

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number

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
Michael	B.	Nelson	Tucson	AZ	US

Inventor 2

Remove

Given Name	Middle Name	Family Name	City	State	Country
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

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

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 (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.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SPEC US-4PRV (27560-006)	
		Application Number		
Title of Invention	EXCITATION LIGHT SOURCE ASSEMBLY			
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. 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.				

Secrecy Order 37 CFR 5.2

☐	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.)
--------------------------	---

Applicant Information:

Applicant 1									
Applicant Authority ☒ Inventor			☐ Legal Representative under 35 U.S.C. 117			☐ Party of Interest under 35 U.S.C. 118			
Prefix	Given Name		Middle Name		Family Name			Suffix	
	Michael		B.		Nelson				
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ 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									
City	Tucson			State/Province	AZ				
Postal Code		85745		Country	US				
Applicant 2									
Applicant Authority ☒ Inventor			☐ Legal Representative under 35 U.S.C. 117			☐ Party of Interest under 35 U.S.C. 118			
Prefix	Given Name		Middle Name		Family Name			Suffix	
	Michael		D.		Cable				
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ 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									
City	Tucson			State/Province	AZ				
Postal Code		85745		Country	US				
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button. Add									

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).	
☐	An Address is being provided for the correspondence information of this application.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SPEC US-4PRV (27560-006)	
		Application Number		
Title of Invention	EXCITATION LIGHT SOURCE ASSEMBLY			
Customer Number	27104			
Email Address	ip@fclaw.com	Add Email	Remove Email	

Application Information:

Title of the Invention	EXCITATION LIGHT SOURCE ASSEMBLY		
Attorney Docket Number	SPEC US-4PRV (27560-006)	Small Entity Status Claimed	☐
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)	

Publication Information:

☐	Request Early Publication (Fee required at time of Request 37 CFR 1.219)
☐	Request Not to Publish. I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application has not and will not be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Enter either Customer Number or complete the Representative Name section below. If both sections are completed the Customer Number will be used for the Representative Information during processing.			
Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	27104		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78(a)(2) or CFR 1.78(a)(4), and need not otherwise be made part of the specification.			
Prior Application Status		Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			

Foreign Priority Information:

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SPEC US-4PRV (27560-006)
		Application Number	
Title of Invention	EXCITATION LIGHT SOURCE ASSEMBLY		

This section allows for the applicant to claim benefit of foreign priority and to identify any prior foreign application for which priority is not claimed. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(a).

			Remove
Application Number	Country ¹	Parent Filing Date (YYYY-MM-DD)	Priority Claimed
			☐ Yes ☒ No
Additional Foreign Priority Data may be generated within this form by selecting the Add button.			

Assignee Information:

Providing this information in the application data sheet does not substitute for compliance with any requirement of part 3 of Title 37 of the CFR to have an assignment recorded in the Office.

Assignee 1

If the Assignee is an Organization check here. ☒

Organization Name SPECTRAL INSTRUMENTS IMAGING, LLC

Mailing Address Information:

Address 1 420 North Bonita Avenue

Address 2

City Tucson

State/Province

AZ

Country US

Postal Code

85745

Phone Number

Fax Number

Email Address

Additional Assignee Data may be generated within this form by selecting the **Add** button.

Signature:

A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. 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
				33670

This collection of information is required by 37 CFR 1.76. 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 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet 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. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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 fluorescent 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 θ , 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 excited 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:

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.

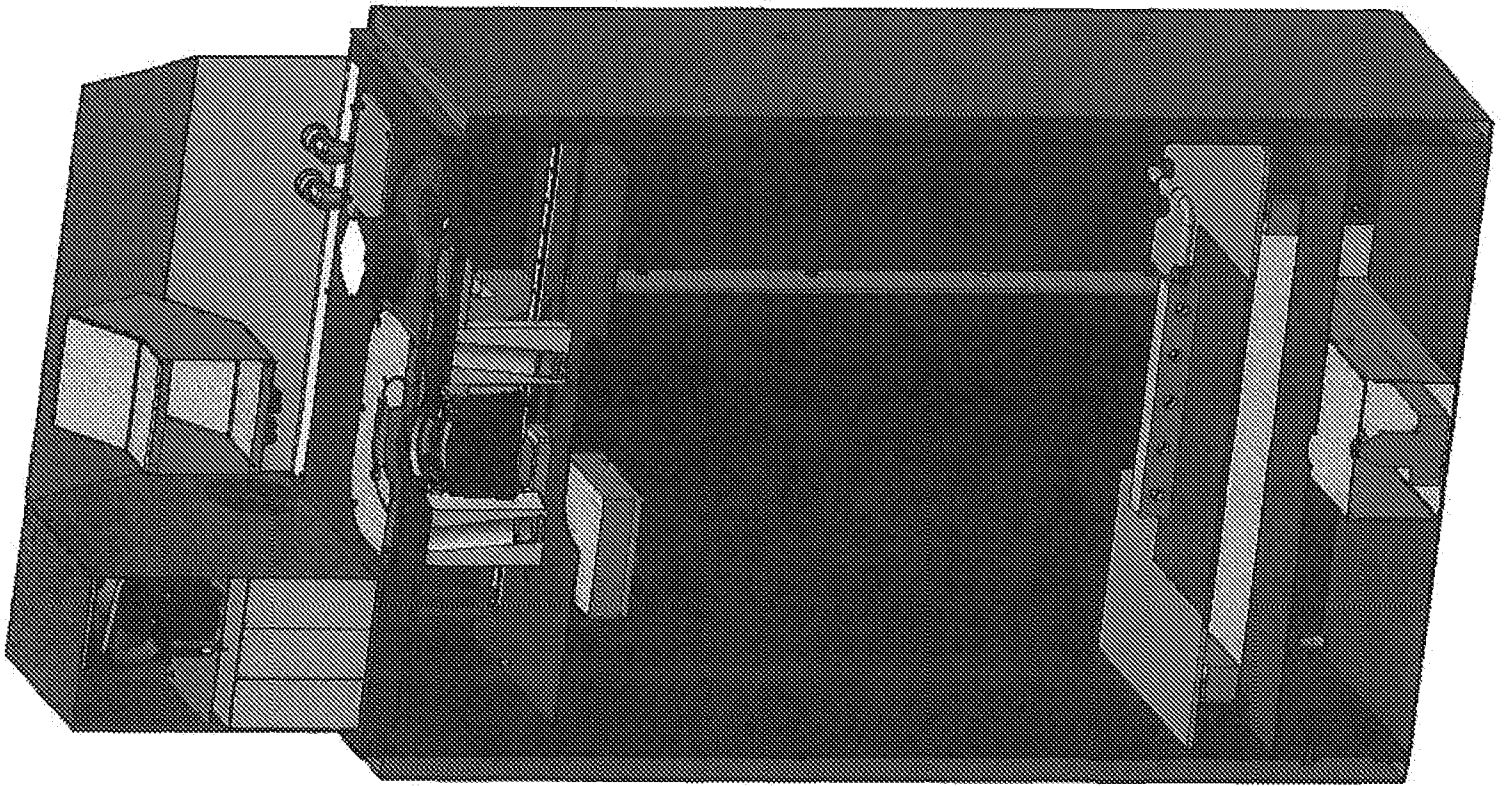
13. The excitation light source assembly of claim 12 wherein said at least one narrow-band light source comprises a light emitting diode.

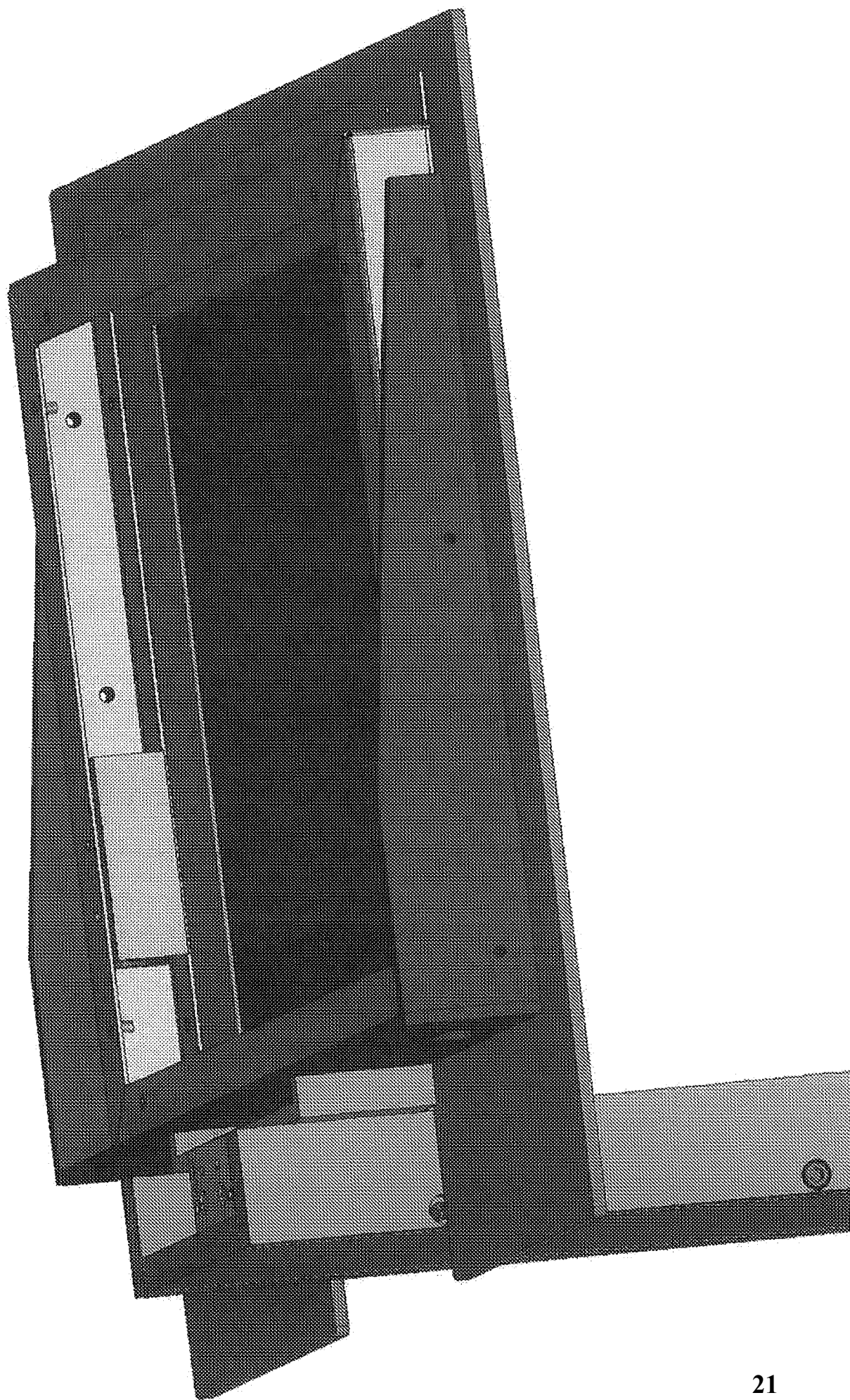
14. The excitation light source assembly of claim 11, further comprising at least one light filter positioned adjacent at least one diffuser in at least one of the elongated holes defined by said housing.

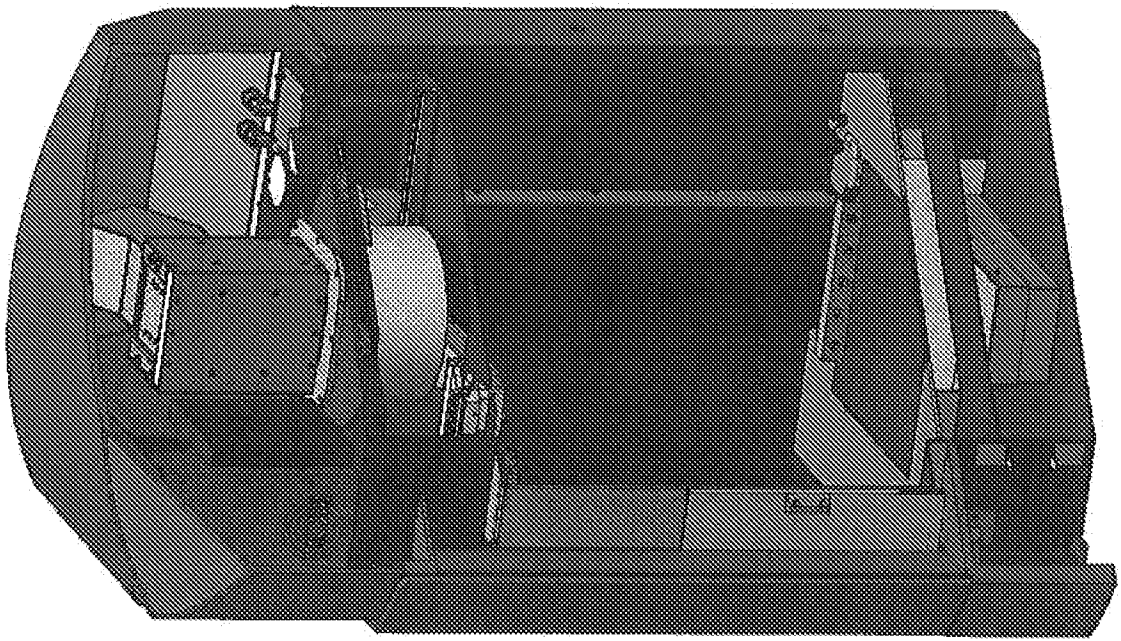
15. The excitation light source assembly of claim 14, wherein said at least one light filter comprises a notch filter having a wavelength bandpass range of about 30 nm.

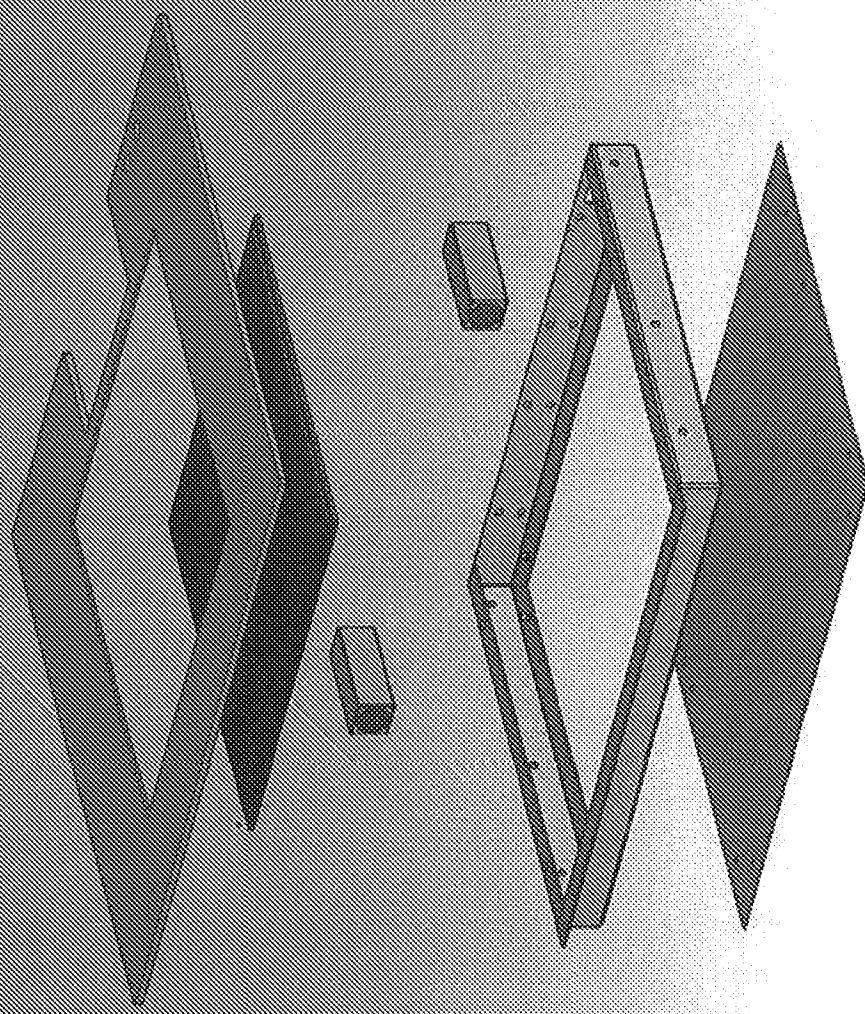
ABSTRACT OF THE DISCLOSURE

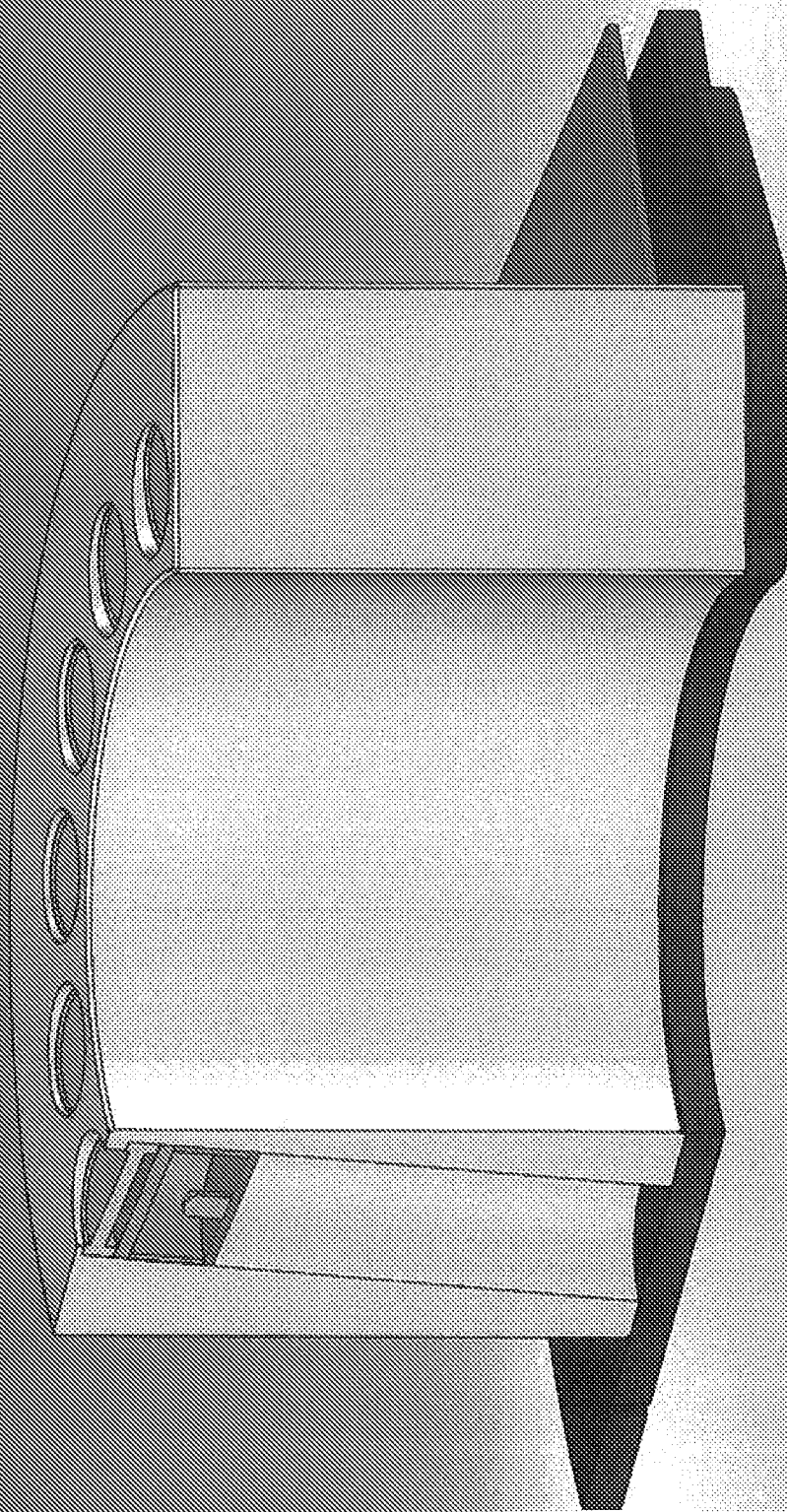
An excitation light source assembly having a housing defining a central opening therein and a plurality of elongated holes surrounding the central opening. The housing is mountable to a support structure having a camera mounted thereto so that a field of view of the camera is unobstructed by the central 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.

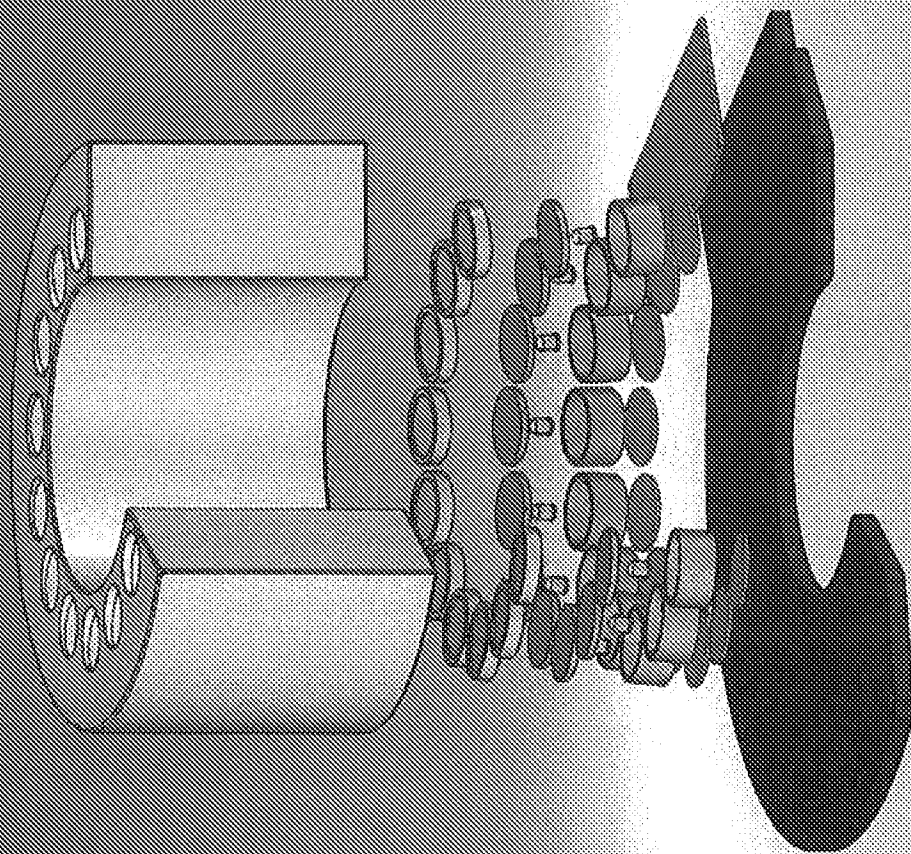


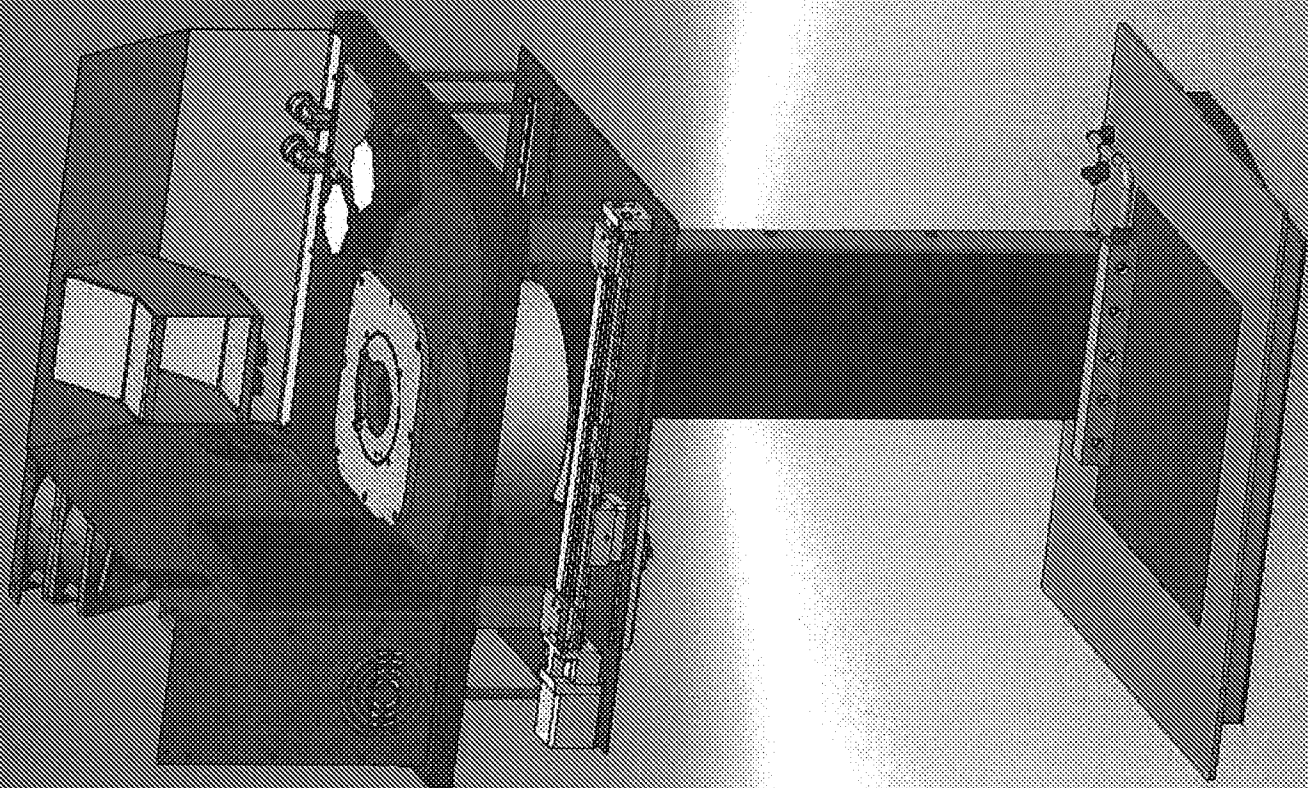


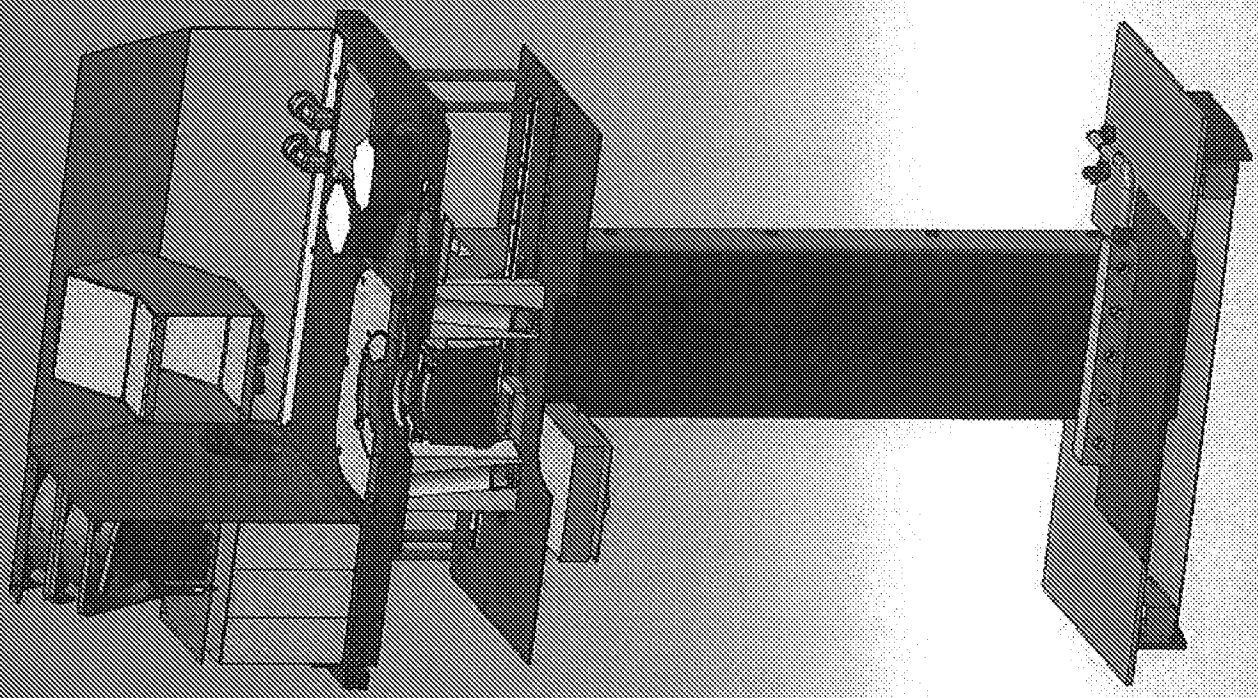


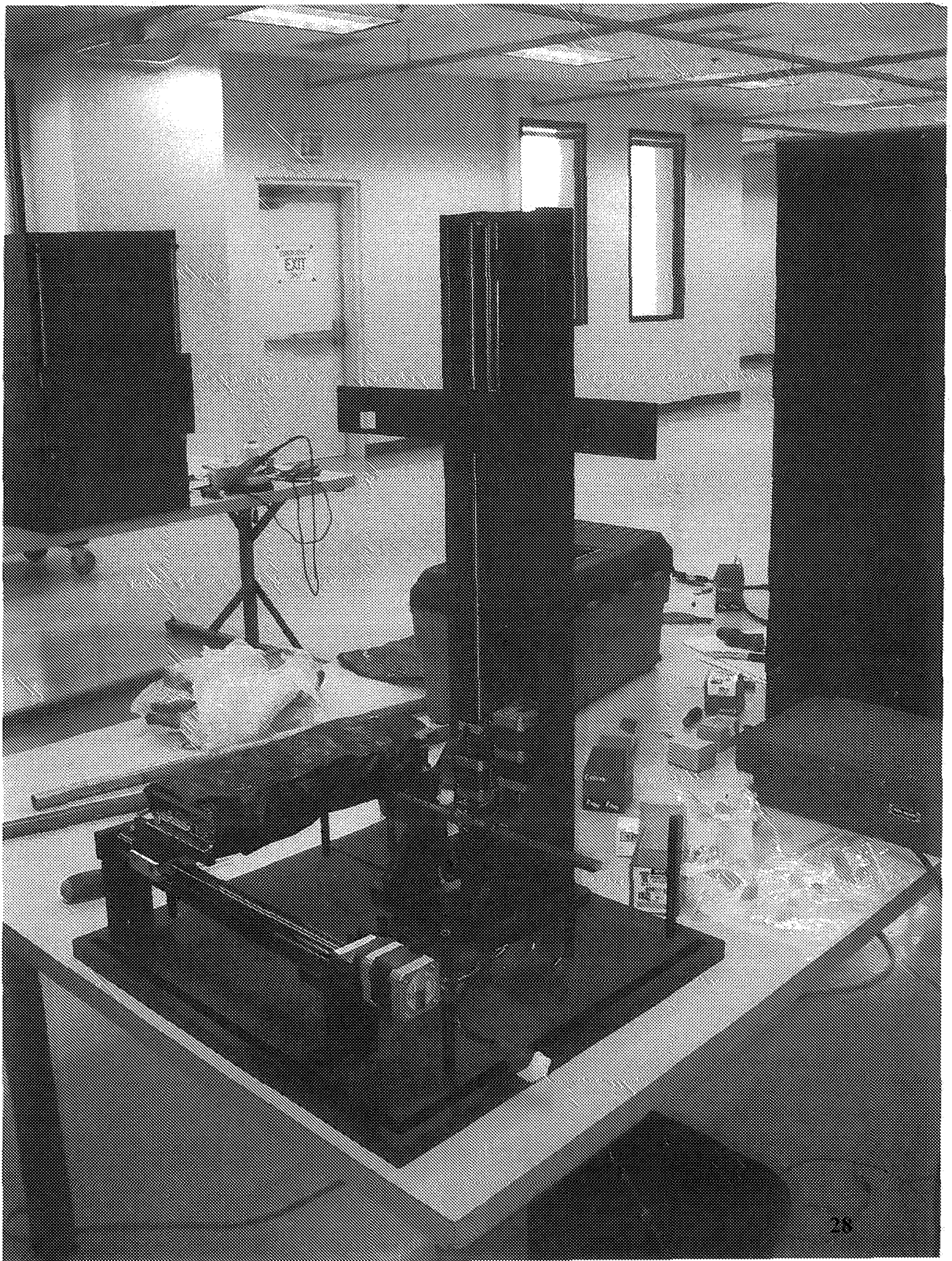


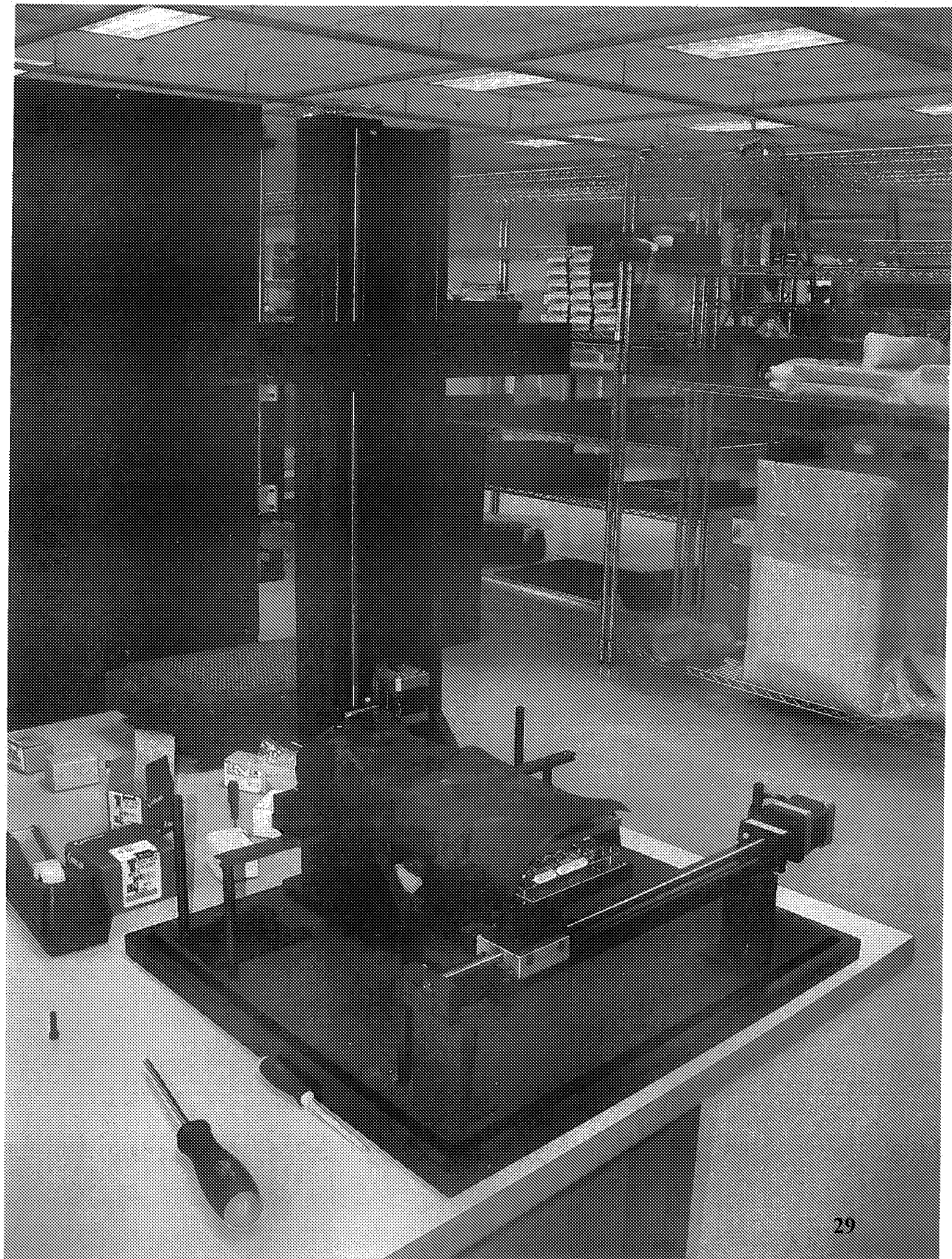


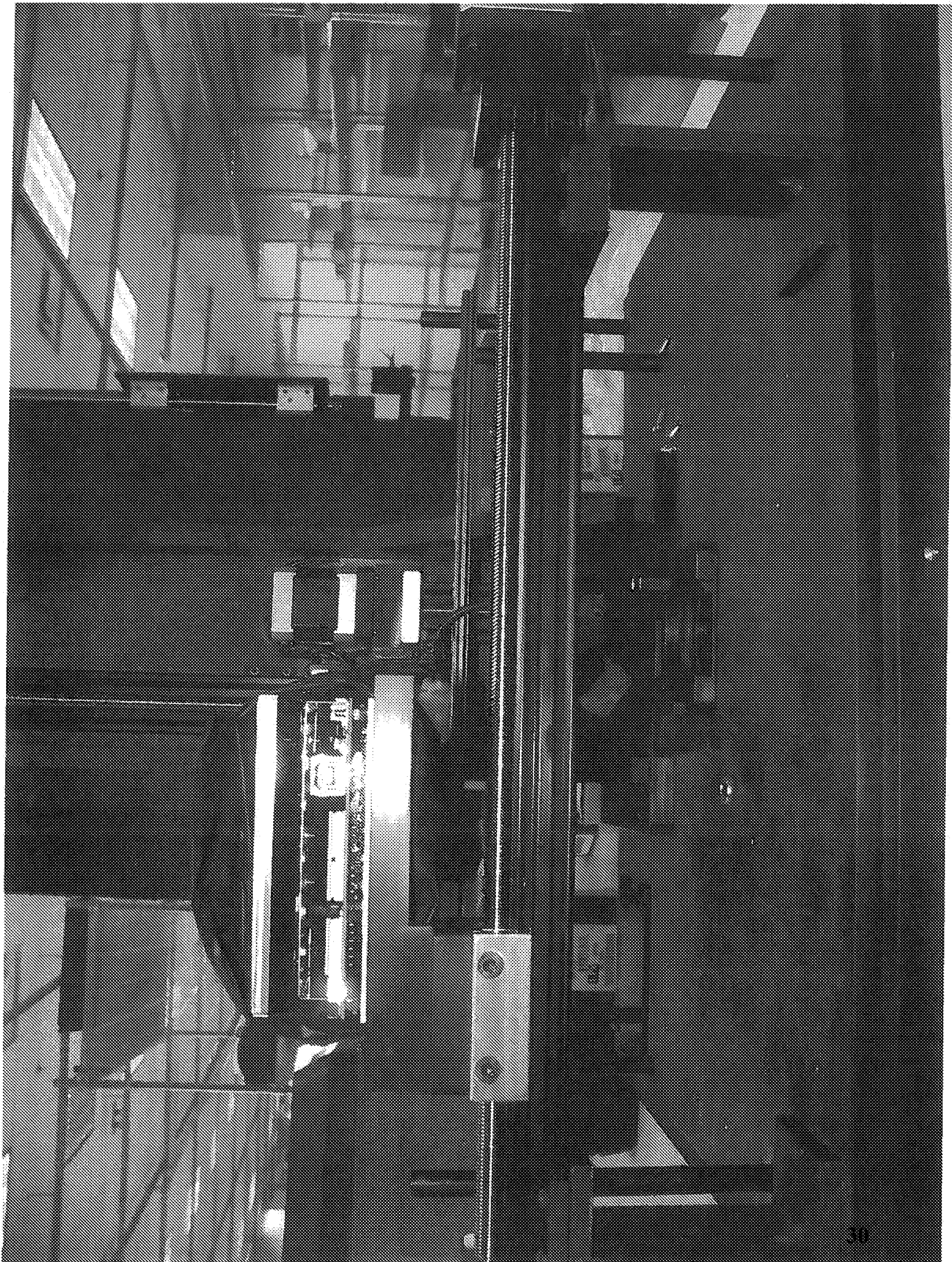




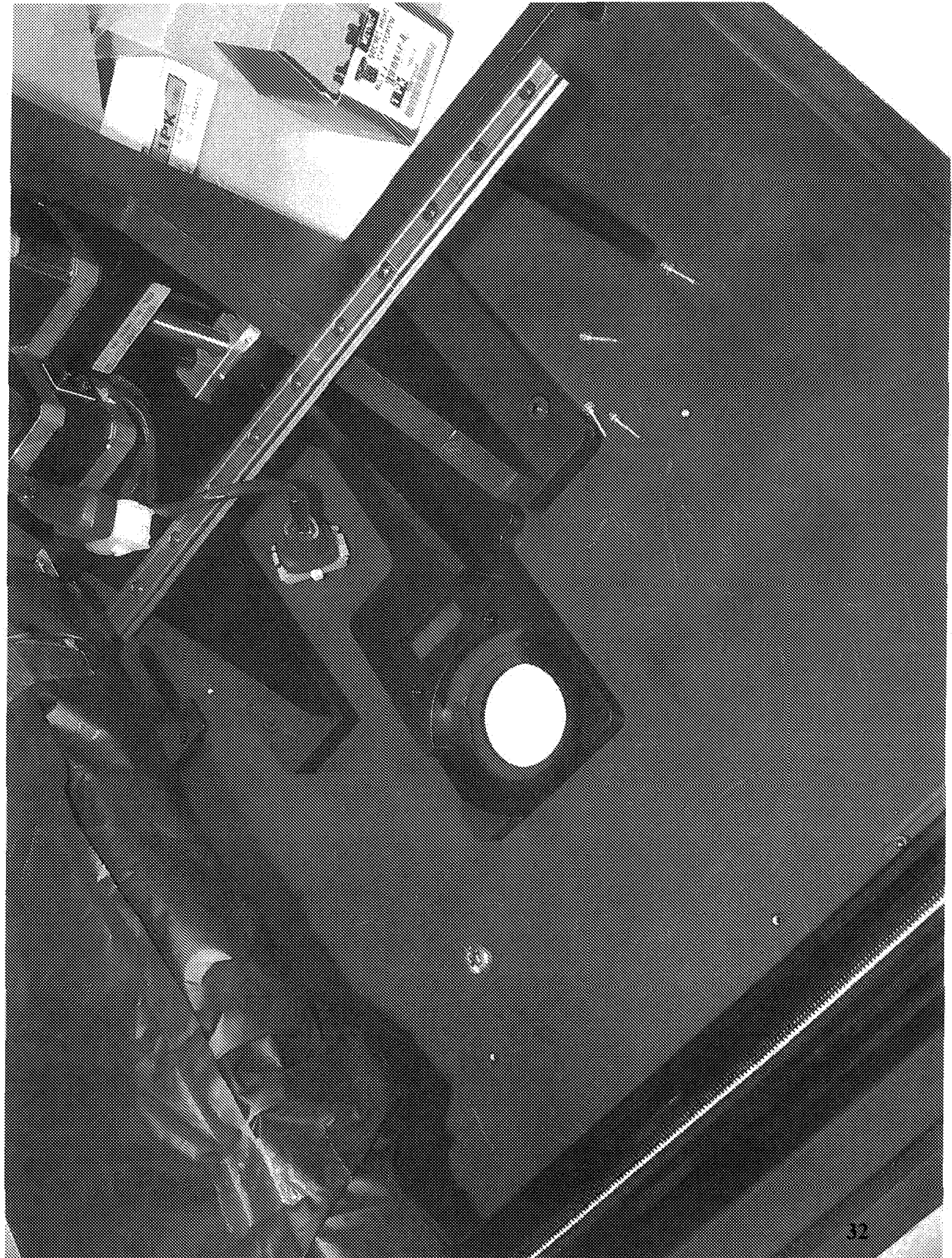


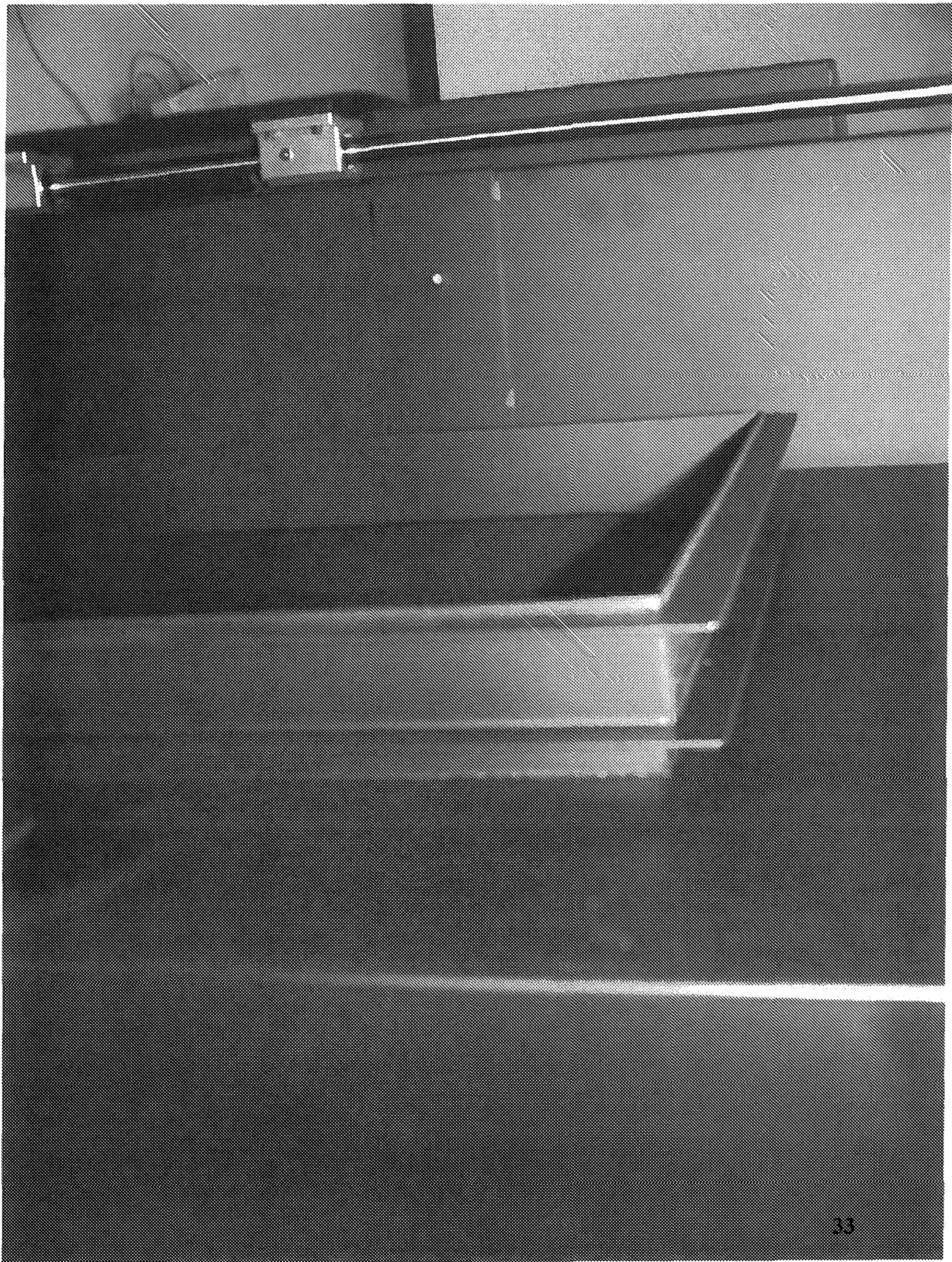


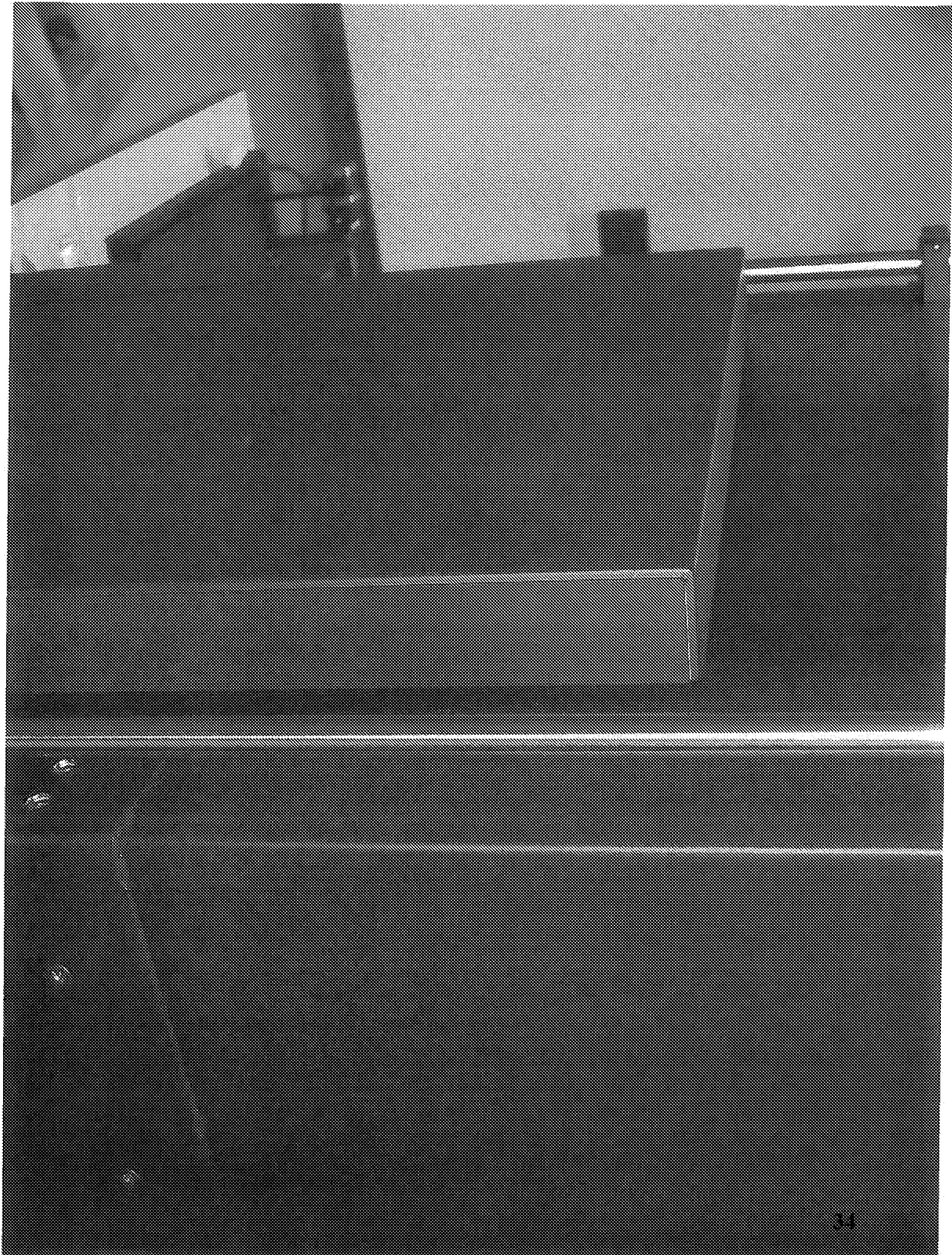


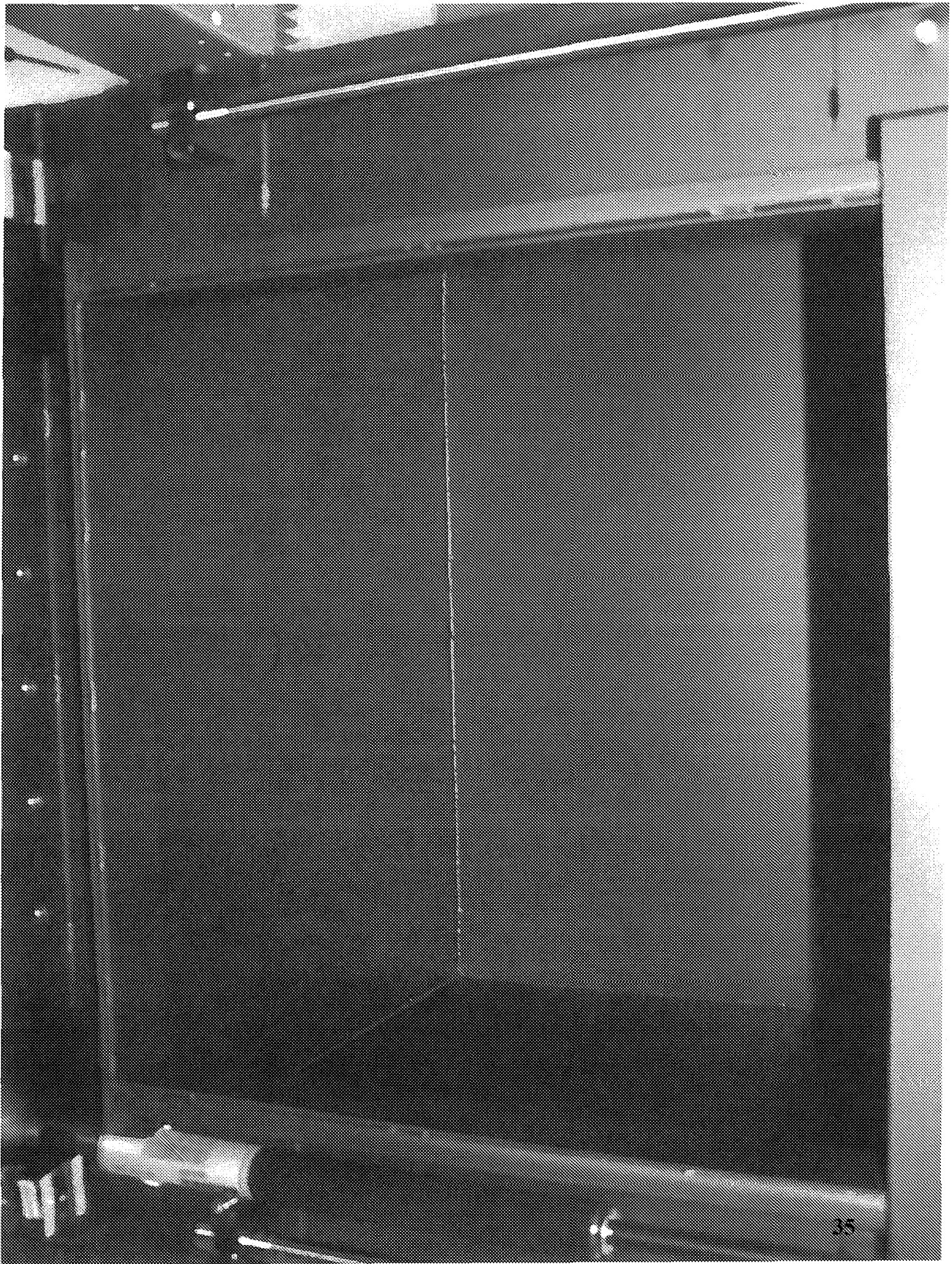


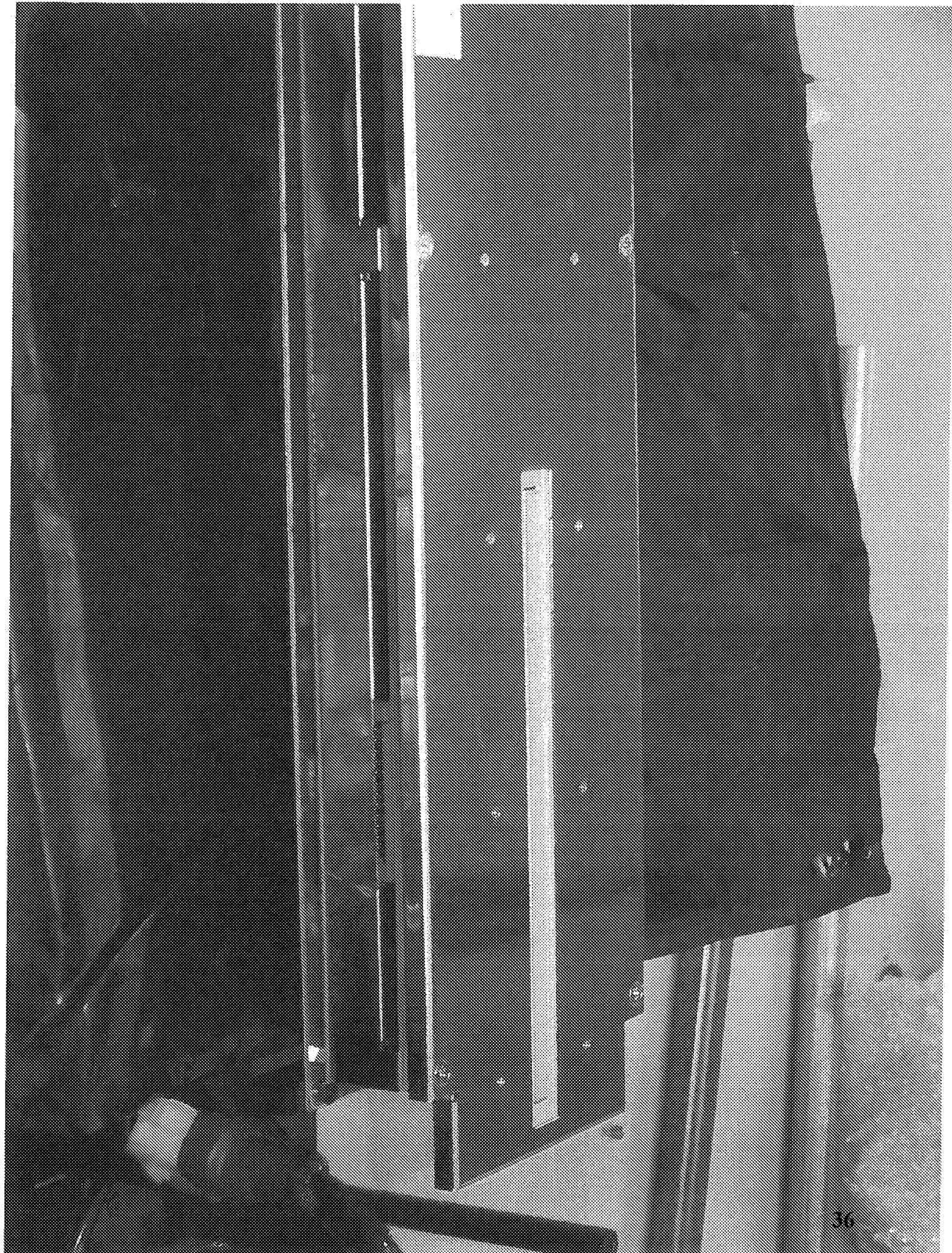












1/7

27560.006
MSR 8/11/06

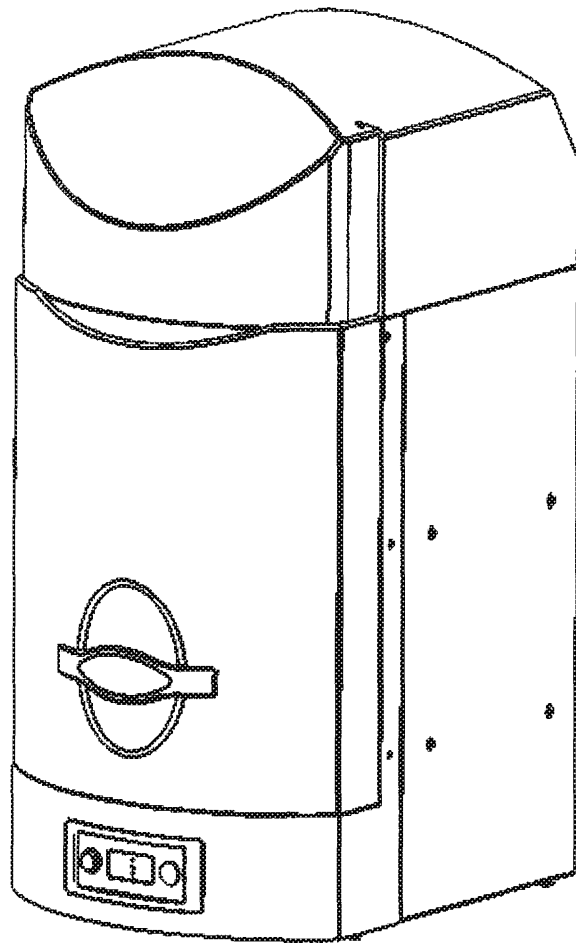


FIG. 1

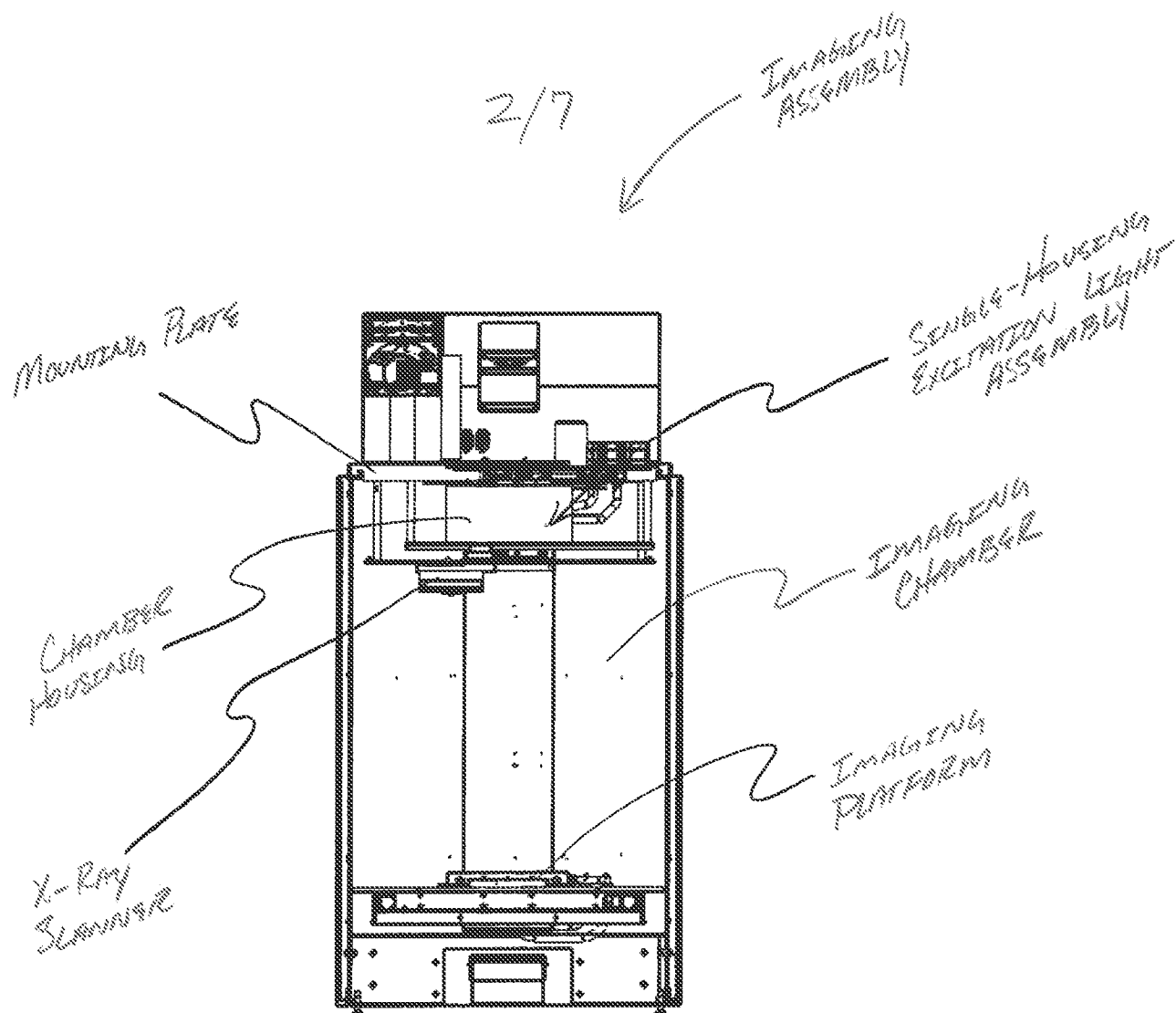


FIG. 2

3/7

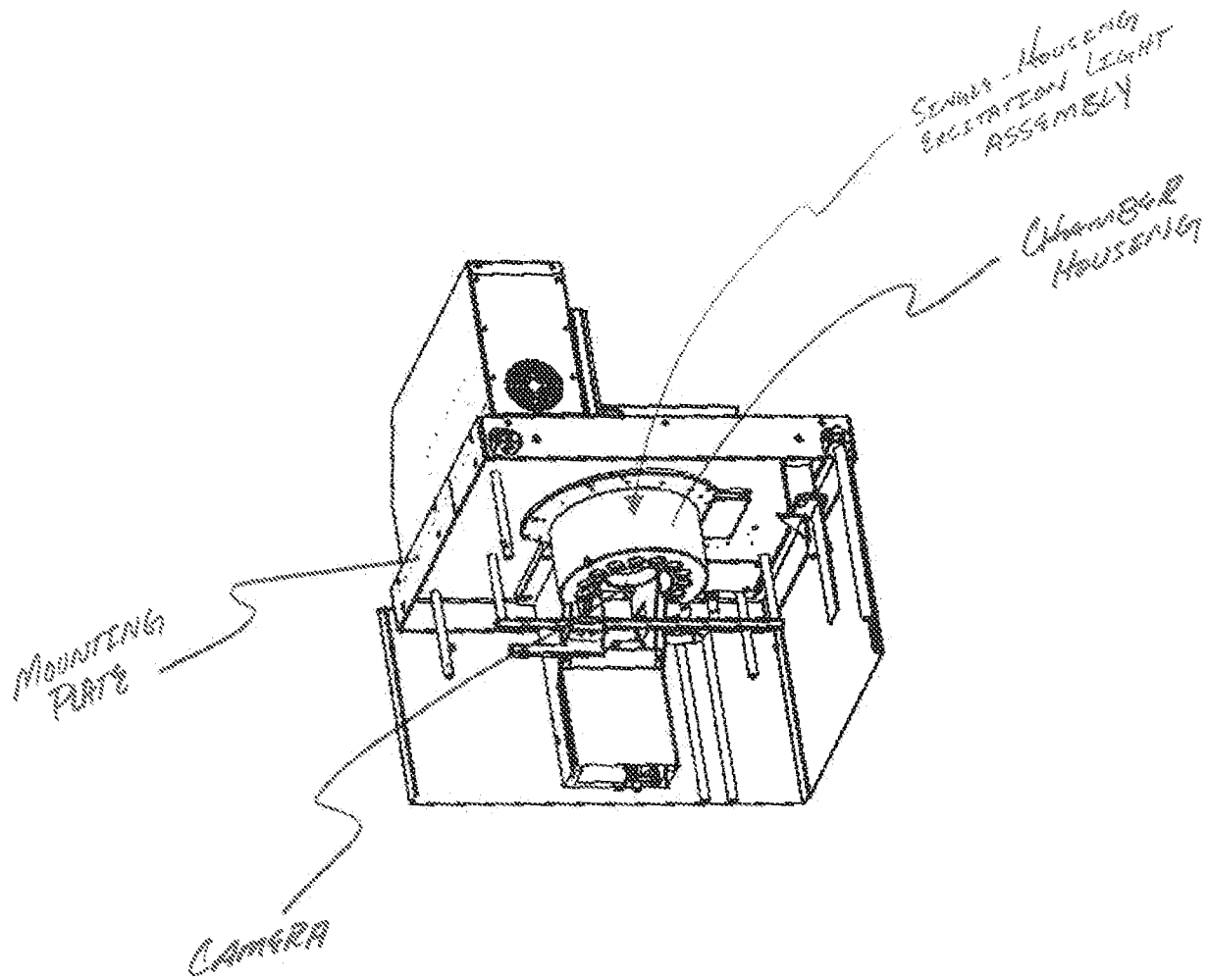


FIG. 3

4/7

LED CHAMBER

SENSOR-HOUSING
EXCITATION ASSEMBLY
BASE PLATE

MOUNTING
PLATE

CHAMBER
HOUSING

SENSOR-HOUSING
EXCITATION LIGHT
ASSEMBLY

CAMERA

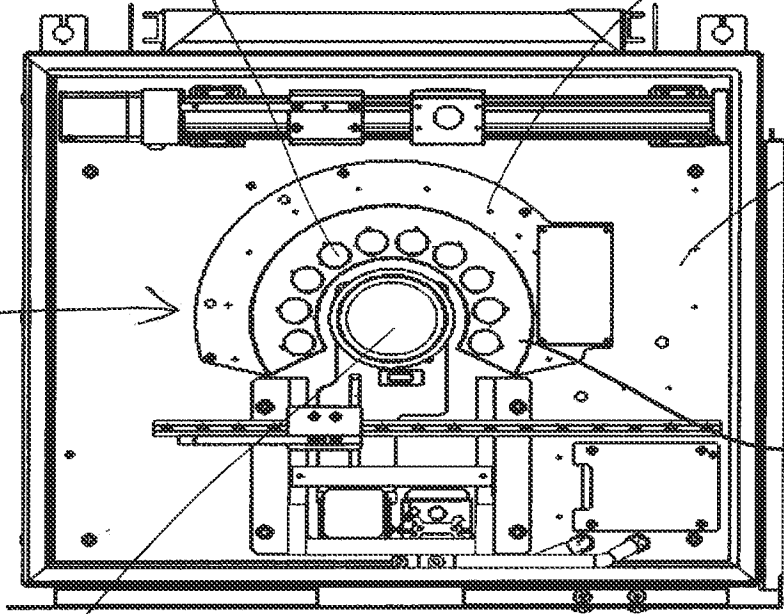


FIG. 4

5/7

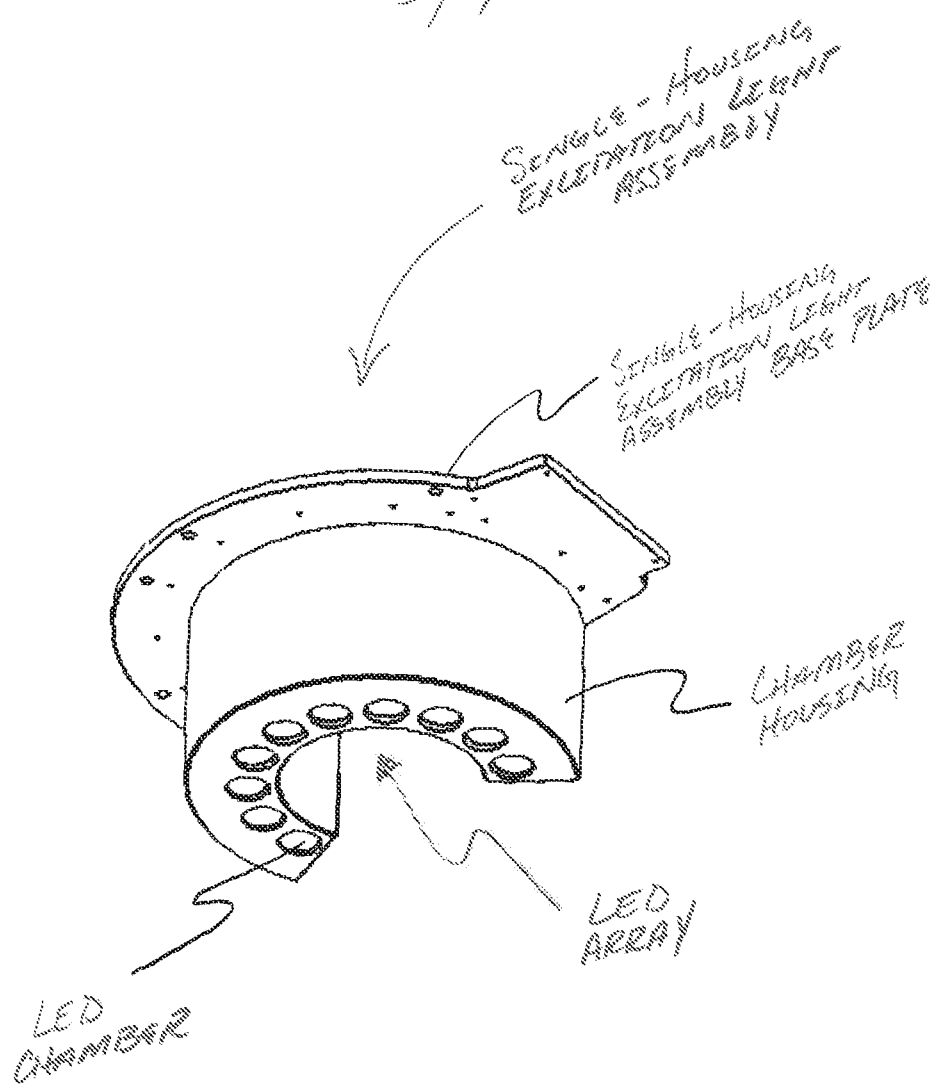


Fig. 5

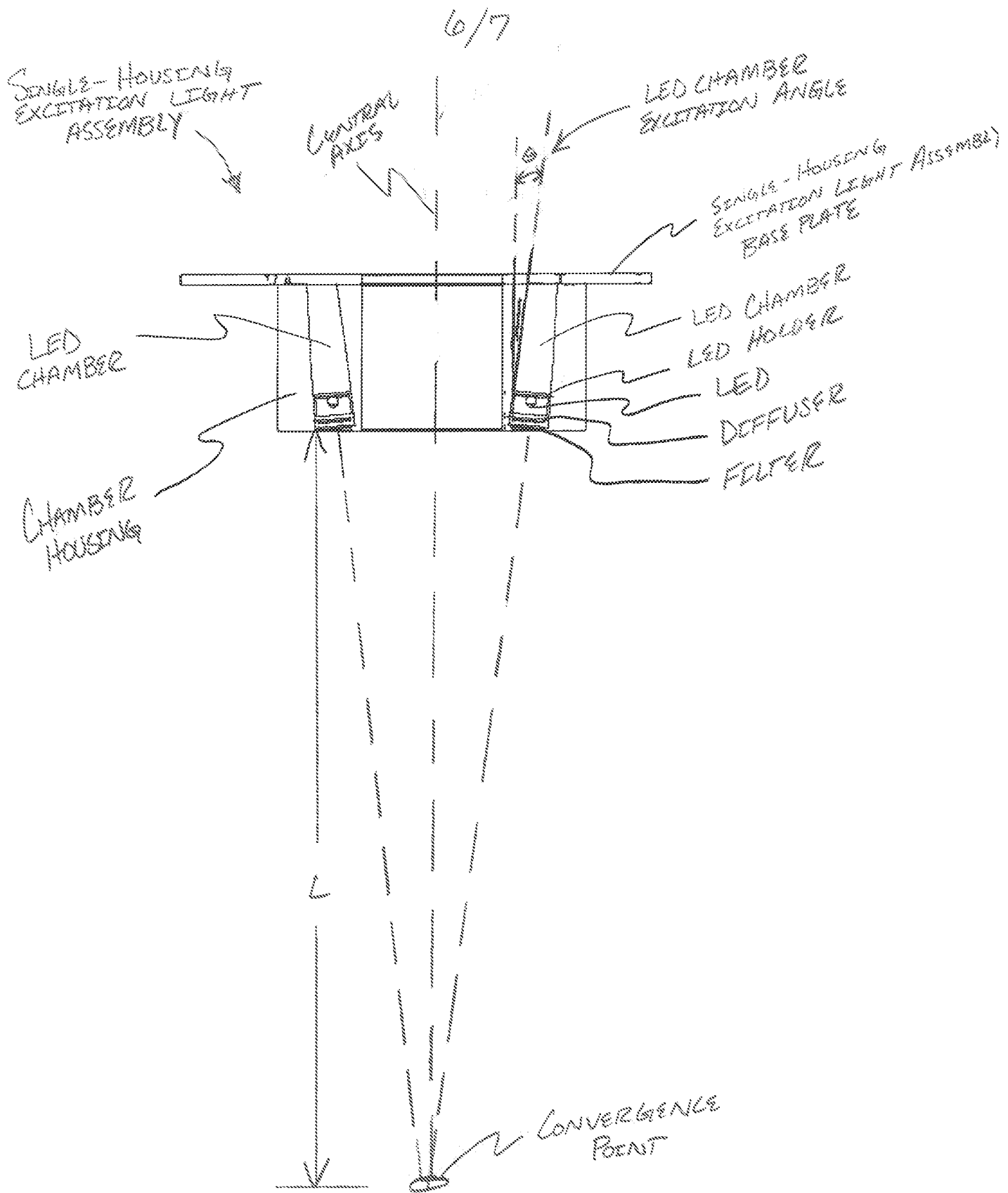


FIG. 6

7/7

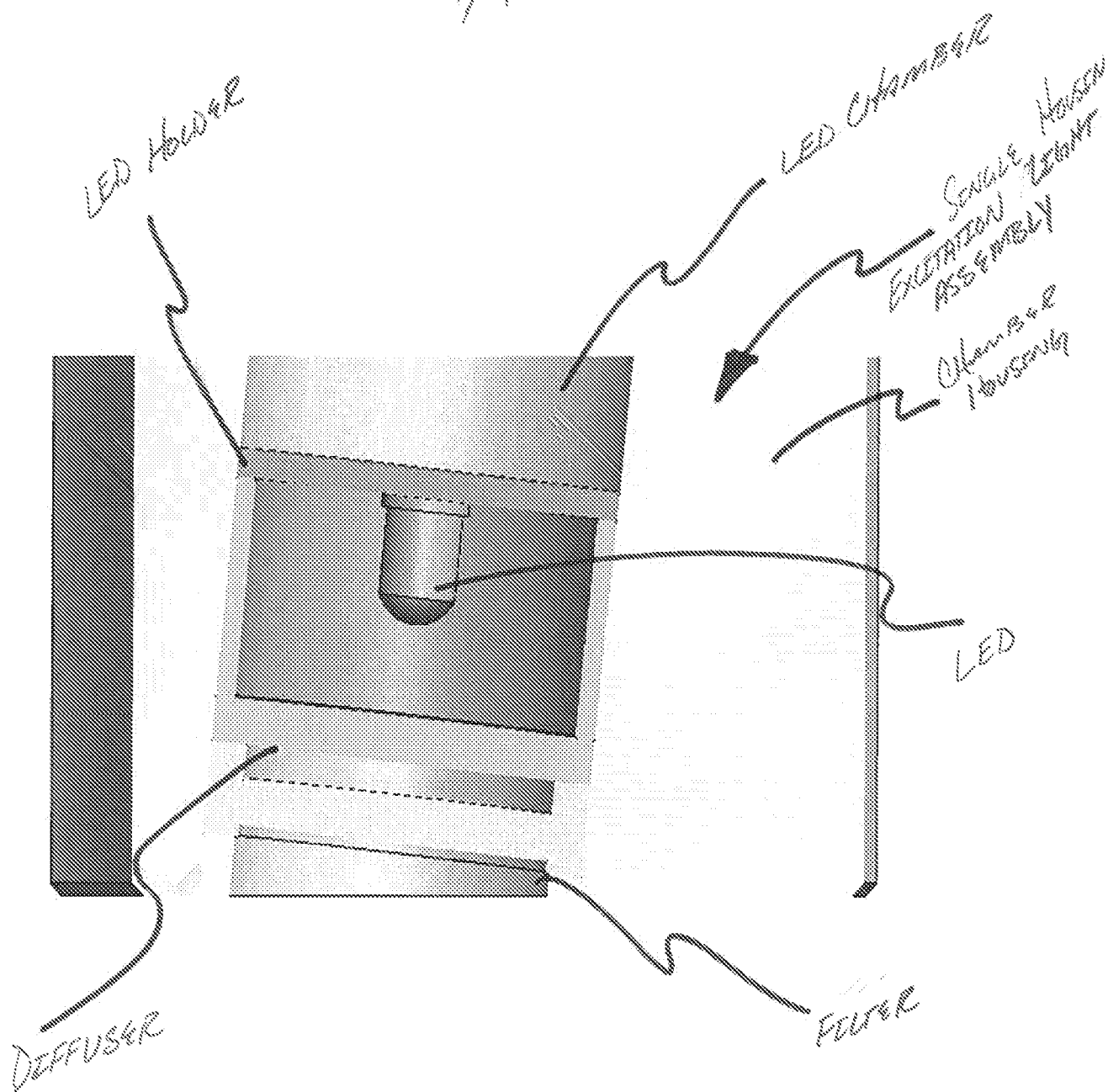


FIG. 7

Electronic Patent Application Fee Transmittal

Application Number:				
Filing Date:				
Title of Invention:	EXCITATION LIGHT SOURCE ASSEMBLY			
First Named Inventor/Applicant Name:	Michael B. Nelson			
Filer:	Bruce E. Dahl/Cynthia Sullivan			
Attorney Docket Number:	SPEC US-4 PRV (27560-006)			
Filed as Large Entity				
Provisional Filing Fees				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Provisional application filing	1005	1	220	220
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				44

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
Total in USD (\$)				220

Electronic Acknowledgement Receipt

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

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)/ 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
			2decfae4ae18d03242bfbe1743820a886b95779c		
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.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
61/379,282	09/01/2010		220	SPEC US-4PRV (27560-006)		

CONFIRMATION NO. 6512

27104
FENNEMORE CRAIG, P.C.
1700 Lincoln Street
SUITE 2900
DENVER, CO 80203

FILING RECEIPT



Date Mailed: 09/14/2010

Receipt is acknowledged of this provisional patent application. It will not be examined for patentability and will become abandoned not later than twelve months after its filing date. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Applicant(s)

Michael B. Nelson, Tucson, AZ;
Michael D. Cable, Tucson, AZ;

Power of Attorney:

Bruce Dahl--33670

If Required, Foreign Filing License Granted: 09/13/2010

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 61/379,282**

Projected Publication Date: None, application is not eligible for pre-grant publication

Non-Publication Request: No

Early Publication Request: No

Title

EXCITATION LIGHT SOURCE ASSEMBLY

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international

patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and

Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).