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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 : G01N 3/46, 21/25, H04N 17/02 H04N 9/44, 9/64, 5/238	A1	(11) International Publication Number: WO 94/01755 (43) International Publication Date: 20 January 1994 (20.01.94)

(21) International Application Number: PCT/US93/05699

(22) International Filing Date: 15 June 1993 (15.06.93)

(30) Priority data:
07/909,109 2 July 1992 (02.07.92) US

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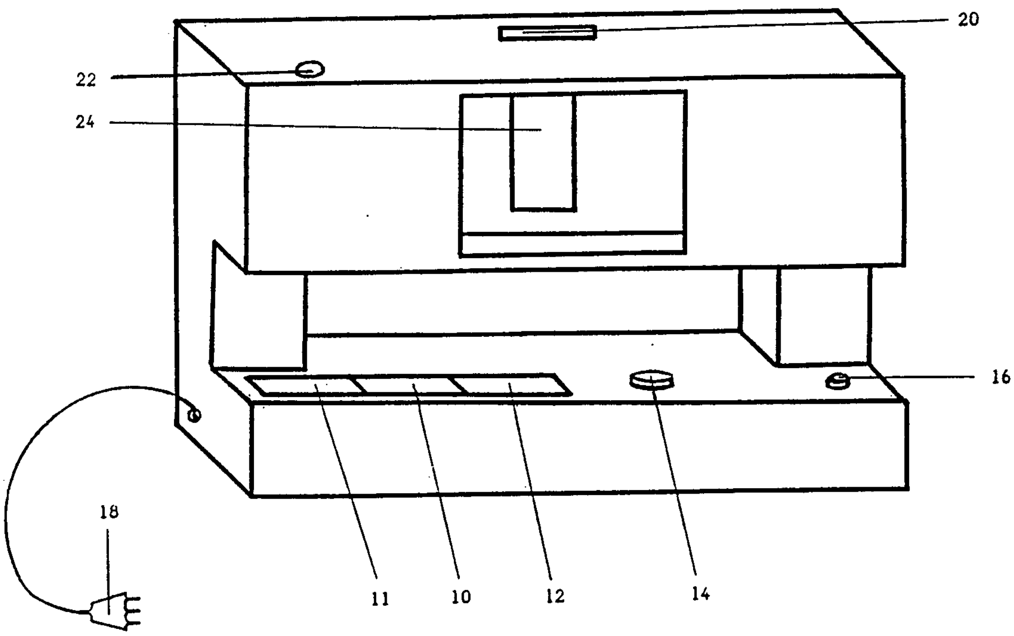
(81) Designated States: JP, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.

(54) Title: METHOD AND CALIBRATION DEVICE FOR CALIBRATING COMPUTER MONITORS USED IN THE PRINTING AND TEXTILE INDUSTRIES



(57) Abstract

A process is disclosed for calibrating color and monochrome monitors (65) for their use in the printing, graphics art and textile industries. The image displayed on the monitor (65), when using calibrated software will appear as printed. This is achieved by producing an instrument (12) and providing a method to calibrate the instrument (12) to the white point color temperature of reflected light from papers and textiles, of industry standard 5000K and 7500K transmitted light (64). The instrument (12) can be used to calibrate color monitors (12) to these same white point color temperatures. Also disclosed is a method by which color and monochrome monitors (12) can be adjusted to specific brightness and contrast setting for standard ambient light as well as to lower ambient light levels. Also, a method and device (12) is provided to set various monitors (65) to the same standard using software so that when an image is displayed on the various monitors (65), the image will appear the same.

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METHOD AND CALIBRATION DEVICE FOR CALIBRATING COMPUTER MONITORS USED IN THE PRINTING AND TEXTILE INDUSTRIES

This invention relates to a method and device for calibrating color and monochrome monitors to the reflected color temperature of various papers used in printing, textile and allied processes and user defined calibrations. The papers, textiles of fabric being illuminated by American National Standards Institute PH2.30 transmissive color temperature of 5,000 degrees Kelvin and 7,500 degrees Kelvin specified by the American Society for Testing Materials ASTM D1684-61. The device also defines the brightness and contrast settings of the monitors, as well as defining the brightness setting of the monitor to compensate for brightness of ambient light. That in combination with the white point setting, and calibrated software applications, an image can be viewed as it will be printed. That through the process herein described, monitors of various manufacture and locations can be calibrated to the same standard, that an image viewed on various monitors so calibrated will look the same.

Color and monochrome monitors used with computers in the production of prepress material for color printing are manufactured by various processes. Therefore, an image will look different in brightness, contrast and color when viewed on various monitors on which it is displayed.

Inventors have created calibrators to define standard white point color temperature settings on color monitors and to permit the user to select an arbitrary brightness and contrast settings. However, the white point color temperature settings defined by these devices when displayed on various color monitors are not the same color temperature when viewed. Using such calibration devices to set specific white point setting on monitors of various manufacturing process, will show an image to be different in color, brightness and contrast. Various patents and available devices disclosed devices and methods to calibrate monitors. Calibrators as the Radius Precision Color Calibrator, SuperMatch Calibrator, RasterOps Calibrator, MonCal calibrator, by Radius, Inc., 1710 Fortune Dr., San Jose, CA 94063, SuperMac Technology, 485 Potero Ave., Sunnyvale, CA 94086, RasterOPs, 2500 Walsh Ave., Santa Clara, CA 95051 and Sequel Imaging, 1 Palm Drive, Londonderry, NH 03053, provides the means to maintain a monitor calibration to specific white point color temperature settings. The SuperMatch Calibrator provides user defined white point gamma color temperature control albeit the monitor cannot be automatically calibrated to such settings. The settings so defined by these instruments do not correlate nor can they calibrate monitors to the white point color temperature settings of paper or textiles. Therefore, color temperature setting displayed on a monitor manufactured by one process will not be the same on a monitor manufactured by another process using the same calibrator. The brightness and contrast controls are arbitrary and setting are not accurate. Therefore, monitors manufactured by various process cannot be calibrated to the same brightness and contrast or account for the brightness of ambient light with these devices.

Various patents describe devices and methods for measuring the color of reflective and transmissive samples including U.S. Pat. No. 4,248,536 issued to Kazuo Hijikata on Feb. 3, 1981; U.S. Pat. No. 4,439,039 issued to O. A. Suovaniemi on March 27, 1984; U.S. Pat. No. 4,543,558 issued to James A. White on Sep 24, 1985; U.S. Pat. No. 4,616,933 issued to Jean-Luc M. Leveque, Gilbert J. Gras on Oct 14, 1986; U.S. Pat No. 4,685,808 issued to Toshiyuki Nakazawa, Akio Izumi, Yokosuka on Aug 11, 1987; U.S. Pat No. 4,773,761 issued to Masami Segiyama, Yoshihiro Tasaka on Sep 27, 1988; U.S. Pat. No. 4,878,756 issued to Norman L. Stauffer on Nov. 7, 1989; U.S. Pat No. 5,004,349 issued to Tsuyoshi Sato, Masahito Inaba, Naoya Takata on Apr. 2, 1991; U.S. Pat. No. 5,015,098 issued to Bernardrd J. Berg, David R. Bowden, Mark A. Cargill, Willaim R. Given on May 14, 1991; U.S. Pat. No. 5,022,765 issued to Daniel Guidotti, Swie-in Tan, John G. Willman on June 11, 1991; U.S. Pat. No. 5,061,066 issued to Yoshihirio Ohno, Hideo Nishiyama on Oct 29, 1991; U.S. Pat. No. 5,062,714 issued to Steven H. Peterson, Timothy R. Friend on Nov. 5, 1991. Other various patents disclose apparatus and methods for measuring and comparing color from reflection and transmissive materials and for transferring color and white point parameters from one medium to another including U.S. Pat. No. 3,507,598 issued to Harry H. Malvin on Apr. 21, 1970; U.S. Pat. No. 4,281,337 issued to Takashi Nakanura on Jul. 28, 1981; U.S. Pat. No.4,500,919 issued to Shreiber on Feb. 19, 1985; U.S. Pat. No. 4,633,299 issued to Yutaka Tanaka on Dec. 30, 1986; U.S. Pat. No. 4,989,983 issued to Takao Terada, Hiroyaki Ota, Shigers Nakita on Feb 5, 1991; U.S. Pat. No. 5,002,392 issued to C. Hermas Swope, John G. Link, Douglas G. Haugeu, Joseph G. Parp on Mar 26, 1991; U.S. Pat. No. 5,033,857 issued to Junichi Kubota, Naokj Hasegawa, Masahiro Furuhata, Kenjiro Watanabe on Jul. 23, 1991; U.S. Pat. No. 5,060,118 issued to Richard J. Penrod, Roy H. McCullagh on Oct 22, 1991. Several of these devices are only capable of reading color temperatures emitted from black body radiance. Therefore, although the readings taken from color monitors are repeatable and suitable for calibrating TV monitors, they do not correlate to color temperatures of reflected light from lamps of specific color temperature measured with these devices. This due to the phosphors used to coat monitors not emitting black body light. In the Shreiber patent, which discloses a color reproduction system, this introduces a color monitor as a human interface to a computer, to show a color representation of a scanned image that adjustments can be made based on the evaluation of the same. The monitors calibration described it this prior art, assumes a 5,000 degree Kelvin white point color temperature displayed on a monitor [TV], to be a simulation of white paper reflection 5,000 degrees Kelvin light, stating that both peak white point [TV] and illumination must be of a suitable color temperature, with the example of 5,000K being given. As white papers have various color reflection indexes, reflected light from the paper will not be 5,000 degrees Kelvin, therefore with the monitor set to 5,000K this white point will not match the light reflected from the paper. Further, this prior art does not stipulate that the monitor should be 5,000K. With this parameter being applied then the monitor image cannot be accurately compared to the printed image as the white point color temperature of the monitor is not that of 5,000K lights reflected from the white paper. Therefore, monitors used in this process are not accurately calibrated, and do not display the image as it will print. The calibration devices disclosed are also not designed to define and set monitor brightness and contrast or relate the monitor brightness to the brightness of ambient light. There exists a need for a generally all-encompassing, monitor calibration device and system, particularly for color and monochrome monitors used in the printing and textile industries, where accurate reproduction is required. Moreover, the system should be able to calibrate all such monitors used in these industries that the image will appear the same whatever the location or manufacturing process that produced the monitors. Assuming the same color temperature ambient light and the software application set to the same parameters on a computer that the monitor is being used to display the image.

Accordingly, it is the object of the present invention to provide a device and method that all color monitors used in the production of prepress material or similar can be exactly calibrated to a standard based on the ANSI PH2.30 and ASTM D1684-61 standard or user defined color temperature settings.

It has been found this objective can be achieved by defining white point color temperatures of light transmitted from standard light sources of a color matching light booth reflected from papers used in printing processes. That these settings and user defined alternatives can be transferred to color monitors via a device calibrated to such settings, by which monitors can be electronically or optically compared to the device and calibrated. Also with this device, monitors can be calibrated for brightness and contrast through reading standard white point and black point references that the monitor can be adjusted to. The monitors can be calibrated for variations in brightness of the ambient lighting. Thus, monitors produced by various manufacturing processes and at various locations, can be calibrated to the same standard. That images prepared for prepress color and monochrome reproduction can be viewed identically and as they will be printed with the software applications being identically calibrated on the computer.

In this aspect therefore several objectives and advantages of the invention are:

[a] to provide a method to define the white point color temperature of papers used in the printing process as viewed by transmitted industry standard lighting ANSI PH2.30 and ASTM D1684-61 in a viewing booth used in the printing and textile industry;

[b] to provide a method to transfer the white point color temperature settings defined in [a] to an opal screen of a device, this being achieved by light transmitted through color and neutral density filters onto the opal screen;

[c] to provide a method to transfer the white point color temperature settings of [b] to a color monitor by adjusting the monitors white point color temperature, that light so transmitted to an opal screen, being the lower half of the screen described in [b], matches standard of [b];

[d] to provide a method to adjust monitor white point color temperature setting described in [c] also monitor gamma adjustment.

[e] to provide, via photoelectric cells the level of monitor brightness and contrast from specific targets displayed on a monitor, that the levels of brightness and contrast so indicated on Liquid Crystal Displays can be compared to a standard, that by the use of monitor controls the brightness and contrast of the monitor can be correctly adjusted.

[f] to provide, via photoelectric cells the level of monitor and ambient brightness, that the levels of brightness so indicated on Liquid Crystal Displays can be compared to standard, that using monitor controls the brightness of the monitor can be adjusted to compensate for the brightness of ambient light.

EXAMPLE 1

In this example therefore, the invention is used to adjust color monitors to specific requirements of the prepress textile and printing industries. Therefore, it is assumed software applications are being used

that TIFF files can be loaded on the computer and displayed on the monitor.
[1] A TIFF file [A] consisting of white and gray calibration targets is loaded on the computer and displayed on the monitor. The calibration device placed in front of the monitor displays on Liquid Crystal Displays, density readings of the plaques read with photoelectric cells.
[2] The Brightness, and where provided, Contrast controls of the monitor are adjusted that the readings of the calibration targets are those of the pre-defined settings for brightness and contrast. The device is calibrated for monitors without a contrast control.
[3] A TIFF file [B], consisting of a white point calibration plaque, is loaded and displayed on the monitor. A filter holder with filter set for specific white point for a given paper or textile is inserted in the slot provided, and the light so filtered is displayed on the top half of an opal display.
[4] The white point gamma control software GAMMA by KNOLL or similar software, or red, green, blue gamma control of a monitor is used to adjust the monitor white point color temperature. Three photoelectric cells receiving signals of red, green, blue wavelengths of light via filters from the lower half of an opal screen of the device, are indicated on a Liquid Crystal Display, adjustments are made to the white point color temperature of the monitor. That when adjusted, meet pre-defined settings to achieve the color temperature setting of [3], displayed on the top half of an opal screen.
[5] The TIFF file target [A], is displayed on the monitor and Liquid Crystal Display [B] is directed via a switch to read the ambient light through a photoelectric cell located at the top of the device.
[6] The monitor brightness reading indicated on the Liquid Crystal Display [A] is adjusted to that of the ambient light intensity indicated on Liquid Crystal Display [B].

EXAMPLE 2

In this example therefore, the invention is used to adjust color monitors to specific requirements of the prepress textile and printing industries. Therefore, it is assumed software applications are being used that TIFF files can be loaded on the computer and displayed on the monitor.

[1] A TIFF file [A] consisting of white and gray calibration targets is loaded on the computer and displayed on the monitor. The calibration device placed in front of the monitor indicates on Liquid Crystal Displays, density readings of the plaques read with photoelectric cells.

[2] The Brightness, and where provided, Contrast controls of the monitor are adjusted that the readings of the calibration targets are those of the pre-defined settings for brightness and contrast. The device is calibrated for monitors without a contrast control.

[3] A TIFF file [B], consisting of a white point calibration plaque, is loaded on the computer and displayed on the monitor. A filter holder with filter set for specific white point for a given paper or textile is inserted in the slot provided, and the light so filtered is displayed on the top half of an opal display.

[4] The white point gamma control software GAMMA by KNOLL or similar software, or red, green, blue gamma control of a monitor is used to adjust the monitor white point color temperature displayed on the lower half of an opal screen of the device. The adjustments are compared to the required white point color temperature of [3] displayed on the top half of an opal screen.

[5] The TIFF file target [A], is displayed on the monitor and Liquid Crystal Display [B] is directed via a switch to indicate the ambient light through a photoelectric cell located at the top of the device.

[6] The monitor brightness reading indicated on the Liquid Crystal Display [A] is adjusted to that of the ambient light intensity reading indicated on Liquid Crystal Display [B].

EXAMPLE 3

In this example therefore, the invention is used to adjust monochrome monitors to the specific requirements of the prepress industry. Therefore it is assumed software applications are being used that TIFF files can be loaded on the computer and displayed on the monitor.

[1] A TIFF file [A] consisting of white and gray calibration targets is loaded on to the computer and displayed on the monitor. The calibration device

placed in front of the monitor indicates on Liquid Crystal Displays, density readings of the plaques read with photoelectric cells.

[2] The Brightness, and where provided, Contrast controls of the monitor are adjusted that the readings of the calibration targets are those of the pre-defined settings for brightness and contrast. The device is calibrated for monitors without a contrast control.

[3] The Liquid Crystal Display [B] is directed via a switch to read the ambient light through a photoelectric cell located at the top of the device.

[4] The monitor brightness indicated on Liquid Crystal Display [A] is adjusted to that of the ambient light intensity indicated on Liquid Crystal Display [B].

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in grater detail by way of example with reference to the accompanying drawings which

FIG. 1 shows a front general perspective view of the embodiment of the calibration device.

FIG.2 shows a rear general perspective view of the embodiment of the calibration device.

FIG. 3 shows a front cutaway general perspective view of the embodiment of the calibration device.

FIG. 4 shows a rear cutaway general perspective view of the embodiment of the calibration device.

FIGS. 5 and 6 shows a general graphical view of the method by which the calibration device is calibrated.

FIG. 7 shows a general graphical view of the calibration device as it is used to calibrate a color monitor.

FIG. 8 shows a schematic of the electronic circuit

FIG. 9 shows a schematic of the lamp circuit

FIG. 10a shows the response of the photoelectric cells

FIG. 11a shows Spectrophotometric curves of Wratten filters 47,58,25.

Fig. 12a shows ambient light adjustment chart

Fig. 13 shows light box calibrator

REFERENCE NUMBERS IN DRAWINGS

11 meter for color monitor color temperature white point red filter and brightness, readings also used in conjunction with item 12 for ambient light balance
10 meter for color monitor color temperature white green point monitor readings
12 meter for color monitor color temperature white point and contrast, also ambient light readings
14 photocell and meter selection switch
16 device on/off switch
18 electric input plug
20 filter holder
22 ambient light photocell
24 opal screen comparison display
29 monitor brightness photocell
30 optical diffusion panel collecting transmitted monitor light
31 monitor contrast photocell
34 light transmission filters
36 lamp
38 transformer/starter
40 electronic circuit board
44 red filter and photocell
46 green filter and photocell
48 blue filter and photocell
52 lamp holder
54 lamp electric connection and cable
60 printing paper
62 neutral gray card
63 printing paper gray card comparison window
64 standard lights
65 monitor
66 standard viewer to establish calibration white point and device operator
68 calibration device
70 neutral gray card

72 printing paper gray card comparison window
74 foot candles meter
76 calibration light box
78 calibration box diffusion screen, 20 foot candles
80 calibration box diffusion screen, 30 foot candles
82 calibration box lamps
84 rubber gasket
86 rubber eye caps
90 filter slot
92 NPN-type switching transistor
94 NPN-type switching transistor
96 NPN-type switching transisto
98 2N3906-type transistor
100 2N3906-type transistor
102 2N3906-type transistor
104 47,000 ohm potentiometer
106 1,800 ohm resistor
108 47,000 ohm potentiometer
110 1,800 ohm resistor
112 47,000 ohm potentiometer
114 1,800 ohm resistor
116 battery
118 1N4001 silicon diode
120 1N4001 silicon diode
122 1N4001 silicon diode
124 1N4001 silicon diode
126 1N4001 silicon diode
128 battery
130 ballast
132 ground

DETAILED DESCRIPTION OF EMBODIMENT

The present invention will be described in the following in connection with embodiment thereof with reference to drawings that illustrate the principals. Not with standing, alternate embodiments are possible encompassing the principles described herein.

In Fig 1 a plug 18 is shown to permit connection of device to electric supply, that with switch 16, the lamp 36 [Figs 3-4] via transformer and starter 38 [Figs 3, 9] is turned on, together with electronic components.
A light box [Fig 13] transmitting diffused 20 foot candles of light is used to calibrate the meters of the device. With switch 14 [Figs 1-2], photoelectric cells 44,46,48 [Figs 1, 2, 8, 10a] are selected. With the device placed in front of the light box [Fig 13], the meters 10,11,12, [Figs 1, 2, 8] display readings of the activated photoelectric cells 44,46,48 [Figs 4, 8, 10a] that have Kodak Wratten color separation filters in front of them [Fig 11a]. Photocell 44 with Wratten filter 25 receiving red filtered light, photocell 46 with Wratten filter 58 receiving green filtered light, photocell 48 with Wratten filter 47 receiving blue filtered light. The potentiometers on circuit board 40 [Fig 3] for meters 10, 11, 12 [Figs 1-2] are adjusted to read 200. Photocells 29 and 31 [Fig 2] are selected via switch 14 [Figs 1-2]. If the readings displayed on meters 11 and 12 [Figs 1-2] are not those as predetermined, then neutral density filters of increased density value are used to achieve the required readings. Switch 14 [Figs 1-2] is used to select ambient light sensing photocell 22 and monitor brightness photocell 29 together with meters 11 and 12 [Fig 1-2]. The ambient photocell 22 [Figs 1,2,4] is calibrated using neutral density filters, that reading 30 foot candles of ambient light and displayed on meter 12 [Figs 1-2], the reading equals that of meter 11 displaying the 20 foot candles transmitted light of the light box [Fig 13]. Light from the lamp 36 [Figs 3-4] is transmitted through selected combinations of cyan, magenta, yellow, red, green, blue color compensating filters 34 [Figs 3-5], with wave length of 400-700mu and percent transmission 0.025-0.10 and neutral filters with transmission densities 0-1.3. Using such filter combinations, light transmitted through the opal screen of the calibration device simulates the color temperature of

standard 5,000K or 7,500K light reflected from printing papers or textiles, determined by a standard observer 66, [Fig 6] with good visual color aptitude. The paper or textile 60 [Figs 5-6] that a calibration standard will be determined, is placed in a standard light booth [Fig 6] illuminated to either ANSI standard PH2.30 or ASTM standard D1684-61, dependent on printing or textile standard that monitors will be calibrated to. An 18 percent reflectance neutral gray card 62 [Figs 5-6] e.g., Kodak Gray Card, with a flat line wave length response 400-700mu is placed over the paper 60 [Figs 5-6] that through a window in the card 63 [Figs 5-6] the color of the paper or textile is isolated from surrounding color influence. The filter pack combination 34 [Figs 3-6] required to calibrate the devise 68 [Figs 5-6] to that of the reflected light from the paper or textile. That with a 18 percent reflectance neutral gray card 70 [Fig 6] as specified above, is placed over the the opal screen 24 [Fig 6], that through a window in the card 72 [Fig 6] the standard observer 66 [Fig 6] can determine that the light from the lamp 36 [Figs 3-4] of the calibration device 68 [Fig 6], transmitted through a filter pack 34 [Figs 5-6], retained in a filter holder 20 [Figs 5-6] and placed in the filter slot 90 [Fig 5] of the calibration device 68 [Fig 5], matches the color and percent reflectance of the printing paper or textile 60 [Figs 5-6]. The neutral density filters of the filter pack 34 [Fig 5] are then adjusted to increase or decrease the density of the pack that the transmitted light displayed on the opal screen 24 [Figs 5-6] of the calibration device is that as determined from measuring in foot candles the brightness of the opal screen of the device with the filter pack 34 in the filter holder 20 within the filter slot 90 of the device 68 [Figs 5,7], the monitor white point brightness standard determined correct for a printing or textile reproduction process transmitted from the monitor 65 [Fig 7] to the opal screen 24 [Figs 1,3,4,5,6]. This is achieved with the device correctly located in front of the monitor as described below.

With the the filter combination determined by the above procedure for a specific printing paper or textile, and located between the lamp 36 [Figs 3-4] and the opal display screen 24 [Figs 1,3,4,5,6] in a filter holder 20 [Figs 1-6]. The calibration device 68 [Fig 7] being placed in front of a monitor Fig 7. The monitor is tilted to an angle that the brightness and contrast controls of the monitor are accessible. The calibration device is moved toward the monitor that the rubber eye caps 86 [Fig 2] of the brightness and contrast sensing photoelectric cells 31 [Fig 2] are in contact with the monitor and prevent ambient light entering the photocells. A color monitor gamma and white point red, green, blue, color temperature adjustment software application e.g., GAMMA by KNOLL that is part of the Adobe PhotoShop application, is loaded to the computer and displayed at the top left of the monitor. Using a software application e.g., Adobe PhotoShop 2.0 or above, loaded to the computer, a TIFF file Brightness/Contrast plaque is opened and displayed on the monitor. The image filling the screen of the monitor 65 [Fig 7] is divided into three parts, the top half of the screen having the equivalent of 100 percent black, the lower left the equivalent of a 0 percent dot and the lower right the equivalent of 70 percent dot. With switch 14, meters 11, 12, and brightness and contrast photocells 29,31 [Figs 1-2] are selected and the monitor brightness and contrast controls adjusted to predetermined settings displayed on meters 11, 12 [Figs 1-2].

Using the software application as that to set the monitor brightness and contrast to the correct parameter, a White Point TIFF file consisting of a 0 dot percent is opened to fill the screen of the monitor 65 [Fig 7]. A visual comparison is made of the white point color temperature standard displayed on the top portion of the calibration device screen to that of the monitor white point color temperature displayed on the lower half of the calibration device screen 24 [Figs 1, 5]. If the monitor white point does not match the standard, the monitor gamma and white point adjustment software e.g., GAMMA by KNOLL is selected and displayed on the top left corner of the monitors screen 65 [Fig 7]. With the white point being selected the Red, Green, Blue controls are adjusted to achieve a visual match of the screen white point to that of the standard displayed on the screen of the calibration device 24 [Figs 1, 5]. Selecting the Red, Green, Blue Photocells 44,46,48 [Fig 4] with switch 14 [Fig 1], the white point readings of the monitor, read with photocells 44, 46, 48 and displayed on meters 10,11,12 [Figs 1,4] are compared to that of the required white point color temperature standard. Adjustments to achieve this standard are made with the Red, Green, Blue controls of the gamma and white point adjustment software previously used for the course white point adjustment.

Re-loading the Brightness/Contrast plaque to the screen of the monitor, photocell 22 [Figs 1-4] is selected with switch 14 [Figs 1-2] to measure the brightness of ambient light, also changing meter 12 to display the readings of this photocell. The meter reading from photocell 22 is compared to that of the monitor brightness meter readings of photocell 29 [Fig 2]. If the ambient light is greater or less than that specified by the Illuminating Engineering Society for Visual Display Terminals, being 30 foot candles, then the monitor brightness can be adjusted that the meter readings of photocell 29 [Fig 2] taken from the monitor white point as brightness reading, are compared to that ambient light compensation chart Fig 12a. The chart having been produced with empirical data, that printed matter being illuminated at levels of foot candle greater and lesser than the ideal 30 foot candles, to be compared to that of the original digital data displayed on the monitor. The monitor being adjusted to match the printed copy at the various levels of transmitted illumination. Thus, the monitor settings and ambient light levels so defined produce the chart from which the monitor brightness level can be set to compensate for any deviation from the 30 foot candles ambient light standard.

The following is an example of monitor brightness and contrast settings for newsprint reproduction the device can be calibrated to. That with these settings the device is used to calibrate color monitors to the same standard. The monitor gamma is set to 1.8 using a gamma control software device e.g., PhotoShop Gamma. Using a foot candles meter, the white point is set to 18 foot candles and and the black point to 4 foot candles reading an area equivalent to 70 tone displayed on the monitor. Adjustments to the brightness and contrast controls are made to achieve these settings. The ambient light in which the monitor should be viewed is 30 foot candles as required by the Illuminating Engineering Society of North America for Visual Display Terminals.

WHAT I CLAIM IS:-

1. A method for transferring to a calibration instrument the color temperature of reflected light from printing papers and textiles; the light so reflected being transmitted from industry standard lights.

2. A method for defining computer color monitor white point settings of Claim 1 and the contrast and brightness settings of the monitors, that the brightness of the monitor be in ratio to the brightness of ambient light; that monitors of various manufacture and location can be used to view graphic images for the printing and textile industry identically and as they will be printed, with the software applications being identically calibrated and the color temperature of the ambient light being that of the industry standard.

3. A method for defining computer monochrome monitor contrast and brightness settings, that the brightness of the monitor be in ratio to the brightness of ambient light; that monitors of various manufacture and location can be used to view graphic images for the printing and textile industry identically and as they will be printed, with the software applications being identically calibrated and the color temperature of the ambient light being that of the industry standard.

FIG. 1.

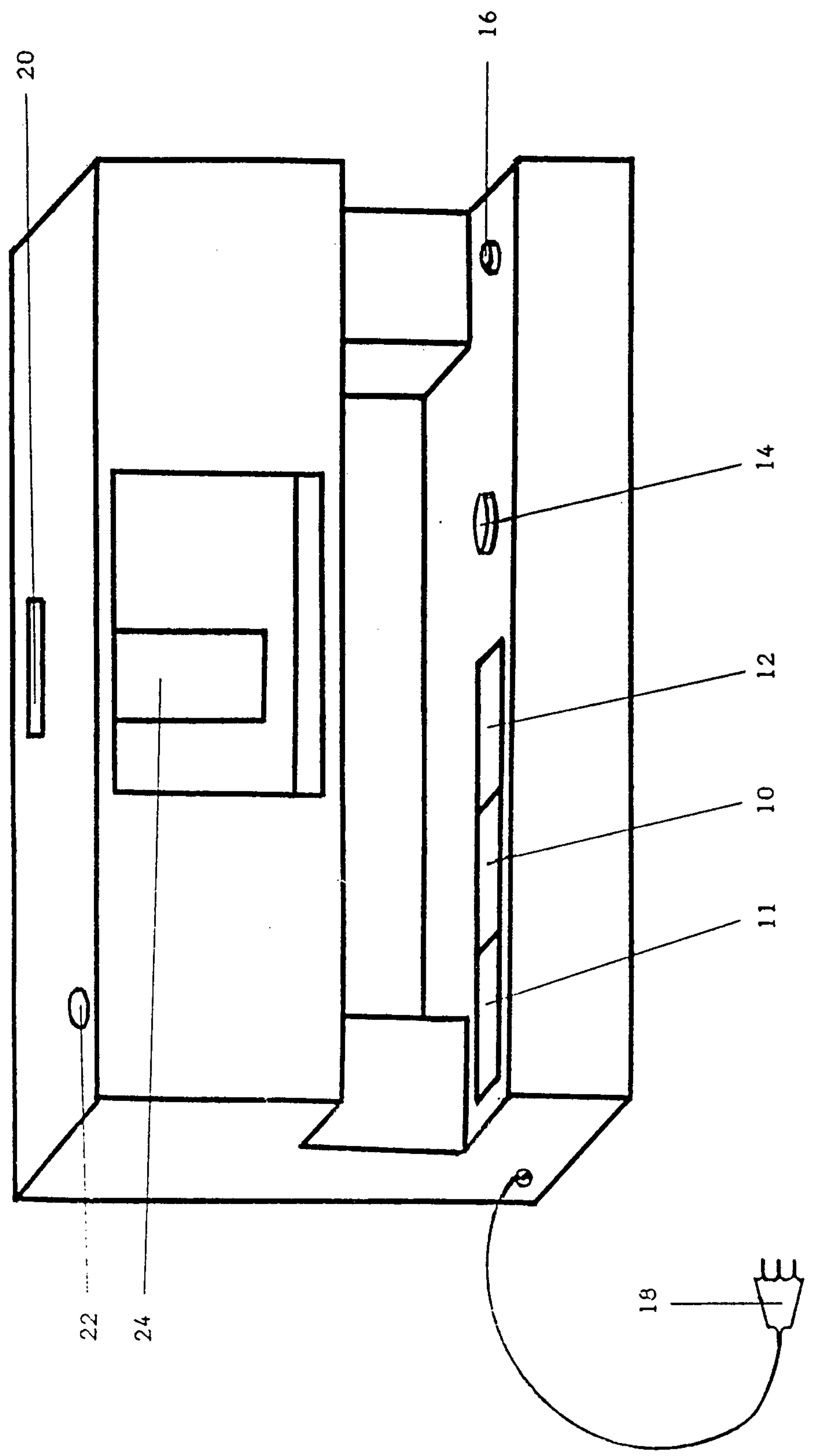


FIG. 2

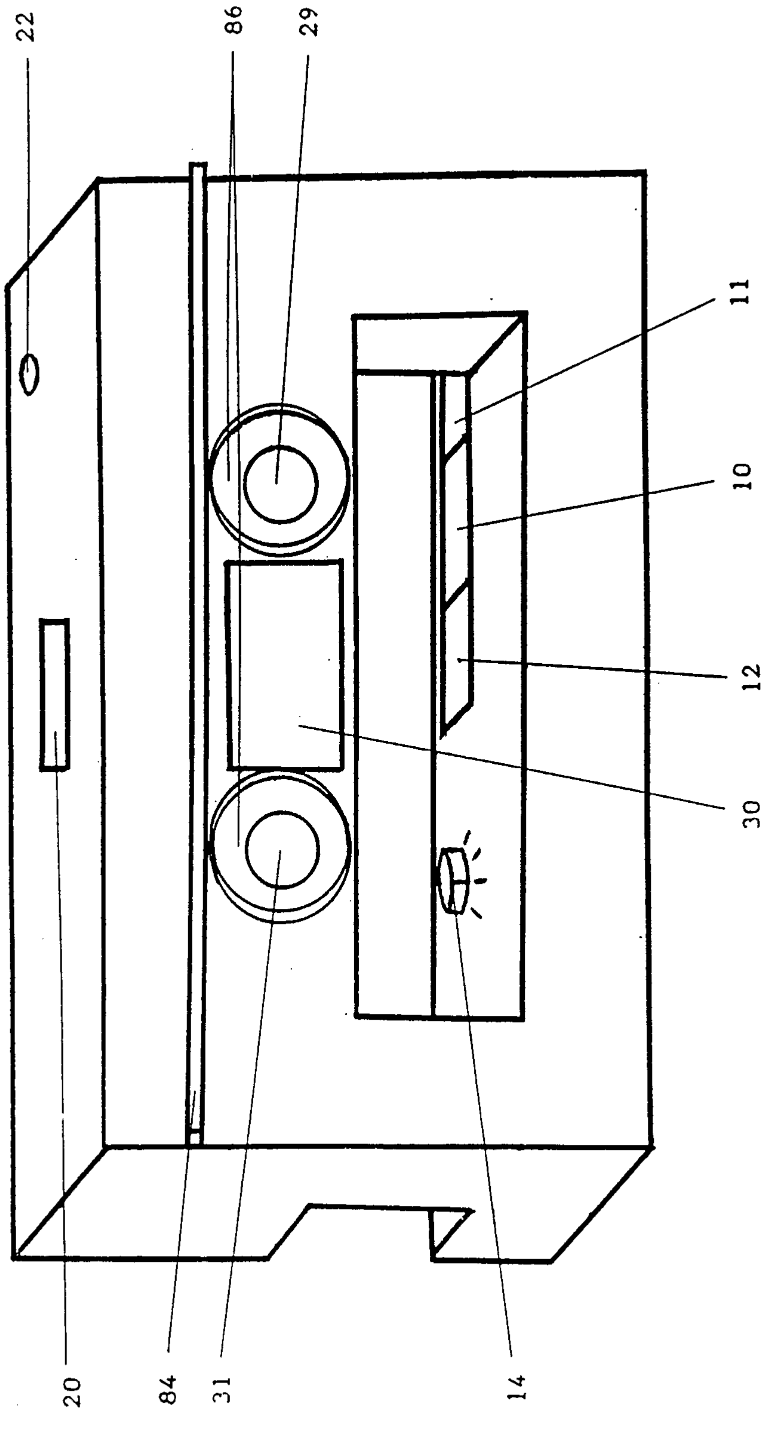


FIG. 3

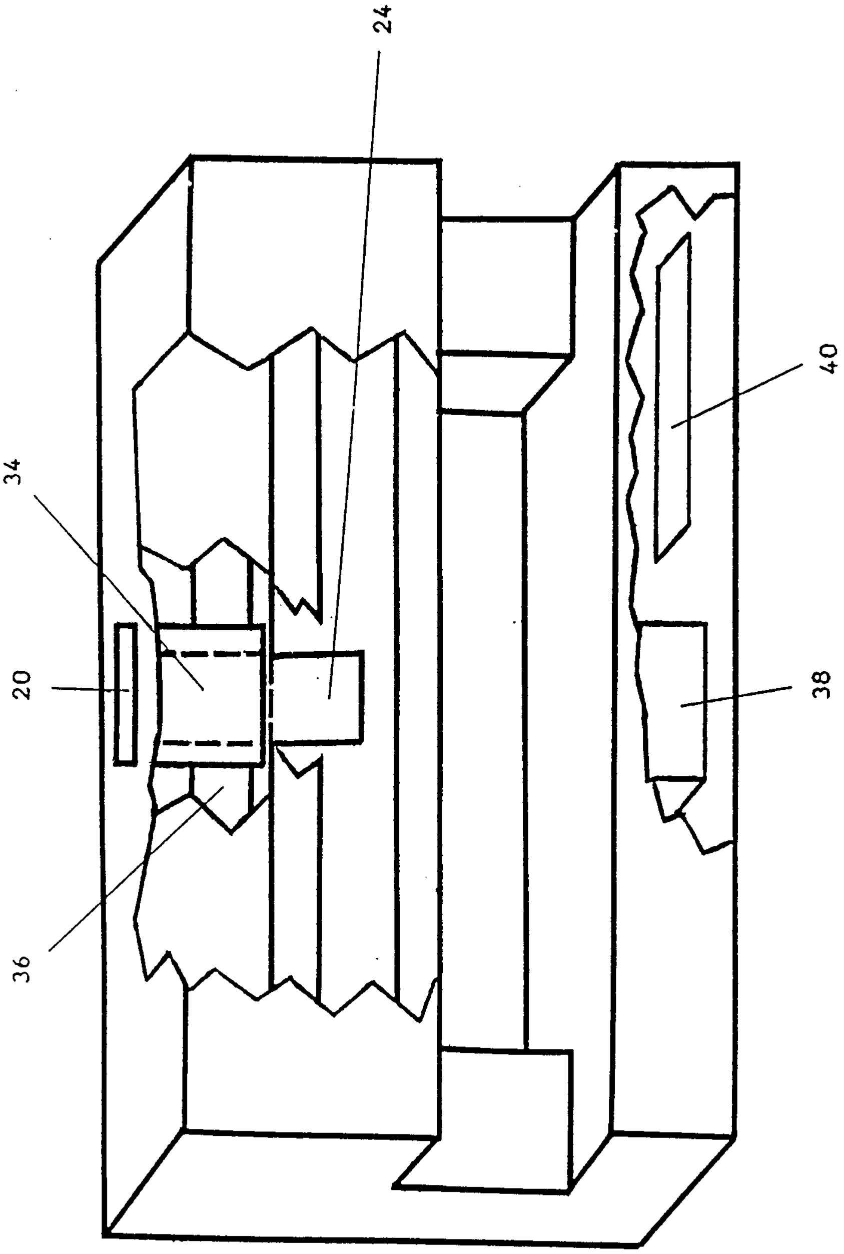
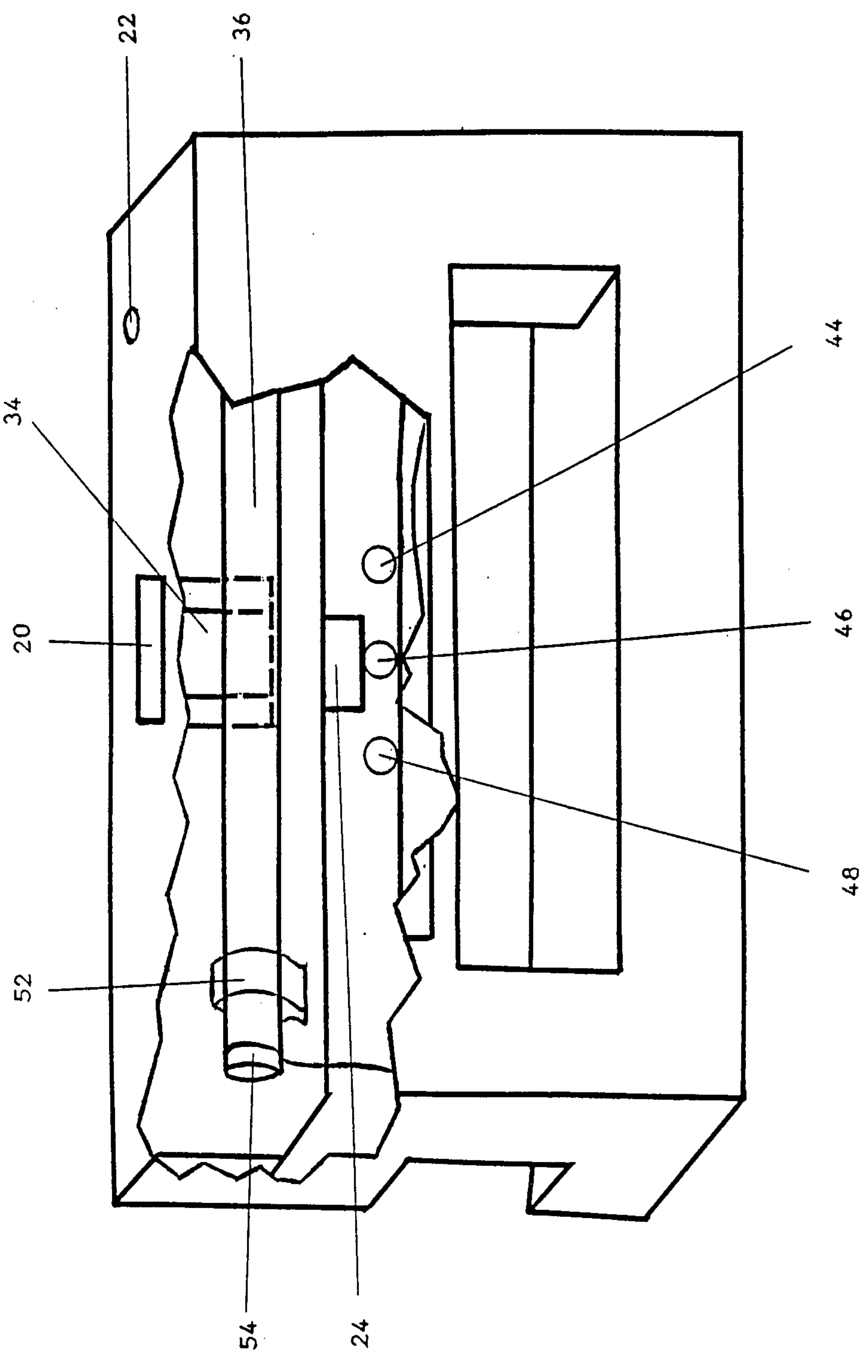


FIG. 4



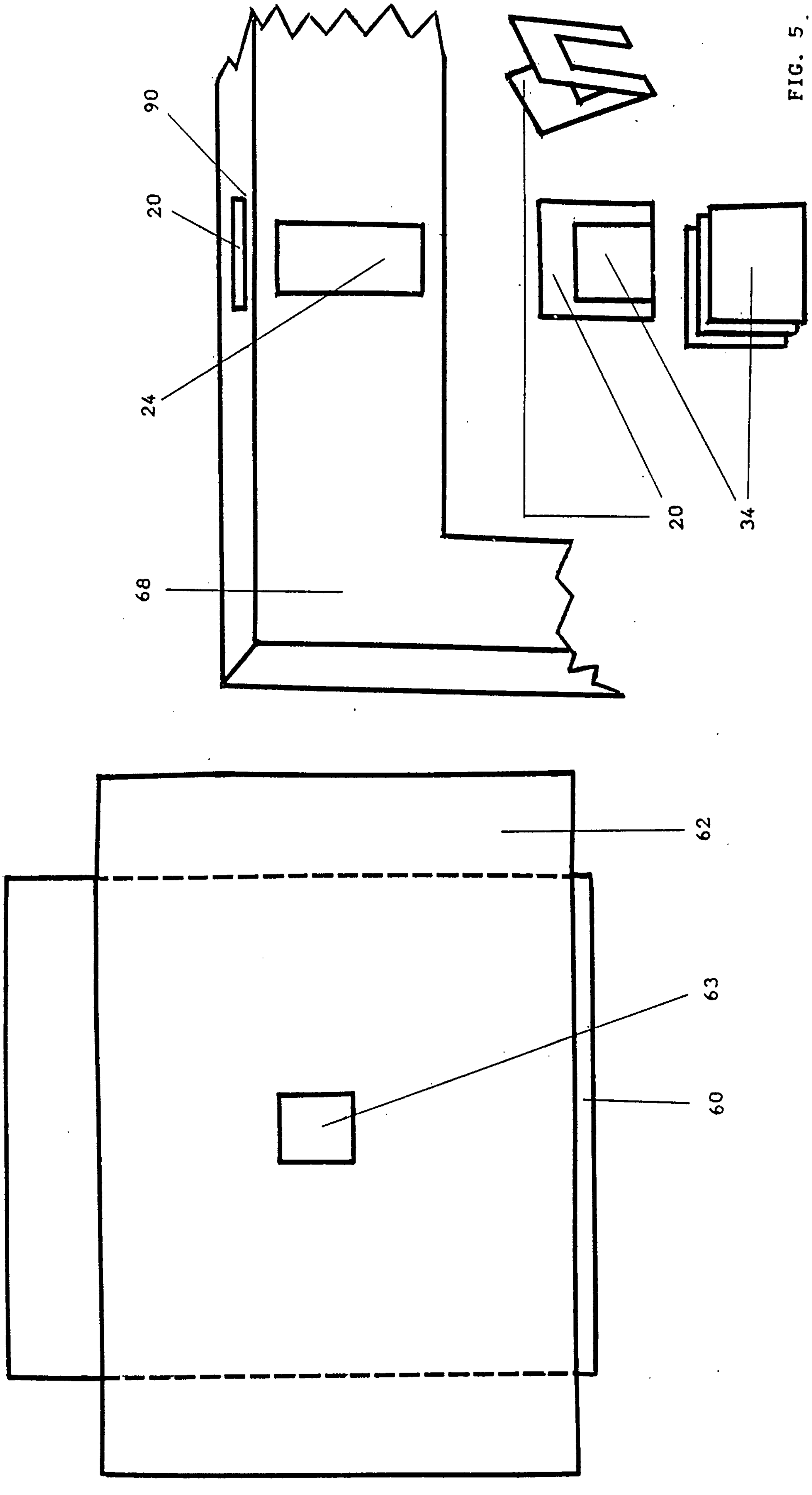


FIG. 5

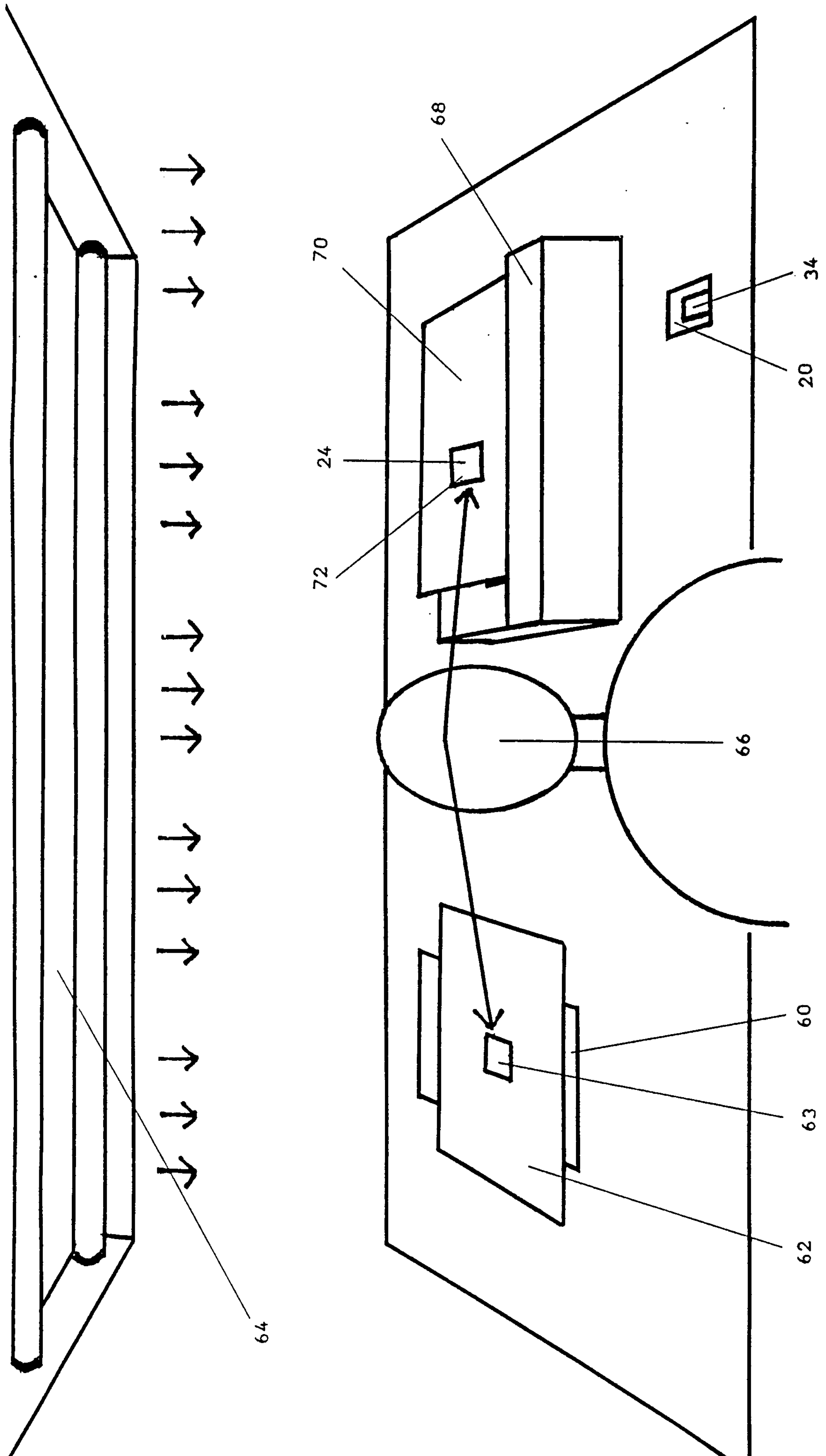


FIG. 6

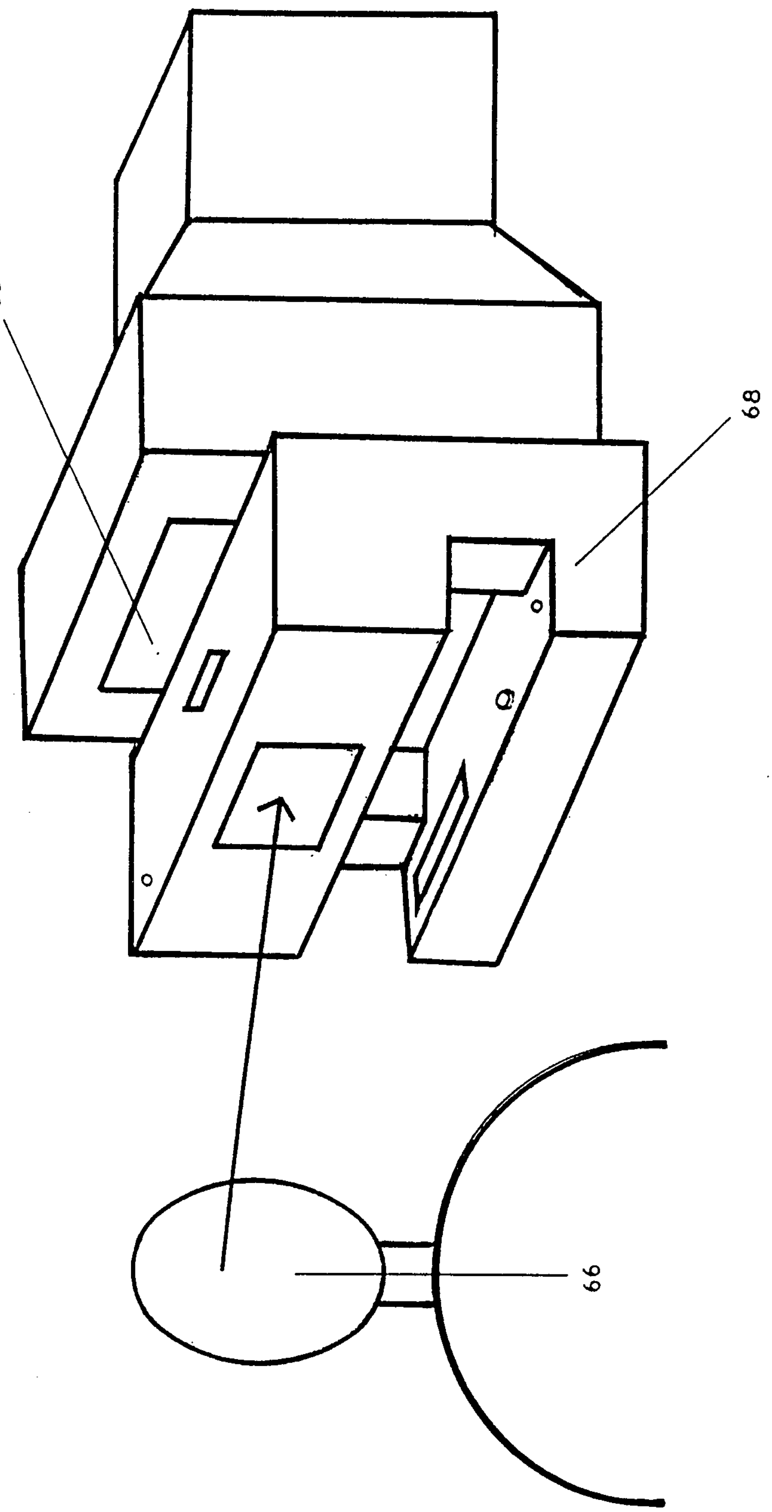


FIG. 7

FIG. 8

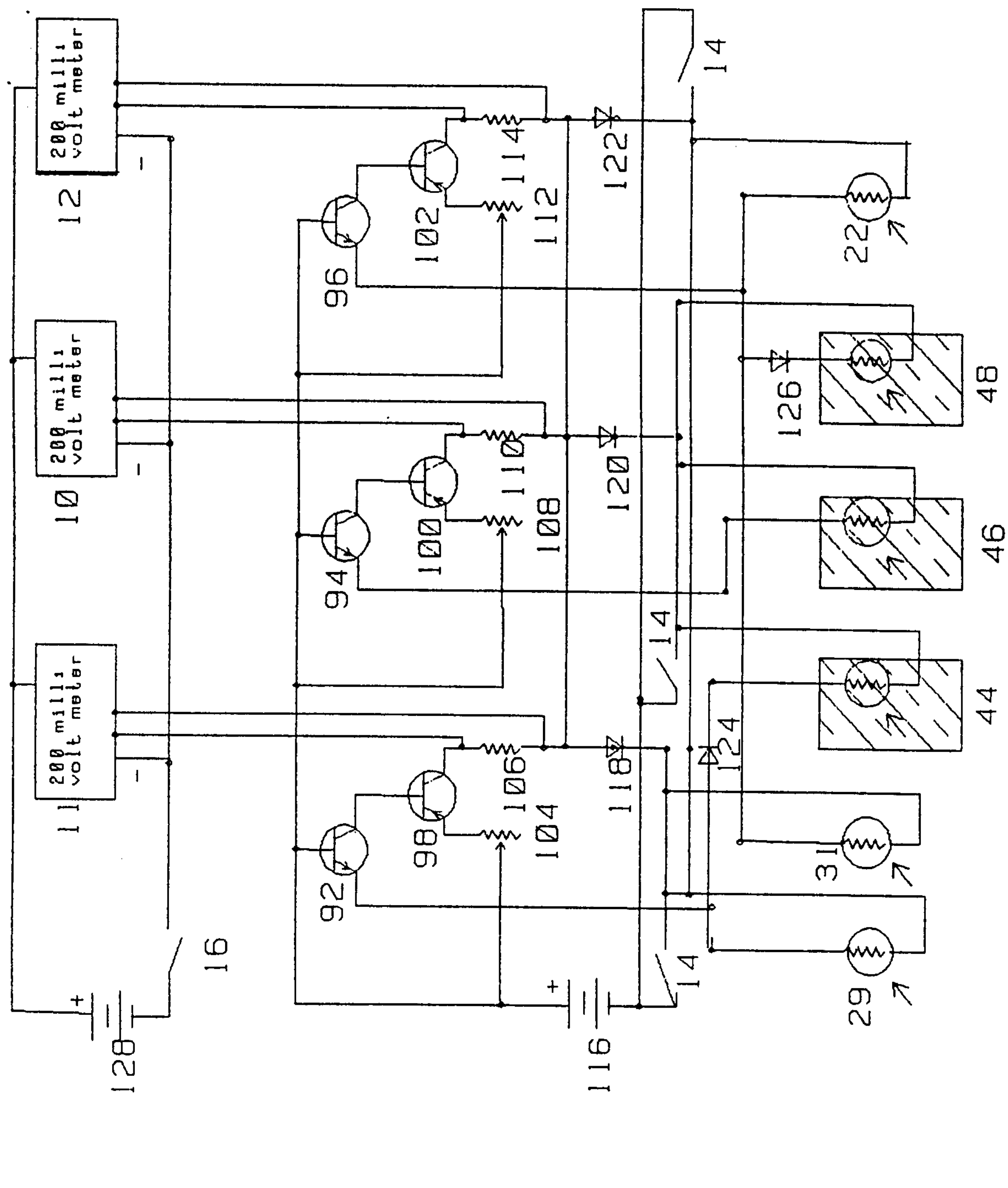
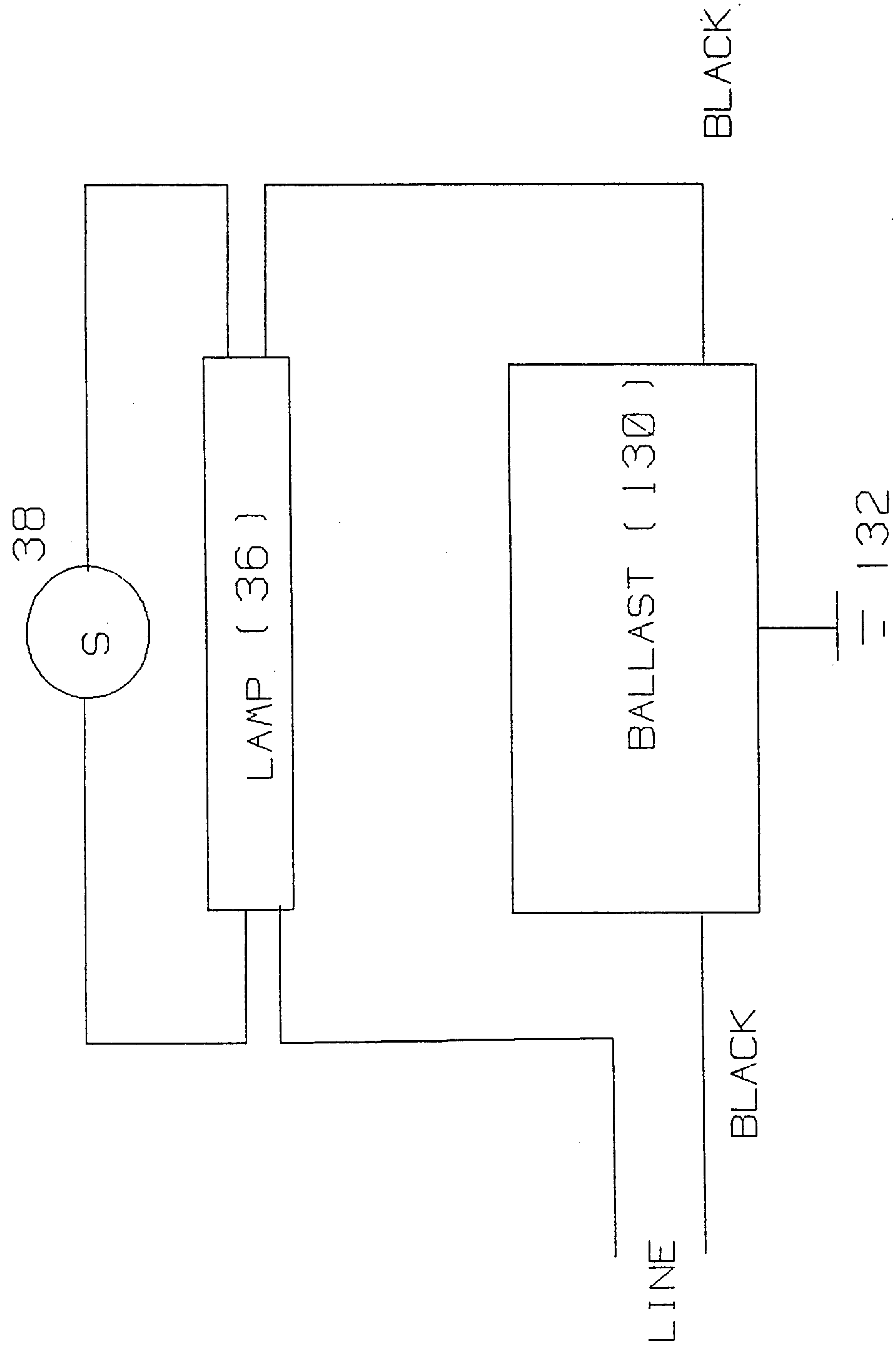
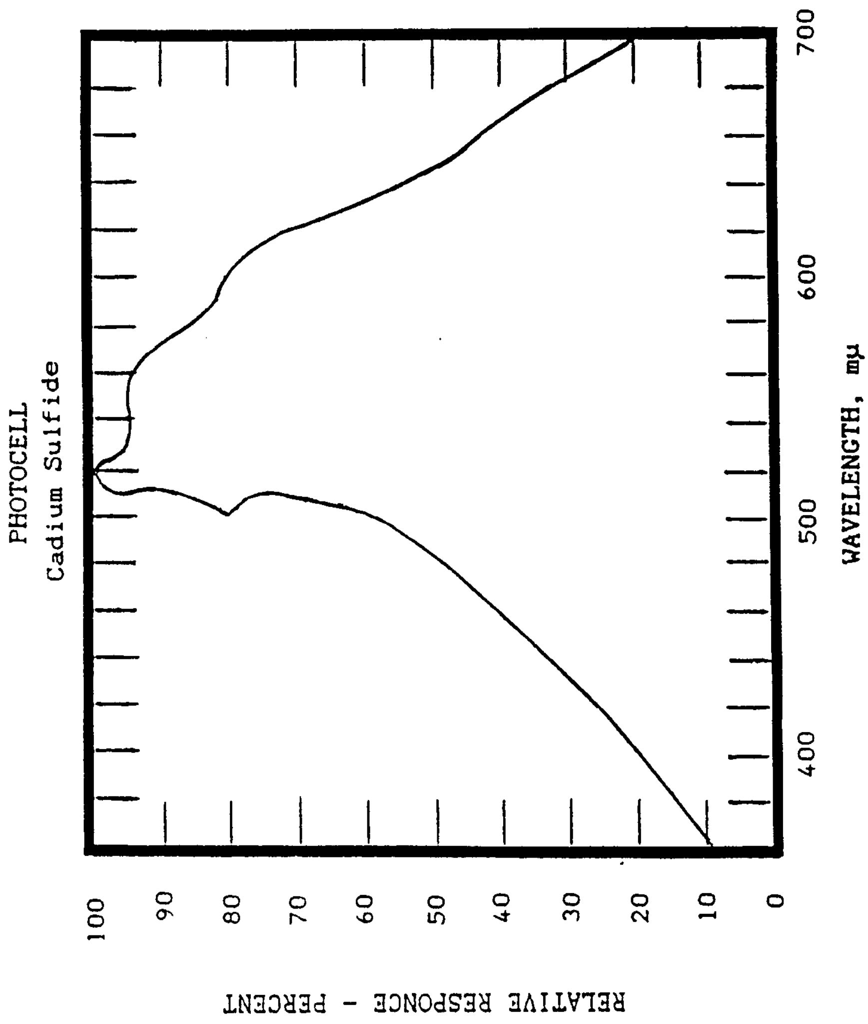

200 milli volt meter
200 milli volt meter
200 milli volt meter
12
10
11
16
128
116
14
92
94
96
98
100
102
104
106
108
110
112
114
118
120
122
124
126
22
29
31
44
46
48

FIG. 9



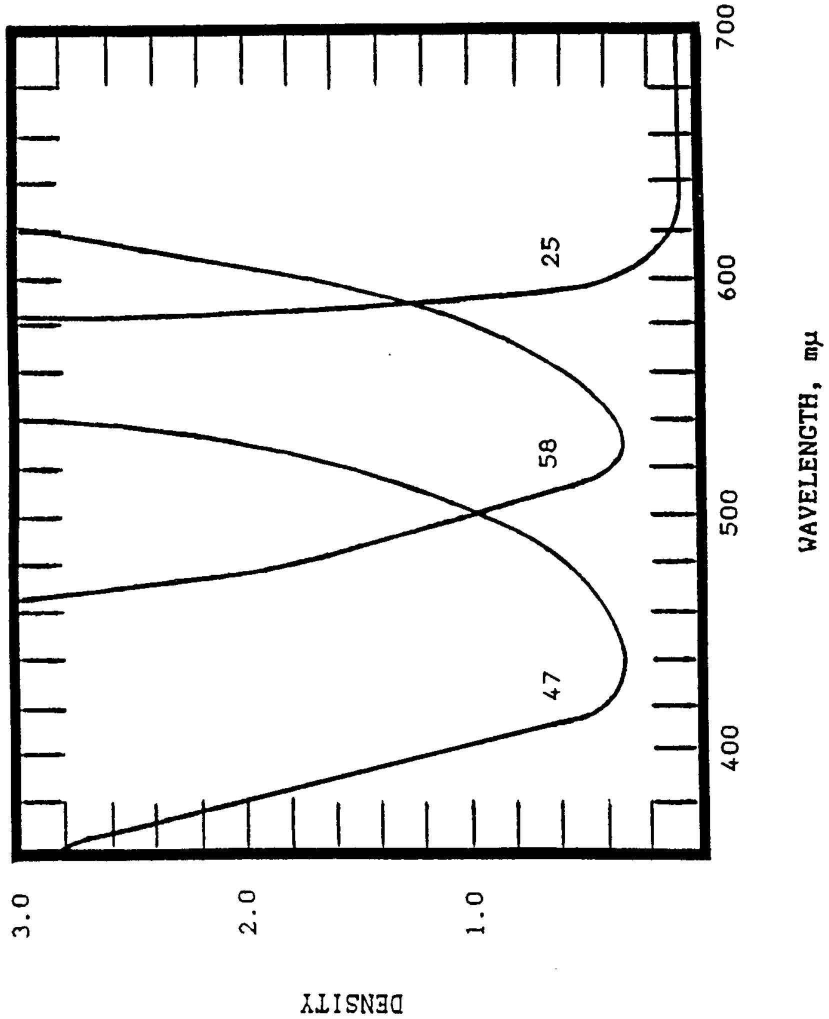


PHOTOELECTRIC CHARACTERISTICS

Resistance at 10 Lux (2854deg K): 15k +- 40%
Typical Resistance 100 Lux (2854deg K): 3k
Resisance Dark Minimum (minute): 0.5 Megohm

FIG. 10a

FIG. 11a



Sectrophotometric curves of Kodak Wratten Filters Nos. 47, 58 and 25.

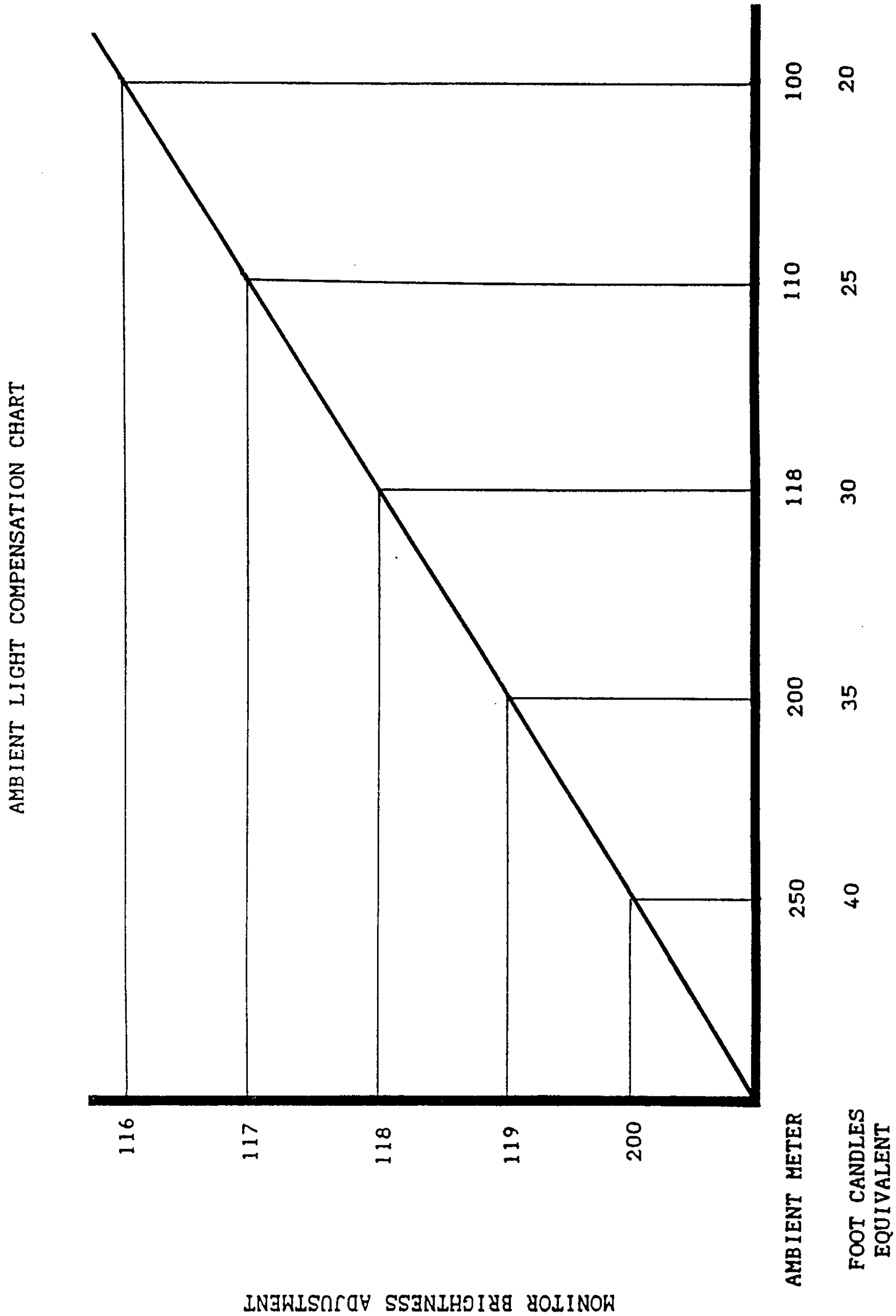
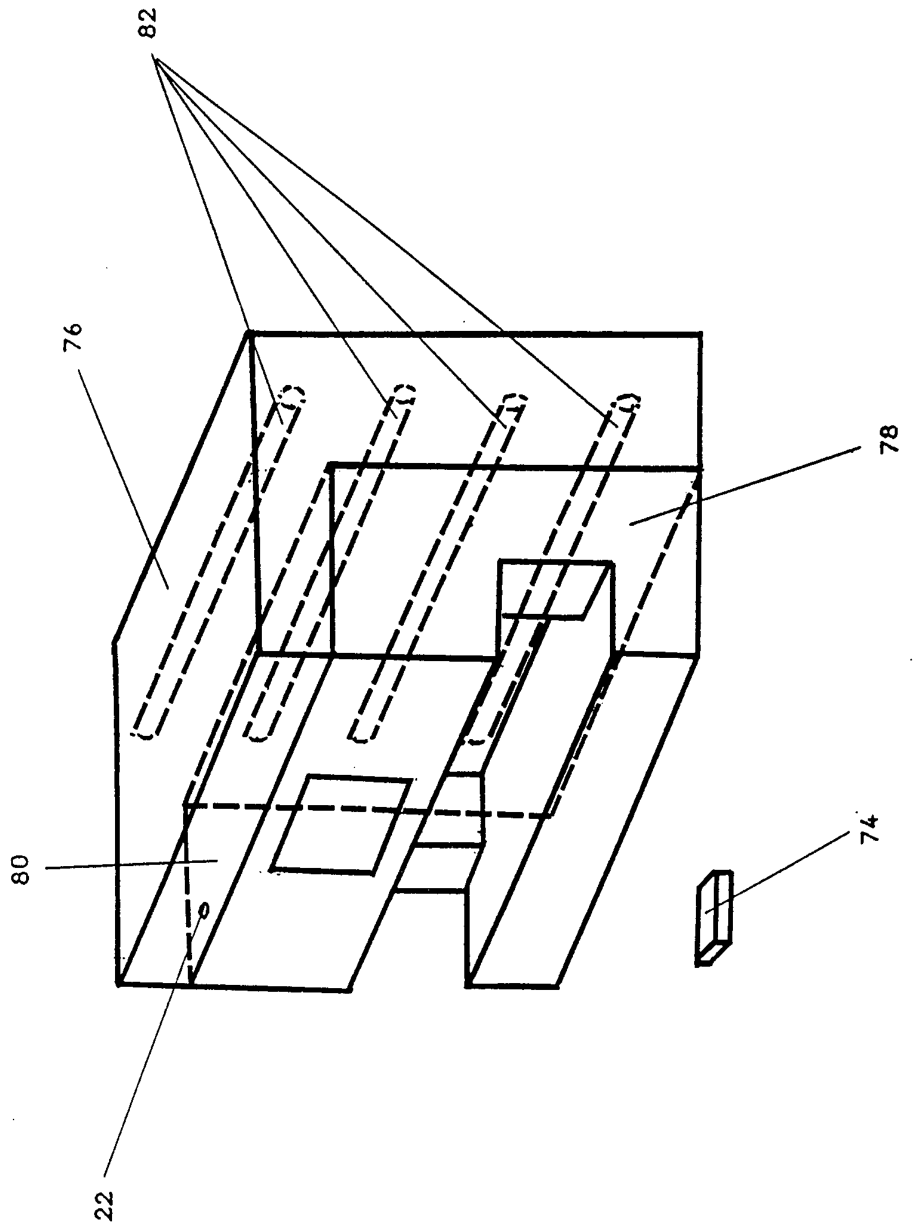

AMBIENT LIGHT COMPENSATION CHART
100
110
118
200
250
20
25
30
35
40
116
117
118
119
200
AMBIENT METER
FOOT CANDLES EQUIVALENT
MONITOR BRIGHTNESS ADJUSTMENT

FIG. 12a.

FIG. 13



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US93/05699

A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :G01N 3/46; GO1N 21/25; H04N 17/02, 9/44, 9/64, 5/238
US CL :356/402, 405, 406; 358/10, 17, 28, 29, 228
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)

U.S. : 356/402, 405, 406; 358/10, 17, 28, 29, 228

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US, A, 4,029,419 (Schumann, Jr. et al) 14 June 1977, see abstract.	1-2
X	US, A, 4,259,020 (Babb) 31 March 1981, see abstract.	1-2
X	US, A, 5,033,857 (Kubota et al) 23 July 1991, see abstract.	1-2
X,P	US, A, 5,157,464 (Laihanen) 20 October 1992, see abstract.	1-2

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be part of particular relevance

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 SEPTEMBER 1993	01 OCT 1993

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US93/05699

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US, A, 4,633,299 (Tanaka) 30 December 1986, see entire document.	3
X	US, A, 4,500,919 (Schreiber) 19 February 1985, see entire document.	3
A	US, A, 4,281,337 (Nakamura) 28 July 1981, see entire document.	1-3
A	US, A, 4,633,301 (Saitoh) 30 December 1986, see entire document.	1-3
A	US, A, 4,678,338 (Kitta et al) 07 July 1987, see entire document.	1-3
A	US, A, 4,813,000 (Wyman et al) 14 March 1989, see entire document.	1-3