holder 3201 is surrounded by a housing; this housing represents a second connector portion; it is also mounted to the lamp receptacle which in figure 10 is the LED light source holder. Hence, the housing surrounding the LED light source holder 3201 represents the second connector portion as defined in the claim)

so that said lamp receptacle can be removably engaged with said first connector portion mounted to said housing

(this feature is implicitly disclosed with the light assembly of document D1; in D1 the LED light source holders can be removably engaged with the LED source unit reception holes; as the LED light source holders represents a lamp receptacle and the LED source unit reception holes a first connector, D1 discloses the respective feature),

said housing being mountable to a support structure so that a field of view of a camera also mounted to support structure is substantially unobstructed by said housing and by said lamp receptacle.

(see the figure accompanying the abstract of D1: housing 9 is mounted to base 6 and the object lens 5 keeps the field of view of camera 24 unobstructed).

Concluding, document D1 anticipates the subject-matter of claim 11.

Likewise, document D2 discloses all features of claim 11, see D2, figure 5 and page 1, lines 16-18 and page 14, lines 1-11.

#### 4. Dependent claims 2-11, 12-15

The dependent claims do not contain any additional features which meet the requirements of the EPC with respect to novelty and/or inventive step.

The additional features of dependent claims 2-3 are disclosed in document D1 (see D1, paragraphs [0131] and [0133] of the computer translation of D1)

Dependent claim 4 is obvious in view of either document D1 or D2.

Claims 5-8 are not new in view of document D2, see page 13, lines 18-32 and figs. 5 and 7A).

Claims 9 and 10 are not inventive over document D2 (see also document D6, paragraph [0019] and figures 1-3 showing cylindrical light source holders).

The features of dependent claims 12 and 13 are not inventive over a combination of documents D2 and D6, D6 disclosing a modular LED light source unit which may be mounted on a printed circuit and D2 disclosing a printed circuit board for use with LEDs (see document D2, page 14, lines 1-11 and see document D6, figures 1-3 and paragraphs [0001], [0019]. In view of a combination of these documents, claims 12 and 13 are not inventive, Art. 56 EPC.

Dependent claims 14-15 are obvious in view of document D1 (see figure 9 and paragraph [0106] of the computer translation of D1).

**Questions about this communication ?**

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Wilkinson, Marc George  
Avidity IP  
Broers Building  
Hauser Forum  
21 JJ Thomson Ave  
Cambridge CB3 0FA  
ROYAUME UNI

Date

26.10.15

|                                                           |                                                                            |
|-----------------------------------------------------------|----------------------------------------------------------------------------|
| Reference<br>P102377EP51                                  | Application No./Patent No.<br>11822574.7 - 1554 / 2612200 PCT/US2011049998 |
| Applicant/Proprietor<br>Spectral Instruments Imaging, LLC |                                                                            |

**Communication**

The extended European search report is enclosed.

The extended European search report includes, pursuant to Rule 62 EPC, the supplementary European search report (Art. 153(7) EPC) and the European search opinion.

Copies of documents cited in the European search report are attached.

☒ 0 additional set(s) of copies of such documents is (are) enclosed as well.

**Refund of the search fee**

If applicable under Article 9 Rules relating to fees, a separate communication from the Receiving Section on the refund of the search fee will be sent later.

Should you wish to further prosecute this application in the examination phase, your attention is drawn to the provisions of Rule 70a EPC. An invitation to respond to the extended European search report will be issued shortly (R. 70(2) EPC).



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Wilkinson, Marc George  
Avidity IP  
Broers Building  
Hauser Forum  
21 JJ Thomson Ave  
Cambridge CB3 0FA  
ROYAUME UNI

Date

12.11.15

|                                                           |                                                                            |
|-----------------------------------------------------------|----------------------------------------------------------------------------|
| Reference<br>P102377EP51                                  | Application No./Patent No.<br>11822574.7 - 1554 / 2612200 PCT/US2011049998 |
| Applicant/Proprietor<br>Spectral Instruments Imaging, LLC |                                                                            |

**Communication pursuant to Rules 70(2) and 70a(2) EPC**

A supplementary European search report has been drawn up concerning the above-identified European patent application (publication number: 2612200).

Since the request for examination has been filed (R. 70(1), 159(1)(f), Art. 94(1) EPC) prior to the transmission of the supplementary European search report, you are hereby invited to indicate within

**six months**

of notification of this communication whether you wish to proceed further with the European patent application.

If you do not indicate in due time that you wish to proceed further with the European patent application, it **will be deemed to be withdrawn** (R. 70(3) EPC).

You are invited, within the above-mentioned six-month period, to comment on the objections raised in the opinion accompanying the European search report and/or to file any amendments to the description, claims and drawings correcting any deficiencies noted in the opinion (R. 70a(2), R. 137(2) EPC; Guidelines for Examination in the EPO, B-XI, 8).

If filing amendments, you must identify them and indicate the basis for them in the application as filed. Failure to meet either requirement may lead to a communication from the Examining Division requesting that you correct this deficiency (R. 137(4) EPC).

Should the reply to the invitation pursuant to Rule 70a(2) EPC be filed in an admissible non-EPO language, a translation is to be submitted within one month of its filing (R. 6(2) EPC).

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**Receiving Section**



# Fax

## AVIDITY IP

European Patent and Trade Mark Attorneys since 1989

**Correspondence Address**

Broers Building  
Hauser Forum  
21 JJ Thomson Avenue  
Cambridge  
CB3 0FA  
United Kingdom

Tel: +44(0)1992 561 756

Fax: +44(0)8453 847 001

www.avidity-ip.com

mail@avidity-ip.com

|                 |                                     |                                |                             |
|-----------------|-------------------------------------|--------------------------------|-----------------------------|
| <b>To:</b>      | Claudia Weber                       | <b>From:</b>                   | Ross M Cummings             |
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# AVIDITY IP

European Patent and Trade Mark Attorneys since 1989

## Correspondence Address

Broers Building  
Hauser Forum  
21 JJ Thomson Avenue  
Cambridge  
CB3 0FA  
United Kingdom

Tel: +44(0)1992 561 756  
Fax: +44(0)8453 847 001

[www.avidity-ip.com](http://www.avidity-ip.com)  
[mail@avidity-ip.com](mailto:mail@avidity-ip.com)

European Patent Office  
D-80298 Munchen  
Germany

FAX 00 49 89 2399 4465

20<sup>th</sup> April 2016

Dear Sirs

Re: **Change to Named Representative**

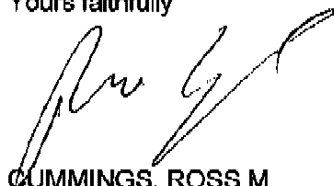
Please amend the Register in respect of the applications on the attached sheet to show, as the first-named representative:

MARCH, Gary C  
Avidity IP  
Broers Building  
Hauser Forum  
21 J J Thomson Ave  
Cambridge  
CB3 0FA  
United Kingdom

Additional representatives in respect of this application are shown on the second attached sheet.

Please acknowledge receipt of this letter and its enclosures by returning the enclosed EPO Form 1037 in due course.

Yours faithfully



CUMMINGS, ROSS M

| APPLICATION NUMBER | FIRST APPLICANT                   | OUR REFERENCE NUMBER |
|--------------------|-----------------------------------|----------------------|
| 11 822574.7        | Spectral Instruments Imaging, LLC | P102377EP51          |
| 08 763494.5        | Ruimy, Shimon                     | P100903EP51          |

**Additional Sheet**

**Additional Representatives: -**

ALI, SULEMAN

BIZLEY, RICHARD EDWARD

BRANSCOMBE, ADAM

CLARKE, GEOFFREY HOWARD

COLE, WILLIAM GWYN

CUMMINGS, ROSS MARTIN

LASTERRA, ELENA

MARCH, GARY CLIFFORD

MOFFAT, JOHN ANDREW

SYMONS, RUPERT JONATHAN

**All of:**

**Avidity IP**

Broers Building, Hauser Forum

21 J J Thomson Avenue

Cambridge

CB3 0FA

UK



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Avidity IP

Broers Building, Hauser Forum  
21 J J Thomson Avenue  
Cambridge  
CB3 0FA

Avidity IP

Date 20/04/2016

File no. Various

Applicant

Various

80298 Munich  
Germany  
Tel. +49(0)89 2399-0 | Fax +4465

P.O. Box 5818  
2280 HV Rijswijk  
Netherlands  
Tel. +31(0)70 340-2040 | Fax +3018

10958 Berlin  
Germany  
Tel. +49(0)30 26901-0 | Fax +840

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## Items filed

## Pièces produites

| Anmeldenummer/Patentnummer<br>Application Number/Patent Number<br>Numéro de la demande/numéro du brevet | Ihr Zeichen<br>Your reference<br>Votre référence | ggfs. Art und Datum der Unterlagen <sup>2</sup><br>Nature and date of items (optional) <sup>3</sup><br>Nature et date des pièces (facultatif) <sup>3</sup> |
|---------------------------------------------------------------------------------------------------------|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Various                                                                                              | Various                                          | Change to Named Representative - GM                                                                                                                        |
| 2.                                                                                                      |                                                  |                                                                                                                                                            |
| 3.                                                                                                      |                                                  |                                                                                                                                                            |
| 4.                                                                                                      |                                                  |                                                                                                                                                            |
| 5.                                                                                                      |                                                  |                                                                                                                                                            |
| 6.                                                                                                      |                                                  |                                                                                                                                                            |
| 7.                                                                                                      |                                                  |                                                                                                                                                            |
| 8.                                                                                                      |                                                  |                                                                                                                                                            |

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EPO - Munich

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23 April 2016

## CONFIRMATION

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### Correspondence Address

Broers Building  
Hauser Forum  
21 JJ Thomson Avenue  
Cambridge  
CB3 0FA  
United Kingdom

Tel: +44(0)1992 561 756  
Fax: +44(0)8453 847 001

[www.avidity-ip.com](http://www.avidity-ip.com)  
[mail@avidity-ip.com](mailto:mail@avidity-ip.com)

|                 |                                     |                                |                             |
|-----------------|-------------------------------------|--------------------------------|-----------------------------|
| <b>To:</b>      | Claudia Weber                       | <b>From:</b>                   | Ross M Cummings             |
| <b>Company:</b> | EPO                                 | <b>Pages<br/>(Inc. Cover):</b> | 5                           |
| <b>Fax:</b>     | 00 49 89 2399 4465                  | <b>Date:</b>                   | 20 <sup>th</sup> April 2016 |
| <b>Re:</b>      | Change to Named Representative - GM |                                |                             |

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## Correspondence Address

Broers Building  
Hauser Forum  
21 JJ Thomson Avenue  
Cambridge  
CB3 0FA  
United Kingdom

Tel: +44(0)1992 561 756  
Fax: +44(0)8453 847 001

[www.avidity-ip.com](http://www.avidity-ip.com)  
[mail@avidity-ip.com](mailto:mail@avidity-ip.com)

European Patent Office  
D-80298 Munchen  
Germany

FAX 00 49 89 2399 4465

20<sup>th</sup> April 2016

Dear Sirs

Re: **Change to Named Representative**

Please amend the Register in respect of the applications on the attached sheet to show, as the first-named representative:

MARCH, Gary C  
Avidity IP  
Broers Building  
Hauser Forum  
21 J J Thomson Ave  
Cambridge  
CB3 0FA  
United Kingdom

Additional representatives in respect of this application are shown on the second attached sheet.

Please acknowledge receipt of this letter and its enclosures by returning the enclosed EPO Form 1037 in due course.

Yours faithfully



CUMMINGS, ROSS M

| <b>APPLICATION NUMBER</b> | <b>FIRST APPLICANT</b>            | <b>OUR REFERENCE NUMBER</b> |
|---------------------------|-----------------------------------|-----------------------------|
| 11 822574.7               | Spectral Instruments Imaging, LLC | P102377EP51                 |
| 08 763494.5               | Ruimy, Shimon                     | P100903EP51                 |

### **Additional Sheet**

Additional Representatives: -

ALI, SULEMAN

BIZLEY, RICHARD EDWARD

BRANSCOMBE, ADAM

CLARKE, GEOFFREY HOWARD

COLE, WILLIAM GWYN

CUMMINGS, ROSS MARTIN

LASTERRA, ELENA

MARCH, GARY CLIFFORD

MOFFAT, JOHN ANDREW

SYMONS, RUPERT JONATHAN

**All of:**

**Avidity IP**

Broers Building, Hauser Forum

21 J J Thomson Avenue

Cambridge

CB3 0FA

UK

## Correspondence Address

Broers Building  
Hauser Forum  
21 JJ Thomson Avenue  
Cambridge  
CB3 0FA  
United Kingdom

Tel: +44(0)1992 561 756  
Fax: +44(0)8453 847 001

[www.avidity-ip.com](http://www.avidity-ip.com)  
[mail@avidity-ip.com](mailto:mail@avidity-ip.com)

European Patent Office  
80298 Munich  
Germany

26 April 2016

## On-Line

Dear Sirs

European Patent Application No. 11822574.7  
Spectral Instruments Imaging, LLC  
Our Ref: P102377EP51

Referring to this application and an informal discussion with the search Examiner, we herewith request a refund of the additional search fee paid.

Moreover, we note the allowed request for treatment on the PPH does not show in the documents available on-line from the EPO register. Can this please be placed on/restored to the public record?

Yours faithfully

/MARCH, Gary C./

---

**MARCH, Gary C.**  
**AVIDITY IP**



## Letter accompanying subsequently filed items

Representative:

**Mr. Gary March**  
**Avidity IP**  
**Broers Building**  
**Hauser Forum**  
**21 J J Thomson Ave**  
**Cambridge Cambridgeshire CB3 0FA**  
**United Kingdom**

**Phone: +44 (0)1992 561756**

**Fax: +44 (0)8453 847 001**

**E-mail: mail@avidity-ip.com**

80298 Munich

Germany

Tel. +49(0)89 2399-0 | Fax -4465

P.O. Box 5818

NL-2280 HV Rijswijk

Netherlands

Tel. +31(0)70 340-2040 | Fax -3016

10958 Berlin

Germany

Tel. +49(0)30 25901-0 | Fax -840

The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number

11822574.7

Applicant's or representative's reference

P102377EP51

|   | Description of document                                 | Original file name                               | Assigned file name |
|---|---------------------------------------------------------|--------------------------------------------------|--------------------|
| 1 | Letter relating to the search and examination procedure | 26.04.16 Let to EPO refund of Exam fee & PPH.pdf | EPLETT-1.pdf       |

### Signatures

Place: **Cambridge**  
Date: **26 April 2016**  
Signed by: **Gary March 37143**  
Representative name: **Gary March**  
Capacity: **(Representative)**

P102377EP51

**Questions about this communication ?**

Contact Customer Services at [www.epo.org/contact](http://www.epo.org/contact)



March, Gary Clifford  
Avidity IP  
Broers Building, Hauser Forum  
21 J J Thomson Avenue  
Cambridge CB3 0FA  
ROYAUME UNI

Date  
02.05.16

|                                                           |                                                           |
|-----------------------------------------------------------|-----------------------------------------------------------|
| Reference<br>P102377EP51                                  | Application No./Patent No.<br>11822574.7 - 1554 / 2612200 |
| Applicant/Proprietor<br>Spectral Instruments Imaging, LLC |                                                           |

**Communication of amended entries concerning the representative (R. 143(1)(h) EPC)**

As requested, for the above-mentioned European patent application / European patent the entries concerning the representative have been amended as follows:

March, Gary Clifford  
Avidity IP  
Broers Building, Hauser Forum  
21 J J Thomson Avenue  
Cambridge CB3 0FA  
GB

The amendment will be recorded in the Register of European Patents.

**Receiving Section**



**Information on Search Strategy - Pilot phase (see OJ 2015, A86)**

The type of information contained in this sheet may change during the pilot for improving the usefulness of this new service.

Application Number

EP 11 82 2574

TITLE:

APPLICANT: Spectral Instruments Imaging, LLC

IPC CLASSIFICATION: G01N21/64, G03B15/05

EXAMINER: Huenges, Alexandra

CONSULTED DATABASES: WPI, EPODOC, XFULL

CLASSIFICATION SYMBOLS DEFINING EXTENT OF THE SEARCH:

IPC:

CPC: G01N21/645/LOW, G01N2021/6419

FI/F-TERMS:

KEYWORDS OR OTHER ELEMENTS FEATURING THE INVENTION:

**SUPPLEMENTARY  
EUROPEAN SEARCH REPORT**

Application Number  
**EP 11 82 2574**

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                             |                                                       |                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|--------------------------------------------|
| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Citation of document with indication, where appropriate, of relevant passages                                                                                                                                                                               | Relevant to claim                                     | CLASSIFICATION OF THE APPLICATION (IPC)    |
| 7 X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | JP 2004 325174 A (OLYMPUS CORP)<br>18 November 2004 (2004-11-18)<br>* abstract *                                                                                                                                                                            | 1-11,<br>14-26                                        | INV.<br>G01N21/64<br>G03B15/05             |
| 6 X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | WO 2006/058161 A2 (IDEXX LAB INC [US];<br>MISNER GARLAND CHRISTIAN [US]; HARJU<br>PHILIP N [US] 1 June 2006 (2006-06-01)<br>* page 15, line 29 - page 16, line 20;<br>figures 7A, 7B *<br>* page 18, lines 2-17 *<br>* page 23, line 24 - page 24, line 3 * | 1-27                                                  |                                            |
| 3 A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | US 2010/152050 A1 (GORDON STEVEN [US] ET<br>AL) 17 June 2010 (2010-06-17)<br>* paragraphs [0004] - [0007] *<br>* paragraph [0013] *                                                                                                                         | 1-10                                                  |                                            |
| 3 A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | DE 10 2007 062367 A1 (KOREA ELECTRO TECH<br>RES INST [KR]) 31 July 2008 (2008-07-31)<br>* paragraphs [0002] - [0003] *<br>* paragraphs [0051] - [0053] *<br>* paragraphs [0088] - [0099]; figures<br>1,7,8 *                                                | 1-10                                                  | TECHNICAL FIELDS<br>SEARCHED (IPC)<br>G01N |
| 3 A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | US 2008/144921 A1 (LIZOTTE TODD E [US] ET<br>AL) 19 June 2008 (2008-06-19)<br>* paragraphs [0044] - [0047]; figures 3, 4<br>*                                                                                                                               | 1-10                                                  |                                            |
| 8 A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | US 2009/075519 A1 (DAILY CHRISTOPHER<br>GEORGE [US] ET AL)<br>19 March 2009 (2009-03-19)<br>* paragraph [0001] *<br>* paragraphs [0019] - [0020]; figures 1-3<br>*                                                                                          | 12,13                                                 |                                            |
| 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | The supplementary search report has been based on the last set of claims valid and available at the start of the search.                                                                                                                                    |                                                       |                                            |
| Place of search<br><b>Munich</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                             | Date of completion of the search<br><b>3 May 2016</b> | Examiner<br><b>Huenges, Alexandra</b>      |
| <p><b>CATEGORY OF CITED DOCUMENTS</b></p> <p>X : particularly relevant if taken alone<br/>Y : particularly relevant if combined with another document of the same category<br/>A : technological background<br/>O : non-written disclosure<br/>P : intermediate document</p> <p>T : theory or principle underlying the invention<br/>E : earlier patent document, but published on, or after the filing date<br/>D : document cited in the application<br/>L : document cited for other reasons<br/>&amp; : member of the same patent family, corresponding document</p> |                                                                                                                                                                                                                                                             |                                                       |                                            |

EPO FORM 1503 03.82 (P04C04)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 11 82 2574

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

03-05-2016

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|-------------------------------------------|---------------------|----------------------------|---------------------|
| JP 2004325174 A                           | 18-11-2004          | NONE                       |                     |
| WO 2006058161 A2                          | 01-06-2006          | AU 2005309510 A1           | 01-06-2006          |
|                                           |                     | CA 2584529 A1              | 01-06-2006          |
|                                           |                     | EP 1828751 A2              | 05-09-2007          |
|                                           |                     | EP 2388571 A1              | 23-11-2011          |
|                                           |                     | JP 2008522160 A            | 26-06-2008          |
|                                           |                     | US 2006109475 A1           | 25-05-2006          |
|                                           |                     | WO 2006058161 A2           | 01-06-2006          |
| US 2010152050 A1                          | 17-06-2010          | CA 2677216 A1              | 14-08-2008          |
|                                           |                     | DE 112008000363 T5         | 12-05-2010          |
|                                           |                     | GB 2458855 A               | 07-10-2009          |
|                                           |                     | US 2010152050 A1           | 17-06-2010          |
|                                           |                     | US 2015159211 A1           | 11-06-2015          |
|                                           |                     | WO 2008097455 A1           | 14-08-2008          |
| DE 102007062367 A1                        | 31-07-2008          | DE 102007062367 A1         | 31-07-2008          |
|                                           |                     | JP 4521587 B2              | 11-08-2010          |
|                                           |                     | JP 2008183394 A            | 14-08-2008          |
|                                           |                     | US 2008180950 A1           | 31-07-2008          |
| US 2008144921 A1                          | 19-06-2008          | NONE                       |                     |
| US 2009075519 A1                          | 19-03-2009          | CN 101803125 A             | 11-08-2010          |
|                                           |                     | JP 2010539652 A            | 16-12-2010          |
|                                           |                     | US 2009075519 A1           | 19-03-2009          |
|                                           |                     | WO 2009035523 A2           | 19-03-2009          |

The examination is being carried out on the **following application documents**

**Description, Pages**

|      |                             |            |
|------|-----------------------------|------------|
| 1-15 | as published                |            |
| 16   | filed in electronic form on | 17-10-2013 |

**Claims, Numbers**

|      |                                  |
|------|----------------------------------|
| 1-27 | filed with telefax on 04-03-2015 |
|------|----------------------------------|

**Drawings, Sheets**

|                          |                             |            |
|--------------------------|-----------------------------|------------|
| 2/12-4/12,<br>7/12-12/12 | as published                |            |
| 1/12, 5/12, 6/12         | filed in electronic form on | 17-10-2013 |

Reference is made to the following documents.

|     |                                                                                                                     |
|-----|---------------------------------------------------------------------------------------------------------------------|
| D1* | JP 2004 325174 A (OLYMPUS CORP) 18 November 2004 (2004-11-18)                                                       |
| D2  | WO 2006/058161 A2 (IDEXX LAB INC [US]; MISENER GARLAND CHRISTIAN [US]; HARJU PHILIP N [US] 1 June 2006 (2006-06-01) |

\*see also the computer translation of document D1

1. Lack of conciseness

Claims 1, 14 and 25 have been drafted as separate independent apparatus claims.

Under Article 84 in combination with Rule 43(2) EPC, an application may contain more than one independent claim in a particular category only if the subject-matter claimed falls within one or more of the exceptional situations set out in paragraph (a), (b) or (c) of Rule 43(2) EPC. This is not the case in the present application, however, as the independent claims define essentially the same subject-matter. The claims therefore need to be restricted to a single independent apparatus claim.

## 2. Lack of novelty of independent apparatus claim 1

The present application does not meet the requirements of Article 52(1) EPC because the subject-matter of claim 1 is not new within the meaning of Article 54(1) and (2) EPC.

Document D1 discloses the features of claim 1, namely

an excitation light source assembly (see the abstract of D1) comprising:  
a housing

(see the figure - accompanying the abstract - of D1: reference numeral 9 represents a housing)

defining a central opening therein

(see the figure D1: an objective lens 5 is depicted in the center of the housing 9; this objective lens 5 makes a central opening in the housing 9 necessary; consequently, the housing has a central opening.)

and a plurality of lamp receptacles surrounding the central opening

(see the figure of D1: housing 9 contains a plurality of holes 902 for receiving LED units 11)

said housing being mountable to a support structure so that the central opening is aligned with a camera also mounted to the support structure so that a field of view of the camera is unobstructed by said housing

(see the figure of D1: housing 9 is mounted to base 6 and the objective lens keeps the field of view of camera 24 unobstructed);

a light source positioned within each of the plurality of lamp receptacles

(LED light source units are positioned in each of the plurality of reception holes 902, see the translation of D1, paragraph 55),

wherein at least one of said light sources comprises a narrow-band light source

(see D1, paragraph [0131] of the computer translation of D1)

and a diffuser positioned within at least some of the plurality of lamp receptacles,  
each of said diffusers diffusing light produced by each of said light sources

(see the computer translation of D1, paragraph 106: the LED source unit comprises a diffusion board 3104);

and a control system operatively connected to each of said light sources, said control system operating selected ones of said light sources to provide a desired excitation illumination to an object within the field of view of said camera

(see the computer translation of D1, paragraph 80),

the object fluorescing in response to the excitation illumination provided by said light sources

(as the object does not seem to be part of the apparatus, the fact that the object fluoresces in response to illumination is not an apparatus feature; however, as the apparatus of D1 is used for exciting and detecting fluorescence, the object 202 of D1 fluoresces in response to the excitation illumination provided by the light sources 11).

Concluding, document D1 anticipates the subject-matter of claim 1.

Likewise, document D2 discloses an excitation light source assembly comprising all features of claim 1. In particular, D2 discloses a housing 28 (see figure 7A of D2), a plurality of lamp receptacles each containing a narrow-band light source (see D2, page 16, lines 15-19: a plurality of LEDs 2 are mounted to a printed circuit board; as an LED is always manufactured in a receptacle, a plurality of lamp receptacles is implicitly disclosed), a diffuser (see D2, page 18, lines 2-5 disclosing the use of diffused narrow viewing angle LEDs), a control system for operating individual LEDs (see D2, page 23, line 24 - page 24, line 3).

Document D2 discloses all features of claim 1.

The subject-matter of claim 1 is therefore not new in view of document D1 and in view of document D2, Art 54 EPC.

3. Lack of novelty of independent apparatus claim 14

The subject-matter of independent claim 14 is not novel for the following reasons, Art. 54 EPC.

Claim 14 defines the subject-matter of claim 1 using a different wording. The argumentation as to lack of novelty is however the same, see point 2. above.

Claim 14 is not novel over each of documents D1 and D2, Art. 54 EPC.

4. Lack of novelty of independent apparatus claim 25

Claim 25 differs from independent apparatus claim 1 in the addition of the feature **"said light sources do not extend beyond the lamp receptacles"** and in the deletion of the feature "diffusers diffusing light produced by each of said light sources".

Regarding the common features of claims 1 and 25, reference is made to the argumentation under point 2. above showing them to be anticipated by each of documents D1 and D2.

The additional feature of claim 25, i.e. **"said light sources do not extend beyond the lamp receptacles"**, is known from document D1, see figures 1 and 10 of D1, as well as from document D2, see figures 7A and 7B with LEDs 2 placed in receptacles.

The subject-matter of claim 25 is therefore anticipated by each of documents D1 and D2 and therefore not novel, Art. 54 EPC.

5. Dependent claims 2-13, 15-24 and 26-27

The dependent claims do not contain any additional features which meet the requirements of the EPC with respect to novelty and/or inventive step.

The additional features of dependent claims 2-5 are disclosed in document D1 (see D1, paragraphs [0131] and [0133] of the computer translation of D1). Furthermore, the additional feature of claim 3 is known from D2, see page 8, lines 22-28.

Dependent claim 6 is obvious in view of either document D1 or D2.

Claim 7 is not new in view of either document D1, see figure 13 or document D2, see LEDs 18 in figure 5.

Claim 8 is not new in view of document D2, see figure 7A and obvious in view of document D1.

Claims 9-11 are not new in view of either document D1, see figures 1 and 10 or document D2, see page 13, lines 18-32 and figs. 5 and 7A.

Claims 12 is not new over document D2 (see figure 7A showing LEDs with larger cylindrical openings and LEDs with smaller oval openings)

Claim 13 is new in view of D2, see the circuit board disclosed in claim 5 of D2 and the cylindrical light source holders (2) shown in figures 7A and 7B.

Dependent claim 15 is not new in view of document D1, paragraph [0106] and figure 9.

The additional features of claim 16 are known from document D1, figure 1 and from document D2, figure 7A.

Dependent claims 17 and 18 are not new in view of either document D1, paragraph [0131] and from document D2, page 13, lines 18-22.

Dependent claim 19 is not inventive over either document D1, paragraph [0131] or document D2, page 13, lines 18-22.

Dependent claim 20 is not new in view of document D1, see paragraphs [0131] and [0133].

The additional features of claims 21-23 are known from document D1, paragraph [0131] and from document D2, see page 13, lines 18-22.

Dependent claim 24 is an obvious selection of a housing material and does not involve an inventive step.

Dependent claim 26 is an obvious arrangement of LEDs with respect to lamp receptacles. Claim 26 does not involve an inventive step.

The additional feature of dependent claim 27 is known from document D2, page 15, lines 29-33.

**Questions about this communication ?**

Contact Customer Services at [www.epo.org/contact](http://www.epo.org/contact)



March, Gary Clifford  
Avidity IP  
Broers Building, Hauser Forum  
21 J J Thomson Avenue  
Cambridge CB3 0FA  
ROYAUME UNI

Date

17.05.2016

|                                                           |                                                                            |
|-----------------------------------------------------------|----------------------------------------------------------------------------|
| Reference<br>P102377EP51                                  | Application No./Patent No.<br>11822574.7 - 1554 / 2612200 PCT/US2011049998 |
| Applicant/Proprietor<br>Spectral Instruments Imaging, LLC |                                                                            |

**Mitteilung / Communication / Notification**

Das Europäische Patentamt übermittelt hiermit einen neuen europäischen Recherchenbericht,

- ☐ durch den der frühere Recherchenbericht vom ..... ersetzt wird.
- ☐ in welchem die Angaben der Klassifikation der Anmeldung geändert worden sind.

-----

The European Patent Office herewith transmits a new European search report,

- ☒ which replaces the previous search report of 26.10.2015 .....
- ☐ in which an alteration in the presentation of the classification has been made.

-----

L'office européen des brevets a l'honneur de vous transmettre un nouveau rapport de recherche,

- ☐ qui annule et remplace le rapport de recherche du ..... .
- ☐ dans lequel l'indication de la classification de la demande a été modifiée.

**Eingangsstelle / Receiving Section / Section de dépôt**



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March, Gary Clifford  
Avidity IP  
Broers Building, Hauser Forum  
21 J J Thomson Avenue  
Cambridge CB3 0FA  
ROYAUME UNI

Date

20.05.2016

|                                                           |                                                                            |
|-----------------------------------------------------------|----------------------------------------------------------------------------|
| Reference<br>P102377EP51                                  | Application No./Patent No.<br>11822574.7 - 1554 / 2612200 PCT/US2011049998 |
| Applicant/Proprietor<br>Spectral Instruments Imaging, LLC |                                                                            |

This communication replaces communication dated 12.11.2015

**Communication pursuant to Rules 70(2) and 70a(2) EPC**

A supplementary European search report has been drawn up concerning the above-identified European patent application (publication number: 2612200).

Since the request for examination has been filed (R. 70(1), 159(1)(f), Art. 94(1) EPC) prior to the transmission of the supplementary European search report, you are hereby invited to indicate within

**six months**

of notification of this communication whether you wish to proceed further with the European patent application.

If you do not indicate in due time that you wish to proceed further with the European patent application, it **will be deemed to be withdrawn** (R. 70(3) EPC).

You are invited, within the above-mentioned six-month period, to comment on the objections raised in the opinion accompanying the European search report and/or to file any amendments to the description, claims and drawings correcting any deficiencies noted in the opinion (R. 70a(2), R. 137(2) EPC; Guidelines for Examination in the EPO, B-XI, 8).

If filing amendments, you must identify them and indicate the basis for them in the application as filed. Failure to meet either requirement may lead to a communication from the Examining Division requesting that you correct this deficiency (R. 137(4) EPC).

Should the reply to the invitation pursuant to Rule 70a(2) EPC be filed in an admissible non-EPO language, a translation is to be submitted within one month of its filing (R. 6(2) EPC).

Should you not comply with this invitation within the time limit, the application **will be deemed to be withdrawn** in accordance with Rule 70a(3) EPC.

**Receiving Section**



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March, Gary Clifford  
Avidity IP  
Broers Building, Hauser Forum  
21 J J Thomson Avenue  
Cambridge CB3 0FA  
ROYAUME UNI

|      |          |
|------|----------|
| Date | 06.07.16 |
|------|----------|

|                                                           |                                                                            |
|-----------------------------------------------------------|----------------------------------------------------------------------------|
| Reference<br>P102377EP51                                  | Application No./Patent No.<br>11822574.7 - 1554 / 2612200 PCT/US2011049998 |
| Applicant/Proprietor<br>Spectral Instruments Imaging, LLC |                                                                            |

### Refund of fees

The following fee(s) was (were) paid in respect of the application 11822574.7:

| Fee                                                             | Reference | Voucher No | Date     | Currency | Amount   |
|-----------------------------------------------------------------|-----------|------------|----------|----------|----------|
| Search fee<br>The fee(s) was (were) paid by Avidity IP Limited. | 002       | 00632078   | 19.03.13 | EUR      | 975,00   |
| Search fee<br>The fee(s) was (were) paid by Avidity IP Limited. | 002       | 01047109   | 03.08.15 | EUR      | 1 285,00 |

According to the present state of the file the refund will be made by:

CREDITING THE DEPOSIT ACCOUNT 28050142 Avidity IP Limited.

| Amount refundable: | Reference | Currency | Amount   | Voucher No |
|--------------------|-----------|----------|----------|------------|
|                    | 002       | EUR      | 1.285,00 | 00970471   |

Reason for refund: Undue payment

The Authorising Officer  
Calafus  
(49)(89)23998694



**Questions about this communication ?**

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March, Gary Clifford  
Avidity IP  
Broers Building, Hauser Forum  
21 J J Thomson Avenue  
Cambridge CB3 0FA  
ROYAUME UNI

Date

19.01.2017

|                                                           |                                                           |
|-----------------------------------------------------------|-----------------------------------------------------------|
| Reference<br>P102377EP51                                  | Application No./Patent No.<br>11822574.7 - 1554 / 2612200 |
| Applicant/Proprietor<br>Spectral Instruments Imaging, LLC |                                                           |

**Noting of loss of rights pursuant to Rule 112(1) EPC**

The European patent application cited above is deemed to be withdrawn because

- ☒ no indication of the desire to proceed further with the application was furnished within the time limit specified in the communication (EPO Form 1082/1224) issued under Rule 70(2) EPC (R. 70(3) EPC).
- ☒ the invitation to comment on or to correct any deficiencies noted in the opinion accompanying the (supplementary) European search report has not been complied with within the time limit specified in the communication (EPO Form 1082/1224) issued under Rule 70a(2) EPC (R. 70a(3) EPC).

**Means of redress**

**Request for a decision (R. 112(2) EPC)**

If the applicant considers that the finding of the European Patent Office is inaccurate, he may, within a (non-extendable) period of **two months** after notification of this communication, apply in writing for a decision on the matter. The application can only lead to the finding being reversed if this does not actually correspond to the factual or legal situation.

**Further processing (Art. 121 EPC)**

The legal consequence of the failure to observe the time limit shall be deemed not to have ensued if, within a (non-extendable) period of **two months** after notification of this communication, further processing is requested by payment of the fee prescribed under Article 2(1)12 of the Rules relating to Fees and the omitted act is completed (R. 135(1) EPC).

It should be noted that if a loss of rights occurs because **neither** the indication of the desire to proceed further with the application **nor** the reply to the opinion accompanying the European search report has been filed within the time limit, **the flat-rate amount of the further processing fee ("other cases") has to be paid twice.**

**Important note to users of the automatic debiting procedure**

The fee for further processing will be debited automatically on the day on which the above-mentioned omitted act is completed (see Arrangements for the automatic debiting procedure, supplementary publication 3 - OJ EPO 2015).

**Receiving Section**

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March, Gary Clifford  
Avidity IP  
Broers Building, Hauser Forum  
21 J J Thomson Avenue  
Cambridge CB3 0FA  
ROYAUME UNI

|      |          |
|------|----------|
| Date | 10.05.17 |
|------|----------|

|                                                           |                                                                            |
|-----------------------------------------------------------|----------------------------------------------------------------------------|
| Reference<br>P102377EP51                                  | Application No./Patent No.<br>11822574.7 - 1554 / 2612200 PCT/US2011049998 |
| Applicant/Proprietor<br>Spectral Instruments Imaging, LLC |                                                                            |

### Refund of fees

The following fee(s) was (were) paid in respect of the application 11822574.7:

| Fee                                               | Reference | Voucher No | Date     | Currency | Amount   |
|---------------------------------------------------|-----------|------------|----------|----------|----------|
| Examination fee                                   | 006       | 00632078   | 19.03.13 | EUR      | 1 555,00 |
| The fee(s) was (were) paid by Avidity IP Limited. |           |            |          |          |          |

According to the present state of the file the refund will be made by:

CREDITING THE DEPOSIT ACCOUNT 28050142 Avidity IP Limited.

| Amount refundable: | Reference | Currency | Amount   | Voucher No |
|--------------------|-----------|----------|----------|------------|
|                    | 006       | EUR      | 1.555,00 | 00834697   |

Reason for refund: Application withdrawn, refused or deemed to be withdrawn before Examining Division has assumed responsibility (100 % of the examination fee refunded)

The Authorising Officer  
Moser  
(49)(89)23998240

