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VWGoA EX1002
U.S. Patent No. 9,955,551

Patent Application of
Yechezkal Evan Spero
for

TITLE: Detector Controlled Illuminating System

Cross Reference to Related Applications
The present application claims the benefit under 35 U.S.C. .sctn. 119(e) of U.S. Provisional Application No. 60/395,308 filed Jul. 12, 2002, entitled: Multiple light source illumination system; and U.S. Provisional Application No. 61/535,981, filed Oct. 17, 2011 entitled Adjustable Lighting Fixture, the disclosures of which are all expressly incorporated herein by reference; and this application is a continuation-in-part application of, and claims the benefit under 35 U.S.C. .sctn.120 from, co-pending U.S. patent application Ser. No. 10/604,360 , entitled "Multiple Light-Source Illuminating System " filed on Jul. 14, 2003, The entire content of this non-provisional patent application is incorporated herein by this reference.

BACKGROUND OF THE INVENTION
Field of the Invention
The present invention is in the field of radiation producing devices. More particularly, the present invention is in the technical field of lighting fixtures. However, radiation used for headlamps, heating, night vision, UV or visible light curing, medical X-rays and other radiation uses are covered as well. General lighting fixtures otherwise known as luminaires will be used as the primary example while other irradiating devices such as infrared heaters are covered as well. The invention relates to multiple light source illuminating devices intended to replace incandescent, fluorescent and HID luminaries in general and specialty lighting applications.

Definitions, Terms, Elements
In order to clarify the intent of the present invention and its dissimilar aspects from prior art, a nomenclature system is established.

Used herein illumination refers to the deliberate application of light to achieve some practical or aesthetic effect. Correct illumination or recommend lighting practice refers to lighting industry standards and recommendations for the illumination of living, recreation, architectural and work areas as described in standards and handbooks published by industry professional organizations such as the Illuminating Engineering Society, the International Association of Lighting Designers, IALD or International Commission on Illumination CIE.

Lamp: A lamp, other than a reflector lamp, is generally a device that generates light radially from the source. Due to the physics involved in the light generation process, it is difficult at the source to gain control of the spatial light propagation. A reflector lamp will partially control the emitted light which hits the reflector, but will not control the remaining light emanating from the filament or discharge tube. A lamp other than a solid-state lamp will generally produce light over a wide range of spectrum. The overall color is a function of the physics involved in the generation of the different photon energies. While some lamps spectra are closer to sunlight and have a good color rendering in relation thereto, other lamps such as low-pressure sodium are highly monochromatic with a yellow- orange appearance. A color

temperature in degrees Kelvin based on the color of an incandescent filament is used to describe a lamp. An incandescent lamp color will be termed "warm" at 2000 Kelvin and a Metal Halide "cool" at 4000K. In general, there is no ability to affect the color over the intensity level even where dimming is afforded. A lamp is also intended to be a replaceable element. Lamps are constructed according to universal standards which allow for the substitution of lamps by other manufacturers. Prior-art lamps are thus provided with bulky bases which fit into bulky sockets and do not lend themselves to being permanently wired into printed circuit boards or bonded onto electronic chips.

Luminaire: A Lighting Fixture or luminaire (the terms are used interchangeably) is a device which is constructed around the lamp to provide lighting specific to the application including non-lighting considerations such as aesthetics, safety etc. Some LF designs are primarily based on aesthetics while others are based on tailoring the lumen output such that the lighting fixture output meets the visual task at hand. Between these two extremes there are many possible designs, with maintenance, fixture cost, hazardous and rough service location considerations also playing a role. This is essentially why the industry produces so many different types of luminaires. One type for high industrial building ceilings known as high-bay lighting, another for office lighting and a third for roadway lighting and a fourth for illuminating corridors. Each fixture has its photometric distribution characteristics, that is, how many candela at what angle are exiting from the luminaire. Other luminaire considerations include keeping the lighting from causing discomfort glare or from being a source of veiling reflections. The purely technical goal is to get the required amount of light at the work surfaces where visual tasks are carried out by man, animals, plants and machines. A LF has a longer life than the lamp, and the lamp is meant to be replaceable within the fixture. A luminaire is wired directly to the electrical mains while a lamp due to its need to be replaced has a base which fits into a socket by way of which the lamp receives its power. Prior art solid-state lamp assemblies are considered lamps, as they have no provision for being connected to the mains. A luminaire has apparatus whereby it is attached to the building structure while a lamp is mechanically affixed to the lamp holder or socket. Another aspect of distinction is, that in general, correct lighting practice principles are used to guide in the design of a LF while a lamp is "bare" and is expected to have reflectors, refractors, shades and louvers to prevent glare and redirect its rays to increase light utilization.

Digital: The term digital used herein in refers to the luminaire concept as espoused by teachings of this invention and is loosely defined in parallel to the fine control associated with digital equipment. The multiple light sources of specific characteristics provide quanta of power and spectrum which are smoothly added or detracted to generate a changed lighting effect. The digital aspect arises from the sufficient progression of values, varying by minute degrees to produce a continuum so as be non-discernable or irrelevant to the user. The added controllability is realized by breaking up the light-production, into discrete, specifically aimable, and dimmable elements which can be addressed by control electronics for the purpose of affecting the intensity, spectrum and spatial distribution of spectrum and of intensity of the illumination provided by the luminaire of the present invention.

The overall combination of control capability and discrete light sources yields a digital lighting fixture. The terminology "digital" as used herein also refers to the discrete nature of the multiple LED lamps provided in the luminaire, whereby,

"digital" control results from the individual control of the discrete, i.e., "digital" lighting elements, the LEDs, in the luminaire.

Correct lighting practice: A bare incandescent lamp illuminating a room is arbitrarily termed poor lighting practice. The bare light bulb hooked up to the electric power via a light switch, causes glare, wastes light, delivering the light to useless areas, has no provision for dimming and is energy inefficient. The Illuminating Engineering Society of North America (IESNA) as well as other professional groups such as the International Association of Lighting Designers (IALD) have developed recommended lighting practices for specific applications in indoor and outdoor lighting. These recommendations and equations for implementing the recommendations can be found in the IESNA Lighting Handbook, 8th and/or 9th Editions (available from the Illuminating Engineering Society of North America 120 Wall St. Floor 17 New York, NY 10005 included herein by reference. Factors in good lighting include lighting intensity levels which may be based on the age of the users of the light, the color rendering capacity of the light source, its color temperature, the non-production of glare, veiling reflections and energy efficiency amongst others. Recommendations for all aspects of lighting in terms of intensity, distribution, color temperature, color temperature as a function of light intensity and correct color rendering exist in the literature in terms of lighting applications that is the environment to be illuminated, in parameters such as lux for intensity, CRI for color rendering index and Visual Comfort Parameter (VCP) for glare. In recent years, the Unified Glare Rating (UGR) as recommended by the CIE has become widely accepted as a general formula for assessing glare. While the US may still use VCP ratings, all the lighting-practice engineering organizations worldwide have standards and recommended ratings for different activities. For example lighting levels of 500 lux and a UGR of 19 is recommended in offices while industrial areas intended for coarse work a UGR of 28 can tolerated. In good lighting practice, attention is given by lighting designers to the correct amount of uplight, that is, light exiting from the luminaire towards the ceiling, which prevents a gloomy "dark cave" effect. Attention is also given to the cut-off angle of the luminaire, usually provided by shielding elements, such that high intensity rays are not emitted at an angle where they enter the occupant's eye during normal activity. A correctly designed luminaire for indoor lighting may provide 30% uplight and 70% downlight in the angles from the nadir 0 to 60 degrees and then again 135 to 170 degrees. A governing equation in lighting and used in "reverse luminaire design" of the present invention is the cosine law or Lambert's law, Equation 1:

$$E = \frac{I \cos\theta}{D^2}$$

Where: E=Illuminance in lux or footcandles, I=Luminous intensity in candles, D=Distance between the source and the point of calculation in meters or feet, θ = Angle of light incidence with illuminated surface

Another useful equation used in fixture analysis to avoid glare producing designs yields the level of discomfort on the DeBoer scale. The DeBoer rating scale (1-9) describes the level of discomfort where: 1= Unbearable, 3 = Disturbing, 5 = Just acceptable, 7 = Satisfactory, and 9 = Just noticeable. The allowable level is dependent on the application. A surgeon performing an operation may be very sensitive to glare

while a chlorophyll producing plant is not. The equation to determine the rating is Equation 2:

$$W = 5.0 - 2.0 \, LOG \, [E_i / (0.003) \, (1 + SQRT \, (La / 0.04)) \, (\varphi_i)^{0.46}]$$

where: W = glare sensation on a scale of 1 to 9, La = adaptation luminance (cd/m 2), E_i = illumination directed at observer's eyes from the i-th source (lux), φ_i = glare angle of the i-th source (minutes of arc) from the observer's line of sight.

Using these equations and correct lighting practice covering preferred angles of lighting for visual tasks, it is possible to design from the specific application's illumination requirements the spatial light intensity distribution and yet avoid manufacturing a glare producing luminaire.

The present invention generally relates to an improved illuminator for use both in general and specialty lighting. The term general lighting includes use in living spaces such as lighting in industrial, commercial, residential and transportation vehicle applications. By specialty lighting we mean emergency lighting activated during power failures, fires or smoke accumulations in buildings, microscope, stage illuminators, billboard front-lighting, hazardous and difficult access location lighting, backlighting for signs, agricultural lighting etc.

Energy Efficiency and Costs. In an example to illustrate the advantages of an energy efficient lighting solution, the total cost of lighting a typical 300 foot by 300 foot retail facility at 1000 lux over a 10 year period using state of the art (2002) HID luminaires is assessed. Including equipment, installation and maintenance cost the total bill is over one million dollars. Approximately 80% of this is in energy costs. The commodity being purchased is lighting, the major lifecycle cost is electricity. To cut down on costs and also conserve energy it desirable to maximize the use of light generated. A Japanese survey of office luminaires (Japan Lighting Information Services-Seminar-Save Energy of Office Lighting-Loss of light in luminaire-.htm) shows LF efficiencies (light that exits the fixture vs. the light produced by the lamp) in an open office fluorescent luminaire without anti-glare louvers to be 84% while one equipped with louvers is only 52% efficient. The "utilization factor" (which equals the light flux which arrives at a work site (e.g. upper surface of a desk) divided by the sum of all light flux of the lamp) is 74% for an open fixture and only 50% for louvered version. This however, is still not what the customer is paying for. The customer is after the best lighting solution at minimal energy cost. Chances are, as experienced lighting designers know, that the light intensity, even in a good lighting design, is still not evenly distributed over the work surfaces. While care is taken in the lighting design computer runs not to fall below the minimum illumination intensity at any point in the room, there are non-trivial excesses at some points in the lighting layout design. This excess light, wasted energy as far as the customer is concerned, probably accounts for another 10% loss. While a fluorescent may be appear to be a superior and very efficient light source at 80 lumen per watt vs. 30 lumen per watt for LEDs this is not actually the case, in actuality 60% of the fluorescent LF's light is wasted. Thus, in terms of energy use, a properly designed LED luminaire can be, with the proper luminaire design of the present invention, as effective lumen per lumen as any discharge light source in illuminating living areas.

Expressed in terms of the above background and nomenclature, it is the goal of this disclosure to teach how to construct a luminaire which will radiate photons where needed, exactly in the correct amounts to accomplish visual tasks and/or create an atmosphere. The controlled radiation of light into a living space with a specific spatial intensity distribution also having optimal spectral characteristics for the seeing tasks at hand is provided by the present invention. Each visual task application has its own correct lighting solution with optimal light intensities, light color emanating at angles which will not cause glare that interferes with vision or causes discomfort. Tasks in living spaces vary with time so it is another objective of the present invention is to provide the optimal lighting solution in "real time"(at that specific moment in time).

As a light source of ever increasing choice, LEDs have been packaged in numerous forms and used in lighting applications. Special control circuits have been developed to take advantage of the variability offered by the new light source and are today being offered as a solution to specific applications. In general however the design process has not zeroed in on providing the correct lighting solution. A number of LED illumination devices create "white" light by combining two or more LEDs of various wavelengths. White LEDs are also made using phosphors. The goal has not been to vary this color spectrum in real time to coordinate with the usage of the living space. The term "white" light is loosely interpreted to cover a range of illuminating light having spectral light distributions acceptable to the user for that application. HPS's yellow light has even been called white by some and the term is exclusive only of almost monochromatic sources such as LEDs and LPS lamps. The terms light spectrum, spectra, spectrum, spectral and color are used to refer to the relative spectral power distribution of the light source.

DESCRIPTION OF THE PRIOR ART

In prior art illuminating devices a universal light source such as an incandescent or fluorescent lamp emits light in many directions up to a 360 degree light distribution where in practice only a limited angular light distribution is needed in order for people to carry out visual tasks. So as to control the light distribution to certain angles, reflectors and refractors are used to redirect the light where it is needed. A great deal of light is wasted in the inherent inefficiencies in redirecting the light and shielding the glare causing light sources. In addition the actual placement of the light rays where needed, but not beyond, is often inexact and wasteful.
In addition it necessary to have a wide variety of lighting fixtures each with dedicated optics and even then, there is much wasted light or insufficient lighting in the area covered by the luminaire. In addition the light intensity and color spectrum of the luminaire is fixed while the visual tasks going on in the space are changing all the time. Usually, there is no provision for either detecting the changes going on in the living space nor is the lighting fixture equipped with apparatus to effect the necessary changes in the lighting. In addition individuals often have their personal lighting preferences as to the color and intensity of the lighting. Prior art lighting fixtures have no provision for the localized provision of preferred lighting to individuals.

A prior art LED light strip consists of circuitry including a plurality of LEDs mounted on a substrate and connected to electrical conductors. The circuitry is sometimes encased within a tube like, partially transparent protective sheathing and connected to a power source for selective LED illumination. Two examples of LED strip types are described in U.S. Pat. No. 5,130,909 to Gross, entitled Emergency Lighting Strip and

U.S. Pat. No. 4,597,033 to Meggs et al., entitled Flexible Elongated Lighting System. Such strips are utilized in a variety of indoor and outdoor configurations such as emergency pathway markers, exit door indicators and ornamental lighting arrangements. The LEDs are being used as outline markers where the lighting strips are the object to be seen. It is not the purpose of the lighting strips to project light on other objects to make them visible. In other applications, where lighting distributed evenly along an area is required, these strips are placed at an edge. No attempt is made at obtaining an even illumination outward from the edge to the area perpendicular to the long dimension.

LED lamps and ballast systems can reduce maintenance costs due to an average rated life of 100,000 hours. This is five to eight times the typical service life of conventional fluorescent and metal halide lamps. The present system is especially well suited for applications where relamping is difficult or expensive.

U.S. Pat. No 6,346,777 issued February 12, 2002 to Kim teaches an illuminating lamp assembly. An LED lamp apparatus comprises a plurality of LED lamps including at least one LED chip mounted on a Printed Circuit Board (PCB), on which a driver circuit and/or a control circuit are provided in a printed circuit pattern to drive and/or control the LED chip. The device is independent of the lighting application and is simply a lamp not a lamp and fixture combination.

U.S. Pat. No. 5,018,290 issued May 28, 1991 to Kozek et al. Teaches an exit sign with a plurality of low voltage incandescent lamps mounted on a PCB to provide illumination from within a housing. There is no combination of different light source characteristics to build a new combined light source characteristic and this is a lamp replacement not a LF fit for general illumination.

U.S. Pat. No. 5,577,832 to Lodhie one of the originators of the use of LEDs for illumination, describes a multilayer LED assembly which is used as a replacement light for equipment used in manufacturing environments. On each layer of the multi-layer assembly, there are multiple LEDs which are mounted perpendicular to a base. The base is used to provide electrical and mechanical connection to a socket. The LED assembly may utilize multiple layers of LEDs, with each layer itself having multiple LEDs. The LEDs in each layer are mounted in a direction perpendicular to the base which results in light emanating in a direction perpendicular to the base. The LED assembly is used as a replacement lamp for equipment used in manufacturing environments. There is no attempt to match the light distribution to the task at hand.

U.S. Pat. No. 6,379,022 issued April 30, 2002 to Amerson, et al. titled Auxiliary illuminating device having adjustable color temperature, describes an auxiliary illuminating device that has a least two preset ratios of light adjustable color temperature. The color temperature is adjusted by varying the light output at least two independently adjustable light sources. The light source is an array of at least 2 colors. The light source typically uses at least one set of LED's. The application specifically relates to use in producing correct lighting for photography but does not relate to general illumination so that its control equipment does not correlate the overall illuminance level to the color temperature over the range of illumination nor does its control equipment integrate the aiming function for correct light distribution. Essentially the auxiliary illuminating device is a lamp replacement for a photographic flash lamp.

U.S. Pat. No. 6,340,868, Illumination components, discloses a current control for an LED lighting assembly, where each current-controlled unit is uniquely addressable and capable of receiving illumination color information on a computer lighting network. The teachings of the above patent are incorporated herein by reference. Although this patent discloses how to construct controllable illumination light systems this patent does not relate to the concept of control within the parameters of accurate light distribution and correct lighting practice.

In US 6,498,440 Stam, et al. incorporated herein by reference, describes a lamp assembly incorporating optical feedback to produce an illuminator assembly that is capable of utilizing a plurality of light sources to produce a desired resultant hue. The assembly includes a processor, a memory, a plurality of light sources and a detector. The memory is coupled to the processor and stores data and information. Each of the plurality of light sources are coupled to the processor and produce a different color. The processor is capable of independently controlling the intensity of each light source so as to produce a desired resultant hue. The detector is also coupled to the processor. The detector provides the processor with information which the processor utilizes in determining how to adjust the intensity of each of the light sources to provide the desired resultant hue.

In an earlier patent U.S. Pat. No. 5,803,579 titled: Illuminator assembly incorporating LEDs, by Turnbull, incorporated herein by reference, the different color LEDs light output is coincident in such a manner that this overlapped and mixed illumination forms a metameric white color and has sufficient intensity and color rendering qualities to be an effective illuminator. Electronic circuits for control of the independent light sources consist of microprocessor controlled adjustable current sources.

United States Patent Application 20020130326 issued to Tamura et al., incorporated herein by reference, describes a lighting device that includes a plurality of LEDs arranged in an at least two-dimensionally dispersed manner; a transparent resin layer that covers the plurality of LEDs in an integrated form; a photo-detecting unit that detects an intensity of light emitted from the plurality of LEDs using a photodetector and a power supply circuit unit that controls driving of the plurality of LEDs based on a detection output from the photo-detecting unit. The purpose is to have a predetermined balance of light intensities of the colors according to an output detected as to each color by the photo-detecting unit. This device does not integrally cover the light distribution function within and does not correlate the lighting spectrum with the light intensity. It also does not provide a method to handle color shift over the lifetime of the illuminating device.

In U.S. Pat. No. 6,528,954 a light bulb is provided which may include a housing, an illumination source, disposed in the housing, and a processor, disposed in the housing, for controlling the illumination source. The housing may be configured to fit a conventional light fixture. The processor may control the intensity or the color of the illumination source. The housing may also house a transmitter and/or receiver. Although this device includes the desirable communications control aspect, this device does not relate to a multi-light source capability which allows for the smooth variation lighting and its even distribution.

In the prior-art approach, the LED manufacture and the power supply manufacture are separate units. Typically one power supply is good for a certain number of LEDs. This is similar to the historical lamp and ballast segregation that came about probably because one manufacturer was working with glass and the other with copper. Electronic light sources are semiconductor components as are the power supply components. A unique opportunity for integration exists in solid-state luminaire design which has not being taken advantage of.

In many energy conserving multi resident stairwell lighting systems the lights are typically activated by pressing a button in the hallway or in each apartment. This requires special wiring between the switches and the central controller. In many other stairwells and hallways the lighting is always left on wasting energy. With long life LED lamps, a low energy distributed lighting solution could always be on for orientation purposes and would only turn on to full output when activity levels require the lights turning on, using integral optoelectronic motion detectors.

A home lighting fixture is often left on at full power when really only lighting for orientation purposes is required. A light switch on the wall is provided and sometimes this has a dimmer option. An electronic power supply with programmable electronic controller with communication over a dedicated data line or alternately over the power line or alternately wireless is also possible in present art such as with the DALI (Digital Addressable Lighting Interface) protocol. With digital signals, power supplies become individually addressable compared to analog systems where only circuits are addressable. Additionally, DALI allows for bi-directional communication between the power supply and control. DALI also brings the capability of broadcast messaging to ballasts. With DALI or any other protocol much more than dimming can be effected. Control of spectrum, occupancy sensor controls and specific spatial intensity distributions can be modified. However, the present-day lamp or fixture is not designed to fully and efficiently take advantage of these new control capabilities.

In United States Patent Application 20100302779 by Chemel titled Fixture with Replaceable Light Bars he describes an intelligent LED-based lighting system. The LED based lighting systems may include fixtures with one or more of rotatable LED light bars, integrated sensors, onboard intelligence to receive signals from the LED light bars and control the LED light bars. In this system while an adjustable system of moving bars is illustrated so that the LED luminaire can retrofit a variety of older discharge lamp based luminaires, advantage has not been taken of the multiplicity of light sources to obtain a superior light distribution lighting solution that is now obtainable with multiple sources.

Spero in United States Patent Application 20040105264 describes the design of a multiple light source system using unique placements of the LEDs on the structure of a lighting fixture to generate an application specific light distribution pattern capable of providing recommended illuminance levels. The lighting fixture has means for being affixed within a living space to be illuminated in a unique orientation in relation to the surfaces therein. Subsequently, the lighting fixture is designed by positioning LED light sources thereon that emanate light in direction and intensity as required by the lighting application. The geometric layout is determined by using knowledge of the distances and angles from the light sources to the living-space surfaces as dictated by the inverse square law and Lambert's Cosine Law of Incidence. The combination of the unique placement of the LEDs on the lighting fixture and the unique orientation

of the fixture in the living space results in the predetermined illuminance being obtained on the room surfaces. A problem with this technique can arise in non-standard illumination instances which may be the majority of lighting applications. For example in industrial plant lighting, such as in open chemical processing facilities or where there are desks, shelves, machinery or other elements requiring an unpredictable light distribution. Much energy is wasted in these facilities with the wasted light often contributing to light pollution.

In another embodiment Spero describes a solution to this problem where an overabundance of LEDs are deployed on the fixture structure giving it the ability to illuminate in all directions at required intensities. The controller of the LEDs is coupled to a camera which analyzes surfaces and usage within the living space and adjusts the lighting accordingly. While the design is highly flexible it requires an over capacity of LEDs and the cost of driver and light sources would be high.

People need light for the performance of visual tasks, its aesthetic value or security. Light generated but not used by people is wasted energy, money and causes air and light pollution. Standard lighting fixtures, even those that are somewhat area based, such as a low bay or bedroom luminaire, because of the different object and usages within the area, either provide too much light and are wasteful or provide insufficient lighting inhibiting visual performance. Therefore it would be beneficial to have a lighting fixture that is further configurable to meet the demands of the actual lighting application where it has been installed. In addition it would be beneficial if the lighting fixture was responsive in real time to the lighting needs at that moment. It is no longer necessary to have fixtures providing illumination where there is nothing to be seen.

Thus there is a need for a lighting fixture having provision for the differentiation over space and time of the light's intensity and color that could be set-up in the field and/or adjusted in real-time to the changing lighting requirements. Such an exigency based fixture would provide correct illuminance in terms of chromaticity, homogeneous or aesthetic lighting generally and task lighting locally for the visual tasks at hand.

Prior art lighting practice utilizes an apparatus termed a luminaire or Lighting Fixture to provide illumination to indoor and outdoor living spaces, vehicles machinery etc for the performance of various visual tasks. A luminaire provides features other than just light which may include light distribution, shielding, man-machine-interfaces such as on/off switches, connection to power mains, apparatus for affixation to construction elements and aesthetics. A typical prior art luminaire is comprised of: a replaceable lamp, a lamp holder, wiring, optical control elements such as a reflectors and refractors, fasteners and brackets. In addition if the lamp has a negative resistance characteristic, then the luminaire includes power control elements such as a ballast. If a light control system is employed also included are elements including relays, logic controllers and communication devices which may be part of an electronic ballast design. All of these elements packaged together constitute a luminaire. In typical present day luminaire (lighting fixture) practice, a lamp with a mostly radially uniform spatial light distribution is placed within an optical assembly consisting of a reflector and or refractor for the purpose of having the light exit the luminaire in the desired direction and preferred distribution pattern. This is a process that involves cost and inefficiencies in redirecting the light.

Recently solid-state light sources have evolved from indicator lamps into illumination sources. The present art approach is to package these new lamp types into luminaires of the old lamp type with some minor adjustments. This was the case when fluorescents replaced incandescents and when HID replaced fluorescents. The question arises, is this really the best solution as far as functionality and construction are concerned. The question is especially cogent when the fact that solid state light sources are electronic devices with high reliability, long lifetimes and are capable of rapid change over a very wide operating range.

Examples of the inflexible prior-art approach based on today's designs include: lighting is often provided in rooms where daylight contributes significantly to the overall lighting level or in areas near the window but the lighting system is not flexible enough spatially to take advantage of the daylight contribution and reduce power; or the lighting is always on at maximum power irrespective of whether or not there is activity in the room to justify the lighting level.

Even when external dimming controls are provided to the lighting fixture, the color quality of the lighting is deleteriously affected. At a lower lighting level a warmer color temperature is generally required and the luminaire lamp color is not adjustable.

Lighting systems are generally based around a lamp source and lighting application. When a new lamp source arrives generally they are placed into present-day lighting luminaire designs which are not optimal for the new light source. LEDs are a light source which have a number of advantages due to relatively long life expectancy. In the future it is also expected that LEDs will have conversion efficiencies equivalent to those of discharge lamps. Presently however, the high cost of lumen per watt appears to make LEDs uneconomical for most lighting applications. A few applications of which step, stairwell, pathway and emergency lighting are examples require low lighting levels to begin with and thus present at this time a feasible application. An LED light source is well adapted to a number of additional applications. Very often in these additional applications the areas over which the lighting is to be provided are large and bringing electric power to the luminaire is a significant safety and cost consideration. An inherently low voltage light source such as an LED is suitable for use with safe 12 or 24 volt of a distributed power system with low current demands. The control of the light distribution, especially the beam cut-off necessary at low light levels to prevent discomfort, is well suited to the high directionality of the small LED light source. Maintenance of prior-art luminaires in outdoor applications and the requirement for watertight resealing increases fixture cost and complexity. Robustness of luminaires is another requirement as they located on ground level endangered by passersby contact or vandalism.

In prior art lighting fixture construction, the lamp, reflector, socket and ballast are separate units. Foremost, the lamp must be replaceable and thus access provided, because the lamp lifetime is less than other components in the fixture. The reflector is large, to envelope the light source and provide ray control, and is manufactured of special, highly reflective, material. The power-conditioning device such as a core and coil ballast or more recently electronic power transistor components differs again from the glass lamp, reflector and fixture material. The dissimilarity of the manufacturing technologies, operating lifetimes and materials results in a multi-component fixture assembly held together by fasteners which don't lend themselves to mass production and the luminaires are not factory sealed for life.

OBJECTIVES OF THE INVENTION

The present invention provides a unique approach to solid-state illuminating devices that is a departure from conventional prior art LED lighting practice. Prior-Art LED lighting technology manufacturers have been taking LED junctions and packaging them in ever more-powerful configurations to carry out the function of lamps. These LED lamps are teamed with reflectors and/or refractors similar to the techniques practiced with standard lamps or put on strips which is just another way of distributing the light over the area to be illuminated. This invention comprises a different approach which is to provide the end user with the most correct lighting solution not a new technology lamp to replace the old one. The present invention comprises a novel multi-light source approach to the design and construction of solid-state lighting fixtures (vs. solid-state lamps), which is termed a "Digital Lighting Fixture", due to the control of individual lighting element "digits" to provide the "correct" lighting solution for the situation at hand.

The invention embraces LED-illuminating devices covering a wide scope of applications including a room light and step light design as well as the general method for designing solid state luminaires from ground up from indoor to outdoor use in residences, factories, stores stadiums and streets. The general concept allows anyone to build a lighting fixture from the ground up, tailor made to the final application rather than building a fixture around a common lamp. This is because it difficult to control the high temperature processes of incandescent and discharge lamps. In addition it takes a tremendous amount of investment in tooling to manufacture an incandescent, fluorescent or HID lamp. Electronic components on the other hand are made of large quantities of discrete components which are masked or robotically placed on to substrates. These smaller building blocks can then be easily configured per specific applications.

This disclosure also teaches that when it comes to solid-state lighting big is not necessarily better. The approach of LED manufacturers trying to get into the lighting business by attempting to replicate the effect of present day lamps has been to make large, high current capacity, high lumen output electroluminescent junctions having marginally acceptable lighting characteristics. Lumileds Luxeon ® DS25 Emitter running at 350mA is an example of such an approach. In a few years manufacturers have raised currents from 50 mA to above 500 mA, at the time of this writing. These advances are certainly favorable at reducing costs and making LEDs a practical light source but attempting to get 1000 lumen (equivalent to a 60W incandescent lamp) is not necessarily the best path to take, especially if it comes at the price of light conversion or distribution efficiency. In contrast to a prior art, single large, lamp replacement like light source, the present invention provides multiple, small sized sources of differing characteristics such that the effect of the whole is greater than the sum of the individual parts. The determining size factor then becomes when is there a sufficient progression of values varying by minute degrees or continuum so as be non-discernable or irrelevant to the user. That is, LEDs are generally of a single wavelength (color, frequency), have small optics close in to the individual light sources since they operate coolly, and have stable conversion efficiency over a wide range of currents and light output. The added controllability offered by breaking the total light output up into discrete ("digital") specifically aimable and dimmable elements which can be addressed by control electronics to effect intensity, spectrum

and spatial distribution of intensity and spectrum, yields a lighting fixture (vs. lamp) of unparalleled performance. Unique to this patent is the approach. It is the approach of a lighting manufacturer who provides lighting solutions versus that of a lamp manufacturer who produces a generic lamp.

The advance over prior art is a solid-state light source with increased: 1.Efficiency-more effective lumen per watt electricity. 2. Durability - physical strength, life expectancy, lumen maintenance and spectral stability. 3. Lighting quality - as related to visual comfort and "atmosphere". 4. Functionality - ability to control the light placement, intensity and color temperature and do so as needed. 5. Energy savings 6.Lower overall lifecycle cost

Integrating the light source with power conditioning electronics, control circuitry and sensors gives additional cost benefits and functionality including: 1.Mass production capability 2.Sealed-for-life fixture 3.Exact optical performance less spill light 4.Compact design 5.Feedback control and recalibrated color consistency over the device lifetime 6.Real-time lighting needs adaptability.

Therefore, it would be advantageous to have a luminaire that require no maintenance, has smoothly controllable light output in terms of intensity, spectra, spatial distribution, is robust, mass-producible as a single unit, factory sealed against the elements, is self calibrating over its lifetime, is adaptable to changing requirements, works on high or low voltage, has an affixation apparatus and is aesthetic.

Further Objectives of the Invention
The objectives of the present invention are (among others) to overcome the deficiencies in the prior art and effect the following: Light is generated only when, where and in the proper amount and color that can best be used by people or is their personal preference. This will save wasted energy, money and air and light pollution while increasing visual performance and comfort. An exigency based lighting fixture is presented that provides correct illuminance in terms of chromaticity, homogeneous or aesthetic lighting generally and task lighting locally for the visual tasks at hand while preserving high visual comfort.

A number of unique illuminating device embodiments are achievable using the basic elements presented above. A few examples presented in the disclosure include: (1) an industrial lighting fixture for use in chemical and process plants where lighting that normally spills out of the existing structure as wasted light, is not produced to begin with; (2) a bedroom luminaire where normal activity and night-light lighting levels are provided as well as the ability to provide individualized lighting to each person; (3) Living room lighting with provision of modes for typical uses such as television viewing, reading with the provision of radiant spot heating based on the users unique location and usage at that instant in time; (4) A therapeutic luminaire designed to use illumination and irradiation on persons to alter biological disorders or schedule sleep or awakening; (5) a luminaire for emergency and security forces having a non-readiness situation intensity and chromacity and second high-readiness situation setting of a unique intensity and/or chromacity, where the unique chromacity does not damage the biological visual purple pigment of the retina that is responsible for enabling night vision. It thus eliminates the time these security forces would need to adjust from normal lighting to low-light night vision conditions; (6) a restaurant luminaire which illuminates foods and/or people in their best light while providing for

the correct level and chromacity of ambient lighting for generating the optimal dining atmosphere; (7) A general luminaire which the end user configures themselves in situ to best suit their desired lighting preferences. The field adjusted luminaire comes with the lighting elements and their power supplies but the user re-arranges in particular directions and sets their light output levels and/or chromacity to obtain the preferred output; (8) A do it yourself modular lighting fixture which is a structure capable of receiving light sources over its surface where the user chooses the light source with its chromacity and intensity level. The user builds up the light distribution pattern on their own and connects the sources to the integral modular power supply; (9) A single light engine device for a room or outdoor location with concentrated light output capable of being beamed distances to reflectors or refractors which redirect the light to be more optimally used in a localized area.

The overall objective of these exemplary embodiments is the disclosure of an exigency based lighting fixture that provides correct or user preferred illuminance in terms of chromaticity, homogenenaity, aesthetic considerations over a general area and/or task lighting provided in a small area for the visual tasks at hand. Providing illumination only where, how and when it is needed to efficiently carry out visual tasks minimizes wasted light thus minimizing energy use for lighting. To achieve this efficiency goal there is a need for a lighting fixture having provision for 1) the differentiation over space and time of its light intensity and color 2) that can be set-up in the field and/or 3) adjusted in real-time to changing lighting requirements.

While these objectives should not be understood to limit the teachings of the present invention, in general these objectives are achieved in part or in whole by the disclosed invention that is presented in the following sections. One skilled in the art will no doubt be able to select aspects of the present invention as disclosed to affect any combination of the objectives described above.

SUMMARY OF THE INVENTION

A lighting device incorporates one or more discrete light sources and their ancillary optical and electrical control equipment in an integrated illuminating element. The overall lighting effect is the result of the combination of these multiple sources, detector and control components operating together. Preferably, the power conditioning circuitry, light sources, logic control circuitry, sensors and optical elements are packaged together in one integral device. The system contrives a lighting device which replaces the present day multi-component lighting fixtures or luminaires including: the lamp; optical light control element/s such as reflector, refractor and shade; power conditioning devices such as a ballast; control equipment such as switch, dimmer, and timer. Detectors, emitters and sensors for light intensity, spectrum, temperature etc such as photodiodes, photocells thermocouples etc are provided. These provide data input to the controller, allow feedback and enable recalibration. An additional apparatus that conducts electric power along length, as electrical wiring, may be added to the system to provide further unitization. The integral lighting element is packaged in the shape of a globe, hemisphere, disc or strip and is designed to quick connect to the electric power carrying conductors. Provision is made for mechanical affixation to a structural surface. In the present concept over the life time of the fixture there is no lamp replacement only fixture replacement. It's assumed that after 100,000 hours it is time to change the fixture.

The method of creating a luminaire adapted to the usage and surroundings in which the luminaire will be integrated is disclosed. The process includes determining: the correct lighting practice for the application; the surroundings; the selection and placement of light sources and their integration with the mechanical support and; electronic control elements to realize the objective.

The present invention also relates to lighting fixtures comprised of many directional light sources that are mounted with different aimings so as to correctly illuminate an area. The LED light sources are moveable so that they can be adjusted to best illuminate the area where the luminaire has actually been installed. In addition they may be controllable by a microprocessor as to the light intensity and color so as to best assist people to see what they are doing at that moment, be it reading a book, watching TV or assembling an automobile. The lighting fixture is equipped with a "smart" camera (similar to a cell phone's processor controlled digital camera) which inputs data on the lighting, occupants and current conditions within the room. The result of this added sophistication is that electricity is spent on generating only useful light. The energy savings greatly reduces electricity costs and environmental impact.

The present invention more specifically relates to lighting fixtures whose spatial light distribution and/or spectral power distribution is capable of being adapted, either manually or automatically, to provide the illumination needed in that specific surrounding and at that specific time. The Field Adjustable Multiple-Light-Source Luminaire, FAML, is thus a universal product that can be tailored onsite so as to provide design illuminance and color spectrum to the relevant surfaces in the specific lighting installation. Thus a preferred embodiment of the invention is a lighting fixture comprised of many light sources which can be separately aimed and powered so as to illuminate areas or objects in a room or outdoors in a most correct, efficient and comfortable manner.

To affect this directional lighting versatility, in a preferred embodiment the luminaire is comprised of many directional light sources that can be re-positioned so as to illuminate in different directions. The light sources at a particular aiming may all be one color, say white or may be of different colors which when combined together yield a different colored light beam. Altering the radiated power of one color light source versus the other allows for the creation of light in a myriad of colors. The luminaire has some light sources at the same aiming and others at different aimings and may come in a standard configuration for the general type of lighting application from the factory. Upon installation, if the factory preset lighting distribution does not fit the actual surroundings, the installer will customize the configuration by adjusting the light source aimings and light intensity output such that the correct amount of light is supplied to where it is needed while not at all or minimally illuminating areas where it is not needed. The installer will also make provision for the existence of other lighting fixture in the same or adjacent areas. When light is provided at higher angles and glare would result from the LED light source being visible, the light is not wasted by covering it with a shade or passing the light through a diffuser thereby losing the directionality and light flux due to absorption. Instead taking advantage of the small étendue of the light source, an optical spreader is used to increase the area from where the light is exiting thus lowering the luminous exitance while maintaining directionality.

To effect the provision of lighting that is in concert with the actual illumination needs at a given time, in an embodiment of the FAML, a camera serves as a sensor capable of detecting light, color and contents of the living space. The fixture is equipped with a logical controller. Using computer vision technology to recognize people, objects and surroundings the lighting fixture can provide the lighting requirements needed in the room at that moment in time. The computer vision system has been taught to recognize different visual tasks such as an individual operating a machine, reading a book or watching TV. The logical controller has instruction sets as to what color lighting at what intensity is preferable for that specific visual task. Thus if no one is in the room the lighting is off or a dimmed, aesthetic lighting is provided for the good feeling of those looking in. When people enter the room, immediately general room lighting is turned on and following that, specific task lighting is provided and adjusted to the right level and color based on where they are in the room and what they are doing.

An automatic embodiment of the FAML would include motion control elements for the light sources. Coupled with the camera and logical controller, the light distribution is altered automatically as required by changes in the physical surroundings, people or environment. In a similar fashion to how a preprogrammed moving head stage light follows the performer about the stage the FAML logical controller will automatically locate the person in the room and provide locally the lighting needed for the performance of visual tasks. To save energy, the rest of the room will then be illuminated at a lower, yet comfortable lighting level.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 represents a block diagram of the elements making up a Digital Lighting Fixture system.

FIG. 2A is prior-art design and FIG. 2B an illustration of a preferred embodiment of this invention of a retrofit LED lamp illuminator while FIG. 2C is a side view of an embodiment of this invention using a PCB provided with standard 5 mm hole-through LEDs.

FIG. 3A and FIG, 3B illustrate a preferred embodiment of a decorative LED outdoor wall sconce juxtaposed with a prior-art design.

FIG. 4 is an illustration of a Surface or Railing Mounted Digital Lighting Fixture.

FIG. 5 is a Surface or Railing Mounted Distributed Digital Lighting Fixture.

FIG. 6 is an Asymmetric Light Source made of Directional Chip Facets.

FIG. 7 illustrates an application employing the Discrete Unit Step Light.

FIG. 8 illustrates an application using the LED based Distributed Step Light Fixture.

FIG. 9 is a path lighting application using an LED Stake-Top Path Light.

FIG. 10 is the Illuminating Engineering Society Preferred color Temperature vs. Intensity Correlation.

FIG. 11 depicts an integrated digital lighting fixture using discrete solid-state light source arrays deployed angularly about the geometric volume.

FIG. 12 is a universal luminaire embodiment using an adaptive digital lighting fixture which is programmed to illuminate the area as is needed.

FIGS. 13A through 13C depict a streetlight fixture designed according to the teachings of this invention.

FIG. 14 is a flowchart of a typical design procedure for a multi-source lighting fixture of the present disclosure

FIG. 15 shows a multiple light-source headlamp capable of optimally carrying out the diverse illumination functions used in driving under various environmental conditions and surroundings.

FIG. 16 is an illustration of an anti-glare system using the multiple light source headlamp.

FIG. 17 a representative Electronic Power Supply Unit for Surface or Railing Mounted Luminaire.

Fig. 18A is a perspective view of a configurable LED luminaire comprised of many light modules;

Fig. 18B is a view of light module optical accessories;

Fig. 19 is a perspective view of a light guide;

Fig. 20A and Fig. 20B are perspective view of basic embodiments of the present invention;

Fig. 21 is a perspective view of a substantially linear embodiment of the present invention;

Fig 22 is a block diagram of the elements comprising the present invention;

Fig. 23 is an exemplary flow chart for a computer program run to obtain the optimal illumination;

Fig. 24 is a perspective view of a universal lighting fixture structure with means for attaching light source and sensor elements mechanically and electrically;

Fig. 25A and Fig. 25B shows an embodiment where the light source arrays are mounted at the end of moveable rods;

Fig. 26 is a perspective view of a lighting fixture capable of producing both a differentiated spatial light intensity distribution as well as a spatially differentiated light spectrum distribution;

Fig. 27 is a perspective view of a field adjustable multiple light source lighting fixture;

Fig. 28A and Fig. 28B is a perspective view of satellite light source from the side and from the front respectively;

Fig.29 depicts an adjustable luminaire in a lighting application;

Fig. 30 is a perspective view of a luminaire with a special night-light functionality;

Fig. 31 is a perspective view of an adjustable luminaire with added irradiation functionality;

Fig. 32 is a perspective view of an industrial lighting fixture for use in hazardous locations;

Fig. 33 is a process flow chart for a computer lighting fixture design program.

DETAILED DESCRIPTION

The system is built around a "digital" light source. That is, the emanating lighting effect is the sum of the characteristics of a multiplicity of discretely controllable "digit" sources. The difference between the individual "digit" light sources and their summation manifests itself in the resultant light characteristic, be in its intensity, spatial intensity distribution, spectral energy content and spectral intensity distribution. All of these characteristics are also variable with time. A light source for this purpose may be electroluminescent such as a Light Emitting Diode (LED) junction, Organic Light Emitting Diode (OLED) or carbon-related field emission devices such as a nanotube- phosphor-combination, HID, fluorescent or even an incandescent source. While a one-source lamp will not have the flexibility to effect the most correct illumination characteristics, such as maintaining correct intensity and color temperature for the lighting task at hand over changing environmental conditions, two or more differentiated sources will have an increased operating range. This flexibility is useful as for example in a multi-source luminaire with spatially differentiated dimming capability used in an office lighting application. In a normal day's operation, such as in a windowed room between peak daylight and nighttime hours, the intensity and color temperature of the light varies greatly over different portions of the room. The smooth variation possible with many light sources ("digits") vs. one light source offers superior flexibility in providing the actual lighting needs. Therefore, the illuminating device may be described as a "digital" light source or as a Multiple Solid-state Light Source (MSLS), comprising many "digits", SLSs, and essentially replaces the lamp of present-day luminaires.

As used herein, the term "light source", LED or "solid state light source" means any system that is capable of receiving an electrical signal and producing light in response to the signal. Thus, the term "light source" should be understood to include light emitting diodes of all types, light emitting polymers, semiconductor dies that produce

or emanate light in response to current, organic LEDs, electro-luminescent strips, and other such systems. Incandescent and discharge light sources are also included and multiples of incandescent and discharge light sources also provide a digital luminaire. In an embodiment, a "light source" may refer to a single light emitting diode package including multiple semiconductor LED dies that are individually controlled.

The term "illuminate" should be understood to refer to the production of a wavelength of radiation by an illumination source. The term "color" should be understood to refer to any wavelength of radiation within a spectrum; that is, a "color," as used herein, should be understood to encompass wavelengths not only of the visible spectrum, but also wavelengths in the infrared and ultraviolet areas of the spectrum, and in other areas of the electromagnetic spectrum.

In designing a multi-light source luminaire the minimum design criterion for intensity and spectrum differs for each application and is related to the end user who is the ultimate measuring instrument and economic consideration of the light provider. The regularity of the changes in effects is derived from the user's perception. It is generally accepted that the eye cannot discern changes in beam intensity that are smaller than a factor of two to ten and color temperature differences of 200 to 300K. Illumination intensity changes are discernable as a logarithmic function and depend on background illumination levels. For example illuminating practice allows for hallway lighting to be 20% of room lighting due to rapid eye adaptation. However the eye is very perceptive of intensity changes when comparing images such as in comparison of gray scales and thus lighting for an art lay-up room must be very even.

A further improvement is where the lamp and lighting fixture function are carried out in one device. In a typical present-day lighting fixture, a lamp with a symmetrical distribution in placed in a reflector to redirect the light, a requirement involving added cost of the reflector and performance inefficiencies. While PAR and other integral reflector lamps exist, they again have a symmetrical distribution in one of the axes and are large due to the high temperature of operation and requirement to distance reflective surfaces due to heat and large light source dimension consideration. Since the solid state or LED lamp is made of cool operating components which have a mechanical base (versus a 1000K gas discharge which is free floating) the LED allows for an integral small sized optical element near the power source. Where the terms optics or optical are mentioned herein, they refer to redirecting light rays through any of the known phenomenon including: reflection, refraction and diffraction. Typically, an LED will come packaged in an optical assembly consisting of a reflector and lens with 8 ° to 50 ° spreads being typical. A Surface Mount Device -SMD LED with no optics will still be limited to 180 ° due to its construction.

A power-conditioning device such as a ballast is required to operate efficient fluorescent and HID light sources but is separate there from in function and physical construction. In the MSLS the power source is electronic as is the control equipment and thus the electric power conditioning circuitry can be integrated with the light source circuitry and packaged as one on a PC board or integrated circuit manufactured in the same way of the same materials. Chip on board and chip on chip technologies are used as a packaging configuration for LED chips as well as power and logic control transistors and other components. Power transistors come packaged in plastic and so do LED junctions only that the LED package is light transmitting and can be formed into a lens. Transistors, molded in a transparent package together with LEDs,

may be shielded from undesirably receiving illumination causing base photocurrent, by providing opaque "junction coat" over the transistor die, as is well known in the semiconductor industry. The packaging also lends itself to the same manufacturing methodology such as soldering elements onto a PC board. Both hole through and SMT configurations are presently available for most of the components. This combined unit of compatible, mass producible, apparatus, including the solid-state lamps, their optical assembly, electronic ballast gear and structural fixture equipment, provides a unique Digital Lighting Fixture (DLF) device.

In a preferred embodiment the DLF is provided with an onboard controller. The controller may be a computer board, embedded device, a Digital Signal Processor, etc. In general, the term "logical controller, controller or computer" can be broadly defined to encompass any device having control circuitry or a processor which executes instructions from a memory medium.

A further improvement is the reduction of all electronic and optical components to the chip level. That is, light-emitting junctions may be placed with power electronics in an integrated circuit. For example, combination GaAs LED-JFET technology may be used, the JFETs (junction FETs, acting as control devices for the LEDs. The carrier is made of materials and shaped to carry out optical and or heat transfer functions. Multiple light emitting junctions of similar or differing characteristics, a function of doping and diffusion, are placed with the control circuitry on chips. The VLSI techniques used in digital camera photodiode arrays containing millions of pixels is used to create arrays of light emitting diodes. Actually reversing the current flow on some photodiodes will cause them to emit light. This is how OLEDs were discovered. OLEDs began in the lab as photovoltaic cells until by error they were driven in reverse. Alternately other die bonding techniques are used to create chip on chip assemblies as is known in the art. Sets of chips with similar or differing characteristics may be geometrically arranged to provide a specific light distribution and color mixing. The total envelope is then a combined lamp, power supply and lighting fixture "luminaire", and is positioned within the room to be illuminated at the design height and position to give a consistent and sufficient lighting to the area under its control. Cooling is effected using natural convection or for air currents from a cooling fan or fluidic cooling using natural or forced circulation.

On the chip and die level further magnitudes of manufacturing and packaging efficiency are realized. The integration can avail itself of other more compact packaging technologies such as chip on board and chip on chip. Assemblies with conductive and non-conductive diebonding using epoxies and eutectic solders used for a variety of semiconductor die types including ASIC's, MEM's, LED's and Sensor's. These may be used on a variety of substrate materials including FR4, Alumina, Metalized Ceramic, Carbon Fiber and Chip on Flex as single die or multiple die arrays for Chip scale packaging / CSP's. Conductors are attached to the dies via Aluminum and Gold wirebonding using both wedge bonding and ball bonding. The manufacture of Multi chip modules / MCM or Chip scale packages / CSP are also possible and can be ceramic, laminate or PCB based. These assemblies can be single or multiple die assemblies with external components making it possible to manufacture all light, sensor, power and control components as a superior integrated device.

The present invention provides an illuminating device which serves as a replacement for the lamp, socket, reflector, electric power control gear, dimmer and mechanical structure of a present-day lighting fixture or luminaire. A semiconductor junction packaged integrally with light controlling components provides a Solid-State Light Source SLS and many together form an MSLS, which when combined with power conditioning, and optionally logic control, communications and affixing elements, provides a DLF. The basis of the invention is the use of a multitude of discrete light emitting sources ("digits") to generate light. The light control elements can be applied on a per junction basis or on a "white" color generating set grouping such as RGB or on a larger set which may be convenient for manufacturing or other color rendering considerations. The requirement for controllability is however, that the SLS output is definitive in relation to spectrum and spatial distribution.

The discrete light emitting elements by operating and not operating, at full power or at a fraction of, either partially or in unison, generate light with optimal intensity, spectral distribution, and spatial distribution of intensity and spectral distribution for the viewing task at hand. This is accomplished without recourse to separate (exterior to the DLF) reflectors to redirect the light, filters to alter color, shades to control glare or dimmers to control intensity. An example of light source used in a DLF would be an electroluminescent semi-conducting material an example of which is a LED. Such a source is characterized relative to a standard incandescent lamp by its small dimensions, low voltage, low current, monochromatic spectrum, high resistance to physical shock, high directionality of the light output, and at the present, relatively high cost. In addition, the intensity of the light output over a defined range is a function of the current and within limits may be varied by orders of magnitude without deleteriously affecting the efficiency or lifetime of the LED.

Although the light production of a typical 5mm, 50mA maximum rated, LED of between 1 to 2 lumen is much too low to be of any practical use for illumination, the combined output of a few to hundreds to thousands of LED's is quite significant. Higher current LEDs are now being introduced which operate at 350mA and provide 20 to 30 lumen. This however, is still is highly impractical for use in lighting a room when compared to a 100 watt incandescent lamp of 1700 lumen. Based on progress to date it is expected that LEDs will reach comparative lumen per Watt efficiencies of 60 to 120 l/W as found in gaseous discharge lamps. This invention relates to technologies which are feasible at the present state of the art l/W as well as those which will become feasible in the future.

A "light bulb" of the present invention is comprised of a multitude of LED's where each LED or group of LED's may be of the same or different wavelength, (color- where said wavelength may be mono or multi-chromatic), light output, spatial distribution and operating frequency (as when an alternating signal is used or it is multiplexed). The light from an LED or group of LED's of red color operating with an LED of blue and green color impinging on an object would appear to the viewer as "white light". By varying the number and/or light power output of a specific color LED or group of LED's relative to the others, a different intensity and color temperature of light with a "warm" or "cool" appearance may be effected. "White" LEDs can also be used in the invention alone or with other monochromatic LEDs. A white LED comprises an emitter in the blue spectrum covered with a phosphor which fluoresces in yellow such that the combined output appears white. White LEDs come in various angular light distribution patterns and color temperature variations. White

LEDs can also be combined to vary intensity and spectrum. In the preferred embodiments, "white" LEDs are not used, as the use of phosphor adds unnecessary conversion inefficiencies and output degradation with time. The ability to correct for color shift over the DLF lifetime with white LEDs is limited. However, the present invention includes the use of white or other multi-spectrum light sources.

Presently the efficiency of many types of LED's (the chemical make-up of the junction differs between colors) is high relative to incandescent but low relative to discharge lamps. However, the theoretical efficiency is quite high and the inefficiencies have to do with getting the light out between the junction and heat dissipation considerations. Expressed in lumens per watt LED's may produce up to 30 lumen/W versus 100 l/W for a discharge lamp and 18 l/W for an incandescent lamp. In the preferred embodiment, a highly efficient constant current power source is used to drive the LED's where the electronic circuit is a series connection of the discrete LED light sources. The open failure of an LED or series of LEDs which would interrupt the circuit is circumvented by the use of Zener diodes, placed such that the functionality of the lamp would not be seriously affected. The constant current power source has the advantage that different LEDs, of different forward voltage drops, from different manufacturing runs or chemical composition, may be operated together. Alternately, power circuits available in the literature for driving the LEDs are used as published in technical notes by manufactures such as Agilent ® .

The life expectancy of an LED can be expected to be as high as 240,000 hours between failure. Due to light degradation over time average lifetime is normally rated at 100,000 hours. At best an incandescent's rated life may be 2,000 hours and that of a fluorescent, 20,000 hours. However, the LED operated in a circuit would have only the reliability of the circuit and MTBF divided by the number of series connected LED'S. A printed circuit board with the LED's alternately connected to separate circuits with redundant access to the power sources and with the use of Zener diodes every so many LED's to circumvent any failed sections could operate directly off of the 120/240V line. Any voltage AC or DC from 4V up to 480V is practical. The LED's of the hole -thru or SMT type would be soldered in place or the LED's connected leg to leg without using a PC board.

The LED's are mounted flat in rectangular patterns or in concentric circles or on or within holes situated on geometrically curved surfaces such as on a sphere or hemisphere of round, parabolic or elliptical shape according to the desired candle power distribution pattern. The LEDs can be mounted perpendicularly to the geometric fixture surfaces or at any other angle. When mounted perpendicularly the surface, geometry is dictated by the light distribution pattern and the LED photometrics. This is the generally assumed design case in this disclosure. However, any geometry is possible with the non-perpendicular mounting of the light sources. A flexible PC board is manufactured in the flat and then "origami" style cutouts are made allowing the PCB to be bent and shaped into the preferred form. LEDs are insertable into holes made in plastic or metal forms to secure the LEDs in the correct location at the correct aiming.

For fluorescent lamp retrofit applications, the MSLS "luminaire" would be linear with LED's mounted all around the circumference or predominantly downwards for whichever lighting effect is desired. While a fluorescent's light distribution is usually not controlled in the longitudinal direction (the reflector can't get around the long

dimension of the lamp) the LED version would be spatially directed so as to give uniform light. In comparison to a fluorescent lamp, where the light is produced equally in all directions irrespective of the final distribution pattern required in the room, the DLF has the advantage of producing light directed only where it's needed. The number of SLS aimed in a specific direction at the time of manufacture is such that the proportion and angle of the light going to the ceiling and floor are calculated to produce the desired result. Louvers and reflectors are unnecessary to prevent glare or redirect the light. Up to 40% to 60% of the light produced in a fluorescent fixture goes to waste due to these considerations.

In other embodiments of a linear fluorescent replacement SLS lamp "luminaire", the position regarding the nadir (floor) of the rows of SLS are adjustable. One or more SLS strips are free to move in an arc about a long axis such that they are aimed for uplight or down light. Apparatus is provided to fix the re-positioned SLS in place. Markers along the arc can delineate the angle. Thus, the installer can adjust the amount of up-light, down-light and floor coverage in the field, (markings on the fixture would indicate standard settings) just as an adjustable reflector changes luminaire light distribution. Here again, the difference is that there are no reflector-induced inefficiencies because of operation away from the ideal design point.

A pear shaped globe "luminaire" studded with LED's projecting light outward from the surface would give both down-light and up-light with more projection surface towards the down-light side in a typical 1 to 3 recommended ratio. Most buildings, rooms or areas to be illuminated are of a rectangular shape. The LED's on the DLF are concentrated at the 90-degree intervals. This yields a more square lighting pattern to ensure equivalent lighting in all areas of the room including the corners. This is in contrast to the chronic lack of even coverage obtained from the circular light pattern of present day light bulbs or most luminaires. At best these prior-art lamps give a circular light distribution which requires overlapping to ensure complete coverage of the area with the overlap lighting levels in wasteful excess of the requirements. A position oriented MSLS lamp has a greater concentration of LED's aimed at 90 ° intervals so that more light energy is directed into the far-off corners of a room to give an even illumination throughout the rectangular or square shaped area. A DLF is made with square, rectangular and even rounded light distribution if the application requires.

Typically, an incandescent or HID lamp is used in conjunction with a reflector to redirect the light to obtain a desired light pattern where more of the light is directed where it is most useful. A luminaire for area lighting will have a "bat wing" candlepower light distribution pattern, which yields equal horizontal illumination on a surface as it compensates for the "inverse square law"(a function of the cosine of the angle and the distance squared from the source). Generally, such an optical assembly has efficiency less than 80% due to losses on the reflector's surfaces. The MSLS needs no reflector to redistribute the light since each discrete SLS "digit" is aimed such that the candle power intensity varies with angle as is needed to give the optimum illumination on the room work surfaces for a given mounting height. The MSLS lamp distribution is pre-designed according to typical house or office settings. Thus, there is no need for a reflector to redirect the light and its consequent inefficiencies in order to obtain a "bat wing" distribution. The present approach by LED manufacturers is to provide single high output LEDs with optics yielding a "batwing" distribution. These batwings are usually less than optimal and are circular.

The "digital" approach of this invention would yield a finer control and thus a more accurate batwing, generating a more even distribution in a rectangular/square vs. circular pattern.

In a DLF it is possible to combine a task light having a very narrow "spot" beam at the correct aiming with a general area lighting "flood" beam into one fixture. The digital lighting fixture is positioned according to recommended lighting practice near a workstation and correctly oriented such that the DLF gives a wide (though still controlled, so as not to cause glare on a computer display) general illumination distribution as well as a narrow distribution aimed at the desktop for high intensity task lighting. In a preferred embodiment a positionable task lighting spotlight located on a section of the DLF can be aimed manually or by servomotor to project onto the work area.

In another example of prior art practice a table lamp for reading is provided with a shade. The shade is there to partially redirect the light onto the book and also prevent direct, glaring, rays from the lamp used for general lighting from reaching the reader's eyes. According to the present invention, instead of having a glaring lamp producing light which is then made non-glaring by a shade at a loss in excess of 50% the LF is built such the amounts of light directed downward at useful angles and the amount of light directed upward are in the correct ratio. The surface area, from which discomfort-glare causing rays exit, is designed such that the luminous exitance is within recommended UGR levels for home use. The fixture has no need for a shade to protect from glare; the glare was never produced at those angles to begin with due to proper geometric design. To get the desired luminous exitance expressed in terms of lumen per sq. meter or luminance in terms of candela per sq. meter, the light exiting the source of specific intensity at angles which normally reach the room occupant's eyes, is spread over an area such that the exiting light is non-glaring. These lighting design parameters serve as the product specification and are incorporated into the initial design. There is no need to add on components to achieve correct lighting.

In MSLS technology an antique style table lamp uses a MSLS "bulb" specifically designed for the application, there is no need for an additional shade other than for aesthetics. The shade is a decorative element which diffuses a small amount of light for the rustic effect. The small amount of light which would be directed between 70 ° to 150 ° (the glare zone) would cause as little discomfort glare as that which is obtained from a shaded incandescent lamp but without the waste. This is done by sizing the area and intensity of the light source responsible for providing light at those angles such that the luminous exitance from the surface is within acceptable non-glaring luminance values. If desired, uplight to the ceiling above the glare zone is provided with light sources projecting between 150 ° to 180 ° . To maintain the aesthetics that people are used to or for the good feeling, a shade may be placed over the "digital" table lamp. A few LEDs can be dedicated for the purpose of illuminating the shade, either by projecting thru the shade and diffusing the light or projecting the LEDs into the shade as in a light guide. Colored LEDs could make the shade look yellow, pink or blue as preferred and programmed by the user.

The dimming capability of the MSLS is quite dramatic. A typical LED of today such as an Agilent ® HLMP25-ED-xxxx will produce light at a tenth of a milli-Ampere and may be operated up to 50mA. At 0.1 mA it may produce 5 milli-lumen while at 50mA over 1000ml. This is a hundredfold range. Another radiation output control

technique is to provide pulsed power in place of constant current. LEDS are operated on DC as well as pulse power and current as well as timing in terms of duty cycle, pulse width and other signal modulations are useable by the controller to effect intensity changes.

Correct lighting doesn't only include an even light distribution and a lack of glare but a list of other factors including intensity, warmth and color rendering. Experiments have shown (IES Lighting Handbook 8th edition p.99) a graph of preferred color temperature of light sources at various illumination levels. The graph specifies a warmer color temperature say 2,500 Kelvin for lighting levels in the 100-lux range and a cooler temperature say 3,500 for 1,000 lux. However, a typical dimming system used in a fluorescent luminaire will lower the lighting level but will not change the color temperature. A DLF of the present invention will change the balance of the different spectrum light sources in order to achieve the correct color temperature for the new lighting level. As far as dimming goes, it possible to get an instantaneous "instant on" from the SLS light source. Thus, with a built in or exterior motion detector, the DLF can be operated at emergency lighting levels, sufficient for orientation, and then immediately power up to full level when someone enters the room. Whereas a fluorescent dimmed to 50% power will give a negative return of only 10% light an LED will generally give a linear if not positive decrease in power with light reduction. Auto-dimming circuits taking sunlight into account have been touted as an energy saving technique.

In another embodiment, the electronic luminaire has a light level detector and automatically adjusts the output to the required level. If the lighting level on only one side of the room is enhanced by the sunlight, directional luminance meters, external or integral to the DLF, detect the imbalance and the controller dims only those SLS oriented to illuminate in the sunlight illuminated direction. This detailed spatial distribution intensity control is not possible with other lamp types.

The MSLS lifetime is long such that there is essentially no need for "lamp" replacement over the life of the DLF luminaire. However, power supply circuit and light source characteristics may vary over time and correct lamp color will deviate from the standard. A feedback control loop using sensors would recalibrate color based on daylight readings over the twenty-year lifetime of the fixture. Thus a photodiode with an RGB filter is calibrated under natural light conditions. Alternately, discrete wavelength or alternately stable "white", or color, LEDs which are used only for calibration or only operated in a regime where their color is known not to shift are used as the recalibration color standard. This basis serves the dimming system in its color temperature control over its lifetime. The controller is programmed over the lifetime to seek possible recalibration opportunities. These may include using daylight or other artificial light sources available when the LSLS is not producing light. The systems can determine the accuracy of this source partially by comparing it to its previous factory or onsite calibration. Time of day analysis and initial small deviations would allow the system to evaluate whether the source was a reliable standard to use over its lifetime to correct for component color shift.

To ensure higher reliability the MSLS in the preferred embodiment will make use of large-scale integrated circuit technology where the LED junctions, Zeners and other elements are interconnected on, a chip. The chips then mounted into plane surfaces which are flat, rounded or X-hedrons.

The MSLS lifetime is long such that there is essentially no need for "lamp" replacement over the life of the DLF. This requires that the designs of the other electronic components are similarly reliable. The fixture mechanical design is again a significant departure from prior art. The fixture is sealed for life. There are no openings, gaskets, and sockets and there is no need for a mechanism to open the luminaire. All the components can be encapsulated for life to prevent water and dust ingress and thus provide a reliable, maintenance free, weatherproof and hazardous location ready lighting fixture.

The small dimensions of the light sources makes them ideal for use in conjunction with fiber optic light transmission systems. One of the primary requirements of such systems is the ability to collect the generated light into the narrow fibers. The excellent controllability of the light beam and the small source size allows for the generation of high-power narrow non-dispersing beams as would be used in flashlight, searchlight and beacons.

Multiplexing of the lamps is possible for power and lighting effect considerations. Slower duty cycles will reduce energy consumption, increase lifetime and would be used in a number of applications. Aircraft warning beacons which flash is an application, as the on-off cycling of an LED is not harmful to lamp life as it is to an incandescent lamp. Disco lighting-effect lamps are another flashing application. Dimming as well as illumination color can be carried out with both the duty cycle and current being altered.

In summary, as opposed to LED industry trends of going with a single large source, the present invention provides multiple smaller sized sources of differing characteristics such that their combined effect is greater than that which could have been offered by sum of the individual parts operating separately. The added controllability offered by breaking the total light output up into discrete specifically aimable and dimmable elements, "digits", which can be addressed by control electronics to effect intensity, spectrum and distribution, yields a lighting fixture (vs. lamp) of unparalleled performance.

In order to better understand the embodiments and methods of this invention reference is now made to the following figures.

Fig. 1 is a block diagram of the elements which in combination provide a digital lighting fixture (DLF). The DLF serves as a complete luminaire solution including: power conditioning circuitry, control electronics, sensors, mechanical fixture and light source. The DLF replaces the lighting fixture, ballast, socket, lamp, dimmers, reflector, gaskets and fasteners with a sealed for life electronic assembly. An electric power source 1, supplies power at line Voltage 110 to 480V or at low Voltage 12-24 Volt to the DLF 2. The DLF includes more than one light source 3, which is preferably an electroluminescent solid-state light source but may be any other light source, such as incandescent, high intensity discharge, fluorescent, etc such that the individual characteristics of each lamp's light are combined in operation to achieve a sum of the characteristics presenting a benefit not achievable from a single source alone. The light sources are affixed or contained within a mechanical device 4, which may serve as containment to all of the components and facilitates affixation to building surfaces. The electric power is received in the correct waveform, voltage and

current from the power source 1, or is conditioned within the DLF 2, by power conditioning elements and circuitry 5. The direction of light exiting from the DLF as a whole or from each SLS individually is controllable by optical elements 6, such as reflective surfaces and or refractors, and may be electronically variable optical elements.

The separate light sources may be of the same color and intensity characteristic or may have different color and intensity characteristics. Thus for a 3-stage light bulb equivalent, each of three sources can have the same lumen rating or two sources are used where one is twice the output of the other. In a finely variable, digital embodiment the effect of continuous dimming effect is achieved when the differences in the lighting level is imperceptible to the people in the room. Typically a 5% change will not be perceived. Thus with twenty equivalent intensity LEDs as a base (one additional would add less than 5%), additional quanta could be smoothly added, or on the other hand, to in reality perform perceptible dimming (which is the objective) a greater than 5% change should be effected. The same is true for the final spectral color of the light emanating from the DLF to illuminate objects. The eye adds the radiation reaching the eye and cannot perceive the separate components, contrary to the ear's recognition of sounds where each frequency is individually resolved. Therefore, quanta of specific spectral color energy may be added to the mix without perception. For example changes up to 200 degrees Kelvin in HID lamps are not perceived. Thus to effect a noticeable color change, a quanta of spectral color power would need to be added or detracted from the sum.

In a preferred embodiment the DLF contains logic control electronics unit 7. Logic control electronics unit, 7, receives input and/or feedback from motion, intensity and/or spectral sensors 8, or from manual control button 9 and increases or decreases or turns on or shuts off the power to one or more of the SLS to effect the desired change. That is, the control logic unit 7 has stored parameters for intensity and spectral distribution and operates the MSLS lamp within the predefined range. The control unit may include a DSP or computer with storage media, computer algorithms, signal input and output electronics, analog to digital converters, and communications elements to carry out intensity, distribution, dimming and color balance control. Computer algorithms and instruction sets 7A are induced by the logical controller to manipulate data, calculate results generate output signals and maintain the operating parameters within the specifications. Measured parameters are checked against the stored parameters and the control circuitry adjusts the power to SLS.

Sensors 8 include any of the following: light, temperature and motion detection devices. Two types of optical detection sensors may be used: A photo detector with specific spectral sensitivity to detect a specific color. For example a standard red, blue and green set which would then indicate how "white" the light is. Alternately, a wide spectrum photo detector that irrespective of color measures the intensity of each excited die as it is test fired, based on the eye visual sensitivity curve. The optical sensor may be lensed and capable of forming an image, that is a camera and the detector may be a detector array of photodiode pixels. The detector array may be a CMOS or CCD VSLI array and may be monochromatic or color as in a monochromatic or digital camera. Such arrays are readily available in mega-pixel resolution.

With changes in ambient lighting the light sensors detecting conditions at a specific location receive input. The detector instantaneously reads the ambient during a momentary shut off the artificial light source. The momentary shutoff is of short duration, e.g., less than one millisecond duration, at rates undetectable to the users as the eye does not discern flicker rates above 1/100th of a second. The controller then readjusts the driving circuitry to the correct power level. The sampling of multiple sensors around the DLF can be simultaneous using buffers in the controller to facilitate analysis by methods known in the art. Alternately, the light sources and coordinated detectors at specific locations are turned off, sampled, turned on again and sampled, to verify that the illumination is within recommended specifications. Interaction between DLFs, located in close proximity to each other, is avoided, by the use of the short-duration momentary shutoff controller readjusting time interval. The probability of simultaneous controller readjustment of two adjacent DLFs is very small. Further, the timer which controls the time between the controller readjusting time intervals, is preferably analog, such that there is very low probability of two DLFs having the same time between controller readjusting intervals.

In a system with feedback, changes in the light source output reflected back to the lamp such as color shift and diminishing flux over time can be compensated for. A typical fluorescent or HID source will experience serious color shift over its 10,000 to 20,000 hour lifetime. It would be a significant advantage to have a 100,000 hour life lamp with color accuracy over the complete lifetime of the lamp.

In a preferred embodiment a re-calibration system will operate as follows. The DLF is provided with a reflective rod or strip the surface of which has a wide spectrum, non-angle of incidence dependency and stable reflection characteristics over time. The reflective rod or strip is positionable so that the rod or strip can reflect light back to the outward facing photodetector based on the DLF body. In another embodiment the DLF is provided with a calibration wand on which inward facing photodetectors are placed. The calibration wand is capable being positioned such that the detectors can detect SLS performance. Both the reflective rod/strip and calibration wand can be narrow such that they can be permanently deployed about the DLF and not block light. In another embodiment the rod, strip or wand is stored and is only deployed when calibration is required. When called upon, the rod, strip or wand is rotated around the DLF to read SLS intensities. Alternately, the DLF body rotates and the rod, strip or wand remains fixed. The DLF is originally calibrated in the factory using external detectors. The spectral output of each SLS is calibrated with the power supply controller over the range of power outputs and the characteristics are stored in a memory device for recall during operation. The calibration wand or reflective rod or strip is then used by the DLF in an internal calibration where the DLF detector's readings at the initial SLS power settings are recorded. These readings become the standard for future calibrations, where the controller will affect the power to individual junctions such that proper intensity and color is produced.

The DLF has a clock unit and/or a communication unit capable of receiving signals from the US government operated "atomic clock" which is located in Colorado. The DLF automatically searches for the signal or once a day it automatically recalibrates its time. On a periodic basis after degradation is assumed to be significant, the controller 7 invokes the calibration routine.

In another preferred embodiment the DLF surroundings are used for calibration in place of the calibration strip. A short time following installation, (after the furniture and decor has settled down), an onsite calibration is scheduled and run at the first opportunity. The purpose of this on-site calibration is to have the controller check the spectral characteristics of the illuminated area. A specific die on an SLS is fired on a timed basis and the controller reads the photo detector value. The new site-specific reading is then taken and compared to the original calibration and stored. The site-specific reading will serve as the base for the next calibration, as it is assumed to render the surroundings correctly based on still calibrated light sources. The next calibration may be scheduled for night and holidays to ensure a date when dark conditions prevail. If darkness cannot be ensured, the incremental shift in intensity above the ambient can be measured. Photo diode detectors of known field of view are placed on the DLF such that SLS output is detected. In lights out conditions of darkness the controller takes a base reading sample of a detector. The base reading allows the subtraction of "noise" from further readings. During the calibration the base reading may be repeated to ensure accuracy. Periodically, possibly every half a year, more or less depending on manufacturer data of how much the LEDs drift from their initial performance, a calibration routine is run. If a change in decor has been made, then the drastic change will signal the logic controller to ignore the latest reading and use the present "white" setting to recalibrate the new decor. Although photodetectors are stable devices, over a 30 year DLF lifetime it may be necessary to calibrate the photodetectors as well. Absolute intensity readings can only be recalibrated against a laboratory standard. However, daylight may be used to recalibrate color sensitive photodetectors over the 20-year lifetime. At the post installation calibration session a day reading of photodetectors is performed and the readings analyzed for daylight sources. This is done using the clock where daylight will show a predicable spectral shift over the hours of the day. The controller will then compare the readouts of detectors over the day to identify those exposed to daylight. First during the day readings of the photodetectors are taken.

The detectors facing the daylight are assumed calibrated to read "white light. In darkness SLS units, SLS 1 in view of one calibrated daylight facing detector, detector 1 and one uncalibrated detector, detector 2, are powered to produce white light as determined by the calibrated detector. Now detector 2 is calibrated. Moving stepwise around the DLF the process is repeated with now calibrated detector 2 used to adjust SLS 2 located between detector 2 and not yet calibrated detector 3 to produce "white" light. SLS 2's output is then used to calibrate detector 3. The process continues around the DLF till other daylight-calibrated detectors are reached. For greater accuracy the process can then be performed in the other direction, moving stepwise until detector 1 is reached again. By using this nodal analysis method discrepancies propagated in the calibration process are reduced.

A power guide 10 can serve as both a power distribution and mechanical affixation device to the placement of additional DLF units 11 within an expanse. Light output 12 from one DLF may differ in distribution from another 13, if say one MSLS is in the center of a room and the other is at the edge or one light illuminates steps between the landings and another is the last step before the landing, the last step would be illuminated in a different color.

Since an LED device is operable over a wide range of currents, when an LED serves as the light source, dimming and color balance are smoothly and infinitesimally variable.

For the purpose of illustration, a preferred embodiment of the present invention is presented in Fig. 2B juxtaposed with a prior art solution using LEDs shown in Fig. 2A. A typical "bulb" shape with a screw in base is provided for retrofit locations where a socket is available. The prior art design depicts LEDs spread out on the surface of what looks like a reflector lamp. It is evident from the downward facing 5mm hole-thru type LEDs - 14 that no attempt has been made to extract a "batwing" or any other effective type of light distribution pattern. Upward facing LEDs - 15 seem intended for uplighting and again it is clear from the symmetry that no attempt has been made to provide a rectangular pattern which will give a better use of light for indirect lighting.

Fig 2B illustrates the teachings of the present invention. In this case, although packaged to appear as a typical "A" shaped light bulb, the device is actually a DLF and provides a complete lighting solution. Although shaped like a lamp with a screw base to facilitate replacement when the "lamp" burns out, this is not necessarily the intent. Rather, in the present concept, after 100,000 hours (over 30 years in typical use) it's time to refurbish the room and change the fixture. The outward design is thus generated by what people expect to purchase and not what a DLF, that is not a lamp should look like. A true DLF design would not include the ceiling mounted socket and would be provided with a wiring connector and accoutrements and fasteners for attachment directly to the ceiling.

A retrofit MSLS lamp or digital lighting fixture/luminaire 16 intended to replace the lamp, fixture, reflector or shade and control-gear combination of a typical lighting fixture, includes a screw base 17, which receives line power 18 into the electronic power conditioning circuitry 19. In a preferred embodiment, control circuitry 20 is provided in the lamp. The input to the control is from an external source or internal logic circuit or both and in a preferred embodiment a sensor pack 21 with one or more radiation and communication sensors capable of detecting motion, day/night, spectrum, luminance etc is provided. In external control, a control signal 22 rides on the power signal 18 and enters via the screw base 17 or an infrared or other radiation detector provided in 21 picks up the control signal. Discrete packaged light sources, e.g. Solid-state Light Source SLS 23 containing one or more junctions are mounted on the DLF lighting fixture body 24 and connected to the controlled power circuitry that determines which of the SLS 23 will operate and at what power. Each SLS with it spectral and distribution characteristic is mounted in a specific location on the surface of the DLF with an angle α , 25 from the nadir. Any angle from the nadir is possible including 180 degrees and the light flux can serve to provide uplight or illuminate a picture on a wall.

In a position oriented lamp arrangement, that is where the socket has a distinct stop point, detent or pin and is mounted substantially oriented to the room or its contents such as a work desk or wall painting, and also the DLF has a specific mounting orientation relative to the socket, then the light distribution can be nonsymmetrical and tailored to the needs of the room. The screw base 17 has a detent or pin 26 that coincides with the stop point on the socket, which is mounted in a specific location radially around the lamp at an angle β , 27 in reference to pin 26 and a design start

point on the circumference of body 24. The SLS are placed at an angle β horizontally and vertically angled α to illuminate specific areas and also have their own spatial light distribution angle θ 1 28A. An SLS aimed to illuminate an interior area may have a wide distribution or a distribution without a sharp cutoff 28A while those SLS located at the edge of the area to be illuminated may be of narrow distribution θ 2 28B and have a sharp cutoff. This technique is similar to how a sport playing field is illuminated with multiple floodlights. Floodlights of narrow beam spreads such as a NEMA 2 are used to illuminate at the edge of the illuminated area while wider NEMA 4 beam spreads are used near the center of the playing area. The MSLS lamp will have concentrations of SLS at specific aimings to provide a wide "flood" type distribution to one part of the room and a "spot" type distribution to another such as to a painting on the wall. Each illumination target is at a different light intensity and color temperature or color rendering.

In another embodiment SLS, which perform an equivalent to a task light function with a very narrow beam, are combined with SLS performing a general background lighting function in one fixture. While general lighting recommendations in an office call for the provision of 300 to 500 lux over the working plane, specific task lighting, for example where copy work is to be illuminated by auxiliary lighting, 1,000 lux is required. To this end a section 29, containing SLS on the DLF, provides a narrow beam of higher intensity, to provide added light flux to the working surface. In an alternate embodiment section 29 on the DLF is on a swivel and can be manually adjusted to be aimed at the worktable. In an alternate embodiment the swivel is positioned by a servomotor and controlled by a remote control unit. In an alternate embodiment to the fixed task light section 29, in an attempt to cut down on separate fixture types with left or right handed spot or other asymmetric orientations, the MSLS portion of the DLF body 24 is rotatable in relation to the affixing base 17. Such an embodiment also obviates the need for a position oriented socket and base pin 26.

In another embodiment, modulating the output of wide distribution and narrow distribution LEDs by the controller varies the net resultant beam spread characteristics. The fixture is placed near a workstation and gives a wide distribution general lighting as well as a narrow high intensity beam for increased illumination level task lighting on demand.

In order to assure an even distribution of light from a point source over an area, it is necessary to take the effects of the angle and distance to the illuminated surfaces into account as stated in the inverse square law. Often a "batwing" type of candlepower light distribution is used. In a prior art luminaries the reflector, which concentrates reflected rays in the higher angles, accomplishes this. In a preferred embodiment of the MSLS there are more, or more powerful, SLS over a range 1 aimed at higher angles to increase light flux at those angles in order to maintain an even light distribution. If the lamp is specifically oriented in relation to the room concentrating more light into the distant corners effects a squared distribution pattern, which would fill in the corners of a square room with equivalent illumination. An added amount of SLS are added on the DLF body 24 at 90 degree angles on β , 27 where SLS aimings will push added light into areas corresponding to the "corners". To effect uplight towards the ceiling or for indirect lighting SLS 23A are aimed towards the ceiling such that an optimal utilization of the light is achieved.

In the preferred embodiment color of light emanating from an SLS 23 is "white" light. This is accomplished by using a "white" light producing arrangement of LEDs that is comprised of two or more spectrally differentiated junctions, which then combine their light output such that the illuminating light appears white. Other white LED technologies use phosphor or other coatings over the junction which causes a shift to longer wavelengths. The separate junctions in an SLS or separate SLS may be independently controlled. In a multi-junction SLS the total color of the illumination may be shifted to "warm" or "cool" light in correct accordance with the illumination level (see Fig. 10) or other considerations. In another preferred embodiment, a motion detector is used to conserve energy. The room lamp is dimmable to a lighting level sufficient for safe orientation. A motion sensor 21 picks up activity and increases the illumination level to meet the activity level. This integral placement significantly reduces the wiring from sensor to power supply and again back to lamp in prior-art dimmer - motion sensor applications.

In alternate embodiment each SLS 23 may have a non-white color. The operation of many SLS in unison of different or similar wavelength may be used to create any color desired from white to monochrome in any specific region to be illuminated. A spectrum sensor 21 inputs data to controller 20, which maintains color at predefined level. Such a feedback mode allows for the MSLS to maintain constant color over the full lifetime of the lamp even if specific wavelength SLS shift output characteristics such as light flux and spectrum with age within bounds of the sensors calibration over age. Constant color is maintained in a room with an influx of a less desirable color temperature light on one side. Spectrum sensor 21 with a specific orientation would detect a "cool" light reflection emanating from a specific side of the lamp and will increase "warm" e.g. 2000K light to compensate. Over the long lifetime the DLF could recalibrate its spectral sensors 21 to white light based on readings of daylight where such daylight is available and the controller has determined that the room at the time of calibration is being illuminated with white light "daylight" of a specific color temperature per orientation and time of day.

The same light distribution effect based on light source aimings could have been accomplished as in the prior-art, easy to manufacture flat pc-board configuration by simply angling the LEDs 23B from the perpendicular as shown in Fig. 2C. Shown is a side view of a PCB provided with standard 5mm hole-through LEDs. The LEDs are produced with standoffs on the legs such that after soldering automatic machinery can bend the legs so that the LEDs project at the required angle from the nadir to achieve the required photometric pattern. Lead bending as is known in the art also allows for uplight as with LED 23C. Though not as elegant as DLF 16, this easy to manufacture configuration will accomplish much of the sought after light distribution.

Fig. 3A is an illustration of a prior art wall sconce for outdoor use displayed by a leading LED manufacture in at a lighting trade show in 2003. It is juxtaposed with Fig 3B to highlight the difference in the design methodology as taught buy this invention. The very aesthetic prior-art wall sconce fixture encased in a curved decorative frame is portrayed in top, front and side views. It uses a multiplicity LED light sources to shine through a diffuser to produce an even glow. "White" LEDs 31 were placed on a flat printed circuit board 32 and the light was dispersed via a white diffuser 33 with the light exiting lambertianally in all directions. The good optical control initially present on the LED 31 is now squandered on the prior-art diffuser in an attempt to prevent glare from the pinpoint LED source and produce a pleasant glow on the

diffuser. Light is projected evenly in all directions including uselessly upward, where it will help drown out starlight. The prior art flat PCB and optional metal heat sink 32B facilitates manufacture and heat transfer and that is probably why the design is the way it is, with production feasibility considerations driving the design, rather than correct energy saving lighting principles.

Fig. 3B illustrates how the same improved lighting design process can be accomplished for an outdoor wall sconce DLF intended to illuminate a walkway at night. According to the teachings of this invention, the LEDs 31, power supply and other electrical components 34 are assembled on strips of semi-flexible printed circuit boards 35. The LEDs can be multi-colored or monochromatic LEDs with overlapping coverage or white LEDs. As illustrated in the top view of Fig. 3B, the LEDs 31 are mounted on a convex surface 35 such that some face to the left, some right and a smaller quantity towards the middle. The middle aimings require fewer light sources due to the inverse square and cosine law for a point source as is this DLF, where light at the angle of illumination of 0 degrees is more intense than for light at an angle greater than zero and a point closer to the DLF is more intense by the square of the distance in the denominator. The exact solution for the aimings is such that for a desired coverage and illumination level the illuminance equation 1 is used to calculate the necessary light intensity in candela at each aiming angle. The side view shows the LEDs 31A and 31B with varied downward angles, such that even illumination is produced on the walkway out to the prescribed distance from the wall. The PCB strips are optionally affixed onto a curved and angled aluminum heat sink 36 with electrically insulative but thermally conductive adhesive such as Dow Corning ® SE 4400 Thermally Conductive Adhesive.

The diffuser 37, is shown in the side section view to have white diffusing sections 38 and clear, fully transmissive slots 39. The controlled angular distribution light emanating from the LEDs 31 passes through the clear slots 39 and illuminated the walkway. The diffuser 37 is illuminated by stray light emanating beyond the controlled angle of the LED 31 or one or more LEDs can be dedicated to the task and aimed into the diffuser material, using it as a light guide to spread the light within the diffuser as is practiced in the art.

Fig 3B illustrates how the same end result as the prior art fixture Fig. 3A, of having a pleasantly illuminated diffuser can be accomplished while not compromising on the energy efficiency and correct lighting output of the luminaire. The fixture aesthetics can be maintained while a more physically compact design can be carried out. The components depicted in Fig. 3B are possibly more complex and thus initially more costly. However in a comparison of the life cycle cost per effective lux, which includes the electricity charges over the life of the fixture, the DLF is certainly superior to the prior-art.

The above design depicted in Fig. 3B is easily adapted to a hallway application where some light to the ceiling is beneficial. To provide up light a row of LEDs 31A is aimed towards the ceiling instead of downwards.

Fig. 4 illustrate additional embodiments of a DLF which may take on any shape be it disc shaped or linear depending on the aesthetic choice of the designer and the lighting application at hand. Thus, a preferred luminaire configuration for lighting an area from within, (using a number of lighting fixtures to prevent shadows) would be a

concentrated point source design. To illuminate from the perimeter of the room or along a walkway, a linear configuration luminaire or many distributed point source luminaires are optimal. In Fig. 4 a disc shaped containment 40 would contain SLS 41 where again, the radial position of each SLS and the aiming is such as to yield a specified lighting pattern on the surfaces to be illuminated therefrom. A smooth light distribution is achieved by aiming relatively more SLS 42 in the direction of the more distant (or less perpendicular) surfaces or objects to be illuminated. One or more sensors such as motion, day/night, spectrum, luminance, are provided for in 43 or any other location as is required. A printed circuit board with power and control circuitry is provided for 44, as are screws 45 and or adhesive on the rear 46 for affixing to a surface. Electrical connection is made via a connector or sharp prongs to a conductor 47 which are pressed against the conductors to make electrical contact. The total assembly 48 with its light sources at specific positions and aimings, its power conditioning and control equipment and connection to power source, be it integral such as with on board batteries, or external from a power line constitutes a complete lighting fixture replacement element.

Based on the disc or puck shaped integrated luminaire above an application featuring a snap on Step Light 66 used outdoors is illustrated. One or more SLS 50 are contained in housing 51 which is substantially transparent in the area in front of the SLS. The SLS light source is very long lived therefore the unit is sealed watertight for life in the injection molding process or via glue. The SLS 50 are aimed so that the distribution pattern, at standard mounting height, effectively illuminates the steps. In one embodiment the luminaire is provided in two models each specific to a right side and left side installation with opposite aimings in order to yield an even distribution along either the receding or proceeding stairs.

A two-conductor cable, which conducts power 52, is installed along a building surface or railing along the area to be illuminated. A bracket 53 is attached to the wall 64 on which the light puck is to be placed. The slot 54 atop the puck is inserted under the top clip 55 of bracket 53. The puck is hinged down and the bottom pivoted, catch lever 56 enters within the void of bottom clip 57. The screw 58, which can be a tamperproof screw to prevent removal by vandals, is tightened forcing the protruding leg of top-heavy catch lever 56 to fill the void in the bottom clip 57 of bracket 53 and lock the light puck in place. At the time of tightening screw 58 pushes contact block 59 with conductive piercing prong 60 against power cable 52. Conductive prong 60 pieces outer insulation layer 61 of power cable 52 and makes contact with electrical conductor 62. Further tightening of the screw 58 forces the prong on the opposite contact block 63 to pierce through the insulating layer and make electrical contact. A power cable 52 conducting current at low voltage, say 24 Volt, may be directly affixed to the wall 64 without enclosure in a conduit, and the light puck attached at points along the power cable. A bracket or clip 53 is used to affix the lighting puck fixture to the wall and has an opening 65 for the contact blocks 59 and 63 to fit through. The fixture 66 may be sealed for life during manufacture since there are no serviceable parts inside for the lifetime of the electronic components.

Other applications include stairwell lighting that is activated by motion detector or is always on due to the low power consumption or a combination of constant low level on state, with the increase to full power based on activity. Distributed along a power strip running along the stairwell are disc shaped DLF units such as luminaire 66. A motion detector 67 in the first and last units between the floor landings is used to turn

on the lamps ahead of the person using the stairs. An outdoor solar energy step light application will use a photocell or any other arrangement to turn the system on at night and a motion detector to turn the lights on for a short duration after motion is detected thus reducing the amount of energy needed to be collected in solar cells. Instead of being in a totally off state, the lighting can be partially on, such that it is visible in order to give definition to the landscape and help in orientation. This power usage is very low since even at very low current LEDs are visible at night. Upon being initiated by the motion detector it can go to full power to illuminate obstacles in the path.

Last Step or first step could be indicated by a different color of light. A motion detector could accordingly change the MSLS output color if the individual is approaching the steps say to green and to amber or red when reaching the last step.

Fig. 5 illustrates another DLF embodiment, a linear lighting fixture 70 where the similar or different SLS 71 and 72 are distributed along the area to be illuminated such as is typical with fluorescent lighting fixtures used in soffit lighting. The system may have a power conducting strip of a similar shape 73 which connects to lighting strip 70 via receptacle 74 and pin 75 set and which are attached to conductor set 76. The two strip types, the lighting fixture strip and the power conducting strip may be adjoined together or affixed directly to the wall or attached to bracket 77 which may slide into a slot 78 in 70 and 73 and where there may also be provided matching cutouts in the lighting fixture and bracket. The matching cutouts 79 allow for a quicker, straight on insertion before sliding horizontally in the slot 78. The bracket is thus first attached to the wall and the strips are brought up to the bracket and moved sideways to latch.

Many lengths of strips 70 or 73 up to the power capacity of the conductors can be joined together and connected to a power source with a connector 80. Interchangeable sections of the power strip can contain LEDs of different colors for effects or alternate between power strips and lighting strips for a similar aesthetic architectural design.

The lighting/power strip may be thin and linear substantially in one or two planes or for aesthetic considerations have curves or be constructed of a flexible material and have the ability to be manipulated into curves and bends in three planes, to make such designs as an arc, wave or circle. The electrical conductors may provide the malleability to shape the strip and then hold the configuration after it is bent up, for example if they are made of copper or aluminum or alternately an additional bendable, yet shape-retaining material may be inserted in the casing 81 or the casing material itself may have such properties.

The Lighting strip 70 and Power strip 73 may also conduct light and radiate light to give a lighting effect all along its length. Alternately, the strips may be a light conductor with little light exitance from the surface and the total internal reflection is selectively frustrated to let light out along the length in a specific direction or at desired intervals. The strip lighting may come from SLS specifically aimed to project light into the strip or from light leakage from regularly placed optimally (per the main lighting application) aimed LEDs.

Another embodiment of a solid-state lighting fixture, DLF or luminaire is shown in Fig. 6. Whereas previously described luminaires were described as incorporating

LEDs in standard hole-through or SMD packages, here, a luminaire using the unpackaged solid-state light source junction is described. A multifaceted luminaire 90 is comprised of any of the following list including a mechanical affixing method to a surface 91, an electrical connection to an outside power source 92, a mechanical frame 93 to hold the one or more light sources 98 or lighting facets 94. Power conditioning, heat rejection and control elements are contained on or within the interior of the structure 93. A number of light sources, facet or many facets are placed in position radially around the lamp and angled vertically to effect the desired light distribution. Thus while facet 94 is positioned in the frame 93 radially and angled so as to be aimed substantially downward to the left of the fixture position, facet 95 is positioned and angled to illuminate an area further out and to the right.

A detail of a lighting chip or facet is shown in front view 96 and side view 97. In the first embodiment P/N junctions 98 of light emitting semiconductor material are placed on a thermal conducting and or light-reflecting surface 99. Electrical connection 100 is made between the junctions often referred to in the industry as dies, such that different color junctions may be located in close proximity to each other and their combined light spectrum yielding the desired color. The power and control circuitry have access to each individual die, a cluster of dies or to a total facet. This allows for the dimming and color temperature adjustment of the illumination. To more tightly control the light intensity distribution the surface 101 beneath the light-emitting junction is formed concave to reflect and concentrate the radiation into a narrow beam. Alternately, or if additional optical control is needed, the top layer of the junction 102, if it is light transmitting, is formed to act as a lens such as a Fresnel lens or a surface 103 above the die serves as a lens.

The level of miniaturization is irrelevant. The principal is the method of powering and controlling the light source intensity directionality and color spectrum in one integral unit by varying power signal to specifically positioned light sources of specific spectral power distribution. Device 90 contains for this purpose any or all of the following: unit 104 for effecting the power conditioning of electric current supplied to the light emitting elements, a control unit 105 to vary power to specific junctions or chips and sensor units 106 to provide input and feedback to the control elements as described earlier in devices 2 and 14. The earlier described DLFs of Figs 1 through 5 are also designable using the facet light source building blocks.

In an LED, light is produced at the p-n junction of the diode. It is known that one of the major losses of light output from solid-state lamps is the absorption of light within the epitaxial layer of the chip. On a submicron level, other inefficiencies derive from defects caused by the lattice mismatch. Often LEDs are producing light at a quantum efficiency of approximately 5 percent. Depending on the chemistry and the junction molecular geometry a specific thickness of light emitting layer is required. Also the width of the junction is important as light is absorbed in the interior.

Light extraction from AlGaInN-based LEDs is limited by the various parasitic optical loss mechanisms present within or surrounding the AlGaInN epitaxial layers. These mechanisms include absorption at the semi-transparent metallic layer as well as absorption within many layers comprising the epitaxial portion of the LED, such as the buffer layer the active region and the heavily Mg-doped GaN contact layer. Because of the refractive index step between the multi-layered epitaxial structure (n=2.4) and the sapphire substrate (n=1.77) or the encapsulation epoxy layer (n=1.5),

only approximately 25% of the light generated within the active region escapes into the epoxy or the substrate upon first encountering these interfaces. The rest of the light is trapped in a waveguide formed by the encapsulation epoxy layer above the chip and the substrate. The trapped light must travel distances on the order of the length of the chip to escape from the sides of the LED. Such distances require many passes through the various loss mechanisms within the LED structure, increasing the probability of absorption. Thus, much of this trapped light is eventually lost, decreasing the overall light output of the LED.

The LED is designed to allow the light produced to escape through an end face. However not all of the light is able to escape a diode in air because a portion is totally internally reflected at the interface between the diode and surrounding air. Due to the very high refractive index of most semiconductor materials, the portion of the light totally internally reflected is very large.

Therefore contrary to the present trend in high flux LED design of building very large, high current diodes, it would be advantageous to build a multitude of very small diodes with relatively large surface areas relative to volume and lessen these losses.

The layout of the facet in Fig. 6 is applicable to a submicron-sized dice 102 with nano wires 107 and other subminiature connectors 108 bringing power to the junction. To prevent absorption of light by the neighboring junction the cusped reflective structure 101of the lower surface surrounds the lower hemisphere of the junction.

The reflector as mentioned earlier for the dice on the micron level may be similar to the one described in "Semiconductor light emitter" United States Patent 5,537,433 by Watanabe, where a semiconductor light emitter, such as the light-emitting diode or the semiconductor laser, having a structure in which a light emitting area or an active layer; a transparent layer which is pervious to light radiated from the light emitting area or the active layer; and an opaque layer or an opaque substrate which is impervious to the radiated light are arranged in order or in the inverse order. The semiconductor light emitter includes (a) total reflection layer(s) arranged between the transparent layer(s) and the opaque layer(s) so as to come into contact with the transparent layer. The refractive index of the total reflection layer is smaller than that of the transparent layer. Therefore, at least one part of the light, which has been radiated from the light emitting area or the active layer and which has been reflected by the total reflection layer thereafter, is either radiated outward from side surfaces of the transparent layer or returned to the active layer.

To carry away heat from the electronic components, a hollow center 109 will act as a thermal chimney and components are mounted on heat sinks. In compact applications, a fan or pump 110 is used in forced circulation cooling. In alternate preferred embodiment, a highly optically transmissive cooling fluid, 111 surround the chips, junctions or facets 94. The fluid absorbs waste heat and circulates to a radiator area 112 on the body 93 where the heat can be transferred to the surroundings. The circulation can be natural thermo-siphon circulation, based on the density differences or forced, utilizing a pump 110. An added benefit can be derived from the optical coupling of the fluid between the junctions 98 or facets 94 and the cover 103. At an air plastic or glass interface typically 4% of the light is reflected back. With two such interfaces the loss will be 8%. The cooling fluid is selected such as to have a

refractive index that it is close to the plastic, ceramic or glass used in the cover 103 and this loss mechanism is eliminated boosting efficiency.

Fig. 7 is an illustration of a typical application using the digital lamps as proposed in the present invention. A digital lighting fixture such as the puck shaped illuminating unit 66 of Fig. 4 described above shown here as 120 and 121 would be used to illuminate steps 122 by being affixed to the wall 123 or onto or within a railing 124. A pedestrian 125 using the stairs would not be blinded by stray light reaching his or her eye's since the highly controlled light beams of the SLS 50 in Fig. 4 are aimed downward and have a sharp cut off of light distribution at an angle such that even a pedestrian coming from below and looking up the steps would not see the light source (except from a great distance on long stairways where the light intensity is weakened by the distance and does not glare). A right handed and left handed fixture design would further prevent any blinding light by always illuminating the stairs with SLS aimed toward the nadir or at angles from the nadir in the upward direction of the stairs up to 70 degree angle 126 and by having the fixtures mounted below the eye height of short adults 125 or children who walk stairs at night. A low voltage transformer 127 located within or by the outlet box or at any other power supply juncture can supply power, free from the danger of causing electric shock. A motion detector 128 could be a separate device or as propounded in this invention, be an integral part of the fixture and could cause the fixture to change color and illuminate in amber, red or green to signal the approach of the last or first step.

In a solar energy powered application, the motion detector would turn the DLFs on or alternately increase power. To conserve energy, when there is no foot traffic, it would operate in a low power mode where it is visible and gives a general outline of the terrain to warn of approaching steps. When motion is detected it would switch to a mode where it actually illuminates the steps for correct foot placement to prevent mishaps.

In another embodiment the railing 124 is an aluminum or steel extrusion 129 specially constructed to accept the lighting fixture 130 and formed with brackets 131 to carry the conductors which supply electric power. The railing is actually a combined railing lighting fixture and carries out the both functions including providing elements for the power distribution. Grooves along the extrusion accept mounting brackets 132 that facilitate attachment to the wall or upright post 133 and also have a locking mechanism such as fastener 134. It is to be understood that any other shape or material of railing, fixture and combinations of bracket and extrusions can carry out the similar function of a combined railing -lighting fixture device.

In another embodiment the railing is a standard railing profile 135 available in the industry and the digital lighting fixture is shaped in an arced or banana shape 136 or has a bracket shaped to facilitate its merging with the railing. An insulated electrical conducting element, 137 runs along the railing to provide power to the fixtures at intervals along its length.

Fig. 8 illustrates the use of the linear packaged digital lighting fixture 70 as described earlier in Fig. 5, here shown as 140 in a step 141 or stairwell lighting application. The power and lighting need to be distributed substantially linear at constant distance 142 of the light source from the stairs to be illuminated and the correct light distribution for the task is designed into the SLS and or digital lighting fixture from ground up.

The angle 143 of light distribution from the SLS is such that it takes the mounting height 142, step 141 width 144 and required illumination level into account. The lighting fixture may attach to the wall 145 or onto the handrail 146. The person's 147 presence is detectable by a motion detector 148 as he nears the last step 149 and indication by a change in color or frequency can be signaled by a segment of the lighting fixture. Alternately or in addition to, in order to save power as with a solar energy installation, the detector may cause a change in the power supplied to the DLFs.

Fig. 9 depicts a DLF 160 which can be used in pathway lighting where upon being installed at the correct orientation the SLS 161 are aimed in a controlled wide distribution 162 (but yet not in the wasteful, present-day practice of 360 degrees), such that they illuminate a section 163 along a walkway 164 of standard width 165 with equal light distribution and there is no stray light upward or to the rear. A marker, 166 situated on the fixture 160, aids in orienting the fixture perpendicular to the path. Alternately, shrubbery 167 can be illuminated with another grouping of upward aimed SLS 168 with a more spotlight like distribution alternately of another color spectrum which may illuminate the green growth in a more aesthetic light. The group 167 may be mounted on a swivel base 169 so that it can be aimed independently of the path lighting SLS aimings. A dedicated shrubbery illuminating DLF configuration is another alternative. A stake 170 is used to install the DLF in the ground at the correct orientation and may be provided with an electrical connection box to hook up to power through piecing quick connectors as is known in the art. Alternately the DLF can be self-sufficient with an onboard power source consisting of solar cell 171 and batteries. As described in previous devices, in more embellished embodiments, onboard control logic circuitry and sensors are employed to control intensity, color spectrum and on/off switching. A motion detector 172 can control the transition from a standby mode to full operation.

Fig. 10 is a graph of the preferred parameters for lighting color temperature at different illuminance levels. It is adapted from the IES Lighting Handbook 8th edition 1993 and illustrates the Kruithof effect. It is used here as a sample of one of the recommended lighting procedure templates used by controlling logic circuitry on a DLF to keep lighting parameters such as color temperature, color rendering properties, illuminance levels and distribution in optimal bounds. Other control parameters such as switching on and off and color change used to signal critical circumstances are examples of look up, truth tables and media storage data that can be provided to a controller.

Shown in Fig. 11 is a revisited step light which incorporates the chip technology introduced in Fig. 6 into the step light application which has been used to demonstrate the general method of digital luminaire design as espoused by the present patent. The intent is to illustrate the advantages of the placement of the junctions on a facet configuration over the discrete component approach in the previously described step light design of Fig. 4. The significant feature that stands out is the size reduction. Many junctions are packed in a facet and the facets are cast in epoxy at the correct position and angle to properly illuminate the steps. Again the entire lighting fixture function is carried out in this properly shaped button-like device which yields the correct light distribution. A button shaped step light 170 is shown on the bottom side of the railing section 171. A power cable 172 single wire (it can be a single conductor with the railing serving as the other conductor) supplies AC or DC power, which for

safety considerations can be low voltage. The power, sensor and control circuitry package 173 makes contact 174 with the power cable 172 and distributes power to the light generating discrete LED or multiple-packaged facet elements 175. The light facets 175 are strategically located on the relevant geometric surface of 170 such that their aimings contribute to the illumination 176 of the steps from the preferred direction and at even intensities. While facet 175 is contributing light at higher angles on the receding step surfaces facet 177 is illuminating 178, the close face of the upward step 179. In manufacturing such a luminaire the components must all be wired together and then positioned in their proper locations at the exact angles. This can be done with automatic machinery while the components are in the flat. Each component is placed by automated pick-and-place machinery in a hollow where it is temporarily set and where the wiring is attached as well. The hollow is actually a computer positionable setting and all the hollows are moved with the components in situ into the molding positions. An epoxy like spray is used to temporarily lay up the components until the final encapsulation into the final "button" shaped lighting fixture. This is a general lay-up method and applies to subassemblies as well, which can later be brought together before final encapsulation. Conductors that require subsequent electrical connection are mechanically or chemically covered during the spraying process.

In another preferred embodiment shown in Fig. 12 the DLF is an Adaptive Digital Lighting Fixture. As opposed to a DLF described earlier, is not pre-designed with light source aimings based on a pre-known application. Instead the DLF is equipped with a plethora of light sources ready for most of the conceivable lighting tasks in the illuminated area. The light sources are then controlled such as to adapt the lighting to the room construction and the lighting tasks at hand. The same technique applies to outdoor area lighting applications. This universal DLF is the preferred design when the cost of having an overabundance of light sources is low enough such that other economic considerations such as minimizing stocking units in inventory, repeated changing of the room tenants etc will be more expensive. It is similar to purchasing a 100-Watt lamp where a 40W lamp would suffice and always operating it on 60% dimming. The capacity is there but it is unwise to use it since electricity is costly.

The adaptive or intelligent DLF 190 shown in Fig. 12 has multiple light sources 191 placed about the body 192 having a geometric shape. The shape, which influences the spatial light distribution, may be of a fixed or flexible design. In a flexible design, solenoids, servo motors, actuators, pumps, controlled fluid or air pressure devices 193 are used to realign surfaces, moveable plates or expandable tubes or cylinders 194 to morph the topology of the fixture. The ADLF is equipped with an electronic power supply, computer control and communications unit 195. One or more light sensors 196 are placed strategically to detect necessary inputs. Alternately one or more digital cameras 197 with a photodetector array which is equipped with a lens which can be a 360 degree lens or a fisheye lens is placed with a field of view of the area to be illuminated. The geometric shape of the body 192 is such that an asymmetric lighting pattern is produced for the provision of a non-circular lighting pattern in a typically rectangular room. Because more light needs to be directed to the far corners of the room, more surface area for projecting SLSs at that position is required. If multiple fixtures are used in a large room then squared lighting patterns will obviate the need for overlapping coverage as with circular distribution luminaires or the prior art. Concave section 198 increases the ADLF surface area available for light source mounting at the room corner orientations. In bottom view 199, a section of the body

192 is shown with asymmetric surface cut out 198 which increases the available surface area on the ADLF.

Spatially differentiated motion detectors 200 are provided on the Adaptive Digital Lighting Fixture along with the light sources 191 and light sensors 196. Typically motion detectors have been associated with lighting in motel rooms to shut off the lighting if there is no activity. There is another level of control that can include matching the lighting to type and amount of activity. On sport fields for example, 200 lux may be used general sport activities, 1,000 lux for night practice sessions while 3,000 lux is used in a televised game. Taken to the extreme, one or more limited field-of-view motion detectors 200, or camera 197, can be used to follow the whereabouts of room occupants. The DLF controller acts to provide heightened lightning to the occupants" present locations. The controller has stored look-up-tables, instruction sets and algorithms which it uses to processes the information communicated from the sensors or a camera and in response control the light provided to the illuminated area.
A special or standard remote control unit 201 can be used to operate and program the ADLF. In one embodiment the control 201 is equipped with a laser pointer and/or light sensor 202 that is used to assist in providing positional an angular data on the location of work surfaces, room structures and dimensions. The control 201can then pass on information concerning the visual task performed at that specific location. This data now enables the controller195 to use stored algorithms, look-up-table templates to calculate and program the correct lighting intensities and spectrum for that room location as explained earlier in the block diagram as functionality 7 and computer processes 7A.The photometer on the remote control 201 held at the specific location will then corroborate the illumination and spectral performance of the ADLF with the specific light source aiming being programmed at the particular instant. The communication can be optical in the visual or infrared wavelength or wireless. An antenna 203 is provided for wireless communication. The adaptive DLF is thus manually capable of being programmed with all the input parameters necessary for a computer program 7A as is practiced in the art of lighting design, to determine the correct intensities and spectrum to carry out the visual tasks at a specific room location. This is a unique property for a single luminaire. Lighting designers are usually forced to compromise and provide the entire room or area with the highest common denominator of lighting in the room. With the ADLF non-glaring, spectrally correct lighting at minimum intensities is provided and this affords significant energy savings. The added daylight and activity related dimming functions are another significant energy savings factor with its ensuing economic and environmental benefits.

A calibration system is provided in the form of calibration element 204 constructed such that it has coverage of the light source radiation on the ADLF body 192. The calibration element 204 is a reflective rod or strip the surface of which 205 has a wide spectrum, non-angle of incidence dependency and stable reflection characteristics over time. The reflectance of 205 is known at each wavelength and it serves as the standard reflector for the calibration routine. The reflective rod or strip is moveable so that it can reflect light back to the outward facing photodetector 196 based on the ADLF body 192. To test SLS performance the calibration element 204 is rotated about the body 192 by actuator or motor 206. When the reflecting surface 205 is opposite a column of SLSs 191, the controller times the firing of each independently addressable SLS 191 location and acquires detector 196 intensity readings uniquely for each SLS. The results of the test firing are analyzed in controller 195 which has

the functionality described in Fig.1 of components 7 and software 7A. Correction is made to the junction power supply parameters in order to maintain metametrically balanced outputs for white light and overall lumen production. The controller 195 re-powers the SLS 191again using the updated power supply instruction set and retests for accuracy. The process continues until the SLS performance is repeatable at different power levels. In another embodiment the ADLF is provided with a calibration wand 204 on which inward facing photodetectors 207 are placed. The calibration wand is capable being positioned such that the detectors 207 can detect SLS 191 performance as the wand 204 is rotated about the body 192 and SLS 191 are independently tested as describe in the previous embodiment. Both the reflective rod/strip and calibration wand 204 are narrow such that when not in use, rod/strip/wand 204 is parked at a specific position where it does not block light sources 191. In another embodiment the rod, strip or wand is stored and is only deployed when calibration is required. When called upon, the deployed rod, strip or wand 204 is rotated around the DLF body 192 to read SLS 191 intensities. Alternately, the DLF body 192 rotates and the rod, strip or wand 204 remains fixed.

An ADLF 190 outfitted with computer calculation, communication, calibration and other feature may be costly, such that using a number of units to illuminate a room is impractical. Correct lighting practice encourages the use of multiple point light sources to illuminate an area using a number of criteria. A single fixture cannot cover an area larger than glare and mounting height considerations allow. There is a limit on the maximum angle of light provision. Another consideration has to do with the production of shadows. Finally due to the cosine law there is a practical maximum angle at which the lighting can be delivered. At large angles the lighting effect becomes negligible. Therefore, due to all the above considerations it is advantageous to have multiple lighting fixtures in a room. A single ADLF 190 is used in a large room. The ADLF is designed to be used with one or more satellite reflectors 220 which are strategically positioned about the room. The satellite has provision for being attached to a supporting structure such as a ceiling or light pole and being fixed with a certain orientation in relation to the ADLF 190 and the working surfaces below. The satellite's inward facing surface is a highly efficient specular, semi-specular or diffuse reflector or combinations thereof. A part of the surface 221 is provided with a full spectrum, white reflector which may be a spot or a band across the top bottom or middle or all combinations thereof used in calibrating the intensity and or spectrum photodetectors and/or light sources over the lifetime of the DLF. A part of the surface may be a special reflector 221 such as a retroreflector which will serve as a ray targeting aid useful in the installation process of the satellites. The targeting can be manual using a red laser pointer or automatic using the detectors 196 on the ADLF 190 and the retroreflector 221 on the satellite 220. A section 222 of light sources, which may be high power light sources, is dedicated to provide sufficient light to the other areas of the room or for specific task lighting applications such as to computer terminals which require lighting at small angles from the nadir. The section 222 may be on a swivel so as to be aimable at the satellite 220. Section 222 projects light 223 at the satellite reflector 220. In use, the satellite is installed substantially over the work area to intercept rays 223 from 222 so as to provide task-lighting 224. The specular reflector 220 is positioned and angled such that it concentrates and re-directs the light rays 224 downward onto an area or worktable. The downward directed light coming at very small angles will illuminate the worktable 225 but will not cause veiling glare reflections on the computer screen 226. To provide general lighting to room extremities, the satellite reflector is specular, semispecular or diffuse

and has a surface geometry for reflecting the incident light 223 so that it spreads the light evenly over the area to be illuminated.

In place of the manual programming technique for ADLF 190, a semi-automatic self-programming process using luminance measurement via detectors 196 is provided. The camera 197 has a view of the room its contents and occupants. Pattern recognition techniques known in the art are used to identify room occupants, furniture, office equipment such as computers etc, room structures such as walls and windows.

The intelligent lighting fixture system 190 is adaptive to the room structure, usage and occupants on a dynamic basis. In one embodiment a hand held laser pointer and sensor on the remote control 201 is used to assist in providing positional an angular data on the work surfaces and room structure enabling the controller to corroborate program lighting for the location with the specific light source aiming being programmed at the particular instant. The room occupants also use the remote control 201 at any instant to input lighting preferences or call up stored lighting scenarios to the DLF 190. Thus the controller 195 or a controller 195 which communicates with a PC computer is provided with an interactive program which based on application look up tables will determine recommended light intensity and spectrum for the application at hand. Procedures useful in the lighting design process, lookup tables and specific application guidelines can be found in the IES Lighting Handbook 8th edition pages 447 - 903. A number of commercially available programs are available which prescribe lighting based on the application and calculate the illuminance based on the fixture. In this invention the procedure is reversed in that the recommendations are first used to generate the illuminance on or luminance from the room surfaces. The computer program 7A is used to calculate the light intensities required at each angle in order to produce the desired illuminance or luminance results. Luminance in cd/m 2 is the reflection of the light flux lumen/m 2 from a surface having a reflectance property and is more similar to what the eye sees. The algorithms are processed onboard the ADLF 190 or run on a PC which communicates with the ADLF. Computer programming for lighting calculations and correct lighting practice recommendations is known in the prior art. Commercial programs using procedures based on IES, ILDA and other standards and professional lighting engineering and design organizations are available. Lumen Micro ® and Simply Lighting ® from Lighting Technologies Inc are examples of such programs which provide tools to create and simulate lighting layouts for both indoor and outdoor applications. Simply Lighting ® is a suite of Windows ® -based lighting analysis tools that are designed to answer the questions you need answered using a step-driven application targeted at a specific lighting application. Lighting Analysts, Inc AGI32 ® is a program used to predict lighting system performance for any application from one to hundreds of luminaires, interior or exterior. Users can build environments for most any electric lighting application with unlimited luminaires, calculation points, and reflective or transmissive surfaces including day lighting effects. The program used in this invention is an adaptation of a state of the art lighting programs. It is capable of receiving data inputs automatically or manually interpreting them according to correct lighting practice and calculating the candlepower distribution from the illuminance back to the luminaire. A post processor and outputs the operational instructions to the controller 195 for the application at hand.

The operation of the system is demonstrated in home use but the method is the same for office, store and industrial applications. The input program 7A is user friendly including the use of icons representing pieces of furniture, e.g. table, lounge chair, equipment such as TV, computer etc, and visual tasks being performed such as reading, and watching TV. The homeowner moves about the room with the remote control 201. At a specific location the homeowner enters the furniture type, possible occupant postures, sitting reclining, standing etc, and visual tasks to be performed. The room and its surfaces is defined the by being positioned at a wall, entering into 201 that it is a wall at that position and at another position entering that it is a window. The control unit 201 is optionally outfitted with a photometer 202 which can be used to read the surface reflectance of the wall and transmit the data to the lighting program 7A. This is the same process a lighting designer uses to enter data to the lighting analysis programs. The lighting program as known in the art then specifies the correct lighting levels, aimings and spectrum for the different locations and uses throughout the room. This is reversing the typical design process as described earlier where the lighting fixtures performance is simulated on a computer and the results calculated. Here, the required illuminance results are known first and the fixture is then programmed to make them happen. The controller 195 uses its stored performance characteristics to determine the power supply to the SLS so that it provides the required intensities and obtain the required illuminance. The lighting calculations and programming of the power supply 195 of the light sources 191 is preferably performed in real time such that the sensor 202 detects the illuminance to corroborate the performance while the homeowner is still at the location. If the lighting is not to specification then the controller 195 readjusts the parameters so as to bring them in line. This trial and error process continues until the readings are within tolerance. The process is best carried out in the dark or when there is non-varying daylight. Alternately, the photometric reading sensors are on the luminaire and they are used to corroborate performance. Alternately, the process is automatic using feedback from the surroundings and pattern recognition to determine surroundings and applications.

Providing correct lighting for the various activities a homeowner in a room involves the use of numerous lighting regimes. Typically he or she would move about the room performing various activities with diverse lighting requirements. First, moving from the table where work was performed on the computer to a lounge chair to read the paper and finally moving to the sofa for a little relaxation watching TV. In prior-art practice, several lighting fixtures of different design are used to carry out the different tasks. In order to conserve energy each one would have to be turned on and off or dimmed as the resident moves about the room. A glare-shielded luminaire would be used for correct illumination in the computer task, while a floor lamp may provide lighting for reading on the lounge chair. General lighting from an overhead luminaire is sufficient for TV viewing. According to the present invention, as the room occupant moves about the room performing varied tasks, the motion detector 200 or camera 197 picks up the new location and from its stored templates which correlate location to lighting application, controller 195 provides the correct lighting regime.

According to the teachings of the present disclosure, the room lighting needs are provided by one or more DLFs or ADLFs including satellites or combinations thereof placed such that they are capable of providing lighting at the correct non-glaring angles for the lighting tasks at hand. The ADLFs are programmed as to the whereabouts of furniture, computer monitors, TVs etc as described above. The

ADLFs and DLF can communicate with each other and an ADLF can control a DLF and vise versa so that level lighting is accomplished in the room. Two or more DLFs can share in the illumination requirements of a location located between them. The DLF turns off its illumination towards a specific location, reads the ambient luminance and then correctly powers the SLS to provide the additional illumination. An oscillating "singing" feedback network incapable of settling is prevented by the provision of inexact timing. The DLF lighting assessment process occurs on a periodic basis as the controller surveys its numerous detectors and SLS, the complete cycle taking a number of seconds. The same process is occurring in the neighboring DLFs. A clock on the DSP controls the process. The DSP is programmed to randomly nudge the clock timing by a number of a multiple of milliseconds typical of the survey process from cycle to cycle. The similar timed assessment process with an independently random shift in timing occurs on the adjacent DLFs. Thus the chance of seesaw interaction between DLFs is insignificant. Alternately, communication between neighboring DLFs can also be used to synchronize the process and prevent feedback oscillations.

The novel lighting-application oriented approach to light-source construction, as taught by this invention impacts on the method involved with marketing the DLFs. Rather than speaking of a wattage for a lamp or lighting fixture, now with DLF technology, the area covered is the determining factor, somewhat like the coverage area of a can of paint printed on the container. The customer needs only to specify the room area and what the lighting is used for in order to select the correct luminaire. In today's prior-art process of selecting by lumen or wattage, there is an additional step, that of taking the effective lumen output and dividing it by the area of the room. Instead, a DLF is packaged and marked according to the area it will cover (when mounted at the designed for), mounting height (usually standard for most residential ceilings) and the lux it will provide or the visual tasks for which it is suited. Thus a homeowner in a store will be queried by the sales staff or be presented with instructional promotional media which allows for the determination of the room dimensions, type of room and typical activities carried out therein. The lists printed on the cartons for the various DLFs will include location types and task types. Location possibilities for consumer lighting include corridors, kitchens, bathrooms, bedrooms, play areas, garages, driveways, backyard, playing fields, steps, workrooms etc. Task possibilities which would generally be a subdivision in a location type will include reading, dining, TV viewing, exercise, sport etc. A single DLF may be suitable for more than one location and task type and be so marked. Thus typical DLFs would come in bathroom, kitchen, garage, bedroom, hallway, and etc models. The bedroom model comes in a 12ft. by 12 ft. Coverage and is also the TV room model etc. An ADLF is suitable for many more locations and applications and is so marked.

Industrial and commercial lighting DLFs are similarly marked and marketed. Mounting height determines the maximum area covered according to correct lighting practice principles and adds another variant less prevalent in the consumer market. The many DLF models will not exceed the plethora of prior art luminaire designs, as they are also based on mounting height and lighting application. While prior art luminaires rely on large reflector and every variant requires new investment in tooling, in a DLF a basic carcass will support many MSLS configurations with their particular amount of SLSs and their aimings.

In non-color critical applications for example in low lighting used for orientation a further energy saving can be obtained. LED junctions are made of different materials. The blue, green, and white illuminators utilize InGaN LEDs and the amber and red utilize AlInGaP for the junction material. Some materials are more efficient at converting electrical energy to visible light than others. As an example, (in terms only relevant at the time of this writing since the efficiencies are increasing daily), while a green LED which has the advantage of high photopic eye sensitivity to its wavelength, is producing only 30 lumen per watt, a super flux red LED can produce over 50 lumen per watt. Thus, when color rendering is not important in the lighting application at hand it is possible to shift the workload onto the more efficient LEDs. This of course must also take the eye sensitivity at the specific lighting intensity into account. While a purely scotopic rod eye response at extremely low light levels, less than .01 lux gives added sensitivity to the 510 nano-meter green blue, photopic vision at levels above 100 lux is most sensitive to the greenish yellow 555 nm wavelength. In most illuminated cases low lighting would not be below 5 to 10 lux where the sensitivity peak is around the 550 nm yellowish green. Thus two factors are used by 7 in 7A to calculate the most efficient light color of the DLF; the LED radiation power per watt multiplied by the eye sensitivity curve for the present illuminance value. In a less rigorous embodiment, if the par between the LED efficiencies is large such as in the example above, then the red LED is used combined in ratios with other wavelengths, such that the color still found acceptable by the users.

In a preferred embodiment, using pattern recognition techniques the ADLF 190 is semi or fully automatic in programming itself to correctly function where installed. The DLFs or ADLFs will adapt to the seating arrangement of room occupants in real time. In the preferred embodiment, the addition of a machine vision system with pattern recognition capabilities as is known in the art, easily deduces room occupancy and usage. The camera 197 including a wide angle or fisheye lens camera is mounted on the DLF or ADLF. In an alternate embodiment, one or more cameras in communication with the lighting system controller, has coverage of all, or part of the area to be illuminated. The camera may also serve as an illuminance and spectral measuring device as the individual detectors in the array, for example as on a CCD or CMOS array, may be read for their individual stimulus. The detector array pixels are calibrated to the room coordinates. The calibration routine can be manual or automatic. A manual method includes walking a controller around the room and programming in the coordinate to the camera system or alternately using a PC CAD program to input room coordinates overlaid on the image obtained from the camera such that the lighting system coordinates and the camera coordinates are the same. An automatic routine as in 7A uses timed firing of a coordinate-specific light source, or array of light sources and the following reading of the camera detector of light reflected to that specific coordinates pixel, or set of pixels to corroborate action between light sources and the detectors. The detector pixels 197can then be used to obtain images of the room which the controller 195 can assess as furniture, equipment or occupants. Pattern recognition methods known in the art, including neural networks, can provide a generalized stored application library of usages to the controller or the controller is an artificial intelligence controller and can learn the actual room usage with time. Outputs from the CCD arrays are analyzed by appropriate computational means employing trained pattern recognition technologies, to classify, identify or locate the contents. These techniques known in the art are covered in texts such as: Schalkhoff, Pattern Recognition, statistical, structural and neural approaches, John Wiley and Sons, New York, 1992 and Neural Networks for

Pattern Recognition by Christopher M. Bishop, Chris Bishop, Oxford University Press; (January 1996) included herein by reference. Thus, the controller with or without human intervention will program the ADLF lighting system to carry out lighting within the realm of correct lighting practice. This includes providing the correct illumination in real-time based on occupant whereabouts, activity being performed and outside factors such as sunlight contribution, time of day factors etc. Advanced robotic vision techniques including object segmentation and selective-attention modeling (Itti, Visual attention and target detection in cluttered natural scenes in Optical Engineering, Vol. 40 No. 9, September 2001 included herein by reference) will aid in identifying various room objects and the lighting program 7A will associate with their location the visual tasks and recommended lighting characteristics. In case if the machine settings are not acceptable to the users, provision is made for human intervention. Through the data input device 201 a user, the ultimate "sensor" corrects or customizes the lighting arrangement and reprograms the controller.

In a further ADLF intelligent lighting system improvement over prior-art practice, machine vision is used to control surrounding luminance. A prime example is an office application where a computer Visual Display Terminal is in use. This is an application where the quality of the localized task lighting is important. Contrast plays a major role in seeing and glare plays a role in producing veiling reflections as causing fatigue. The correct illuminating solution involves the control of surrounding luminances. A prior art workstation design will include partition, carpet, ceiling and desk surface reflectance which reduce the luminance in the workers field of view. Using the ADLFs ability to recognize the computer screen chair, desk and surrounding floor and ceiling, the illuminance in lux on each element is varied to obtain the optimal luminance. That now allows any color scheme to be used by the interior designer on the work cell decor. The ADLF will control the luminance by varying the spatial light intensity distribution over the different surfaces.

In another embodiment using the camera 197, the controller 195 is instructed to identify and track a roving speaker during a video presentation. A signaling device is used by the speaker to allow the pattern recognition program to initially lock-on and recognize a target attribute as is known in the art of object tracking. The signaling device can be a laser light pointer 202 aimed at the camera or a hand held remote control 201 in communication with the camera vision system. The controller 195, based on the camera input runs the pattern recognition routines, derives the coordinates and generates instructions to drive the specific light sources with aimings which will project light at the speaker as the speaker move about the room. It is to be understood that in a theater lighting application there is no need for a preprogrammed moving light using motors to change position. Instead a fixed DLF or ADLF with multiple light sources powers the necessary light sources to illuminate the performer as he or she moves about the stage. This actually is similar to the banks of shuttered lights used in present day stage lighting. Only now the digital aspect of discrete multiple light sources allowing for a smooth transition of aimings with instantaneous control of almost infinite variation of spectrum and intensity is accomplished. The controller, once locked-on to the performer using images from the camera 197, will now follow the performer around the stage illuminating instantaneously in the intensities and spectrum as preprogrammed in the choreographic setup or in correspondence to the music or some other characteristic as in known in stage lighting practice.

An emerging problem with LED light sources is that with the increase in light conversion efficiency the LEDs are becoming ever brighter and for their small size present uncomfortable sources of glare. These high intensity light sources would have to be used with diffusers which would impair the light control characteristic. One solution is to construct the DLF large enough such that the area over which the light flux emanates is sufficiently large that the luminance in candela per square meter will not exceed allowed luminous exitance values or glare limits. In this solution of increasing the luminaire area over which the light emanates, the number of light sources at specific location may not be sufficient to provide the continuum of light distributions and spectral combinations necessary to carry out correct lighting practice as per the teachings of this invention. Another way of looking at the problem is, that with added lumen output, a few high performance LEDs could provide the illumination for a room but due to even distribution and spectrum consideration many discreet SLS are required. That is, the SLS needed for the smooth continuum, digital aspect of the invention exceeds the number required for the maximum light flux.

In a preferred embodiment the DLF or ADLF is rotated about an axis such that the time any source in the glare causing zone is exposed to an observers eye is such that it is not observed as glaring and the time the source is out of view is below the flicker rate for that intensity level. HID and fluorescent lamps operated on 50Hz have a 100 Hz flicker rate and are not considered to flicker. For aesthetic, aerodynamic and dynamic balance reasons the DLF can appear as the globe shape 190 of Fig. 12. However, the now reduced dimension DLF is spun rapidly on its axis 227 by motor 206. The LEDs can be concentrated in an arc from top to bottom along the surface 192 or be located in the concave arc section 198. The concentration of SLS in this section is sufficient to offer a large number of spectral combinations at any aiming. Two arcs of SLS 191 opposite each other for balance or one arc with counterweight can be used. With one arc a 6,000 RPM rotation rate is used to prevent flicker and with two a 3000 rpm rate. In an alternate embodiment instead of a complete globe just an arc section such as 198 runs from top to bottom. The arc is on an axis and is motorized so it rotates rapidly on its axis. The speed of rotation is such that the light source does not appear to flicker. This way a compact unit can be made since the apparent brightness is reduced. This process is possible because the eye is an integrator of light over time and persistence of vision minimizes flicker. The LEDs 191 disposed along the surface are timed to fire in the correct intensity according to the instantaneous position. The timed operation is coordinated with room location. Thus, when the spinning light sources 191are facing a corner more intense light at higher angles is projected so the far corner is illuminated equally to the areas near the DLF. The positionally correlated timed firings of the rotating DLF will illuminate as need per location per usage requirements in real time. The side of the room near the window receiving ambient daylight will receive less illumination than the opposing darker side. This is also possible because the controller electronic 195 operates much more rapidly than the mechanical motion and that the rise time of the SLS is extremely fast measured in single digit microseconds. In a preferred embodiment, the globe or arc can be placed in an outer jacket which is partially evacuated of gas. The globe or arc is then rotated in a partial vacuum envelope to reduce air friction losses.

In Figs. 13A through 13C a streetlight fixture designed according to the teachings of this invention is shown. The design and functionality distinction as compared to prior-art streetlights is derived from the multi-light source, digital design. In Fig 13A the

aesthetically designed DLF streetlight 240 is shown in a front view. The geometric shape is a derivation of the surface geometry for mounting the SLS perpendicularly thereon to obtain photometric light distribution compatible with the requirements of the street lighting application. These photometric distributions are expressed in terms of luminaire cutoff angle which refers to the angle beyond which rays capable of producing glare are prevented from exiting the fixture. Another type of classification used by the IES, refers to the elongation of the light pattern along the road in terms of Long, Medium and Short and another categorization, perpendicular to the roadway called "Type", describing the distance in units of mounting height (where the fixture is mounted), that is illuminated. The novel design includes SLS with over 100,000 hour lifetime allowing for the fixture to be factory sealed for life. This obviates the need for cleaning reflectors, as all the exterior surfaces are cleanable by rain and there are no light sources at the sharp bottom drip point where dirt normally accumulates. The compact design 240 shown mounted on a pole 241 in side view Fig 13B has a small exposure area, reducing wind induced drag force loads on the pole. This low wind factor and low weight of the electronic components allows for the use of a less expensive pole. The pole arm 242 fits into slipfitter 243 which is provided to perform the mechanical fixing means of the DLF 240. Fig. 13C is a side section view through the center of the fixture. The electrical power and communications connection is made to a connector block 244 mounted such that it accessible for the external wiring of the fixture during installation. The grid power is connected to power supply 245 and the data to the controller DSP 246. A dedicated communications line is used or the data is sent over the power line using communications protocols as known in the industry and the DLF communicate with each other or with a central control. The SLS aimings are shown in front view Fig. 13A where the SLS aimings to the right 247 and left 248 along the roadway show how an even distribution pattern out to the maximum design distance from the pole center is obtained. This distance is a function of the fixture mounting height and cutoff angle. Hole-through SLS units have been drawn to illustrate the point but the principle the design is valid for SMD, SMT, the chip 94 design of Fig, 6 as well as other package arrangements known in the art. Many more SLS 249 are concentrated at the larger angles 250 to illuminate out to the extremes of the area covered by the DLF. Fewer SLS 251 are needed at the small angles near the pole to maintain with equal illumination. The SLS at the cutoff angle 250 have a tightly controlled beam spread 252 to maintain a sharp cutoff, minimize glare and eliminate spill light. The SLS 253 in the interior have a wider beam spread 254. The DLF 240 projects light in a highly controlled pattern perpendicular to the roadway as well SLS 255 as seen in the side sectional view Fig. 13C are aimed such that the cutoff angle 256 is out to the road width with or without the shoulders as designed. In applications where illumination for a sidewalk is required, "house side" illumination is provided by inward SLS aimings 257. On a dual carriageway road where the illumination provided is limited to a single carriageway, the lighting from the roadway fixture need not be symmetric about the nadir along the roadway. While approaching the streetlight, glare is to be avoided and the cut-off angles must be small for light aimed at the advancing vehicles. However, after passing the streetlight, the lighting in the direction of travel may be provided at increased beam angle from nadir and still not cause glare. This would significantly increase pole spacing saving cost and eliminating hazardous poles.

In all stages of the SLS positioning and aiming design process which works in reverse of the normal process by engineering from the illumination required on the working surface back to the light source. Glare ratings for the design are checked to make sure

they are within the acceptable limits. If the light source concentration is such that drivers or pedestrians in normal eye viewing conditions would experience glare then the luminous exitance is lowered by design changes in the geometry or light source attributes. The ramifications of a dynamic and exact light control are numerous in a street light luminaire. First there is no spill light and no light trespass. If the position of a luminaire is such that light is shining into a house the individual SLS at that aiming is not powered by the control 246. All the light power is placed where needed in the designed for illumination intensity, neither in deficit nor excess. While prior art luminaire show 80% of the light falling in the area designed to be illuminated, the DLF will have a near 100% utilization factor.

When artificial intelligence methods known in the art is combined with the fine control and functional flexibility of the DLF additional advantages are realized. A detector or camera 258 in concert with a logic controller 246 is capable of providing the road lighting needs to a driver or group of drivers in according to the time of day, needs of the roadway layout and usage at any moment. The detector 258 will provide signal to the controller 246 of the ambient lighting conditions. When daylight is no longer sufficient for viewing such as at dusk the DLF will add lighting. At dawn the process is reversed. In an alternate embodiment the roadway lighting can be dimmed if there are no approaching vehicles. The detector or camera 258 is capable of detecting oncoming and retreating traffic. The headlights and backlights are used or more sophisticated pattern recognition is used to determine traffic on the roadway. When there is no traffic the luminaire will illuminate at a fraction of the power used to generate the 5 or 10 lux used in street lighting. Taken to the extreme the controllability of the DLFs or series of communicating DLF street lights allows for the lighting to precede the vehicle by the stopping distance, say 300 ft. at 65MPH (91 meters), and dim the unused lighting behind the driver if it is not necessary for other drivers. In the late hours of the night when traffic is low this function can save significant amount of energy. A typical 250W HPS streetlight will consume over 25,000Kwh in its 20 yr lifetime. On moonlit nights the dimming of the DLF can be greater as moonlight provides up 0.10 lux. The dimming of SLS actually improves their lighting efficiency and prolongs lifetime. Dimming of HID sources has a negative return, typically 10% light at 50% power. The color spectrum of the light is also varied in the DLF to match the intensity levels. Here an additional efficiency boost is achieved when the added scotopic eye sensitivity to 510 nm bluish white similar to the pale moonlight is taken into account.

It has been shown that certain colors of light i.e. of different spectral power distribution (SPD) are perceived to be more glaring than others in night driving. Studies of drivers (Flannagan, M. J., (1999). Subjective and objective aspects of headlamp glare: Effects of size and spectral power distribution, Report No. UMTRI-99 -36). Ann Arbor: The University of Michigan Transportation Research Institute.) indicate that blue-white color has been found to cause more glare discomfort than yellow light. On the other hand, studies have shown that driver night vision is better under the blue-white spectral power distribution. Recent laboratory studies have also shown, for example, off-axis detection peripheral detection can be better for bluish, metal halide lamps than for yellowish, high pressure sodium lamps at the same photopically specified light level (Bullough, J. and Rea, M. S. 2000. Simulated driving performance and peripheral detection at mesopic light levels, Lighting Research and Technology, 32 (4), 194-198). In the DLF streetlight luminaire it is possible to use the blue-white SPD to illuminate most of the roadway yet increase the

cutoff angle, which is determined by glare considerations, by using yellow-white SPD light at the large angles which throw the light further along the road. The higher angle lighting provides more vertical lumens and is actually more effective at illuminating objects along the roadway. The increased visibility afforded by the added vertical lumens at high angles offsets the decrease in visibility due to the yellow-white SPD. This means that the overall visibility over the roadway sections is constant. Thus, SLS near the angle 250 would have a yellow-white non-glaring SPD while interior SLS such as 253 would have the superior blue-white SPD. The higher the cutoff angle, the fewer luminaires that are required to illuminate a roadway. The same differentiation would be possible with SLSs 255 in the side view of which some illuminate the sidewalk 257, some the right lane and others the left lane. The SPD of the SLSs at the high glare causing angles 250 facing the oncoming driver aimed to cover the near lane would be yellowish while those SLS covering the same lane but now to the rear of the receding driver, will still be of bluish-white SPD. The opposite is true for the far lane. The SPD of the SLS aimed 257 at covering the sidewalk would again be in the blue-white to aid in peripheral vision detection of pedestrians or objects approaching the roadway from the side.

As with all correct lighting practice the visual surroundings at any instant in time determine the amount of illumination required to carry out visual tasks including the luminance of background surfaces. Roadway luminance as detailed in the IES Handbook pages 751-779, is the preferred factor used in specifying required illumination levels. Freshly paved blacktop with its diffuse reflection will change over time to a mostly specular reflection. The higher luminance value pavement requires less illumination to see objects. This characteristic changes over time with wear and periodic road maintenance and illumination levels need to vary accordingly. A detection by 258 of this road luminance will provide the controller will the data necessary to set the required illumination. Roadway activity is another factor in determining illumination levels. This factor often changes over days of the week or seasons of the year. An adaptive DLF with detectors 258 and computer devices 246 capable of recording this traffic activity will provide the correct illumination for the traffic situation at hand.

Though the design of a streetlight has been detailed the same design process is valid for floodlights and other outdoor lighting applications. The use of the SLS of specific spatial candlepower distributions at particular aimings, the use of tighter beams at the edges of coverage, the non-glare design and the optional use of logical control are as applicable to DLF floodlight design as to the street light design.

Fig. 14 is a flow chart which illustrates the general design concept which allows anyone to build a multi-light source lighting fixture from the ground up, tailor made to the final application. This process differs fundamentally from prior art lighting fixture design. Rather than building a fixture around a common lamp and then coercing the usually isotropically radiating lamp to perform in a certain application, the lighting application is used to describe the light source construction. The light source construction is unique in that its flux density is spatially differentiated over its volume in concert with its final orientation when in use. The light source design then defines the supportive power, control and mechanical elements. These elements are then integrated into a single unit with shared components and packaging. The method for designing an application oriented luminaire designed according to correct lighting practice, providing the correct light intensity, spectrum, and spatial distribution of

intensity and spectrum, suited to the specific lighting application, would comprise a number of steps some of which can be left out of the process while others may be added including a) determining the lighting application, and the recommended lighting practices for the application b) determining the luminaire mounting height, illumination area covered and surrounding conditions typical of the application c) determining candlepower required to effect the required illumination over the area d) selecting SLS types capable of producing required intensities and spectrum at highest conversion efficiencies at lowest economic cost e) determining SLS beam spreads f)determining SLS aimings for the required distribution pattern g) determining electronics to control and power SLS h) determining lighting fixture surface geometry and size i)testing whether the glare rating for the viewing angle is acceptable j) if the glare rating is not acceptable, then changing SLS beam spread, fixture geometries, or size, resulting in an acceptable glare rating; and, h)when the glare rating is acceptable, then designing the luminaire aesthetics for the application.

The digital lighting concept is extended to transportation vehicle applications. A headlamp for an automobile uses multiple light sources based on electro luminescence of semiconductor junctions. The proposed unique approach is to combine the lighting engineering function i.e. the correct light distribution, color spectrum and level necessary for the visual task at hand into the lamp such that the digital lamp obviates the need for additional light controls and fixtures. The digital electronic lamp utilizes 1/3 the energy and has over 100,000 hours lifetime versus 2000 for an automotive incandescent lamp and can be rapidly switched on and off without deleteriously affecting lifetime. (Quite the opposite, off time is not part of the lifetime). The multiple light-source, digital device, is an electronic headlight which provides the driver with the correct aiming, illumination level and distribution (e.g. parking lights, low beam, high beam, lighting around curves and corners) based on input from the vehicle's speed, steering wheel position, turn signal indicator and detection of approaching headlights. These functions are carried out automatically however; the standard manual override controls are still maintained.

Headlamp glare is addressed in two alternate ways. European regulators recognize the danger presented by excessive headlamp glare, and so European cars with HID lamps must have dynamic headlamp leveling. On-the-fly headlamp vertical aim adjustment has been required by European directives for quite some time now, but dashboard dial control of the vertical aim is no longer acceptable. Recent European regulations require that the headlamp leveling of HID-equipped cars be linked to the suspension system of the car so the lamps don't glare as much to oncoming traffic when the rear of the car is loaded-down or the car is heading up a small hill. The digital headlamp solves this problem by automatically sensing the angle of the headlamp assembly and will employ in real time only the properly aimed light sources to illuminate so as not to glare oncoming traffic.

An alternate method of glare control is accomplished by rapidly switching on and off the headlamp light output or only the high beam portion thereof at such a rate that flicker is not observed by the driver. This persistence of vision is the same effect on which motion picture viewing operates using shutters to intermittently block the light while the frame changes. On the oncoming vehicle, a variable light transmitting element, an electronic shutter, located in the driver's field of view is rapidly switched to a blocking state synchronized in time with the on state of the oncoming car's

headlamp. The situation is vise versa for the driver in the other vehicle such that in the instant one driver is seeing the other is not.

The Spectral Power Distribution, SPD, of the headlamp is also variable as a function of the area being illuminated. Studies by Flannagan cited earlier, have shown a preference by drivers for yellow tinted headlights on oncoming vehicles. The drivers find the yellowish colored light of an incandescent less glaring vs. the bluish "white" light of an HID Metal Halide lamp. On the other hand recent studies by Bullough, cited earlier, on driver's peripheral night vision show the clear benefits of HID MH headlamps in detecting pedestrians and objects along the side of the road. Thus an ideal solution is to have the SPD in that part of the beam visible to oncoming drivers be of the less glaring yellowish type while the beams headed everywhere else would be of the blue-white SPD for increased driver visibility. In fog or snow the color spectrum would also be adjusted so as to maximize visibility. Yellow colored lights are used in fog and snow conditions to prevent flashback. Thus according to the teachings of this invention the DLF headlamps serve as the fog-lamps. The digital headlamp will automatically or manually be adjusted to the optimal intensity and SPD lighting parameters for the environmental conditions at hand.

Present advances in automobile lighting include Adaptive Frontal-lighting Systems which aid in seeing around curves and other features in the road. In these systems the light distribution pattern and color spectrum will be changed according to the instantaneous road conditions at hand. Thus, the headlamp now has much more flexibility than the high beam / low beam variation of today. At any instant in time the intensity, spectrum and beam pattern of the headlamp may be varied as a function of the drivers intent, lay of the road and environmental factors. A GPS system on the car may also let the headlamps system know of curves up ahead, one way traffic and others factors such the headlamp may be operated in the optimal mode at that instantaneous location. With sensors sensitive to environmental surroundings such as ambient light, fog or snow conditions etc. lighting can be adapted to the optimal operating regime.

Additional features include an optional concentrated flashlight type of beam to illuminate distant overhead and roadside signs, which due to the narrow directed beam will not blind oncoming traffic. Image recognition via a camera will allow the beam to follow the retroreflective sign as the vehicle moves or the signs will be provided with a special marker for this purpose. In this way the headlamp cutoff above horizontal except for the concentrated sign beam can be total.

Fig. 15 illustrates a preferred embodiment of a digital automotive headlamp. A headlamp is a specialty lighting application unrivaled in terms of the need for controllability and is especially suitable to the methods and devices described in this disclosure. The headlamp fixture is unique in the continuum of beam patterns, intensities and color spectrum. The number of possible control modes are: 1. Parking Lights. 2. Low Beam lights; 3. High Beam; 4. Cornering Lights; 5. Load leveling adjustment; 6. Integral turn signal indicator, 7. Programmable alternate beam spread selection so that one headlamp fulfills the different sets of legal regulations for the high and low beam in different regions of the world such as the U.S.A., Japan and Europe; 8. Driver preferential color; 9. Oncoming vehicle or vehicle-ahead driver's preferred color 10. Color of ambulances extra headlamp provides red flashes to be more easily picked up in rear view mirror; and 11. Non-Glaring pulsed headlamps.

Input data to the controller would first and foremost be in the control of the driver and would consist of an overriding manual selector switch. Otherwise headlamp control is automatic, from turning on automatically when ambient lighting levels fall to such a level where it is advantageous to have headlamps on, either to aid in illuminating the way ahead or facilitate being seen by others, to automatic dimming of high beam due to detection of oncoming vehicles and shut off when ambient lighting levels are sufficient. A possible control system for such purposes is described in United States Patent 6,281,632 by Stam, et-al from August 28, 2001 titled: A Continuously variable headlamp control incorporated herein by reference. The patent describes how continuously variable headlamps offer greater flexibility for roadway illumination but offer challenges in automatic control design. Each continuously variable headlamp has an effective illumination range varied by changing at least one parameter from a set including horizontal direction aimed, vertical direction aimed, and intensity emitted. Stam discloses a system for automatically controlling continuously variable headlamps on a controlled vehicle includes an imaging system capable of determining lateral and elevational locations of headlamps from oncoming vehicles and tail lamps from leading vehicles.

Using a control system such as that above, many driver functions are automated. With the digital headlamp, automatic control of headlight beam is a function of speed of travel, that is: when vehicle is in Park the parking lights are on, when speed is low the lamp beam is aimed sufficiently forward to give ample reaction to brake for objects in the vehicle's path per the speed it is traveling up to the intensity, angle and thus distance which is the upper legal limit for the beam. If there is no oncoming traffic then it operates as the high beam. If there is oncoming traffic then it acts as the regular low beam.

Additional features can include an optional very narrow flashlight type of beam. Present day LEDs come in very narrow aimings such as two half angle 8 degrees which may not be narrow enough (a 10 meter spread for 150 meters down the road which may be sufficiently aimed to the right) but with need, smaller angles are also feasible. Such a beam at the correct narrow aiming can continue to illuminate far ahead (in high beam) without blinding oncoming traffic. Analysis by a detector or an imaging system of the oncoming vehicles position (using its headlights for example) can be used to determine which exact aiming is the maximum allowable for any given traffic situation and road layout.

Using color and pattern recognition techniques it is possible to determine what is a sign. It is then possible to provide the equivalent of "task lighting"and use the controller and properly aimed SLS to follow and illuminate distant overhead and roadside signs for a longer time, yet not blind oncoming traffic due to the narrow beam.

Wavelength specific SLSs in the infrared or near Ultra Violet spectrum, not visible to the driver by the unaided eye are used for communication between vehicles and roadway controllers or toll booths. Infrared SLS will provide radiation to be reflected from objects for night vision cameras. UV SLS are used for or illuminating UV fluorescent dyes in clothing bicycles and baby carriages to increase pedestrian visibility as is known in the art.

In fig. 16 a headlamp 270 of a land, sea or air vehicle 271 is shown in front view 272, side view of a section 273 and top view of a section 274. A discreet SLS light source such as an LED 275 with specific location within the cluster276 has a specific spatial light distribution, color wavelength and aiming relative to the vehicle, such as straight ahead, and or downwards and or off towards the right or left. The SLS may have one junction and be monochromatic or have a many junctions and provide a wide spectral power distribution and the power to the SLS may be varied. An SLS can also be a "white" LED. For example a typical "white" LED such as a Luxeon ® white LED such as LXHL-XXXX will have a colder "bluish" 4,500K color temperature. LED 277 at a second location within the same cluster may have a similar or dissimilar aiming, wavelength and spatial light distribution. The concept cluster shown by the dashed lines, is used to describe a control function and is not necessarily related to contiguous placement. In general a cluster may be deemed a separate grouping due to a function it performs, either exclusively or in conjunction with other clusters or sub-clusters, such as high beam function versus a second cluster 278 which may provide a parking light function. The same SLS may be used, albeit at different intensities, for both the above functions and thus clusters may overlap and be discontinuous. As two LEDs may be of different wavelengths, operating in unison at different power levels will yield a variable light "color". A possible combination of two or more LEDs such as a blue, 470 nanometer and an amber 590, nanometer wavelength LED would yield a "white" light similar to the yellow tint of sunrise at the correct power intensity setting for each lamp. Coincidently aimed LEDs 275 and 277, at the correct output intensity of each LED, with more power in the amber will accomplish this. Thus when following another vehicle, assuming, as drivers have reported, that they find yellow incandescent colored headlamps less offending than the HID blue-white color, the external controller 279 which receives traffic data from sensors 280 would shift wavelength specific radiant power contributions of SLSs such that the resultant on the CIE chromacity diagram would be yellowish. If however there is no car immediately ahead or oncoming traffic, then assuming as drivers reported they see further with bluish light, then the energy of the 490 nanometer LED is increased and the resultant color will shift to bluish white, allowing the driver to better ascertain road conditions further up ahead. The LEDs, their packages, wavelength and light source type are mentioned by way of example and it is clear that any other types of discreet light sources, such as the chip 95 of Fig. 6, with differing aimings wavelengths and distributions could be used to accomplish the same functions.

To further illustrate the innovative DLF headlamp device, a cluster 281 would be used to illuminate around a corner. Thus when the turn indicator has been selected or the steering wheel has been rotated by the driver, the DLF headlamp is powered by the controller to illuminate sideways at angles which according to the speed of travel is correct. (A driver can't make a 90-degree turn traveling 90 kph but from a stop, the turn may be around a corner.) In a preferred embodiment a multitude of LEDs in 281 are differently aimed in top view 274 showing the top view of the cluster 282 with SLS 283 angled less outwards and SLS 284 angled more outward with the forward aiming (distance ahead of the vehicle) of the more angled SLS 284, closer in for illuminating sharp turn, than that of the less angled SLS 283 for a shallow curve. Side sectional view 273 shows a general downward aiming with SLSs of front view 272 cluster 285 corresponding to cluster 286 shown from the side. The cluster 286 is the most angled downward such as for a slow driving as in a parking light type of application where the idea is not to cause glare yet be seen. The parking light function can also be done with higher angled LEDs by just lowering the intensity to very low

non-glaring intensities. Cluster 287 of the front view would be the main illuminating workhorse and is shown in side view 273 as angled SLSs in cluster 288 and top view 274 as cluster 289. The top cluster 276 shown in side view 273, as 290 would perform alone or in tandem with part of 287 the high beam lighting function.

Many more degrees of flexibility are possible with the digital headlamp by varying the timing of the LED operation. For example, more intense illumination of red LEDs for a fraction of time would give the effect of flashing ambulance lights if required by the type of vehicle and could be effected by programming alone without the need for a different type of headlamp greatly reducing the different types of headlights that need to be installed on a vehicle or maintained in inventory. That is the same MSLS light engine device could be placed in different aesthetic packages by different manufacturers and could provide different functions. In one embodiment the digital headlamp carries out all the functions in a single unit 270. SLSs have different locations and aimings 291 and 292 to carry out the functions. In another embodiment 293 the spotlight sign illuminating function or corner lighting function is in a separate package 294 with its aiming 295. The low and high beam lighting is accomplished with fixture 296 and its general aiming 297. The separate units may be dictated by design or sales considerations and yield more flexibility but are within the scope of the overall integral digital lamp headlight device. The controller 279 will addresses the power supply of each DLF headlamp 270, 296 and 294 independently such that each lamp performs its functions separately.

In another embodiment Fig. 16 the digital headlights 300 and 301 on vehicle 302 are also part of an anti-glare system operating between two or more vehicles 303. The system is designed to prevent discomfort and disability glare from oncoming headlights or glaring headlights viewed in the rear view or side mirrors. The anti-headlight-glare system works based on the "persistence of vision" of the human eye-brain system and is accomplished by the synchronization of the illuminating and light attenuating or blocking devices which intermittently enable the driver to see the night scene ahead but not the counter-timed glare of oncoming vehicles. The elimination of blinding glare will increase traffic safety, as a driver may lose vision may for a number of seconds following a glare event. It will also prevent driver fatigue caused by glaring headlights. Another of the advantages of the anti-glare system is that it increases the distance that a driver can see at night by allowing the use of more powerful headlamps aimed at higher angles, thus illuminating more of the road ahead while not blinding oncoming traffic. The anti-glare system consists of pulsed headlamps 304 and 305 on the oncoming vehicle 303 and a synchronized on/off switched light filtering or blocking element 306A in between the driver's eyes 307 and the glare sources 304 and 305. The light attenuating element is normally highly transmissive of light i.e., see-through. When energized, the light-attenuating element turns non-transmissive and attenuates or totally blocks the glare intensity. The attenuating element is similar in operation to the fast acting automatic darkening welding helmets commercially available, only here the off switching is also very rapid. The glare, or light-attenuating element may be the windshield, a part of the windshield be a specific element located on or within the windshield 306A and 308A or on a visor located in front of the driver shown in 306B and 308B. The light attenuating device 306A or 306B is synchronized with the oncoming headlight such that when low-beam or even high beam, glare causing headlamps 300 and 301 of vehicle "one"302 is "on" the light attenuating device 308A or 308B on vehicle "two"303 is toggled into a mode which reduces or totally blocks the light beams.

Conversely, in the next instant, when the headlamps 304 and 305 of vehicle "two"303 is "on", that is, in the glare causing mode, the light attenuating device 306 on vehicle "one" 302 is switched into a mode, which reduces or totally blocks the light beams. The light-attenuating device 306A or 306B consists of an LCD, ferroelectric, SPD, electrochromic or any other medium that can be switched between substantially light transmitting to substantially light blocking in the form of a screen, visor or film. It may be placed on the windshield from without or within, in between the glass layers of the windshield safety glass 306A or positioned anywhere in between the drivers eyes and windshield 306B including being worn as eye glasses. A motorcyclist would have it installed in the visor of the helmet or on a windscreen. The speed of vision is slow relative to electronic pulsation and depending on the illumination level persistence of vision will fuse on/off levels into a constant flicker free level. Motion pictures operate at 24 frames per second. For scotopic nighttime levels 10 HZ is sufficiently flicker free while at high levels of illumination 60 Hz is required. Totally flicker-free operation is assured at 120Hz operation even for peripheral vision which is more sensitive to movement.

LEDs are excellent light sources for a pulsed lamp since they are not damaged by on/off cycling (actually off-time adds to the overall lifetime) as are the prior-art incandescent and other cathode based lamps. Rise time to full output is on the order of microseconds, much faster than necessary. The pulsed SLS is operated at a higher power during the on-time of the duty cycle to offset for the off-time in order to produce the required illumination. This is typical of normal LED operation which may be run in DC mode or pulsed, AC operation. Actually, HID lamps cycle on/off at twice the line frequency and the eye integrates the light intensity over time. However, it should be understood that incandescent or any other lamp switchable within the constraints of the flicker free visual requirement are acceptable for use according to the teachings of this invention. In an alternative embodiment, the lamp may be a state of the art incandescent, halogen or HID lamp and the switching is accomplished by an additional light-attenuating element placed in front of the light source. Alternately, electronic signal control circuitry can rapidly switch an HID or incandescent headlamp used in the anti-glare system. The lamp need not totally turn off, the requirement is that during the seeing portion of time when the driver's light attenuating element is letting light through un-attenuated, the light intensity reaching the eye is non-glaring. Therefore it shall be considered that present state of the art incandescent and HID headlamps operated in a pulsed mode fall under the realm of the present invention. That is, any headlamp system where the high beam is toggled such that it is synchronized with a light-blocking element before the driver's eyes in the approaching vehicle is included within this disclosure. It is also to be understood that the headlamps when not in high beam mode may not be totally off rather they can be in a non-glaring low beam mode. This leaves the vehicle visible to oncoming traffic.

It is to be understood that for the system to work, all oncoming vehicles using high beam synchronized blocking must be working according to the same timing among them versus all the traffic headed in the opposite direction. A timing protocol based on major heading determines the synchronization. Thus, on a substantially north south route, a train of traffic headed north will all be similarly timed and counter synchronized with all southbound traffic. The blocking screen's timing is synchronized with the oncoming high beam headlight's timing either universally, through a global clock system such as that of the global positioning system GPS or

the National Institute of Standards and Technology atomic clock broadcast over radio station WWVB located in Fort Collins, Colorado or locally through communication among vehicles in proximity to being within the line of sight. A combination of directional data together with a timing protocol based on direction will determine the synchronization among proximate north/south and east/westbound vehicles. The vehicles direction data is derived from an onboard compass or gyro or GPS to eliminate the influence of roadway curves in cases of borderline directionality, the vehicle's direction for synchronization is not the instantaneous reading but rather is based on distance traveled over time and previous headings history. A stop and turn for example will change the synchronization while a smooth curve will wait for an oncoming cars synchronization to indicate that the road ahead is actually in a new heading unless sufficient elapsed time makes it clear the car is on a new course. The protocol will give benefit to the north on a 45 degree North/East heading and to the south on a 135-degree heading. GPS location and route recognition can also be used to set synchronization protocols for opposing vehicles. In one embodiment, the communication between vehicles for synchronization is effected through the headlamps themselves either through modulations in visible light LEDs of the digital headlight itself or with LEDs, radio or infrared emitters dedicated for the purpose 173. Detectors 174 on the vehicle, pick up the signal and signal-processing equipment passes the information on to the controlling unit 175.

Glare attenuating elements can be placed over the mirror surfaces or the side windows where the glare from the side mirrors passes. Thus not only the glare from oncoming headlights through the windshield is blocked but also glaring beams emanating from following vehicles, reflected off the rear and side view mirrors is controlled. To eliminate glare off the mirror 176 from reaching the driver's eyes from the side mirrors 177, a pulsed blocking screen or film 178 is placed on the driver facing side of the mirror's the reflecting surface. Similarly a rearview mirror 179 is embodied with a pulsed blocking screen or film. The timing of the modes in this instance is such that the light-attenuating mode occurs at the same time as the glaring or high beam headlamp mode since all cars in the same direction are in glaring mode at the same instant. All mirrors are synchronized to block the headlight glare coming from the rear which are on at the same synchronization time as that of the first lead vehicle in the traffic train.

In another embodiment additional information used to control the headlight aiming can come from analysis of the driver's eye movement and gaze. The headlight aiming system obtains information from a driver eye tracking system concerning the driver's gaze (i.e. what the driver is looking at). Analysis of saccade can be used to instantaneously predict where the driver will end up looking and the headlight intensity in that aiming changed to illuminate the area where the driver wishes to see in advance of the driver's re-accommodation. A machine vision system using pattern recognition and other object identification techniques to discern eye gaze direction, is contrived of the camera 316 with a view of the driver's eyes, infrared emitters 317 and the computer logic system 311. The data obtained is analyzed according to eye tracking methods and algorithms known in the art of in a computer routine 7A to adjust the light aimings of the headlamps according to the drivers gaze at required intensities. The allowed intensities at any aiming take glare considerations into account so as not to cause offending glare. In another embodiment an outward and inward facing camera 316 is used to acquire both images of the scene ahead and the driver's gaze and using both sets of data adjust the headlamp illumination.

Accordingly it has been illustrated in the streetlight and headlamp application the benefit of a multiple-light source illuminating device. The flexible characteristics of the DLF allow for spatial variations of the intensity and spectral power distribution of the light over the area covered. When the element of variation of intensity and SPD with time over the area covered is introduced another dimension of flexibility is introduced. These properties are unique to the DLF and allow them to deal with dynamic lighting situations in a way not afforded by prior-art lighting devices. When combined with devices capable of detection changes in the surrounding environment the flexible DLF is capable of changing the illumination so as to provide the optimal lighting solution in real-time.

Fig. 17 illustrates a power supply circuit used on a DLF such as the Surface or Railing Mount Discrete 66 or Distributed 70 Digital Lighting Fixture of figures 4 and 5. The circuit controls current and illustrates the use of two disparate LED sets one red colored with specific voltage and current characteristics and the other green colored with its own voltage characteristics. When operated in this quanta and regime of voltage and current the combined output light is whitish in color according to the earlier teachings of this disclosure.

New Preferred and Additional Embodiments

Referring now to the invention in more detail, in Fig. 18A there is shown an illuminating or irradiating device which is capable of being adjusted in situ to match the radiation output with the actual illuminating requirements of the surround where the lighting fixture has been installed. As an example, the device is a lighting fixture and the installation is in a chemical processing plant which is an open facility with piping and vessels placed in the structure with walkways, floors and stairs made of metal grating. The walkways, vessels, machinery and piping needs to be illuminated at night by lighting fixtures placed on the structural support uprights along the walkways. In this lighting application example the walkways are at the exterior edge of the structure with the piping and machinery towards the interior. Beyond the walkway safety fence there is no structure and no need for illumination. The spatial light distribution pattern of the lighting fixture shown in Fig. 18A can be arranged so as to illuminate inwards towards the vessels, machinery and piping as well as downward along the walkways and stairs but not outward into free space.

The lighting fixture 410 is comprised of light sources 411. The multiple light sources are referred to as LEDs, Light Emitting Diodes which is but one type of exemplary light sources used herein. Light sources referred to in this disclosure include any of a wide range of visible and non-visible electromagnetic radiation emitting or generating devices formed from organic or inorganic semiconductor materials such as LEDs, organic light emitting diodes, OLEDs and all gaseous high and low intensity discharge lamps, incandescent filament and other solid state light sources. The light sources 411 shown in Figs. 18A and 18B have means to be coupled with apparatus for modifying the light output of LED chips or arrays of chips 412 such as a reflector 413 which yields a symmetric light distribution or an asymmetric reflector 414 which yields a substantially asymmetric light distribution. An optical lens or light guide 415, or other refractive or diffractive device may be used to modify the light output as well as phosphors or filters within the light guide 415 which may be used to add or filter

out certain wavelengths. The spatial light distribution of the light source refers to the luminous flux emanating from the light source 411 at various candle power intensities as a function of the angle. The light source 411 has a characteristic angular light distribution 416 also called herein beam spread and when installed on a lighting fixture attached to the building, object therein or lighting pole with a specific orientation in the surrounding living space, the beam axis 417 will have a particular aiming towards surfaces within the living space and therefore the light source will illuminate only the specific surfaces it is intended to fall upon. In an embodiment of the invention a light source module 411 is comprised of the one or more LED chip 412, optical modifying device 413, 414, or 415, a heat dissipative element 418 such as a heat sink and a physical and/or electrical connecting element for the LED chip 412 such as a printed circuit board 419. In one embodiment a very narrow beam laser LED is mounted in the array of chips 412 such that it shines along the optical axis of the light module 411. In an embodiment of the LED the beam spread has been determined on the die level without the need for additional optical modifying devices as part of the light module 411.

A preferred embodiment of the invention is a lighting fixture comprised of many light sources of which some or all can be separately aimed and powered so as to illuminate areas, surfaces or objects in a room in a most correct, efficient and comfortable manner or for a desired lighting effect. The overall luminaire 410 spatial light distribution at various angles is comprised of that of the individual light sources. Thus when the multiplicity of light sources having their respective light distribution patterns, which are substantially directional and subtend lesser angles than those of the overall light distribution pattern are mounted and arranged on the lighting fixture structure their respective directional light distributions combine to form a wider overall light fixture distribution pattern. The overall distribution pattern is efficiently formed directly by the multiplicity of light sources without recourse to inefficient reflectors or refractors. Using a goniophotometer to measure over space the emanating light intensity in the various directions one obtains the overall spatial light distribution pattern of the luminaire 410.

Using commercially available LEDs such as the Artavi 10° product from Illumitex which offers 90% of the light output in 10 degrees of the beam, it is possible to generate well controlled light distribution patterns with minimal spill light. Thus the Coefficient of Utilization (CU) or the utilization factor of the luminaire is high. That is, the ratio of the luminous flux (lumens) from a luminaire received on the work-plane to the lumens emitted by all the luminaire's light sources alone. The Illumitex LED package emits light in a uniform, highly-precise beam directly from the source. The result is that with die-level optical integration, the need for cumbersome and inefficient secondary optics to control light is obviated. Using well defined light beams to illuminate the area allows for the floor surface in the distant corners of a square room to have the same illuminance as the floor at the nadir, directly beneath the luminaire. This results in high uniformity which is a measure of variation of illuminance over a given plane, expressed as either the ratio of the minimum to the maximum illuminance or the ratio of the minimum to the average illuminance and a measure of the energy efficiency of the luminaire system.

In order to alter the spatial light distribution, the lighting fixture 410 has apparatus such as joints and flexible electrical connections giving it the ability to morph or change shape. That is, by the alteration of fixture geometry, moving structures or arms

on which the light sources are mounted or by changing the LEDs' refractor or reflector geometry, the direction of the light emanating from groups or even individual light sources is modified so as to generate an overall site specific light distribution pattern. For example LEDs are mounted on moveable luminaire structural elements such as the end of posts, on bars or curved arms which can be adjusted to provide various symmetrical and asymmetrical illumination patterns as the installation requires. In the lighting fixture 410 the arms, such as arm 420 has apparatus to swivel around the central support post 421. In an embodiment of the invention control electronics 422 have electronic means and circuitry configured to provide different power levels to LEDs or groups of LEDs such that the light intensity in any given direction and angular aiming may be varied as needed. In an embodiment of the invention the power supply and control electronics 422 are further defined to provide power only in the amount needed using a logical controller 428. Controller 428 performance can be further enabled with sensor 429 providing information about the surroundings. The resulting light fixture embodiment described is thus a Field Adjustable Multiple-light-source Luminaire or FAML.

Thus in Fig. 18A the beam spread 423 of LED 411 differs from the beam spread 424 of a LED light source 425 which may have a wider area from which the light exits so that its higher angled light output will not be as bright so as not to cause glare. An accessory reflector 426 may be used to shield from glaring rays. The method disclosed for reducing the glare from concentrated high luminance light sources is the use of light guides to reduce the luminous emmitance or luminance of a very bright LED. Light guides using the principle of total internal reflection redirect the light. They may in addition be used to increase the area from which the light flux is exiting and thus reduce the luminance or luminosity of the light source.

Fig. 19 shows a light guide which can be used to redirect the light from a light source and/or increase the area from which the light is exiting in order to reduce the apparent brightness. The light guide is constructed of a transparent material with an index of refraction greater than that of air. The light guide 430 will accept light rays emanating at large angles away from the beam axis and bend the rays to smaller angles from the axis thus producing a narrow beam. Light produced by the LED 412 at various angles enters the aperture 431. The light then bends as total internal reflection contains it within the walls of the curved light guide and exits from the light guide at surface 432 with a different aiming. More than one light guide can be used and when stacked light exiting the light source at different angle can be directed outwards at different angles or the same angle. Light guide assembly 433 is shown with two light guides stacked but many similar or different beam modifying characteristic light guides can be stacked for a unique total light distribution resulting from the source. Thus in Fig. 18B the optical device 415 can be a light guide assembly 433 as shown in Fig. 19 which has been added over a light source in Fig. 18A aimed at a potentially glaring angle as shown covered by the light guide assembly 433. The exit surface 432 may be a lens, a Fresnel lens or microlens whose optical features enable precise control of uniformity, exit angle and beam spread. In addition any of the surfaces may be covered with optical substrate or films to reduce light loss on entry or exit, frustrate the total internal reflection or filter or control the light. Light guides may also be asymmetrical.

In an alternate embodiment when using a single light source in a FAML yet an asymmetric spatial light distribution is desired, light guide assembly 434 made of

light guide segments 435 is designed take light from the single light source and spatially differentiate its delivery to different parts of a room. For example, if the light fixture light source is located on the ceiling in the center of a square room and the assembly 434 is turned over so the light exits downward; then when the light exits the surface 436 with a Lambertian distribution and the segments are aimed in the direction of the corners of the room, a substantially homogeneous illumination can be obtained on a work plane near the floor in the square room. More than one segment of assembly 434 can be stacked and light guides with different light exiting directions can take the light of one light source and symmetrically or asymmetrically distribute over an area. Combined with reflective control elements 437 added within, upon the surface or external to the light guide further light control can be achieved.

While light guides are known for their ability to carry and redirect light, in this disclosure another novel embodiment of a light guide used as a light control device is its use to increase the area from which the light from the LED is exiting from thus reducing the light source luminance or glare. In an embodiment where the inlet aperture 431 cross section is small and the cross section of the light guide exit surface 432 is large there will be a significant reduction in the light source luminance and it will appear less bright and cause less glare to persons viewing it. Thus while persons in a room would find high brightness LEDs disturbing it is possible to add optical devices that while maintaining the directionality of the illuminating beams spreads them over a larger area thus reducing the luminous emmitance.

The Spectral Power Distribution of the luminaire refers to the distribution of light energy emitted by the light source arranged in order of wavelengths. In an embodiment of the invention the LED chip 412 is made of many separated LED chips or LED array. The array of semiconductor LED chips or dies 412 are of the same material and have a similar wavelength or are of different composition and produce a variety of wavelengths. In an embodiment the controlling power circuitry 428 is connected independently to each chip. The result of using differentiated composition chips 412 or phosphors with them is that the light output is a mix a various wavelengths of light and therefore of variable chromacity. Thus a warm color temperature of lighting can be produced as well as a cool daylight color temperature. Thus when the light sources that make up a light module 411 are not all producing the same color spectrum or wavelength, the luminaire's chromaticity, spectral power distribution or spectral light distribution is alterable by the controller 428 via driver 422 energizing to a greater or lesser degree the individual light sources. These light sources may be substantially monochromatic or wide spectrum with different wide SPDs and monochromatics complementing each other. Using the principles of additive color mixing of light sources to control the change in chromacity via the differentiated powering of coincidently aimed light sources, the luminaire produces a unique spectral light distribution having a certain color temperature and/or color rendering index of light at all or any particular aiming.

For example the curvilinear light guide 430 can be used to combine different colored LED chips 412. Thus if 3 different colored LEDs were stacked and their light entered into one or more light guides the light guides will re-orient the light and aim them in the same direction whereupon they will mix. The mixed light when falling upon a surface and reflected to a person's eye will generate a uniquely observed color lighting effect. When phosphors are added to the light guide material other chromaticity may be generated. Thus a blue LED could generate one color

temperature with one light guide and another color temperature in another light guide. If the guides are co-directional the colors will be mixed. Physical movement of the inlet aperture from one light guide of particular phosphors to another would then serve as a way of changing the correlated color temperature, CCT and/or color rendering index, CRI of a light source. Thus an active way of controlling the spatial and spectral output of the LED light source 411 is to reposition the light guide apparatus 433 or 434 thus changing the angular or spectral characteristic of the light modification.

Individual bars or arms 420 by their structural geometry determine the aimings of the light sources mounted on them. Thus using Lambert's cosine law and the inverse square law the arm geometry is designed such that more luminous flux can be directed to surfaces further away or surfaces at greater angles to the incident light to achieve a more homogenous light distribution. In addition when mounted in a living space the arm 420 can be rotated into a better aiming in order to optimally illuminate the area. Thus as a principle teaching of this invention the light sources attached to the arms have already been given the capability of generating a unique spatial distribution pattern in the factory set format. Most importantly, this preset distribution carries though to the homogeneous illuminance of room surfaces even after specific installation adjustment requirements have been made.

After adjustment the position of the arm can be input into the controller 428 or the camera 429 can be used to determine the lighting effects produced by the new arm arrangement. This calibration is accomplished by energizing a light source or array of light sources and reading the with the camera sensor array the luminance values off the surface. Comparing the new results with prior control luminance values at known power settings the present luminaire configuration is determined. A reference sheet of known reflectance is placed on surfaces to aid in the re-calibration. Alternately, the prior stored reference luminance values are for a number of surfaces of different reflectivities allowing the controller to guess from the surface at hand which reflectance model is a best fit. The data stored in the controller 422 can now be used for applying recommended lighting practice to specific lighting application or lighting tasks that luminaire is called on to perform. Herein this disclosure, a logical controller executes instruction sets based best lighting practices as recommended by lighting engineers and published in handbooks such as the Illuminating Engineering Society of North America IESNA and standards such as ANSI or CIE. The latest by the IESNA is the10th edition ISBN-13: 9780879952419, Publisher: Illuminating Engineering Society of North America that has numerous recommendations and best practice standards specifically related to LED lighting. The specific location lighting task information or programming may be manually input to the luminaire controller via an input device such as a keypad or be remote input controller using infra-red communications or other wireless device using a communications system such as, Wi-Fi, Bluetooth™ etc communicated via a computer or smart-phone or via a speaker microphone system. To determine lighting requirements in an area based on usage and characteristics of the users, the controller uses a speaker to communicate queries from a lighting specification questionnaire and receives audio response processed by a voice recognition software application as input for the purpose running the lighting design algorithms.

Figure 20A is a perspective view of an embodiment of a modular industrial lighting fixture with the addition of another adjustable arm 420 where the same LED driver

electronics 422 are capable of powering additional arms when added or not powering them when they are subtracted such as in Fig. 20B. The arms 420 are rotatable so that they may be concentrated at a specific aiming so as to produce higher illumination intensity in a specific area. In an alternative embodiment the driver electronics are modular in concert with the light source arms 420 such that when an additional arm is added an additional plug and play driver module is added as well with full communications and hookup capability to the logical controller 428.

An example using a FAML in an industrial, commercial or house lighting application may be a hallway lighting function. An embodiment of an asymmetrical lighting fixture shown in Fig. 20B with two arms 420 at 180 degrees with light source modules 411 laid out on the arms at higher angles to illuminate along the hallway will do a more economical job of illuminating then would the four armed symmetrical luminaire of Fig. 20A. The light sources illuminating the hallway at higher angles from the nadir may have large areas to reduce the luminous emmitance to comfortable, non-glaring levels using optical light guides such as 430 to increase area while maintaining directionality. When the camera sensor element 429 detects people entering the hallway, the logical controller 428 increases the power driving the LEDs and the lighting intensity is increased from zero power or some low level of lighting sufficient for orientation purposes to full level. After the person has passed under the luminaire the LEDs on the approach side can already be dimmed again saving power. It is to be understood that the luminaire embodiment of Fig. 20B is only showing the practical operational elements. Obviously, when used as a home hallway lighting fixture additional aesthetic elements can be added to improve the fixtures artistic appeal.

In an embodiment of this invention the adjustments to the light output distribution, intensity and chromacity are made automatically by the logical controller 428 operating per programmed instruction sets based on data supplied by sensors regarding living space geometry, environment and contents including living beings. Such sensors 429 use sound or electromagnetic radiation to measure distances to surfaces within the intended design illumination range of the lighting fixture. An embodiment of the invention uses as a sensor an electronic camera with a lens 427 allowing it to view the surroundings. Natural light sources or light sources on the luminaire firing at known timings and chromacity can be used with the sensors 429 and logical controller 428 to determine distances, movement, reflectance, surface colors and other information about the surroundings during set up and in real time. The camera chip transfers the image information to the logical controller. Using real time image processing methodologies with image and scene recognition technology known in the art, room or outdoor area elements, objects and people are identified. Using face recognition techniques an individual may be identified and personal lighting preferences or functions can be provided by the luminaire. The controller being programmed to illuminate people, objects and surfaces according to best lighting practice or user preferences then manipulates fixture elements to adjust the lighting to meet the standards or personal preferences. In addition the computer vision can recognize the visual task being performed. The logical controller 428 then uses control of the power signal to the LED to provide recommended practice light intensities.

Light entering the digital camera 429 through its lens 427 is converted into electric signals by a CCD or CMOS image sensor. The lens can be an optical lens or a wide

angle lens or a Fresnel lens giving the sensor array a view of the area illuminated by the lighting fixture or a wider area covered by a group of lighting fixtures under control of the logical controller. More than one camera sensor 429 with different areas of coverage can be used if more accuracy is required for image processing. The processor based control system for illumination has stored data and programs for driving the LEDs at the correct levels in order illuminate according to recommended lighting practice and stored algorithms which it uses to process pattern recognition, image recognition and other computer vision methodologies known in the art to recognize a particular object, surface or individual as well as distances to surfaces, their color, reflectance and the geometry of the environmental surround. The same image recognition camera may be used as the luminance meter or a separate light sensor may be employed. A further capability of the digital lighting fixture using image recognition methodology known in the art that it can recognize the individuals and provide personal preference lighting conditions or determine the optimal lighting parameters as required by their age. A processor based control system for illumination having stored data and algorithms which uses image recognition algorithms to recognize a particular individual. Using image recognition algorithms and artificial intelligence techniques known in the art, based on the appearance and movements of the occupants, the camera vision system will automatically guess their age and sex. The processor runs the computer vision routines to determine an occupants age or sex and sends instruction to a building's utility devices to provide individualized services such as heating and lighting on basis of age or sex.

The personalized control of the illuminating device or other appliances in communication with the controller can be effected by using a brain–computer interface, (BCI, often called a mind-machine interface (MMI), or sometimes called a direct neural interface or a brain–machine interface (BMI). Using apparatus to read brain activity, a direct communication pathway between the brain and the external device can be effected. The BCI can be combined with the computer vision system having knowledge of the surround to help the controller relate the brain activity to the visual aid required to carry out the desired function. For example in an automotive application the brain activity related to eye saccade can replace eye gaze tracking in knowing where the eye desires to see next and illumination can be provided on time, in advance of the visual task to be performed next.

The sensor 429 can be an LSI chip enabling high-speed processing of the generated image data by a digital image processor function within the logical controller 428 using algorithms known in the art for motion, scene and/or face detection. From these signals the logical control affects lighting changes as needed to perform visual tasks or create ambiance. The sensor and transducer pack 429 is sensitive to a wide range of electromagnetic or sonic pressure variations and has means for determining luminance, temperature and humidity. The logical controller 428 having communications capability can transfer information gained from the sensor pack 429 to other home automation networks or it can supply information to other home heating, cooling, security, lighting and host of other appliances. With a view of the front door the luminaire sensor can serve data to the home automation network on whether someone has entered of left the house.

In a preferred embodiment of this invention the lighting fixture is equipped with a camera vision system comprised of the digital camera 429 and logical controller 428 having computer algorithms for performing computer vision and has the capability of

identifying the eyes of occupants in a room (this is similar to present day face detect mode used in digital camera technology such as a Canon PowerShot SD900, where the processor face recognition identifies the triangle of two eyes and a nose and focuses automatically). The camera vision system is capable of detecting glare causing visual discomfort on the eyes of room occupants caused by the lighting fixture and the logical controller will accordingly reduce the intensity of the illumination reaching the eyes from the responsible light source. The camera vision system can detect the glare by assessing the amount of light reflected back to the camera from the eyes of room occupants and determining on the basis of a scale, such as the de Boer rating scale for discomfort glare, whether or not glare is occurring. Alternatively the logical controller 428 upon detecting eyes will set the light source intensity shining in the direction of the eyes to a level that will not cause glare.

In addition the camera vision system 428 will prevent the lighting fixture 410 from producing veiling reflections on objects such as glossy magazines or computer screens. Using machine vision technology known in the art such as neural networks training and other pattern recognition techniques the vision system has sensor, algorithmic and computational means for identifying devices or objects. Using lookup tables to identify a possible veiling glare situation in the users field of view the logical controller 428 adjusts the lighting by providing illumination from a different angle such as beaming light off the ceiling in place of direct lighting and/or altering the intensity of the direct lighting.

Actual vision and perception is not only a function of the illuminance falling on the object being observed but also of the luminance of surfaces in the surround, spectral distributions of the object and background and the general illuminance level to which the eye has adapted. Veiling luminance and veiling reflections may even be as interfering so as to disturb the ability to see. Described is a method of using the an embodiment of multiple light source lighting fixture of the present invention with finely controlled light delivery to assist people to better see objects or carry out visual tasks such as reading. The method comprises altering the intensity and/or color of the illumination delivered to the task versus other surfaces in the visual surround (that is they are in the viewer's field of view) such that the luminance of the object, the luminance of the background, the contrast and the veiling reflections are controlled so as to produce optimal vision conditions. To accomplish the spatially differentiated light delivery to the object of the visual task such as a book or computer screen the light sources to produce task lighting have multiple, narrow beams with minimal spill light. The limited coverage area of each beam and sharp cutoff is such that the lighting fixture controller can target a book while not substantially illuminating the desk. Other light sources illuminate the desk and other surfaces in the visual surround at an optimal background level luminance. The background level is determined by factors such as whether it is an office environment where others are present and a dark office is unpleasant or if the reading is at home and a lower background can be tolerated.

With the eye recognition capability the lighting fixture can, irrespective of the glare consideration, lower the illumination in areas where eyes are not looking thus saving power. Thus as in the Fig. 20B hallway lighting application the logical controller upon identifying the occupant's eyes can illuminate at higher intensity the areas forward of the occupant in their field of view but limit light rays to below the eye level and dim the areas not in the visual path of the occupant. The same capability for

dimming is available in many other lighting applications such as in other rooms in a house, warehouses, stores, factories as well as outdoors. In sports lighting glare can be eliminated by the controller 428 following the ball and calculating which light sources 411 are adding to vision and those which are detracting and reducing the intensity of those detracting. Thus the lighting fixture 410 provides illumination in real time only where people need it to carry out visual tasks while the illumination in other areas is off or dimmed to comfortable or aesthetic lighting levels.

An alternate embodiment of the Fig. 20B fixture used in a highway lighting fixture application having a camera vision system has controllable light distribution and logical means for providing illumination based on the vehicle's position in relation to the lighting fixture 410. In low traffic conditions in order to save energy used for lighting, the controller 428 using stored algorithms increases illumination with the approach of a vehicle and changes the beam cut-off levels as the automobile advances towards the lighting fixture to eliminate glare from the driver's eyes. It then dims the lighting after the vehicle has passed and is no longer useful. When multiple vehicles are presents the operating regime changes to illumination from the adjacent luminaire located behind the vehicles. By using communication between the luminaires 410 the optimal lighting regime is coordinated between them.

In a preferred embodiment the illumination device 410 of Fig. 18 with computer vision capability, also having means for communications with other devices and human factors engineering algorithms that allows it to predict in certain situations what a room occupant is interested in doing, has wired or wireless electronic communications apparatus for communicating the information it obtained via the camera for actuating or closing other devices. For example a person sitting down in front of the TV can have the TV turned on automatically and have heating concentrated on that area of the house. The camera based lighting system via a central logical control unit or the home computer inputs data on the house occupants' whereabouts and aids in the control of house lighting and heating and cooling. Thus the lighting fixture 410 communicates data and integrates with intelligent home automation systems as 1) it provides an ideal location for the sensors which includes any of sensors 429 for: temperature, humidity, motion and artificial vision and 2) the smart illuminating device 410, itself which has a logical controller 428 capable of communicating with and being controlled by the automated home network.

The lighting fixture being the world's most ubiquitous device serves as the ideal platform for simple and intelligent camera vision systems for use in home, commercial, outdoor and industrial facilities control systems to the end of surveillance, control of the use of energy and supplying people with sound, lighting, heating, cooling and fragrance. A lighting fixture is almost always installed in any living space, from work spaces to entertainment spaces and an infrastructure of power lines and often data lines are already installed to them. Thus, a lighting fixture is ideal as a platform for sensors, transducers and detectors. It is also ideal as a platform for delivering lighting, sound, radiated heating and the dispersion of fragrance. For example a multiply placed speaker sound system for providing a listening experience upon receiving from the camera's information on the users' whereabouts can better tailor the sound delivery based on their location as in known in the art thus enhancing the sound experience. Computer recognition of the person/s in the room can call up from memory the users individuals listening and sound setting preferences. A fragrance system will provide aroma based on room occupancy and location if there is

apparatus in the fragrance system for delivering fragrance to separate areas of the room. Again here a computer recognition of the individual can tailor the type of fragrance.

In an automated embodiment of the invention the light sources 411 and 425 are mounted on moveable elements 420 having actuators or motors that are controlled by the logical controller. The automatic mechanization of light source supporting fixture parts allows for the direction of the light output to be altered by the logical controller thus enabling the luminaire to perform better in the specific lighting application where the fixture 410 has been installed. This may be a onetime rearrangement of the light source aimings or may be performed in real time as the lighting requirements in the living space change. Similarly, based on changed parameters in the surrounding, the logical controller 428 adjusts as required the light intensity in any direction and/or the chromacity. Thus hereby we have demonstrated the systems unique lighting agility and energy saving capacity where the controller 428 can affect a dimming function based on factors in the surrounding such as the real-time sunlight contribution within parts of its coverage area, the amount of people in the room or the density and positions of cars on a highway.

Fig. 21 is an alternative embodiment of a field adjustable multiple light source lighting fixture 440 with light source modules arranged in a substantially linear form. Thus light source module 441 may be aimed towards the nadir while light source module 442 is aimed sideways to illuminate a different area off to the left. Light source module 443 is aimed at a higher angle from the nadir and illuminates a third area. The modules are connected mechanically and electrically to each other and to the power supply 444 and logical controller 445. A different configuration is affected by changing the angle between modules on joint 446 which is capable of bending in the x and/or y direction. Detents and/or markings are provided on the joints 446 indicating different angular settings. Thus instructions for each joint's 446 setting can be given to the homeowner or lighting fixture installer by a lighting design computer program known in the art. The light sources are specified and the room dimensions are entered into the program and the light source aiming angles are specified for the FAML 440. Whereas, in a special aiming configuration with light sources directed at different aimings, an even or homogeneous light distribution will be affected over the area under the fixture, the light fixture can be rearranged so that all the light sources are aimed in the same direction and thus a distribution similar to that of a single light module's own spatial light distribution will be obtained. Thus, if the light module light distribution is narrow, and they are all aimed in the same direction a spot light distribution will be obtained from the fixture 440.

Alternatively the LEDs can all be aimed at the ceiling or objects on the wall for an indirect lighting effect or soffit lighting effect. Alternately, some LEDs can be aimed in the same direction and others at differentiated aimings obtaining both a spot and flood light distribution from fixture 440. Light source modules can be added to the chain or detracted depending on the lighting application. In addition the light source modules can be enclosed in an aesthetic enclosure 447 hiding the actual light source modules. As shown in Figs. 18 and 20, the embodiments are depicted in their practical light engine form with the skeletal light source support structure. It is clarified that the skeletal support structures in the luminaire embodiments presented may be embellished with outer enclosures of a more aesthetic nature. The only requirement is that the outer structure does not interfere substantially with the light and heat transfer

from the light engine outwards. Thus the disclosure has shown a FAML that can be agile in meeting differing illumination requirements, aesthetic and energy efficient in providing illumination in a specific lighting application.

The unique approach of this multiple light source luminaire invention over previous art luminaires is that in prior art, even when many LED sources are used the spatial light intensity distribution output of the luminaire is determined by the primary or secondary optics on the light source. Whatever light distribution there is emanating from the light source that is the light distribution of the luminaire. In this invention the overall light distribution of a single luminaire is comprised of many smaller light distribution patterns. It could be argued that a track lighting luminaire with its multiple light sources is such a fixture. As opposed to a dispersed track lighting luminaire used to spot light specific areas spread in a room the FALM is a centralized, integral lighting unit with both general area lighting and spot lighting functionality under the uniting structural, logical control and electronic circuitry of the luminaire.

Fig. 22 is a block diagram of the functional elements comprising adjustable LED luminaires 450 disclosed in this invention. The block diagram illustrates the power and communication connections between the elements. The power source 451 can be electrical utility power or battery power which is altered in a power conditioning element 452 such that it may operate the transducer and sensors pack 453 and other electricity users such as the logical controller 454 and LED drivers 456. The logical controller 454 receives information from the input communications and sensors 453 and provides instructions to the power controls 455 and LED drivers 456 so as to drive the LEDs 457 as required by the lighting application. To alter intensity or chromacity of the light output by LED chip arrays 457 the logical controller uses techniques such as multiplexing of the power signal going to the light sources or pulse width modulation thereof. In another embodiment, the light module 411 includes control electronics which divides power up between the LED chips 412 according to instruction signals received from the central controller 428. Thus the light module 411 receives from the central control electronics both a power and control signal. The control signal may be modulations on the power signal. The light module controller then re-divides the power to the individual LED chips 412 as required to obtain light intensity and chromacity. To lengthen the times between the power signals to the light module, the light module 411 may be equipped with an energy storage means such as a capacitor or battery.

A unique feature of the adjustable lighting fixture is that extra lighting element modules 457, i.e. those not needed in a specific application can be deactivated. Thus if an arm 420 is removed, the corresponding LED driver circuit 456 can be deactivated. In a modularly built system the customer can purchase light source modules for the application such as four light source modules 457 for symmetric illumination as in fixture 410 or just 2 modules for a two arm 420 hallway light as in Fig. 20B. The electronic circuitry allows for LED drivers 456 to be added as needed and thus the customer would purchase the matching LED driver circuitry 456 for the hallway light configuration.

In a preferred embodiment the LED light fixture system is provided with mechanical means 458 for changing the structural shape which affects the direction of the illumination produced by the LED module 457. By re-aiming the light sources a new fixture 450 light distribution pattern is obtained. The feedback of the new position of

joint 446 is accomplished by input from a position sensor at joint 446 which is part of the sensor pack. In a manually adjusted system joint 446 is provided with markings and/or detents for vertical and horizontal angular positions such that instructions given to the user for aiming the light sources are in understandable terms. The logical controller 454 uses the new geometric data to recalculate the light distribution. Alternately, or in addition to, the camera acting as a light a sensor coupled with the logical controller's firing of the newly adjusted LED sources 457 at a known timing, obtains the new light distribution pattern. In addition results are corroborated with the position sensor data. The logical controller 454 with new knowledge of the light distribution calculates, using computer programs such as Fig. 23, how to best provide required illumination based on algorithms run on the processor 454 pulling stored lookup-data from the data storage of 454 or received information via the communications device of 454. The transducer sensor pack 453 is comprised of any of the following devices: an ultrasonic transducer and receiver, an electromagnetic radiation source and detector, including IR, UV, Light and Laser sources/detectors, a speaker and a microphone for audible output and reception among others. Thus, the intelligent light system 454 can receive voice input from the user which the logical controller equipped with voice recognition programs will interpret into commands and give feedback. The input to the fixture can be via a wired input device, voice recognition of commands similar to those used in computers and mobile phones, other noises such as clapping, a remote control device or wireless communication from a computer. Thus a user of the lighting can override lighting choices made by the logical controller and input their personal lighting preferences which if desired, are stored for the future. The logical controller is programmed to interpret the input signals into functions to be carried out by the FALM 450 in terms of spatial, spectral and intensity distributions of the light in space and in time.

Fig. 23 is an exemplary flow chart for a computer program run by the logical controller of the lighting fixtures disclosed in this invention to provide correct illumination. Based on information obtained by the sensors or manually input the logical controller 428 of light fixture 410 again shown in Fig. 22 as logical controller 454, calculates and sends control signals to power controller 455 and LED drivers 456 to produce the optimal illumination for the visual tasks being performed by people within or adjacent to the area being illuminated. The computer routine first acquires information regarding the light distribution pattern of the luminaire in its present configuration. Using data from the initial calibration stored in data storage 454 and powering a LED 457 at a specific aiming, the digital camera light sensor array reads the luminance value returned by surfaces. The processor using the inverse square cosine law obtains the reflectance of those surfaces which are then registered in the data storage 454 for further use in determining spatial distribution of light flux from the luminaire after adjustment. Thus a feedback control routine is effected by the controller and sensor devices using the stored computer routines.

The logical controller 454 next determines the lighting environment in which the luminaire has been installed and area for which the luminaire is to provide illumination. If other intelligent luminaires are present, the communications program coordinates between them. If the neighboring luminaire is unintelligent, then the installer powers it on and off and the controller 454 records the differences in illumination due to its influence for future use. Using pattern recognition technology known in the art of machine and computer vision, the controller 454 identifies architectural features of the room such as windows and walls as well as furniture and

appliances. Powering the LED light sources 457 or transducers 453 and reading the reflected signal captured by the sensors 453, the logical controller 454 obtains a first guess result for the iterative process of customizing the luminaire for the installed location. Running algorithms, the processor 454 determines the luminance values obtained from the sensors 453 and compares with best practice lighting recommendations. If necessary, the logical controller corrects on its own the light source 457 aimings via control of joint 458 which is equipped with automatic means for movement. Alternately, via communication with other devices or people it relays the necessary angular setting information for them to carry out the adjustment. The controller next measures the obtained luminance and checks if the recommended or best practice luminance level has been reached. The customer may also receive a report of the measured luminances from the lighting fixture system 450 and input to the logical control the desired changes. Alternately, the customer based on their own or other users' visual experiences can input desired corrections to the logical controller 454 which then re-adjusts the light source aimings. If re-aiming the light sources 457 alone cannot solve the required illumination requirements the controller 454 determines and communicates the need for the installation of additional light sources or communicates which light sources are superfluous.

In a preferred embodiment of the invention the logical controller 454 receiving image input from the camera 453 and running pattern recognition software will identify what is the visual task a person is trying to perform. The computer routine receives images from the camera and by determining the proximity of persons to objects such as books, newspapers, computer screens, telephones, televisions, cereal bowls , a writing pad, etc that are recognized by the computer vision techniques predicts what visual task the user is trying to perform. The logical controller 454 then drives the light sources 457 according to recommended lighting practice levels stored in its data storage. In another preferred embodiment of the invention the user can command the logical controller as to the visual task being performed and the type of lighting desired such as "warm white" or "more light" and their preferred intensity level. The user input to the logical controller 454 may be thru a keyboard on the light fixture or via an electronic device in communication with the light fixture via the communications apparatus of 454 therein or audible or visual commands detected by the microphone or image sensor apparatus of the sensor pack 453. Alternately, a smart mobile phone application with a Bluetooth or Wi-Fi communications capability serves as the remote controller and will handle the voice recognition, present a touchpad menu for control input or provide keyboard for command entry. If the logical controller makes an incorrect decision in the eyes of the user, the user can override the last change by a signal such as snapping ones fingers or voice command etc. Unique to this invention people are able to choose the lighting that suits them best and the fixture, having differentiated light delivery, can provide a first user with one type of chromacity and/or intensity and a second type for a different user in a different area.

The logical controller 454 provides its own feedback by checking in real time via the sensors 453 if the illumination provided by driving the light sources at the current setting is in accordance with recommended lighting levels and chromacity. In addition by using pattern recognition and knowing the location of the user's eyes the logical controller can determine if the illumination is causing glare discomfort or veiling reflections. The logical controller by comparing new images with previous images detects if there is a change in the lighting requirements. If changes have occurred, the

illumination determining process of Fig. 23 is repeated and a new configuration of driver settings and/or light source aimings is obtained.

Yet another feature of the present invention logical controller and software is that the lighting fixture 450 has apparatus to check the illumination level of the lighting set-up upon installation and provide feedback so that manually made aimings are directed to obtain a desired illumination or luminance. The camera 453 serving as a light meter obtains luminance readings on surfaces in the living space. It inputs data to the controller 454 which provides readout either on a display on the FAML 450 or communicated to another device having a display. The installer using a calibrated reference reflective sheet of known color and reflectance values placed on surfaces at particular aimings will check if the desired illumination and chromacity is being provided. The reference sheets can also be used to calibrate the room surfaces for future camera sensor 453 readings by storing in 454 the actual surface readings vs. those of the reference sheet. Once the camera 453 is calibrated as to the reflectance and color of room surfaces the FAML 450, in a servomechanism enabled embodiment, with automatically movable light sources 457, will perform its own re-configuration to reach optimal light provision. The calibration is affected by using the camera array 453 to detect luminance as a measure of the lighting fixture instantaneous illuminance in that direction vs. the power level at which the light source is being driven. To calibrate the illumination system, the logical controller 454 can use a given LED installed on the fixture which serves as a light source standard when driven at known voltage and current. Alternately, an additional light sensor of superior accuracy stability is provided for in the sensor pack 453 and can be used to calibrate the camera sensor array.

In a preferred embodiment the control unit 454 is optionally outfitted with a photometer 453 which can be used to read the luminance of the room surfaces and transmit the data for use in the lighting program Fig. 23. Using the same process a lighting designer uses to enter data to the lighting analysis programs the installer inputs to the controller as to the illuminance goals for each surface. The lighting program as known in the art then specifies the correct lighting levels, aimings and spectrum for the different locations and uses throughout the room. This is reversing the typical design process where the lighting fixtures performance is simulated on a computer and the results calculated. Here, the required illuminance results are known first and the fixture is then programmed to make them happen. The controller 454 uses its stored performance characteristics to determine the power supply to the light sources so that it provides the required intensities to obtain the required illuminance. The lighting calculations and programming of the power supply 456 of the light sources 457 is preferably performed in real time such that the sensor 453 detects the illuminance to corroborate the performance while the installer is still at the location. If the lighting is not to specification then the controller 454 readjusts the parameters so as to bring them in line. This trial and error process continues until the readings are within tolerance. The process is best carried out in the dark or when there is non-varying daylight. Alternately, the photometric reading sensors are on the luminaire and they are used to corroborate performance. Alternately, the process is automatic using feedback from the surroundings and pattern recognition to determine surroundings and applications.

A number of circuits in devices 452, 455 and 456 are utilized to power equipment in the fixture 450 and carry out control. The power supply may be a constant voltage

supply or current source. The control circuitry comprises feedback sensors 453 coupled to the logical controller 454 to detect light intensity and color spectrum of the radiation. Associated logic circuitry, responsive to the detected light intensity and color spectrum over the spatial distribution, controls the power delivered to the individual LED diodes, so as to provide a desired intensity distribution over space. In an example using a combination of different colored LEDs, the logic circuitry 454 is responsive to the detected color spectrum of the outputted light. It controls the driver 456 to selectively increase or decrease power to individual coincidently directed light emitting diodes as is needed to obtain the desired color spectrum of the illumination as well as it luminous intensity.

Fig. 24 is a universal lighting fixture 470 comprised of a structure 471 with means for attaching mechanically and electrically to any of the elements selected from the group consisting of electric power conditioning apparatus, a logical controller with processing and storage capacity, light sources, radiation sources, transducers and sensors. The structure can be factory manufactured or come in a do-it-yourself DIY version. The lighting fixture has a geometrical shape calculated by the inverse square cosine law for set types of light pattern distributions. In one embodiment the structural shape of fixture 470 is such that an even, homogenous light distribution will be obtained on a work plane below when the Plug and Play light source modules 472 are connected. In a do-it-yourself lay-up-able embodiment of the luminaire 470, the luminaire light source elements 472 are configured by the user in situ according to the illumination needs where the fixture 470 is hung. They may be reconfigured when the lighting needs changes such as when furniture is rearranged in the room. The lighting fixture structure 471 covered with removable facet covers 473. Facet 474 has been opened exposing the receptacle 476 to accept additional light source module 477. The receptacle 476 is provided with a connective affixing means 478 for having light source module 477 attached to it both mechanically and electrically. Light source module 477 is also provided with a complementary connector element 479 which mates with connector 477. Connector 478 is wired to a power conditioning and control elements provided with luminaire 470 as needed by the configuration. The additional light source module 477 with its characteristic beam spread 480 mounted on a opened facet 474 on the structure 471 is at a different aiming via the position on the luminaire 471 where it is being mounted. The light sources 477 have a characteristic beam spread 480 and optical axis 481. The receptacle 476 allows for some rotation of the installed light source 477 on the X Y or Z axes. Thus when a number of light sources are laid up and aimed in the same direction they will add intensity to the light distribution in that direction and when added on the curved fixture 471 surface at different angles they will increase the coverage area of the lighting fixtures illumination. Markings are provided on the structure with the angle of the position thus the user following instructions can attach the light sources at angles which will yields an even light distribution up to the cutoff angle.

A lighting design computer program known in the art will simulate to the user what the light output will be from the luminaire as it is configured. A logical controller on the luminaire can determine from the plugged in light source units which have a identifying data chip 479 in the connector relaying what its light distribution is and communicates to a simulation program the present configuration aimings and light source characteristics. In addition a sensor 482 is provided on the luminaire. The camera like sensor 482 measures the resultant light output and relays those results to the simulation program. Thus the user can build a customized lighting fixture that

ensures proper lighting intensity where needed and does not waste light where not needed. The plug and play light source characteristics are known to the controller and their operating characteristics may then be programmed via the lighting simulation program. Using the lighting simulation program, the employed element characteristics, now a part of the controllers feedback loop, are used to direct the user to rearrange the lighting modules to further refine the fixture's 470 light output.

The do-it-yourself lighting fixture 470 has special lighting fixture accessories that are attachable to the structure. Spot light module 482 with a narrow beam spread is an example of a special accessory. It can be a light source or a radiation source such as an Infra-Red heating source or a combined heat and light source. It is mounted on the fixture via swivel joint 483 which is manually positioned at an angle required for the illumination task. A special laser pointer LED 484 is provided in the center of the light source LED array 485 to facilitate exact aiming of the spot light. The lighting module 482 is provided with connection means to the power and control signals via the joint 483. The module is also provided with cooling fins 486 to maintain optimal temperature for the LED sources. The swivel joint 483 can be a motorized joint with motion in two axes controlled by the logical controller. Thus the logical controller 454 in conjunction with the camera vision system 475 when identifying a person in need of spot lighting as per the computer program of Fig. 23 will pivot the spot light 482 so that it is aimed in the direction where the task lighting is required. At the same time the lighting fixture 470 will maintain general lighting at recommended levels over the rest of the room thus significantly saving energy.

In another embodiment one or more light sources, acting as a spot light 482 of limited beam angle, is on an automated swivel joint. The controller 454 receiving input from the camera and using computational image recognition algorithms in a program as in Fig. 23 follows the person around the room providing them with higher intensity lighting for their visual tasks. Further image recognition capability which may also be complemented by video analytics technology where computer vision is used to filter and manage real time video for security and intelligent traffic monitoring, helping to recognize activities as they happen in real-time which enables the controller to determine any of the following: a change in the persons activity, in what direction the eyes may be directed, what objects the person is viewing and what visual task the person needs to perform. Based on that information the controller 454 powers the spot light sources 482 and general lighting sources 472 to provide the correct lighting for the specific visual task undertaken, be it reading a book or watching TV.

An irradiation device embodiment of this FAML invention can use the computer vision and aim-ability function to provide infrared heating to individuals in indoor and outdoor settings. The heat radiation sources can be infrared filament lamps or infrared LEDs in addition to other wavelengths. The irradiating devices 472 mounted on the irradiation fixture can provide general area heating or spot heating 482 to people or objects. Computer recognition of individuals is used to irradiate them as they move about the living space. Using face recognition algorithms and stored personal preferences from the data storage, the logical controller 454 will aim the heating rays specifically where on their body they prefer to be heated as well as in what amount and at what times. The camera 475 has sensors sensitive to infra-red wavelengths around 12 μm (micrometers) radiated from people. The controller obtaining the information from the body temperature sensor will run algorithms to calculate radiation parameters and will control the irradiation in time and intensity on

the individual to maintain comfortable heating per best practice standards, drawing on stored data of heating practices, or personally input preferences. People may be sensitive to radiation heating on certain parts of the body. For example heating on the head area causes some people discomfort, The camera and controller processor system can use image recognition to identify parts of the body and the controller can provide a different radiation level to the head vs. the rest of the body. Other people feel the cold in the legs etc. In addition the controller can obtain information on other environmental parameters such as the temperature, humidity etc which affect the heating regimen. Thus the camera sensor 475 is an energy saving sensor replacing the room heating thermostat used to maintain the entire room at a high ambient temperature with a more accurate and localized actual measure of the individual's temperature. The radiating fixture 470 will them provide localized heating on an as needed basis to maintain comport. The FAML logical controller 454 runs the algorithms and provides spot heating only when necessary and in the right amount. Just as moveable head stage lighting follows the performer about the stage the camera/controller vision system follows the person around the room or outdoors and keeps them warm with an infra-red lamp 482. It is to be understood that the irradiating source can be supplying UV radiation, visible light, or any other radiation for therapeutic, pleasure or manufacturing purposes such as UV, EB or heat curing adhesives etc.

In an embodiment of the FAML the infrared radiation sources are added to the light source and can work together when necessary to provide heat and light. Thus in a living room fixture where the house heating has been turned down to energy saving levels an individual can receive concentrated light for reading as well as concentrated beam of infrared heating.

Fig. 25A and Fig. 25B shows an embodiment of this invention for use indoors or outdoors the light source arrays are mounted at the end of rods extending from the light fixture housing containing the control equipment. In an example lighting application, the fixture 487 is located over a table in a living room. The rods 488 supporting the light source modules have means for re-positioning either manually or automatically. In a manual system, the user based on the future use of the luminaire, sets up the spatial light distribution to best meet the visual requirements of people within the living space by re-positioning the rods. In one embodiment, for set up purposes, a red laser pointer is built into each array as was laser 484 in Fig. 24. Alternately, a laser pointer accessory is clipped onto the individual light module to assist in aiming. The user by trial and error using their own eyes as detectors or sensors 489 eventually reaches a functional light distribution with the lighting fixture for that specific installation. In an automatic system when the camera sensor 489 detects a person sitting at the table the automatic servos move the rods 488 so that the light output of many sources is aimed towards the table below producing high intensity task lighting as shown in Fig. 25A. When a room occupant is seated on the couch in the living room and watching TV the lighting fixture structure is changed to the configuration of Fig. 25B which offers general lighting at a lower intensity. The camera vision system will recognize a TV screen and the controller using the program of Fig. 23 will not illuminate light sources shining in the screen's direction that are aimed towards it at angles which would cause glare.

An outdoor FAML 487 equipped with camera vision capabilities for the detection and/or tracking of people, is another embodiment of this invention which has a

number of improvements over present area illumination technology. The outdoor lighting fixture 487 is first configured to the geometrical peculiarities of the specific yard where it has been installed and is calibrated with the sensors 489 readings. If the area to be illuminated is rectangular with a narrow distance ahead of the fixture and a wide area of to the sides, the light sources mounted on the moveable arms are moved closer together in y axis while on the x axis the light source are distanced from each other and are at aimings angled higher to cover the extended width on the x axis. To compensate for the larger are the LEDs on the x axis are driven at higher power to cover for the larger area. Conversely for a square area the light sources are distributed evenly so as to illuminate on the intensity level set at the factory as in Fig. 25B. If there is an area where high intensity task lighting is needed the luminaire is configured with multiple light sources coincidentally directed to intensely illuminate that area as in Fig. 25A. The lighting level for security and orientation is usually low and when people arrive on the scene the light level increases. When people are present in the specific area where high intensity is needed for tasks the spot light function is engaged. If infrared lighting is need for the security camera then provision is made to have IR sources aimed at the specific areas of concern.

Fig. 26 is a perspective view of a lighting fixture embodiment 490 capable of producing both a differentiated spatial light intensity distribution as well as a spatially differentiated light spectrum distribution. The luminaire 490 has multiple light source modules 491, 492 and 493 with each module comprised of more than one LED chips which can be powered by the logical controller and control electronics 494 at differentiated power levels. LEDs are arranged in arrays of RGB (substantially red, green and blue color LEDs) or arrays with of any of ROYGBIV LEDs completing white LEDs to produce varieties of white light. The logical controller 494, using algorithms based on the principles of additive color mixing of light sources to control the change in chromacity affects, via the differentiated powering of coincidently aimed light sources, the production of a unique spectral light distribution having a certain color temperature and/or color rendering index of light. This may be accomplished at once for all light output from the luminaire 490 or any particular aiming 495. The logical controller operates with data storage and program similar to the system shown in Fig. 22 and Fig. 23.

Alternately, to vary the CCT or CRI, in place of an RGB or MCY (substantially magenta, cyan and yellow LED's) or some alternative LED colorimetry system, the luminaire is equipped with different types of phosphor based white light LEDs 491 of different color temperature, where one or the other is used for a specific lighting task. In another embodiment, a monochrome LED can be added to the white LED to adjust its color temperature or rendering shifting its CCT and/or CRI. In addition, the use of shorter wavelength LEDs with nano-dots or quantum dot optics such as those from QD Vision, whose Quantum Light™ optics and films improve the color gamut of LEDs as they absorb some of the cool, blue LED light and efficiently re-emit it as warm, red light. This balances the lighting color spectrum, creating a pleasing incandescent quality light yet at significantly higher efficiency. Thus the fixture 490, in addition to having a controllable non-symmetric light intensity distribution in different directions also has a controlled spectral light distribution in different directions enabling a unique color rendering of one surface and a different color rendering of a second surface.

As an example of the luminaire's benefits and agility to provide correct lighting where it is needed at minimal energy consumption, an embodiment of the invention, a spatially and spectrally adjustable restaurant lighting fixture is presented in Fig. 26. In a restaurant lighting application it would be beneficial for the customer experience if those dining, the food and ambience would all appear at their best. The problem is that even at high CRI, some color temperatures are better than others at making food appear more appetizing to customers than another. As the portions served under a single prior-art lighting fixture vary, some of them will not be shown in their best light. For example, light at 3500K-4100K helps accentuate the textures and colors of fish and white meat while the rosy hue of a 2250K light source will accentuate the color and juices of red meat. Thus it would be beneficial if the light which is illuminating the specific table setting can be varied in accordance with the food being served. The FAML with its capability of delivering spatially differentiated illumination will render each portion in its best light. Using programmed scene recognition algorithms, the luminaire's computer vision system comprised of the camera sensor 496 and logical controller 494 identifies the food on the plate, looks-up in storage the recommended CCT and powers each of the different colored LED chips aimed thereon at the correct power level in order to provide the optimal color illumination.

In addition the logical controller can determine on its own the preferential color of the illumination based on the reflections off of the food. The controller runs a computer routine where it rapidly varies the light spectrum to preset CCTs and/or CRIs shining on the food on the plate. The camera records the image at each preset and the logical controller 494 compares the image coloring with stored rules of recommended practice for color rendering and determines the best illumination color setting. The controller 494 resets the illumination characteristics until the next change on the table occurs. The recommended practice programmed into the controller is based on IESNA illuminance information or restaurant illumination as described in industry literature such as Successful Restaurant Design by Regina S. Baraban, Joseph F. Durocher John Wiley and Sons, 2001.

The lighting fixture 490 has means to illuminate separate portions at a table comprised of directable or aim-able lighting modules 491etc which are on moveable structural parts 497. The lighting fixture 490 also has computational means of providing the optimal color and intensity of light so as to render people, food, objects in their best light as well as to build a dining room ambience through lighting according to recommended practice or user preferences. The moveable structural bars 497 are manually positionable so as to aim the light sources towards the people, table and surrounding. In a preferred embodiment, the moveable structural parts 497 connected to the light modules are automatically moveable via actuator or servo motors controlled by the logical controller 494.

We have described a system for improving the appearance of the food but the same system applies to making the customer appear at their best. In another fixture embodiment the intensity and chromacity of the lighting illuminating the customer is adjusted manually via input means or automatically via stored algorithms to suit the customer's preferences. The fixture 490 has separately amiable light sources such as LED module 492 to illuminate the food and light source 493 to illuminate the customer. The specific group of light sources for each task may be manually

positioned or a camera vision system has algorithmic means to identify and track the position of people and objects and the logical controller has motion control means for re-aiming the light sources towards targeted elements and changing the power level to the LED chips.

In an automated embodiment, controller 494, based on image recognition of images provided by camera sensor 496, moves the powered structural parts 497 to re-aim the light sources on the food, table or those dining as needed. Thus as an example of the unique, differentiated lighting capability of the novel luminaire 490, multiple light sources are used as follows; a number of wide angle light distribution light sources 491 are used to illuminate the table at a low 100 lux illuminance with a warm 3000K color temperature to build dining ambiance; while narrow beam, spot LED 492 illuminates the fish on the plate at 300 lux and 4000K CCT (in conjunction with ambient lighting LED 491) to help accentuate the textures and colors of the fish; while the light module 493 is aimed at a diner with low enough luminous exitance so as not to cause glare but with a color spectrum that is complementary to that of general lighting module 491 such that it enhances the makeup and skin color of the customer showing them at their best. When the visual task of the customer reading the menu is recognized by the computer vision system, the logical controller 494 can increase the light module 491 output to 300 lux making the reading easier. The controller re-dims the light module 491 when the menu is recognized by the vision system 496 as being put away.

In an integrated restaurant illumination system embodiment, the customer will first try out the lighting in the rest room where they may apply makeup under a FAML luminaire having capability of producing light in a variety of chromacities, which the customer can experiment while viewing themselves in a mirror. The rest-room lighting fixture has a readout or is equipped with communications means, as is the lighting fixture controller 494 with which it is in contact. Having discovered their CCT and/or CRI lighting preference, the customer uses an input means and communications means to set the lighting fixture 490 at the table to the same successful chromacity obtained in the restroom.

In another embodiment a lighting fixture on the wall or floor such as a torchiere or a ceiling mounted fixture serves as a light engine for the entire room replacing a number of lighting fixtures while increasing the efficiency and quality of the lighting. Fig. 27 is a perspective view of a FAML lighting fixture 500 capable of providing both general and task lighting. The fixture body 501 has power conditioning electronics and logical control electronics and has light sources mounted on curvilinear light bars 503 that are configurable. This geometry and configurability enables light source aimings that will provide a substantially homogeneous illumination on a work plane through the room in which it is installed. It will also offer customization of the illumination to the actual geometric and usage peculiarities of the living space where the fixture 500 has been installed. In addition the lighting fixture 500 is equipped with one or more spot lights 504 having a narrow light beam spread which are able to provide high intensity illumination over a small area. As opposed to general area lighting, the spot may provide task lighting. It is a principle of this invention that the fixture 500 provides as much light as is needed in the living space, no less and no more. Thus the LED powering circuitry as shown in Fig. 22 is configured such that each light source covering a different area is capable of being driven at a different power level. The differentiated electronic power supply is

configured such that if a homogenous illuminance is required by recommend lighting practice within a living space, the illuminance in the area covered by higher angled light source 505 is at recommended level even if that area is at a greater distance and angle from the luminaire than an area illuminated by a second light source 502 as dictated by the inverse square cosine law. The adjustable lighting fixture structure is provided with moveable joints 506 which have means for being positioned at specific angles which are relatable to a lighting design software program such as those commercially available to lighting designers. The software can be run on the logical controller 501 or on a remote computer. When the light source module 502 etc light distributions and aimings are input into the lighting design software program along with the room dimensions and surface reflectance's, the illuminance within the room is calculated. The powering of the LED modules is then adjusted via controller electronics 501 to obtain the recommended practice illuminance.

Normally, a light fixture must be placed substantially above the area to be illuminated so as not to produce glare and veiling reflections. For example computer screens are to be protected from light rays at large angles from the nadir to prevent veiling reflections. In addition the illuminance of light rays at large angles from the nadir striking horizontal surfaces decreases as described by the cosine law. In addition, the quality of the lighting is a function of the balance of vertical as well as horizontal lumens illuminating an object. A tennis ball illuminated on top but not on the sides flying at 80 mph will be difficult to see. It is also important to provide illumination from multiple angles to prevent shadows that can be created by single lights. Thus, many lighting fixtures would be needed to illuminate a large room to insure the visual performance and comfort of its inhabitants. In an embodiment of the invention, a single light engine device for a room our outdoor location allows for the light to be generated in one place and then beamed from the concentrated light sources 504 at small angles of divergence to reflectors or refractors which redirect the light to the users in a localized area or to other reflectors so as to go around corners and illuminate areas not in the luminaire's direct line of sight. A single location for the light source simplifies the provision of power to the fixture. A builder doesn't need to run wiring all over the ceiling and not having an outlet box in the right place in a room or lot is no longer a problem. In addition a single location allows for greater investment in an efficient cooling system as well as for the removal of waste heat from an air conditioned environment and reduces installation and fixture costs. It also allows for greater investment in computer vision and logical controller apparatus enabling higher quality lighting at lower energy expenditures.

A necessary prerequisite for this remote lighting technology to be effective is the ability to generate concentrated beams of light with low divergence angles at high beam utilization. That is, 1) that most of the initial light generated gets out of the optical apparatus used to generate the tight beam and 2) most of the light flux is within the narrow beam with minimum spill outside the beam. A commercially available LED product such as the Artavi 10° product from Illumitex offers 90% of the light output in 10 degrees of the beam. The beam efficacy is above 80 lumen per watt proving that it is possible to generate well controlled light distribution patterns with minimal spill light. However, to reduce the size of the remote reflectors at the mounting heights and distances typically found in rooms, a 5 degree beam spread is even more attractive. Typically 3 meter distances are beyond the coverage of a comfortable cutoff home and office luminaires mounted at 2.7 meter ceiling height. Thus large room lighting needs would not be best met with a single light source due to

the visual discomfort due to glare at higher angles of light emission. Therefore, it is highly beneficial to have an efficient manner of moving light in narrow beams of limited divergence over large distances to reduce the cost of lighting installations. LED optics as shown in Fig. 20 including a collimating lens for narrow beam generation are available with a light collection efficiency of >85%. Its function is based on the optical principle of total internal reflection, which contributes to the high efficiency of the optical system. Further measures can be taken to collect the 15% escaping light such as an encompassing reflector system.

Fig. 28 is a perspective view of satellite secondary light source which is a light modifying element capable of redirecting light from primary light sources such as lamps or the sun while not producing light on its own. In this embodiment the light engine 500 is equipped with light sources 504 capable of projecting at an exact aiming 508 high intensity, narrow light beams with minimal beam spread to the distant light modifying elements 510 in the room such that the light rays 511 from the light source 504 that are reflected off of theses surfaces 512 become local light source rays 513 at smaller angles from the nadir (directly down at zero degrees angle) substantially above or behind the user's eyes thus providing comfortable non- glaring lighting. These light direction modifying devices 514, referred to herein as Satellite Light Source, STLS, are reflective surfaces or refractors or combinations thereof or other optical light modifying apparatus. The satellite light sources may be ubiquitous insofar as a reflective decal on the wall or a painted wall or ceiling with sufficient reflectivity will function well as a secondary source. Thus specially installed STLS can work together with room elements of sufficient reflectivity using direct lighting and indirect lighting to achieve lighting goals. The secondary light source may be attached via an extended rod to the luminaire itself or may be a highly reflective large diameter ceiling medallion. The illumination advantages of having secondary light sources are many and include: lighting exits the light source at angles which do not cause glare, the lighting comes from additional directions to that of the luminaire avoiding shadows, and adds light from angles that contribute to the proper mix of vertical and horizontal lumens. In addition there are a number of practical, economic and efficiency advantages.

In a manual system, the fixture's 500 concentrated light sources 504 can be aimed using a laser pointer to aim the light beam 508 to target 519 on the re-directive optical device. This manual method may also be used to initially calibrate an automatic aiming system with preset scenario positions for the concentrated light sources stored into the logical controller 501. In an automated embodiment, the light engine uses a computer vision capability to identify the whereabouts of persons performing visual tasks in the room. The controller then aims one or more concentrated light sources at the optical device which re-distributes the light locally. The light engine can be equipped with more than one aim-able concentrated light source and can provide more than one user with task lighting. Thus, a ceiling fixture 500 may have light sources providing a general lighting function with light aimed at the ceiling edges to perform an indirect, soffit lighting type of lighting effect, with task lighting performed by the concentrated light source aimed on the task directly from the fixture itself or via a re-directive STLS optical device. In a preferred embodiment an infra-red or visible laser on the concentrated light source assists the automated computer vision system in aiming all the light producing and modifying elements such that maximum light is directed on the visual task in real time. Undetectable infra-red sources may also be included in the light source array make-up so as to assist in computer vision

recognition. These non-visible sources may be pulsed to aid in tracking of people, their eyes and objects while not disturbing normal vision.

The light engine 500 of Fig. 27 together with the re-directive optical devices of Fig. 28 can be used to integrate light energy obtained from the sun with the artificial lighting system. That is, where a building has apparatus for the collection of sunlight and its transport via light guides or fibers into the building's interior, the light fixture 500 will serve to distribute the sunlight within the living space. Whereby the light engine 500 has any of: a) optical device for accepting the solar light, b) optical guide paths for conducting the light; c) optical devices for redirecting the path of the light and d) filters for adjusting the amount and spectrum of the light to be used so as to be able to distribute it within to the room to where it is needed. These optical devices and filters include light valves, prisms, controllable piezoelectric light guides, MEMS devices, optical switches and mirrors to redirect or modulate light beams. In addition, the light engine has optical devices which when necessary, can direct the sunlight to the satellite re-directive optical devices deployed around the living space. When light from the sun is no longer sufficient the artificial lighting system powers the light sources to make up for the shortfall. The light engine may be placed on a wall and integrally include the sunlight collection system outdoors with the artificial light generation and distribution system indoors. It would be similar in concept to how a wall air-conditioner system works. The sunlight collection system via the controller would take the need for the lighting into account based on occupancy and environmental conditions. In the summer the system using dichroic or other filter method would remove the infra-red spectrum from the light while in the winter when heating is needed would pass the radiation indoors. The sunlight collection system using controlled re-directive optical devices to capture the sunlight will redirect the light through windows or optical paths to aid in light is required within the room.

Fig. 29 depicts an adjustable luminaire 500 in a lighting application where the user needs for illumination vary with time. The STLS 510 is a specially mounted remote reflective surface, strategically placed in the room so as to illuminate work, living or entertainment stations or alternatively is a wall or ceiling surface with sufficient or modified reflectivity. The re-directive optical devices have an optical design capable of efficiently redirecting the light symmetrically or asymmetrically for the performance of visual tasks such as looking at a computer screen or reading. They have means of attachment 515 to the ceiling, wall or placed on a piece of furniture. The STLS may be of fixed light modification characteristics or have means 516 for moving the reflecting surfaces 512 and selecting between various light distribution patterns. That is, the satellite light source 510 has manual or automatic means 516 for changing its optical performance, say from a spot light to a flood light distribution and/or it has automatic or manual means517 for changing the direction of the satellite's illumination. In addition the outgoing beam 508 from the FAML 500 to the STLS 511 can be modified by the controller 501 via the light source 504 in a way that changes the output luminous flux to the visual task. The outgoing beam spread is varied or its aiming changed to a different area 518 on the STLS with a different light modification characteristic. To change the beam spread of light 508 exiting from light source 504 the logical controller 501 has means to vary the LED chips being powered or the configuration of beam modifying optical device 509. The optical device may be a lens using refraction or a reflector, a combination of both or any other light ray modifying device.

In order to aid in aiming the concentrated light source 504 such as with the laser pointer device described earlier, there is a target area 519 on satellite 510 for use with manual or automated computer vision aiming. In an automated satellite embodiment there is need for electric power to control apparatus used for light beam aiming, sensors and communications. A hook up of control mechanism 517 to electricity from a battery or the mains power supply is provided for in attachment means 515. In an advanced embodiment, satellite light source 510 is powered by photovoltaic cells 520 receiving light energy and converting it to electric energy which may be stored in the movement control apparatus 517. The movement control apparatus 517 also has communications capability with the lighting control system and light engine 500. To obtain better images for scene recognition software or for eye tracking, a camera or sensor 521 is positioned on the satellite light source 510. Thus the STLS can provide high definition images of people and objects within a living space for use with the lighting control system as well as with other home automation or security systems.

In an automated embodiment of this invention the logical controller 501 can communicate with and modify the secondary satellite light source 510 optical performance, say from a spot light to a flood light distribution, via controlled joints 516 or alter the STLS aiming via rotation apparatus 517 to illuminate a different area or object in real time as picked up by the camera 507 and analyzed in controller 501. As the illumination need in the room changes, the controller 501 sends a light beam with tailored spread, intensity and chromacity to the re-directive STLS optical device or room surface best positioned in the room to provide the optimal lighting. The controller 501 determines the visual task needed to be performed at that moment and chooses the optimal STLS device in the room to send light towards. The controller re-directs light source 504 which is mounted on moveable joint 506 to beam correct intensity and chromacity light flux to that STLS. In instances where an installed STLS device is not correctly positioned to provide lighting at optimal incident angles, the wall or ceiling (if their reflectance and color values are reasonable) can be used. In order to power sensors and actuators on a STLS satellite not connected to the mains power supply, a battery can be used. In a preferred embodiment in place of a cumbersome power mains supply hookup, a photocell or power transducer is mounted on a portion of the STLS. It is used to translate light energy or radiation from the FAML or other energy source to electric power for use by power consuming elements such as sensors, automated motion equipment or communications devices on the STLS.

To further illustrate the capabilities of a multiple light source lighting fixture with differentiated control of the spatial light distribution coupled with a camera sensor system, an example of usage in a home environment is described. As shown in Fig. 29 a man seated on a chair reading a book122 is detected by camera sensor 507 and the vision recognition software recognizes the scene and the logical controller 501 runs algorithms and looks up the recommended lighting level and set up from the data storage as described earlier. The light engine luminaire controller 501 adjusts concentrated light source 504 via joint 506 so that it is aimed at satellite reflector 510 which has been attached to the ceiling or wall. Reflector 510 is positioned and angled relative to the incoming beam 523 such that that the reflected beam 525 illuminates the book 522. The reader now receives illumination to read the book from the rear over his shoulder which is superior to receiving light from the luminaire 500 in front. To corroborate if enough light is being provided for the visual task of reading, the controller 501 uses feedback control methodology obtaining an approximation of the

luminance on the book 522 from camera 507. The light intensity of beam 523 can be raised or lowered by logical controller 501 to conform with recommended practice. If the user is unhappy with the lighting system's performance, he signals logical controller 501 audibly or electromagnetically to affect a change and obtain their personally preferred lighting characteristics.

The table lamp 524 next to the man on the chair is another embodiment of this invention and consists of remotely positioned electricity to light energy conversion device 500 which beams light to a STLS mounted on a table atop a post which captures the beam 511 coming from centralized light engine500 and redirects it downwards on the book 522. Thus the controller 501 has the capability to use an alternative path to illuminating the book 522. Instead of from behind and above the reader, it controls adjusting means 506 to redirect light source 504 such that it is aimed at table satellite lamp 524 which illuminate the book from the side. Another alternative illumination method to illuminating the book 522 is controller 501 directing light source 504 to illuminate the reflective wall section 525 proximate to the book 522. The logical controller 501 uses the camera sensor 507 and vision system 501 to check if there are obstacles in the beam path and choose the best illumination scheme at the lowest energy use for getting the visual task done. Most importantly, the user themselves have control access to the wide variety of optional lighting schemes from which to choose the one they prefer. Their preferences are then stored for future instances of the same application in controller 501. The logical controller 501 sensing that the TV 526 is being observed, such as when the TV screen is turned on and the book closed, adjusts luminaire 500 light output in that section of the room to the recommend lighting level and chromacity for TV viewing.

Another room occupant is sitting at the dining room table. She is sipping a cup at the same time as he is watching TV. At the same time logical controller 501 discerns, using scene recognition algorithms, that based on her head position, she is reading a book 527 and not watching the television screen 526. The concentrated light source 528 is aimed by controller 501 to provide direct illumination to perform the visual task of reading the book that she is assumed to be undertaking. If not happy with the lighting level she may command the lighting controller, either audibly or by a gesture picked up by the camera vision system or electromagnetically through a control device, to affect a change.

To further save energy the logical controller 501 receives input from the light sensor 507 that natural lighting from the window 529 is contributing to the illuminance on the book 527. To get an accurate reading of illuminance on the book from the natural lighting source, the logical controller will, for an instantaneous fraction of a second, indiscernible to the human eye, turn off the artificial lighting of luminaire 500. If the natural lighting is not at the required level per correct lighting practice, the controller drives area lighting LED light source 528 as needed to compensate. When the sun changes position, the altered contribution is picked up by the sensor 507 and the intensity of illuminator 504 is adjusted by the controller. Further power saving is obtained due to the differentiated light delivery capacity of the luminaire as well as its differentiated area sensor system. Light sources 502 on the light bar 503 whose aimings are towards surfaces illuminated by the sunlight are reduced in power while those directed at areas in the room far from the window not receiving a significant solar illumination are powered at the usual level.

In another embodiment of this invention, the centralized light engine 500 is adapted for use in an open plan office lighting system. The large office space is divided into cubicles and workstations beneath an acoustic ceiling. The light engine 500 is mounted within the plenum space above the acoustic ceiling in a location central to a number of workstations. It is equipped with a number of high intensity narrow beam light sources 504 which project light to STLS satellite light sources 510 which is a light guide or reflector which redirects the beam through a transparent aperture in the acoustic ceiling to the workstation below. The STLS sensor 507 detects whether an office worker is at the workstation and communicates with controller 501 to power the light source 504 so as to provide lighting at the workstation. The camera sensor 507 relays images to the controller which analyzes the data to determine the visual task being performed and drives the LEDs so as to obtain the correct illumination. When the workstation is vacated, even temporarily, the lighting returns to the low ambient lighting level. More than one STLS can be used per workstation to provide illumination to individual objects, surfaces or other STLS or light guides beneath the acoustic ceiling which can provide illumination under overhanging shelves on work surfaces.

The artificial vision scene recognition system algorithms programmed into the controller 501 are obtained by methodologies known in the art such as using neural network architectures and learning algorithms for pattern recognition, image processing, and computer vision. The remote lighting system that has been disclosed herein, the home example of which has been illustrated in Fig 29 and an office example in the preceding paragraph is a generalized illumination technique for providing distinctive area illumination from a single light engine is a unique teaching of the present invention; whereby a centralized area lighting system is comprised of 1) one or more primary light sources which generate light from electricity capable of directly and indirectly illuminating a living space, 2) differentiated secondary light sources, dispersed over the area that receive light energy from the primary light source and 3) sensors that are in communication with the controller which provide feedback on the illumination, help in aiming the light output from the sources and collect images for identifying visual tasks to aid the controller in directing and regulating the light. The light is sent either directly to the areas to be lit or to the secondary STLS, wall, ceiling, or satellite light sources. The result being that the lighting system provides correct and comfortable lighting for a variety of visual tasks being carried out in different, distinct sections of the area.

Fig 30 is a perspective view of a luminaire with a special night light functionality. In locations such as a bedroom or tent used for security forces, besides the luminaire's standard white-light illumination function, there is need for an additional nightlight function for providing light of different chromacity or wavelength. Thus in an embodiment of the adjustable luminaire of this invention, a number of modes of lighting, varying in light intensity alone or both in intensity and chromacity are provided for by night light luminaire 530. The luminaire is comprised of multiple light sources 531, 532, and 533 of different color spectrum and/or wavelength. The LEDs are powered by electronic power condition gear 534 and logical controller 535 which implements these modes based on programmed times via the light fixture's internal clock as well as by an input device. An optional sensor pack 536 is provided which has a camera array or a light and/or occupancy sensor.

Using light at wavelengths that have different effects in the stimulation of the rods and cones in the eye, it is possible to provide night vision that does not require adaptation time normally required to best see in darkness. In addition it is possible to provide night light vision with light at wavelengths that do not interfere with the production of melatonin, the sleep hormone, by the pineal gland which is sensitive to light. In addition it is possible to provide bright light to increase serotonin levels and aid in waking. There are also instances where one occupant of a room needs to arise while another desires to remain sleeping and not be awakened by the turning on of a disturbing light. Thus it would be preferable for the lighting fixture used in sleeping areas to possess a lower illumination mode which allows for limited visual tasks to be carried out by some, while not intense enough to awaken others. It would also be preferable that the lighting intensity and/or spectrum be unique such that it does not disturb the sleep cycle of others who may be sleeping in the room by avoiding the suppression of melatonin production by the pineal gland.

An application for the use of the luminaire 530 is in permanent or temporary sleeping quarters for military or security personnel. The power conditioning equipment 534 is able to receive power at different voltages from 10 volts to 480 Volts from DC to any frequency any source of power. In a military setting it is important that soldiers exiting the sleeping quarters are able to immediately perform visual tasks in the darkness without waiting for their eye to adapt to the dark. This is because rhodopsin, also known as visual purple, a biological pigment of the retina that is responsible for enabling vision in low-light conditions, immediately photo-bleaches when exposed to light and it takes about 30 minutes to fully regenerate. Thus it would be beneficial for security force personnel who need to move around the living quarters to ready themselves for duty could use light at low levels that would not interfere with the rhodopsin. Thus, when the quarters are occupied only by non-sleeping individuals, the logical controller 535 powers the white light sources 531 at the power level set for high-activity general lighting. When the quarters are occupied by sleeping individuals, the logical controller 535 dims the white light sources 531 and powers the special wavelength light sources 532 and 533 at low intensity.

The special wavelength light sources are chosen as a function of the eye's photoreceptor's sensitivity. The rods (responsible for night vision) are most sensitive at a particular color blue-green (507nm). Thus low lighting by light source 532 at that wavelength would provide the greatest visual response while minimizing energy causing the rhodopsin breakdown. A problem however with scotopic rod vision is that nothing can be seen directly in front of the eyes (no rods in the center of the retina). To see in the extreme dark one must learn to look about 15-20° off center. Not doing so results in the night blind spot which can cause mishaps and physical injury. On the other hand, the center 1.5% of the retina (the fovea) which provides the most detailed vision is packed almost exclusively with red sensitive cones. Thus to correct for the night blind spot light source 533 producing low levels of red light at a greater than a 650nm wavelength are powered to illuminate. Experimentation shows that red LEDs with a peak around 697nm seem to work best to supplement the low intensity blue-green 505nm wavelength LED 532. Other wavelengths to accomplish the night vision functionality are possible and the two described here are by way of example.

Thus in an embodiment of the luminaire 530 for use where there is immediacy in the performance of low light visual tasks, there is provided an illumination capability with light sources of wavelength which interfere minimally with seeing in the dark.

FAML 530 for use in airplane cockpits or living quarters used by security forces in a state of high readiness has a controller 535 and control gear 534 which drives special wavelength light sources 532 and 533 at the above mentioned wavelengths at low intensity. Either of light sources can be present and used independently or most beneficially in unison in the luminaire 530 to facilitate night vision. When maximum dark adaptation is required the red light intensity is set by the controller 535 and monitored by optional light sensor 536 to provide a low luminance of 0.07 - 0.35 cd/m2 (0.02 - 0.10 ft-L). In normal states of readiness the controller employs light sources 531 producing white light general lighting at an illumination level recommend by the IES for normal activities which is dimmed to a night light setting during non-alert low readiness situations. The nighttime low setting is such that the light flux will yield an illuminance of 0.15 lux on the floor with the chromacity of 4000K similar to moonlight.

In an embodiment of the multiple wavelength producing lighting fixture 530 light sources are provided that can be used to aid in the onset of sleep and/or in the onset of awakening. The multiple light source fixture is equipped with control and light source apparatus to illuminate persons or animals with light at wavelengths that are conducive to sleep or awakening. Kayumov et al. showed that light containing only wavelengths greater than 530 nm does not suppress melatonin production even in relatively bright-light conditions. Also Brainard et al in "Evidence for a Novel Circadian Photoreceptor" The Journal of Neuroscience, 15 August 2001 shows that in normal healthy humans, equal photon density exposures of 1.9×10^{18} photons/cm^2 at 460, 630, and 700 nm monochromatic light elicited a significant melatonin suppression at 460 nm while only small reductions of plasma melatonin levels at 630 and 700 nm. Thus the lighting fixture 530 has a general lighting light sources 531 which has radiation at wavelengths that suppress melatonin production and other light sources 532 and/or 533 which are at wavelengths above 570 nm and do not suppress melatonin production. Individuals with difficulty in going to sleep who are aided by increasing the melatonin level can then instruct logical controller 535 to provide only melatonin friendly illumination at the necessary time of day so as not to interfere with their or the children's sleep time. To aid in awakening the controller would illuminate the living space with light sources 531 which have melatonin suppressing wavelengths helping the individual to awaken. Research shows that if the light is in a particular spectrum (around 460 nanometers, which is in the blue range) greater benefits can be derives even from much dimmer light.

In places where individuals with sleep disorders reside in the hours before going to sleep, it would preferable to have illuminating devices capable of influencing sleep patterns. Thus it may be preferable to use lighting house wide to control sleep times. In a preferred embodiment the lighting fixture in the living room, bedroom or office would aid in the onset of sleep or aid in the onset of awakening with the lighting fixture making use of intensity variation and chromacity. The lighting intensity in the patients surround is controlled with reference to the planned sleep hours to adjust the circadian cycle and/or induce hormones so as to assist sleepers to arise by the use of light that is stimulating.

Fig. 31 is a perspective view of a multiple light source adjustable luminaire with added irradiation functionality. Returning to the geometrically adjustable FAML design with light sources for general lighting on moveable light bars and aim-able spot lighting sources we present an innovative added functionality illumination

device. In this embodiment the luminaire 540 has means for limiting at certain times the spectrum of the illumination visible to an individual with difficulty in falling asleep. A fully featured FAML embodiment would be comprised of: a logical controller 541 having means for processing algorithms, data storage, communications and control capability for the task of influencing sleep cycles; power conditioning means 542 for powering controllers, sensors and light sources; standard full spectrum chromacity light sources combined with uniquely driveable light sources 543 that produce light at wavelengths most effective in stimulating or suppressing nocturnal melatonin; and sensors for detecting light and/or images 544. That is, the logical controller 541 can drive LED chips comprising light module 543 that produce a wide range of wavelengths or selectively drive only chips within a permitted wavelength range for some medical, therapeutic or even aesthetic effect. The narrow beam spread, spot light illuminating source 544 also has light producing semiconductor chips of a variety of wavelengths that can be independently powered from driver electronics 542. The light sources 543 and 544 are on movable mounting elements such as light bar 545 and there is the provision of sensors for logical control and feedback in sensor pack 546.

The use of the luminaire to affect sleep cycles is as follows: prior to going to sleep the individual will command controller 541 of the FAML 540 to illuminate their surroundings exclusively using light sources producing wavelengths greater than 530nm. Light sources 543 and 544 of one or more wavelengths above 530 nm may be employed. Utilizing algorithms or stored preset power levels the logical control via the metametric mixing of light source chips in 543 and 544 illuminates the area or visual task with a color close to white light. Thus, the individual will be able to carry out routine tasks such as watching television in the living room or reading a book in bed. However the pineal gland will be "fooled" into producing melatonin as if the individual was sitting in darkness.

The melatonin friendly white light can be generated for example by using commercially available Osram Golden Dragon Plus LEDs LT, LY and LR W5AM as the light source chips or diodes comprising the light modules 543 and 544 in the FALM bedroom luminaire 540. When powered by driver 542 at 20 Watts at approximately 350mA, about 1,200 lumen of very warm white 1200K Color Coordinated Temperature, CCT, light can be produced using the following mix: 156 lumen of 528 nm higher wavelength green light mixed with 400 lumen of 590 nm yellow and 640 lumen of 625nm red. This mix yields a good color rendering index, CRI of 80 while still allowing for melatonin production. Alternately a single monochromatic LED above 530 nm could be powered but vision and comfort would be compromised. The same luminaire 540 in a second operating mode, that is not required to stimulate melatonin production, can at the same wattage produce a cooler color temperature light. This is achieved by powering blue light source diodes in addition to the previous mix while having the logical controller 541 adjust the power level of each LED chip. For example with the addition of two watts or 48 lumen of 470nm blue LEDs (e.g. Osram LB W5AM) a 4250 Kelvin CCT daylight white light can be produced using 600 lumen of 528nm green light mixed with 500 lumen of 590 nm yellow and a mere 100 lumen of 625nm red yielding a good color rendering CRI of 82.

In another embodiment, the same fixture 540 is used for the standard lighting in the bedroom in a normal high output operating mode. Thus by powering more light

sources still at approximately 350mA a higher lighting level and whiter chromacity is achieved. For example doubling the power to 40 Watts with the addition of four watts or 100 lumen of 470nm Blue LEDs (e.g. Osram LB W5AM) a 3800 Kelvin CCT cool white light can be produced using 500 lumen of 528 nm green light mixed with 400 lumen of 590 nm yellow and 150 lumen of 625nm red yielding a good color rendering CRI of 82. A similar effect can be achieved without increasing the number of light sources but instead increasing the current to each LED. This usually however results in shortening of the LEDs useful lifespan. Using a controller 541 and power source 542 capable of powering each LED individually a full range of dimming to very low light levels can be achieved. In a alternative methodology of using different wavelength LEDs for generating melatonin friendly light, a white LED or any other wide spectrum light source could be used with the manual or automatic introduction of a light filter to remove wavelengths lower than 530nm as needed.

Thus the same bedroom fixture 540 can serve as a night light obviating the need for an additional night light lighting unit in the same room. Again, the night light mode has special chromacity to allow visual tasks to be performed yet with minimal interference to sleep as described above in Fig. 30. Utilizing the non-symmetric light distribution capability of the FAML when in night light mode, higher intensity lighting for orientation could be provided in areas of movement around the bed or on the way to the bathroom while zero or only very low intensity night lighting would fall near the head of the sleeping person. The fixture 540 is illustrated as having been hung on the ceiling of a bedroom above the beds for two occupants with the spot lights 544 facing the wall above the head of the beds. In the spirit of the adjustable luminaire of the present invention, the light bars 545 holding the light modules 543 have been swung out of direct view of an individual lying on the bed with their eyes facing upwards to the ceiling. The flexibility of the invention is again demonstrated insofar as this re-configuration ability is unique to the multiple light source lighting fixture making it a truly universal lighting fixture. In this unusual case of the eyes facing upwards, indirect lighting via the ceiling becomes the recommended lighting practice alternative of choice, especially if the TV is mounted high off the floor.

In another embodiment, the FAML bedroom luminaire 540 is equipped with a camera 546 and the logical controller has means for image recognition and computer vision. Thus now as opposed to a standard night light which is always on, the innovative night light 540 using computer vision analysis could be highly dimmed or off most of the time making it easier to sleep and saving power. It would be reactivated when there is major movement on the part of the sleeper indicative of the need for illumination or a baby crying is picked up by microphone in sensor pack 546 in anticipation of light being needed by the parent awakening to care for the child. Greater movement such as getting out of bed would further increase light levels for proper orientation and object avoidance.

As a further customization of the illumination characteristics, when utilizing the light source aim-ability feature of the FALM, one occupant of the room could receive controlled exposure to lighting conducive to melatonin production while other occupants in the room at the same time receive a normal, fuller spectrum illumination. Thus the right side spot light 544 could be of melatonin friendly light wavelengths for the individual receiving its light while a second individual in the second bed receives a full spectrum of light for reading from the left side spot light 549.

In addition to using light of specific wavelength for treatment of sleep disorders and other circadian rhythm disorders such as delayed sleep phase syndrome, light therapy or phototherapy can be used for the treatment of vitamin D deficiency, skin disorders (for example psoriasis, acne vulgaris and eczema, and some psychiatric disorders for example seasonal affective disorder. As described earlier the spot light source 544 can be moved by actuators under the control of the logical controller 541 much as a moving head stage light follows actors on the stage. This is a unique feature of a computer/machine vision capable FAML irradiating device which can follow and irradiate the patient while they are carrying out their daily activities and is of major benefit. To ensure that the light therapy rays from the FAML strikes the retina from the best angle, a portable STLS may be placed on the floor or furniture in front of the patients eyes. In instances where the FAML is providing UVB radiation such as in vitamin D therapy and high intensity UVB is hazardous to the eyes, the computer vision system would make sure to stop radiation unless it knew that the eyes were not being irradiated. Other medical applications of light therapy also include pain management, accelerated wound healing, hair growth, improvement in blood properties and blood circulation, and sinus-related diseases and disorders. Many of these use low level laser therapy and red light therapy in the 620–660 nm range.

In an embodiment of the therapeutic luminaire 540 having radiation sources controlled by a logical controller using computer image recognition algorithms that enable face recognition the device is capable of providing the correct dosage to an individual. For example curing SAD winter depression caused by serotonin deficiency by treatment with bright light therapy the luminaire's logical controller 541 will measure the individual patient's exposure time ensuring that it complies with the medically prescribed dosage to preserve serotonin levels for that time of year. In an embodiment where the computer vision system 546 has capability for eye recognition and tracking, a more accurate dosage intensity and exposure time is metered. The dosage analysis is based on either computer knowledge that the eye is exposed by actually measuring the radiation reflection off the eye which may include a daylight component in addition to the artificial luminaire component. Thus a more accurate therapy record may be obtained and reported to a monitoring computer or health practitioner if necessary. If a satellite light re-directive STLS device is positioned fore of the patient, a specular mirror section is provided on the STLS and may be used by the camera imaging system to capture the eye or reflections off of the eye and verify the dosage received. Non-disturbing infra-red radiation may be used by the transducer sensor system 546 to capture and measure the eye reflections for imaging and dosage measurement purposes. Using eye-tracking algorithms the controller logs all the time the eyes have received the therapeutic radiation dosage and adjust the treatment accordingly. Having communications apparatus the controller conveys the treatment history to medical care supervisory personnel.

Another embodiment of the luminaire assists people to awaken at any hour by irradiating them with shorter wavelengths of light or safe UV, which suppress melatonin production. A FAML 540 is provided with: a logical controller 541 having algorithms and data for the task of influencing sleep cycles and with light sources that produce light at wavelengths most effective in suppressing nocturnal melatonin. It then uses a time and intensity controlled exposure to illuminate the person or animal at a prescribed interval time in advance of the wake time. Decreases in melatonin production in human and animals are known to be caused by environmental lighting, especially short-wavelength lighting (between 460 and 525 nm). Test results

strengthen earlier findings that the human circadian system is more sensitive to the short wavelengths of light than the longer wavelengths. It is principally blue light, around 460 to 480nm, that suppresses melatonin, increasingly with increased light intensity and length of exposure (Wirz-Justice, A; Benedetti, F; Terman, M (2009). Chronotherapeutics for Affective Disorders: A Clinician's Manual for Light and Wake Therapy. Basel: Karger. ISBN 978-3-8055-9120-1. It is also possible to use violet colored LED to which the visual response is low such as a 420 nm wavelength. The disturbance to sleeping individuals may be lower, however, though studies demonstrated a clear fluence-response relationship between 420-nm light and melatonin suppression the response is weaker.

Thus a person sleeping in their bed could program the lighting fixture controller 541 to begin irradiation with the melatonin suppressing wavelength LEDs in advance of the wake up time as required. Again, with the light aiming differentiation capability of the FALM 540, two people in the same room with different wake-up times could receive different dosage at different times as programmed into the controller. One person could be irradiated with melatonin producing radiation or none at all while the other receives melatonin suppressing irradiation. Alarm clock functionality can be added to the logical controller 541 of the bedroom illuminating device and/or an additional device 547 is provided. It will use lighting and/or sound from alarm speakers 547 to awaken the individual when wake time finally arrives. Voice commands can be used to program and turn off the alarm clock. To ensure the user is really awake the alarm clock can ask the user to solve a mathematical equation before stopping the alarm.

In another embodiment example of a bedroom application (a living room or kitchen lighting application would be much the same), the FAML 540 is located on the ceiling near the room center. It uses distributed light sources 543 or optical means over a single light source to provide for homogeneous ambient lighting and concentrated light sources 544 or optics to create a narrow beam for task lighting. The concentrated sources 544 and 549 may be used to provide illumination for the visual task of reading a book thus replacing the night-table lamps. It is preferable that the beam not come from above and in front of the reader lying in bed as the rays from above will disturb reader. Also one occupant of the room may desire to sleep while the other is reading. Thus a re-directive satellite light source STLS is placed directly behind or off to a side and behind the reader. The STLS has a substantially specular reflectivity rather than a diffuse one so as to maintain a concentrated spot beam with little spill light beyond the book. Of course the book itself is a Lambertian reflector but the maximum has been done to minimize disturbing others. The FAML 540 configuration can be adjusted upon installation to have the narrow beam spot light aimed at the STLS. The STLS itself may be manually adjusted by the user to best direct the light for the visual task at hand such as reading a book in bed. The user will keep the laser pointer on the target disc while swiveling the STLS until the book receives the maximum light. This is similar to adjusting the shade of the table lamp which it replaces. When properly aligned there is very little spill light and the other occupant of the room can sleep undisturbed. In an embodiment having a computer vision enabled luminaire capable of determining the book position, the controller 541 will automatically re-direct the light beam 548 from the movable light source 544 and/or re-aim the movable STLS so as to maximize illumination effectiveness. Alternatively, the wall or surface behind the bed or the headboard has sufficiently good optical characteristic enabling light from the beam to be used or has had a

specially reflective decal placed on it. In a computer vision enabled embodiment the logical controller 541 is programmed such that when the reader puts the book away the light goes out or slowly dims into the night light mode.

It has been demonstrated that a single bedroom luminaire 540 can replace two other typical bedroom lighting fixtures. The night-table lamp and the nightlight. In addition, by using the directional light output capability of the FAML fixture, this spectrally accurate lighting may be further limited in its illumination coverage to bedroom areas where movement is possible, thus not shining towards a sleeping person's eyes. Using machine vision techniques for image recognition, the position of those sleeping and those up and awake is determined. In addition computer vision allows for automatic tracking spot lighting similar in function to how a moving head stage light for stage performers follows them about the stage. All this can be carried out by the automated lighting fixture 540 where the light sources are moved by the controller so as to illuminate only the person awake in the room. The trajectory of the light beam is checked by the controller such that the light beam does not fall on the head of anyone else sleeping in the room.

Fig. 32 is a perspective view of an industrial lighting fixture for use in hazardous locations. These are locations that are characterized by the presence of combustible gasses or dust particles. So that the explosion proof lighting fixture 550 can to obtain ExProof certification for use in hazardous locations, it is constructed in a unique manner which prevents ignition of the gases or dusts by electricity or heat produced by the fixture. The intrinsic safety protection techniques used in its construction enable safe operation in explosive atmospheres and ensure that the available electrical and thermal energy in the system is always low enough that ignition of the hazardous atmosphere cannot occur. The intrinsic safety of the illuminating device 550 includes the control of component temperatures even in fault conditions (such as an internal short inside an electronic device). The electrical control gear 551, logical controller 552 and LED light sources 553 are all thermally protected. The temperature of a failed component will not rise to a level higher than the autoignition temperature of a combustible atmosphere. Current limiting safeguards, such resistors and fuses, are employed in the electronic circuitry throughout to ensure that in no circumstance can a component reach a hazardous temperature.

To a major extent the fixture is intrinsically safe as it is hermetically sealed for life. This is accomplished because the LEDs 553 are driven at or below design currents as well as having the junction being thermally cooled to well below allowable temperatures due to lifetime and explosion proof certification considerations. Note that in prior art ExProof fixtures the lamp needs to be replaced and therefore allowance was made in fixture design for opening the fixture to replace the lamp. Under these low current cool operation conditions the LEDS will provide 90% of their initial lumen output even after 100,000 hours or over 20 years of night operation. This in turn allows for a design where the LEDs are encapsulated for life in resin type materials 554. There is no possible contact with explosive materials between electrical or heat generating components. Thus in this novel hazardous location fixture design, the LEDs, electronics and electrical components are intrinsically safe in a sealed for life fixture. This is an inherent safety design and allows for the fixture to be located even in the most hazardous locations including underground mines or inside of tanks i.e. division 1 and zone 0 classified hazardous areas. In an embodiment of the fixture there are no screws to open for access to the internal fixture parts other

than on the wiring box 555 which connects the Exproof fixture to the power mains. The wiring box itself is approved for zone 0 hazardous locations and has explosion proof sealing apparatus. While prior art fixtures that can be opened for service may not be properly closed by service personnel thus becoming an explosion hazard this sealed fixture is foolproof in that there is no access for life.

Referring now to the adjustable lighting fixture embodiment in more detail, in Fig. 32 there is shown an illuminating or irradiating device 550 which is capable of being adjusted to match the radiation spatial distribution with the actual illuminating requirements of the surround where the lighting fixture 550 has been installed. The light sources 553 are mounted on curvilinear support structures 556. The rear side 557 of the support structure (or light bar) 556 is a heat exchanger structure of increased surface area for the transfer of heat from the LED junctions to the surrounding air. The front surface material 558 of the support structure is highly transmissive to light allowing the light generated by the light sources 553 to exit the luminaire. These curvilinear support structures 556 possess a unique geometry and thermal transfer characteristic and are innovative in a number a ways. The luminaire is comprised a multiplicity of light sources having respective spectral distributions and respective light distribution patterns which are directional and subtend lesser angles than those of the overall luminaire light distribution pattern. The light source mounting structure556 is configured to mount the light sources 553 so arranged on the structure such that the respective directional light distribution patterns and the respective spectral distributions combine to form an efficiently distributed overall light distribution pattern. This overall light distribution has been calculated to efficiently provide the surface areas intended for illumination by the fixture 550 with the design illuminance. In this unique configuration the overall light distribution pattern, subtending greater angles than that of the respective light distribution patterns is produced directly by the multiplicity of light sources without recourse to inefficient non-integral reflectors and/or refractors.

As the overall spatial light distribution of luminaire 550 is comprised of the sum of the narrower beam light sources 553, each light source covers a specific area proximate to the luminaire. The aiming angles of the sources of known light flux and beam angle are determined by using the inverse cosine law to determine the amount of light flux required to illuminate the surfaces to be covered by the luminaire. Once the aiming angle with reference to the nadir is known there is yet another design criterion that needs to be met. There is great importance in maintaining the light emitting diode junction at low temperature. To remove the heat from the junction it is important for the LED assembly 553 to have excellent thermal contact with the heat sink 557 at every aiming angle. Thus the construction of the support structure has been dictated by the individual light source aimings that are designed to illuminate both near and distant surfaces with the recommended illuminance. In addition, the rear side of the support structure556 which is exposed to the outside air is integral with the heat sink 557 which is most beneficially in direct contact with the LED junction to maximize thermal transfer away from the diode structure to the environment. Uniquely both of the design requirements have been met by the unique construction of the support arm 556. The final benefit of the unique curvilinear light bar is the strength it imparts to the structure. In an embodiment the shock proof glass lens 558 is slightly recessed within the light bar channel 556 allowing for the edge 559 to act as a protective bumper protecting the glass from breakage even if impacted by a metal tool. Often explosion proof glass globes are protected by a guard. The

curved metal guards protect the glass from mechanical breakage in the harsh industrial setting. The shape of the bars 556 and the recessed glass cover maintains this protective design approach to effect shielding from mechanical breakage.

An exemplary embodiment of the adjustable explosion proof fixture in a chemical processing plant characterized by an open facility design is presented. In the facility, piping and vessels are supported by the skeletal support structure with walkways, floors and stairs made of metal grating. The walkways, vessels, machinery and piping all need to be illuminated at night by lighting fixtures placed on the structure along the walkways. In this lighting application example the walkways are at the exterior edge of the structure with the piping and machinery towards the interior. Beyond the walkway fence there is no structure and no need for illumination. The configuration of the lighting fixture as shown in Fig. 32 has been arranged so as to illuminate inwards towards the vessels, machinery and piping as well as along the walkways and stairs but not outward into free space. The luminaire has been mounted on an upright beam at height of 3 meters at the inward edge of the 1.5 meter wide walkway. The LED bar 560 is rotated 15 degrees off the nadir out of the page around the axis 561 to be aimed at the center of the walkway and the LED 553 beam spread is 30 degrees. LED 562, because it is projecting to the work plane further away at a higher angle from the nadir, will, following the inverse square and cosine law, have a narrower beam spread (at least along the width of the walkway i.e. the beam 564 may be rectangular or elliptical, taller than it is wide) ensuring that most of the light is utilized and not spilled over the edges of the walkway. The light bars 556 and 563 have mechanical means to be rotated 360 degrees about the center 565 and have been aimed to the same side, inwards to the facility. Thus they illuminate the piping and machinery and do not shine out of the facility wasting the energy or even causing light pollution as would a standard prior art luminaire. Now in their new configuration, the light intensity output of each LED must be reset in the driving electronics 551 and controller 552 so as take into account overlapping coverage on surfaces to be maintained at the recommended illuminance.

In a preferred embodiment a sensor apparatus 566 is capable of measuring the illuminance of surfaces in the processing facility and providing the logical controller 552 the necessary feedback information to control the power to the light sources 553 etc so that the illuminance goals are met. Alternately, if the light bars have been incorrectly configured in aimings that do not allow for coherent illumination of the surfaces, the controller communicates the necessary aiming modification to the installer. An example of the logical controller 552 circuitry, computing apparatus and algorithm processing were described above in Fig. 22 and 23. In an embodiment where sensor 566 is a digital camera and the logical controller 552 has means for computer vision, an installer can use reference sheets of known reflectivity and luminance to calibrate the illumination level setting of the individual light sources within the logical controller 552 based on the fixtures initial factory calibration data. For example, when setting up the system the installer can customize the illuminance level on each element of interest. The system calibrates light coverage by firing LEDs at synchronized timings with the vision analysis system 552 determining which LED illuminates what surface. Next the installer can input the desired illuminance via the reference sheet by indicating on it the number of lux desired on the surface. For example attaching a note with 200 lux printed on it on a valve. The image recognition software then provides the logical controller the illuminance goal of 200 lux on that surface and the logical controller 552 powers the light sources 553 etc aimed towards

that surface with the necessary power signal to obtain the needed light flux. Feedback is provided to the installer if additional light sources are needed or their re-aiming is required. Information is provided to the installer through visual display on the logical controller 552 of the luminaire or another display device in communication with the logical controller 552.

In another embodiment the cooling of the harsh environment luminaire 550 is effected by using liquid cooling of the LED light sources. The coolant may be anything from deionized water (approximately 18.2 megohm-cm) to heat-conductive oil. The oil may be part of the methodology used to secure intrinsic safety classification from ignition danger of electrical circuits in explosive environments. It may also be an optically transmissive medium which couples optically with the light sources to produce a desired light distribution with other complementary optical devices. The oil may be pumped mechanically with a pumping apparatus such as a long life diaphragm pump to cool the diode junction. Alternately, in a preferred embodiment shown here, thermo siphon effect circulation is utilized to convect the thermal transfer fluid from the light bars 560, 556 and 563 to the central heat exchanger 568. The thermo siphon return post 567 serves as the path for the cooled lower density cooling fluid to return to the light bars 560, 556 and 563 from the heat exchanger 568. The benefit of the thermo siphon system is that it is motor less, doesn't require power and is highly reliable. It also adds longevity and efficiency to the LED light sources by offering superior heat transfer rates maintaining the diode junctions at the lowest possible temperature.

Fig. 33 is the process flow chart for novel web based computer application that can help the customer design the multiple light source luminaire for their particular lighting application and order it compete correctly configured from the factory. Alternately, in a DIY luminaire version, they can receive all the necessary luminaire parts with their unique set of assembly instructions for their lighting application. The build-the luminaire-to-order program turns the customer into a professional luminaire and lighting designer. In creating the tailor made luminaire the customer, aka lighting fixture designer, has control of illumination performance based on the skeletal light engine design as well as a choice of various aesthetic luminaire outer body designs. The program is novel insofar as it builds the lighting fixture from multiple light sources according to the dictates of the living space. Prior art practice used hitherto in other lighting programs take standard lighting fixtures with known photometric data as to the light distribution and calculates the resultant illuminance obtained on the workplace or room surfaces. Here the process begins with specifying a surface illuminance and using goal solving techniques, the application builds the fixture's light distribution. Next, in a unique process, the computer application using engineering and look-up table algorithms chooses light sources and places them on the fixture to obtain the desired light distribution.

In practice the customer inputs the lighting application geometry, fixture mounting position, living space elements and projected usage answering a live questionnaire. Digital camera pictures of the living space uploaded to the site may aid the program in generating the architectural CAD lighting layout. The customer assigns visual task information to areas of the room, e.g. reading chair, adult over 50 years old etc. The layout process ends with a map of the room surfaces now assigned with illuminance levels. The program assigns a specific orientation of the luminaire within the living space e.g. fixture orientation mark facing east window. The luminaire in practice

must be hung in the room in the instructed orientation. A preliminary grid is assigned to the room surfaces based on the distances from the luminaire to the surface and the light intensity limits of the light sources. By using the inverse square and cosine law with known illuminance, distances and angles the program solves for the luminous intensity. By working a luminaire design program such as Photopia™ from LTI Optics in reverse, the light source ray distribution properties are obtained. The program then looks up in the light source library the light source with the best matching spatial intensity distribution for illuminating the specific grid area. The design program then arranges the selected light sources on a fixture skeleton structure to obtain the overall necessary illumination. The web application next simulates the fixture performance through lighting design software applications known in the art such as AGI32™ from Lighting Analysts. The computer routine checks the lighting layout against best practice guidelines for visual comfort from glare, lighting levels and recommends need for additional light modules, luminaires or reflective satellite light sources. The customer can review the simulated lighting output in their application and after a few fine tuning iterations a final design can be satisfactorily achieved. Now that the fixture skeleton and light source positions thereon are known, the customer then chooses from the available candidates of aesthetic luminaire outer façade choices that can be used with the dictated skeletal structure. The final fixture outer design and lighting performance is simulated. Should the customer be unhappy with the aesthetics or performance they may begin again with the option of forcing an aesthetic design which may dictate a less than optimal skeletal structure. When satisfied, the customer orders the luminaire to be assembled by the manufacturer to spec. In the DIY version the web application generates the fixture parts list for the kit to be sent to the customer. It is clear that the application is not only web based but can be a downloadable version run from a computer.

In another version of this Do-It-Yourself lighting designer application, the main skeleton lighting fixture with the power supply electronics and the camera based vision system and controller is supplied to the customer. The camera vision system measures the room geometry and identifies room contents as described earlier via algorithms known in the art for measuring distances with a camera and pattern recognition techniques for identification. Based on the information garnered about the lighting application such as by following a computerized lighting application design questionnaire and checklist (activities performed in the room, age of the occupants etc), the lighting layout is specified and the lighting fixture design with the light source layout is determined using the lighting design software. The answers to the question are input via a speaker microphone system on the lighting fixture or via come other input device such as a computer or smart-phone in communication with the controller.Once the illumination needs have been determined and the fixture designed the rest of the light sources are ordered up and the DIY fixture similar to 470 in Fig. 24 is assembled

While the preferred embodiment of this invention comprises an adjustable luminaire having means for changing the spatial light distribution as well as the spectral light distribution, it is clear that embodiments of this invention may offer only the spatial light output distribution adjustability as for example when using a single color spectrum LED for all the light sources or only color spectrum adjustability where spectrally differentiated light sources have been used but there is no means for adjusting the spatial light distribution. Many of the novel features of this invention disclosed herein in this continuation in part of the earlier disclosure of the Multiple

light illuminating system included herein by reference apply to the lighting fixture embodiments of that disclosure as well.

CONCLUSION

We have been disclosed a luminaire with control of at least one of the light intensity, light spectrum and light direction and that further being combined with a controller and directional sensors such as a camera having an artificial vision system capability is uniquely able to effect the provision of lighting on an as needed basis in the optimal intensity, spectrum and placement.

There has thus been shown and described, among other things, a multiple-source lighting technology which allows for the design and construction of illuminating devices. Many changes, modifications, variations and other uses and applications of the subject invention will, however, become apparent to those skilled in the art after considering this specification and the accompanying drawings which disclose the preferred embodiments thereof. All such changes, modifications, variations and other uses and applications which do not depart from the spirit and scope of the invention are deemed to be covered by the invention without departing from the spirit or scope of the following claims.

Although a limited number of preferred embodiments of the present invention have been illustrated in the accompanying drawings and described in the foregoing detailed description, it is possible mix and combine the features of one embodiment with another to create a DLF with differing characteristics as taught in the method herein. Therefore, it will be understood that the invention is not limited to the embodiments disclosed, but is capable of numerous rearrangements, modifications, and substitutions without departing from the spirit of the invention as set forth and defined by the following claims. The invention should therefore not be limited by the above described embodiment, method, and examples, but by all embodiments and methods within the scope and spirit of the invention.

ABSTRACT OF DISCLOSURE

ABSTRACT: An illuminating device coupled with sensors or an image acquisition device and a logical controller allows illumination intensity and spectrum to be varied according to changing user needs. The system provides illumination to areas according to the principles of correct lighting practice for the optimal performance of visual tasks in the most efficient, cost effective manner. Aspects of the invention include: lighting fixtures which adapt to ambient lighting, movement, visual tasks being performed, and environmental and personal conditions affecting illumination requirements at any given instant. Lighting fixtures having spatial distribution of spectrum and intensity, providing both "background" room lighting, and "task" lighting.

WHAT IS CLAIMED IS:

1. An illuminating device which produces light to meet an illumination requirement of an illuminated area, comprising:

a light fixture including a multiplicity of directional light sources including at least two light sources pointing in different directions, the light sources having at least one of controllable light intensity and spectral light distribution;

a controller for adjusting at least one of a light intensity and light spectrum of the directional light sources;

one or more detectors for sensing at least one of objects, surfaces and people within the illuminated area and of passing the sensed information to the controller; a processor for processing the sensed information and determining illumination requirements of the at least one of objects and people using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables and for directing the controller to adjust the directional light sources to meet the illumination requirement

2. The illuminating device of claim 1 where the detector is comprising at least one of (i) a camera being a photo sensor array coupled with an optical lens, (ii) a photo sensor, (iii) an ultrasound transducer and sensor, (iv) microwave transducer and sensor, and (v) pyroelectric detectors.

3. The illumination device of claim 1, wherein the illuminated area is indoors and further comprising a detector for detecting variable illumination from daylight and/or sunlight entering indoors, wherein the controller taking into consideration the area now illuminated by the daylight and/or sunlight adjusts the light intensity of the directional light sources to meet the varied illumination requirement.

4. The illuminating device of claim 1, wherein the one or more detectors detects information regarding one or more individuals within the illuminated area, said information is at least one of (i)age, (ii) sex, and (iii) recognition of an individual for matching with stored data about that individual's needs and wherein the controller adjusts the light intensity and/or spectrum of the illumination provided to the one or more individuals based on illumination requirements from at least one of (i) best practices looked up and calculated from stored data, (ii) age and/or sex of the individual, (iii) personal preferences input to the controller and stored in memory, and (iv) commands received by the controller from an input device.

5. The illuminating device of claim 1 for optimally displaying food, wherein the one or more detectors detect an identity of one or more foods and wherein the controller adjusts the light intensity and/or spectrum of the illumination on the one or more foods based on illumination requirements from the processor.

6. An illuminating device having automatic control of the light provided to an illuminated area comprising:

a structure for incorporating illuminating device elements;

one or more light sources incorporated in the structure and in communication with a power source;

electronic circuitry apparatus for the controlled powering of the light source and other illuminating device elements;

one or more cameras placed on the structure for detecting information about the illuminated area, said camera in communication with power and control device elements;

a controller integrated with the structure, in communication with the light source controlling power circuitry, said controller arranged to processes the information communicated from the camera and automatically control the light provided to the illuminated area.

7. The illumination device of claim 6, wherein the one or more detectors are configured to sense a presence of glare on a person's eyes in the illuminated area, and wherein the controller is programmed to adjust an intensity of the directional light sources to reduce the glare.

8. An illuminating device which provides light to meet an illumination requirement of an illuminated area in which visual activities are performed, comprising:

a light fixture including a multiplicity of directional light sources including at least two directional light sources pointing in different directions, the light fixture having movable structure for aiming the directional light sources mounted thereon in a defined direction;

a camera for obtaining images of the illuminated area functioning as a detector for at least one of (i) a light detector (ii) a spectrum detector, (iii) a motion detector, (iv) a measuring detector for sensing a geometry of the illuminated area, and (v) a detector for sensing at least one of work surfaces and road objects and at least one of vehicles and people;

a controller for adjusting a light intensity and a direction of each of the directional light sources;

a processor with stored algorithms and data for identifying at least one of (i) tasks being carried out by people, (ii) location of people, (iii) frequency of area usage by people, (iv) traffic density in the illuminated area from the sensed geometry, (v) work surfaces, (vi) road objects, people and/or vehicles, and (vii) roadway surface luminance any of which is used by said processor for determining illumination within the illuminated area using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables wherein said processer, upon calculating the required illumination parameters, directs the controller to adjust the directional light sources to meet the illumination requirements of the visual activities.

9. The illuminating device of claim 8, further comprising the illumination requirement that different parts of the illuminated area to be illuminated at a different intensity and/or at a different spectrum than another part of the illuminated area.

10. The illuminating device of claim 8, adjustable by an installer based on room geometry and/or usage further comprising the light fixture having adjustable arms on which directional light sources are mounted for aiming the directional light sources within the illuminated area, where said detector and processor combination provides feedback to the installer so as to aim the light sources such that the illumination requirements can be met by the re-adjusted light source aimings.

11. The illumination device of claim 8, wherein the controller receives real time information from the camera and wherein the processor, using image recognition capability, directs the controller to adjust at least one of (i) the intensity, (ii) the spectral light distribution and, (iii) the direction of the light sources based on at least

one of (i) where people requiring illumination are located, (ii)what object the person is viewing and (iii) what visual task the person needs to perform.

12. The illumination device of claim 8, further comprising at least one of the directional light sources mounted on the movable structure where the movement of the light source direction is automatically controlled by the controller.

13. The illumination device of claim 12, providing a different illumination to a sub-area based on usage wherein the controller interpreting images from the camera adjusts the moveable light sources such that they provide the required illumination in a sub-area proximate to the individuals as they move around in the illuminated area.

14. The illumination device of claim 8, wherein the illuminated area is a road and the objects include road signs.

15. The illumination device of claim 8, further comprising at least one of the directional light sources on an automatic swivel joint and providing spot lights of limited beam angle for task lighting while other light source provide general illumination to the illuminated area.

16. The illumination device of claim 8, further comprising a controller with communication capability to other devices, where the camera in one location obtains information and the controller process the information a communicates the camera obtained information to a second device.

17. The illumination device of claim 16, where the illuminated area is a road and the second device to where the camera obtained information is communicated to is a lighting fixture.

18. The illumination device of claim 17, where the processor uses information obtained from the cameras and exchanged between fixtures for identifying traffic requirements in the illuminated area and from the vehicles locations and geometry determining the illumination requirements of the illumination area thereby directing the controller to adjust the directional light sources to meet the illumination requirements.

19. The illumination device of claim 18, wherein the controller is programmed to adjust at least one of (i) increase illumination with an approach of a vehicle, and (ii) change beam cut-off levels as the vehicle advances toward the lighting fixture to eliminate glare.

20. An automated irradiating device for providing radiation to individuals within an area intended to provide a desired radiation in a sub-area proximate to the individuals, comprising:

an irradiation fixture including one or more directional radiation sources where the radiation is in a defined direction;

at least one detector for sensing a location of individuals in the area and feeding that information to a controller;

a controller for adjusting at least one of (i) a radiation intensity, and (ii) a direction of the irradiation based on sensed location,

whereby the desired radiation is provided proximate to individuals in the area.

21. The automated irradiating device of claim 20 intended to provide a desired heating to one or more individuals in an area, further comprising:

at least two directional heat radiation sources pointing in different directions;

the detector being a camera with capability for sensing at least one of (i) a presence of one or more individuals in the heated area, (ii) the identity of the individuals, and (iii) a body temperature of individuals present in the heated area;

the controller further having processing capability for determining the heating requirements of the individuals in the area from at least one of (i) algorithms to calculate radiation parameters, (ii) stored data of heating practices, (iii) image recognition algorithms for identifying the individual based on the camera information, and (iv) an identified individual's personal preferences.

22. The automated irradiating device of claim 20, further comprising:

One or more directional radiation sources capable of being moved so as to direct radiation in a defined direction;

the at least one detector capable of providing information on the present location of individuals in the area;

the controller programmed to process the detector information and move the radiating sources so as to follow the one or more individuals,

whereby the desired radiation is provided in a sub-area substantially proximate to the individuals.

23. The irradiation device of claim 21, further comprising;

the detector being a camera capable of providing images of different parts of the body of individuals to the controller for image processing;

the radiation sources being able to direct radiation to different parts of the body; and

the controller further programmed to run the image recognition algorithms to identify different parts of the body, to compute the desired radiation level to the different parts of the body and to adjust the radiation from sources directed at the different parts of the body.

24. The irradiation device of claim 21, further comprising the controller programmed to control the irradiation in time and intensity on the individual to maintain comfortable heating based on at least one of (i) best practices, (ii) feedback from the heat detector configured to detect body temperature of different parts of a body, (iii) personal preferences input to the controller and stored in memory and (iv) commands input from an input device.

25. The irradiation device of claim 21 where the irradiation instead of for heat is for therapeutic purposes and the radiation may be any of (i) UV radiation, (ii) red light therapy in the 620–660 nm range, and (iii) light therapy for SAD and other disorders, where the controller aims the radiation sources to the location where the individual is located and controls the time and intensity of the radiation.

26. The automated irradiating device of claim 20 further comprising where one or more of the irradiating sources is radiating visible light and one or more of the irradiating sources is designed to substantially radiate heat whereby the device is capable of providing both a desired light and heat radiation to the individuals.

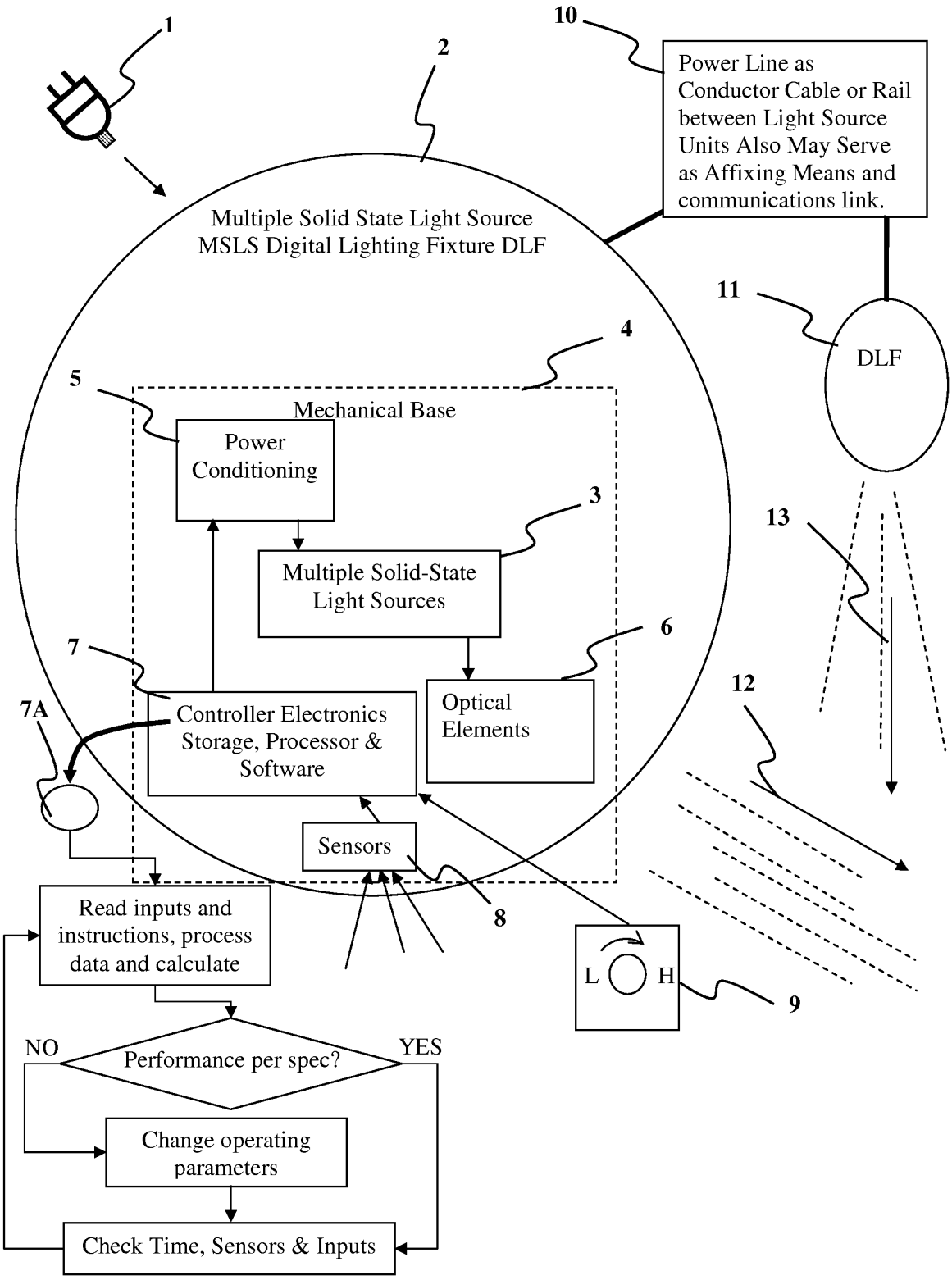

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Power Line as Conductor Cable or Rail between Light Source Units Also May Serve as Affixing Means and communications link.
Multiple Solid State Light Source
MSLS Digital Lighting Fixture DLF
11
DLF
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5
Mechanical Base
Power Conditioning
3
Multiple Solid-State Light Sources
13
6
7
7A
Controller Electronics Storage, Processor & Software
Optical Elements
12
Sensors
8
Read inputs and instructions, process data and calculate
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NO
Performance per spec?
YES
Change operating parameters
Check Time, Sensors & Inputs

FIG. 1

PRIOR ART

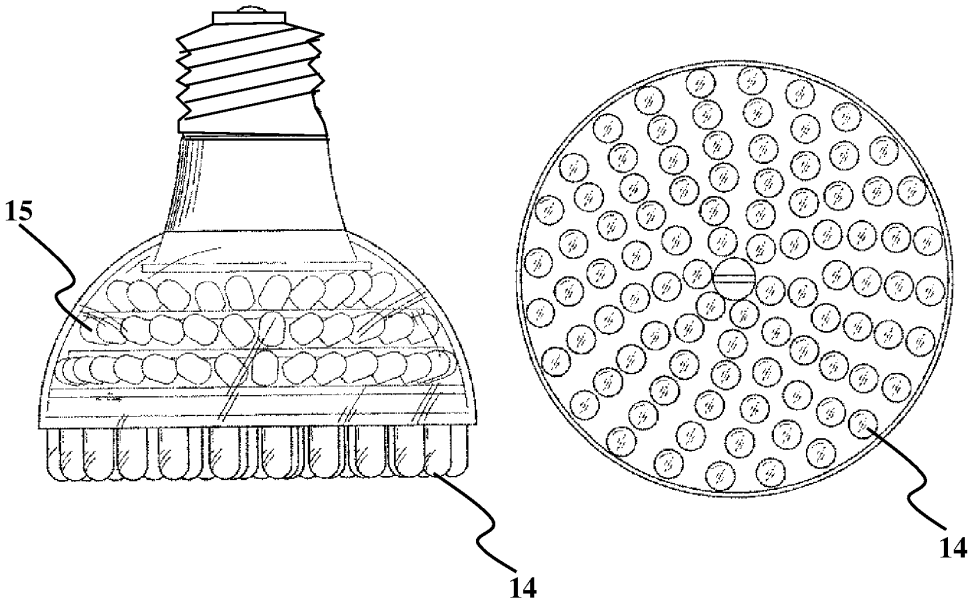


FIG. 2A

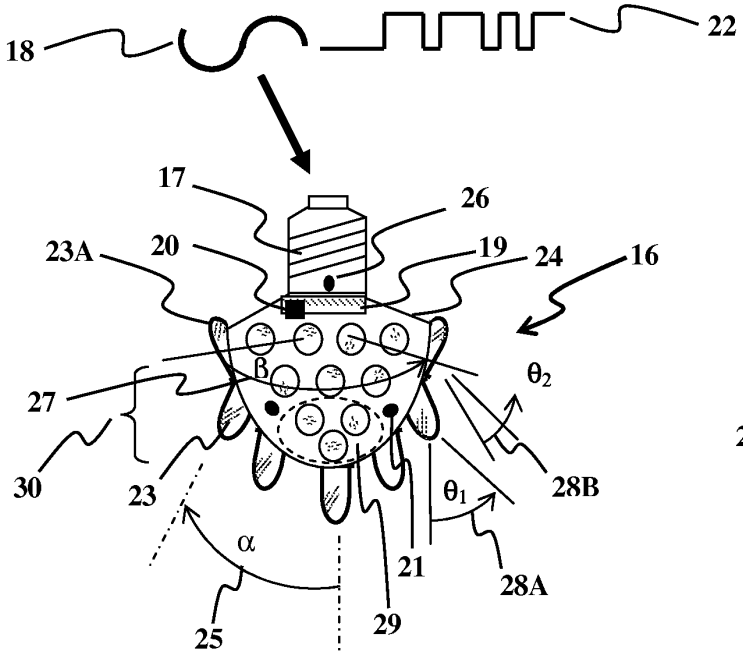


FIG. 2B

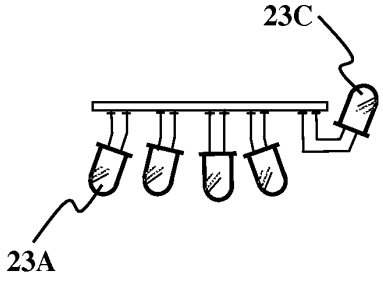


FIG. 2C

PRIOR ART

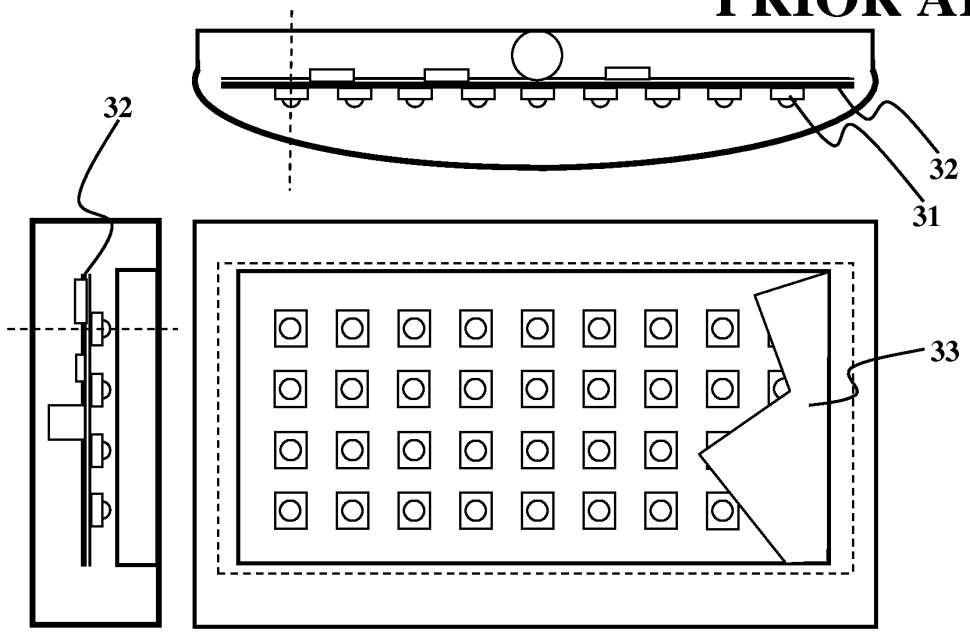


FIG. 3A

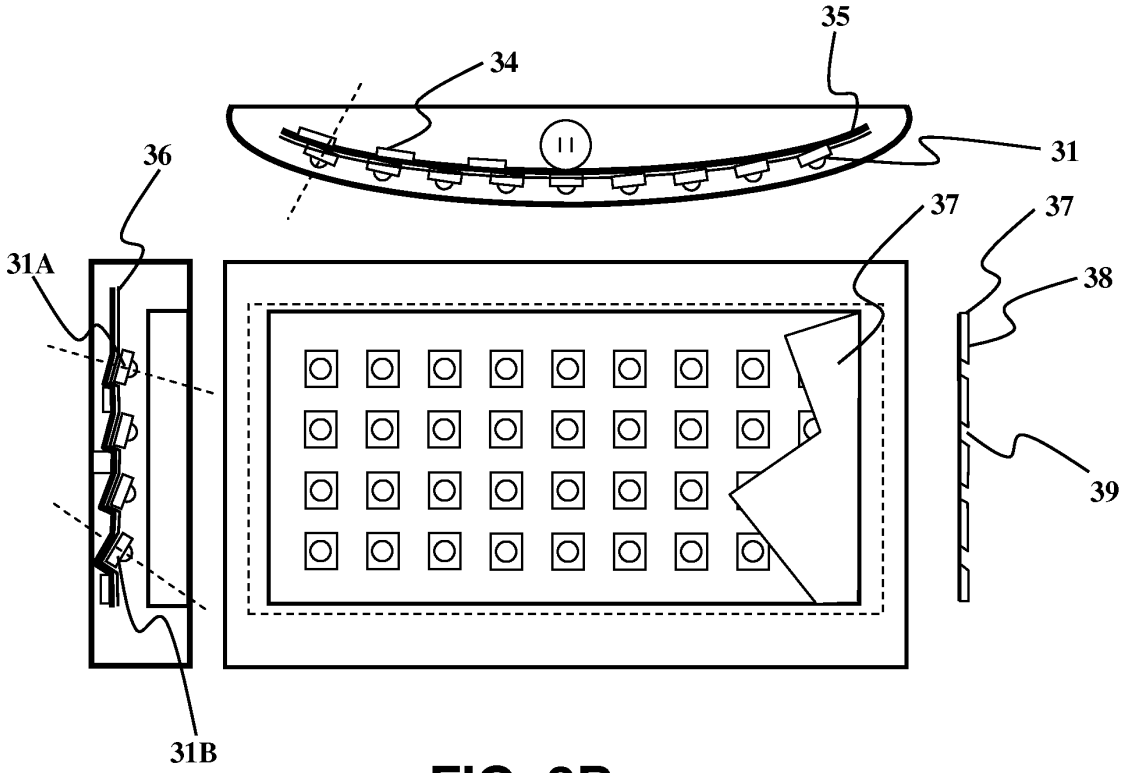
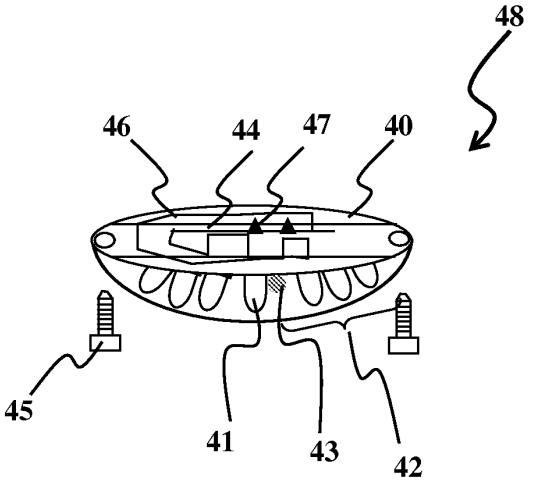


FIG. 3B


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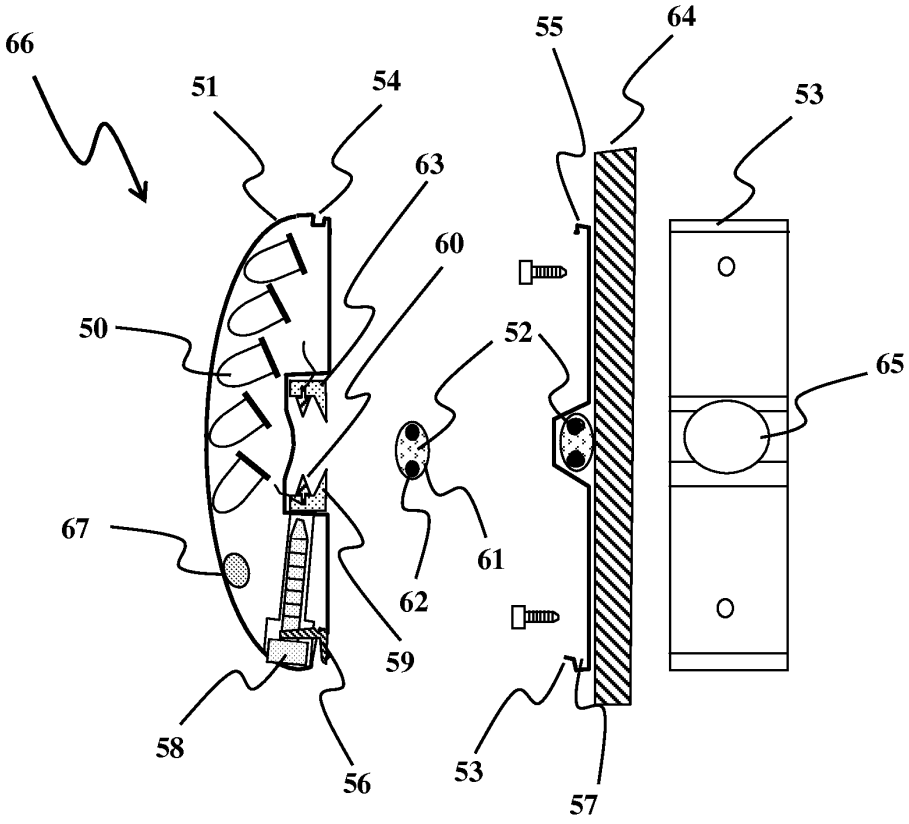

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FIG. 4

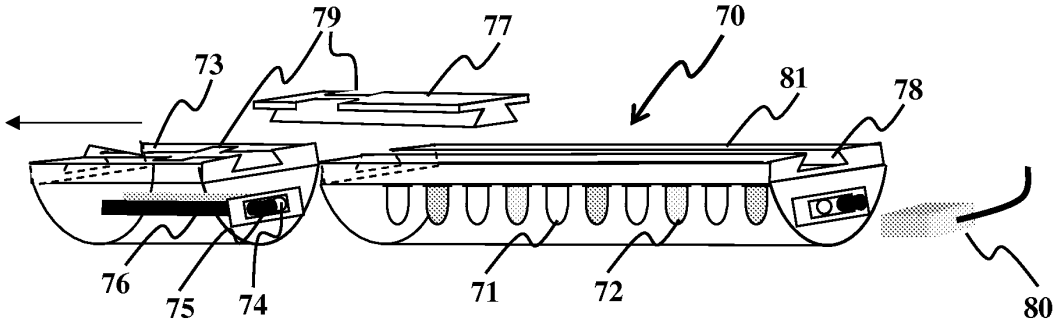

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FIG. 5

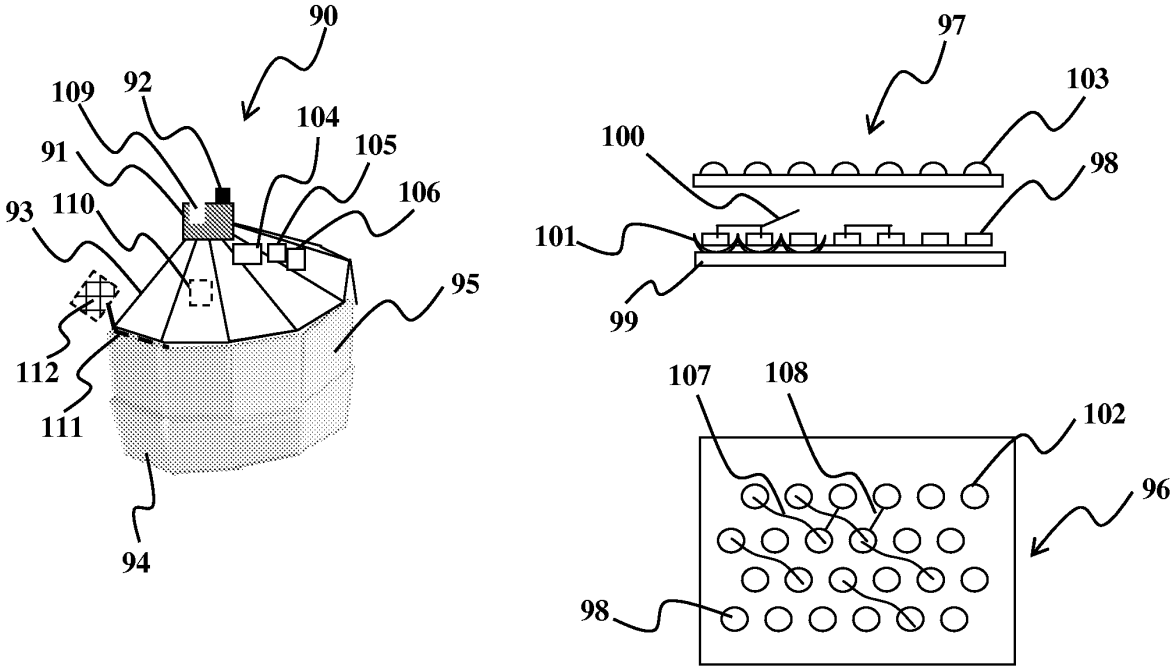

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FIG. 6

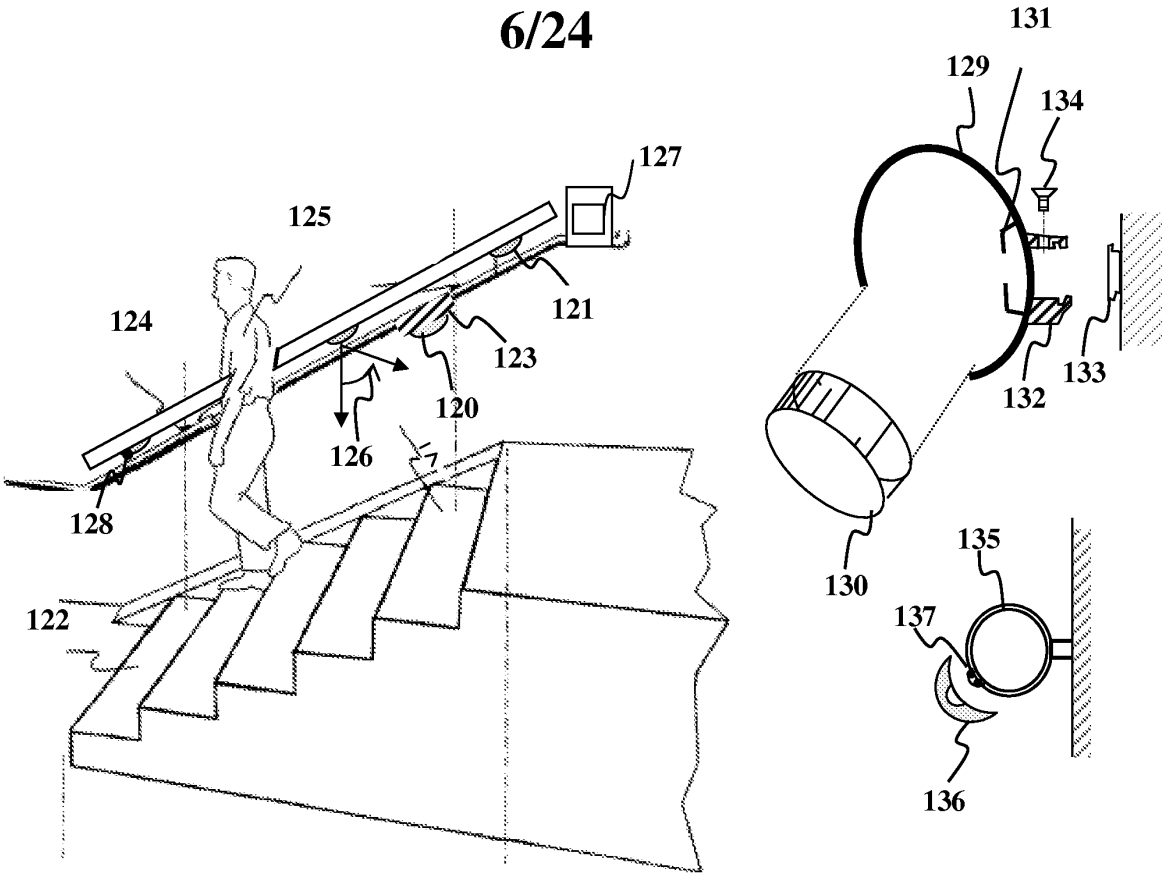

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FIG. 7

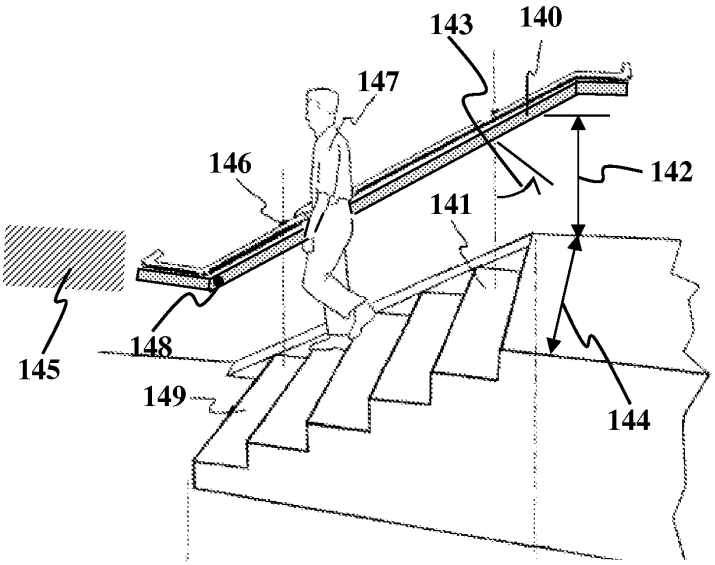

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FIG. 8

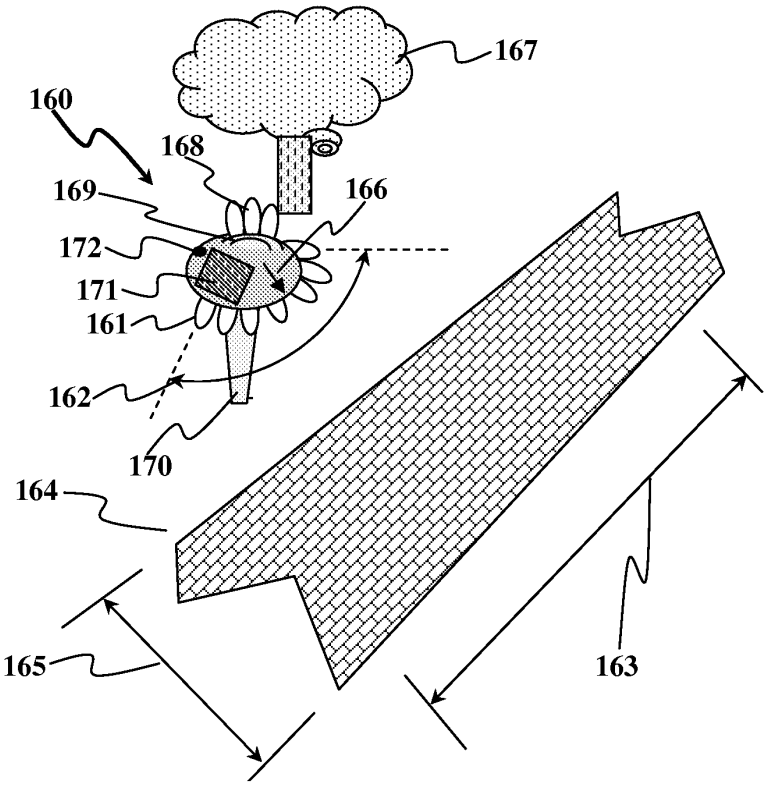

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FIG. 9

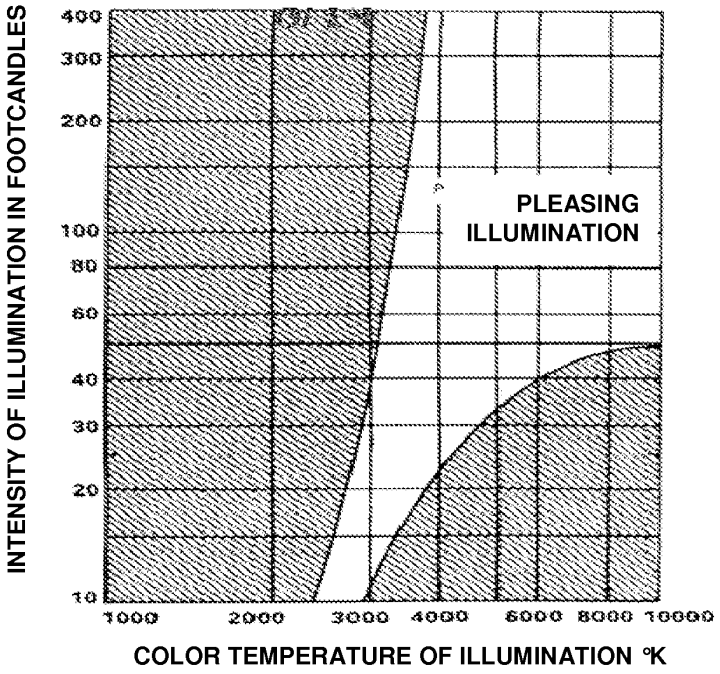

INTENSITY OF ILLUMINATION IN FOOTCANDLES
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100
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PLEASING
ILLUMINATION
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3000
4000
6000
8000
10000
COLOR TEMPERATURE OF ILLUMINATION °K

FIG. 10

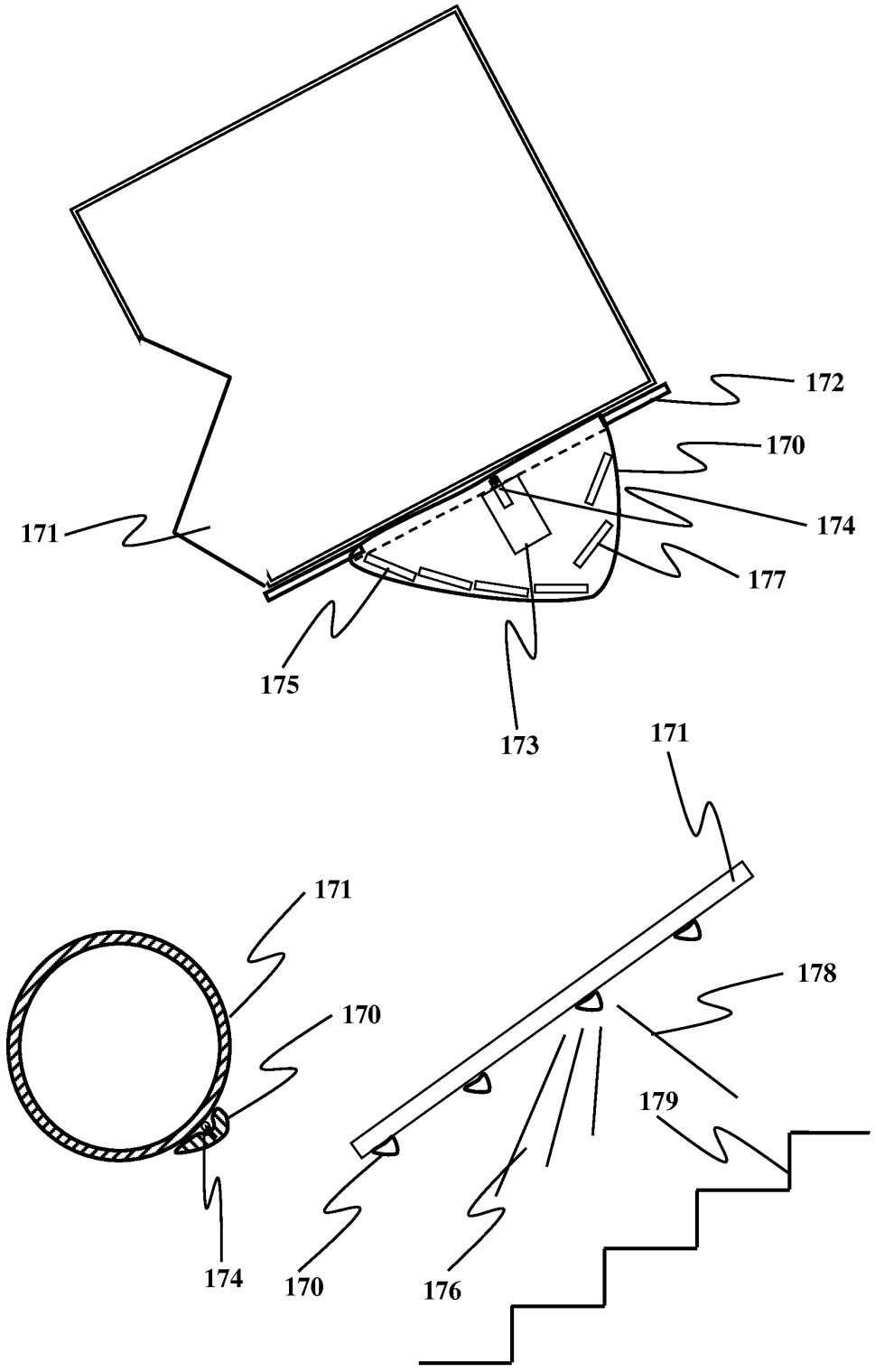


FIG. 11

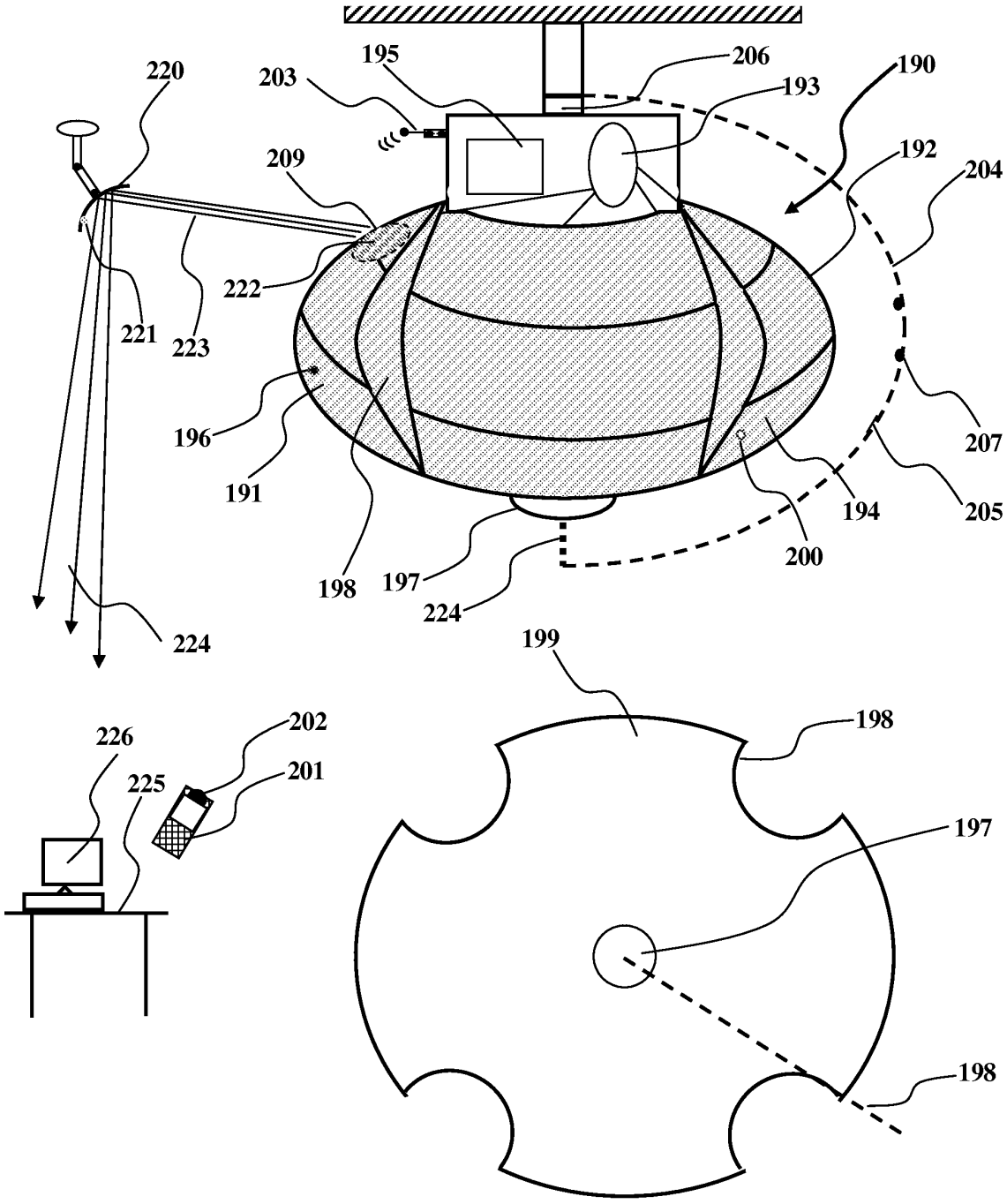

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FIG. 12

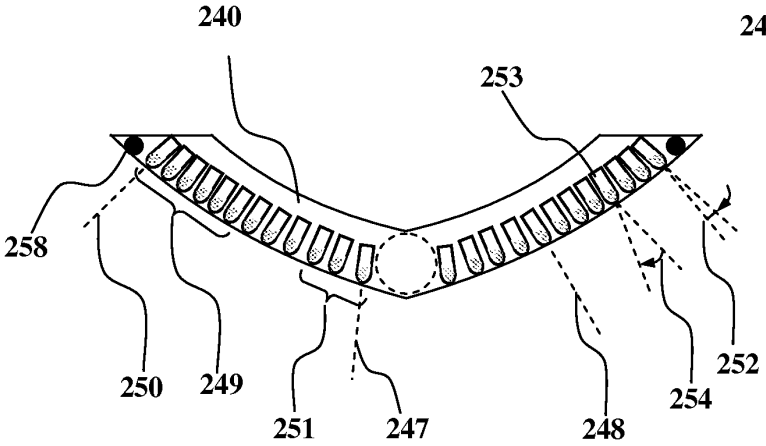


FIG. 13A

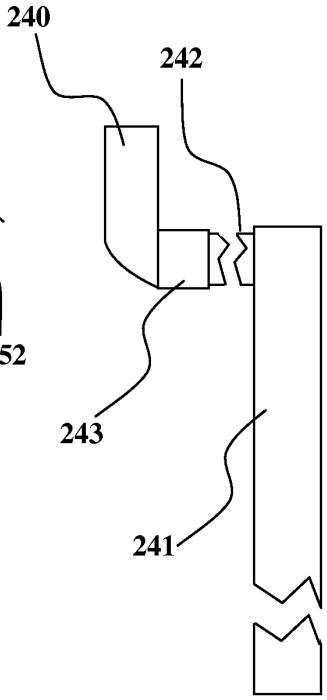


FIG. 13B

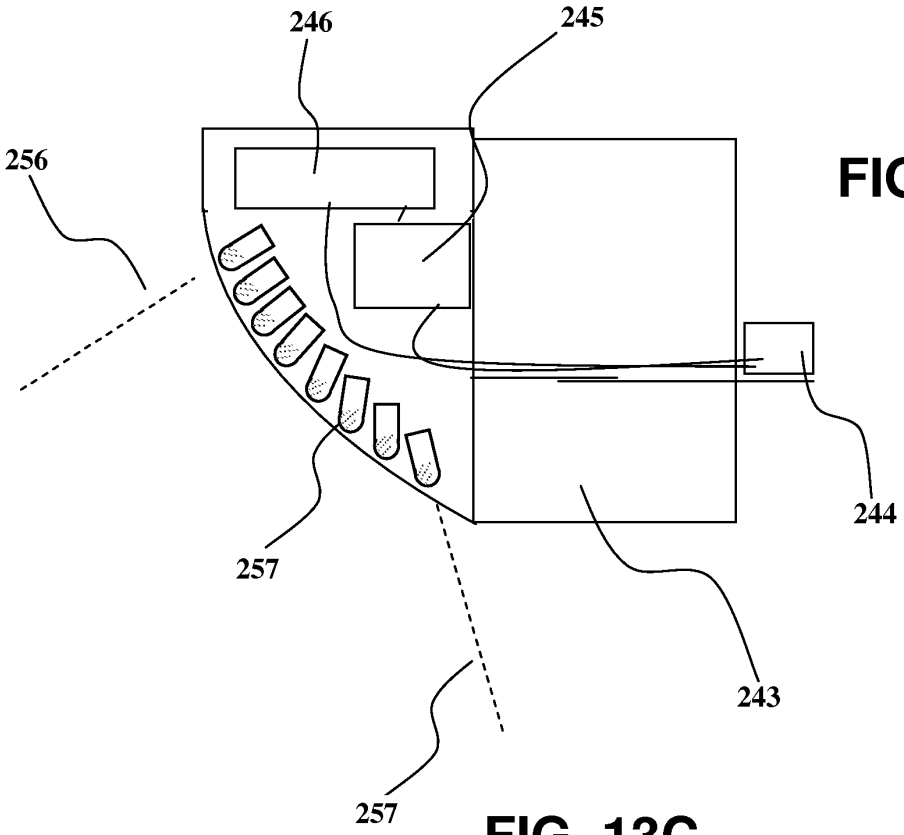


FIG. 13C

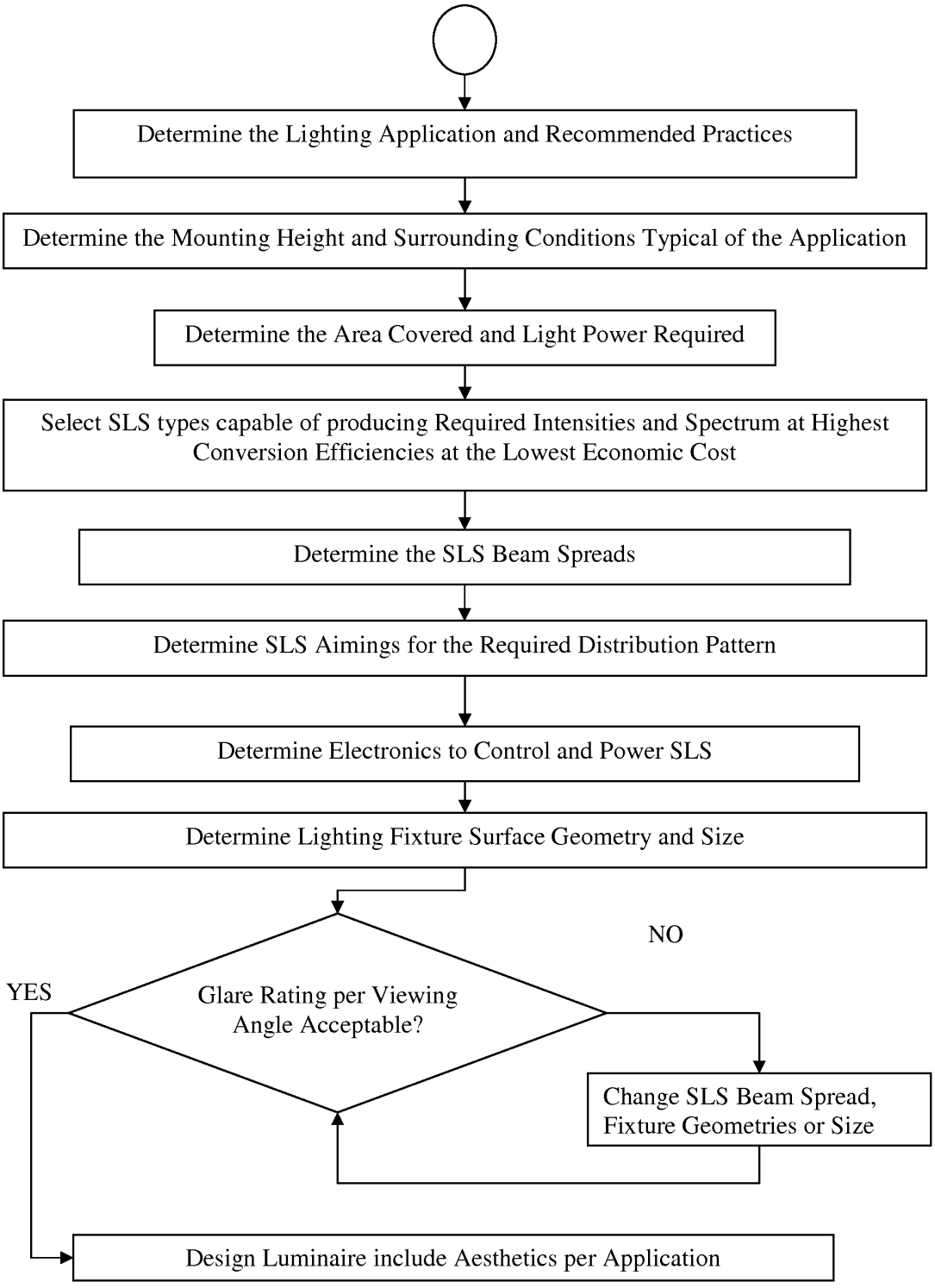

Determine the Lighting Application and Recommended Practices
Determine the Mounting Height and Surrounding Conditions Typical of the Application
Determine the Area Covered and Light Power Required
Select SLS types capable of producing Required Intensities and Spectrum at Highest Conversion Efficiencies at the Lowest Economic Cost
Determine the SLS Beam Spreads
Determine SLS Aimings for the Required Distribution Pattern
Determine Electronics to Control and Power SLS
Determine Lighting Fixture Surface Geometry and Size
Glare Rating per Viewing Angle Acceptable?
NO
YES
Change SLS Beam Spread, Fixture Geometries or Size
Design Luminaire include Aesthetics per Application

FIG. 14

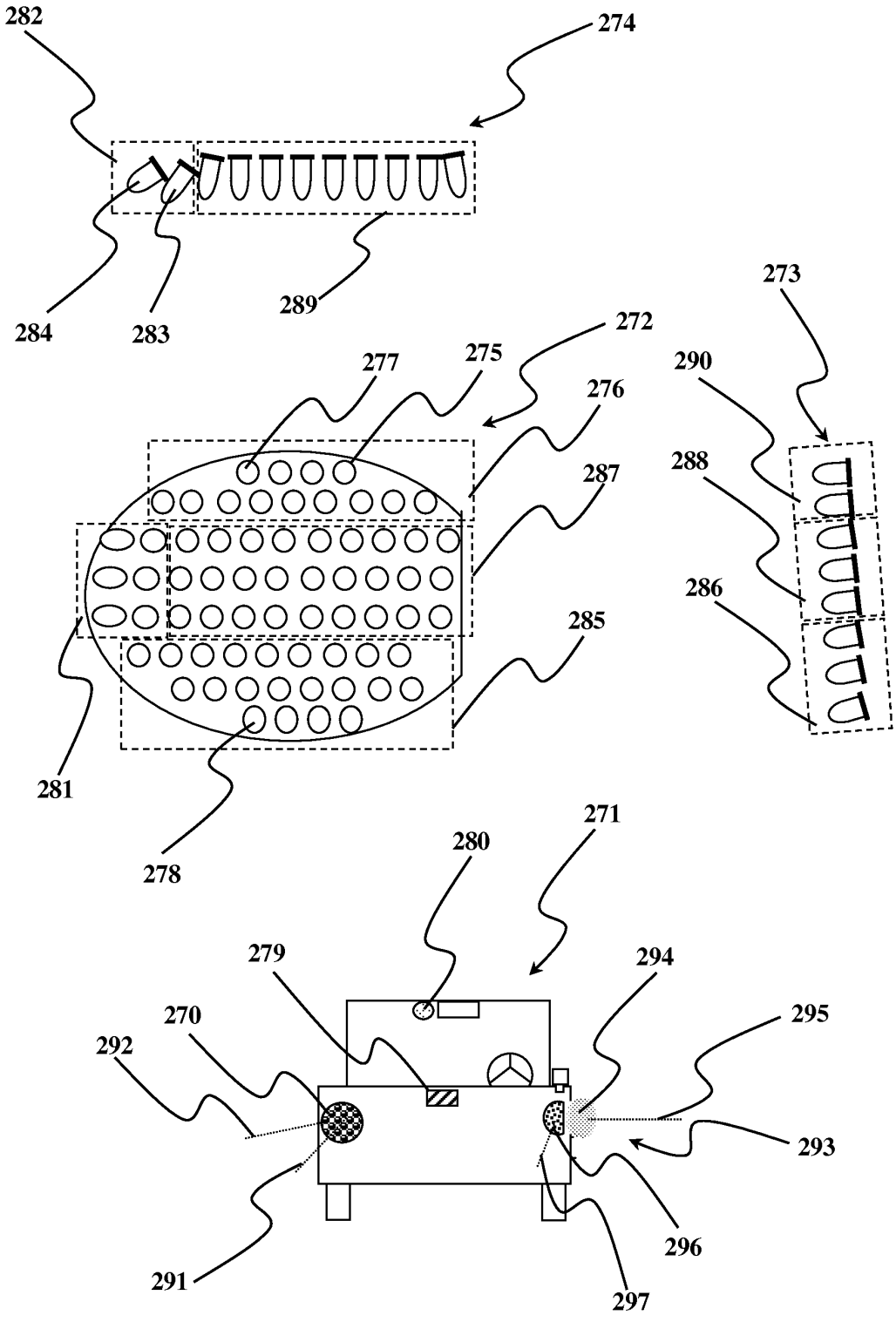

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FIG. 15

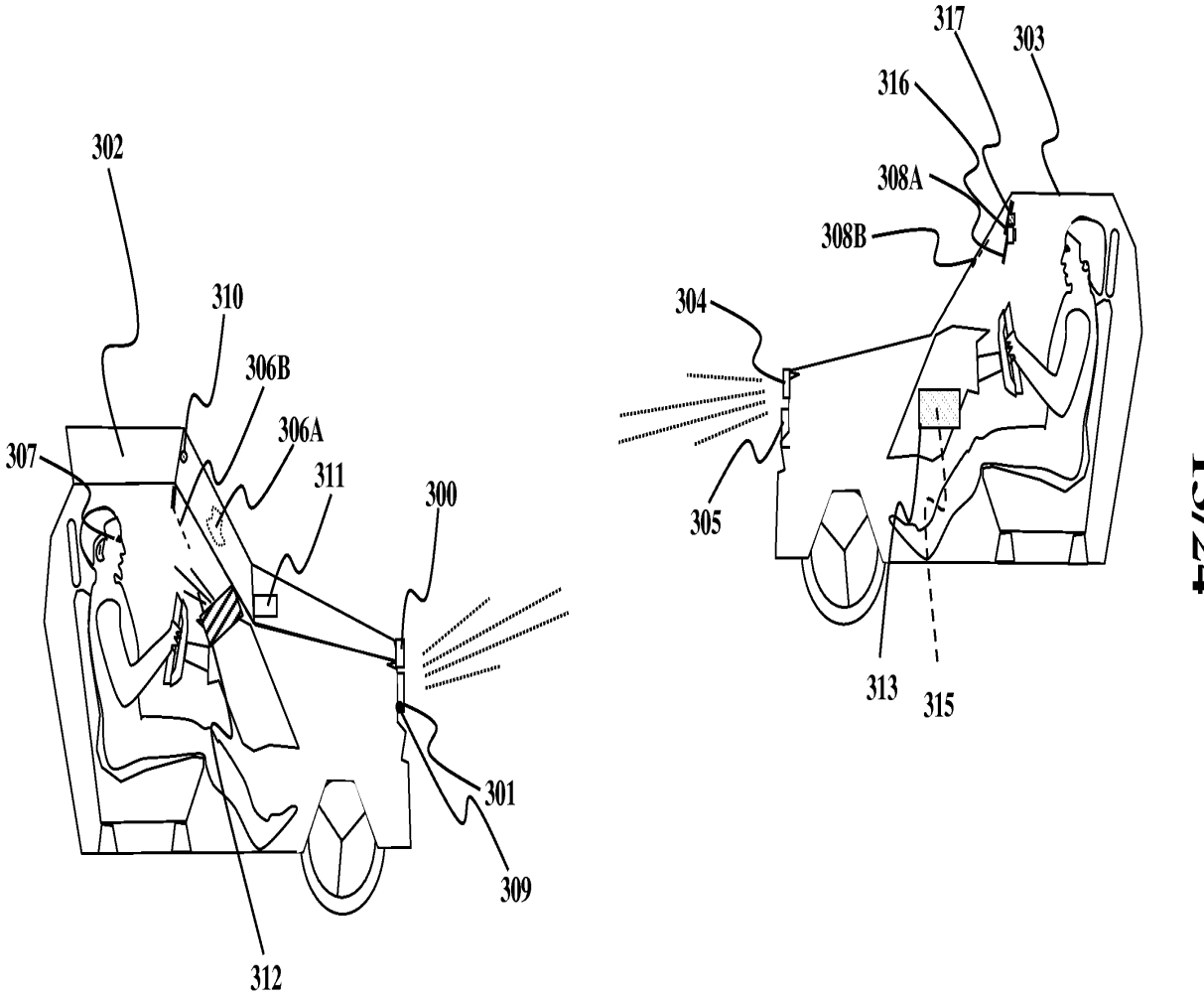

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FIG. 16

Title: Detector Controlled Illuminating System **Inventor:** Spero

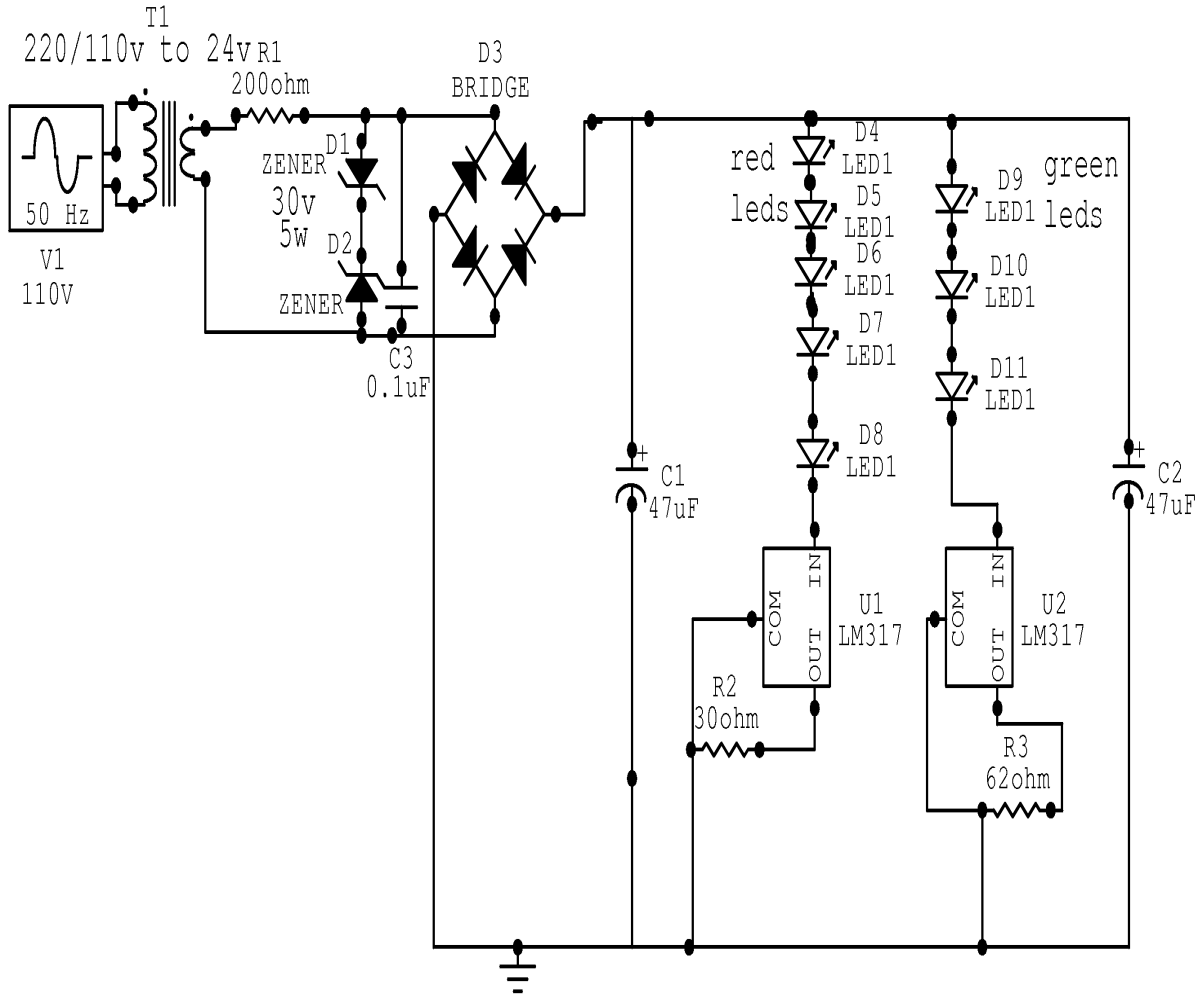


FIG. 17

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Note – There are additionall drawings
Drawings 18 – 33 are in a separately uploaded file

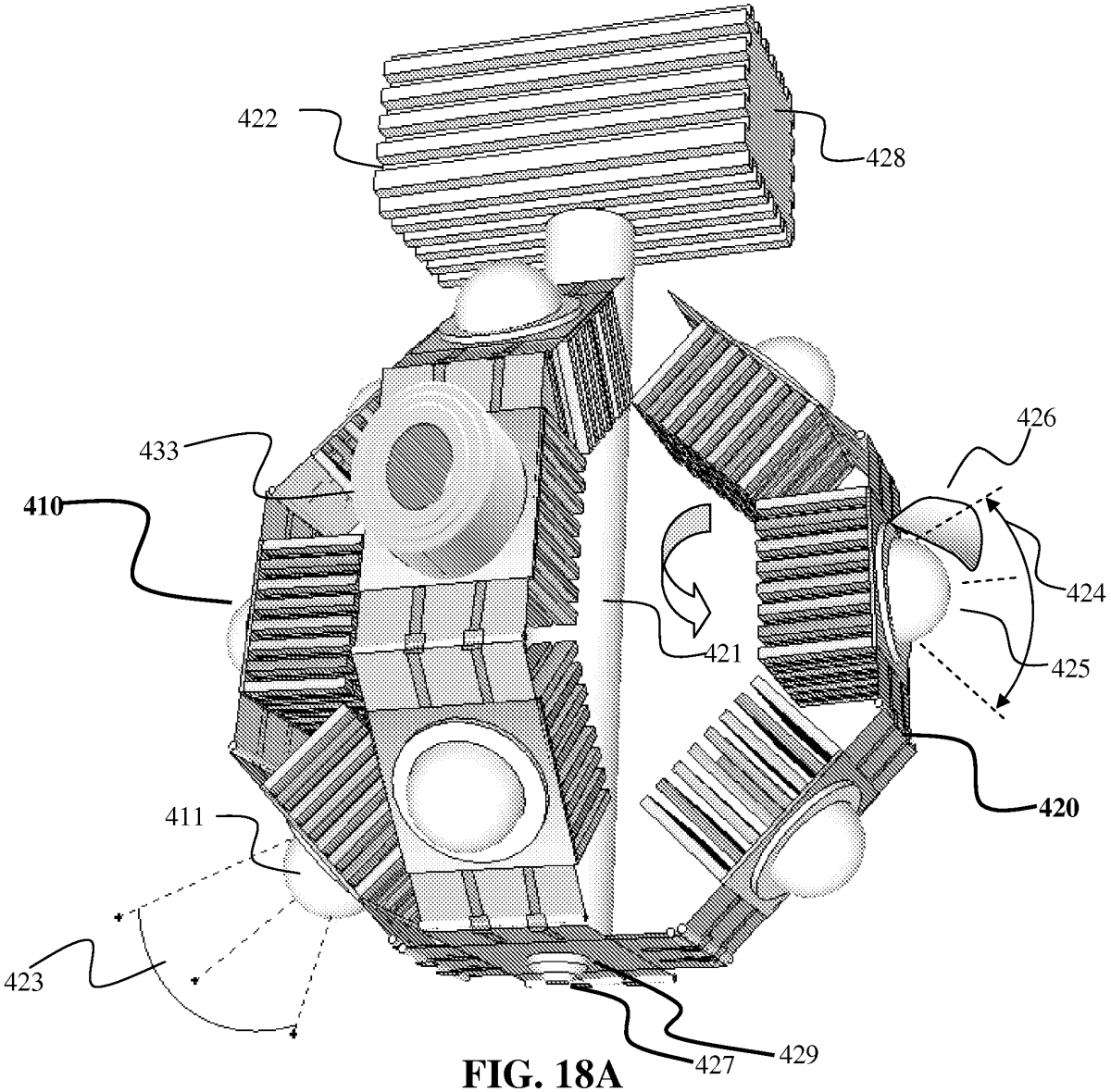


FIG. 18A

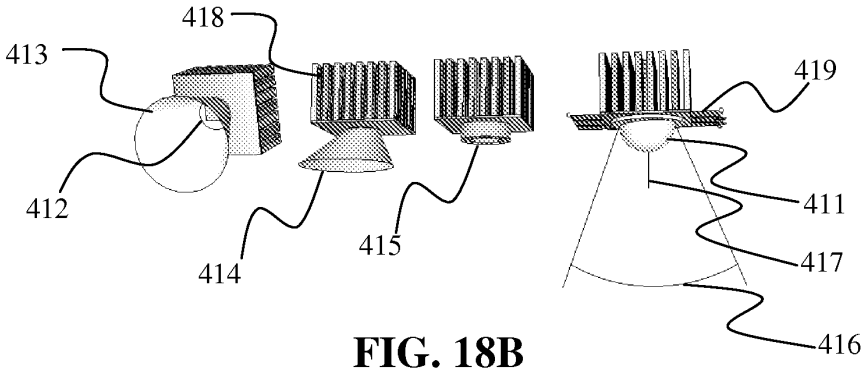


FIG. 18B

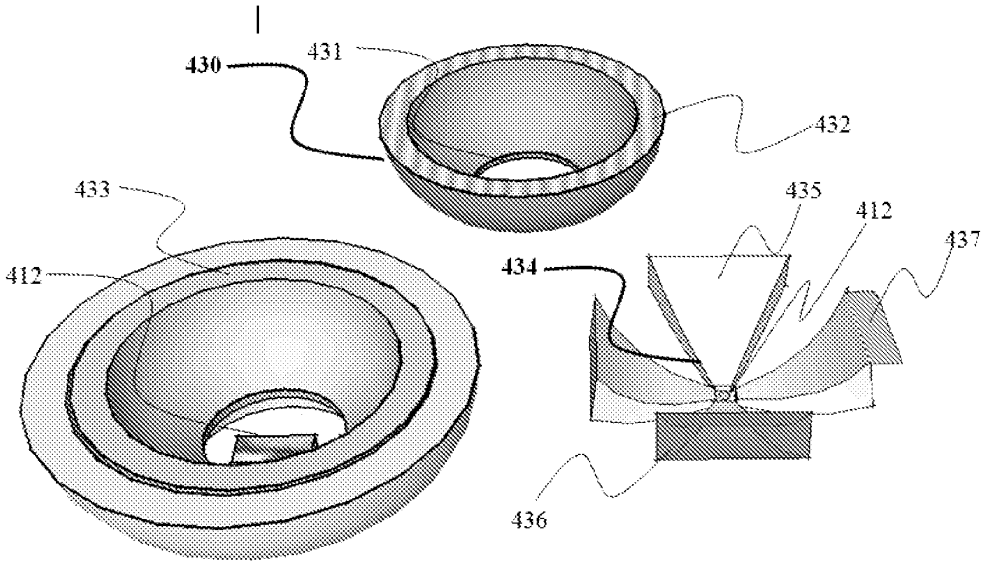


FIG. 19

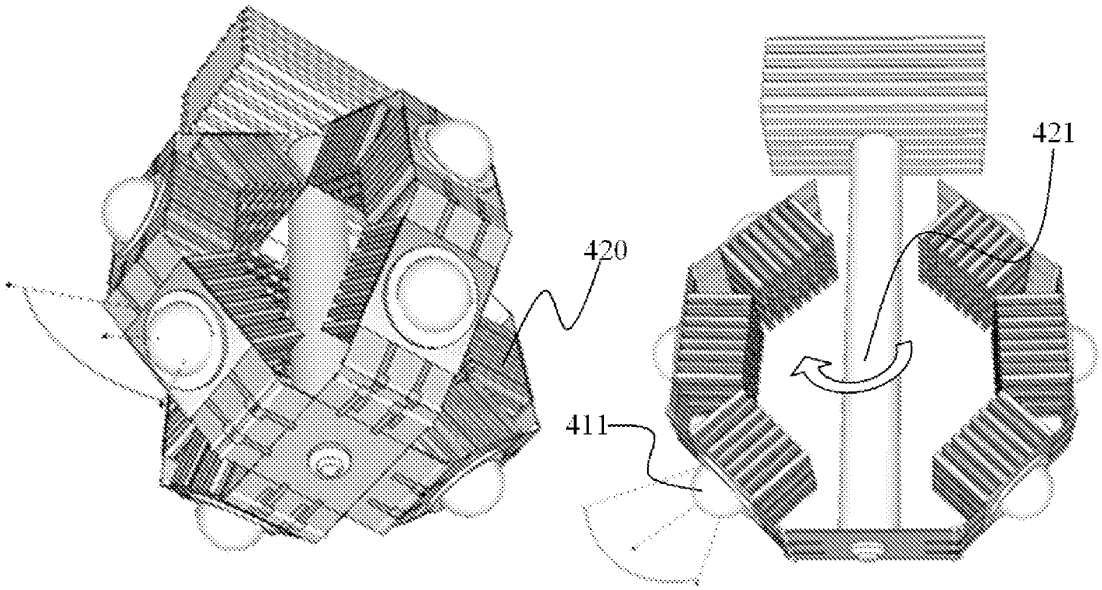


FIG. 20A FIG. 20B

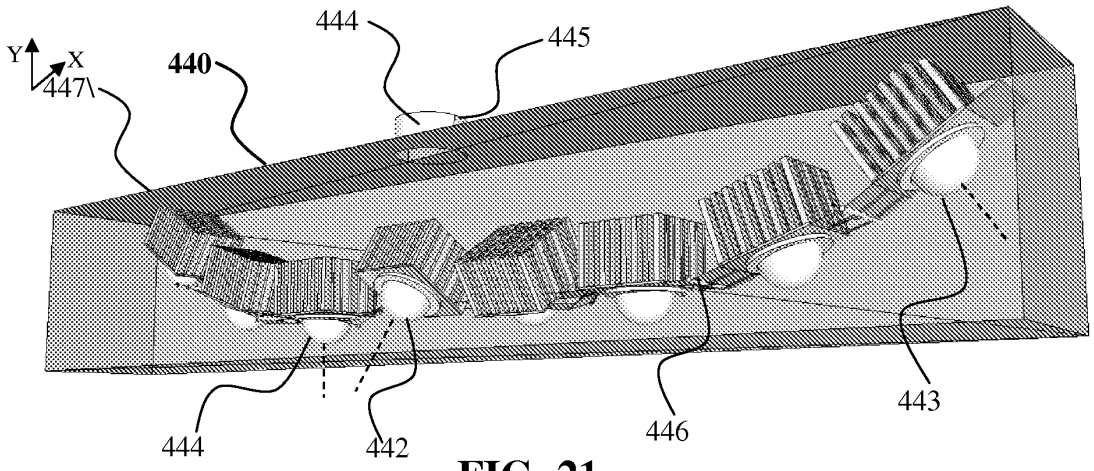

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FIG. 21

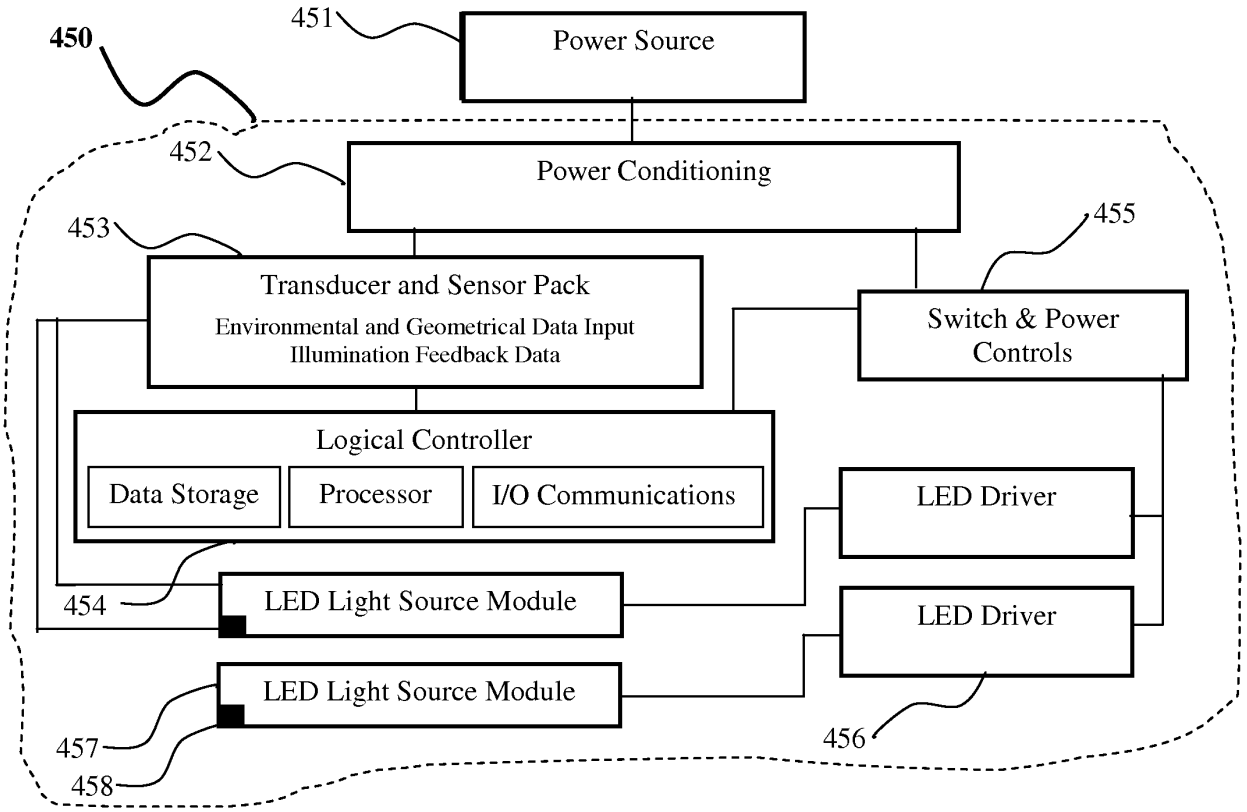

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451
Power Source
452
Power Conditioning
453
Transducer and Sensor Pack
Environmental and Geometrical Data Input
Illumination Feedback Data
455
Switch & Power Controls
Logical Controller
Data Storage
Processor
I/O Communications
LED Driver
454
LED Light Source Module
LED Driver
LED Light Source Module
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FIG. 22

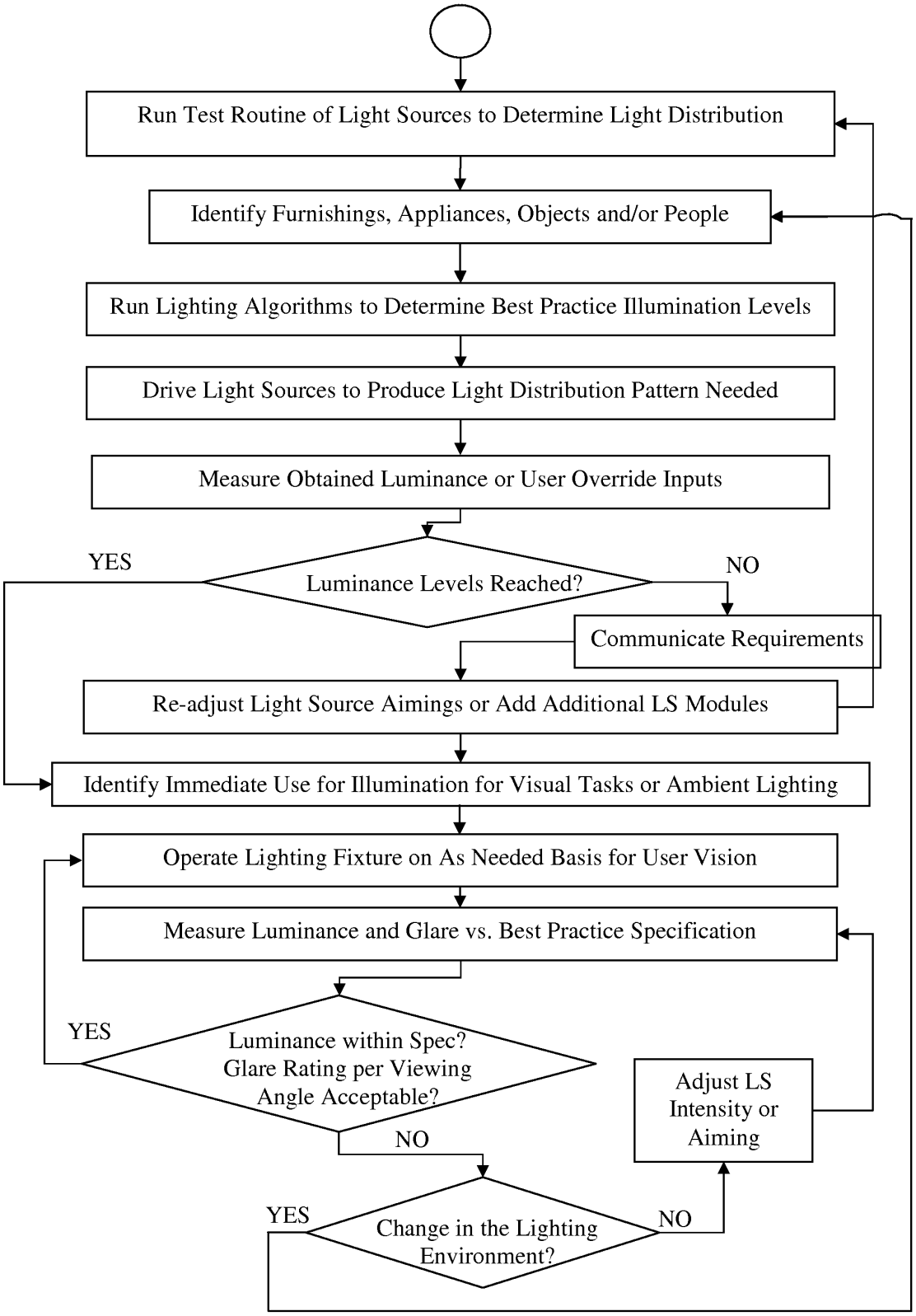

Run Test Routine of Light Sources to Determine Light Distribution
Identify Furnishings, Appliances, Objects and/or People
Run Lighting Algorithms to Determine Best Practice Illumination Levels
Drive Light Sources to Produce Light Distribution Pattern Needed
Measure Obtained Luminance or User Override Inputs
YES
Luminance Levels Reached?
NO
Communicate Requirements
Re-adjust Light Source Aimings or Add Additional LS Modules
Identify Immediate Use for Illumination for Visual Tasks or Ambient Lighting
Operate Lighting Fixture on As Needed Basis for User Vision
Measure Luminance and Glare vs. Best Practice Specification
YES
Luminance within Spec? Glare Rating per Viewing Angle Acceptable?
Adjust LS Intensity or Aiming
NO
YES
Change in the Lighting Environment?
NO

Fig. 23

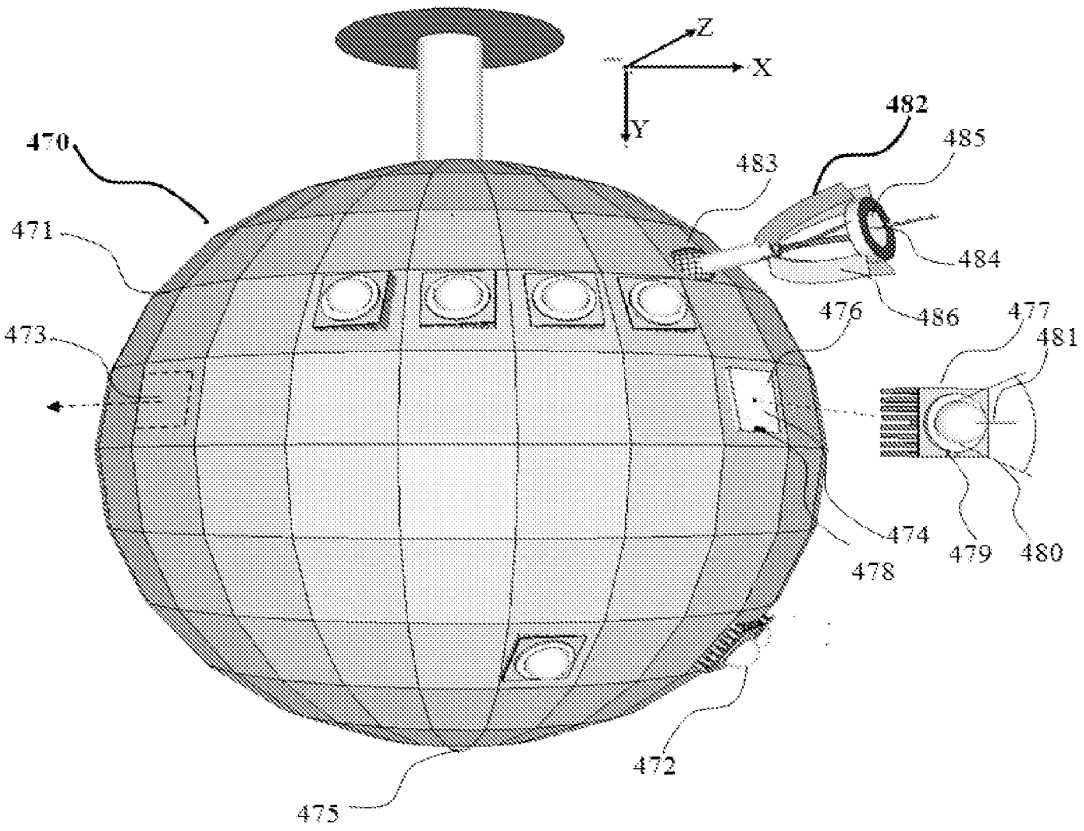


FIG. 24

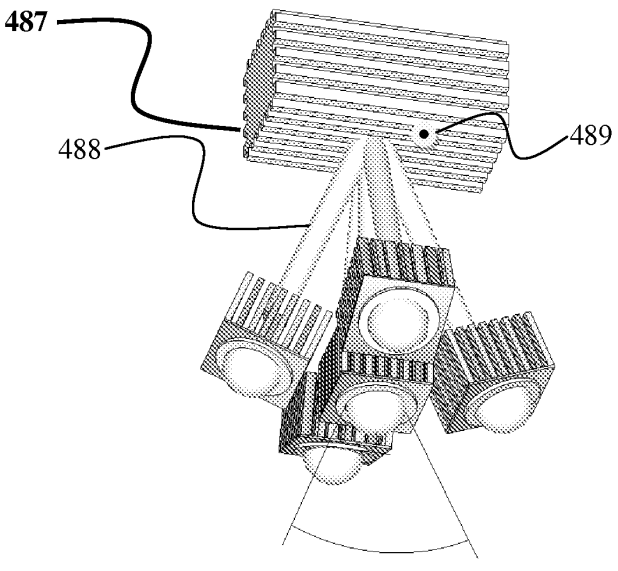


FIG. 25A

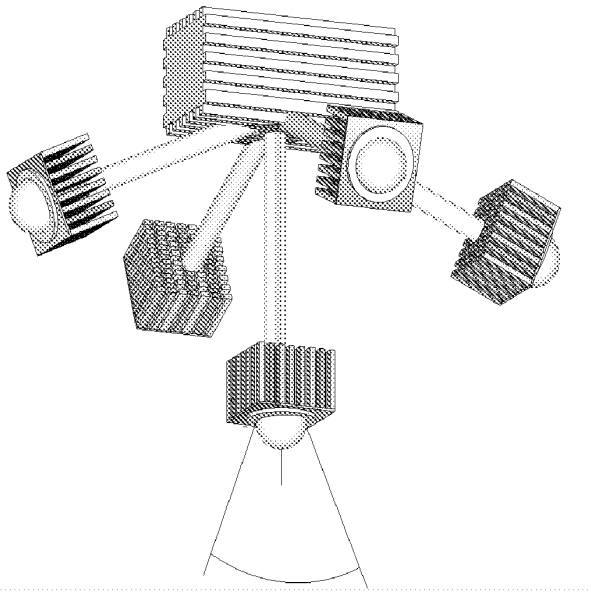


FIG. 25B

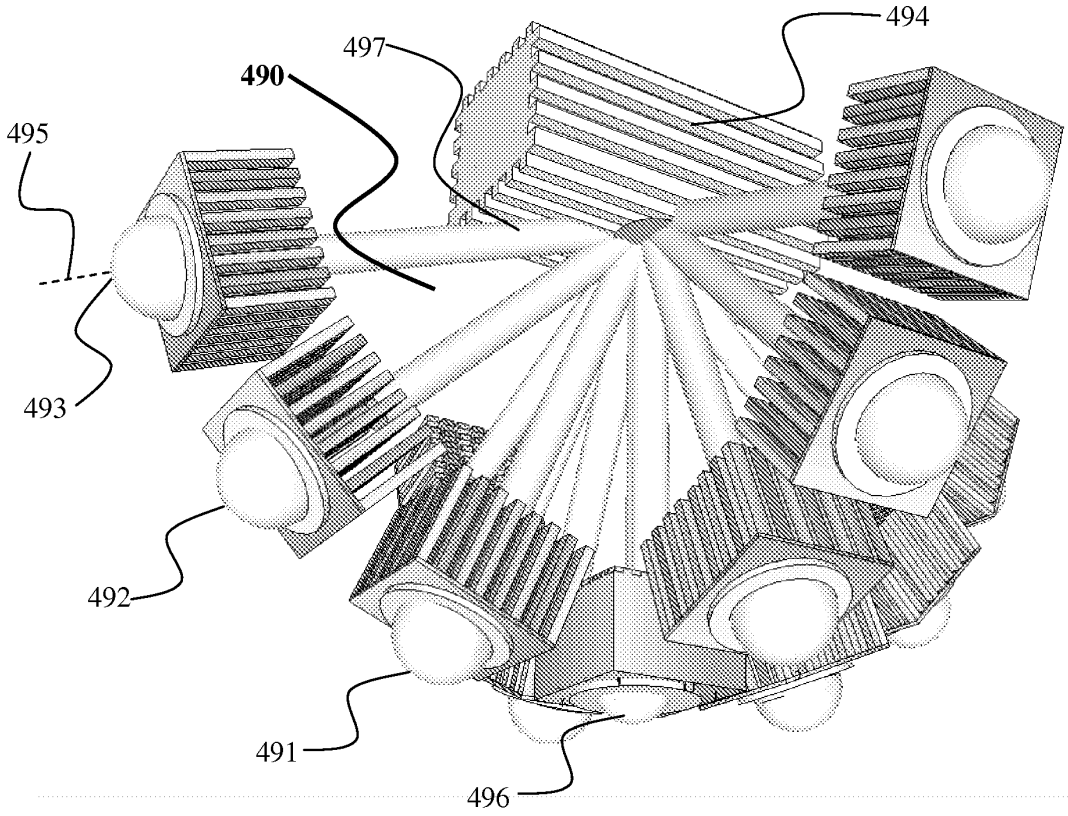


FIG. 26

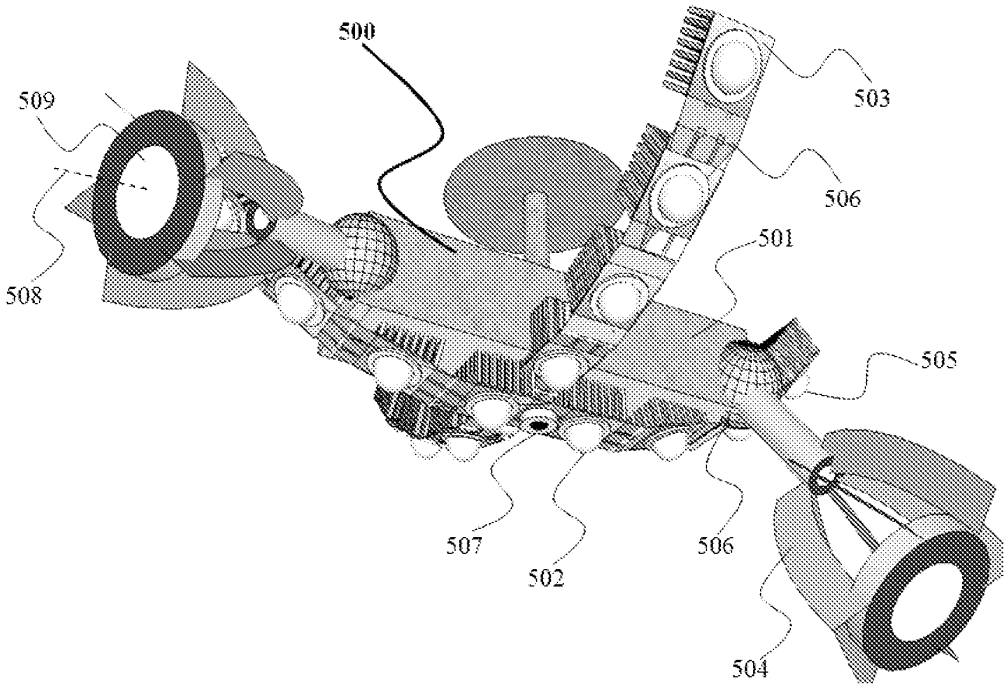


FIG. 27

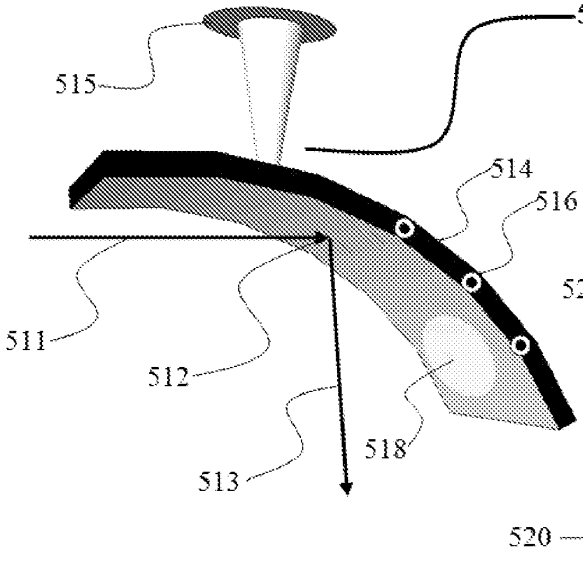


FIG. 28A

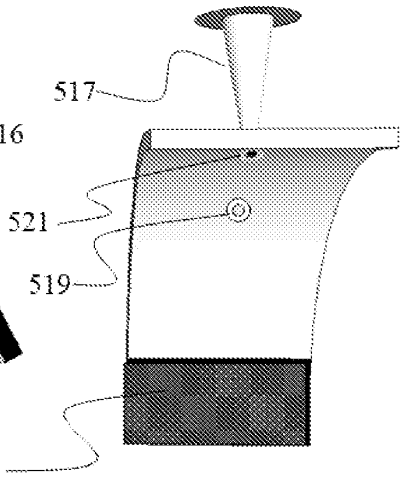


FIG. 28B

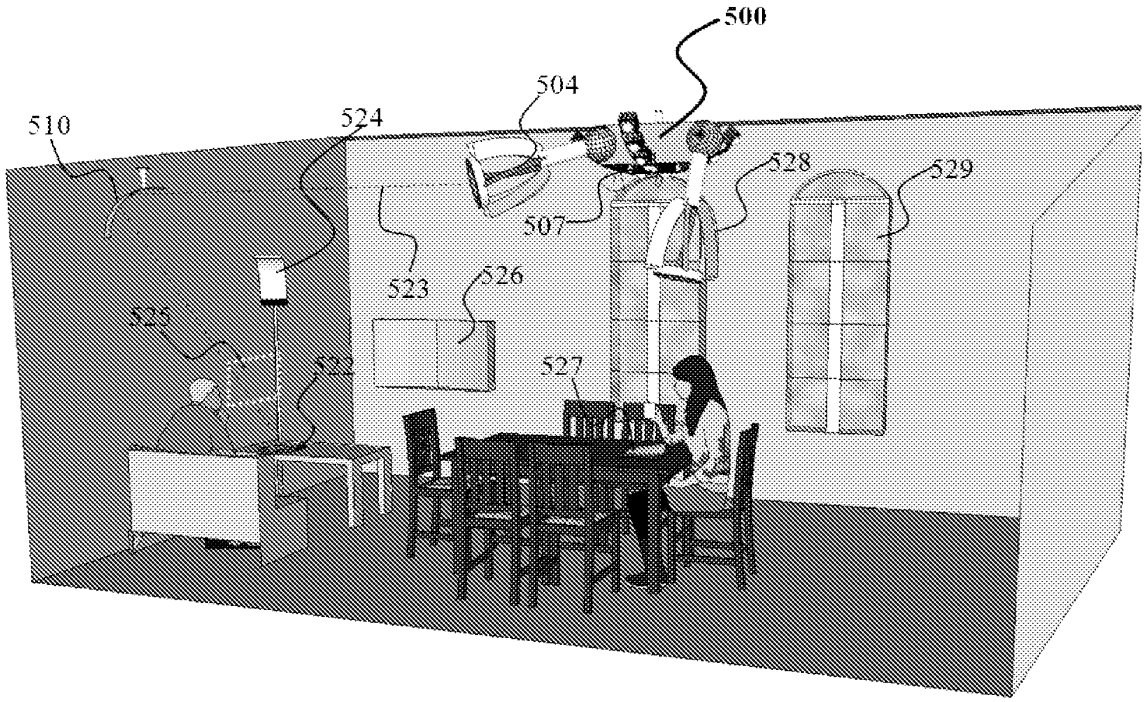

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FIG. 29

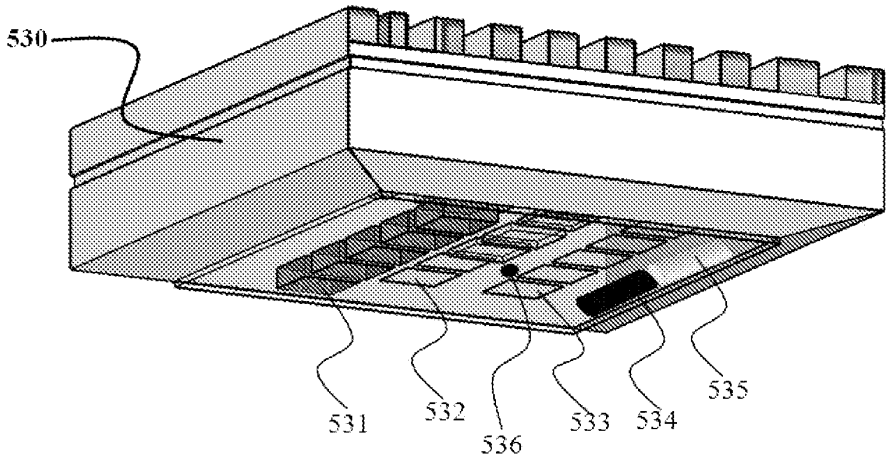

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FIG. 30

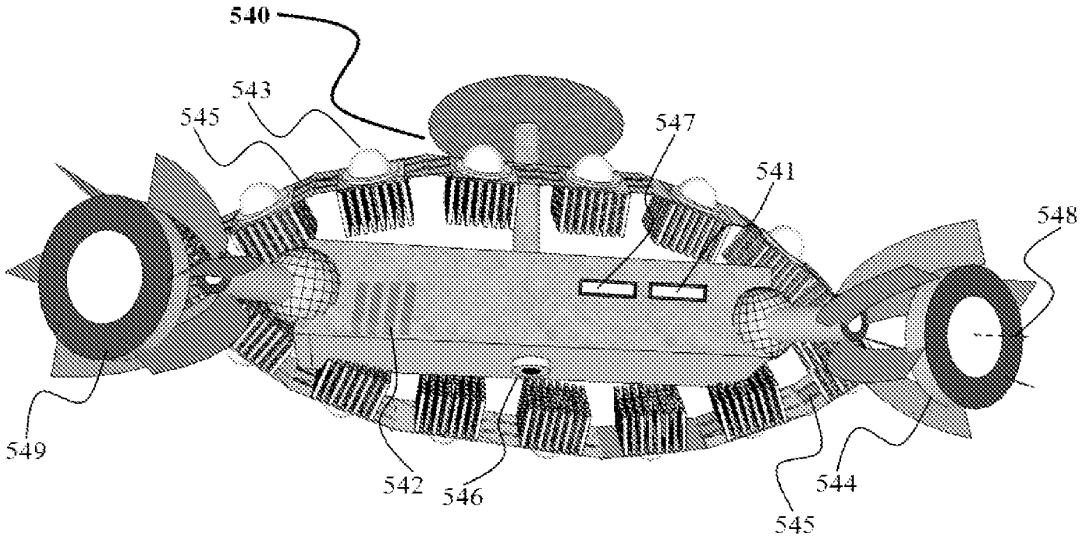

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FIG. 31

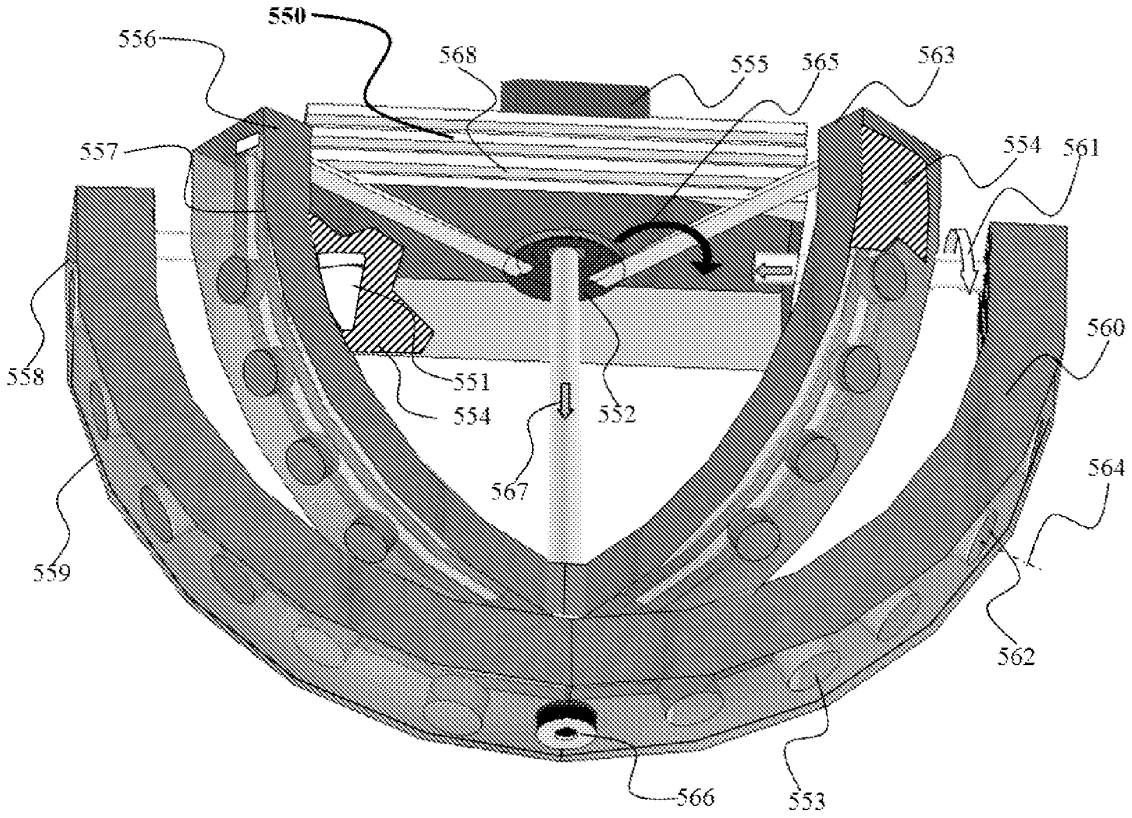

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FIG. 32

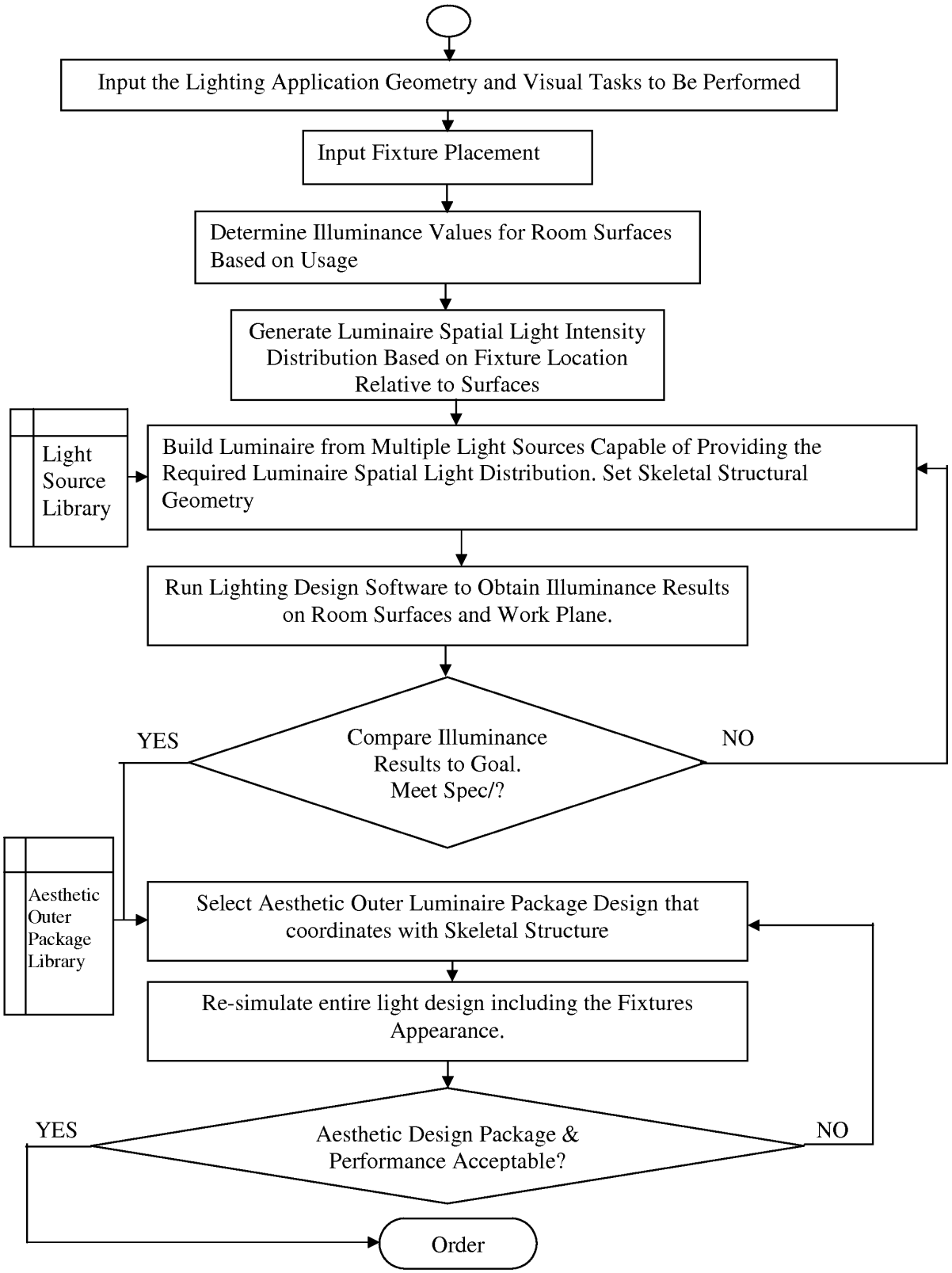

Input the Lighting Application Geometry and Visual Tasks to Be Performed
Input Fixture Placement
Determine Illuminance Values for Room Surfaces Based on Usage
Generate Luminaire Spatial Light Intensity Distribution Based on Fixture Location Relative to Surfaces
Light Source Library
Build Luminaire from Multiple Light Sources Capable of Providing the Required Luminaire Spatial Light Distribution. Set Skeletal Structural Geometry
Run Lighting Design Software to Obtain Illuminance Results on Room Surfaces and Work Plane.
Compare Illuminance Results to Goal. Meet Spec/?
YES
NO
Aesthetic Outer Package Library
Select Aesthetic Outer Luminaire Package Design that coordinates with Skeletal Structure
Re-simulate entire light design including the Fixtures Appearance.
Aesthetic Design Package & Performance Acceptable?
YES
NO
Order

FIG. 33

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	Detector Controlled Illuminating System
First Named Inventor/Applicant Name:	Yechezkal Evan Spero
Filer:	Yechezkal Spero
Attorney Docket Number:	

Filed as Small Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Utility filing Fee (Electronic filing)	4011	1	95	95
Utility Search Fee	2111	1	310	310
Utility Examination Fee	2311	1	125	125
Pages:				
Claims:				
Claims in excess of 20	2202	6	30	180
Independent claims in excess of 3	2201	1	125	125
Miscellaneous-Filing:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**835**

Electronic Acknowledgement Receipt

EFS ID:	11912385
Application Number:	13357549
International Application Number:	
Confirmation Number:	1905
Title of Invention:	Detector Controlled Illuminating System
First Named Inventor/Applicant Name:	Yechezkal Evan Spero
Customer Number:	37268
Filer:	Yechezkal Spero
Filer Authorized By:	
Attorney Docket Number:	
Receipt Date:	24-JAN-2012
Filing Date:	
Time Stamp:	20:40:37
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$835
RAM confirmation Number	19595
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1		DCI_SYSTEM_CIP.pdf	738002 6b98cdc7033ce78337ac0bb4e9482ab12ee94abd	yes	100
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Specification		1	95	
	Abstract		96	96	
	Claims		97	100	
Warnings:					
Information:					
2	Drawings-only black and white line drawings	Figs1-17_Detector_Controlled_CIP_Part1_.pdf	444011 1235f7b4f73bea800f48d9704677485 19b8e6db9	no	15
Warnings:					
Information:					
3	Drawings-only black and white line drawings	Figs18-33_Detector_Controlled_CIP_Part2_.pdf	2036849 f15d82ea2d8efe3fe5fa205fea0980e6c07a7efe	no	10
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	37178 268bc439fea8c6f05a6b2e412e0515c4af156ec8	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	3256040		

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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.

SCORE Placeholder Sheet for IFW Content

Application Number: 13357549 Document Date: 1/24/2012

The presence of this form in the IFW record indicates that the following document type was received in electronic format on the date identified above. This content is stored in the SCORE database.

- Drawings – Other than Black and White Line Drawings

Since this was an electronic submission, there is no physical artifact folder, no artifact folder is recorded in PALM, and no paper documents or physical media exist. The TIFF images in the IFW record were created from the original documents that are stored in SCORE.

To access the documents in the SCORE database, refer to instructions developed by SIRA.

At the time of document entry (noted above):

- Examiners may access SCORE content via the eDAN interface.
- Other USPTO employees can bookmark the current SCORE URL (http://es/ScoreAccessWeb/).
- External customers may access SCORE content via the Public and Private PAIR interfaces.

Form Revision Date: February 8, 2006

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United States Patent and Trademark Office
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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
13/357,549	01/24/2012	2875	835		26	4

CONFIRMATION NO. 1905

37268
YECHEZKAL EVAN SPERO
74 MOSHAV TIFRACH
M. P. HANEGEV, 85102
ISRAEL

FILING RECEIPT

OC000000052407742

Date Mailed: 02/08/2012

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. 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)

Yechezkal Evan Spero, Residence Not Provided;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This appln claims benefit of 61/535,981 09/17/2011
and is a CIP of 10/604,360 07/14/2003 PAT 8100552
which claims benefit of 60/395,308 07/12/2002

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)

If Required, Foreign Filing License Granted: 02/03/2012

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/357,549**

Projected Publication Date: To Be Determined - pending completion of Missing Parts

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****

Title

Detector Controlled Illuminating System

Preliminary Class

362

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

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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

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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.

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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).

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 13/357,549

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	95		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	310		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	125		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	26 minus 20 =	* 6	x 30 =	180	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	4 minus 3 =	* 1	x 125 =	125			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	835		TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)	OR	RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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Address: COMMISSIONER FOR PATENTS
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/357,549	01/24/2012	Yechezkal Evan Spero	

CONFIRMATION NO. 1905

37268
YECHEZKAL EVAN SPERO
74 MOSHAV TIFRACH
M. P. HANEGEV, 85102
ISRAEL

FORMALITIES LETTER

OC000000052407743

Date Mailed: 02/08/2012

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The oath or declaration is missing.
  A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.
  Note: If a petition under 37 CFR 1.47 is being filed, an oath or declaration in compliance with 37 CFR 1.63 signed by all available joint inventors, or if no inventor is available by a party with sufficient proprietary interest, is required.

The application is informal since it does not comply with the regulations for the reason(s) indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- A substitute specification in compliance with 37 CFR 1.52, 1.121(b)(3), and 1.125, is required. The substitute specification must be submitted with markings and be accompanied by a clean version (without markings) as set forth in 37 CFR 1.125(c) and a statement that the substitute specification contains no new matter (see 37 CFR 1.125(b)). The specification, claims, and/or abstract page(s) submitted is not acceptable and cannot be scanned or properly stored because:
  - The line spacing on the specification, claims, and/or abstract is not 1½ or double spaced (see 37 CFR 1.52(b)).

Applicant is cautioned that correction of the above items may cause the specification and drawings page count to exceed 100 pages. If the specification and drawings exceed 100 pages, applicant will need to submit the required application size fee.

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- A surcharge (for late submission of filing fee, search fee, examination fee or oath or declaration) as set forth in 37 CFR 1.16(f) of $**65** for a small entity in compliance with 37 CFR 1.27, must be submitted.

SUMMARY OF FEES DUE:

Total fee(s) required within **TWO MONTHS** from the date of this Notice is $**65** for a small entity
- $**65** Surcharge.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

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https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html

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/atesfaye/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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I hereby certify that this correspondence is being facsimile transmitted to the United States Patent and Trademark Office

on 03/15/2012
Date

Evan Spero
Signature

Echahid Evan Spero
Typed or printed name of person signing Certificate

37268
Registration Number, if applicable

+972-8-956-0324
Telephone Number

Sent:
Application Data Sheet
3 Pages in addition to this one

Note: Each paper must have its own certificate of transmission, or this certificate must identify each submitted paper.

to fax: 571-273-8300

This collection of information is required by 37 CFR 1.8. 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 1.8 minutes 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. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	
	Application Number	
Title of Invention	Detector Controlled Illuminating Syestem	

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
	Yechezkal	Evan	Spero	
Residence Information (Select One) ◉ US Residency	○ Non US Residency	○ Active US Military Service		
City	Moshav Tifrach	State/Province		Country of Residence IL
Citizenship under 37 CFR 1.41(b)	US			
Mailing Address of Applicant:				
Address 1	20 Rashi St.			
Address 2				
City	Moshav Tifrach	State/Province		
Postal Code	85102	Country	IL	

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.

Customer Number	37268		
Email Address	yspero@netvision.net.il	Add Email	Remove Email

Application Information:

Title of the Invention	Detector Controlled Illuminating Syestem		
Attorney Docket Number		Small Entity Status Claimed ☒	
Application Type	Nonprovisional		
Subject Matter	Utility		
Suggested Class (if any)		Sub Class (if any)	
Suggested Technology Center (if any)			
Total Number of Drawing Sheets (if any)	24	Suggested Figure for Publication (if any)	27

EFS Web 2.2.3

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	
	Application Number	
Title of Invention	Detector Controlled Illuminating Syestem	

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	37268		

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	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13357549	Continuation in part of	10604360	2003-07-14	8100552	2012-01-24

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Foreign Priority Information:

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

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CENTRAL FAX CENTER
MAR 15 2012

PTO/SB/14 (11-08)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	
	Application Number	
Title of Invention	Detector Controlled Illuminating Syestem	

If the Assignee is an Organization check here. ☐				
Prefix	Given Name	Middle Name	Family Name	Suffix
Mr.	Yechezkal	Evan	Spero	

Mailing Address Information:			
Address 1	20 Rashi St.		
Address 2			
City	Moshav Tifrach	State/Province	
Country	IL	Postal Code	85102
Phone Number	+97289960324	Fax Number	+97289987638
Email Address	yspero@netvision.net.il		

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	/Evan Spero/			Date (YYYY-MM-DD)	2012-02-28
First Name	Evan	Last Name	Spero	Registration Number	37268

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.**

EFS Web 2.2.3

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	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/357,549	01/24/2012	Yechezkal Evan Spero	

CONFIRMATION NO. 1905

37268
YECHEZKAL EVAN SPERO
74 MOSHAV TIFRACH
M. P. HANEGEV, 85102
ISRAEL

FORMALITIES LETTER

OC000000053314047

Date Mailed: 03/23/2012

NOTICE OF INCOMPLETE REPLY (NONPROVISIONAL)

Filing Date Granted

The U.S. Patent and Trademark Office has received your reply on 03/15/2012 to the Notice to File Missing Parts (Notice) mailed 02/08/2012 and it has been entered into the nonprovisional application. The reply, however, does not include the following items required in the Notice. A complete reply must be timely filed to prevent ABANDONMENT of the above-identified application. Replies should be mailed to: Mail Stop Missing Parts, Commissioner for Patents, P.O. Box 1450, Alexandria VA 22313-1450.

Applicant is given **TWO MONTHS** from the date of the Notice to File Missing Parts (Notice) mailed 02/08/2012 within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The oath or declaration is missing.
  A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.
  Note: If a petition under 37 CFR 1.47 is being filed, an oath or declaration in compliance with 37 CFR 1.63 signed by all available joint inventors, or if no inventor is available by a party with sufficient proprietary interest, is required.
- Surcharge (for late submission of filing fee, search fee, examination fee or oath or declaration) as set forth in 37 CFR 1.16(f) of $65 was not received.

The application is informal since it does not comply with the regulations for the reason(s) indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- A substitute specification in compliance with 37 CFR 1.52, 1.121(b)(3), and 1.125, is required. The substitute specification must be submitted with markings and be accompanied by a clean version (without markings) as set forth in 37 CFR 1.125(c) and a statement that the substitute specification contains no new matter (see 37 CFR 1.125(b)). The specification, claims, and/or abstract page(s) submitted is not acceptable and cannot be scanned or properly stored because:
  - The line spacing on the specification, claims, and/or abstract is not 1½ or double spaced (see 37 CFR 1.52(b)).

Applicant is cautioned that correction of the above items may cause the specification and drawings page count to exceed 100 pages. If the specification and drawings exceed 100 pages, applicant will need to submit the required application size fee.

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

SUMMARY OF FEES DUE:

Total fee(s) required within **TWO MONTHS** from the date of the Notice is $**65** for a small entity
- $**65** Surcharge.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web.
https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html

For more information about EFS-Web please call the USPTO Electronic Business Center at **1-866-217-9197** or visit our website at http://www.uspto.gov/ebc.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

/tnnguyen/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 13/357,549

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	95		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	310		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	125		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	26 minus 20 =	* 6	x 30 =	180	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	4 minus 3 =	* 1	x 125 =	125			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	835		TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)	OR	RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

Appl. No. : 13/357,549 Confirmation No. 1905
Applicant : Yechezkal Evan Spero
Filed : Jan. 24, 2012
TC/A.U. : N/A
Examiner : N/A
Docket No. : N/A
Customer No. : 37268

Attn: Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

March 27, 2012

COMMUNICATION regarding NOTICE TO FILE MISSING PARTS
Accompanying Statement per 37 CFR 1.125(b)
&
Substitute Specification Markings per CFR 1.125(c)

Sir:

In response to the NOTICE TO FILE MISSING PARTS OF A NONPROVISIONAL APLICATION of 02/08//2012 per 37CFR 1.53(b): *A substitute specification is required pursuant to 37 CFR 1.125(b)… not acceptable … because the line spacing on the specification is not 1 ½ spaced;*

Accompanying Statement per 37 CFR 1.125(b)

STATEMENT:

The applicant hereby states that the substitute specification includes no new matter. The applicant submitted a substitute specification in place of above-identified application which has been amended by increasing the line spacing as required to 1.5 lines.

Respectfully submitted,

Yechezkal Evan Spero March 27, 2012

By_/ Yechezkal Evan Spero/

Reg. No. 37268

Tel.: (+972) 8-996-0324

Electronic Patent Application Fee Transmittal

Application Number:	13357549
Filing Date:	24-Jan-2012
Title of Invention:	Detector Controlled Illuminating System
First Named Inventor/Applicant Name:	Yechezkal Evan Spero
Filer:	Yechezkal Evan Spero
Attorney Docket Number:	

Filed as Small Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Late filing fee for oath or declaration	2051	1	65	65
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
			Total in USD ($)	**65**

Electronic Acknowledgement Receipt

EFS ID:	12398930
Application Number:	13357549
International Application Number:	
Confirmation Number:	1905
Title of Invention:	Detector Controlled Illuminating System
First Named Inventor/Applicant Name:	Yechezkal Evan Spero
Customer Number:	37268
Filer:	Yechezkal Evan Spero
Filer Authorized By:	
Attorney Docket Number:	
Receipt Date:	27-MAR-2012
Filing Date:	24-JAN-2012
Time Stamp:	11:06:41
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$65
RAM confirmation Number	14199
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1	Oath or Declaration filed	Missing_Oath_SB01A_27th.pdf	555044 9e51f1fcd90b68693cd516867b5d95b107bcc963	no	2
Warnings:					
Information:					
2		Substitute_Specification_DCIS_CIP_Submitted.pdf	819218 63b7b969fe0ea9ac0e29fc2f06f57a60ceeae867	yes	118

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Specification	1	112
	Abstract	113	113
	Claims	114	118

Warnings:					
Information:					
3	Miscellaneous Incoming Letter	AccompanyStatmnt_per37CFR1-125_b.pdf	80672 5e86bcda6167555816463c61d0849255e176082a	no	1
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	29366 26fbe9c3bfdaf7499e5c111b1c2b867a42171470	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1484300		

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.

PTO/SB/01A (01-09)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	

As the below named inventor(s), I/we declare that:

This declaration is directed to:

☐ The attached application, or

☑ United States application or PCT international application number 13/357,549

filed on 01/24/2012

☐ As amended on _____ (if applicable);

I/we believe that I/we am/are the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought;

I/we have reviewed and understand the contents of the above-identified application, including the claims, as amended by any amendment specifically referred to above;

I/we acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me/us to be material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT International filing date of the continuation-in-part application.

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 the 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.

All statements made herein of my/our own knowledge are true, all statements made herein on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001, and may jeopardize the validity of the application or any patent issuing thereon.

FULL NAME OF INVENTOR(S)

Inventor one: Yechezkal Evan Spero Date: March 27, 2012

Signature: /Yechezkal Evan Spero/ Citizen of: USA

Inventor two: _____ Date: _____

Signature: _____ Citizen of: _____

☐ Additional inventors or a legal representative are being named on _____ additional form(s) attached hereto.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. 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 1 minute 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. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Patent Application of
Yechezkal Evan Spero
for

TITLE: Detector Controlled Illuminating System

Cross Reference to Related Applications

The present application claims the benefit under 35 U.S.C. .sctn. 119(e) of U.S. Provisional Application No. 60/395,308 filed Jul. 12, 2002, entitled: Multiple light source illumination system; and U.S. Provisional Application No. 61/535,981, filed Oct. 17, 2011 entitled Adjustable Lighting Fixture, the disclosures of which are all expressly incorporated herein by reference; and this application is a continuation-in-part application of, and claims the benefit under 35 U.S.C. .sctn.120 from, co-pending U.S. patent application Ser. No. 10/604,360 , entitled "Multiple Light-Source Illuminating System " filed on Jul. 14, 2003, The entire content of this non-provisional patent application is incorporated herein by this reference.

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention is in the field of radiation producing devices. More particularly, the present invention is in the technical field of lighting fixtures. However, radiation used for headlamps, heating, night vision, UV or visible light curing, medical X-rays and other radiation uses are covered as well. General lighting fixtures otherwise known as luminaires will be used as the primary example while other irradiating devices such as infrared heaters are covered as well. The invention relates to multiple light source illuminating devices intended to replace incandescent, fluorescent and HID luminaries in general and specialty lighting applications.

Definitions, Terms, Elements

In order to clarify the intent of the present invention and its dissimilar aspects from prior art, a nomenclature system is established.

Used herein illumination refers to the deliberate application of light to achieve some practical or aesthetic effect. Correct illumination or recommend lighting practice refers to lighting industry standards and recommendations for the illumination of living, recreation, architectural and work areas as described in standards and handbooks published by industry professional organizations such as the Illuminating Engineering Society, the International Association of Lighting Designers, IALD or International Commission on Illumination CIE.

Lamp: A lamp, other than a reflector lamp, is generally a device that generates light radially from the source. Due to the physics involved in the light generation process, it is difficult at the source to gain

control of the spatial light propagation. A reflector lamp will partially control the emitted light which hits the reflector, but will not control the remaining light emanating from the filament or discharge tube. A lamp other than a solid-state lamp will generally produce light over a wide range of spectrum. The overall color is a function of the physics involved in the generation of the different photon energies. While some lamps spectra are closer to sunlight and have a good color rendering in relation thereto, other lamps such as low-pressure sodium are highly monochromatic with a yellow-orange appearance. A color temperature in degrees Kelvin based on the color of an incandescent filament is used to describe a lamp. An incandescent lamp color will be termed "warm" at 2000 Kelvin and a Metal Halide "cool" at 4000K. In general, there is no ability to affect the color over the intensity level even where dimming is afforded. A lamp is also intended to be a replaceable element. Lamps are constructed according to universal standards which allow for the substitution of lamps by other manufacturers. Prior-art lamps are thus provided with bulky bases which fit into bulky sockets and do not lend themselves to being permanently wired into printed circuit boards or bonded onto electronic chips.

Luminaire: A Lighting Fixture or luminaire (the terms are used interchangeably) is a device which is constructed around the lamp to provide lighting specific to the application including non-lighting considerations such as aesthetics, safety etc. Some LF designs are primarily based on aesthetics while others are based on tailoring the lumen output such that the lighting fixture output meets the visual task at hand. Between these two extremes there are many possible designs, with maintenance, fixture cost, hazardous and rough service location considerations also playing a role. This is essentially why the industry produces so many different types of luminaires. One type for high industrial building ceilings known as high-bay lighting, another for office lighting and a third for roadway lighting and a fourth for illuminating corridors. Each fixture has its photometric distribution characteristics, that is, how many candela at what angle are exiting from the luminaire. Other luminaire considerations include keeping the lighting from causing discomfort glare or from being a source of veiling reflections. The purely technical goal is to get the required amount of light at the work surfaces where visual tasks are carried out by man, animals, plants and machines. A LF has a longer life than the lamp, and the lamp is meant to be replaceable within the fixture. A luminaire is wired directly to the electrical mains while a lamp due to its need to be replaced has a base which fits into a socket by way of which the lamp receives its power. Prior art solid-state lamp assemblies are considered lamps, as they have no provision for being connected to the mains. A luminaire has apparatus whereby it is attached to the building structure while a lamp is mechanically affixed to the lamp holder or socket. Another aspect of distinction is, that in general, correct lighting practice principles are used to guide in the design of a LF while a lamp is "bare" and is expected to have reflectors, refractors, shades and louvers to prevent glare and redirect its rays to increase light utilization.

Digital: The term digital used herein in refers to the luminaire concept as espoused by teachings of this invention and is loosely defined in parallel to the fine control associated with digital equipment. The multiple light sources of specific characteristics provide quanta of power and spectrum which are smoothly added or detracted to generate a changed lighting effect. The digital aspect arises from the sufficient progression of values, varying by minute degrees to produce a continuum so as be non-discernable or irrelevant to the user. The added controllability is realized by breaking up the light-production, into discrete, specifically aimable, and dimmable elements which can be addressed by control electronics for the purpose of affecting the intensity, spectrum and spatial distribution of spectrum and of intensity of the illumination provided by the luminaire of the present invention.

The overall combination of control capability and discrete light sources yields a digital lighting fixture. The terminology "digital" as used herein also refers to the discrete nature of the multiple LED lamps provided in the luminaire, whereby, "digital" control results from the individual control of the discrete, i.e., "digital" lighting elements, the LEDs, in the luminaire.

Correct lighting practice: A bare incandescent lamp illuminating a room is arbitrarily termed poor lighting practice. The bare light bulb hooked up to the electric power via a light switch, causes glare, wastes light, delivering the light to useless areas, has no provision for dimming and is energy inefficient. The Illuminating Engineering Society of North America (IESNA) as well as other professional groups such as the International Association of Lighting Designers (IALD) have developed recommended lighting practices for specific applications in indoor and outdoor lighting. These recommendations and equations for implementing the recommendations can be found in the IESNA Lighting Handbook, 8th and/or 9th Editions (available from the Illuminating Engineering Society of North America 120 Wall St. Floor 17 New York, NY 10005 included herein by reference. Factors in good lighting include lighting intensity levels which may be based on the age of the users of the light, the color rendering capacity of the light source, its color temperature, the non-production of glare, veiling reflections and energy efficiency amongst others. Recommendations for all aspects of lighting in terms of intensity, distribution, color temperature, color temperature as a function of light intensity and correct color rendering exist in the literature in terms of lighting applications that is the environment to be illuminated, in parameters such as lux for intensity, CRI for color rendering index and Visual Comfort Parameter (VCP) for glare. In recent years, the Unified Glare Rating (UGR) as recommended by the CIE has become widely accepted as a general formula for assessing glare. While the US may still use VCP ratings, all the lighting-practice engineering organizations worldwide have standards and recommended ratings for different activities. For example lighting levels of 500 lux and a UGR of 19 is recommended in offices while industrial areas intended for coarse work a UGR of 28 can tolerated. In good lighting practice, attention is given by lighting

designers to the correct amount of uplight, that is, light exiting from the luminaire towards the ceiling, which prevents a gloomy "dark cave" effect. Attention is also given to the cut-off angle of the luminaire, usually provided by shielding elements, such that high intensity rays are not emitted at an angle where they enter the occupant's eye during normal activity. A correctly designed luminaire for indoor lighting may provide 30% uplight and 70% downlight in the angles from the nadir 0 to 60 degrees and then again 135 to 170 degrees. A governing equation in lighting and used in "reverse luminaire design" of the present invention is the cosine law or Lambert's law, Equation 1:

$$E = \frac{I \cos\theta}{D^2}$$

Where: E=Illuminance in lux or footcandles, I=Luminous intensity in candles, D=Distance between the source and the point of calculation in meters or feet, θ = Angle of light incidence with illuminated surface

Another useful equation used in fixture analysis to avoid glare producing designs yields the level of discomfort on the DeBoer scale. The DeBoer rating scale (1-9) describes the level of discomfort where: 1= Unbearable, 3 = Disturbing, 5 = Just acceptable, 7 = Satisfactory, and 9 = Just noticeable. The allowable level is dependent on the application. A surgeon performing an operation may be very sensitive to glare while a chlorophyll producing plant is not. The equation to determine the rating is Equation 2:

$$W = 5.0 - 2.0 \, LOG \, [E_i / (0.003) \, (1 + SQRT \, (La / 0.04)) \, (\varphi_i)^{0.46}]$$

where: W = glare sensation on a scale of 1 to 9, La = adaptation luminance (cd/m 2), E_i = illumination directed at observer's eyes from the i-th source (lux), φ_i = glare angle of the i-th source (minutes of arc) from the observer's line of sight.

Using these equations and correct lighting practice covering preferred angles of lighting for visual tasks, it is possible to design from the specific application's illumination requirements the spatial light intensity distribution and yet avoid manufacturing a glare producing luminaire.
The present invention generally relates to an improved illuminator for use both in general and specialty lighting. The term general lighting includes use in living spaces such as lighting in industrial, commercial, residential and transportation vehicle applications. By specialty lighting we mean emergency lighting activated during power failures, fires or smoke accumulations in buildings, microscope, stage illuminators, billboard front-lighting, hazardous and difficult access location lighting, backlighting for signs, agricultural lighting etc.

Energy Efficiency and Costs. In an example to illustrate the advantages of an energy efficient lighting solution, the total cost of lighting a typical 300 foot by 300 foot retail facility at 1000 lux over a 10 year period using state of the art (2002) HID luminaires is assessed. Including equipment, installation and maintenance cost the total bill is over one million dollars. Approximately 80% of this is in energy costs. The commodity being purchased is lighting, the major lifecycle cost is electricity. To cut down on costs and also conserve energy it desirable to maximize the use of light generated. A Japanese survey of office luminaires (Japan Lighting Information Services-Seminar-Save Energy of Office Lighting-Loss of light in luminaire-.htm) shows LF efficiencies (light that exits the fixture vs. the light produced by the lamp) in an open office fluorescent luminaire without anti-glare louvers to be 84% while one equipped with louvers is only 52% efficient. The "utilization factor" (which equals the light flux which arrives at a work site (e.g. upper surface of a desk) divided by the sum of all light flux of the lamp) is 74% for an open fixture and only 50% for louvered version. This however, is still not what the customer is paying for. The customer is after the best lighting solution at minimal energy cost. Chances are, as experienced lighting designers know, that the light intensity, even in a good lighting design, is still not evenly distributed over the work surfaces. While care is taken in the lighting design computer runs not to fall below the minimum illumination intensity at any point in the room, there are non-trivial excesses at some points in the lighting layout design. This excess light, wasted energy as far as the customer is concerned, probably accounts for another 10% loss. While a fluorescent may be appear to be a superior and very efficient light source at 80 lumen per watt vs. 30 lumen per watt for LEDs this is not actually the case, in actuality 60% of the fluorescent LF's light is wasted. Thus, in terms of energy use, a properly designed LED luminaire can be, with the proper luminaire design of the present invention, as effective lumen per lumen as any discharge light source in illuminating living areas.

Expressed in terms of the above background and nomenclature, it is the goal of this disclosure to teach how to construct a luminaire which will radiate photons where needed, exactly in the correct amounts to accomplish visual tasks and/or create an atmosphere. The controlled radiation of light into a living space with a specific spatial intensity distribution also having optimal spectral characteristics for the seeing tasks at hand is provided by the present invention. Each visual task application has its own correct lighting solution with optimal light intensities, light color emanating at angles which will not cause glare that interferes with vision or causes discomfort. Tasks in living spaces vary with time so it is another objective of the present invention is to provide the optimal lighting solution in "real time"(at that specific moment in time).

As a light source of ever increasing choice, LEDs have been packaged in numerous forms and used in lighting applications. Special control circuits have been developed to take advantage of the variability offered by the new light source and are today being offered as a solution to specific

applications. In general however the design process has not zeroed in on providing the correct lighting solution. A number of LED illumination devices create "white" light by combining two or more LEDs of various wavelengths. White LEDs are also made using phosphors. The goal has not been to vary this color spectrum in real time to coordinate with the usage of the living space. The term "white" light is loosely interpreted to cover a range of illuminating light having spectral light distributions acceptable to the user for that application. HPS's yellow light has even been called white by some and the term is exclusive only of almost monochromatic sources such as LEDs and LPS lamps. The terms light spectrum, spectra, spectrum, spectral and color are used to refer to the relative spectral power distribution of the light source.

DESCRIPTION OF THE PRIOR ART

In prior art illuminating devices a universal light source such as an incandescent or fluorescent lamp emits light in many directions up to a 360 degree light distribution where in practice only a limited angular light distribution is needed in order for people to carry out visual tasks. So as to control the light distribution to certain angles, reflectors and refractors are used to redirect the light where it is needed. A great deal of light is wasted in the inherent inefficiencies in redirecting the light and shielding the glare causing light sources. In addition the actual placement of the light rays where needed, but not beyond, is often inexact and wasteful.
In addition it necessary to have a wide variety of lighting fixtures each with dedicated optics and even then, there is much wasted light or insufficient lighting in the area covered by the luminaire. In addition the light intensity and color spectrum of the luminaire is fixed while the visual tasks going on in the space are changing all the time. Usually, there is no provision for either detecting the changes going on in the living space nor is the lighting fixture equipped with apparatus to effect the necessary changes in the lighting. In addition individuals often have their personal lighting preferences as to the color and intensity of the lighting. Prior art lighting fixtures have no provision for the localized provision of preferred lighting to individuals.

A prior art LED light strip consists of circuitry including a plurality of LEDs mounted on a substrate and connected to electrical conductors. The circuitry is sometimes encased within a tube like, partially transparent protective sheathing and connected to a power source for selective LED illumination. Two examples of LED strip types are described in U.S. Pat. No. 5,130,909 to Gross, entitled Emergency Lighting Strip and U.S. Pat. No. 4,597,033 to Meggs et al., entitled Flexible Elongated Lighting System. Such strips are utilized in a variety of indoor and outdoor configurations such as emergency pathway markers, exit door indicators and ornamental lighting arrangements. The LEDs are being used as outline markers where the lighting strips are the object to be seen. It is not the purpose of the lighting strips to project light on other objects to make them visible. In other applications, where lighting distributed evenly along an area is required, these strips are placed at an

edge. No attempt is made at obtaining an even illumination outward from the edge to the area perpendicular to the long dimension.

LED lamps and ballast systems can reduce maintenance costs due to an average rated life of 100,000 hours. This is five to eight times the typical service life of conventional fluorescent and metal halide lamps. The present system is especially well suited for applications where relamping is difficult or expensive.

U.S. Pat. No 6,346,777 issued February 12, 2002 to Kim teaches an illuminating lamp assembly. An LED lamp apparatus comprises a plurality of LED lamps including at least one LED chip mounted on a Printed Circuit Board (PCB), on which a driver circuit and/or a control circuit are provided in a printed circuit pattern to drive and/or control the LED chip. The device is independent of the lighting application and is simply a lamp not a lamp and fixture combination.

U.S. Pat. No. 5,018,290 issued May 28, 1991 to Kozek et al. Teaches an exit sign with a plurality of low voltage incandescent lamps mounted on a PCB to provide illumination from within a housing. There is no combination of different light source characteristics to build a new combined light source characteristic and this is a lamp replacement not a LF fit for general illumination.

U.S. Pat. No. 5,577,832 to Lodhie one of the originators of the use of LEDs for illumination, describes a multilayer LED assembly which is used as a replacement light for equipment used in manufacturing environments. On each layer of the multi-layer assembly, there are multiple LEDs which are mounted perpendicular to a base. The base is used to provide electrical and mechanical connection to a socket. The LED assembly may utilize multiple layers of LEDs, with each layer itself having multiple LEDs. The LEDs in each layer are mounted in a direction perpendicular to the base which results in light emanating in a direction perpendicular to the base. The LED assembly is used as a replacement lamp for equipment used in manufacturing environments. There is no attempt to match the light distribution to the task at hand.

U.S. Pat. No. 6,379,022 issued April 30, 2002 to Amerson, et al. titled Auxiliary illuminating device having adjustable color temperature, describes an auxiliary illuminating device that has a least two preset ratios of light adjustable color temperature. The color temperature is adjusted by varying the light output at least two independently adjustable light sources. The light source is an array of at least 2 colors. The light source typically uses at least one set of LED's. The application specifically relates to use in producing correct lighting for photography but does not relate to general illumination so that its control equipment does not correlate the overall illuminance level to the color temperature over the range of illumination nor does its control equipment integrate the aiming function for

correct light distribution. Essentially the auxiliary illuminating device is a lamp replacement for a photographic flash lamp.

U.S. Pat. No. 6,340,868, Illumination components, discloses a current control for an LED lighting assembly, where each current-controlled unit is uniquely addressable and capable of receiving illumination color information on a computer lighting network. The teachings of the above patent are incorporated herein by reference. Although this patent discloses how to construct controllable illumination light systems this patent does not relate to the concept of control within the parameters of accurate light distribution and correct lighting practice.

In US 6,498,440 Stam, et al. incorporated herein by reference, describes a lamp assembly incorporating optical feedback to produce an illuminator assembly that is capable of utilizing a plurality of light sources to produce a desired resultant hue. The assembly includes a processor, a memory, a plurality of light sources and a detector. The memory is coupled to the processor and stores data and information. Each of the plurality of light sources are coupled to the processor and produce a different color. The processor is capable of independently controlling the intensity of each light source so as to produce a desired resultant hue. The detector is also coupled to the processor. The detector provides the processor with information which the processor utilizes in determining how to adjust the intensity of each of the light sources to provide the desired resultant hue.

In an earlier patent U.S. Pat. No. 5,803,579 titled: Illuminator assembly incorporating LEDs, by Turnbull, incorporated herein by reference, the different color LEDs light output is coincident in such a manner that this overlapped and mixed illumination forms a metameric white color and has sufficient intensity and color rendering qualities to be an effective illuminator. Electronic circuits for control of the independent light sources consist of microprocessor controlled adjustable current sources.

United States Patent Application 20020130326 issued to Tamura et al., incorporated herein by reference, describes a lighting device that includes a plurality of LEDs arranged in an at least two-dimensionally dispersed manner; a transparent resin layer that covers the plurality of LEDs in an integrated form; a photo-detecting unit that detects an intensity of light emitted from the plurality of LEDs using a photodetector and a power supply circuit unit that controls driving of the plurality of LEDs based on a detection output from the photo-detecting unit. The purpose is to have a predetermined balance of light intensities of the colors according to an output detected as to each color by the photo-detecting unit. This device does not integrally cover the light distribution function within and does not correlate the lighting spectrum with the light intensity. It also does not provide a method to handle color shift over the lifetime of the illuminating device.

In U.S. Pat. No. 6,528,954 a light bulb is provided which may include a housing, an illumination source, disposed in the housing, and a processor, disposed in the housing, for controlling the illumination source. The housing may be configured to fit a conventional light fixture. The processor may control the intensity or the color of the illumination source. The housing may also house a transmitter and/or receiver. Although this device includes the desirable communications control aspect, this device does not relate to a multi-light source capability which allows for the smooth variation lighting and its even distribution.

In the prior-art approach, the LED manufacture and the power supply manufacture are separate units. Typically one power supply is good for a certain number of LEDs. This is similar to the historical lamp and ballast segregation that came about probably because one manufacturer was working with glass and the other with copper. Electronic light sources are semiconductor components as are the power supply components. A unique opportunity for integration exists in solid-state luminaire design which has not being taken advantage of.

In many energy conserving multi resident stairwell lighting systems the lights are typically activated by pressing a button in the hallway or in each apartment. This requires special wiring between the switches and the central controller. In many other stairwells and hallways the lighting is always left on wasting energy. With long life LED lamps, a low energy distributed lighting solution could always be on for orientation purposes and would only turn on to full output when activity levels require the lights turning on, using integral optoelectronic motion detectors.

A home lighting fixture is often left on at full power when really only lighting for orientation purposes is required. A light switch on the wall is provided and sometimes this has a dimmer option. An electronic power supply with programmable electronic controller with communication over a dedicated data line or alternately over the power line or alternately wireless is also possible in present art such as with the DALI (Digital Addressable Lighting Interface) protocol. With digital signals, power supplies become individually addressable compared to analog systems where only circuits are addressable. Additionally, DALI allows for bi-directional communication between the power supply and control. DALI also brings the capability of broadcast messaging to ballasts. With DALI or any other protocol much more than dimming can be effected. Control of spectrum, occupancy sensor controls and specific spatial intensity distributions can be modified. However, the present-day lamp or fixture is not designed to fully and efficiently take advantage of these new control capabilities.

In United States Patent Application 20100302779 by Chemel titled Fixture with Replaceable Light Bars he describes an intelligent LED-based lighting system. The LED based lighting systems may

include fixtures with one or more of rotatable LED light bars, integrated sensors, onboard intelligence to receive signals from the LED light bars and control the LED light bars. In this system while an adjustable system of moving bars is illustrated so that the LED luminaire can retrofit a variety of older discharge lamp based luminaires, advantage has not been taken of the multiplicity of light sources to obtain a superior light distribution lighting solution that is now obtainable with multiple sources.

Spero in United States Patent Application 20040105264 describes the design of a multiple light source system using unique placements of the LEDs on the structure of a lighting fixture to generate an application specific light distribution pattern capable of providing recommended illuminance levels. The lighting fixture has means for being affixed within a living space to be illuminated in a unique orientation in relation to the surfaces therein. Subsequently, the lighting fixture is designed by positioning LED light sources thereon that emanate light in direction and intensity as required by the lighting application. The geometric layout is determined by using knowledge of the distances and angles from the light sources to the living-space surfaces as dictated by the inverse square law and Lambert's Cosine Law of Incidence. The combination of the unique placement of the LEDs on the lighting fixture and the unique orientation of the fixture in the living space results in the predetermined illuminance being obtained on the room surfaces. A problem with this technique can arise in non-standard illumination instances which may be the majority of lighting applications. For example in industrial plant lighting, such as in open chemical processing facilities or where there are desks, shelves, machinery or other elements requiring an unpredictable light distribution. Much energy is wasted in these facilities with the wasted light often contributing to light pollution.

In another embodiment Spero describes a solution to this problem where an overabundance of LEDs are deployed on the fixture structure giving it the ability to illuminate in all directions at required intensities. The controller of the LEDs is coupled to a camera which analyzes surfaces and usage within the living space and adjusts the lighting accordingly. While the design is highly flexible it requires an over capacity of LEDs and the cost of driver and light sources would be high.

People need light for the performance of visual tasks, its aesthetic value or security. Light generated but not used by people is wasted energy, money and causes air and light pollution. Standard lighting fixtures, even those that are somewhat area based, such as a low bay or bedroom luminaire, because of the different object and usages within the area, either provide too much light and are wasteful or provide insufficient lighting inhibiting visual performance. Therefore it would be beneficial to have a lighting fixture that is further configurable to meet the demands of the actual lighting application where it has been installed. In addition it would be beneficial if the lighting fixture was responsive in

real time to the lighting needs at that moment. It is no longer necessary to have fixtures providing illumination where there is nothing to be seen.

Thus there is a need for a lighting fixture having provision for the differentiation over space and time of the light's intensity and color that could be set-up in the field and/or adjusted in real-time to the changing lighting requirements. Such an exigency based fixture would provide correct illuminance in terms of chromaticity, homogeneous or aesthetic lighting generally and task lighting locally for the visual tasks at hand.

Prior art lighting practice utilizes an apparatus termed a luminaire or Lighting Fixture to provide illumination to indoor and outdoor living spaces, vehicles machinery etc for the performance of various visual tasks. A luminaire provides features other than just light which may include light distribution, shielding, man-machine-interfaces such as on/off switches, connection to power mains, apparatus for affixation to construction elements and aesthetics. A typical prior art luminaire is comprised of: a replaceable lamp, a lamp holder, wiring, optical control elements such as a reflectors and refractors, fasteners and brackets. In addition if the lamp has a negative resistance characteristic, then the luminaire includes power control elements such as a ballast. If a light control system is employed also included are elements including relays, logic controllers and communication devices which may be part of an electronic ballast design. All of these elements packaged together constitute a luminaire. In typical present day luminaire (lighting fixture) practice, a lamp with a mostly radially uniform spatial light distribution is placed within an optical assembly consisting of a reflector and or refractor for the purpose of having the light exit the luminaire in the desired direction and preferred distribution pattern. This is a process that involves cost and inefficiencies in redirecting the light.

Recently solid-state light sources have evolved from indicator lamps into illumination sources. The present art approach is to package these new lamp types into luminaires of the old lamp type with some minor adjustments. This was the case when fluorescents replaced incandescents and when HID replaced fluorescents. The question arises, is this really the best solution as far as functionality and construction are concerned. The question is especially cogent when the fact that solid state light sources are electronic devices with high reliability, long lifetimes and are capable of rapid change over a very wide operating range.

Examples of the inflexible prior-art approach based on today's designs include: lighting is often provided in rooms where daylight contributes significantly to the overall lighting level or in areas near the window but the lighting system is not flexible enough spatially to take advantage of the daylight contribution and reduce power; or the lighting is always on at maximum power irrespective of whether or not there is activity in the room to justify the lighting level.

Even when external dimming controls are provided to the lighting fixture, the color quality of the lighting is deleteriously affected. At a lower lighting level a warmer color temperature is generally required and the luminaire lamp color is not adjustable.

Lighting systems are generally based around a lamp source and lighting application. When a new lamp source arrives generally they are placed into present-day lighting luminaire designs which are not optimal for the new light source. LEDs are a light source which have a number of advantages due to relatively long life expectancy. In the future it is also expected that LEDs will have conversion efficiencies equivalent to those of discharge lamps. Presently however, the high cost of lumen per watt appears to make LEDs uneconomical for most lighting applications. A few applications of which step, stairwell, pathway and emergency lighting are examples require low lighting levels to begin with and thus present at this time a feasible application. An LED light source is well adapted to a number of additional applications. Very often in these additional applications the areas over which the lighting is to be provided are large and bringing electric power to the luminaire is a significant safety and cost consideration. An inherently low voltage light source such as an LED is suitable for use with safe 12 or 24 volt of a distributed power system with low current demands. The control of the light distribution, especially the beam cut-off necessary at low light levels to prevent discomfort, is well suited to the high directionality of the small LED light source. Maintenance of prior-art luminaires in outdoor applications and the requirement for watertight resealing increases fixture cost and complexity. Robustness of luminaires is another requirement as they located on ground level endangered by passersby contact or vandalism.

In prior art lighting fixture construction, the lamp, reflector, socket and ballast are separate units. Foremost, the lamp must be replaceable and thus access provided, because the lamp lifetime is less than other components in the fixture. The reflector is large, to envelope the light source and provide ray control, and is manufactured of special, highly reflective, material. The power-conditioning device such as a core and coil ballast or more recently electronic power transistor components differs again from the glass lamp, reflector and fixture material. The dissimilarity of the manufacturing technologies, operating lifetimes and materials results in a multi-component fixture assembly held together by fasteners which don't lend themselves to mass production and the luminaires are not factory sealed for life.

OBJECTIVES OF THE INVENTION

The present invention provides a unique approach to solid-state illuminating devices that is a departure from conventional prior art LED lighting practice. Prior-Art LED lighting technology manufacturers have been taking LED junctions and packaging them in ever more-powerful

configurations to carry out the function of lamps. These LED lamps are teamed with reflectors and/or refractors similar to the techniques practiced with standard lamps or put on strips which is just another way of distributing the light over the area to be illuminated. This invention comprises a different approach which is to provide the end user with the most correct lighting solution not a new technology lamp to replace the old one. The present invention comprises a novel multi-light source approach to the design and construction of solid-state lighting fixtures (vs. solid-state lamps), which is termed a "Digital Lighting Fixture", due to the control of individual lighting element "digits" to provide the "correct" lighting solution for the situation at hand.

The invention embraces LED-illuminating devices covering a wide scope of applications including a room light and step light design as well as the general method for designing solid state luminaires from ground up from indoor to outdoor use in residences, factories, stores stadiums and streets. The general concept allows anyone to build a lighting fixture from the ground up, tailor made to the final application rather than building a fixture around a common lamp. This is because it difficult to control the high temperature processes of incandescent and discharge lamps. In addition it takes a tremendous amount of investment in tooling to manufacture an incandescent, fluorescent or HID lamp. Electronic components on the other hand are made of large quantities of discrete components which are masked or robotically placed on to substrates. These smaller building blocks can then be easily configured per specific applications.

This disclosure also teaches that when it comes to solid-state lighting big is not necessarily better. The approach of LED manufacturers trying to get into the lighting business by attempting to replicate the effect of present day lamps has been to make large, high current capacity, high lumen output electroluminescent junctions having marginally acceptable lighting characteristics. Lumileds Luxeon ® DS25 Emitter running at 350mA is an example of such an approach. In a few years manufacturers have raised currents from 50 mA to above 500 mA, at the time of this writing. These advances are certainly favorable at reducing costs and making LEDs a practical light source but attempting to get 1000 lumen (equivalent to a 60W incandescent lamp) is not necessarily the best path to take, especially if it comes at the price of light conversion or distribution efficiency. In contrast to a prior art, single large, lamp replacement like light source, the present invention provides multiple, small sized sources of differing characteristics such that the effect of the whole is greater than the sum of the individual parts. The determining size factor then becomes when is there a sufficient progression of values varying by minute degrees or continuum so as be non-discernable or irrelevant to the user. That is, LEDs are generally of a single wavelength (color, frequency), have small optics close in to the individual light sources since they operate coolly, and have stable conversion efficiency over a wide range of currents and light output. The added controllability offered by breaking the total light output up into discrete ("digital") specifically aimable and

dimmable elements which can be addressed by control electronics to effect intensity, spectrum and spatial distribution of intensity and spectrum, yields a lighting fixture (vs. lamp) of unparalleled performance. Unique to this patent is the approach. It is the approach of a lighting manufacturer who provides lighting solutions versus that of a lamp manufacturer who produces a generic lamp.

The advance over prior art is a solid-state light source with increased: 1.Efficiency- more effective lumen per watt electricity. 2. Durability - physical strength, life expectancy, lumen maintenance and spectral stability. 3. Lighting quality - as related to visual comfort and "atmosphere". 4. Functionality - ability to control the light placement, intensity and color temperature and do so as needed. 5. Energy savings 6.Lower overall lifecycle cost

Integrating the light source with power conditioning electronics, control circuitry and sensors gives additional cost benefits and functionality including: 1.Mass production capability 2.Sealed-for-life fixture 3.Exact optical performance less spill light 4.Compact design 5.Feedback control and recalibrated color consistency over the device lifetime 6.Real-time lighting needs adaptability.

Therefore, it would be advantageous to have a luminaire that require no maintenance, has smoothly controllable light output in terms of intensity, spectra, spatial distribution, is robust, mass-producible as a single unit, factory sealed against the elements, is self calibrating over its lifetime, is adaptable to changing requirements, works on high or low voltage, has an affixation apparatus and is aesthetic.

Further Objectives of the Invention

The objectives of the present invention are (among others) to overcome the deficiencies in the prior art and effect the following: Light is generated only when, where and in the proper amount and color that can best be used by people or is their personal preference. This will save wasted energy, money and air and light pollution while increasing visual performance and comfort. An exigency based lighting fixture is presented that provides correct illuminance in terms of chromaticity, homogeneous or aesthetic lighting generally and task lighting locally for the visual tasks at hand while preserving high visual comfort.

A number of unique illuminating device embodiments are achievable using the basic elements presented above. A few examples presented in the disclosure include: (1) an industrial lighting fixture for use in chemical and process plants where lighting that normally spills out of the existing structure as wasted light, is not produced to begin with; (2) a bedroom luminaire where normal activity and night-light lighting levels are provided as well as the ability to provide individualized lighting to each person; (3) Living room lighting with provision of modes for typical uses such as television viewing, reading with the provision of radiant spot heating based on the users unique

location and usage at that instant in time; (4) A therapeutic luminaire designed to use illumination and irradiation on persons to alter biological disorders or schedule sleep or awakening; (5) a luminaire for emergency and security forces having a non-readiness situation intensity and chromacity and second high-readiness situation setting of a unique intensity and/or chromacity, where the unique chromacity does not damage the biological visual purple pigment of the retina that is responsible for enabling night vision. It thus eliminates the time these security forces would need to adjust from normal lighting to low-light night vision conditions; (6) a restaurant luminaire which illuminates foods and/or people in their best light while providing for the correct level and chromacity of ambient lighting for generating the optimal dining atmosphere; (7) A general luminaire which the end user configures themselves in situ to best suit their desired lighting preferences. The field adjusted luminaire comes with the lighting elements and their power supplies but the user re-arranges in particular directions and sets their light output levels and/or chromacity to obtain the preferred output; (8) A do it yourself modular lighting fixture which is a structure capable of receiving light sources over its surface where the user chooses the light source with its chromacity and intensity level. The user builds up the light distribution pattern on their own and connects the sources to the integral modular power supply; (9) A single light engine device for a room or outdoor location with concentrated light output capable of being beamed distances to reflectors or refractors which redirect the light to be more optimally used in a localized area.

The overall objective of these exemplary embodiments is the disclosure of an exigency based lighting fixture that provides correct or user preferred illuminance in terms of chromaticity, homogenenaity, aesthetic considerations over a general area and/or task lighting provided in a small area for the visual tasks at hand. Providing illumination only where, how and when it is needed to efficiently carry out visual tasks minimizes wasted light thus minimizing energy use for lighting. To achieve this efficiency goal there is a need for a lighting fixture having provision for 1) the differentiation over space and time of its light intensity and color 2) that can be set-up in the field and/or 3) adjusted in real-time to changing lighting requirements.

While these objectives should not be understood to limit the teachings of the present invention, in general these objectives are achieved in part or in whole by the disclosed invention that is presented in the following sections. One skilled in the art will no doubt be able to select aspects of the present invention as disclosed to affect any combination of the objectives described above.

SUMMARY OF THE INVENTION

A lighting device incorporates one or more discrete light sources and their ancillary optical and electrical control equipment in an integrated illuminating element. The overall lighting effect is the

result of the combination of these multiple sources, detector and control components operating together. Preferably, the power conditioning circuitry, light sources, logic control circuitry, sensors and optical elements are packaged together in one integral device. The system contrives a lighting device which replaces the present day multi-component lighting fixtures or luminaires including: the lamp; optical light control element/s such as reflector, refractor and shade; power conditioning devices such as a ballast; control equipment such as switch, dimmer, and timer. Detectors, emitters and sensors for light intensity, spectrum, temperature etc such as photodiodes, photocells thermocouples etc are provided. These provide data input to the controller, allow feedback and enable recalibration. An additional apparatus that conducts electric power along length, as electrical wiring, may be added to the system to provide further unitization. The integral lighting element is packaged in the shape of a globe, hemisphere, disc or strip and is designed to quick connect to the electric power carrying conductors. Provision is made for mechanical affixation to a structural surface. In the present concept over the life time of the fixture there is no lamp replacement only fixture replacement. It's assumed that after 100,000 hours it is time to change the fixture.

The method of creating a luminaire adapted to the usage and surroundings in which the luminaire will be integrated is disclosed. The process includes determining: the correct lighting practice for the application; the surroundings; the selection and placement of light sources and their integration with the mechanical support and; electronic control elements to realize the objective.

The present invention also relates to lighting fixtures comprised of many directional light sources that are mounted with different aimings so as to correctly illuminate an area. The LED light sources are moveable so that they can be adjusted to best illuminate the area where the luminaire has actually been installed. In addition they may be controllable by a microprocessor as to the light intensity and color so as to best assist people to see what they are doing at that moment, be it reading a book, watching TV or assembling an automobile. The lighting fixture is equipped with a "smart" camera (similar to a cell phone's processor controlled digital camera) which inputs data on the lighting, occupants and current conditions within the room. The result of this added sophistication is that electricity is spent on generating only useful light. The energy savings greatly reduces electricity costs and environmental impact.

The present invention more specifically relates to lighting fixtures whose spatial light distribution and/or spectral power distribution is capable of being adapted, either manually or automatically, to provide the illumination needed in that specific surrounding and at that specific time. The Field Adjustable Multiple-Light-Source Luminaire, FAML, is thus a universal product that can be tailored onsite so as to provide design illuminance and color spectrum to the relevant surfaces in the specific lighting installation. Thus a preferred embodiment of the invention is a lighting fixture comprised of

many light sources which can be separately aimed and powered so as to illuminate areas or objects in a room or outdoors in a most correct, efficient and comfortable manner.

To affect this directional lighting versatility, in a preferred embodiment the luminaire is comprised of many directional light sources that can be re-positioned so as to illuminate in different directions. The light sources at a particular aiming may all be one color, say white or may be of different colors which when combined together yield a different colored light beam. Altering the radiated power of one color light source versus the other allows for the creation of light in a myriad of colors. The luminaire has some light sources at the same aiming and others at different aimings and may come in a standard configuration for the general type of lighting application from the factory. Upon installation, if the factory preset lighting distribution does not fit the actual surroundings, the installer will customize the configuration by adjusting the light source aimings and light intensity output such that the correct amount of light is supplied to where it is needed while not at all or minimally illuminating areas where it is not needed. The installer will also make provision for the existence of other lighting fixture in the same or adjacent areas. When light is provided at higher angles and glare would result from the LED light source being visible, the light is not wasted by covering it with a shade or passing the light through a diffuser thereby losing the directionality and light flux due to absorption. Instead taking advantage of the small étendue of the light source, an optical spreader is used to increase the area from where the light is exiting thus lowering the luminous exitance while maintaining directionality.

To effect the provision of lighting that is in concert with the actual illumination needs at a given time, in an embodiment of the FAML, a camera serves as a sensor capable of detecting light, color and contents of the living space. The fixture is equipped with a logical controller. Using computer vision technology to recognize people, objects and surroundings the lighting fixture can provide the lighting requirements needed in the room at that moment in time. The computer vision system has been taught to recognize different visual tasks such as an individual operating a machine, reading a book or watching TV. The logical controller has instruction sets as to what color lighting at what intensity is preferable for that specific visual task. Thus if no one is in the room the lighting is off or a dimmed, aesthetic lighting is provided for the good feeling of those looking in. When people enter the room, immediately general room lighting is turned on and following that, specific task lighting is provided and adjusted to the right level and color based on where they are in the room and what they are doing.

An automatic embodiment of the FAML would include motion control elements for the light sources. Coupled with the camera and logical controller, the light distribution is altered automatically as required by changes in the physical surroundings, people or environment. In a similar fashion to

how a preprogrammed moving head stage light follows the performer about the stage the FAML logical controller will automatically locate the person in the room and provide locally the lighting needed for the performance of visual tasks. To save energy, the rest of the room will then be illuminated at a lower, yet comfortable lighting level.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 represents a block diagram of the elements making up a Digital Lighting Fixture system.

FIG. 2A is prior-art design and FIG. 2B an illustration of a preferred embodiment of this invention of a retrofit LED lamp illuminator while FIG. 2C is a side view of an embodiment of this invention using a PCB provided with standard 5 mm hole-through LEDs.

FIG. 3A and FIG, 3B illustrate a preferred embodiment of a decorative LED outdoor wall sconce juxtaposed with a prior-art design.

FIG. 4 is an illustration of a Surface or Railing Mounted Digital Lighting Fixture.

FIG. 5 is a Surface or Railing Mounted Distributed Digital Lighting Fixture.

FIG. 6 is an Asymmetric Light Source made of Directional Chip Facets.

FIG. 7 illustrates an application employing the Discrete Unit Step Light.

FIG. 8 illustrates an application using the LED based Distributed Step Light Fixture.

FIG. 9 is a path lighting application using an LED Stake-Top Path Light.

FIG. 10 is the Illuminating Engineering Society Preferred color Temperature vs. Intensity Correlation.

FIG. 11 depicts an integrated digital lighting fixture using discrete solid-state light source arrays deployed angularly about the geometric volume.

FIG. 12 is a universal luminaire embodiment using an adaptive digital lighting fixture which is programmed to illuminate the area as is needed.

FIGS. 13A through 13C depict a streetlight fixture designed according to the teachings of this invention.

FIG. 14 is a flowchart of a typical design procedure for a multi-source lighting fixture of the present disclosure

FIG. 15 shows a multiple light-source headlamp capable of optimally carrying out the diverse illumination functions used in driving under various environmental conditions and surroundings.

FIG. 16 is an illustration of an anti-glare system using the multiple light source headlamp.

FIG. 17 a representative Electronic Power Supply Unit for Surface or Railing Mounted Luminaire.

Fig. 18A is a perspective view of a configurable LED luminaire comprised of many light modules;

Fig. 18B is a view of light module optical accessories;

Fig. 19 is a perspective view of a light guide;

Fig. 20A and Fig. 20B are perspective view of basic embodiments of the present invention;

Fig. 21 is a perspective view of a substantially linear embodiment of the present invention;

Fig 22 is a block diagram of the elements comprising the present invention;

Fig. 23 is an exemplary flow chart for a computer program run to obtain the optimal illumination;

Fig. 24 is a perspective view of a universal lighting fixture structure with means for attaching light source and sensor elements mechanically and electrically;

Fig. 25A and Fig. 25B shows an embodiment where the light source arrays are mounted at the end of moveable rods;

Fig. 26 is a perspective view of a lighting fixture capable of producing both a differentiated spatial light intensity distribution as well as a spatially differentiated light spectrum distribution;

Fig. 27 is a perspective view of a field adjustable multiple light source lighting fixture;

Fig. 28A and Fig. 28B is a perspective view of satellite light source from the side and from the front respectively;

Fig.29 depicts an adjustable luminaire in a lighting application;

Fig. 30 is a perspective view of a luminaire with a special night-light functionality;

Fig. 31 is a perspective view of an adjustable luminaire with added irradiation functionality;

Fig. 32 is a perspective view of an industrial lighting fixture for use in hazardous locations;

Fig. 33 is a process flow chart for a computer lighting fixture design program.

DETAILED DESCRIPTION

The system is built around a "digital" light source. That is, the emanating lighting effect is the sum of the characteristics of a multiplicity of discretely controllable "digit" sources. The difference between the individual "digit" light sources and their summation manifests itself in the resultant light characteristic, be in its intensity, spatial intensity distribution, spectral energy content and spectral intensity distribution. All of these characteristics are also variable with time. A light source for this purpose may be electroluminescent such as a Light Emitting Diode (LED) junction, Organic Light Emitting Diode (OLED) or carbon-related field emission devices such as a nanotube- phosphor-combination, HID, fluorescent or even an incandescent source. While a one-source lamp will not have the flexibility to effect the most correct illumination characteristics, such as maintaining correct intensity and color temperature for the lighting task at hand over changing environmental conditions, two or more differentiated sources will have an increased operating range. This flexibility is useful as for example in a multi-source luminaire with spatially differentiated dimming capability used in an office lighting application. In a normal day's operation, such as in a windowed room between peak daylight and nighttime hours, the intensity and color temperature of the light varies greatly over different portions of the room. The smooth variation possible with many light sources ("digits") vs. one light source offers superior flexibility in providing the actual lighting needs. Therefore, the illuminating device may be described as a "digital" light source or as a Multiple Solid-state Light Source (MSLS), comprising many "digits", SLSs, and essentially replaces the lamp of present-day luminaires.

As used herein, the term "light source", LED or "solid state light source" means any system that is capable of receiving an electrical signal and producing light in response to the signal. Thus, the term "light source" should be understood to include light emitting diodes of all types, light emitting polymers, semiconductor dies that produce or emanate light in response to current, organic LEDs, electro-luminescent strips, and other such systems. Incandescent and discharge light sources are also included and multiples of incandescent and discharge light sources also provide a digital luminaire. In an embodiment, a "light source" may refer to a single light emitting diode package including multiple semiconductor LED dies that are individually controlled.

The term "illuminate" should be understood to refer to the production of a wavelength of radiation by an illumination source. The term "color" should be understood to refer to any wavelength of radiation within a spectrum; that is, a "color," as used herein, should be understood to encompass wavelengths not only of the visible spectrum, but also wavelengths in the infrared and ultraviolet areas of the spectrum, and in other areas of the electromagnetic spectrum.

In designing a multi-light source luminaire the minimum design criterion for intensity and spectrum differs for each application and is related to the end user who is the ultimate measuring instrument and economic consideration of the light provider. The regularity of the changes in effects is derived from the user's perception. It is generally accepted that the eye cannot discern changes in beam intensity that are smaller than a factor of two to ten and color temperature differences of 200 to 300K. Illumination intensity changes are discernable as a logarithmic function and depend on background illumination levels. For example illuminating practice allows for hallway lighting to be 20% of room lighting due to rapid eye adaptation. However the eye is very perceptive of intensity changes when comparing images such as in comparison of gray scales and thus lighting for an art lay-up room must be very even.

A further improvement is where the lamp and lighting fixture function are carried out in one device. In a typical present-day lighting fixture, a lamp with a symmetrical distribution in placed in a reflector to redirect the light, a requirement involving added cost of the reflector and performance inefficiencies. While PAR and other integral reflector lamps exist, they again have a symmetrical distribution in one of the axes and are large due to the high temperature of operation and requirement to distance reflective surfaces due to heat and large light source dimension consideration. Since the solid state or LED lamp is made of cool operating components which have a mechanical base (versus a 1000K gas discharge which is free floating) the LED allows for an integral small sized optical element near the power source. Where the terms optics or optical are mentioned herein, they refer to redirecting light rays through any of the known phenomenon including: reflection, refraction and diffraction. Typically, an LED will come packaged in an optical assembly consisting of a reflector and lens with 8 ° to 50 ° spreads being typical. A Surface Mount Device -SMD LED with no optics will still be limited to 180 ° due to its construction.

A power-conditioning device such as a ballast is required to operate efficient fluorescent and HID light sources but is separate there from in function and physical construction. In the MSLS the power source is electronic as is the control equipment and thus the electric power conditioning circuitry can be integrated with the light source circuitry and packaged as one on a PC board or integrated circuit manufactured in the same way of the same materials. Chip on board and chip on chip technologies are used as a packaging configuration for LED chips as well as power and logic control transistors and other components. Power transistors come packaged in plastic and so do LED junctions only that the LED package is light transmitting and can be formed into a lens. Transistors, molded in a transparent package together with LEDs, may be shielded from undesirably receiving illumination causing base photocurrent, by providing opaque "junction coat" over the transistor die, as is well known in the semiconductor industry. The packaging also lends itself to the same manufacturing methodology such as soldering elements onto a PC board. Both hole through and SMT

configurations are presently available for most of the components. This combined unit of compatible, mass producible, apparatus, including the solid-state lamps, their optical assembly, electronic ballast gear and structural fixture equipment, provides a unique Digital Lighting Fixture (DLF) device.

In a preferred embodiment the DLF is provided with an onboard controller. The controller may be a computer board, embedded device, a Digital Signal Processor, etc. In general, the term "logical controller, controller or computer" can be broadly defined to encompass any device having control circuitry or a processor which executes instructions from a memory medium.

A further improvement is the reduction of all electronic and optical components to the chip level. That is, light-emitting junctions may be placed with power electronics in an integrated circuit. For example, combination GaAs LED-JFET technology may be used, the JFETs (junction FETs, acting as control devices for the LEDs. The carrier is made of materials and shaped to carry out optical and or heat transfer functions. Multiple light emitting junctions of similar or differing characteristics, a function of doping and diffusion, are placed with the control circuitry on chips. The VLSI techniques used in digital camera photodiode arrays containing millions of pixels is used to create arrays of light emitting diodes. Actually reversing the current flow on some photodiodes will cause them to emit light. This is how OLEDs were discovered. OLEDs began in the lab as photovoltaic cells until by error they were driven in reverse. Alternately other die bonding techniques are used to create chip on chip assemblies as is known in the art. Sets of chips with similar or differing characteristics may be geometrically arranged to provide a specific light distribution and color mixing. The total envelope is then a combined lamp, power supply and lighting fixture "luminaire", and is positioned within the room to be illuminated at the design height and position to give a consistent and sufficient lighting to the area under its control. Cooling is effected using natural convection or for air currents from a cooling fan or fluidic cooling using natural or forced circulation.

On the chip and die level further magnitudes of manufacturing and packaging efficiency are realized. The integration can avail itself of other more compact packaging technologies such as chip on board and chip on chip. Assemblies with conductive and non-conductive diebonding using epoxies and eutectic solders used for a variety of semiconductor die types including ASIC's, MEM's, LED's and Sensor's. These may be used on a variety of substrate materials including FR4, Alumina, Metalized Ceramic, Carbon Fiber and Chip on Flex as single die or multiple die arrays for Chip scale packaging / CSP's. Conductors are attached to the dies via Aluminum and Gold wirebonding using both wedge bonding and ball bonding. The manufacture of Multi chip modules / MCM or Chip scale packages / CSP are also possible and can be ceramic, laminate or PCB based. These assemblies can be single or multiple die assemblies with external components making it possible to manufacture all light, sensor, power and control components as a superior integrated device.

The present invention provides an illuminating device which serves as a replacement for the lamp, socket, reflector, electric power control gear, dimmer and mechanical structure of a present-day lighting fixture or luminaire. A semiconductor junction packaged integrally with light controlling components provides a Solid-State Light Source SLS and many together form an MSLS, which when combined with power conditioning, and optionally logic control, communications and affixing elements, provides a DLF. The basis of the invention is the use of a multitude of discrete light emitting sources ("digits") to generate light. The light control elements can be applied on a per junction basis or on a "white" color generating set grouping such as RGB or on a larger set which may be convenient for manufacturing or other color rendering considerations. The requirement for controllability is however, that the SLS output is definitive in relation to spectrum and spatial distribution.

The discrete light emitting elements by operating and not operating, at full power or at a fraction of, either partially or in unison, generate light with optimal intensity, spectral distribution, and spatial distribution of intensity and spectral distribution for the viewing task at hand. This is accomplished without recourse to separate (exterior to the DLF) reflectors to redirect the light, filters to alter color, shades to control glare or dimmers to control intensity. An example of light source used in a DLF would be an electroluminescent semi-conducting material an example of which is a LED. Such a source is characterized relative to a standard incandescent lamp by its small dimensions, low voltage, low current, monochromatic spectrum, high resistance to physical shock, high directionality of the light output, and at the present, relatively high cost. In addition, the intensity of the light output over a defined range is a function of the current and within limits may be varied by orders of magnitude without deleteriously affecting the efficiency or lifetime of the LED.

Although the light production of a typical 5mm, 50mA maximum rated, LED of between 1 to 2 lumen is much too low to be of any practical use for illumination, the combined output of a few to hundreds to thousands of LED's is quite significant. Higher current LEDs are now being introduced which operate at 350mA and provide 20 to 30 lumen. This however, is still is highly impractical for use in lighting a room when compared to a 100 watt incandescent lamp of 1700 lumen. Based on progress to date it is expected that LEDs will reach comparative lumen per Watt efficiencies of 60 to 120 l/W as found in gaseous discharge lamps. This invention relates to technologies which are feasible at the present state of the art l/W as well as those which will become feasible in the future.

A "light bulb" of the present invention is comprised of a multitude of LED's where each LED or group of LED's may be of the same or different wavelength, (color- where said wavelength may be mono or multi-chromatic), light output, spatial distribution and operating frequency (as when an

alternating signal is used or it is multiplexed). The light from an LED or group of LED's of red color operating with an LED of blue and green color impinging on an object would appear to the viewer as "white light". By varying the number and/or light power output of a specific color LED or group of LED's relative to the others, a different intensity and color temperature of light with a "warm" or "cool" appearance may be effected. "White" LEDs can also be used in the invention alone or with other monochromatic LEDs. A white LED comprises an emitter in the blue spectrum covered with a phosphor which fluoresces in yellow such that the combined output appears white. White LEDs come in various angular light distribution patterns and color temperature variations. White LEDs can also be combined to vary intensity and spectrum. In the preferred embodiments, "white" LEDs are not used, as the use of phosphor adds unnecessary conversion inefficiencies and output degradation with time. The ability to correct for color shift over the DLF lifetime with white LEDs is limited. However, the present invention includes the use of white or other multi-spectrum light sources.

Presently the efficiency of many types of LED's (the chemical make-up of the junction differs between colors) is high relative to incandescent but low relative to discharge lamps. However, the theoretical efficiency is quite high and the inefficiencies have to do with getting the light out between the junction and heat dissipation considerations. Expressed in lumens per watt LED's may produce up to 30 lumen/W versus 100 l/W for a discharge lamp and 18 l/W for an incandescent lamp. In the preferred embodiment, a highly efficient constant current power source is used to drive the LED's where the electronic circuit is a series connection of the discrete LED light sources. The open failure of an LED or series of LEDs which would interrupt the circuit is circumvented by the use of Zener diodes, placed such that the functionality of the lamp would not be seriously affected. The constant current power source has the advantage that different LEDs, of different forward voltage drops, from different manufacturing runs or chemical composition, may be operated together. Alternately, power circuits available in the literature for driving the LEDs are used as published in technical notes by manufactures such as Agilent ® .

The life expectancy of an LED can be expected to be as high as 240,000 hours between failure. Due to light degradation over time average lifetime is normally rated at 100,000 hours. At best an incandescent's rated life may be 2,000 hours and that of a fluorescent, 20,000 hours. However, the LED operated in a circuit would have only the reliability of the circuit and MTBF divided by the number of series connected LED'S. A printed circuit board with the LED's alternately connected to separate circuits with redundant access to the power sources and with the use of Zener diodes every so many LED's to circumvent any failed sections could operate directly off of the 120/240V line. Any voltage AC or DC from 4V up to 480V is practical. The LED's of the hole -thru or SMT type would be soldered in place or the LED's connected leg to leg without using a PC board.

The LED's are mounted flat in rectangular patterns or in concentric circles or on or within holes situated on geometrically curved surfaces such as on a sphere or hemisphere of round, parabolic or elliptical shape according to the desired candle power distribution pattern. The LEDs can be mounted perpendicularly to the geometric fixture surfaces or at any other angle. When mounted perpendicularly the surface, geometry is dictated by the light distribution pattern and the LED photometrics. This is the generally assumed design case in this disclosure. However, any geometry is possible with the non-perpendicular mounting of the light sources. A flexible PC board is manufactured in the flat and then "origami" style cutouts are made allowing the PCB to be bent and shaped into the preferred form. LEDs are insertable into holes made in plastic or metal forms to secure the LEDs in the correct location at the correct aiming.

For fluorescent lamp retrofit applications, the MSLS "luminaire" would be linear with LED's mounted all around the circumference or predominantly downwards for whichever lighting effect is desired. While a fluorescent's light distribution is usually not controlled in the longitudinal direction (the reflector can't get around the long dimension of the lamp) the LED version would be spatially directed so as to give uniform light. In comparison to a fluorescent lamp, where the light is produced equally in all directions irrespective of the final distribution pattern required in the room, the DLF has the advantage of producing light directed only where it's needed. The number of SLS aimed in a specific direction at the time of manufacture is such that the proportion and angle of the light going to the ceiling and floor are calculated to produce the desired result. Louvers and reflectors are unnecessary to prevent glare or redirect the light. Up to 40% to 60% of the light produced in a fluorescent fixture goes to waste due to these considerations.

In other embodiments of a linear fluorescent replacement SLS lamp "luminaire", the position regarding the nadir (floor) of the rows of SLS are adjustable. One or more SLS strips are free to move in an arc about a long axis such that they are aimed for uplight or down light. Apparatus is provided to fix the re-positioned SLS in place. Markers along the arc can delineate the angle. Thus, the installer can adjust the amount of up-light, down-light and floor coverage in the field, (markings on the fixture would indicate standard settings) just as an adjustable reflector changes luminaire light distribution. Here again, the difference is that there are no reflector-induced inefficiencies because of operation away from the ideal design point.

A pear shaped globe "luminaire" studded with LED's projecting light outward from the surface would give both down-light and up-light with more projection surface towards the down-light side in a typical 1 to 3 recommended ratio. Most buildings, rooms or areas to be illuminated are of a rectangular shape. The LED's on the DLF are concentrated at the 90-degree intervals. This yields a more square lighting pattern to ensure equivalent lighting in all areas of the room including the

corners. This is in contrast to the chronic lack of even coverage obtained from the circular light pattern of present day light bulbs or most luminaires. At best these prior-art lamps give a circular light distribution which requires overlapping to ensure complete coverage of the area with the overlap lighting levels in wasteful excess of the requirements. A position oriented MSLS lamp has a greater concentration of LED's aimed at 90 ° intervals so that more light energy is directed into the far-off corners of a room to give an even illumination throughout the rectangular or square shaped area. A DLF is made with square, rectangular and even rounded light distribution if the application requires.

Typically, an incandescent or HID lamp is used in conjunction with a reflector to redirect the light to obtain a desired light pattern where more of the light is directed where it is most useful. A luminaire for area lighting will have a "bat wing" candlepower light distribution pattern, which yields equal horizontal illumination on a surface as it compensates for the "inverse square law"(a function of the cosine of the angle and the distance squared from the source). Generally, such an optical assembly has efficiency less than 80% due to losses on the reflector's surfaces. The MSLS needs no reflector to redistribute the light since each discrete SLS "digit" is aimed such that the candle power intensity varies with angle as is needed to give the optimum illumination on the room work surfaces for a given mounting height. The MSLS lamp distribution is pre-designed according to typical house or office settings. Thus, there is no need for a reflector to redirect the light and its consequent inefficiencies in order to obtain a "bat wing" distribution. The present approach by LED manufacturers is to provide single high output LEDs with optics yielding a "batwing" distribution. These batwings are usually less than optimal and are circular. The "digital" approach of this invention would yield a finer control and thus a more accurate batwing, generating a more even distribution in a rectangular/square vs. circular pattern.

In a DLF it is possible to combine a task light having a very narrow "spot" beam at the correct aiming with a general area lighting "flood" beam into one fixture. The digital lighting fixture is positioned according to recommended lighting practice near a workstation and correctly oriented such that the DLF gives a wide (though still controlled, so as not to cause glare on a computer display) general illumination distribution as well as a narrow distribution aimed at the desktop for high intensity task lighting. In a preferred embodiment a positionable task lighting spotlight located on a section of the DLF can be aimed manually or by servomotor to project onto the work area.

In another example of prior art practice a table lamp for reading is provided with a shade. The shade is there to partially redirect the light onto the book and also prevent direct, glaring, rays from the lamp used for general lighting from reaching the reader's eyes. According to the present invention, instead of having a glaring lamp producing light which is then made non-glaring by a shade at a loss

in excess of 50% the LF is built such the amounts of light directed downward at useful angles and the amount of light directed upward are in the correct ratio. The surface area, from which discomfort-glare causing rays exit, is designed such that the luminous exitance is within recommended UGR levels for home use. The fixture has no need for a shade to protect from glare; the glare was never produced at those angles to begin with due to proper geometric design. To get the desired luminous exitance expressed in terms of lumen per sq. meter or luminance in terms of candela per sq. meter, the light exiting the source of specific intensity at angles which normally reach the room occupant's eyes, is spread over an area such that the exiting light is non-glaring. These lighting design parameters serve as the product specification and are incorporated into the initial design. There is no need to add on components to achieve correct lighting.

In MSLS technology an antique style table lamp uses a MSLS "bulb" specifically designed for the application, there is no need for an additional shade other than for aesthetics. The shade is a decorative element which diffuses a small amount of light for the rustic effect. The small amount of light which would be directed between 70 ° to 150 ° (the glare zone) would cause as little discomfort glare as that which is obtained from a shaded incandescent lamp but without the waste. This is done by sizing the area and intensity of the light source responsible for providing light at those angles such that the luminous exitance from the surface is within acceptable non-glaring luminance values. If desired, uplight to the ceiling above the glare zone is provided with light sources projecting between 150 ° to 180 ° . To maintain the aesthetics that people are used to or for the good feeling, a shade may be placed over the "digital" table lamp. A few LEDs can be dedicated for the purpose of illuminating the shade, either by projecting thru the shade and diffusing the light or projecting the LEDs into the shade as in a light guide. Colored LEDs could make the shade look yellow, pink or blue as preferred and programmed by the user.

The dimming capability of the MSLS is quite dramatic. A typical LED of today such as an Agilent ® HLMP25-ED-xxxx will produce light at a tenth of a milli-Ampere and may be operated up to 50mA. At 0.1 mA it may produce 5 milli-lumen while at 50mA over 1000ml. This is a hundredfold range. Another radiation output control technique is to provide pulsed power in place of constant current. LEDS are operated on DC as well as pulse power and current as well as timing in terms of duty cycle, pulse width and other signal modulations are useable by the controller to effect intensity changes.

Correct lighting doesn't only include an even light distribution and a lack of glare but a list of other factors including intensity, warmth and color rendering. Experiments have shown (IES Lighting Handbook 8th edition p.99) a graph of preferred color temperature of light sources at various illumination levels. The graph specifies a warmer color temperature say 2,500 Kelvin for lighting

levels in the 100-lux range and a cooler temperature say 3,500 for 1,000 lux. However, a typical dimming system used in a fluorescent luminaire will lower the lighting level but will not change the color temperature. A DLF of the present invention will change the balance of the different spectrum light sources in order to achieve the correct color temperature for the new lighting level. As far as dimming goes, it possible to get an instantaneous "instant on" from the SLS light source. Thus, with a built in or exterior motion detector, the DLF can be operated at emergency lighting levels, sufficient for orientation, and then immediately power up to full level when someone enters the room. Whereas a fluorescent dimmed to 50% power will give a negative return of only 10% light an LED will generally give a linear if not positive decrease in power with light reduction. Auto-dimming circuits taking sunlight into account have been touted as an energy saving technique.

In another embodiment, the electronic luminaire has a light level detector and automatically adjusts the output to the required level. If the lighting level on only one side of the room is enhanced by the sunlight, directional luminance meters, external or integral to the DLF, detect the imbalance and the controller dims only those SLS oriented to illuminate in the sunlight illuminated direction. This detailed spatial distribution intensity control is not possible with other lamp types.

The MSLS lifetime is long such that there is essentially no need for "lamp" replacement over the life of the DLF luminaire. However, power supply circuit and light source characteristics may vary over time and correct lamp color will deviate from the standard. A feedback control loop using sensors would recalibrate color based on daylight readings over the twenty-year lifetime of the fixture. Thus a photodiode with an RGB filter is calibrated under natural light conditions. Alternately, discrete wavelength or alternately stable "white", or color, LEDs which are used only for calibration or only operated in a regime where their color is known not to shift are used as the recalibration color standard. This basis serves the dimming system in its color temperature control over its lifetime. The controller is programmed over the lifetime to seek possible recalibration opportunities. These may include using daylight or other artificial light sources available when the LSLS is not producing light. The systems can determine the accuracy of this source partially by comparing it to its previous factory or onsite calibration. Time of day analysis and initial small deviations would allow the system to evaluate whether the source was a reliable standard to use over its lifetime to correct for component color shift.

To ensure higher reliability the MSLS in the preferred embodiment will make use of large-scale integrated circuit technology where the LED junctions, Zeners and other elements are interconnected on, a chip. The chips then mounted into plane surfaces which are flat, rounded or X-hedrons.

The MSLS lifetime is long such that there is essentially no need for "lamp" replacement over the life of the DLF. This requires that the designs of the other electronic components are similarly reliable. The fixture mechanical design is again a significant departure from prior art. The fixture is sealed for life. There are no openings, gaskets, and sockets and there is no need for a mechanism to open the luminaire. All the components can be encapsulated for life to prevent water and dust ingress and thus provide a reliable, maintenance free, weatherproof and hazardous location ready lighting fixture.

The small dimensions of the light sources makes them ideal for use in conjunction with fiber optic light transmission systems. One of the primary requirements of such systems is the ability to collect the generated light into the narrow fibers. The excellent controllability of the light beam and the small source size allows for the generation of high-power narrow non-dispersing beams as would be used in flashlight, searchlight and beacons.

Multiplexing of the lamps is possible for power and lighting effect considerations. Slower duty cycles will reduce energy consumption, increase lifetime and would be used in a number of applications. Aircraft warning beacons which flash is an application, as the on-off cycling of an LED is not harmful to lamp life as it is to an incandescent lamp. Disco lighting-effect lamps are another flashing application. Dimming as well as illumination color can be carried out with both the duty cycle and current being altered.

In summary, as opposed to LED industry trends of going with a single large source, the present invention provides multiple smaller sized sources of differing characteristics such that their combined effect is greater than that which could have been offered by sum of the individual parts operating separately. The added controllability offered by breaking the total light output up into discrete specifically aimable and dimmable elements, "digits", which can be addressed by control electronics to effect intensity, spectrum and distribution, yields a lighting fixture (vs. lamp) of unparalleled performance.

In order to better understand the embodiments and methods of this invention reference is now made to the following figures.

Fig. 1 is a block diagram of the elements which in combination provide a digital lighting fixture (DLF). The DLF serves as a complete luminaire solution including: power conditioning circuitry, control electronics, sensors, mechanical fixture and light source. The DLF replaces the lighting fixture, ballast, socket, lamp, dimmers, reflector, gaskets and fasteners with a sealed for life electronic assembly. An electric power source 1, supplies power at line Voltage 110 to 480V or at low Voltage 12-24 Volt to the DLF 2. The DLF includes more than one light source 3, which is

preferably an electroluminescent solid-state light source but may be any other light source, such as incandescent, high intensity discharge, fluorescent, etc such that the individual characteristics of each lamp's light are combined in operation to achieve a sum of the characteristics presenting a benefit not achievable from a single source alone. The light sources are affixed or contained within a mechanical device 4, which may serve as containment to all of the components and facilitates affixation to building surfaces. The electric power is received in the correct waveform, voltage and current from the power source 1, or is conditioned within the DLF 2, by power conditioning elements and circuitry 5. The direction of light exiting from the DLF as a whole or from each SLS individually is controllable by optical elements 6, such as reflective surfaces and or refractors, and may be electronically variable optical elements.

The separate light sources may be of the same color and intensity characteristic or may have different color and intensity characteristics. Thus for a 3-stage light bulb equivalent, each of three sources can have the same lumen rating or two sources are used where one is twice the output of the other. In a finely variable, digital embodiment the effect of continuous dimming effect is achieved when the differences in the lighting level is imperceptible to the people in the room. Typically a 5% change will not be perceived. Thus with twenty equivalent intensity LEDs as a base (one additional would add less than 5%), additional quanta could be smoothly added, or on the other hand, to in reality perform perceptible dimming (which is the objective) a greater than 5% change should be effected. The same is true for the final spectral color of the light emanating from the DLF to illuminate objects. The eye adds the radiation reaching the eye and cannot perceive the separate components, contrary to the ear's recognition of sounds where each frequency is individually resolved. Therefore, quanta of specific spectral color energy may be added to the mix without perception. For example changes up to 200 degrees Kelvin in HID lamps are not perceived. Thus to effect a noticeable color change, a quanta of spectral color power would need to be added or detracted from the sum.

In a preferred embodiment the DLF contains logic control electronics unit 7. Logic control electronics unit, 7, receives input and/or feedback from motion, intensity and/or spectral sensors 8, or from manual control button 9 and increases or decreases or turns on or shuts off the power to one or more of the SLS to effect the desired change. That is, the control logic unit 7 has stored parameters for intensity and spectral distribution and operates the MSLS lamp within the predefined range. The control unit may include a DSP or computer with storage media, computer algorithms, signal input and output electronics, analog to digital converters, and communications elements to carry out intensity, distribution, dimming and color balance control. Computer algorithms and instruction sets 7A are induced by the logical controller to manipulate data, calculate results generate output signals

and maintain the operating parameters within the specifications. Measured parameters are checked against the stored parameters and the control circuitry adjusts the power to SLS.

Sensors 8 include any of the following: light, temperature and motion detection devices. Two types of optical detection sensors may be used: A photo detector with specific spectral sensitivity to detect a specific color. For example a standard red, blue and green set which would then indicate how "white" the light is. Alternately, a wide spectrum photo detector that irrespective of color measures the intensity of each excited die as it is test fired, based on the eye visual sensitivity curve. The optical sensor may be lensed and capable of forming an image, that is a camera and the detector may be a detector array of photodiode pixels. The detector array may be a CMOS or CCD VSLI array and may be monochromatic or color as in a monochromatic or digital camera. Such arrays are readily available in mega-pixel resolution.

With changes in ambient lighting the light sensors detecting conditions at a specific location receive input. The detector instantaneously reads the ambient during a momentary shut off the artificial light source. The momentary shutoff is of short duration, e.g., less than one millisecond duration, at rates undetectable to the users as the eye does not discern flicker rates above 1/100th of a second. The controller then readjusts the driving circuitry to the correct power level. The sampling of multiple sensors around the DLF can be simultaneous using buffers in the controller to facilitate analysis by methods known in the art. Alternately, the light sources and coordinated detectors at specific locations are turned off, sampled, turned on again and sampled, to verify that the illumination is within recommended specifications. Interaction between DLFs, located in close proximity to each other, is avoided, by the use of the short-duration momentary shutoff controller readjusting time interval. The probability of simultaneous controller readjustment of two adjacent DLFs is very small. Further, the timer which controls the time between the controller readjusting time intervals, is preferably analog, such that there is very low probability of two DLFs having the same time between controller readjusting intervals.

In a system with feedback, changes in the light source output reflected back to the lamp such as color shift and diminishing flux over time can be compensated for. A typical fluorescent or HID source will experience serious color shift over its 10,000 to 20,000 hour lifetime. It would be a significant advantage to have a 100,000 hour life lamp with color accuracy over the complete lifetime of the lamp.

In a preferred embodiment a re-calibration system will operate as follows. The DLF is provided with a reflective rod or strip the surface of which has a wide spectrum, non-angle of incidence dependency and stable reflection characteristics over time. The reflective rod or strip is positionable

so that the rod or strip can reflect light back to the outward facing photodetector based on the DLF body. In another embodiment the DLF is provided with a calibration wand on which inward facing photodetectors are placed. The calibration wand is capable being positioned such that the detectors can detect SLS performance. Both the reflective rod/strip and calibration wand can be narrow such that they can be permanently deployed about the DLF and not block light. In another embodiment the rod, strip or wand is stored and is only deployed when calibration is required. When called upon, the rod, strip or wand is rotated around the DLF to read SLS intensities. Alternately, the DLF body rotates and the rod, strip or wand remains fixed. The DLF is originally calibrated in the factory using external detectors. The spectral output of each SLS is calibrated with the power supply controller over the range of power outputs and the characteristics are stored in a memory device for recall during operation. The calibration wand or reflective rod or strip is then used by the DLF in an internal calibration where the DLF detector's readings at the initial SLS power settings are recorded. These readings become the standard for future calibrations, where the controller will affect the power to individual junctions such that proper intensity and color is produced.

The DLF has a clock unit and/or a communication unit capable of receiving signals from the US government operated "atomic clock" which is located in Colorado. The DLF automatically searches for the signal or once a day it automatically recalibrates its time. On a periodic basis after degradation is assumed to be significant, the controller 7 invokes the calibration routine.

In another preferred embodiment the DLF surroundings are used for calibration in place of the calibration strip. A short time following installation, (after the furniture and decor has settled down), an onsite calibration is scheduled and run at the first opportunity. The purpose of this on-site calibration is to have the controller check the spectral characteristics of the illuminated area. A specific die on an SLS is fired on a timed basis and the controller reads the photo detector value. The new site-specific reading is then taken and compared to the original calibration and stored. The site-specific reading will serve as the base for the next calibration, as it is assumed to render the surroundings correctly based on still calibrated light sources. The next calibration may be scheduled for night and holidays to ensure a date when dark conditions prevail. If darkness cannot be ensured, the incremental shift in intensity above the ambient can be measured. Photo diode detectors of known field of view are placed on the DLF such that SLS output is detected. In lights out conditions of darkness the controller takes a base reading sample of a detector. The base reading allows the subtraction of "noise" from further readings. During the calibration the base reading may be repeated to ensure accuracy. Periodically, possibly every half a year, more or less depending on manufacturer data of how much the LEDs drift from their initial performance, a calibration routine is run. If a change in decor has been made, then the drastic change will signal the logic controller to ignore the latest reading and use the present "white" setting to recalibrate the new decor. Although

photodetectors are stable devices, over a 30 year DLF lifetime it may be necessary to calibrate the photodetectors as well. Absolute intensity readings can only be recalibrated against a laboratory standard. However, daylight may be used to recalibrate color sensitive photodetectors over the 20-year lifetime. At the post installation calibration session a day reading of photodetectors is performed and the readings analyzed for daylight sources. This is done using the clock where daylight will show a predicable spectral shift over the hours of the day. The controller will then compare the readouts of detectors over the day to identify those exposed to daylight. First during the day readings of the photodetectors are taken.

The detectors facing the daylight are assumed calibrated to read "white light. In darkness SLS units, SLS 1 in view of one calibrated daylight facing detector, detector 1 and one uncalibrated detector, detector 2, are powered to produce white light as determined by the calibrated detector. Now detector 2 is calibrated. Moving stepwise around the DLF the process is repeated with now calibrated detector 2 used to adjust SLS 2 located between detector 2 and not yet calibrated detector 3 to produce "white" light. SLS 2's output is then used to calibrate detector 3. The process continues around the DLF till other daylight-calibrated detectors are reached. For greater accuracy the process can then be performed in the other direction, moving stepwise until detector 1 is reached again. By using this nodal analysis method discrepancies propagated in the calibration process are reduced.

A power guide 10 can serve as both a power distribution and mechanical affixation device to the placement of additional DLF units 11 within an expanse. Light output 12 from one DLF may differ in distribution from another 13, if say one MSLS is in the center of a room and the other is at the edge or one light illuminates steps between the landings and another is the last step before the landing, the last step would be illuminated in a different color.

Since an LED device is operable over a wide range of currents, when an LED serves as the light source, dimming and color balance are smoothly and infinitesimally variable.

For the purpose of illustration, a preferred embodiment of the present invention is presented in Fig. 2B juxtaposed with a prior art solution using LEDs shown in Fig. 2A. A typical "bulb" shape with a screw in base is provided for retrofit locations where a socket is available. The prior art design depicts LEDs spread out on the surface of what looks like a reflector lamp. It is evident from the downward facing 5mm hole-thru type LEDs - 14 that no attempt has been made to extract a "batwing" or any other effective type of light distribution pattern. Upward facing LEDs - 15 seem intended for uplighting and again it is clear from the symmetry that no attempt has been made to provide a rectangular pattern which will give a better use of light for indirect lighting.

Fig 2B illustrates the teachings of the present invention. In this case, although packaged to appear as a typical "A" shaped light bulb, the device is actually a DLF and provides a complete lighting solution. Although shaped like a lamp with a screw base to facilitate replacement when the "lamp" burns out, this is not necessarily the intent. Rather, in the present concept, after 100,000 hours (over 30 years in typical use) it's time to refurbish the room and change the fixture. The outward design is thus generated by what people expect to purchase and not what a DLF, that is not a lamp should look like. A true DLF design would not include the ceiling mounted socket and would be provided with a wiring connector and accoutrements and fasteners for attachment directly to the ceiling.

A retrofit MSLS lamp or digital lighting fixture/luminaire 16 intended to replace the lamp, fixture, reflector or shade and control-gear combination of a typical lighting fixture, includes a screw base 17, which receives line power 18 into the electronic power conditioning circuitry 19. In a preferred embodiment, control circuitry 20 is provided in the lamp. The input to the control is from an external source or internal logic circuit or both and in a preferred embodiment a sensor pack 21 with one or more radiation and communication sensors capable of detecting motion, day/night, spectrum, luminance etc is provided. In external control, a control signal 22 rides on the power signal 18 and enters via the screw base 17 or an infrared or other radiation detector provided in 21 picks up the control signal. Discrete packaged light sources, e.g. Solid-state Light Source SLS 23 containing one or more junctions are mounted on the DLF lighting fixture body 24 and connected to the controlled power circuitry that determines which of the SLS 23 will operate and at what power. Each SLS with it spectral and distribution characteristic is mounted in a specific location on the surface of the DLF with an angle α , 25 from the nadir. Any angle from the nadir is possible including 180 degrees and the light flux can serve to provide uplight or illuminate a picture on a wall.

In a position oriented lamp arrangement, that is where the socket has a distinct stop point, detent or pin and is mounted substantially oriented to the room or its contents such as a work desk or wall painting, and also the DLF has a specific mounting orientation relative to the socket, then the light distribution can be nonsymmetrical and tailored to the needs of the room. The screw base 17 has a detent or pin 26 that coincides with the stop point on the socket, which is mounted in a specific location radially around the lamp at an angle β , 27 in reference to pin 26 and a design start point on the circumference of body 24. The SLS are placed at an angle β horizontally and vertically angled α to illuminate specific areas and also have their own spatial light distribution angle θ 1 28A. An SLS aimed to illuminate an interior area may have a wide distribution or a distribution without a sharp cutoff 28A while those SLS located at the edge of the area to be illuminated may be of narrow distribution θ 2 28B and have a sharp cutoff. This technique is similar to how a sport playing field is illuminated with multiple floodlights. Floodlights of narrow beam spreads such as a NEMA 2 are used to illuminate at the edge of the illuminated area while wider NEMA 4 beam spreads are used

near the center of the playing area. The MSLS lamp will have concentrations of SLS at specific aimings to provide a wide "flood" type distribution to one part of the room and a "spot" type distribution to another such as to a painting on the wall. Each illumination target is at a different light intensity and color temperature or color rendering.

In another embodiment SLS, which perform an equivalent to a task light function with a very narrow beam, are combined with SLS performing a general background lighting function in one fixture. While general lighting recommendations in an office call for the provision of 300 to 500 lux over the working plane, specific task lighting, for example where copy work is to be illuminated by auxiliary lighting, 1,000 lux is required. To this end a section 29, containing SLS on the DLF, provides a narrow beam of higher intensity, to provide added light flux to the working surface. In an alternate embodiment section 29 on the DLF is on a swivel and can be manually adjusted to be aimed at the worktable. In an alternate embodiment the swivel is positioned by a servomotor and controlled by a remote control unit. In an alternate embodiment to the fixed task light section 29, in an attempt to cut down on separate fixture types with left or right handed spot or other asymmetric orientations, the MSLS portion of the DLF body 24 is rotatable in relation to the affixing base 17. Such an embodiment also obviates the need for a position oriented socket and base pin 26.

In another embodiment, modulating the output of wide distribution and narrow distribution LEDs by the controller varies the net resultant beam spread characteristics. The fixture is placed near a workstation and gives a wide distribution general lighting as well as a narrow high intensity beam for increased illumination level task lighting on demand.

In order to assure an even distribution of light from a point source over an area, it is necessary to take the effects of the angle and distance to the illuminated surfaces into account as stated in the inverse square law. Often a "batwing" type of candlepower light distribution is used. In a prior art luminaries the reflector, which concentrates reflected rays in the higher angles, accomplishes this. In a preferred embodiment of the MSLS there are more, or more powerful, SLS over a range 1 aimed at higher angles to increase light flux at those angles in order to maintain an even light distribution. If the lamp is specifically oriented in relation to the room concentrating more light into the distant corners effects a squared distribution pattern, which would fill in the corners of a square room with equivalent illumination. An added amount of SLS are added on the DLF body 24 at 90 degree angles on β , 27 where SLS aimings will push added light into areas corresponding to the "corners". To effect uplight towards the ceiling or for indirect lighting SLS 23A are aimed towards the ceiling such that an optimal utilization of the light is achieved.

In the preferred embodiment color of light emanating from an SLS 23 is "white" light. This is accomplished by using a "white" light producing arrangement of LEDs that is comprised of two or more spectrally differentiated junctions, which then combine their light output such that the illuminating light appears white. Other white LED technologies use phosphor or other coatings over the junction which causes a shift to longer wavelengths. The separate junctions in an SLS or separate SLS may be independently controlled. In a multi-junction SLS the total color of the illumination may be shifted to "warm" or "cool" light in correct accordance with the illumination level (see Fig. 10) or other considerations. In another preferred embodiment, a motion detector is used to conserve energy. The room lamp is dimmable to a lighting level sufficient for safe orientation. A motion sensor 21 picks up activity and increases the illumination level to meet the activity level. This integral placement significantly reduces the wiring from sensor to power supply and again back to lamp in prior-art dimmer - motion sensor applications.

In alternate embodiment each SLS 23 may have a non-white color. The operation of many SLS in unison of different or similar wavelength may be used to create any color desired from white to monochrome in any specific region to be illuminated. A spectrum sensor 21 inputs data to controller 20, which maintains color at predefined level. Such a feedback mode allows for the MSLS to maintain constant color over the full lifetime of the lamp even if specific wavelength SLS shift output characteristics such as light flux and spectrum with age within bounds of the sensors calibration over age. Constant color is maintained in a room with an influx of a less desirable color temperature light on one side. Spectrum sensor 21 with a specific orientation would detect a "cool" light reflection emanating from a specific side of the lamp and will increase "warm" e.g. 2000K light to compensate. Over the long lifetime the DLF could recalibrate its spectral sensors 21 to white light based on readings of daylight where such daylight is available and the controller has determined that the room at the time of calibration is being illuminated with white light "daylight" of a specific color temperature per orientation and time of day.

The same light distribution effect based on light source aimings could have been accomplished as in the prior-art, easy to manufacture flat pc-board configuration by simply angling the LEDs 23B from the perpendicular as shown in Fig. 2C. Shown is a side view of a PCB provided with standard 5mm hole-through LEDs. The LEDs are produced with standoffs on the legs such that after soldering automatic machinery can bend the legs so that the LEDs project at the required angle from the nadir to achieve the required photometric pattern. Lead bending as is known in the art also allows for uplight as with LED 23C. Though not as elegant as DLF 16, this easy to manufacture configuration will accomplish much of the sought after light distribution.

Fig. 3A is an illustration of a prior art wall sconce for outdoor use displayed by a leading LED manufacture in at a lighting trade show in 2003. It is juxtaposed with Fig 3B to highlight the difference in the design methodology as taught buy this invention. The very aesthetic prior-art wall sconce fixture encased in a curved decorative frame is portrayed in top, front and side views. It uses a multiplicity LED light sources to shine through a diffuser to produce an even glow. "White" LEDs 31 were placed on a flat printed circuit board 32 and the light was dispersed via a white diffuser 33 with the light exiting lambertianally in all directions. The good optical control initially present on the LED 31 is now squandered on the prior-art diffuser in an attempt to prevent glare from the pinpoint LED source and produce a pleasant glow on the diffuser. Light is projected evenly in all directions including uselessly upward, where it will help drown out starlight. The prior art flat PCB and optional metal heat sink 32B facilitates manufacture and heat transfer and that is probably why the design is the way it is, with production feasibility considerations driving the design, rather than correct energy saving lighting principles.

Fig. 3B illustrates how the same improved lighting design process can be accomplished for an outdoor wall sconce DLF intended to illuminate a walkway at night. According to the teachings of this invention, the LEDs 31, power supply and other electrical components 34 are assembled on strips of semi-flexible printed circuit boards 35. The LEDs can be multi-colored or monochromatic LEDs with overlapping coverage or white LEDs. As illustrated in the top view of Fig. 3B, the LEDs 31 are mounted on a convex surface 35 such that some face to the left, some right and a smaller quantity towards the middle. The middle aimings require fewer light sources due to the inverse square and cosine law for a point source as is this DLF, where light at the angle of illumination of 0 degrees is more intense than for light at an angle greater than zero and a point closer to the DLF is more intense by the square of the distance in the denominator. The exact solution for the aimings is such that for a desired coverage and illumination level the illuminance equation 1 is used to calculate the necessary light intensity in candela at each aiming angle. The side view shows the LEDs 31A and 31B with varied downward angles, such that even illumination is produced on the walkway out to the prescribed distance from the wall. The PCB strips are optionally affixed onto a curved and angled aluminum heat sink 36 with electrically insulative but thermally conductive adhesive such as Dow Corning ® SE 4400 Thermally Conductive Adhesive.

The diffuser 37, is shown in the side section view to have white diffusing sections 38 and clear, fully transmissive slots 39. The controlled angular distribution light emanating from the LEDs 31 passes through the clear slots 39 and illuminated the walkway. The diffuser 37 is illuminated by stray light emanating beyond the controlled angle of the LED 31 or one or more LEDs can be dedicated to the task and aimed into the diffuser material, using it as a light guide to spread the light within the diffuser as is practiced in the art.

Fig 3B illustrates how the same end result as the prior art fixture Fig. 3A, of having a pleasantly illuminated diffuser can be accomplished while not compromising on the energy efficiency and correct lighting output of the luminaire. The fixture aesthetics can be maintained while a more physically compact design can be carried out. The components depicted in Fig. 3B are possibly more complex and thus initially more costly. However in a comparison of the life cycle cost per effective lux, which includes the electricity charges over the life of the fixture, the DLF is certainly superior to the prior-art.

The above design depicted in Fig. 3B is easily adapted to a hallway application where some light to the ceiling is beneficial. To provide up light a row of LEDs 31A is aimed towards the ceiling instead of downwards.

Fig. 4 illustrate additional embodiments of a DLF which may take on any shape be it disc shaped or linear depending on the aesthetic choice of the designer and the lighting application at hand. Thus, a preferred luminaire configuration for lighting an area from within, (using a number of lighting fixtures to prevent shadows) would be a concentrated point source design. To illuminate from the perimeter of the room or along a walkway, a linear configuration luminaire or many distributed point source luminaires are optimal. In Fig. 4 a disc shaped containment 40 would contain SLS 41 where again, the radial position of each SLS and the aiming is such as to yield a specified lighting pattern on the surfaces to be illuminated therefrom. A smooth light distribution is achieved by aiming relatively more SLS 42 in the direction of the more distant (or less perpendicular) surfaces or objects to be illuminated. One or more sensors such as motion, day/night, spectrum, luminance, are provided for in 43 or any other location as is required. A printed circuit board with power and control circuitry is provided for 44, as are screws 45 and or adhesive on the rear 46 for affixing to a surface. Electrical connection is made via a connector or sharp prongs to a conductor 47 which are pressed against the conductors to make electrical contact. The total assembly 48 with its light sources at specific positions and aimings, its power conditioning and control equipment and connection to power source, be it integral such as with on board batteries, or external from a power line constitutes a complete lighting fixture replacement element.

Based on the disc or puck shaped integrated luminaire above an application featuring a snap on Step Light 66 used outdoors is illustrated. One or more SLS 50 are contained in housing 51 which is substantially transparent in the area in front of the SLS. The SLS light source is very long lived therefore the unit is sealed watertight for life in the injection molding process or via glue. The SLS 50 are aimed so that the distribution pattern, at standard mounting height, effectively illuminates the steps. In one embodiment the luminaire is provided in two models each specific to a right side and

left side installation with opposite aimings in order to yield an even distribution along either the receding or proceeding stairs.

A two-conductor cable, which conducts power 52, is installed along a building surface or railing along the area to be illuminated. A bracket 53 is attached to the wall 64 on which the light puck is to be placed. The slot 54 atop the puck is inserted under the top clip 55 of bracket 53. The puck is hinged down and the bottom pivoted, catch lever 56 enters within the void of bottom clip 57. The screw 58, which can be a tamperproof screw to prevent removal by vandals, is tightened forcing the protruding leg of top-heavy catch lever 56 to fill the void in the bottom clip 57 of bracket 53 and lock the light puck in place. At the time of tightening screw 58 pushes contact block 59 with conductive piercing prong 60 against power cable 52. Conductive prong 60 pieces outer insulation layer 61 of power cable 52 and makes contact with electrical conductor 62. Further tightening of the screw 58 forces the prong on the opposite contact block 63 to pierce through the insulating layer and make electrical contact. A power cable 52 conducting current at low voltage, say 24 Volt, may be directly affixed to the wall 64 without enclosure in a conduit, and the light puck attached at points along the power cable. A bracket or clip 53 is used to affix the lighting puck fixture to the wall and has an opening 65 for the contact blocks 59 and 63 to fit through. The fixture 66 may be sealed for life during manufacture since there are no serviceable parts inside for the lifetime of the electronic components.

Other applications include stairwell lighting that is activated by motion detector or is always on due to the low power consumption or a combination of constant low level on state, with the increase to full power based on activity. Distributed along a power strip running along the stairwell are disc shaped DLF units such as luminaire 66. A motion detector 67 in the first and last units between the floor landings is used to turn on the lamps ahead of the person using the stairs. An outdoor solar energy step light application will use a photocell or any other arrangement to turn the system on at night and a motion detector to turn the lights on for a short duration after motion is detected thus reducing the amount of energy needed to be collected in solar cells. Instead of being in a totally off state, the lighting can be partially on, such that it is visible in order to give definition to the landscape and help in orientation. This power usage is very low since even at very low current LEDs are visible at night. Upon being initiated by the motion detector it can go to full power to illuminate obstacles in the path.

Last Step or first step could be indicated by a different color of light. A motion detector could accordingly change the MSLS output color if the individual is approaching the steps say to green and to amber or red when reaching the last step.

Fig. 5 illustrates another DLF embodiment, a linear lighting fixture 70 where the similar or different SLS 71 and 72 are distributed along the area to be illuminated such as is typical with fluorescent lighting fixtures used in soffit lighting. The system may have a power conducting strip of a similar shape 73 which connects to lighting strip 70 via receptacle 74 and pin 75 set and which are attached to conductor set 76. The two strip types, the lighting fixture strip and the power conducting strip may be adjoined together or affixed directly to the wall or attached to bracket 77 which may slide into a slot 78 in 70 and 73 and where there may also be provided matching cutouts in the lighting fixture and bracket. The matching cutouts 79 allow for a quicker, straight on insertion before sliding horizontally in the slot 78. The bracket is thus first attached to the wall and the strips are brought up to the bracket and moved sideways to latch.

Many lengths of strips 70 or 73 up to the power capacity of the conductors can be joined together and connected to a power source with a connector 80. Interchangeable sections of the power strip can contain LEDs of different colors for effects or alternate between power strips and lighting strips for a similar aesthetic architectural design.

The lighting/power strip may be thin and linear substantially in one or two planes or for aesthetic considerations have curves or be constructed of a flexible material and have the ability to be manipulated into curves and bends in three planes, to make such designs as an arc, wave or circle. The electrical conductors may provide the malleability to shape the strip and then hold the configuration after it is bent up, for example if they are made of copper or aluminum or alternately an additional bendable, yet shape-retaining material may be inserted in the casing 81 or the casing material itself may have such properties.

The Lighting strip 70 and Power strip 73 may also conduct light and radiate light to give a lighting effect all along its length. Alternately, the strips may be a light conductor with little light exitance from the surface and the total internal reflection is selectively frustrated to let light out along the length in a specific direction or at desired intervals. The strip lighting may come from SLS specifically aimed to project light into the strip or from light leakage from regularly placed optimally (per the main lighting application) aimed LEDs.

Another embodiment of a solid-state lighting fixture, DLF or luminaire is shown in Fig. 6. Whereas previously described luminaires were described as incorporating LEDs in standard hole-through or SMD packages, here, a luminaire using the unpackaged solid-state light source junction is described. A multifaceted luminaire 90 is comprised of any of the following list including a mechanical affixing method to a surface 91, an electrical connection to an outside power source 92, a mechanical frame 93 to hold the one or more light sources 98 or lighting facets 94. Power conditioning, heat rejection

and control elements are contained on or within the interior of the structure 93. A number of light sources, facet or many facets are placed in position radially around the lamp and angled vertically to effect the desired light distribution. Thus while facet 94 is positioned in the frame 93 radially and angled so as to be aimed substantially downward to the left of the fixture position, facet 95 is positioned and angled to illuminate an area further out and to the right.

A detail of a lighting chip or facet is shown in front view 96 and side view 97. In the first embodiment P/N junctions 98 of light emitting semiconductor material are placed on a thermal conducting and or light-reflecting surface 99. Electrical connection 100 is made between the junctions often referred to in the industry as dies, such that different color junctions may be located in close proximity to each other and their combined light spectrum yielding the desired color. The power and control circuitry have access to each individual die, a cluster of dies or to a total facet. This allows for the dimming and color temperature adjustment of the illumination. To more tightly control the light intensity distribution the surface 101 beneath the light-emitting junction is formed concave to reflect and concentrate the radiation into a narrow beam. Alternately, or if additional optical control is needed, the top layer of the junction 102, if it is light transmitting, is formed to act as a lens such as a Fresnel lens or a surface 103 above the die serves as a lens.

The level of miniaturization is irrelevant. The principal is the method of powering and controlling the light source intensity directionality and color spectrum in one integral unit by varying power signal to specifically positioned light sources of specific spectral power distribution. Device 90 contains for this purpose any or all of the following: unit 104 for effecting the power conditioning of electric current supplied to the light emitting elements, a control unit 105 to vary power to specific junctions or chips and sensor units 106 to provide input and feedback to the control elements as described earlier in devices 2 and 14. The earlier described DLFs of Figs 1 through 5 are also designable using the facet light source building blocks.

In an LED, light is produced at the p-n junction of the diode. It is known that one of the major losses of light output from solid-state lamps is the absorption of light within the epitaxial layer of the chip. On a submicron level, other inefficiencies derive from defects caused by the lattice mismatch. Often LEDs are producing light at a quantum efficiency of approximately 5 percent. Depending on the chemistry and the junction molecular geometry a specific thickness of light emitting layer is required. Also the width of the junction is important as light is absorbed in the interior.

Light extraction from AlGaInN-based LEDs is limited by the various parasitic optical loss mechanisms present within or surrounding the AlGaInN epitaxial layers. These mechanisms include absorption at the semi-transparent metallic layer as well as absorption within many layers comprising

the epitaxial portion of the LED, such as the buffer layer the active region and the heavily Mg-doped GaN contact layer. Because of the refractive index step between the multi-layered epitaxial structure (n=2.4) and the sapphire substrate (n=1.77) or the encapsulation epoxy layer (n=1.5), only approximately 25% of the light generated within the active region escapes into the epoxy or the substrate upon first encountering these interfaces. The rest of the light is trapped in a waveguide formed by the encapsulation epoxy layer above the chip and the substrate. The trapped light must travel distances on the order of the length of the chip to escape from the sides of the LED. Such distances require many passes through the various loss mechanisms within the LED structure, increasing the probability of absorption. Thus, much of this trapped light is eventually lost, decreasing the overall light output of the LED.

The LED is designed to allow the light produced to escape through an end face. However not all of the light is able to escape a diode in air because a portion is totally internally reflected at the interface between the diode and surrounding air. Due to the very high refractive index of most semiconductor materials, the portion of the light totally internally reflected is very large.

Therefore contrary to the present trend in high flux LED design of building very large, high current diodes, it would be advantageous to build a multitude of very small diodes with relatively large surface areas relative to volume and lessen these losses.

The layout of the facet in Fig. 6 is applicable to a submicron-sized dice 102 with nano wires 107 and other subminiature connectors 108 bringing power to the junction. To prevent absorption of light by the neighboring junction the cusped reflective structure 101of the lower surface surrounds the lower hemisphere of the junction.

The reflector as mentioned earlier for the dice on the micron level may be similar to the one described in "Semiconductor light emitter" United States Patent 5,537,433 by Watanabe, where a semiconductor light emitter, such as the light-emitting diode or the semiconductor laser, having a structure in which a light emitting area or an active layer; a transparent layer which is pervious to light radiated from the light emitting area or the active layer; and an opaque layer or an opaque substrate which is impervious to the radiated light are arranged in order or in the inverse order. The semiconductor light emitter includes (a) total reflection layer(s) arranged between the transparent layer(s) and the opaque layer(s) so as to come into contact with the transparent layer. The refractive index of the total reflection layer is smaller than that of the transparent layer. Therefore, at least one part of the light, which has been radiated from the light emitting area or the active layer and which has been reflected by the total reflection layer thereafter, is either radiated outward from side surfaces of the transparent layer or returned to the active layer.

To carry away heat from the electronic components, a hollow center 109 will act as a thermal chimney and components are mounted on heat sinks. In compact applications, a fan or pump 110 is used in forced circulation cooling. In alternate preferred embodiment, a highly optically transmissive cooling fluid, 111 surround the chips, junctions or facets 94. The fluid absorbs waste heat and circulates to a radiator area 112 on the body 93 where the heat can be transferred to the surroundings. The circulation can be natural thermo-siphon circulation, based on the density differences or forced, utilizing a pump 110. An added benefit can be derived from the optical coupling of the fluid between the junctions 98 or facets 94 and the cover 103. At an air plastic or glass interface typically 4% of the light is reflected back. With two such interfaces the loss will be 8%. The cooling fluid is selected such as to have a refractive index that it is close to the plastic, ceramic or glass used in the cover 103 and this loss mechanism is eliminated boosting efficiency.

Fig. 7 is an illustration of a typical application using the digital lamps as proposed in the present invention. A digital lighting fixture such as the puck shaped illuminating unit 66 of Fig. 4 described above shown here as 120 and 121 would be used to illuminate steps 122 by being affixed to the wall 123 or onto or within a railing 124. A pedestrian 125 using the stairs would not be blinded by stray light reaching his or her eye's since the highly controlled light beams of the SLS 50 in Fig. 4 are aimed downward and have a sharp cut off of light distribution at an angle such that even a pedestrian coming from below and looking up the steps would not see the light source (except from a great distance on long stairways where the light intensity is weakened by the distance and does not glare). A right handed and left handed fixture design would further prevent any blinding light by always illuminating the stairs with SLS aimed toward the nadir or at angles from the nadir in the upward direction of the stairs up to 70 degree angle 126 and by having the fixtures mounted below the eye height of short adults 125 or children who walk stairs at night. A low voltage transformer 127 located within or by the outlet box or at any other power supply juncture can supply power, free from the danger of causing electric shock. A motion detector 128 could be a separate device or as propounded in this invention, be an integral part of the fixture and could cause the fixture to change color and illuminate in amber, red or green to signal the approach of the last or first step.

In a solar energy powered application, the motion detector would turn the DLFs on or alternately increase power. To conserve energy, when there is no foot traffic, it would operate in a low power mode where it is visible and gives a general outline of the terrain to warn of approaching steps. When motion is detected it would switch to a mode where it actually illuminates the steps for correct foot placement to prevent mishaps.

In another embodiment the railing 124 is an aluminum or steel extrusion 129 specially constructed to accept the lighting fixture 130 and formed with brackets 131 to carry the conductors which supply electric power. The railing is actually a combined railing lighting fixture and carries out the both functions including providing elements for the power distribution. Grooves along the extrusion accept mounting brackets 132 that facilitate attachment to the wall or upright post 133 and also have a locking mechanism such as fastener 134. It is to be understood that any other shape or material of railing, fixture and combinations of bracket and extrusions can carry out the similar function of a combined railing -lighting fixture device.

In another embodiment the railing is a standard railing profile 135 available in the industry and the digital lighting fixture is shaped in an arced or banana shape 136 or has a bracket shaped to facilitate its merging with the railing. An insulated electrical conducting element, 137 runs along the railing to provide power to the fixtures at intervals along its length.

Fig. 8 illustrates the use of the linear packaged digital lighting fixture 70 as described earlier in Fig. 5, here shown as 140 in a step 141 or stairwell lighting application. The power and lighting need to be distributed substantially linear at constant distance 142 of the light source from the stairs to be illuminated and the correct light distribution for the task is designed into the SLS and or digital lighting fixture from ground up. The angle 143 of light distribution from the SLS is such that it takes the mounting height 142, step 141 width 144 and required illumination level into account. The lighting fixture may attach to the wall 145 or onto the handrail 146. The person's 147 presence is detectable by a motion detector 148 as he nears the last step 149 and indication by a change in color or frequency can be signaled by a segment of the lighting fixture. Alternately or in addition to, in order to save power as with a solar energy installation, the detector may cause a change in the power supplied to the DLFs.

Fig. 9 depicts a DLF 160 which can be used in pathway lighting where upon being installed at the correct orientation the SLS 161 are aimed in a controlled wide distribution 162 (but yet not in the wasteful, present-day practice of 360 degrees), such that they illuminate a section 163 along a walkway 164 of standard width 165 with equal light distribution and there is no stray light upward or to the rear. A marker, 166 situated on the fixture 160, aids in orienting the fixture perpendicular to the path. Alternately, shrubbery 167 can be illuminated with another grouping of upward aimed SLS 168 with a more spotlight like distribution alternately of another color spectrum which may illuminate the green growth in a more aesthetic light. The group 167 may be mounted on a swivel base 169 so that it can be aimed independently of the path lighting SLS aimings. A dedicated shrubbery illuminating DLF configuration is another alternative. A stake 170 is used to install the DLF in the ground at the correct orientation and may be provided with an electrical connection box

to hook up to power through piecing quick connectors as is known in the art. Alternately the DLF can be self-sufficient with an onboard power source consisting of solar cell 171 and batteries. As described in previous devices, in more embellished embodiments, onboard control logic circuitry and sensors are employed to control intensity, color spectrum and on/off switching. A motion detector 172 can control the transition from a standby mode to full operation.

Fig. 10 is a graph of the preferred parameters for lighting color temperature at different illuminance levels. It is adapted from the IES Lighting Handbook 8th edition 1993 and illustrates the Kruithof effect. It is used here as a sample of one of the recommended lighting procedure templates used by controlling logic circuitry on a DLF to keep lighting parameters such as color temperature, color rendering properties, illuminance levels and distribution in optimal bounds. Other control parameters such as switching on and off and color change used to signal critical circumstances are examples of look up, truth tables and media storage data that can be provided to a controller.

Shown in Fig. 11 is a revisited step light which incorporates the chip technology introduced in Fig. 6 into the step light application which has been used to demonstrate the general method of digital luminaire design as espoused by the present patent. The intent is to illustrate the advantages of the placement of the junctions on a facet configuration over the discrete component approach in the previously described step light design of Fig. 4. The significant feature that stands out is the size reduction. Many junctions are packed in a facet and the facets are cast in epoxy at the correct position and angle to properly illuminate the steps. Again the entire lighting fixture function is carried out in this properly shaped button-like device which yields the correct light distribution. A button shaped step light 170 is shown on the bottom side of the railing section 171. A power cable 172 single wire (it can be a single conductor with the railing serving as the other conductor) supplies AC or DC power, which for safety considerations can be low voltage. The power, sensor and control circuitry package 173 makes contact 174 with the power cable 172 and distributes power to the light generating discrete LED or multiple-packaged facet elements 175. The light facets 175 are strategically located on the relevant geometric surface of 170 such that their aimings contribute to the illumination 176 of the steps from the preferred direction and at even intensities. While facet 175 is contributing light at higher angles on the receding step surfaces facet 177 is illuminating 178, the close face of the upward step 179. In manufacturing such a luminaire the components must all be wired together and then positioned in their proper locations at the exact angles. This can be done with automatic machinery while the components are in the flat. Each component is placed by automated pick-and-place machinery in a hollow where it is temporarily set and where the wiring is attached as well. The hollow is actually a computer positionable setting and all the hollows are moved with the components in situ into the molding positions. An epoxy like spray is used to temporarily lay up the components until the final encapsulation into the final "button" shaped

lighting fixture. This is a general lay-up method and applies to subassemblies as well, which can later be brought together before final encapsulation. Conductors that require subsequent electrical connection are mechanically or chemically covered during the spraying process.

In another preferred embodiment shown in Fig. 12 the DLF is an Adaptive Digital Lighting Fixture. As opposed to a DLF described earlier, is not pre-designed with light source aimings based on a pre-known application. Instead the DLF is equipped with a plethora of light sources ready for most of the conceivable lighting tasks in the illuminated area. The light sources are then controlled such as to adapt the lighting to the room construction and the lighting tasks at hand. The same technique applies to outdoor area lighting applications. This universal DLF is the preferred design when the cost of having an overabundance of light sources is low enough such that other economic considerations such as minimizing stocking units in inventory, repeated changing of the room tenants etc will be more expensive. It is similar to purchasing a 100-Watt lamp where a 40W lamp would suffice and always operating it on 60% dimming. The capacity is there but it is unwise to use it since electricity is costly.

The adaptive or intelligent DLF 190 shown in Fig. 12 has multiple light sources 191 placed about the body 192 having a geometric shape. The shape, which influences the spatial light distribution, may be of a fixed or flexible design. In a flexible design, solenoids, servo motors, actuators, pumps, controlled fluid or air pressure devices 193 are used to realign surfaces, moveable plates or expandable tubes or cylinders 194 to morph the topology of the fixture. The ADLF is equipped with an electronic power supply, computer control and communications unit 195. One or more light sensors 196 are placed strategically to detect necessary inputs. Alternately one or more digital cameras 197 with a photodetector array which is equipped with a lens which can be a 360 degree lens or a fisheye lens is placed with a field of view of the area to be illuminated. The geometric shape of the body 192 is such that an asymmetric lighting pattern is produced for the provision of a non-circular lighting pattern in a typically rectangular room. Because more light needs to be directed to the far corners of the room, more surface area for projecting SLSs at that position is required. If multiple fixtures are used in a large room then squared lighting patterns will obviate the need for overlapping coverage as with circular distribution luminaires or the prior art. Concave section 198 increases the ADLF surface area available for light source mounting at the room corner orientations. In bottom view 199, a section of the body 192 is shown with asymmetric surface cut out 198 which increases the available surface area on the ADLF.

Spatially differentiated motion detectors 200 are provided on the Adaptive Digital Lighting Fixture along with the light sources 191 and light sensors 196. Typically motion detectors have been associated with lighting in motel rooms to shut off the lighting if there is no activity. There is another

level of control that can include matching the lighting to type and amount of activity. On sport fields for example, 200 lux may be used general sport activities, 1,000 lux for night practice sessions while 3,000 lux is used in a televised game. Taken to the extreme, one or more limited field-of-view motion detectors 200, or camera 197, can be used to follow the whereabouts of room occupants. The DLF controller acts to provide heightened lightning to the occupants" present locations. The controller has stored look-up-tables, instruction sets and algorithms which it uses to processes the information communicated from the sensors or a camera and in response control the light provided to the illuminated area.

A special or standard remote control unit 201 can be used to operate and program the ADLF. In one embodiment the control 201 is equipped with a laser pointer and/or light sensor 202 that is used to assist in providing positional an angular data on the location of work surfaces, room structures and dimensions. The control 201can then pass on information concerning the visual task performed at that specific location. This data now enables the controller195 to use stored algorithms, look-up-table templates to calculate and program the correct lighting intensities and spectrum for that room location as explained earlier in the block diagram as functionality 7 and computer processes 7A.The photometer on the remote control 201 held at the specific location will then corroborate the illumination and spectral performance of the ADLF with the specific light source aiming being programmed at the particular instant. The communication can be optical in the visual or infrared wavelength or wireless. An antenna 203 is provided for wireless communication. The adaptive DLF is thus manually capable of being programmed with all the input parameters necessary for a computer program 7A as is practiced in the art of lighting design, to determine the correct intensities and spectrum to carry out the visual tasks at a specific room location. This is a unique property for a single luminaire. Lighting designers are usually forced to compromise and provide the entire room or area with the highest common denominator of lighting in the room. With the ADLF non-glaring, spectrally correct lighting at minimum intensities is provided and this affords significant energy savings. The added daylight and activity related dimming functions are another significant energy savings factor with its ensuing economic and environmental benefits.

A calibration system is provided in the form of calibration element 204 constructed such that it has coverage of the light source radiation on the ADLF body 192. The calibration element 204 is a reflective rod or strip the surface of which 205 has a wide spectrum, non-angle of incidence dependency and stable reflection characteristics over time. The reflectance of 205 is known at each wavelength and it serves as the standard reflector for the calibration routine. The reflective rod or strip is moveable so that it can reflect light back to the outward facing photodetector 196 based on the ADLF body 192. To test SLS performance the calibration element 204 is rotated about the body 192 by actuator or motor 206. When the reflecting surface 205 is opposite a column of SLSs 191, the controller times the firing of each independently addressable SLS 191 location and acquires detector

196 intensity readings uniquely for each SLS. The results of the test firing are analyzed in controller 195 which has the functionality described in Fig.1 of components 7 and software 7A. Correction is made to the junction power supply parameters in order to maintain metametrically balanced outputs for white light and overall lumen production. The controller 195 re-powers the SLS 191again using the updated power supply instruction set and retests for accuracy. The process continues until the SLS performance is repeatable at different power levels. In another embodiment the ADLF is provided with a calibration wand 204 on which inward facing photodetectors 207 are placed. The calibration wand is capable being positioned such that the detectors 207 can detect SLS 191 performance as the wand 204 is rotated about the body 192 and SLS 191 are independently tested as describe in the previous embodiment. Both the reflective rod/strip and calibration wand 204 are narrow such that when not in use, rod/strip/wand 204 is parked at a specific position where it does not block light sources 191. In another embodiment the rod, strip or wand is stored and is only deployed when calibration is required. When called upon, the deployed rod, strip or wand 204 is rotated around the DLF body 192 to read SLS 191 intensities. Alternately, the DLF body 192 rotates and the rod, strip or wand 204 remains fixed.

An ADLF 190 outfitted with computer calculation, communication, calibration and other feature may be costly, such that using a number of units to illuminate a room is impractical. Correct lighting practice encourages the use of multiple point light sources to illuminate an area using a number of criteria. A single fixture cannot cover an area larger than glare and mounting height considerations allow. There is a limit on the maximum angle of light provision. Another consideration has to do with the production of shadows. Finally due to the cosine law there is a practical maximum angle at which the lighting can be delivered. At large angles the lighting effect becomes negligible. Therefore, due to all the above considerations it is advantageous to have multiple lighting fixtures in a room. A single ADLF 190 is used in a large room. The ADLF is designed to be used with one or more satellite reflectors 220 which are strategically positioned about the room. The satellite has provision for being attached to a supporting structure such as a ceiling or light pole and being fixed with a certain orientation in relation to the ADLF 190 and the working surfaces below. The satellite's inward facing surface is a highly efficient specular, semi-specular or diffuse reflector or combinations thereof. A part of the surface 221 is provided with a full spectrum, white reflector which may be a spot or a band across the top bottom or middle or all combinations thereof used in calibrating the intensity and or spectrum photodetectors and/or light sources over the lifetime of the DLF. A part of the surface may be a special reflector 221 such as a retroreflector which will serve as a ray targeting aid useful in the installation process of the satellites. The targeting can be manual using a red laser pointer or automatic using the detectors 196 on the ADLF 190 and the retroreflector 221 on the satellite 220. A section 222 of light sources, which may be high power light sources, is dedicated to provide sufficient light to the other areas of the room or for specific task lighting

applications such as to computer terminals which require lighting at small angles from the nadir. The section 222 may be on a swivel so as to be aimable at the satellite 220. Section 222 projects light 223 at the satellite reflector 220. In use, the satellite is installed substantially over the work area to intercept rays 223 from 222 so as to provide task-lighting 224. The specular reflector 220 is positioned and angled such that it concentrates and re-directs the light rays 224 downward onto an area or worktable. The downward directed light coming at very small angles will illuminate the worktable 225 but will not cause veiling glare reflections on the computer screen 226. To provide general lighting to room extremities, the satellite reflector is specular, semispecular or diffuse and has a surface geometry for reflecting the incident light 223 so that it spreads the light evenly over the area to be illuminated.

In place of the manual programming technique for ADLF 190, a semi-automatic self-programming process using luminance measurement via detectors 196 is provided. The camera 197 has a view of the room its contents and occupants. Pattern recognition techniques known in the art are used to identify room occupants, furniture, office equipment such as computers etc, room structures such as walls and windows.

The intelligent lighting fixture system 190 is adaptive to the room structure, usage and occupants on a dynamic basis. In one embodiment a hand held laser pointer and sensor on the remote control 201 is used to assist in providing positional an angular data on the work surfaces and room structure enabling the controller to corroborate program lighting for the location with the specific light source aiming being programmed at the particular instant. The room occupants also use the remote control 201 at any instant to input lighting preferences or call up stored lighting scenarios to the DLF 190. Thus the controller 195 or a controller 195 which communicates with a PC computer is provided with an interactive program which based on application look up tables will determine recommended light intensity and spectrum for the application at hand. Procedures useful in the lighting design process, lookup tables and specific application guidelines can be found in the IES Lighting Handbook 8th edition pages 447 - 903. A number of commercially available programs are available which prescribe lighting based on the application and calculate the illuminance based on the fixture. In this invention the procedure is reversed in that the recommendations are first used to generate the illuminance on or luminance from the room surfaces. The computer program 7A is used to calculate the light intensities required at each angle in order to produce the desired illuminance or luminance results. Luminance in cd/m 2 is the reflection of the light flux lumen/m 2 from a surface having a reflectance property and is more similar to what the eye sees. The algorithms are processed onboard the ADLF 190 or run on a PC which communicates with the ADLF. Computer programming for lighting calculations and correct lighting practice recommendations is known in the prior art. Commercial programs using procedures based on IES, ILDA and other standards and professional

lighting engineering and design organizations are available. Lumen Micro ® and Simply Lighting ® from Lighting Technologies Inc are examples of such programs which provide tools to create and simulate lighting layouts for both indoor and outdoor applications. Simply Lighting ® is a suite of Windows ® -based lighting analysis tools that are designed to answer the questions you need answered using a step-driven application targeted at a specific lighting application. Lighting Analysts, Inc AGI32 ® is a program used to predict lighting system performance for any application from one to hundreds of luminaires, interior or exterior. Users can build environments for most any electric lighting application with unlimited luminaires, calculation points, and reflective or transmissive surfaces including day lighting effects. The program used in this invention is an adaptation of a state of the art lighting programs. It is capable of receiving data inputs automatically or manually interpreting them according to correct lighting practice and calculating the candlepower distribution from the illuminance back to the luminaire. A post processor and outputs the operational instructions to the controller 195 for the application at hand.

The operation of the system is demonstrated in home use but the method is the same for office, store and industrial applications. The input program 7A is user friendly including the use of icons representing pieces of furniture, e.g. table, lounge chair, equipment such as TV, computer etc, and visual tasks being performed such as reading, and watching TV. The homeowner moves about the room with the remote control 201. At a specific location the homeowner enters the furniture type, possible occupant postures, sitting reclining, standing etc, and visual tasks to be performed. The room and its surfaces is defined the by being positioned at a wall, entering into 201 that it is a wall at that position and at another position entering that it is a window. The control unit 201 is optionally outfitted with a photometer 202 which can be used to read the surface reflectance of the wall and transmit the data to the lighting program 7A. This is the same process a lighting designer uses to enter data to the lighting analysis programs. The lighting program as known in the art then specifies the correct lighting levels, aimings and spectrum for the different locations and uses throughout the room. This is reversing the typical design process as described earlier where the lighting fixtures performance is simulated on a computer and the results calculated. Here, the required illuminance results are known first and the fixture is then programmed to make them happen. The controller 195 uses its stored performance characteristics to determine the power supply to the SLS so that it provides the required intensities and obtain the required illuminance. The lighting calculations and programming of the power supply 195 of the light sources 191 is preferably performed in real time such that the sensor 202 detects the illuminance to corroborate the performance while the homeowner is still at the location. If the lighting is not to specification then the controller 195 readjusts the parameters so as to bring them in line. This trial and error process continues until the readings are within tolerance. The process is best carried out in the dark or when there is non-varying daylight. Alternately, the photometric reading sensors are on the luminaire and they are used to

corroborate performance. Alternately, the process is automatic using feedback from the surroundings and pattern recognition to determine surroundings and applications.

Providing correct lighting for the various activities a homeowner in a room involves the use of numerous lighting regimes. Typically he or she would move about the room performing various activities with diverse lighting requirements. First, moving from the table where work was performed on the computer to a lounge chair to read the paper and finally moving to the sofa for a little relaxation watching TV. In prior-art practice, several lighting fixtures of different design are used to carry out the different tasks. In order to conserve energy each one would have to be turned on and off or dimmed as the resident moves about the room. A glare-shielded luminaire would be used for correct illumination in the computer task, while a floor lamp may provide lighting for reading on the lounge chair. General lighting from an overhead luminaire is sufficient for TV viewing. According to the present invention, as the room occupant moves about the room performing varied tasks, the motion detector 200 or camera 197 picks up the new location and from its stored templates which correlate location to lighting application, controller 195 provides the correct lighting regime.

According to the teachings of the present disclosure, the room lighting needs are provided by one or more DLFs or ADLFs including satellites or combinations thereof placed such that they are capable of providing lighting at the correct non-glaring angles for the lighting tasks at hand. The ADLFs are programmed as to the whereabouts of furniture, computer monitors, TVs etc as described above. The ADLFs and DLF can communicate with each other and an ADLF can control a DLF and vise versa so that level lighting is accomplished in the room. Two or more DLFs can share in the illumination requirements of a location located between them. The DLF turns off its illumination towards a specific location, reads the ambient luminance and then correctly powers the SLS to provide the additional illumination. An oscillating "singing" feedback network incapable of settling is prevented by the provision of inexact timing. The DLF lighting assessment process occurs on a periodic basis as the controller surveys its numerous detectors and SLS, the complete cycle taking a number of seconds. The same process is occurring in the neighboring DLFs. A clock on the DSP controls the process. The DSP is programmed to randomly nudge the clock timing by a number of a multiple of milliseconds typical of the survey process from cycle to cycle. The similar timed assessment process with an independently random shift in timing occurs on the adjacent DLFs. Thus the chance of seesaw interaction between DLFs is insignificant. Alternately, communication between neighboring DLFs can also be used to synchronize the process and prevent feedback oscillations.

The novel lighting-application oriented approach to light-source construction, as taught by this invention impacts on the method involved with marketing the DLFs. Rather than speaking of a wattage for a lamp or lighting fixture, now with DLF technology, the area covered is the determining

factor, somewhat like the coverage area of a can of paint printed on the container. The customer needs only to specify the room area and what the lighting is used for in order to select the correct luminaire. In today's prior-art process of selecting by lumen or wattage, there is an additional step, that of taking the effective lumen output and dividing it by the area of the room. Instead, a DLF is packaged and marked according to the area it will cover (when mounted at the designed for), mounting height (usually standard for most residential ceilings) and the lux it will provide or the visual tasks for which it is suited. Thus a homeowner in a store will be queried by the sales staff or be presented with instructional promotional media which allows for the determination of the room dimensions, type of room and typical activities carried out therein. The lists printed on the cartons for the various DLFs will include location types and task types. Location possibilities for consumer lighting include corridors, kitchens, bathrooms, bedrooms, play areas, garages, driveways, backyard, playing fields, steps, workrooms etc. Task possibilities which would generally be a subdivision in a location type will include reading, dining, TV viewing, exercise, sport etc. A single DLF may be suitable for more than one location and task type and be so marked. Thus typical DLFs would come in bathroom, kitchen, garage, bedroom, hallway, and etc models. The bedroom model comes in a 12ft. by 12 ft. Coverage and is also the TV room model etc. An ADLF is suitable for many more locations and applications and is so marked.

Industrial and commercial lighting DLFs are similarly marked and marketed. Mounting height determines the maximum area covered according to correct lighting practice principles and adds another variant less prevalent in the consumer market. The many DLF models will not exceed the plethora of prior art luminaire designs, as they are also based on mounting height and lighting application. While prior art luminaires rely on large reflector and every variant requires new investment in tooling, in a DLF a basic carcass will support many MSLS configurations with their particular amount of SLSs and their aimings.

In non-color critical applications for example in low lighting used for orientation a further energy saving can be obtained. LED junctions are made of different materials. The blue, green, and white illuminators utilize InGaN LEDs and the amber and red utilize AlInGaP for the junction material. Some materials are more efficient at converting electrical energy to visible light than others. As an example, (in terms only relevant at the time of this writing since the efficiencies are increasing daily), while a green LED which has the advantage of high photopic eye sensitivity to its wavelength, is producing only 30 lumen per watt, a super flux red LED can produce over 50 lumen per watt. Thus, when color rendering is not important in the lighting application at hand it is possible to shift the workload onto the more efficient LEDs. This of course must also take the eye sensitivity at the specific lighting intensity into account. While a purely scotopic rod eye response at extremely low light levels, less than .01 lux gives added sensitivity to the 510 nano-meter green blue, photopic

vision at levels above 100 lux is most sensitive to the greenish yellow 555 nm wavelength. In most illuminated cases low lighting would not be below 5 to 10 lux where the sensitivity peak is around the 550 nm yellowish green. Thus two factors are used by 7 in 7A to calculate the most efficient light color of the DLF; the LED radiation power per watt multiplied by the eye sensitivity curve for the present illuminance value. In a less rigorous embodiment, if the par between the LED efficiencies is large such as in the example above, then the red LED is used combined in ratios with other wavelengths, such that the color still found acceptable by the users.

In a preferred embodiment, using pattern recognition techniques the ADLF 190 is semi or fully automatic in programming itself to correctly function where installed. The DLFs or ADLFs will adapt to the seating arrangement of room occupants in real time. In the preferred embodiment, the addition of a machine vision system with pattern recognition capabilities as is known in the art, easily deduces room occupancy and usage. The camera 197 including a wide angle or fisheye lens camera is mounted on the DLF or ADLF. In an alternate embodiment, one or more cameras in communication with the lighting system controller, has coverage of all, or part of the area to be illuminated. The camera may also serve as an illuminance and spectral measuring device as the individual detectors in the array, for example as on a CCD or CMOS array, may be read for their individual stimulus. The detector array pixels are calibrated to the room coordinates. The calibration routine can be manual or automatic. A manual method includes walking a controller around the room and programming in the coordinate to the camera system or alternately using a PC CAD program to input room coordinates overlaid on the image obtained from the camera such that the lighting system coordinates and the camera coordinates are the same. An automatic routine as in 7A uses timed firing of a coordinate-specific light source, or array of light sources and the following reading of the camera detector of light reflected to that specific coordinates pixel, or set of pixels to corroborate action between light sources and the detectors. The detector pixels 197can then be used to obtain images of the room which the controller 195 can assess as furniture, equipment or occupants. Pattern recognition methods known in the art, including neural networks, can provide a generalized stored application library of usages to the controller or the controller is an artificial intelligence controller and can learn the actual room usage with time. Outputs from the CCD arrays are analyzed by appropriate computational means employing trained pattern recognition technologies, to classify, identify or locate the contents. These techniques known in the art are covered in texts such as: Schalkhoff, Pattern Recognition, statistical, structural and neural approaches, John Wiley and Sons, New York, 1992 and Neural Networks for Pattern Recognition by Christopher M. Bishop, Chris Bishop, Oxford University Press; (January 1996) included herein by reference. Thus, the controller with or without human intervention will program the ADLF lighting system to carry out lighting within the realm of correct lighting practice. This includes providing the correct illumination in real-time based on occupant whereabouts, activity being performed and outside factors such as sunlight

contribution, time of day factors etc. Advanced robotic vision techniques including object segmentation and selective-attention modeling (Itti, Visual attention and target detection in cluttered natural scenes in Optical Engineering, Vol. 40 No. 9, September 2001 included herein by reference) will aid in identifying various room objects and the lighting program 7A will associate with their location the visual tasks and recommended lighting characteristics. In case if the machine settings are not acceptable to the users, provision is made for human intervention. Through the data input device 201 a user, the ultimate "sensor" corrects or customizes the lighting arrangement and reprograms the controller.

In a further ADLF intelligent lighting system improvement over prior-art practice, machine vision is used to control surrounding luminance. A prime example is an office application where a computer Visual Display Terminal is in use. This is an application where the quality of the localized task lighting is important. Contrast plays a major role in seeing and glare plays a role in producing veiling reflections as causing fatigue. The correct illuminating solution involves the control of surrounding luminances. A prior art workstation design will include partition, carpet, ceiling and desk surface reflectance which reduce the luminance in the workers field of view. Using the ADLFs ability to recognize the computer screen chair, desk and surrounding floor and ceiling, the illuminance in lux on each element is varied to obtain the optimal luminance. That now allows any color scheme to be used by the interior designer on the work cell decor. The ADLF will control the luminance by varying the spatial light intensity distribution over the different surfaces.

In another embodiment using the camera 197, the controller 195 is instructed to identify and track a roving speaker during a video presentation. A signaling device is used by the speaker to allow the pattern recognition program to initially lock-on and recognize a target attribute as is known in the art of object tracking. The signaling device can be a laser light pointer 202 aimed at the camera or a hand held remote control 201 in communication with the camera vision system. The controller 195, based on the camera input runs the pattern recognition routines, derives the coordinates and generates instructions to drive the specific light sources with aimings which will project light at the speaker as the speaker move about the room. It is to be understood that in a theater lighting application there is no need for a preprogrammed moving light using motors to change position. Instead a fixed DLF or ADLF with multiple light sources powers the necessary light sources to illuminate the performer as he or she moves about the stage. This actually is similar to the banks of shuttered lights used in present day stage lighting. Only now the digital aspect of discrete multiple light sources allowing for a smooth transition of aimings with instantaneous control of almost infinite variation of spectrum and intensity is accomplished. The controller, once locked-on to the performer using images from the camera 197, will now follow the performer around the stage illuminating instantaneously in the intensities and spectrum as preprogrammed in the choreographic

setup or in correspondence to the music or some other characteristic as in known in stage lighting practice.

An emerging problem with LED light sources is that with the increase in light conversion efficiency the LEDs are becoming ever brighter and for their small size present uncomfortable sources of glare. These high intensity light sources would have to be used with diffusers which would impair the light control characteristic. One solution is to construct the DLF large enough such that the area over which the light flux emanates is sufficiently large that the luminance in candela per square meter will not exceed allowed luminous exitance values or glare limits. In this solution of increasing the luminaire area over which the light emanates, the number of light sources at specific location may not be sufficient to provide the continuum of light distributions and spectral combinations necessary to carry out correct lighting practice as per the teachings of this invention. Another way of looking at the problem is, that with added lumen output, a few high performance LEDs could provide the illumination for a room but due to even distribution and spectrum consideration many discreet SLS are required. That is, the SLS needed for the smooth continuum, digital aspect of the invention exceeds the number required for the maximum light flux.

In a preferred embodiment the DLF or ADLF is rotated about an axis such that the time any source in the glare causing zone is exposed to an observers eye is such that it is not observed as glaring and the time the source is out of view is below the flicker rate for that intensity level. HID and fluorescent lamps operated on 50Hz have a 100 Hz flicker rate and are not considered to flicker. For aesthetic, aerodynamic and dynamic balance reasons the DLF can appear as the globe shape 190 of Fig. 12. However, the now reduced dimension DLF is spun rapidly on its axis 227 by motor 206. The LEDs can be concentrated in an arc from top to bottom along the surface 192 or be located in the concave arc section 198. The concentration of SLS in this section is sufficient to offer a large number of spectral combinations at any aiming. Two arcs of SLS 191 opposite each other for balance or one arc with counterweight can be used. With one arc a 6,000 RPM rotation rate is used to prevent flicker and with two at 3000 rpm rate. In an alternate embodiment instead of a complete globe just an arc section such as 198 runs from top to bottom. The arc is on an axis and is motorized so it rotates rapidly on its axis. The speed of rotation is such that the light source does not appear to flicker. This way a compact unit can be made since the apparent brightness is reduced. This process is possible because the eye is an integrator of light over time and persistence of vision minimizes flicker. The LEDs 191 disposed along the surface are timed to fire in the correct intensity according to the instantaneous position. The timed operation is coordinated with room location. Thus, when the spinning light sources 191are facing a corner more intense light at higher angles is projected so the far corner is illuminated equally to the areas near the DLF. The positionally correlated timed firings of the rotating DLF will illuminate as need per location per usage requirements in real time. The side

of the room near the window receiving ambient daylight will receive less illumination than the opposing darker side. This is also possible because the controller electronic 195 operates much more rapidly than the mechanical motion and that the rise time of the SLS is extremely fast measured in single digit microseconds. In a preferred embodiment, the globe or arc can be placed in an outer jacket which is partially evacuated of gas. The globe or arc is then rotated in a partial vacuum envelope to reduce air friction losses.

In Figs. 13A through 13C a streetlight fixture designed according to the teachings of this invention is shown. The design and functionality distinction as compared to prior-art streetlights is derived from the multi-light source, digital design. In Fig 13A the aesthetically designed DLF streetlight 240 is shown in a front view. The geometric shape is a derivation of the surface geometry for mounting the SLS perpendicularly thereon to obtain photometric light distribution compatible with the requirements of the street lighting application. These photometric distributions are expressed in terms of luminaire cutoff angle which refers to the angle beyond which rays capable of producing glare are prevented from exiting the fixture. Another type of classification used by the IES, refers to the elongation of the light pattern along the road in terms of Long, Medium and Short and another categorization, perpendicular to the roadway called "Type", describing the distance in units of mounting height (where the fixture is mounted), that is illuminated. The novel design includes SLS with over 100,000 hour lifetime allowing for the fixture to be factory sealed for life. This obviates the need for cleaning reflectors, as all the exterior surfaces are cleanable by rain and there are no light sources at the sharp bottom drip point where dirt normally accumulates. The compact design 240 shown mounted on a pole 241 in side view Fig 13B has a small exposure area, reducing wind induced drag force loads on the pole. This low wind factor and low weight of the electronic components allows for the use of a less expensive pole. The pole arm 242 fits into slipfitter 243 which is provided to perform the mechanical fixing means of the DLF 240. Fig. 13C is a side section view through the center of the fixture. The electrical power and communications connection is made to a connector block 244 mounted such that it accessible for the external wiring of the fixture during installation. The grid power is connected to power supply 245 and the data to the controller DSP 246. A dedicated communications line is used or the data is sent over the power line using communications protocols as known in the industry and the DLF communicate with each other or with a central control. The SLS aimings are shown in front view Fig. 13A where the SLS aimings to the right 247 and left 248 along the roadway show how an even distribution pattern out to the maximum design distance from the pole center is obtained. This distance is a function of the fixture mounting height and cutoff angle. Hole-through SLS units have been drawn to illustrate the point but the principle the design is valid for SMD, SMT, the chip 94 design of Fig, 6 as well as other package arrangements known in the art. Many more SLS 249 are concentrated at the larger angles 250 to illuminate out to the extremes of the area covered by the DLF. Fewer SLS 251 are needed at the

small angles near the pole to maintain with equal illumination. The SLS at the cutoff angle 250 have a tightly controlled beam spread 252 to maintain a sharp cutoff, minimize glare and eliminate spill light. The SLS 253 in the interior have a wider beam spread 254. The DLF 240 projects light in a highly controlled pattern perpendicular to the roadway as well SLS 255 as seen in the side sectional view Fig. 13C are aimed such that the cutoff angle 256 is out to the road width with or without the shoulders as designed. In applications where illumination for a sidewalk is required, "house side" illumination is provided by inward SLS aimings 257. On a dual carriageway road where the illumination provided is limited to a single carriageway, the lighting from the roadway fixture need not be symmetric about the nadir along the roadway. While approaching the streetlight, glare is to be avoided and the cut-off angles must be small for light aimed at the advancing vehicles. However, after passing the streetlight, the lighting in the direction of travel may be provided at increased beam angle from nadir and still not cause glare. This would significantly increase pole spacing saving cost and eliminating hazardous poles.

In all stages of the SLS positioning and aiming design process which works in reverse of the normal process by engineering from the illumination required on the working surface back to the light source. Glare ratings for the design are checked to make sure they are within the acceptable limits. If the light source concentration is such that drivers or pedestrians in normal eye viewing conditions would experience glare then the luminous exitance is lowered by design changes in the geometry or light source attributes. The ramifications of a dynamic and exact light control are numerous in a street light luminaire. First there is no spill light and no light trespass. If the position of a luminaire is such that light is shining into a house the individual SLS at that aiming is not powered by the control 246. All the light power is placed where needed in the designed for illumination intensity, neither in deficit nor excess. While prior art luminaire show 80% of the light falling in the area designed to be illuminated, the DLF will have a near 100% utilization factor.

When artificial intelligence methods known in the art is combined with the fine control and functional flexibility of the DLF additional advantages are realized. A detector or camera 258 in concert with a logic controller 246 is capable of providing the road lighting needs to a driver or group of drivers in according to the time of day, needs of the roadway layout and usage at any moment. The detector 258 will provide signal to the controller 246 of the ambient lighting conditions. When daylight is no longer sufficient for viewing such as at dusk the DLF will add lighting. At dawn the process is reversed. In an alternate embodiment the roadway lighting can be dimmed if there are no approaching vehicles. The detector or camera 258 is capable of detecting oncoming and retreating traffic. The headlights and backlights are used or more sophisticated pattern recognition is used to determine traffic on the roadway. When there is no traffic the luminaire will illuminate at a fraction of the power used to generate the 5 or 10 lux used in street lighting. Taken to

the extreme the controllability of the DLFs or series of communicating DLF street lights allows for the lighting to precede the vehicle by the stopping distance, say 300 ft. at 65MPH (91 meters), and dim the unused lighting behind the driver if it is not necessary for other drivers. In the late hours of the night when traffic is low this function can save significant amount of energy. A typical 250W HPS streetlight will consume over 25,000Kwh in its 20 yr lifetime. On moonlit nights the dimming of the DLF can be greater as moonlight provides up 0.10 lux. The dimming of SLS actually improves their lighting efficiency and prolongs lifetime. Dimming of HID sources has a negative return, typically 10% light at 50% power. The color spectrum of the light is also varied in the DLF to match the intensity levels. Here an additional efficiency boost is achieved when the added scotopic eye sensitivity to 510 nm bluish white similar to the pale moonlight is taken into account.

It has been shown that certain colors of light i.e. of different spectral power distribution (SPD) are perceived to be more glaring than others in night driving. Studies of drivers (Flannagan, M. J., (1999). Subjective and objective aspects of headlamp glare: Effects of size and spectral power distribution, Report No. UMTRI-99 -36). Ann Arbor: The University of Michigan Transportation Research Institute.) indicate that blue-white color has been found to cause more glare discomfort than yellow light. On the other hand, studies have shown that driver night vision is better under the blue-white spectral power distribution. Recent laboratory studies have also shown, for example, off-axis detection peripheral detection can be better for bluish, metal halide lamps than for yellowish, high pressure sodium lamps at the same photopically specified light level (Bullough, J. and Rea, M. S. 2000. Simulated driving performance and peripheral detection at mesopic light levels, Lighting Research and Technology, 32 (4), 194-198). In the DLF streetlight luminaire it is possible to use the blue-white SPD to illuminate most of the roadway yet increase the cutoff angle, which is determined by glare considerations, by using yellow-white SPD light at the large angles which throw the light further along the road. The higher angle lighting provides more vertical lumens and is actually more effective at illuminating objects along the roadway. The increased visibility afforded by the added vertical lumens at high angles offsets the decrease in visibility due to the yellow-white SPD. This means that the overall visibility over the roadway sections is constant. Thus, SLS near the angle 250 would have a yellow-white non-glaring SPD while interior SLS such as 253 would have the superior blue-white SPD. The higher the cutoff angle, the fewer luminaires that are required to illuminate a roadway. The same differentiation would be possible with SLSs 255 in the side view of which some illuminate the sidewalk 257, some the right lane and others the left lane. The SPD of the SLSs at the high glare causing angles 250 facing the oncoming driver aimed to cover the near lane would be yellowish while those SLS covering the same lane but now to the rear of the receding driver, will still be of bluish-white SPD. The opposite is true for the far lane. The SPD of the SLS aimed 257 at covering the sidewalk would again be in the blue-white to aid in peripheral vision detection of pedestrians or objects approaching the roadway from the side.

As with all correct lighting practice the visual surroundings at any instant in time determine the amount of illumination required to carry out visual tasks including the luminance of background surfaces. Roadway luminance as detailed in the IES Handbook pages 751-779, is the preferred factor used in specifying required illumination levels. Freshly paved blacktop with its diffuse reflection will change over time to a mostly specular reflection. The higher luminance value pavement requires less illumination to see objects. This characteristic changes over time with wear and periodic road maintenance and illumination levels need to vary accordingly. A detection by 258 of this road luminance will provide the controller will the data necessary to set the required illumination. Roadway activity is another factor in determining illumination levels. This factor often changes over days of the week or seasons of the year. An adaptive DLF with detectors 258 and computer devices 246 capable of recording this traffic activity will provide the correct illumination for the traffic situation at hand.

Though the design of a streetlight has been detailed the same design process is valid for floodlights and other outdoor lighting applications. The use of the SLS of specific spatial candlepower distributions at particular aimings, the use of tighter beams at the edges of coverage, the non-glare design and the optional use of logical control are as applicable to DLF floodlight design as to the street light design.

Fig. 14 is a flow chart which illustrates the general design concept which allows anyone to build a multi-light source lighting fixture from the ground up, tailor made to the final application. This process differs fundamentally from prior art lighting fixture design. Rather than building a fixture around a common lamp and then coercing the usually isotropically radiating lamp to perform in a certain application, the lighting application is used to describe the light source construction. The light source construction is unique in that its flux density is spatially differentiated over its volume in concert with its final orientation when in use. The light source design then defines the supportive power, control and mechanical elements. These elements are then integrated into a single unit with shared components and packaging. The method for designing an application oriented luminaire designed according to correct lighting practice, providing the correct light intensity, spectrum, and spatial distribution of intensity and spectrum, suited to the specific lighting application, would comprise a number of steps some of which can be left out of the process while others may be added including a) determining the lighting application, and the recommended lighting practices for the application b) determining the luminaire mounting height, illumination area covered and surrounding conditions typical of the application c) determining candlepower required to effect the required illumination over the area d) selecting SLS types capable of producing required intensities and spectrum at highest conversion efficiencies at lowest economic cost e) determining SLS beam

spreads f)determining SLS aimings for the required distribution pattern g) determining electronics to control and power SLS h) determining lighting fixture surface geometry and size i)testing whether the glare rating for the viewing angle is acceptable j) if the glare rating is not acceptable, then changing SLS beam spread, fixture geometries, or size, resulting in an acceptable glare rating; and, h)when the glare rating is acceptable, then designing the luminaire aesthetics for the application.

The digital lighting concept is extended to transportation vehicle applications. A headlamp for an automobile uses multiple light sources based on electro luminescence of semiconductor junctions. The proposed unique approach is to combine the lighting engineering function i.e. the correct light distribution, color spectrum and level necessary for the visual task at hand into the lamp such that the digital lamp obviates the need for additional light controls and fixtures. The digital electronic lamp utilizes 1/3 the energy and has over 100,000 hours lifetime versus 2000 for an automotive incandescent lamp and can be rapidly switched on and off without deleteriously affecting lifetime. (Quite the opposite, off time is not part of the lifetime). The multiple light-source, digital device, is an electronic headlight which provides the driver with the correct aiming, illumination level and distribution (e.g. parking lights, low beam, high beam, lighting around curves and corners) based on input from the vehicle's speed, steering wheel position, turn signal indicator and detection of approaching headlights. These functions are carried out automatically however; the standard manual override controls are still maintained.

Headlamp glare is addressed in two alternate ways. European regulators recognize the danger presented by excessive headlamp glare, and so European cars with HID lamps must have dynamic headlamp leveling. On-the-fly headlamp vertical aim adjustment has been required by European directives for quite some time now, but dashboard dial control of the vertical aim is no longer acceptable. Recent European regulations require that the headlamp leveling of HID-equipped cars be linked to the suspension system of the car so the lamps don't glare as much to oncoming traffic when the rear of the car is loaded-down or the car is heading up a small hill. The digital headlamp solves this problem by automatically sensing the angle of the headlamp assembly and will employ in real time only the properly aimed light sources to illuminate so as not to glare oncoming traffic.

An alternate method of glare control is accomplished by rapidly switching on and off the headlamp light output or only the high beam portion thereof at such a rate that flicker is not observed by the driver. This persistence of vision is the same effect on which motion picture viewing operates using shutters to intermittently block the light while the frame changes. On the oncoming vehicle, a variable light transmitting element, an electronic shutter, located in the driver's field of view is rapidly switched to a blocking state synchronized in time with the on state of the oncoming car's

headlamp. The situation is vise versa for the driver in the other vehicle such that in the instant one driver is seeing the other is not.

The Spectral Power Distribution, SPD, of the headlamp is also variable as a function of the area being illuminated. Studies by Flannagan cited earlier, have shown a preference by drivers for yellow tinted headlights on oncoming vehicles. The drivers find the yellowish colored light of an incandescent less glaring vs. the bluish "white" light of an HID Metal Halide lamp. On the other hand recent studies by Bullough, cited earlier, on driver's peripheral night vision show the clear benefits of HID MH headlamps in detecting pedestrians and objects along the side of the road. Thus an ideal solution is to have the SPD in that part of the beam visible to oncoming drivers be of the less glaring yellowish type while the beams headed everywhere else would be of the blue-white SPD for increased driver visibility. In fog or snow the color spectrum would also be adjusted so as to maximize visibility. Yellow colored lights are used in fog and snow conditions to prevent flashback. Thus according to the teachings of this invention the DLF headlamps serve as the fog-lamps. The digital headlamp will automatically or manually be adjusted to the optimal intensity and SPD lighting parameters for the environmental conditions at hand.

Present advances in automobile lighting include Adaptive Frontal-lighting Systems which aid in seeing around curves and other features in the road. In these systems the light distribution pattern and color spectrum will be changed according to the instantaneous road conditions at hand. Thus, the headlamp now has much more flexibility than the high beam / low beam variation of today. At any instant in time the intensity, spectrum and beam pattern of the headlamp may be varied as a function of the drivers intent, lay of the road and environmental factors. A GPS system on the car may also let the headlamps system know of curves up ahead, one way traffic and others factors such the headlamp may be operated in the optimal mode at that instantaneous location. With sensors sensitive to environmental surroundings such as ambient light, fog or snow conditions etc. lighting can be adapted to the optimal operating regime.

Additional features include an optional concentrated flashlight type of beam to illuminate distant overhead and roadside signs, which due to the narrow directed beam will not blind oncoming traffic. Image recognition via a camera will allow the beam to follow the retroreflective sign as the vehicle moves or the signs will be provided with a special marker for this purpose. In this way the headlamp cutoff above horizontal except for the concentrated sign beam can be total.

Fig. 15 illustrates a preferred embodiment of a digital automotive headlamp. A headlamp is a specialty lighting application unrivaled in terms of the need for controllability and is especially suitable to the methods and devices described in this disclosure. The headlamp fixture is unique in

the continuum of beam patterns, intensities and color spectrum. The number of possible control modes are: 1. Parking Lights. 2. Low Beam lights; 3. High Beam; 4. Cornering Lights; 5. Load leveling adjustment; 6. Integral turn signal indicator, 7. Programmable alternate beam spread selection so that one headlamp fulfills the different sets of legal regulations for the high and low beam in different regions of the world such as the U.S.A., Japan and Europe; 8. Driver preferential color; 9. Oncoming vehicle or vehicle-ahead driver's preferred color 10. Color of ambulances extra headlamp provides red flashes to be more easily picked up in rear view mirror; and 11. Non-Glaring pulsed headlamps.

Input data to the controller would first and foremost be in the control of the driver and would consist of an overriding manual selector switch. Otherwise headlamp control is automatic, from turning on automatically when ambient lighting levels fall to such a level where it is advantageous to have headlamps on, either to aid in illuminating the way ahead or facilitate being seen by others, to automatic dimming of high beam due to detection of oncoming vehicles and shut off when ambient lighting levels are sufficient. A possible control system for such purposes is described in United States Patent 6,281,632 by Stam, et-al from August 28, 2001 titled: A Continuously variable headlamp control incorporated herein by reference. The patent describes how continuously variable headlamps offer greater flexibility for roadway illumination but offer challenges in automatic control design. Each continuously variable headlamp has an effective illumination range varied by changing at least one parameter from a set including horizontal direction aimed, vertical direction aimed, and intensity emitted. Stam discloses a system for automatically controlling continuously variable headlamps on a controlled vehicle includes an imaging system capable of determining lateral and elevational locations of headlamps from oncoming vehicles and tail lamps from leading vehicles.

Using a control system such as that above, many driver functions are automated. With the digital headlamp, automatic control of headlight beam is a function of speed of travel, that is: when vehicle is in Park the parking lights are on, when speed is low the lamp beam is aimed sufficiently forward to give ample reaction to brake for objects in the vehicle's path per the speed it is traveling up to the intensity, angle and thus distance which is the upper legal limit for the beam. If there is no oncoming traffic then it operates as the high beam. If there is oncoming traffic then it acts as the regular low beam.

Additional features can include an optional very narrow flashlight type of beam. Present day LEDs come in very narrow aimings such as two half angle 8 degrees which may not be narrow enough (a 10 meter spread for 150 meters down the road which may be sufficiently aimed to the right) but with need, smaller angles are also feasible. Such a beam at the correct narrow aiming can continue to illuminate far ahead (in high beam) without blinding oncoming traffic. Analysis by a detector or an

imaging system of the oncoming vehicles position (using its headlights for example) can be used to determine which exact aiming is the maximum allowable for any given traffic situation and road layout.

Using color and pattern recognition techniques it is possible to determine what is a sign. It is then possible to provide the equivalent of "task lighting" and use the controller and properly aimed SLS to follow and illuminate distant overhead and roadside signs for a longer time, yet not blind oncoming traffic due to the narrow beam.

Wavelength specific SLSs in the infrared or near Ultra Violet spectrum, not visible to the driver by the unaided eye are used for communication between vehicles and roadway controllers or toll booths. Infrared SLS will provide radiation to be reflected from objects for night vision cameras. UV SLS are used for or illuminating UV fluorescent dyes in clothing bicycles and baby carriages to increase pedestrian visibility as is known in the art.

In fig. 16 a headlamp 270 of a land, sea or air vehicle 271 is shown in front view 272, side view of a section 273 and top view of a section 274. A discreet SLS light source such as an LED 275 with specific location within the cluster276 has a specific spatial light distribution, color wavelength and aiming relative to the vehicle, such as straight ahead, and or downwards and or off towards the right or left. The SLS may have one junction and be monochromatic or have a many junctions and provide a wide spectral power distribution and the power to the SLS may be varied. An SLS can also be a "white" LED. For example a typical "white" LED such as a Luxeon ® white LED such as LXHL-XXXX will have a colder "bluish" 4,500K color temperature. LED 277 at a second location within the same cluster may have a similar or dissimilar aiming, wavelength and spatial light distribution. The concept cluster shown by the dashed lines, is used to describe a control function and is not necessarily related to contiguous placement. In general a cluster may be deemed a separate grouping due to a function it performs, either exclusively or in conjunction with other clusters or sub-clusters, such as high beam function versus a second cluster 278 which may provide a parking light function. The same SLS may be used, albeit at different intensities, for both the above functions and thus clusters may overlap and be discontinuous. As two LEDs may be of different wavelengths, operating in unison at different power levels will yield a variable light "color". A possible combination of two or more LEDs such as a blue, 470 nanometer and an amber 590, nanometer wavelength LED would yield a "white" light similar to the yellow tint of sunrise at the correct power intensity setting for each lamp. Coincidently aimed LEDs 275 and 277, at the correct output intensity of each LED, with more power in the amber will accomplish this. Thus when following another vehicle, assuming, as drivers have reported, that they find yellow incandescent colored headlamps less offending than the HID blue-white color, the external controller 279 which receives traffic data from sensors 280 would

shift wavelength specific radiant power contributions of SLSs such that the resultant on the CIE chromacity diagram would be yellowish. If however there is no car immediately ahead or oncoming traffic, then assuming as drivers reported they see further with bluish light, then the energy of the 490 nanometer LED is increased and the resultant color will shift to bluish white, allowing the driver to better ascertain road conditions further up ahead. The LEDs, their packages, wavelength and light source type are mentioned by way of example and it is clear that any other types of discreet light sources, such as the chip 95 of Fig. 6, with differing aimings wavelengths and distributions could be used to accomplish the same functions.

To further illustrate the innovative DLF headlamp device, a cluster 281 would be used to illuminate around a corner. Thus when the turn indicator has been selected or the steering wheel has been rotated by the driver, the DLF headlamp is powered by the controller to illuminate sideways at angles which according to the speed of travel is correct. (A driver can't make a 90-degree turn traveling 90 kph but from a stop, the turn may be around a corner.) In a preferred embodiment a multitude of LEDs in 281 are differently aimed in top view 274 showing the top view of the cluster 282 with SLS 283 angled less outwards and SLS 284 angled more outward with the forward aiming (distance ahead of the vehicle) of the more angled SLS 284, closer in for illuminating sharp turn, than that of the less angled SLS 283 for a shallow curve. Side sectional view 273 shows a general downward aiming with SLSs of front view 272 cluster 285 corresponding to cluster 286 shown from the side. The cluster 286 is the most angled downward such as for a slow driving as in a parking light type of application where the idea is not to cause glare yet be seen. The parking light function can also be done with higher angled LEDs by just lowering the intensity to very low non-glaring intensities. Cluster 287 of the front view would be the main illuminating workhorse and is shown in side view 273 as angled SLSs in cluster 288 and top view 274 as cluster 289. The top cluster 276 shown in side view 273, as 290 would perform alone or in tandem with part of 287 the high beam lighting function.

Many more degrees of flexibility are possible with the digital headlamp by varying the timing of the LED operation. For example, more intense illumination of red LEDs for a fraction of time would give the effect of flashing ambulance lights if required by the type of vehicle and could be effected by programming alone without the need for a different type of headlamp greatly reducing the different types of headlights that need to be installed on a vehicle or maintained in inventory. That is the same MSLS light engine device could be placed in different aesthetic packages by different manufacturers and could provide different functions. In one embodiment the digital headlamp carries out all the functions in a single unit 270. SLSs have different locations and aimings 291 and 292 to carry out the functions. In another embodiment 293 the spotlight sign illuminating function or corner lighting function is in a separate package 294 with its aiming 295. The low and high beam lighting is

accomplished with fixture 296 and its general aiming 297. The separate units may be dictated by design or sales considerations and yield more flexibility but are within the scope of the overall integral digital lamp headlight device. The controller 279 will addresses the power supply of each DLF headlamp 270, 296 and 294 independently such that each lamp performs its functions separately.

In another embodiment Fig. 16 the digital headlights 300 and 301 on vehicle 302 are also part of an anti-glare system operating between two or more vehicles 303. The system is designed to prevent discomfort and disability glare from oncoming headlights or glaring headlights viewed in the rear view or side mirrors. The anti-headlight-glare system works based on the "persistence of vision" of the human eye-brain system and is accomplished by the synchronization of the illuminating and light attenuating or blocking devices which intermittently enable the driver to see the night scene ahead but not the counter-timed glare of oncoming vehicles. The elimination of blinding glare will increase traffic safety, as a driver may lose vision may for a number of seconds following a glare event. It will also prevent driver fatigue caused by glaring headlights. Another of the advantages of the anti-glare system is that it increases the distance that a driver can see at night by allowing the use of more powerful headlamps aimed at higher angles, thus illuminating more of the road ahead while not blinding oncoming traffic. The anti-glare system consists of pulsed headlamps 304 and 305 on the oncoming vehicle 303 and a synchronized on/off switched light filtering or blocking element 306A in between the driver's eyes 307 and the glare sources 304 and 305. The light attenuating element is normally highly transmissive of light i.e., see-through. When energized, the light-attenuating element turns non-transmissive and attenuates or totally blocks the glare intensity. The attenuating element is similar in operation to the fast acting automatic darkening welding helmets commercially available, only here the off switching is also very rapid. The glare, or light-attenuating element may be the windshield, a part of the windshield be a specific element located on or within the windshield 306A and 308A or on a visor located in front of the driver shown in 306B and 308B. The light attenuating device 306A or 306B is synchronized with the oncoming headlight such that when low-beam or even high beam, glare causing headlamps 300 and 301 of vehicle "one"302 is "on" the light attenuating device 308A or 308B on vehicle "two"303 is toggled into a mode which reduces or totally blocks the light beams. Conversely, in the next instant, when the headlamps 304 and 305 of vehicle "two"303 is "on", that is, in the glare causing mode, the light attenuating device 306 on vehicle "one" 302 is switched into a mode, which reduces or totally blocks the light beams. The light-attenuating device 306A or 306B consists of an LCD, ferroelectric, SPD, electrochromic or any other medium that can be switched between substantially light transmitting to substantially light blocking in the form of a screen, visor or film. It may be placed on the windshield from without or within, in between the glass layers of the windshield safety glass 306A or positioned anywhere in between the drivers eyes and windshield 306B including being worn as eye glasses. A motorcyclist would have it installed in the

visor of the helmet or on a windscreen. The speed of vision is slow relative to electronic pulsation and depending on the illumination level persistence of vision will fuse on/off levels into a constant flicker free level. Motion pictures operate at 24 frames per second. For scotopic nighttime levels 10 HZ is sufficiently flicker free while at high levels of illumination 60 Hz is required. Totally flicker-free operation is assured at 120Hz operation even for peripheral vision which is more sensitive to movement.

LEDs are excellent light sources for a pulsed lamp since they are not damaged by on/off cycling (actually off-time adds to the overall lifetime) as are the prior-art incandescent and other cathode based lamps. Rise time to full output is on the order of microseconds, much faster than necessary. The pulsed SLS is operated at a higher power during the on-time of the duty cycle to offset for the off-time in order to produce the required illumination. This is typical of normal LED operation which may be run in DC mode or pulsed, AC operation. Actually, HID lamps cycle on/off at twice the line frequency and the eye integrates the light intensity over time. However, it should be understood that incandescent or any other lamp switchable within the constraints of the flicker free visual requirement are acceptable for use according to the teachings of this invention. In an alternative embodiment, the lamp may be a state of the art incandescent, halogen or HID lamp and the switching is accomplished by an additional light-attenuating element placed in front of the light source. Alternately, electronic signal control circuitry can rapidly switch an HID or incandescent headlamp used in the anti-glare system. The lamp need not totally turn off, the requirement is that during the seeing portion of time when the driver's light attenuating element is letting light through un-attenuated, the light intensity reaching the eye is non-glaring. Therefore it shall be considered that present state of the art incandescent and HID headlamps operated in a pulsed mode fall under the realm of the present invention. That is, any headlamp system where the high beam is toggled such that it is synchronized with a light-blocking element before the driver's eyes in the approaching vehicle is included within this disclosure. It is also to be understood that the headlamps when not in high beam mode may not be totally off rather they can be in a non-glaring low beam mode. This leaves the vehicle visible to oncoming traffic.

It is to be understood that for the system to work, all oncoming vehicles using high beam synchronized blocking must be working according to the same timing among them versus all the traffic headed in the opposite direction. A timing protocol based on major heading determines the synchronization. Thus, on a substantially north south route, a train of traffic headed north will all be similarly timed and counter synchronized with all southbound traffic. The blocking screen's timing is synchronized with the oncoming high beam headlight's timing either universally, through a global clock system such as that of the global positioning system GPS or the National Institute of Standards and Technology atomic clock broadcast over radio station WWVB located in Fort Collins, Colorado

or locally through communication among vehicles in proximity to being within the line of sight. A combination of directional data together with a timing protocol based on direction will determine the synchronization among proximate north/south and east/westbound vehicles. The vehicles direction data is derived from an onboard compass or gyro or GPS to eliminate the influence of roadway curves in cases of borderline directionality, the vehicle's direction for synchronization is not the instantaneous reading but rather is based on distance traveled over time and previous headings history. A stop and turn for example will change the synchronization while a smooth curve will wait for an oncoming cars synchronization to indicate that the road ahead is actually in a new heading unless sufficient elapsed time makes it clear the car is on a new course. The protocol will give benefit to the north on a 45 degree North/East heading and to the south on a 135-degree heading. GPS location and route recognition can also be used to set synchronization protocols for opposing vehicles. In one embodiment, the communication between vehicles for synchronization is effected through the headlamps themselves either through modulations in visible light LEDs of the digital headlight itself or with LEDs, radio or infrared emitters dedicated for the purpose 173. Detectors 174 on the vehicle, pick up the signal and signal-processing equipment passes the information on to the controlling unit 175.

Glare attenuating elements can be placed over the mirror surfaces or the side windows where the glare from the side mirrors passes. Thus not only the glare from oncoming headlights through the windshield is blocked but also glaring beams emanating from following vehicles, reflected off the rear and side view mirrors is controlled. To eliminate glare off the mirror 176 from reaching the driver's eyes from the side mirrors 177, a pulsed blocking screen or film 178 is placed on the driver facing side of the mirror's the reflecting surface. Similarly a rearview mirror 179 is embodied with a pulsed blocking screen or film. The timing of the modes in this instance is such that the light-attenuating mode occurs at the same time as the glaring or high beam headlamp mode since all cars in the same direction are in glaring mode at the same instant. All mirrors are synchronized to block the headlight glare coming from the rear which are on at the same synchronization time as that of the first lead vehicle in the traffic train.

In another embodiment additional information used to control the headlight aiming can come from analysis of the driver's eye movement and gaze. The headlight aiming system obtains information from a driver eye tracking system concerning the driver's gaze (i.e. what the driver is looking at). Analysis of saccade can be used to instantaneously predict where the driver will end up looking and the headlight intensity in that aiming changed to illuminate the area where the driver wishes to see in advance of the driver's re-accommodation. A machine vision system using pattern recognition and other object identification techniques to discern eye gaze direction, is contrived of the camera 316 with a view of the driver's eyes, infrared emitters 317 and the computer logic system 311. The data

obtained is analyzed according to eye tracking methods and algorithms known in the art of in a computer routine 7A to adjust the light aimings of the headlamps according to the drivers gaze at required intensities. The allowed intensities at any aiming take glare considerations into account so as not to cause offending glare. In another embodiment an outward and inward facing camera 316 is used to acquire both images of the scene ahead and the driver's gaze and using both sets of data adjust the headlamp illumination.

Accordingly it has been illustrated in the streetlight and headlamp application the benefit of a multiple-light source illuminating device. The flexible characteristics of the DLF allow for spatial variations of the intensity and spectral power distribution of the light over the area covered. When the element of variation of intensity and SPD with time over the area covered is introduced another dimension of flexibility is introduced. These properties are unique to the DLF and allow them to deal with dynamic lighting situations in a way not afforded by prior-art lighting devices. When combined with devices capable of detection changes in the surrounding environment the flexible DLF is capable of changing the illumination so as to provide the optimal lighting solution in real-time.

Fig. 17 illustrates a power supply circuit used on a DLF such as the Surface or Railing Mount Discrete 66 or Distributed 70 Digital Lighting Fixture of figures 4 and 5. The circuit controls current and illustrates the use of two disparate LED sets one red colored with specific voltage and current characteristics and the other green colored with its own voltage characteristics. When operated in this quanta and regime of voltage and current the combined output light is whitish in color according to the earlier teachings of this disclosure.

New Preferred and Additional Embodiments

Referring now to the invention in more detail, in Fig. 18A there is shown an illuminating or irradiating device which is capable of being adjusted in situ to match the radiation output with the actual illuminating requirements of the surround where the lighting fixture has been installed. As an example, the device is a lighting fixture and the installation is in a chemical processing plant which is an open facility with piping and vessels placed in the structure with walkways, floors and stairs made of metal grating. The walkways, vessels, machinery and piping needs to be illuminated at night by lighting fixtures placed on the structural support uprights along the walkways. In this lighting application example the walkways are at the exterior edge of the structure with the piping and machinery towards the interior. Beyond the walkway safety fence there is no structure and no need for illumination. The spatial light distribution pattern of the lighting fixture shown in Fig. 18A can be arranged so as to illuminate inwards towards the vessels, machinery and piping as well as downward along the walkways and stairs but not outward into free space.

The lighting fixture 410 is comprised of light sources 411. The multiple light sources are referred to as LEDs, Light Emitting Diodes which is but one type of exemplary light sources used herein. Light sources referred to in this disclosure include any of a wide range of visible and non-visible electromagnetic radiation emitting or generating devices formed from organic or inorganic semiconductor materials such as LEDs, organic light emitting diodes, OLEDs and all gaseous high and low intensity discharge lamps, incandescent filament and other solid state light sources. The light sources 411 shown in Figs. 18A and 18B have means to be coupled with apparatus for modifying the light output of LED chips or arrays of chips 412 such as a reflector 413 which yields a symmetric light distribution or an asymmetric reflector 414 which yields a substantially asymmetric light distribution. An optical lens or light guide 415, or other refractive or diffractive device may be used to modify the light output as well as phosphors or filters within the light guide 415 which may be used to add or filter out certain wavelengths. The spatial light distribution of the light source refers to the luminous flux emanating from the light source 411 at various candle power intensities as a function of the angle. The light source 411 has a characteristic angular light distribution 416 also called herein beam spread and when installed on a lighting fixture attached to the building, object therein or lighting pole with a specific orientation in the surrounding living space, the beam axis 417 will have a particular aiming towards surfaces within the living space and therefore the light source will illuminate only the specific surfaces it is intended to fall upon. In an embodiment of the invention a light source module 411 is comprised of the one or more LED chip 412, optical modifying device 413, 414, or 415, a heat dissipative element 418 such as a heat sink and a physical and/or electrical connecting element for the LED chip 412 such as a printed circuit board 419. In one embodiment a very narrow beam laser LED is mounted in the array of chips 412 such that it shines along the optical axis of the light module 411. In an embodiment of the LED the beam spread has been determined on the die level without the need for additional optical modifying devices as part of the light module 411.

A preferred embodiment of the invention is a lighting fixture comprised of many light sources of which some or all can be separately aimed and powered so as to illuminate areas, surfaces or objects in a room in a most correct, efficient and comfortable manner or for a desired lighting effect. The overall luminaire 410 spatial light distribution at various angles is comprised of that of the individual light sources. Thus when the multiplicity of light sources having their respective light distribution patterns, which are substantially directional and subtend lesser angles than those of the overall light distribution pattern are mounted and arranged on the lighting fixture structure their respective directional light distributions combine to form a wider overall light fixture distribution pattern. The overall distribution pattern is efficiently formed directly by the multiplicity of light sources without recourse to inefficient reflectors or refractors. Using a goniophotometer to measure over space the

emanating light intensity in the various directions one obtains the overall spatial light distribution pattern of the luminaire 410.

Using commercially available LEDs such as the Artavi 10° product from Illumitex which offers 90% of the light output in 10 degrees of the beam, it is possible to generate well controlled light distribution patterns with minimal spill light. Thus the Coefficient of Utilization (CU) or the utilization factor of the luminaire is high. That is, the ratio of the luminous flux (lumens) from a luminaire received on the work-plane to the lumens emitted by all the luminaire's light sources alone. The Illumitex LED package emits light in a uniform, highly-precise beam directly from the source. The result is that with die-level optical integration, the need for cumbersome and inefficient secondary optics to control light is obviated. Using well defined light beams to illuminate the area allows for the floor surface in the distant corners of a square room to have the same illuminance as the floor at the nadir, directly beneath the luminaire. This results in high uniformity which is a measure of variation of illuminance over a given plane, expressed as either the ratio of the minimum to the maximum illuminance or the ratio of the minimum to the average illuminance and a measure of the energy efficiency of the luminaire system.

In order to alter the spatial light distribution, the lighting fixture 410 has apparatus such as joints and flexible electrical connections giving it the ability to morph or change shape. That is, by the alteration of fixture geometry, moving structures or arms on which the light sources are mounted or by changing the LEDs' refractor or reflector geometry, the direction of the light emanating from groups or even individual light sources is modified so as to generate an overall site specific light distribution pattern. For example LEDs are mounted on moveable luminaire structural elements such as the end of posts, on bars or curved arms which can be adjusted to provide various symmetrical and asymmetrical illumination patterns as the installation requires. In the lighting fixture 410 the arms, such as arm 420 has apparatus to swivel around the central support post 421. In an embodiment of the invention control electronics 422 have electronic means and circuitry configured to provide different power levels to LEDs or groups of LEDs such that the light intensity in any given direction and angular aiming may be varied as needed. In an embodiment of the invention the power supply and control electronics 422 are further defined to provide power only in the amount needed using a logical controller 428. Controller 428 performance can be further enabled with sensor 429 providing information about the surroundings. The resulting light fixture embodiment described is thus a Field Adjustable Multiple-light-source Luminaire or FAML.

Thus in Fig. 18A the beam spread 423 of LED 411 differs from the beam spread 424 of a LED light source 425 which may have a wider area from which the light exits so that its higher angled light output will not be as bright so as not to cause glare. An accessory reflector 426 may be used to shield

from glaring rays. The method disclosed for reducing the glare from concentrated high luminance light sources is the use of light guides to reduce the luminous emmitance or luminance of a very bright LED. Light guides using the principle of total internal reflection redirect the light. They may in addition be used to increase the area from which the light flux is exiting and thus reduce the luminance or luminosity of the light source.

Fig. 19 shows a light guide which can be used to redirect the light from a light source and/or increase the area from which the light is exiting in order to reduce the apparent brightness. The light guide is constructed of a transparent material with an index of refraction greater than that of air. The light guide 430 will accept light rays emanating at large angles away from the beam axis and bend the rays to smaller angles from the axis thus producing a narrow beam. Light produced by the LED 412 at various angles enters the aperture 431. The light then bends as total internal reflection contains it within the walls of the curved light guide and exits from the light guide at surface 432 with a different aiming. More than one light guide can be used and when stacked light exiting the light source at different angle can be directed outwards at different angles or the same angle. Light guide assembly 433 is shown with two light guides stacked but many similar or different beam modifying characteristic light guides can be stacked for a unique total light distribution resulting from the source. Thus in Fig. 18B the optical device 415 can be a light guide assembly 433 as shown in Fig. 19 which has been added over a light source in Fig. 18A aimed at a potentially glaring angle as shown covered by the light guide assembly 433. The exit surface 432 may be a lens, a Fresnel lens or microlens whose optical features enable precise control of uniformity, exit angle and beam spread. In addition any of the surfaces may be covered with optical substrate or films to reduce light loss on entry or exit, frustrate the total internal reflection or filter or control the light. Light guides may also be asymmetrical.

In an alternate embodiment when using a single light source in a FAML yet an asymmetric spatial light distribution is desired, light guide assembly 434 made of light guide segments 435 is designed take light from the single light source and spatially differentiate its delivery to different parts of a room. For example, if the light fixture light source is located on the ceiling in the center of a square room and the assembly 434 is turned over so the light exits downward; then when the light exits the surface 436 with a Lambertian distribution and the segments are aimed in the direction of the corners of the room, a substantially homogeneous illumination can be obtained on a work plane near the floor in the square room. More than one segment of assembly 434 can be stacked and light guides with different light exiting directions can take the light of one light source and symmetrically or asymmetrically distribute over an area. Combined with reflective control elements 437 added within, upon the surface or external to the light guide further light control can be achieved.

While light guides are known for their ability to carry and redirect light, in this disclosure another novel embodiment of a light guide used as a light control device is its use to increase the area from which the light from the LED is exiting from thus reducing the light source luminance or glare. In an embodiment where the inlet aperture 431 cross section is small and the cross section of the light guide exit surface 432 is large there will be a significant reduction in the light source luminance and it will appear less bright and cause less glare to persons viewing it. Thus while persons in a room would find high brightness LEDs disturbing it is possible to add optical devices that while maintaining the directionality of the illuminating beams spreads them over a larger area thus reducing the luminous emmitance.

The Spectral Power Distribution of the luminaire refers to the distribution of light energy emitted by the light source arranged in order of wavelengths. In an embodiment of the invention the LED chip 412 is made of many separated LED chips or LED array. The array of semiconductor LED chips or dies 412 are of the same material and have a similar wavelength or are of different composition and produce a variety of wavelengths. In an embodiment the controlling power circuitry 428 is connected independently to each chip. The result of using differentiated composition chips 412 or phosphors with them is that the light output is a mix a various wavelengths of light and therefore of variable chromacity. Thus a warm color temperature of lighting can be produced as well as a cool daylight color temperature. Thus when the light sources that make up a light module 411 are not all producing the same color spectrum or wavelength, the luminaire's chromaticity, spectral power distribution or spectral light distribution is alterable by the controller 428 via driver 422 energizing to a greater or lesser degree the individual light sources. These light sources may be substantially monochromatic or wide spectrum with different wide SPDs and monochromatics complementing each other. Using the principles of additive color mixing of light sources to control the change in chromacity via the differentiated powering of coincidently aimed light sources, the luminaire produces a unique spectral light distribution having a certain color temperature and/or color rendering index of light at all or any particular aiming.

For example the curvilinear light guide 430 can be used to combine different colored LED chips 412. Thus if 3 different colored LEDs were stacked and their light entered into one or more light guides the light guides will re-orient the light and aim them in the same direction whereupon they will mix. The mixed light when falling upon a surface and reflected to a person's eye will generate a uniquely observed color lighting effect. When phosphors are added to the light guide material other chromaticity may be generated. Thus a blue LED could generate one color temperature with one light guide and another color temperature in another light guide. If the guides are co-directional the colors will be mixed. Physical movement of the inlet aperture from one light guide of particular phosphors to another would then serve as a way of changing the correlated color temperature, CCT

and/or color rendering index, CRI of a light source. Thus an active way of controlling the spatial and spectral output of the LED light source 411 is to reposition the light guide apparatus 433 or 434 thus changing the angular or spectral characteristic of the light modification.

Individual bars or arms 420 by their structural geometry determine the aimings of the light sources mounted on them. Thus using Lambert's cosine law and the inverse square law the arm geometry is designed such that more luminous flux can be directed to surfaces further away or surfaces at greater angles to the incident light to achieve a more homogenous light distribution. In addition when mounted in a living space the arm 420 can be rotated into a better aiming in order to optimally illuminate the area. Thus as a principle teaching of this invention the light sources attached to the arms have already been given the capability of generating a unique spatial distribution pattern in the factory set format. Most importantly, this preset distribution carries though to the homogeneous illuminance of room surfaces even after specific installation adjustment requirements have been made.

After adjustment the position of the arm can be input into the controller 428 or the camera 429 can be used to determine the lighting effects produced by the new arm arrangement. This calibration is accomplished by energizing a light source or array of light sources and reading the with the camera sensor array the luminance values off the surface. Comparing the new results with prior control luminance values at known power settings the present luminaire configuration is determined. A reference sheet of known reflectance is placed on surfaces to aid in the re-calibration. Alternately, the prior stored reference luminance values are for a number of surfaces of different reflectivities allowing the controller to guess from the surface at hand which reflectance model is a best fit. The data stored in the controller 422 can now be used for applying recommended lighting practice to specific lighting application or lighting tasks that luminaire is called on to perform. Herein this disclosure, a logical controller executes instruction sets based best lighting practices as recommended by lighting engineers and published in handbooks such as the Illuminating Engineering Society of North America IESNA and standards such as ANSI or CIE. The latest by the IESNA is the10th edition ISBN-13: 9780879952419, Publisher: Illuminating Engineering Society of North America that has numerous recommendations and best practice standards specifically related to LED lighting. The specific location lighting task information or programming may be manually input to the luminaire controller via an input device such as a keypad or be remote input controller using infra-red communications or other wireless device using a communications system such as, Wi-Fi, Bluetooth™ etc communicated via a computer or smart-phone or via a speaker microphone system. To determine lighting requirements in an area based on usage and characteristics of the users, the controller uses a speaker to communicate queries from a lighting specification

questionnaire and receives audio response processed by a voice recognition software application as input for the purpose running the lighting design algorithms.

Figure 20A is a perspective view of an embodiment of a modular industrial lighting fixture with the addition of another adjustable arm 420 where the same LED driver electronics 422 are capable of powering additional arms when added or not powering them when they are subtracted such as in Fig. 20B. The arms 420 are rotatable so that they may be concentrated at a specific aiming so as to produce higher illumination intensity in a specific area. In an alternative embodiment the driver electronics are modular in concert with the light source arms 420 such that when an additional arm is added an additional plug and play driver module is added as well with full communications and hookup capability to the logical controller 428.

An example using a FAML in an industrial, commercial or house lighting application may be a hallway lighting function. An embodiment of an asymmetrical lighting fixture shown in Fig. 20B with two arms 420 at 180 degrees with light source modules 411 laid out on the arms at higher angles to illuminate along the hallway will do a more economical job of illuminating then would the four armed symmetrical luminaire of Fig. 20A. The light sources illuminating the hallway at higher angles from the nadir may have large areas to reduce the luminous emmitance to comfortable, non-glaring levels using optical light guides such as 430 to increase area while maintaining directionality. When the camera sensor element 429 detects people entering the hallway, the logical controller 428 increases the power driving the LEDs and the lighting intensity is increased from zero power or some low level of lighting sufficient for orientation purposes to full level. After the person has passed under the luminaire the LEDs on the approach side can already be dimmed again saving power. It is to be understood that the luminaire embodiment of Fig. 20B is only showing the practical operational elements. Obviously, when used as a home hallway lighting fixture additional aesthetic elements can be added to improve the fixtures artistic appeal.

In an embodiment of this invention the adjustments to the light output distribution, intensity and chromacity are made automatically by the logical controller 428 operating per programmed instruction sets based on data supplied by sensors regarding living space geometry, environment and contents including living beings. Such sensors 429 use sound or electromagnetic radiation to measure distances to surfaces within the intended design illumination range of the lighting fixture. An embodiment of the invention uses as a sensor an electronic camera with a lens 427 allowing it to view the surroundings. Natural light sources or light sources on the luminaire firing at known timings and chromacity can be used with the sensors 429 and logical controller 428 to determine distances, movement, reflectance, surface colors and other information about the surroundings during set up and in real time. The camera chip transfers the image information to the logical

controller. Using real time image processing methodologies with image and scene recognition technology known in the art, room or outdoor area elements, objects and people are identified. Using face recognition techniques an individual may be identified and personal lighting preferences or functions can be provided by the luminaire. The controller being programmed to illuminate people, objects and surfaces according to best lighting practice or user preferences then manipulates fixture elements to adjust the lighting to meet the standards or personal preferences. In addition the computer vision can recognize the visual task being performed. The logical controller 428 then uses control of the power signal to the LED to provide recommended practice light intensities.

Light entering the digital camera 429 through its lens 427 is converted into electric signals by a CCD or CMOS image sensor. The lens can be an optical lens or a wide angle lens or a Fresnel lens giving the sensor array a view of the area illuminated by the lighting fixture or a wider area covered by a group of lighting fixtures under control of the logical controller. More than one camera sensor 429 with different areas of coverage can be used if more accuracy is required for image processing. The processor based control system for illumination has stored data and programs for driving the LEDs at the correct levels in order illuminate according to recommended lighting practice and stored algorithms which it uses to process pattern recognition, image recognition and other computer vision methodologies known in the art to recognize a particular object, surface or individual as well as distances to surfaces, their color, reflectance and the geometry of the environmental surround. The same image recognition camera may be used as the luminance meter or a separate light sensor may be employed. A further capability of the digital lighting fixture using image recognition methodology known in the art that it can recognize the individuals and provide personal preference lighting conditions or determine the optimal lighting parameters as required by their age. A processor based control system for illumination having stored data and algorithms which uses image recognition algorithms to recognize a particular individual. Using image recognition algorithms and artificial intelligence techniques known in the art, based on the appearance and movements of the occupants, the camera vision system will automatically guess their age and sex. The processor runs the computer vision routines to determine an occupants age or sex and sends instruction to a building's utility devices to provide individualized services such as heating and lighting on basis of age or sex.

The personalized control of the illuminating device or other appliances in communication with the controller can be effected by using a brain–computer interface, (BCI, often called a mind-machine interface (MMI), or sometimes called a direct neural interface or a brain–machine interface (BMI). Using apparatus to read brain activity, a direct communication pathway between the brain and the external device can be effected. The BCI can be combined with the computer vision system having knowledge of the surround to help the controller relate the brain activity to the visual aid required to

carry out the desired function. For example in an automotive application the brain activity related to eye saccade can replace eye gaze tracking in knowing where the eye desires to see next and illumination can be provided on time, in advance of the visual task to be performed next.

The sensor 429 can be an LSI chip enabling high-speed processing of the generated image data by a digital image processor function within the logical controller 428 using algorithms known in the art for motion, scene and/or face detection. From these signals the logical control affects lighting changes as needed to perform visual tasks or create ambiance. The sensor and transducer pack 429 is sensitive to a wide range of electromagnetic or sonic pressure variations and has means for determining luminance, temperature and humidity. The logical controller 428 having communications capability can transfer information gained from the sensor pack 429 to other home automation networks or it can supply information to other home heating, cooling, security, lighting and host of other appliances. With a view of the front door the luminaire sensor can serve data to the home automation network on whether someone has entered of left the house.

In a preferred embodiment of this invention the lighting fixture is equipped with a camera vision system comprised of the digital camera 429 and logical controller 428 having computer algorithms for performing computer vision and has the capability of identifying the eyes of occupants in a room (this is similar to present day face detect mode used in digital camera technology such as a Canon PowerShot SD900, where the processor face recognition identifies the triangle of two eyes and a nose and focuses automatically). The camera vision system is capable of detecting glare causing visual discomfort on the eyes of room occupants caused by the lighting fixture and the logical controller will accordingly reduce the intensity of the illumination reaching the eyes from the responsible light source. The camera vision system can detect the glare by assessing the amount of light reflected back to the camera from the eyes of room occupants and determining on the basis of a scale, such as the de Boer rating scale for discomfort glare, whether or not glare is occurring. Alternatively the logical controller 428 upon detecting eyes will set the light source intensity shining in the direction of the eyes to a level that will not cause glare.

In addition the camera vision system 428 will prevent the lighting fixture 410 from producing veiling reflections on objects such as glossy magazines or computer screens. Using machine vision technology known in the art such as neural networks training and other pattern recognition techniques the vision system has sensor, algorithmic and computational means for identifying devices or objects. Using lookup tables to identify a possible veiling glare situation in the users field of view the logical controller 428 adjusts the lighting by providing illumination from a different angle such as beaming light off the ceiling in place of direct lighting and/or altering the intensity of the direct lighting.

Actual vision and perception is not only a function of the illuminance falling on the object being observed but also of the luminance of surfaces in the surround, spectral distributions of the object and background and the general illuminance level to which the eye has adapted. Veiling luminance and veiling reflections may even be as interfering so as to disturb the ability to see. Described is a method of using the an embodiment of multiple light source lighting fixture of the present invention with finely controlled light delivery to assist people to better see objects or carry out visual tasks such as reading. The method comprises altering the intensity and/or color of the illumination delivered to the task versus other surfaces in the visual surround (that is they are in the viewer's field of view) such that the luminance of the object, the luminance of the background, the contrast and the veiling reflections are controlled so as to produce optimal vision conditions. To accomplish the spatially differentiated light delivery to the object of the visual task such as a book or computer screen the light sources to produce task lighting have multiple, narrow beams with minimal spill light. The limited coverage area of each beam and sharp cutoff is such that the lighting fixture controller can target a book while not substantially illuminating the desk. Other light sources illuminate the desk and other surfaces in the visual surround at an optimal background level luminance. The background level is determined by factors such as whether it is an office environment where others are present and a dark office is unpleasant or if the reading is at home and a lower background can be tolerated.

With the eye recognition capability the lighting fixture can, irrespective of the glare consideration, lower the illumination in areas where eyes are not looking thus saving power. Thus as in the Fig. 20B hallway lighting application the logical controller upon identifying the occupant's eyes can illuminate at higher intensity the areas forward of the occupant in their field of view but limit light rays to below the eye level and dim the areas not in the visual path of the occupant. The same capability for dimming is available in many other lighting applications such as in other rooms in a house, warehouses, stores, factories as well as outdoors. In sports lighting glare can be eliminated by the controller 428 following the ball and calculating which light sources 411 are adding to vision and those which are detracting and reducing the intensity of those detracting. Thus the lighting fixture 410 provides illumination in real time only where people need it to carry out visual tasks while the illumination in other areas is off or dimmed to comfortable or aesthetic lighting levels.

An alternate embodiment of the Fig. 20B fixture used in a highway lighting fixture application having a camera vision system has controllable light distribution and logical means for providing illumination based on the vehicle's position in relation to the lighting fixture 410. In low traffic conditions in order to save energy used for lighting, the controller 428 using stored algorithms increases illumination with the approach of a vehicle and changes the beam cut-off levels as the

automobile advances towards the lighting fixture to eliminate glare from the driver's eyes. It then dims the lighting after the vehicle has passed and is no longer useful. When multiple vehicles are presents the operating regime changes to illumination from the adjacent luminaire located behind the vehicles. By using communication between the luminaires 410 the optimal lighting regime is coordinated between them.

In a preferred embodiment the illumination device 410 of Fig. 18 with computer vision capability, also having means for communications with other devices and human factors engineering algorithms that allows it to predict in certain situations what a room occupant is interested in doing, has wired or wireless electronic communications apparatus for communicating the information it obtained via the camera for actuating or closing other devices. For example a person sitting down in front of the TV can have the TV turned on automatically and have heating concentrated on that area of the house. The camera based lighting system via a central logical control unit or the home computer inputs data on the house occupants' whereabouts and aids in the control of house lighting and heating and cooling. Thus the lighting fixture 410 communicates data and integrates with intelligent home automation systems as 1) it provides an ideal location for the sensors which includes any of sensors 429 for: temperature, humidity, motion and artificial vision and 2) the smart illuminating device 410, itself which has a logical controller 428 capable of communicating with and being controlled by the automated home network.

The lighting fixture being the world's most ubiquitous device serves as the ideal platform for simple and intelligent camera vision systems for use in home, commercial, outdoor and industrial facilities control systems to the end of surveillance, control of the use of energy and supplying people with sound, lighting, heating, cooling and fragrance. A lighting fixture is almost always installed in any living space, from work spaces to entertainment spaces and an infrastructure of power lines and often data lines are already installed to them. Thus, a lighting fixture is ideal as a platform for sensors, transducers and detectors. It is also ideal as a platform for delivering lighting, sound, radiated heating and the dispersion of fragrance. For example a multiply placed speaker sound system for providing a listening experience upon receiving from the camera's information on the users' whereabouts can better tailor the sound delivery based on their location as in known in the art thus enhancing the sound experience. Computer recognition of the person/s in the room can call up from memory the users individuals listening and sound setting preferences. A fragrance system will provide aroma based on room occupancy and location if there is apparatus in the fragrance system for delivering fragrance to separate areas of the room. Again here a computer recognition of the individual can tailor the type of fragrance.

In an automated embodiment of the invention the light sources 411 and 425 are mounted on moveable elements 420 having actuators or motors that are controlled by the logical controller. The automatic mechanization of light source supporting fixture parts allows for the direction of the light output to be altered by the logical controller thus enabling the luminaire to perform better in the specific lighting application where the fixture 410 has been installed. This may be a onetime rearrangement of the light source aimings or may be performed in real time as the lighting requirements in the living space change. Similarly, based on changed parameters in the surrounding, the logical controller 428 adjusts as required the light intensity in any direction and/or the chromacity. Thus hereby we have demonstrated the systems unique lighting agility and energy saving capacity where the controller 428 can affect a dimming function based on factors in the surrounding such as the real-time sunlight contribution within parts of its coverage area, the amount of people in the room or the density and positions of cars on a highway.

Fig. 21 is an alternative embodiment of a field adjustable multiple light source lighting fixture 440 with light source modules arranged in a substantially linear form. Thus light source module 441 may be aimed towards the nadir while light source module 442 is aimed sideways to illuminate a different area off to the left. Light source module 443 is aimed at a higher angle from the nadir and illuminates a third area. The modules are connected mechanically and electrically to each other and to the power supply 444 and logical controller 445. A different configuration is affected by changing the angle between modules on joint 446 which is capable of bending in the x and/or y direction. Detents and/or markings are provided on the joints 446 indicating different angular settings. Thus instructions for each joint's 446 setting can be given to the homeowner or lighting fixture installer by a lighting design computer program known in the art. The light sources are specified and the room dimensions are entered into the program and the light source aiming angles are specified for the FAML 440. Whereas, in a special aiming configuration with light sources directed at different aimings, an even or homogeneous light distribution will be affected over the area under the fixture, the light fixture can be rearranged so that all the light sources are aimed in the same direction and thus a distribution similar to that of a single light module's own spatial light distribution will be obtained. Thus, if the light module light distribution is narrow, and they are all aimed in the same direction a spot light distribution will be obtained from the fixture 440.

Alternatively the LEDs can all be aimed at the ceiling or objects on the wall for an indirect lighting effect or soffit lighting effect. Alternately, some LEDs can be aimed in the same direction and others at differentiated aimings obtaining both a spot and flood light distribution from fixture 440. Light source modules can be added to the chain or detracted depending on the lighting application. In addition the light source modules can be enclosed in an aesthetic enclosure 447 hiding the actual light source modules. As shown in Figs. 18 and 20, the embodiments are depicted in their practical

light engine form with the skeletal light source support structure. It is clarified that the skeletal support structures in the luminaire embodiments presented may be embellished with outer enclosures of a more aesthetic nature. The only requirement is that the outer structure does not interfere substantially with the light and heat transfer from the light engine outwards. Thus the disclosure has shown a FAML that can be agile in meeting differing illumination requirements, aesthetic and energy efficient in providing illumination in a specific lighting application.

The unique approach of this multiple light source luminaire invention over previous art luminaires is that in prior art, even when many LED sources are used the spatial light intensity distribution output of the luminaire is determined by the primary or secondary optics on the light source. Whatever light distribution there is emanating from the light source that is the light distribution of the luminaire. In this invention the overall light distribution of a single luminaire is comprised of many smaller light distribution patterns. It could be argued that a track lighting luminaire with its multiple light sources is such a fixture. As opposed to a dispersed track lighting luminaire used to spot light specific areas spread in a room the FALM is a centralized, integral lighting unit with both general area lighting and spot lighting functionality under the uniting structural, logical control and electronic circuitry of the luminaire.

Fig. 22 is a block diagram of the functional elements comprising adjustable LED luminaires 450 disclosed in this invention. The block diagram illustrates the power and communication connections between the elements. The power source 451 can be electrical utility power or battery power which is altered in a power conditioning element 452 such that it may operate the transducer and sensors pack 453 and other electricity users such as the logical controller 454 and LED drivers 456. The logical controller 454 receives information from the input communications and sensors 453 and provides instructions to the power controls 455 and LED drivers 456 so as to drive the LEDs 457 as required by the lighting application. To alter intensity or chromacity of the light output by LED chip arrays 457 the logical controller uses techniques such as multiplexing of the power signal going to the light sources or pulse width modulation thereof. In another embodiment, the light module 411 includes control electronics which divides power up between the LED chips 412 according to instruction signals received from the central controller 428. Thus the light module 411 receives from the central control electronics both a power and control signal. The control signal may be modulations on the power signal. The light module controller then re-divides the power to the individual LED chips 412 as required to obtain light intensity and chromacity. To lengthen the times between the power signals to the light module, the light module 411 may be equipped with an energy storage means such as a capacitor or battery.

A unique feature of the adjustable lighting fixture is that extra lighting element modules 457, i.e. those not needed in a specific application can be deactivated. Thus if an arm 420 is removed, the corresponding LED driver circuit 456 can be deactivated. In a modularly built system the customer can purchase light source modules for the application such as four light source modules 457 for symmetric illumination as in fixture 410 or just 2 modules for a two arm 420 hallway light as in Fig. 20B. The electronic circuitry allows for LED drivers 456 to be added as needed and thus the customer would purchase the matching LED driver circuitry 456 for the hallway light configuration.

In a preferred embodiment the LED light fixture system is provided with mechanical means 458 for changing the structural shape which affects the direction of the illumination produced by the LED module 457. By re-aiming the light sources a new fixture 450 light distribution pattern is obtained. The feedback of the new position of joint 446 is accomplished by input from a position sensor at joint 446 which is part of the sensor pack. In a manually adjusted system joint 446 is provided with markings and/or detents for vertical and horizontal angular positions such that instructions given to the user for aiming the light sources are in understandable terms. The logical controller 454 uses the new geometric data to recalculate the light distribution. Alternately, or in addition to, the camera acting as a light a sensor coupled with the logical controller's firing of the newly adjusted LED sources 457 at a known timing, obtains the new light distribution pattern. In addition results are corroborated with the position sensor data. The logical controller 454 with new knowledge of the light distribution calculates, using computer programs such as Fig. 23, how to best provide required illumination based on algorithms run on the processor 454 pulling stored lookup-data from the data storage of 454 or received information via the communications device of 454. The transducer sensor pack 453 is comprised of any of the following devices: an ultrasonic transducer and receiver, an electromagnetic radiation source and detector, including IR, UV, Light and Laser sources/detectors, a speaker and a microphone for audible output and reception among others. Thus, the intelligent light system 454 can receive voice input from the user which the logical controller equipped with voice recognition programs will interpret into commands and give feedback. The input to the fixture can be via a wired input device, voice recognition of commands similar to those used in computers and mobile phones, other noises such as clapping, a remote control device or wireless communication from a computer. Thus a user of the lighting can override lighting choices made by the logical controller and input their personal lighting preferences which if desired, are stored for the future. The logical controller is programmed to interpret the input signals into functions to be carried out by the FALM 450 in terms of spatial, spectral and intensity distributions of the light in space and in time.

Fig. 23 is an exemplary flow chart for a computer program run by the logical controller of the lighting fixtures disclosed in this invention to provide correct illumination. Based on information

obtained by the sensors or manually input the logical controller 428 of light fixture 410 again shown in Fig. 22 as logical controller 454, calculates and sends control signals to power controller 455 and LED drivers 456 to produce the optimal illumination for the visual tasks being performed by people within or adjacent to the area being illuminated. The computer routine first acquires information regarding the light distribution pattern of the luminaire in its present configuration. Using data from the initial calibration stored in data storage 454 and powering a LED 457 at a specific aiming, the digital camera light sensor array reads the luminance value returned by surfaces. The processor using the inverse square cosine law obtains the reflectance of those surfaces which are then registered in the data storage 454 for further use in determining spatial distribution of light flux from the luminaire after adjustment. Thus a feedback control routine is effected by the controller and sensor devices using the stored computer routines.

The logical controller 454 next determines the lighting environment in which the luminaire has been installed and area for which the luminaire is to provide illumination. If other intelligent luminaires are present, the communications program coordinates between them. If the neighboring luminaire is unintelligent, then the installer powers it on and off and the controller 454 records the differences in illumination due to its influence for future use. Using pattern recognition technology known in the art of machine and computer vision, the controller 454 identifies architectural features of the room such as windows and walls as well as furniture and appliances. Powering the LED light sources 457 or transducers 453 and reading the reflected signal captured by the sensors 453, the logical controller 454 obtains a first guess result for the iterative process of customizing the luminaire for the installed location. Running algorithms, the processor 454 determines the luminance values obtained from the sensors 453 and compares with best practice lighting recommendations. If necessary, the logical controller corrects on its own the light source 457 aimings via control of joint 458 which is equipped with automatic means for movement. Alternately, via communication with other devices or people it relays the necessary angular setting information for them to carry out the adjustment. The controller next measures the obtained luminance and checks if the recommended or best practice luminance level has been reached. The customer may also receive a report of the measured luminances from the lighting fixture system 450 and input to the logical control the desired changes. Alternately, the customer based on their own or other users' visual experiences can input desired corrections to the logical controller 454 which then re-adjusts the light source aimings. If re-aiming the light sources 457 alone cannot solve the required illumination requirements the controller 454 determines and communicates the need for the installation of additional light sources or communicates which light sources are superfluous.

In a preferred embodiment of the invention the logical controller 454 receiving image input from the camera 453 and running pattern recognition software will identify what is the visual task a person is

trying to perform. The computer routine receives images from the camera and by determining the proximity of persons to objects such as books, newspapers, computer screens, telephones, televisions, cereal bowls , a writing pad, etc that are recognized by the computer vision techniques predicts what visual task the user is trying to perform. The logical controller 454 then drives the light sources 457 according to recommended lighting practice levels stored in its data storage. In another preferred embodiment of the invention the user can command the logical controller as to the visual task being performed and the type of lighting desired such as "warm white" or "more light" and their preferred intensity level. The user input to the logical controller 454 may be thru a keyboard on the light fixture or via an electronic device in communication with the light fixture via the communications apparatus of 454 therein or audible or visual commands detected by the microphone or image sensor apparatus of the sensor pack 453. Alternately, a smart mobile phone application with a Bluetooth or Wi-Fi communications capability serves as the remote controller and will handle the voice recognition, present a touchpad menu for control input or provide keyboard for command entry. If the logical controller makes an incorrect decision in the eyes of the user, the user can override the last change by a signal such as snapping ones fingers or voice command etc. Unique to this invention people are able to choose the lighting that suits them best and the fixture, having differentiated light delivery, can provide a first user with one type of chromacity and/or intensity and a second type for a different user in a different area.

The logical controller 454 provides its own feedback by checking in real time via the sensors 453 if the illumination provided by driving the light sources at the current setting is in accordance with recommended lighting levels and chromacity. In addition by using pattern recognition and knowing the location of the user's eyes the logical controller can determine if the illumination is causing glare discomfort or veiling reflections. The logical controller by comparing new images with previous images detects if there is a change in the lighting requirements. If changes have occurred, the illumination determining process of Fig. 23 is repeated and a new configuration of driver settings and/or light source aimings is obtained.

Yet another feature of the present invention logical controller and software is that the lighting fixture 450 has apparatus to check the illumination level of the lighting set-up upon installation and provide feedback so that manually made aimings are directed to obtain a desired illumination or luminance. The camera 453 serving as a light meter obtains luminance readings on surfaces in the living space. It inputs data to the controller 454 which provides readout either on a display on the FAML 450 or communicated to another device having a display. The installer using a calibrated reference reflective sheet of known color and reflectance values placed on surfaces at particular aimings will check if the desired illumination and chromacity is being provided. The reference sheets can also be used to calibrate the room surfaces for future camera sensor 453 readings by storing in 454 the actual

surface readings vs. those of the reference sheet. Once the camera 453 is calibrated as to the reflectance and color of room surfaces the FAML 450, in a servomechanism enabled embodiment, with automatically movable light sources 457, will perform its own re-configuration to reach optimal light provision. The calibration is affected by using the camera array 453 to detect luminance as a measure of the lighting fixture instantaneous illuminance in that direction vs. the power level at which the light source is being driven. To calibrate the illumination system, the logical controller 454 can use a given LED installed on the fixture which serves as a light source standard when driven at known voltage and current. Alternately, an additional light sensor of superior accuracy stability is provided for in the sensor pack 453 and can be used to calibrate the camera sensor array.

In a preferred embodiment the control unit 454 is optionally outfitted with a photometer 453 which can be used to read the luminance of the room surfaces and transmit the data for use in the lighting program Fig. 23. Using the same process a lighting designer uses to enter data to the lighting analysis programs the installer inputs to the controller as to the illuminance goals for each surface. The lighting program as known in the art then specifies the correct lighting levels, aimings and spectrum for the different locations and uses throughout the room. This is reversing the typical design process where the lighting fixtures performance is simulated on a computer and the results calculated. Here, the required illuminance results are known first and the fixture is then programmed to make them happen. The controller 454 uses its stored performance characteristics to determine the power supply to the light sources so that it provides the required intensities to obtain the required illuminance. The lighting calculations and programming of the power supply 456 of the light sources 457 is preferably performed in real time such that the sensor 453 detects the illuminance to corroborate the performance while the installer is still at the location. If the lighting is not to specification then the controller 454 readjusts the parameters so as to bring them in line. This trial and error process continues until the readings are within tolerance. The process is best carried out in the dark or when there is non-varying daylight. Alternately, the photometric reading sensors are on the luminaire and they are used to corroborate performance. Alternately, the process is automatic using feedback from the surroundings and pattern recognition to determine surroundings and applications.

A number of circuits in devices 452, 455 and 456 are utilized to power equipment in the fixture 450 and carry out control. The power supply may be a constant voltage supply or current source. The control circuitry comprises feedback sensors 453 coupled to the logical controller 454 to detect light intensity and color spectrum of the radiation. Associated logic circuitry, responsive to the detected light intensity and color spectrum over the spatial distribution, controls the power delivered to the individual LED diodes, so as to provide a desired intensity distribution over space. In an example using a combination of different colored LEDs, the logic circuitry 454 is responsive to the detected color spectrum of the outputted light. It controls the driver 456 to selectively increase or decrease

power to individual coincidently directed light emitting diodes as is needed to obtain the desired color spectrum of the illumination as well as it luminous intensity.

Fig. 24 is a universal lighting fixture 470 comprised of a structure 471 with means for attaching mechanically and electrically to any of the elements selected from the group consisting of electric power conditioning apparatus, a logical controller with processing and storage capacity, light sources, radiation sources, transducers and sensors. The structure can be factory manufactured or come in a do-it-yourself DIY version. The lighting fixture has a geometrical shape calculated by the inverse square cosine law for set types of light pattern distributions. In one embodiment the structural shape of fixture 470 is such that an even, homogenous light distribution will be obtained on a work plane below when the Plug and Play light source modules 472 are connected. In a do-it-yourself lay-up-able embodiment of the luminaire 470, the luminaire light source elements 472 are configured by the user in situ according to the illumination needs where the fixture 470 is hung. They may be reconfigured when the lighting needs changes such as when furniture is rearranged in the room. The lighting fixture structure 471 covered with removable facet covers 473. Facet 474 has been opened exposing the receptacle 476 to accept additional light source module 477. The receptacle 476 is provided with a connective affixing means 478 for having light source module 477 attached to it both mechanically and electrically. Light source module 477 is also provided with a complementary connector element 479 which mates with connector 477. Connector 478 is wired to a power conditioning and control elements provided with luminaire 470 as needed by the configuration. The additional light source module 477 with its characteristic beam spread 480 mounted on a opened facet 474 on the structure 471 is at a different aiming via the position on the luminaire 471 where it is being mounted. The light sources 477 have a characteristic beam spread 480 and optical axis 481. The receptacle 476 allows for some rotation of the installed light source 477 on the X Y or Z axes. Thus when a number of light sources are laid up and aimed in the same direction they will add intensity to the light distribution in that direction and when added on the curved fixture 471 surface at different angles they will increase the coverage area of the lighting fixtures illumination. Markings are provided on the structure with the angle of the position thus the user following instructions can attach the light sources at angles which will yields an even light distribution up to the cutoff angle.

A lighting design computer program known in the art will simulate to the user what the light output will be from the luminaire as it is configured. A logical controller on the luminaire can determine from the plugged in light source units which have a identifying data chip 479 in the connector relaying what its light distribution is and communicates to a simulation program the present configuration aimings and light source characteristics. In addition a sensor 482 is provided on the luminaire. The camera like sensor 482 measures the resultant light output and relays those results to

the simulation program. Thus the user can build a customized lighting fixture that ensures proper lighting intensity where needed and does not waste light where not needed. The plug and play light source characteristics are known to the controller and their operating characteristics may then be programmed via the lighting simulation program. Using the lighting simulation program, the employed element characteristics, now a part of the controllers feedback loop, are used to direct the user to rearrange the lighting modules to further refine the fixture's 470 light output.

The do-it-yourself lighting fixture 470 has special lighting fixture accessories that are attachable to the structure. Spot light module 482 with a narrow beam spread is an example of a special accessory. It can be a light source or a radiation source such as an Infra-Red heating source or a combined heat and light source. It is mounted on the fixture via swivel joint 483 which is manually positioned at an angle required for the illumination task. A special laser pointer LED 484 is provided in the center of the light source LED array 485 to facilitate exact aiming of the spot light. The lighting module 482 is provided with connection means to the power and control signals via the joint 483. The module is also provided with cooling fins 486 to maintain optimal temperature for the LED sources. The swivel joint 483 can be a motorized joint with motion in two axes controlled by the logical controller. Thus the logical controller 454 in conjunction with the camera vision system 475 when identifying a person in need of spot lighting as per the computer program of Fig. 23 will pivot the spot light 482 so that it is aimed in the direction where the task lighting is required. At the same time the lighting fixture 470 will maintain general lighting at recommended levels over the rest of the room thus significantly saving energy.

In another embodiment one or more light sources, acting as a spot light 482 of limited beam angle, is on an automated swivel joint. The controller 454 receiving input from the camera and using computational image recognition algorithms in a program as in Fig. 23 follows the person around the room providing them with higher intensity lighting for their visual tasks. Further image recognition capability which may also be complemented by video analytics technology where computer vision is used to filter and manage real time video for security and intelligent traffic monitoring, helping to recognize activities as they happen in real-time which enables the controller to determine any of the following: a change in the persons activity, in what direction the eyes may be directed, what objects the person is viewing and what visual task the person needs to perform. Based on that information the controller 454 powers the spot light sources 482 and general lighting sources 472 to provide the correct lighting for the specific visual task undertaken, be it reading a book or watching TV.

An irradiation device embodiment of this FAML invention can use the computer vision and aim-ability function to provide infrared heating to individuals in indoor and outdoor settings. The heat radiation sources can be infrared filament lamps or infrared LEDs in addition to other wavelengths.

The irradiating devices 472 mounted on the irradiation fixture can provide general area heating or spot heating 482 to people or objects. Computer recognition of individuals is used to irradiate them as they move about the living space. Using face recognition algorithms and stored personal preferences from the data storage, the logical controller 454 will aim the heating rays specifically where on their body they prefer to be heated as well as in what amount and at what times. The camera 475 has sensors sensitive to infra-red wavelengths around 12 μm (micrometers) radiated from people. The controller obtaining the information from the body temperature sensor will run algorithms to calculate radiation parameters and will control the irradiation in time and intensity on the individual to maintain comfortable heating per best practice standards, drawing on stored data of heating practices, or personally input preferences. People may be sensitive to radiation heating on certain parts of the body. For example heating on the head area causes some people discomfort, The camera and controller processor system can use image recognition to identify parts of the body and the controller can provide a different radiation level to the head vs. the rest of the body. Other people feel the cold in the legs etc. In addition the controller can obtain information on other environmental parameters such as the temperature, humidity etc which affect the heating regimen. Thus the camera sensor 475 is an energy saving sensor replacing the room heating thermostat used to maintain the entire room at a high ambient temperature with a more accurate and localized actual measure of the individual's temperature. The radiating fixture 470 will them provide localized heating on an as needed basis to maintain comport. The FAML logical controller 454 runs the algorithms and provides spot heating only when necessary and in the right amount. Just as moveable head stage lighting follows the performer about the stage the camera/controller vision system follows the person around the room or outdoors and keeps them warm with an infra-red lamp 482. It is to be understood that the irradiating source can be supplying UV radiation, visible light, or any other radiation for therapeutic, pleasure or manufacturing purposes such as UV, EB or heat curing adhesives etc.

In an embodiment of the FAML the infrared radiation sources are added to the light source and can work together when necessary to provide heat and light. Thus in a living room fixture where the house heating has been turned down to energy saving levels an individual can receive concentrated light for reading as well as concentrated beam of infrared heating.

Fig. 25A and Fig. 25B shows an embodiment of this invention for use indoors or outdoors the light source arrays are mounted at the end of rods extending from the light fixture housing containing the control equipment. In an example lighting application, the fixture 487 is located over a table in a living room. The rods 488 supporting the light source modules have means for re-positioning either manually or automatically. In a manual system, the user based on the future use of the luminaire, sets up the spatial light distribution to best meet the visual requirements of people within the living space

by re-positioning the rods. In one embodiment, for set up purposes, a red laser pointer is built into each array as was laser 484 in Fig. 24. Alternately, a laser pointer accessory is clipped onto the individual light module to assist in aiming. The user by trial and error using their own eyes as detectors or sensors 489 eventually reaches a functional light distribution with the lighting fixture for that specific installation. In an automatic system when the camera sensor 489 detects a person sitting at the table the automatic servos move the rods 488 so that the light output of many sources is aimed towards the table below producing high intensity task lighting as shown in Fig. 25A. When a room occupant is seated on the couch in the living room and watching TV the lighting fixture structure is changed to the configuration of Fig. 25B which offers general lighting at a lower intensity. The camera vision system will recognize a TV screen and the controller using the program of Fig. 23 will not illuminate light sources shining in the screen's direction that are aimed towards it at angles which would cause glare.

An outdoor FAML 487 equipped with camera vision capabilities for the detection and/or tracking of people, is another embodiment of this invention which has a number of improvements over present area illumination technology. The outdoor lighting fixture 487 is first configured to the geometrical peculiarities of the specific yard where it has been installed and is calibrated with the sensors 489 readings. If the area to be illuminated is rectangular with a narrow distance ahead of the fixture and a wide area of to the sides, the light sources mounted on the moveable arms are moved closer together in y axis while on the x axis the light source are distanced from each other and are at aimings angled higher to cover the extended width on the x axis. To compensate for the larger are the LEDs on the x axis are driven at higher power to cover for the larger area. Conversely for a square area the light sources are distributed evenly so as to illuminate on the intensity level set at the factory as in Fig. 25B. If there is an area where high intensity task lighting is needed the luminaire is configured with multiple light sources coincidentally directed to intensely illuminate that area as in Fig. 25A. The lighting level for security and orientation is usually low and when people arrive on the scene the light level increases. When people are present in the specific area where high intensity is needed for tasks the spot light function is engaged. If infrared lighting is need for the security camera then provision is made to have IR sources aimed at the specific areas of concern.

Fig. 26 is a perspective view of a lighting fixture embodiment 490 capable of producing both a differentiated spatial light intensity distribution as well as a spatially differentiated light spectrum distribution. The luminaire 490 has multiple light source modules 491, 492 and 493 with each module comprised of more than one LED chips which can be powered by the logical controller and control electronics 494 at differentiated power levels. LEDs are arranged in arrays of RGB (substantially red, green and blue color LEDs) or arrays with of any of ROYGBIV LEDs completing white LEDs to produce varieties of white light. The logical controller 494, using algorithms based on

the principles of additive color mixing of light sources to control the change in chromacity affects, via the differentiated powering of coincidently aimed light sources, the production of a unique spectral light distribution having a certain color temperature and/or color rendering index of light. This may be accomplished at once for all light output from the luminaire 490 or any particular aiming 495. The logical controller operates with data storage and program similar to the system shown in Fig. 22 and Fig. 23.

Alternately, to vary the CCT or CRI, in place of an RGB or MCY (substantially magenta, cyan and yellow LED's) or some alternative LED colorimetry system, the luminaire is equipped with different types of phosphor based white light LEDs 491 of different color temperature, where one or the other is used for a specific lighting task. In another embodiment, a monochrome LED can be added to the white LED to adjust its color temperature or rendering shifting its CCT and/or CRI. In addition, the use of shorter wavelength LEDs with nano-dots or quantum dot optics such as those from QD Vision, whose Quantum Light™ optics and films improve the color gamut of LEDs as they absorb some of the cool, blue LED light and efficiently re-emit it as warm, red light. This balances the lighting color spectrum, creating a pleasing incandescent quality light yet at significantly higher efficiency. Thus the fixture 490, in addition to having a controllable non-symmetric light intensity distribution in different directions also has a controlled spectral light distribution in different directions enabling a unique color rendering of one surface and a different color rendering of a second surface.

As an example of the luminaire's benefits and agility to provide correct lighting where it is needed at minimal energy consumption, an embodiment of the invention, a spatially and spectrally adjustable restaurant lighting fixture is presented in Fig. 26. In a restaurant lighting application it would be beneficial for the customer experience if those dining, the food and ambience would all appear at their best. The problem is that even at high CRI, some color temperatures are better than others at making food appear more appetizing to customers than another. As the portions served under a single prior-art lighting fixture vary, some of them will not be shown in their best light. For example, light at 3500K-4100K helps accentuate the textures and colors of fish and white meat while the rosy hue of a 2250K light source will accentuate the color and juices of red meat. Thus it would be beneficial if the light which is illuminating the specific table setting can be varied in accordance with the food being served. The FAML with its capability of delivering spatially differentiated illumination will render each portion in its best light. Using programmed scene recognition algorithms, the luminaire's computer vision system comprised of the camera sensor 496 and logical controller 494 identifies the food on the plate, looks-up in storage the recommended CCT and

powers each of the different colored LED chips aimed thereon at the correct power level in order to provide the optimal color illumination.

In addition the logical controller can determine on its own the preferential color of the illumination based on the reflections off of the food. The controller runs a computer routine where it rapidly varies the light spectrum to preset CCTs and/or CRIs shining on the food on the plate. The camera records the image at each preset and the logical controller 494 compares the image coloring with stored rules of recommended practice for color rendering and determines the best illumination color setting. The controller 494 resets the illumination characteristics until the next change on the table occurs. The recommended practice programmed into the controller is based on IESNA illuminance information or restaurant illumination as described in industry literature such as Successful Restaurant Design by Regina S. Baraban, Joseph F. Durocher John Wiley and Sons, 2001.

The lighting fixture 490 has means to illuminate separate portions at a table comprised of directable or aim-able lighting modules 491etc which are on moveable structural parts 497. The lighting fixture 490 also has computational means of providing the optimal color and intensity of light so as to render people, food, objects in their best light as well as to build a dining room ambience through lighting according to recommended practice or user preferences. The moveable structural bars 497 are manually positionable so as to aim the light sources towards the people, table and surrounding. In a preferred embodiment, the moveable structural parts 497 connected to the light modules are automatically moveable via actuator or servo motors controlled by the logical controller 494.

We have described a system for improving the appearance of the food but the same system applies to making the customer appear at their best. In another fixture embodiment the intensity and chromacity of the lighting illuminating the customer is adjusted manually via input means or automatically via stored algorithms to suit the customer's preferences. The fixture 490 has separately amiable light sources such as LED module 492 to illuminate the food and light source 493 to illuminate the customer. The specific group of light sources for each task may be manually positioned or a camera vision system has algorithmic means to identify and track the position of people and objects and the logical controller has motion control means for re-aiming the light sources towards targeted elements and changing the power level to the LED chips.

In an automated embodiment, controller 494, based on image recognition of images provided by camera sensor 496, moves the powered structural parts 497 to re-aim the light sources on the food, table or those dining as needed. Thus as an example of the unique, differentiated lighting capability of the novel luminaire 490, multiple light sources are used as follows; a number of wide angle light distribution light sources 491 are used to illuminate the table at a low 100 lux illuminance with a

warm 3000K color temperature to build dining ambiance; while narrow beam, spot LED 492 illuminates the fish on the plate at 300 lux and 4000K CCT (in conjunction with ambient lighting LED 491) to help accentuate the textures and colors of the fish; while the light module 493 is aimed at a diner with low enough luminous exitance so as not to cause glare but with a color spectrum that is complementary to that of general lighting module 491 such that it enhances the makeup and skin color of the customer showing them at their best. When the visual task of the customer reading the menu is recognized by the computer vision system, the logical controller 494 can increase the light module 491 output to 300 lux making the reading easier. The controller re-dims the light module 491 when the menu is recognized by the vision system 496 as being put away.

In an integrated restaurant illumination system embodiment, the customer will first try out the lighting in the rest room where they may apply makeup under a FAML luminaire having capability of producing light in a variety of chromacities, which the customer can experiment while viewing themselves in a mirror. The rest-room lighting fixture has a readout or is equipped with communications means, as is the lighting fixture controller 494 with which it is in contact. Having discovered their CCT and/or CRI lighting preference, the customer uses an input means and communications means to set the lighting fixture 490 at the table to the same successful chromacity obtained in the restroom.

In another embodiment a lighting fixture on the wall or floor such as a torchiere or a ceiling mounted fixture serves as a light engine for the entire room replacing a number of lighting fixtures while increasing the efficiency and quality of the lighting. Fig. 27 is a perspective view of a FAML lighting fixture 500 capable of providing both general and task lighting. The fixture body 501 has power conditioning electronics and logical control electronics and has light sources mounted on curvilinear light bars 503 that are configurable. This geometry and configurability enables light source aimings that will provide a substantially homogeneous illumination on a work plane through the room in which it is installed. It will also offer customization of the illumination to the actual geometric and usage peculiarities of the living space where the fixture 500 has been installed. In addition the lighting fixture 500 is equipped with one or more spot lights 504 having a narrow light beam spread which are able to provide high intensity illumination over a small area. As opposed to general area lighting, the spot may provide task lighting. It is a principle of this invention that the fixture 500 provides as much light as is needed in the living space, no less and no more. Thus the LED powering circuitry as shown in Fig. 22 is configured such that each light source covering a different area is capable of being driven at a different power level. The differentiated electronic power supply is configured such that if a homogenous illuminance is required by recommend lighting practice within a living space, the illuminance in the area covered by higher angled light source 505 is at recommended level even if that area is at a greater distance and angle from the luminaire than an

area illuminated by a second light source 502 as dictated by the inverse square cosine law. The adjustable lighting fixture structure is provided with moveable joints 506 which have means for being positioned at specific angles which are relatable to a lighting design software program such as those commercially available to lighting designers. The software can be run on the logical controller 501 or on a remote computer. When the light source module 502 etc light distributions and aimings are input into the lighting design software program along with the room dimensions and surface reflectance's, the illuminance within the room is calculated. The powering of the LED modules is then adjusted via controller electronics 501 to obtain the recommended practice illuminance.

Normally, a light fixture must be placed substantially above the area to be illuminated so as not to produce glare and veiling reflections. For example computer screens are to be protected from light rays at large angles from the nadir to prevent veiling reflections. In addition the illuminance of light rays at large angles from the nadir striking horizontal surfaces decreases as described by the cosine law. In addition, the quality of the lighting is a function of the balance of vertical as well as horizontal lumens illuminating an object. A tennis ball illuminated on top but not on the sides flying at 80 mph will be difficult to see. It is also important to provide illumination from multiple angles to prevent shadows that can be created by single lights. Thus, many lighting fixtures would be needed to illuminate a large room to insure the visual performance and comfort of its inhabitants. In an embodiment of the invention, a single light engine device for a room our outdoor location allows for the light to be generated in one place and then beamed from the concentrated light sources 504 at small angles of divergence to reflectors or refractors which redirect the light to the users in a localized area or to other reflectors so as to go around corners and illuminate areas not in the luminaire's direct line of sight. A single location for the light source simplifies the provision of power to the fixture. A builder doesn't need to run wiring all over the ceiling and not having an outlet box in the right place in a room or lot is no longer a problem. In addition a single location allows for greater investment in an efficient cooling system as well as for the removal of waste heat from an air conditioned environment and reduces installation and fixture costs. It also allows for greater investment in computer vision and logical controller apparatus enabling higher quality lighting at lower energy expenditures.

A necessary prerequisite for this remote lighting technology to be effective is the ability to generate concentrated beams of light with low divergence angles at high beam utilization. That is, 1) that most of the initial light generated gets out of the optical apparatus used to generate the tight beam and 2) most of the light flux is within the narrow beam with minimum spill outside the beam. A commercially available LED product such as the Artavi 10° product from Illumitex offers 90% of the light output in 10 degrees of the beam. The beam efficacy is above 80 lumen per watt proving that it is possible to generate well controlled light distribution patterns with minimal spill light. However,

to reduce the size of the remote reflectors at the mounting heights and distances typically found in rooms, a 5 degree beam spread is even more attractive. Typically 3 meter distances are beyond the coverage of a comfortable cutoff home and office luminaires mounted at 2.7 meter ceiling height. Thus large room lighting needs would not be best met with a single light source due to the visual discomfort due to glare at higher angles of light emission. Therefore, it is highly beneficial to have an efficient manner of moving light in narrow beams of limited divergence over large distances to reduce the cost of lighting installations. LED optics as shown in Fig. 20 including a collimating lens for narrow beam generation are available with a light collection efficiency of >85%. Its function is based on the optical principle of total internal reflection, which contributes to the high efficiency of the optical system. Further measures can be taken to collect the 15% escaping light such as an encompassing reflector system.

Fig. 28 is a perspective view of satellite secondary light source which is a light modifying element capable of redirecting light from primary light sources such as lamps or the sun while not producing light on its own. In this embodiment the light engine 500 is equipped with light sources 504 capable of projecting at an exact aiming 508 high intensity, narrow light beams with minimal beam spread to the distant light modifying elements 510 in the room such that the light rays 511 from the light source 504 that are reflected off of theses surfaces 512 become local light source rays 513 at smaller angles from the nadir (directly down at zero degrees angle) substantially above or behind the user's eyes thus providing comfortable non- glaring lighting. These light direction modifying devices 514, referred to herein as Satellite Light Source, STLS, are reflective surfaces or refractors or combinations thereof or other optical light modifying apparatus. The satellite light sources may be ubiquitous insofar as a reflective decal on the wall or a painted wall or ceiling with sufficient reflectivity will function well as a secondary source. Thus specially installed STLS can work together with room elements of sufficient reflectivity using direct lighting and indirect lighting to achieve lighting goals. The secondary light source may be attached via an extended rod to the luminaire itself or may be a highly reflective large diameter ceiling medallion. The illumination advantages of having secondary light sources are many and include: lighting exits the light source at angles which do not cause glare, the lighting comes from additional directions to that of the luminaire avoiding shadows, and adds light from angles that contribute to the proper mix of vertical and horizontal lumens. In addition there are a number of practical, economic and efficiency advantages.

In a manual system, the fixture's 500 concentrated light sources 504 can be aimed using a laser pointer to aim the light beam 508 to target 519 on the re-directive optical device. This manual method may also be used to initially calibrate an automatic aiming system with preset scenario positions for the concentrated light sources stored into the logical controller 501. In an automated

embodiment, the light engine uses a computer vision capability to identify the whereabouts of persons performing visual tasks in the room. The controller then aims one or more concentrated light sources at the optical device which re-distributes the light locally. The light engine can be equipped with more than one aim-able concentrated light source and can provide more than one user with task lighting. Thus, a ceiling fixture 500 may have light sources providing a general lighting function with light aimed at the ceiling edges to perform an indirect, soffit lighting type of lighting effect, with task lighting performed by the concentrated light source aimed on the task directly from the fixture itself or via a re-directive STLS optical device. In a preferred embodiment an infra-red or visible laser on the concentrated light source assists the automated computer vision system in aiming all the light producing and modifying elements such that maximum light is directed on the visual task in real time. Undetectable infra-red sources may also be included in the light source array make-up so as to assist in computer vision recognition. These non-visible sources may be pulsed to aid in tracking of people, their eyes and objects while not disturbing normal vision.

The light engine 500 of Fig. 27 together with the re-directive optical devices of Fig. 28 can be used to integrate light energy obtained from the sun with the artificial lighting system. That is, where a building has apparatus for the collection of sunlight and its transport via light guides or fibers into the building's interior, the light fixture 500 will serve to distribute the sunlight within the living space. Whereby the light engine 500 has any of: a) optical device for accepting the solar light, b) optical guide paths for conducting the light; c) optical devices for redirecting the path of the light and d) filters for adjusting the amount and spectrum of the light to be used so as to be able to distribute it within to the room to where it is needed. These optical devices and filters include light valves, prisms, controllable piezoelectric light guides, MEMS devices, optical switches and mirrors to redirect or modulate light beams. In addition, the light engine has optical devices which when necessary, can direct the sunlight to the satellite re-directive optical devices deployed around the living space. When light from the sun is no longer sufficient the artificial lighting system powers the light sources to make up for the shortfall. The light engine may be placed on a wall and integrally include the sunlight collection system outdoors with the artificial light generation and distribution system indoors. It would be similar in concept to how a wall air-conditioner system works. The sunlight collection system via the controller would take the need for the lighting into account based on occupancy and environmental conditions. In the summer the system using dichroic or other filter method would remove the infra-red spectrum from the light while in the winter when heating is needed would pass the radiation indoors. The sunlight collection system using controlled re-directive optical devices to capture the sunlight will redirect the light through windows or optical paths to aid in light is required within the room.

Fig. 29 depicts an adjustable luminaire 500 in a lighting application where the user needs for illumination vary with time. The STLS 510 is a specially mounted remote reflective surface, strategically placed in the room so as to illuminate work, living or entertainment stations or alternatively is a wall or ceiling surface with sufficient or modified reflectivity. The re-directive optical devices have an optical design capable of efficiently redirecting the light symmetrically or asymmetrically for the performance of visual tasks such as looking at a computer screen or reading. They have means of attachment 515 to the ceiling, wall or placed on a piece of furniture. The STLS may be of fixed light modification characteristics or have means 516 for moving the reflecting surfaces 512 and selecting between various light distribution patterns. That is, the satellite light source 510 has manual or automatic means 516 for changing its optical performance, say from a spot light to a flood light distribution and/or it has automatic or manual means517 for changing the direction of the satellite's illumination. In addition the outgoing beam 508 from the FAML 500 to the STLS 511 can be modified by the controller 501 via the light source 504 in a way that changes the output luminous flux to the visual task. The outgoing beam spread is varied or its aiming changed to a different area 518 on the STLS with a different light modification characteristic. To change the beam spread of light 508 exiting from light source 504 the logical controller 501 has means to vary the LED chips being powered or the configuration of beam modifying optical device 509. The optical device may be a lens using refraction or a reflector, a combination of both or any other light ray modifying device.

In order to aid in aiming the concentrated light source 504 such as with the laser pointer device described earlier, there is a target area 519 on satellite 510 for use with manual or automated computer vision aiming. In an automated satellite embodiment there is need for electric power to control apparatus used for light beam aiming, sensors and communications. A hook up of control mechanism 517 to electricity from a battery or the mains power supply is provided for in attachment means 515. In an advanced embodiment, satellite light source 510 is powered by photovoltaic cells 520 receiving light energy and converting it to electric energy which may be stored in the movement control apparatus 517. The movement control apparatus 517 also has communications capability with the lighting control system and light engine 500. To obtain better images for scene recognition software or for eye tracking, a camera or sensor 521 is positioned on the satellite light source 510. Thus the STLS can provide high definition images of people and objects within a living space for use with the lighting control system as well as with other home automation or security systems.

In an automated embodiment of this invention the logical controller 501 can communicate with and modify the secondary satellite light source 510 optical performance, say from a spot light to a flood light distribution, via controlled joints 516 or alter the STLS aiming via rotation apparatus 517 to illuminate a different area or object in real time as picked up by the camera 507 and analyzed in

controller 501. As the illumination need in the room changes, the controller 501 sends a light beam with tailored spread, intensity and chromacity to the re-directive STLS optical device or room surface best positioned in the room to provide the optimal lighting. The controller 501 determines the visual task needed to be performed at that moment and chooses the optimal STLS device in the room to send light towards. The controller re-directs light source 504 which is mounted on moveable joint 506 to beam correct intensity and chromacity light flux to that STLS. In instances where an installed STLS device is not correctly positioned to provide lighting at optimal incident angles, the wall or ceiling (if their reflectance and color values are reasonable) can be used. In order to power sensors and actuators on a STLS satellite not connected to the mains power supply, a battery can be used. In a preferred embodiment in place of a cumbersome power mains supply hookup, a photocell or power transducer is mounted on a portion of the STLS. It is used to translate light energy or radiation from the FAML or other energy source to electric power for use by power consuming elements such as sensors, automated motion equipment or communications devices on the STLS.

To further illustrate the capabilities of a multiple light source lighting fixture with differentiated control of the spatial light distribution coupled with a camera sensor system, an example of usage in a home environment is described. As shown in Fig. 29 a man seated on a chair reading a book122 is detected by camera sensor 507 and the vision recognition software recognizes the scene and the logical controller 501 runs algorithms and looks up the recommended lighting level and set up from the data storage as described earlier. The light engine luminaire controller 501 adjusts concentrated light source 504 via joint 506 so that it is aimed at satellite reflector 510 which has been attached to the ceiling or wall. Reflector 510 is positioned and angled relative to the incoming beam 523 such that that the reflected beam 525 illuminates the book 522. The reader now receives illumination to read the book from the rear over his shoulder which is superior to receiving light from the luminaire 500 in front. To corroborate if enough light is being provided for the visual task of reading, the controller 501 uses feedback control methodology obtaining an approximation of the luminance on the book 522 from camera 507. The light intensity of beam 523 can be raised or lowered by logical controller 501 to conform with recommended practice. If the user is unhappy with the lighting system's performance, he signals logical controller 501 audibly or electromagnetically to affect a change and obtain their personally preferred lighting characteristics.

The table lamp 524 next to the man on the chair is another embodiment of this invention and consists of remotely positioned electricity to light energy conversion device 500 which beams light to a STLS mounted on a table atop a post which captures the beam 511 coming from centralized light engine500 and redirects it downwards on the book 522. Thus the controller 501 has the capability to use an alternative path to illuminating the book 522. Instead of from behind and above the reader, it controls adjusting means 506 to redirect light source 504 such that it is aimed at table satellite lamp

524 which illuminate the book from the side. Another alternative illumination method to illuminating the book 522 is controller 501 directing light source 504 to illuminate the reflective wall section 525 proximate to the book 522. The logical controller 501 uses the camera sensor 507 and vision system 501 to check if there are obstacles in the beam path and choose the best illumination scheme at the lowest energy use for getting the visual task done. Most importantly, the user themselves have control access to the wide variety of optional lighting schemes from which to choose the one they prefer. Their preferences are then stored for future instances of the same application in controller 501. The logical controller 501 sensing that the TV 526 is being observed, such as when the TV screen is turned on and the book closed, adjusts luminaire 500 light output in that section of the room to the recommend lighting level and chromacity for TV viewing.

Another room occupant is sitting at the dining room table. She is sipping a cup at the same time as he is watching TV. At the same time logical controller 501 discerns, using scene recognition algorithms, that based on her head position, she is reading a book 527 and not watching the television screen 526. The concentrated light source 528 is aimed by controller 501 to provide direct illumination to perform the visual task of reading the book that she is assumed to be undertaking. If not happy with the lighting level she may command the lighting controller, either audibly or by a gesture picked up by the camera vision system or electromagnetically through a control device, to affect a change.

To further save energy the logical controller 501 receives input from the light sensor 507 that natural lighting from the window 529 is contributing to the illuminance on the book 527. To get an accurate reading of illuminance on the book from the natural lighting source, the logical controller will, for an instantaneous fraction of a second, indiscernible to the human eye, turn off the artificial lighting of luminaire 500. If the natural lighting is not at the required level per correct lighting practice, the controller drives area lighting LED light source 528 as needed to compensate. When the sun changes position, the altered contribution is picked up by the sensor 507 and the intensity of illuminator 504 is adjusted by the controller. Further power saving is obtained due to the differentiated light delivery capacity of the luminaire as well as its differentiated area sensor system. Light sources 502 on the light bar 503 whose aimings are towards surfaces illuminated by the sunlight are reduced in power while those directed at areas in the room far from the window not receiving a significant solar illumination are powered at the usual level.

In another embodiment of this invention, the centralized light engine 500 is adapted for use in an open plan office lighting system. The large office space is divided into cubicles and workstations beneath an acoustic ceiling. The light engine 500 is mounted within the plenum space above the acoustic ceiling in a location central to a number of workstations. It is equipped with a number of high intensity narrow beam light sources 504 which project light to STLS satellite light sources 510

which is a light guide or reflector which redirects the beam through a transparent aperture in the acoustic ceiling to the workstation below. The STLS sensor 507 detects whether an office worker is at the workstation and communicates with controller 501 to power the light source 504 so as to provide lighting at the workstation. The camera sensor 507 relays images to the controller which analyzes the data to determine the visual task being performed and drives the LEDs so as to obtain the correct illumination. When the workstation is vacated, even temporarily, the lighting returns to the low ambient lighting level. More than one STLS can be used per workstation to provide illumination to individual objects, surfaces or other STLS or light guides beneath the acoustic ceiling which can provide illumination under overhanging shelves on work surfaces.

The artificial vision scene recognition system algorithms programmed into the controller 501 are obtained by methodologies known in the art such as using neural network architectures and learning algorithms for pattern recognition, image processing, and computer vision. The remote lighting system that has been disclosed herein, the home example of which has been illustrated in Fig 29 and an office example in the preceding paragraph is a generalized illumination technique for providing distinctive area illumination from a single light engine is a unique teaching of the present invention; whereby a centralized area lighting system is comprised of 1) one or more primary light sources which generate light from electricity capable of directly and indirectly illuminating a living space, 2) differentiated secondary light sources, dispersed over the area that receive light energy from the primary light source and 3) sensors that are in communication with the controller which provide feedback on the illumination, help in aiming the light output from the sources and collect images for identifying visual tasks to aid the controller in directing and regulating the light. The light is sent either directly to the areas to be lit or to the secondary STLS, wall, ceiling, or satellite light sources. The result being that the lighting system provides correct and comfortable lighting for a variety of visual tasks being carried out in different, distinct sections of the area.

Fig 30 is a perspective view of a luminaire with a special night light functionality. In locations such as a bedroom or tent used for security forces, besides the luminaire's standard white-light illumination function, there is need for an additional nightlight function for providing light of different chromacity or wavelength. Thus in an embodiment of the adjustable luminaire of this invention, a number of modes of lighting, varying in light intensity alone or both in intensity and chromacity are provided for by night light luminaire 530. The luminaire is comprised of multiple light sources 531, 532, and 533 of different color spectrum and/or wavelength. The LEDs are powered by electronic power condition gear 534 and logical controller 535 which implements these modes based on programmed times via the light fixture's internal clock as well as by an input device. An optional sensor pack 536 is provided which has a camera array or a light and/or occupancy sensor.

Using light at wavelengths that have different effects in the stimulation of the rods and cones in the eye, it is possible to provide night vision that does not require adaptation time normally required to best see in darkness. In addition it is possible to provide night light vision with light at wavelengths that do not interfere with the production of melatonin, the sleep hormone, by the pineal gland which is sensitive to light. In addition it is possible to provide bright light to increase serotonin levels and aid in waking. There are also instances where one occupant of a room needs to arise while another desires to remain sleeping and not be awakened by the turning on of a disturbing light. Thus it would be preferable for the lighting fixture used in sleeping areas to possess a lower illumination mode which allows for limited visual tasks to be carried out by some, while not intense enough to awaken others. It would also be preferable that the lighting intensity and/or spectrum be unique such that it does not disturb the sleep cycle of others who may be sleeping in the room by avoiding the suppression of melatonin production by the pineal gland.

An application for the use of the luminaire 530 is in permanent or temporary sleeping quarters for military or security personnel. The power conditioning equipment 534 is able to receive power at different voltages from 10 volts to 480 Volts from DC to any frequency any source of power. In a military setting it is important that soldiers exiting the sleeping quarters are able to immediately perform visual tasks in the darkness without waiting for their eye to adapt to the dark. This is because rhodopsin, also known as visual purple, a biological pigment of the retina that is responsible for enabling vision in low-light conditions, immediately photo-bleaches when exposed to light and it takes about 30 minutes to fully regenerate. Thus it would be beneficial for security force personnel who need to move around the living quarters to ready themselves for duty could use light at low levels that would not interfere with the rhodopsin. Thus, when the quarters are occupied only by non-sleeping individuals, the logical controller 535 powers the white light sources 531 at the power level set for high-activity general lighting. When the quarters are occupied by sleeping individuals, the logical controller 535 dims the white light sources 531 and powers the special wavelength light sources 532 and 533 at low intensity.

The special wavelength light sources are chosen as a function of the eye's photoreceptor's sensitivity. The rods (responsible for night vision) are most sensitive at a particular color blue-green (507nm). Thus low lighting by light source 532 at that wavelength would provide the greatest visual response while minimizing energy causing the rhodopsin breakdown. A problem however with scotopic rod vision is that nothing can be seen directly in front of the eyes (no rods in the center of the retina). To see in the extreme dark one must learn to look about 15-20° off center. Not doing so results in the night blind spot which can cause mishaps and physical injury. On the other hand, the center 1.5% of the retina (the fovea) which provides the most detailed vision is packed almost

exclusively with red sensitive cones. Thus to correct for the night blind spot light source 533 producing low levels of red light at a greater than a 650nm wavelength are powered to illuminate. Experimentation shows that red LEDs with a peak around 697nm seem to work best to supplement the low intensity blue-green 505nm wavelength LED 532. Other wavelengths to accomplish the night vision functionality are possible and the two described here are by way of example.

Thus in an embodiment of the luminaire 530 for use where there is immediacy in the performance of low light visual tasks, there is provided an illumination capability with light sources of wavelength which interfere minimally with seeing in the dark. FAML 530 for use in airplane cockpits or living quarters used by security forces in a state of high readiness has a controller 535 and control gear 534 which drives special wavelength light sources 532 and 533 at the above mentioned wavelengths at low intensity. Either of light sources can be present and used independently or most beneficially in unison in the luminaire 530 to facilitate night vision. When maximum dark adaptation is required the red light intensity is set by the controller 535 and monitored by optional light sensor 536 to provide a low luminance of 0.07 - 0.35 cd/m2 (0.02 - 0.10 ft-L). In normal states of readiness the controller employs light sources 531 producing white light general lighting at an illumination level recommend by the IES for normal activities which is dimmed to a night light setting during non-alert low readiness situations. The nighttime low setting is such that the light flux will yield an illuminance of 0.15 lux on the floor with the chromacity of 4000K similar to moonlight.

In an embodiment of the multiple wavelength producing lighting fixture 530 light sources are provided that can be used to aid in the onset of sleep and/or in the onset of awakening. The multiple light source fixture is equipped with control and light source apparatus to illuminate persons or animals with light at wavelengths that are conducive to sleep or awakening. Kayumov et al. showed that light containing only wavelengths greater than 530 nm does not suppress melatonin production even in relatively bright-light conditions. Also Brainard et al in "Evidence for a Novel Circadian Photoreceptor" The Journal of Neuroscience, 15 August 2001 shows that in normal healthy humans, equal photon density exposures of 1.9×10^{18} photons/cm^2 at 460, 630, and 700 nm monochromatic light elicited a significant melatonin suppression at 460 nm while only small reductions of plasma melatonin levels at 630 and 700 nm. Thus the lighting fixture 530 has a general lighting light sources 531 which has radiation at wavelengths that suppress melatonin production and other light sources 532 and/or 533 which are at wavelengths above 570 nm and do not suppress melatonin production. Individuals with difficulty in going to sleep who are aided by increasing the melatonin level can then instruct logical controller 535 to provide only melatonin friendly illumination at the necessary time of day so as not to interfere with their or the children's sleep time. To aid in awakening the controller would illuminate the living space with light sources 531 which have melatonin suppressing wavelengths helping the individual to awaken. Research shows that if the

light is in a particular spectrum (around 460 nanometers, which is in the blue range) greater benefits can be derives even from much dimmer light.

In places where individuals with sleep disorders reside in the hours before going to sleep, it would preferable to have illuminating devices capable of influencing sleep patterns. Thus it may be preferable to use lighting house wide to control sleep times. In a preferred embodiment the lighting fixture in the living room, bedroom or office would aid in the onset of sleep or aid in the onset of awakening with the lighting fixture making use of intensity variation and chromacity. The lighting intensity in the patients surround is controlled with reference to the planned sleep hours to adjust the circadian cycle and/or induce hormones so as to assist sleepers to arise by the use of light that is stimulating.

Fig. 31 is a perspective view of a multiple light source adjustable luminaire with added irradiation functionality. Returning to the geometrically adjustable FAML design with light sources for general lighting on moveable light bars and aim-able spot lighting sources we present an innovative added functionality illumination device. In this embodiment the luminaire 540 has means for limiting at certain times the spectrum of the illumination visible to an individual with difficulty in falling asleep. A fully featured FAML embodiment would be comprised of: a logical controller 541 having means for processing algorithms, data storage, communications and control capability for the task of influencing sleep cycles; power conditioning means 542 for powering controllers, sensors and light sources; standard full spectrum chromacity light sources combined with uniquely driveable light sources 543 that produce light at wavelengths most effective in stimulating or suppressing nocturnal melatonin; and sensors for detecting light and/or images 544. That is, the logical controller 541 can drive LED chips comprising light module 543 that produce a wide range of wavelengths or selectively drive only chips within a permitted wavelength range for some medical, therapeutic or even aesthetic effect. The narrow beam spread, spot light illuminating source 544 also has light producing semiconductor chips of a variety of wavelengths that can be independently powered from driver electronics 542. The light sources 543 and 544 are on movable mounting elements such as light bar 545 and there is the provision of sensors for logical control and feedback in sensor pack 546.

The use of the luminaire to affect sleep cycles is as follows: prior to going to sleep the individual will command controller 541 of the FAML 540 to illuminate their surroundings exclusively using light sources producing wavelengths greater than 530nm. Light sources 543 and 544 of one or more wavelengths above 530 nm may be employed. Utilizing algorithms or stored preset power levels the logical control via the metametric mixing of light source chips in 543 and 544 illuminates the area or visual task with a color close to white light. Thus, the individual will be able to carry out routine

tasks such as watching television in the living room or reading a book in bed. However the pineal gland will be "fooled" into producing melatonin as if the individual was sitting in darkness.

The melatonin friendly white light can be generated for example by using commercially available Osram Golden Dragon Plus LEDs LT, LY and LR W5AM as the light source chips or diodes comprising the light modules 543 and 544 in the FALM bedroom luminaire 540. When powered by driver 542 at 20 Watts at approximately 350mA, about 1,200 lumen of very warm white 1200K Color Coordinated Temperature, CCT, light can be produced using the following mix: 156 lumen of 528 nm higher wavelength green light mixed with 400 lumen of 590 nm yellow and 640 lumen of 625nm red. This mix yields a good color rendering index, CRI of 80 while still allowing for melatonin production. Alternately a single monochromatic LED above 530 nm could be powered but vision and comfort would be compromised. The same luminaire 540 in a second operating mode, that is not required to stimulate melatonin production, can at the same wattage produce a cooler color temperature light. This is achieved by powering blue light source diodes in addition to the previous mix while having the logical controller 541 adjust the power level of each LED chip. For example with the addition of two watts or 48 lumen of 470nm blue LEDs (e.g. Osram LB W5AM) a 4250 Kelvin CCT daylight white light can be produced using 600 lumen of 528nm green light mixed with 500 lumen of 590 nm yellow and a mere 100 lumen of 625nm red yielding a good color rendering CRI of 82.

In another embodiment, the same fixture 540 is used for the standard lighting in the bedroom in a normal high output operating mode. Thus by powering more light sources still at approximately 350mA a higher lighting level and whiter chromacity is achieved. For example doubling the power to 40 Watts with the addition of four watts or 100 lumen of 470nm Blue LEDs (e.g. Osram LB W5AM) a 3800 Kelvin CCT cool white light can be produced using 500 lumen of 528 nm green light mixed with 400 lumen of 590 nm yellow and 150 lumen of 625nm red yielding a good color rendering CRI of 82. A similar effect can be achieved without increasing the number of light sources but instead increasing the current to each LED. This usually however results in shortening of the LEDs useful lifespan. Using a controller 541 and power source 542 capable of powering each LED individually a full range of dimming to very low light levels can be achieved. In a alternative methodology of using different wavelength LEDs for generating melatonin friendly light, a white LED or any other wide spectrum light source could be used with the manual or automatic introduction of a light filter to remove wavelengths lower than 530nm as needed.

Thus the same bedroom fixture 540 can serve as a night light obviating the need for an additional night light lighting unit in the same room. Again, the night light mode has special chromacity to allow visual tasks to be performed yet with minimal interference to sleep as described above in Fig.

30. Utilizing the non-symmetric light distribution capability of the FAML when in night light mode, higher intensity lighting for orientation could be provided in areas of movement around the bed or on the way to the bathroom while zero or only very low intensity night lighting would fall near the head of the sleeping person. The fixture 540 is illustrated as having been hung on the ceiling of a bedroom above the beds for two occupants with the spot lights 544 facing the wall above the head of the beds. In the spirit of the adjustable luminaire of the present invention, the light bars 545 holding the light modules 543 have been swung out of direct view of an individual lying on the bed with their eyes facing upwards to the ceiling. The flexibility of the invention is again demonstrated insofar as this re-configuration ability is unique to the multiple light source lighting fixture making it a truly universal lighting fixture. In this unusual case of the eyes facing upwards, indirect lighting via the ceiling becomes the recommended lighting practice alternative of choice, especially if the TV is mounted high off the floor.

In another embodiment, the FAML bedroom luminaire 540 is equipped with a camera 546 and the logical controller has means for image recognition and computer vision. Thus now as opposed to a standard night light which is always on, the innovative night light 540 using computer vision analysis could be highly dimmed or off most of the time making it easier to sleep and saving power. It would be reactivated when there is major movement on the part of the sleeper indicative of the need for illumination or a baby crying is picked up by microphone in sensor pack 546 in anticipation of light being needed by the parent awakening to care for the child. Greater movement such as getting out of bed would further increase light levels for proper orientation and object avoidance.

As a further customization of the illumination characteristics, when utilizing the light source aim-ability feature of the FALM, one occupant of the room could receive controlled exposure to lighting conducive to melatonin production while other occupants in the room at the same time receive a normal, fuller spectrum illumination. Thus the right side spot light 544 could be of melatonin friendly light wavelengths for the individual receiving its light while a second individual in the second bed receives a full spectrum of light for reading from the left side spot light 549.

In addition to using light of specific wavelength for treatment of sleep disorders and other circadian rhythm disorders such as delayed sleep phase syndrome, light therapy or phototherapy can be used for the treatment of vitamin D deficiency, skin disorders (for example psoriasis, acne vulgaris and eczema, and some psychiatric disorders for example seasonal affective disorder. As described earlier the spot light source 544 can be moved by actuators under the control of the logical controller 541 much as a moving head stage light follows actors on the stage. This is a unique feature of a computer/machine vision capable FAML irradiating device which can follow and irradiate the patient while they are carrying out their daily activities and is of major benefit. To ensure that the

light therapy rays from the FAML strikes the retina from the best angle, a portable STLS may be placed on the floor or furniture in front of the patients eyes. In instances where the FAML is providing UVB radiation such as in vitamin D therapy and high intensity UVB is hazardous to the eyes, the computer vision system would make sure to stop radiation unless it knew that the eyes were not being irradiated. Other medical applications of light therapy also include pain management, accelerated wound healing, hair growth, improvement in blood properties and blood circulation, and sinus-related diseases and disorders. Many of these use low level laser therapy and red light therapy in the 620–660 nm range.

In an embodiment of the therapeutic luminaire 540 having radiation sources controlled by a logical controller using computer image recognition algorithms that enable face recognition the device is capable of providing the correct dosage to an individual. For example curing SAD winter depression caused by serotonin deficiency by treatment with bright light therapy the luminaire's logical controller 541 will measure the individual patient's exposure time ensuring that it complies with the medically prescribed dosage to preserve serotonin levels for that time of year. In an embodiment where the computer vision system 546 has capability for eye recognition and tracking, a more accurate dosage intensity and exposure time is metered. The dosage analysis is based on either computer knowledge that the eye is exposed by actually measuring the radiation reflection off the eye which may include a daylight component in addition to the artificial luminaire component. Thus a more accurate therapy record may be obtained and reported to a monitoring computer or health practitioner if necessary. If a satellite light re-directive STLS device is positioned fore of the patient, a specular mirror section is provided on the STLS and may be used by the camera imaging system to capture the eye or reflections off of the eye and verify the dosage received. Non-disturbing infra-red radiation may be used by the transducer sensor system 546 to capture and measure the eye reflections for imaging and dosage measurement purposes. Using eye-tracking algorithms the controller logs all the time the eyes have received the therapeutic radiation dosage and adjust the treatment accordingly. Having communications apparatus the controller conveys the treatment history to medical care supervisory personnel.

Another embodiment of the luminaire assists people to awaken at any hour by irradiating them with shorter wavelengths of light or safe UV, which suppress melatonin production. A FAML 540 is provided with: a logical controller 541 having algorithms and data for the task of influencing sleep cycles and with light sources that produce light at wavelengths most effective in suppressing nocturnal melatonin. It then uses a time and intensity controlled exposure to illuminate the person or animal at a prescribed interval time in advance of the wake time. Decreases in melatonin production in human and animals are known to be caused by environmental lighting, especially short-wavelength lighting (between 460 and 525 nm). Test results strengthen earlier findings that the

human circadian system is more sensitive to the short wavelengths of light than the longer wavelengths. It is principally blue light, around 460 to 480nm, that suppresses melatonin, increasingly with increased light intensity and length of exposure (Wirz-Justice, A; Benedetti, F; Terman, M (2009). Chronotherapeutics for Affective Disorders: A Clinician's Manual for Light and Wake Therapy. Basel: Karger. ISBN 978-3-8055-9120-1. It is also possible to use violet colored LED to which the visual response is low such as a 420 nm wavelength. The disturbance to sleeping individuals may be lower, however, though studies demonstrated a clear fluence-response relationship between 420-nm light and melatonin suppression the response is weaker.

Thus a person sleeping in their bed could program the lighting fixture controller 541 to begin irradiation with the melatonin suppressing wavelength LEDs in advance of the wake up time as required. Again, with the light aiming differentiation capability of the FALM 540, two people in the same room with different wake-up times could receive different dosage at different times as programmed into the controller. One person could be irradiated with melatonin producing radiation or none at all while the other receives melatonin suppressing irradiation. Alarm clock functionality can be added to the logical controller 541 of the bedroom illuminating device and/or an additional device 547 is provided. It will use lighting and/or sound from alarm speakers 547 to awaken the individual when wake time finally arrives. Voice commands can be used to program and turn off the alarm clock. To ensure the user is really awake the alarm clock can ask the user to solve a mathematical equation before stopping the alarm.

In another embodiment example of a bedroom application (a living room or kitchen lighting application would be much the same), the FAML 540 is located on the ceiling near the room center. It uses distributed light sources 543 or optical means over a single light source to provide for homogeneous ambient lighting and concentrated light sources 544 or optics to create a narrow beam for task lighting. The concentrated sources 544 and 549 may be used to provide illumination for the visual task of reading a book thus replacing the night-table lamps. It is preferable that the beam not come from above and in front of the reader lying in bed as the rays from above will disturb reader. Also one occupant of the room may desire to sleep while the other is reading. Thus a re-directive satellite light source STLS is placed directly behind or off to a side and behind the reader. The STLS has a substantially specular reflectivity rather than a diffuse one so as to maintain a concentrated spot beam with little spill light beyond the book. Of course the book itself is a Lambertian reflector but the maximum has been done to minimize disturbing others. The FAML 540 configuration can be adjusted upon installation to have the narrow beam spot light aimed at the STLS. The STLS itself may be manually adjusted by the user to best direct the light for the visual task at hand such as reading a book in bed. The user will keep the laser pointer on the target disc while swiveling the STLS until the book receives the maximum light. This is similar to adjusting the shade of the table

lamp which it replaces. When properly aligned there is very little spill light and the other occupant of the room can sleep undisturbed. In an embodiment having a computer vision enabled luminaire capable of determining the book position, the controller 541 will automatically re-direct the light beam 548 from the movable light source 544 and/or re-aim the movable STLS so as to maximize illumination effectiveness. Alternatively, the wall or surface behind the bed or the headboard has sufficiently good optical characteristic enabling light from the beam to be used or has had a specially reflective decal placed on it. In a computer vision enabled embodiment the logical controller 541 is programmed such that when the reader puts the book away the light goes out or slowly dims into the night light mode.

It has been demonstrated that a single bedroom luminaire 540 can replace two other typical bedroom lighting fixtures. The night-table lamp and the nightlight. In addition, by using the directional light output capability of the FAML fixture, this spectrally accurate lighting may be further limited in its illumination coverage to bedroom areas where movement is possible, thus not shining towards a sleeping person's eyes. Using machine vision techniques for image recognition, the position of those sleeping and those up and awake is determined. In addition computer vision allows for automatic tracking spot lighting similar in function to how a moving head stage light for stage performers follows them about the stage. All this can be carried out by the automated lighting fixture 540 where the light sources are moved by the controller so as to illuminate only the person awake in the room. The trajectory of the light beam is checked by the controller such that the light beam does not fall on the head of anyone else sleeping in the room.

Fig. 32 is a perspective view of an industrial lighting fixture for use in hazardous locations. These are locations that are characterized by the presence of combustible gasses or dust particles. So that the explosion proof lighting fixture 550 can to obtain ExProof certification for use in hazardous locations, it is constructed in a unique manner which prevents ignition of the gases or dusts by electricity or heat produced by the fixture. The intrinsic safety protection techniques used in its construction enable safe operation in explosive atmospheres and ensure that the available electrical and thermal energy in the system is always low enough that ignition of the hazardous atmosphere cannot occur. The intrinsic safety of the illuminating device 550 includes the control of component temperatures even in fault conditions (such as an internal short inside an electronic device). The electrical control gear 551, logical controller 552 and LED light sources 553 are all thermally protected. The temperature of a failed component will not rise to a level higher than the autoignition temperature of a combustible atmosphere. Current limiting safeguards, such resistors and fuses, are employed in the electronic circuitry throughout to ensure that in no circumstance can a component reach a hazardous temperature.

To a major extent the fixture is intrinsically safe as it is hermetically sealed for life. This is accomplished because the LEDs 553 are driven at or below design currents as well as having the junction being thermally cooled to well below allowable temperatures due to lifetime and explosion proof certification considerations. Note that in prior art ExProof fixtures the lamp needs to be replaced and therefore allowance was made in fixture design for opening the fixture to replace the lamp. Under these low current cool operation conditions the LEDS will provide 90% of their initial lumen output even after 100,000 hours or over 20 years of night operation. This in turn allows for a design where the LEDs are encapsulated for life in resin type materials 554. There is no possible contact with explosive materials between electrical or heat generating components. Thus in this novel hazardous location fixture design, the LEDs, electronics and electrical components are intrinsically safe in a sealed for life fixture. This is an inherent safety design and allows for the fixture to be located even in the most hazardous locations including underground mines or inside of tanks i.e. division 1 and zone 0 classified hazardous areas. In an embodiment of the fixture there are no screws to open for access to the internal fixture parts other than on the wiring box 555 which connects the Exproof fixture to the power mains. The wiring box itself is approved for zone 0 hazardous locations and has explosion proof sealing apparatus. While prior art fixtures that can be opened for service may not be properly closed by service personnel thus becoming an explosion hazard this sealed fixture is foolproof in that there is no access for life.

Referring now to the adjustable lighting fixture embodiment in more detail, in Fig. 32 there is shown an illuminating or irradiating device 550 which is capable of being adjusted to match the radiation spatial distribution with the actual illuminating requirements of the surround where the lighting fixture 550 has been installed. The light sources 553 are mounted on curvilinear support structures 556. The rear side 557 of the support structure (or light bar) 556 is a heat exchanger structure of increased surface area for the transfer of heat from the LED junctions to the surrounding air. The front surface material 558 of the support structure is highly transmissive to light allowing the light generated by the light sources 553 to exit the luminaire. These curvilinear support structures 556 possess a unique geometry and thermal transfer characteristic and are innovative in a number a ways. The luminaire is comprised a multiplicity of light sources having respective spectral distributions and respective light distribution patterns which are directional and subtend lesser angles than those of the overall luminaire light distribution pattern. The light source mounting structure556 is configured to mount the light sources 553 so arranged on the structure such that the respective directional light distribution patterns and the respective spectral distributions combine to form an efficiently distributed overall light distribution pattern. This overall light distribution has been calculated to efficiently provide the surface areas intended for illumination by the fixture 550 with the design illuminance. In this unique configuration the overall light distribution pattern, subtending greater

angles than that of the respective light distribution patterns is produced directly by the multiplicity of light sources without recourse to inefficient non-integral reflectors and/or refractors.

As the overall spatial light distribution of luminaire 550 is comprised of the sum of the narrower beam light sources 553, each light source covers a specific area proximate to the luminaire. The aiming angles of the sources of known light flux and beam angle are determined by using the inverse cosine law to determine the amount of light flux required to illuminate the surfaces to be covered by the luminaire. Once the aiming angle with reference to the nadir is known there is yet another design criterion that needs to be met. There is great importance in maintaining the light emitting diode junction at low temperature. To remove the heat from the junction it is important for the LED assembly 553 to have excellent thermal contact with the heat sink 557 at every aiming angle. Thus the construction of the support structure has been dictated by the individual light source aimings that are designed to illuminate both near and distant surfaces with the recommended illuminance. In addition, the rear side of the support structure556 which is exposed to the outside air is integral with the heat sink 557 which is most beneficially in direct contact with the LED junction to maximize thermal transfer away from the diode structure to the environment. Uniquely both of the design requirements have been met by the unique construction of the support arm 556. The final benefit of the unique curvilinear light bar is the strength it imparts to the structure. In an embodiment the shock proof glass lens 558 is slightly recessed within the light bar channel 556 allowing for the edge 559 to act as a protective bumper protecting the glass from breakage even if impacted by a metal tool. Often explosion proof glass globes are protected by a guard. The curved metal guards protect the glass from mechanical breakage in the harsh industrial setting. The shape of the bars 556 and the recessed glass cover maintains this protective design approach to effect shielding from mechanical breakage.

An exemplary embodiment of the adjustable explosion proof fixture in a chemical processing plant characterized by an open facility design is presented. In the facility, piping and vessels are supported by the skeletal support structure with walkways, floors and stairs made of metal grating. The walkways, vessels, machinery and piping all need to be illuminated at night by lighting fixtures placed on the structure along the walkways. In this lighting application example the walkways are at the exterior edge of the structure with the piping and machinery towards the interior. Beyond the walkway fence there is no structure and no need for illumination. The configuration of the lighting fixture as shown in Fig. 32 has been arranged so as to illuminate inwards towards the vessels, machinery and piping as well as along the walkways and stairs but not outward into free space. The luminaire has been mounted on an upright beam at height of 3 meters at the inward edge of the 1.5 meter wide walkway. The LED bar 560 is rotated 15 degrees off the nadir out of the page around the axis 561 to be aimed at the center of the walkway and the LED 553 beam spread is 30 degrees. LED

562, because it is projecting to the work plane further away at a higher angle from the nadir, will, following the inverse square and cosine law, have a narrower beam spread (at least along the width of the walkway i.e. the beam 564 may be rectangular or elliptical, taller than it is wide) ensuring that most of the light is utilized and not spilled over the edges of the walkway. The light bars 556 and 563 have mechanical means to be rotated 360 degrees about the center 565 and have been aimed to the same side, inwards to the facility. Thus they illuminate the piping and machinery and do not shine out of the facility wasting the energy or even causing light pollution as would a standard prior art luminaire. Now in their new configuration, the light intensity output of each LED must be reset in the driving electronics 551 and controller 552 so as take into account overlapping coverage on surfaces to be maintained at the recommended illuminance.

In a preferred embodiment a sensor apparatus 566 is capable of measuring the illuminance of surfaces in the processing facility and providing the logical controller 552 the necessary feedback information to control the power to the light sources 553 etc so that the illuminance goals are met. Alternately, if the light bars have been incorrectly configured in aimings that do not allow for coherent illumination of the surfaces, the controller communicates the necessary aiming modification to the installer. An example of the logical controller 552 circuitry, computing apparatus and algorithm processing were described above in Fig. 22 and 23. In an embodiment where sensor 566 is a digital camera and the logical controller 552 has means for computer vision, an installer can use reference sheets of known reflectivity and luminance to calibrate the illumination level setting of the individual light sources within the logical controller 552 based on the fixtures initial factory calibration data. For example, when setting up the system the installer can customize the illuminance level on each element of interest. The system calibrates light coverage by firing LEDs at synchronized timings with the vision analysis system 552 determining which LED illuminates what surface. Next the installer can input the desired illuminance via the reference sheet by indicating on it the number of lux desired on the surface. For example attaching a note with 200 lux printed on it on a valve. The image recognition software then provides the logical controller the illuminance goal of 200 lux on that surface and the logical controller 552 powers the light sources 553 etc aimed towards that surface with the necessary power signal to obtain the needed light flux. Feedback is provided to the installer if additional light sources are needed or their re-aiming is required. Information is provided to the installer through visual display on the logical controller 552 of the luminaire or another display device in communication with the logical controller 552.

In another embodiment the cooling of the harsh environment luminaire 550 is effected by using liquid cooling of the LED light sources. The coolant may be anything from deionized water (approximately 18.2 megohm-cm) to heat-conductive oil. The oil may be part of the methodology used to secure intrinsic safety classification from ignition danger of electrical circuits in explosive

environments. It may also be an optically transmissive medium which couples optically with the light sources to produce a desired light distribution with other complementary optical devices. The oil may be pumped mechanically with a pumping apparatus such as a long life diaphragm pump to cool the diode junction. Alternately, in a preferred embodiment shown here, thermo siphon effect circulation is utilized to convect the thermal transfer fluid from the light bars 560, 556 and 563 to the central heat exchanger 568. The thermo siphon return post 567 serves as the path for the cooled lower density cooling fluid to return to the light bars 560, 556 and 563 from the heat exchanger 568. The benefit of the thermo siphon system is that it is motor less, doesn't require power and is highly reliable. It also adds longevity and efficiency to the LED light sources by offering superior heat transfer rates maintaining the diode junctions at the lowest possible temperature.

Fig. 33 is the process flow chart for novel web based computer application that can help the customer design the multiple light source luminaire for their particular lighting application and order it compete correctly configured from the factory. Alternately, in a DIY luminaire version, they can receive all the necessary luminaire parts with their unique set of assembly instructions for their lighting application. The build-the luminaire-to-order program turns the customer into a professional luminaire and lighting designer. In creating the tailor made luminaire the customer, aka lighting fixture designer, has control of illumination performance based on the skeletal light engine design as well as a choice of various aesthetic luminaire outer body designs. The program is novel insofar as it builds the lighting fixture from multiple light sources according to the dictates of the living space. Prior art practice used hitherto in other lighting programs take standard lighting fixtures with known photometric data as to the light distribution and calculates the resultant illuminance obtained on the workplace or room surfaces. Here the process begins with specifying a surface illuminance and using goal solving techniques, the application builds the fixture's light distribution. Next, in a unique process, the computer application using engineering and look-up table algorithms chooses light sources and places them on the fixture to obtain the desired light distribution.

In practice the customer inputs the lighting application geometry, fixture mounting position, living space elements and projected usage answering a live questionnaire. Digital camera pictures of the living space uploaded to the site may aid the program in generating the architectural CAD lighting layout. The customer assigns visual task information to areas of the room, e.g. reading chair, adult over 50 years old etc. The layout process ends with a map of the room surfaces now assigned with illuminance levels. The program assigns a specific orientation of the luminaire within the living space e.g. fixture orientation mark facing east window. The luminaire in practice must be hung in the room in the instructed orientation. A preliminary grid is assigned to the room surfaces based on the distances from the luminaire to the surface and the light intensity limits of the light sources. By using the inverse square and cosine law with known illuminance, distances and angles the program

solves for the luminous intensity. By working a luminaire design program such as Photopia™ from LTI Optics in reverse, the light source ray distribution properties are obtained. The program then looks up in the light source library the light source with the best matching spatial intensity distribution for illuminating the specific grid area. The design program then arranges the selected light sources on a fixture skeleton structure to obtain the overall necessary illumination. The web application next simulates the fixture performance through lighting design software applications known in the art such as AGI32™ from Lighting Analysts. The computer routine checks the lighting layout against best practice guidelines for visual comfort from glare, lighting levels and recommends need for additional light modules, luminaires or reflective satellite light sources. The customer can review the simulated lighting output in their application and after a few fine tuning iterations a final design can be satisfactorily achieved. Now that the fixture skeleton and light source positions thereon are known, the customer then chooses from the available candidates of aesthetic luminaire outer façade choices that can be used with the dictated skeletal structure. The final fixture outer design and lighting performance is simulated. Should the customer be unhappy with the aesthetics or performance they may begin again with the option of forcing an aesthetic design which may dictate a less than optimal skeletal structure. When satisfied, the customer orders the luminaire to be assembled by the manufacturer to spec. In the DIY version the web application generates the fixture parts list for the kit to be sent to the customer. It is clear that the application is not only web based but can be a downloadable version run from a computer.

In another version of this Do-It-Yourself lighting designer application, the main skeleton lighting fixture with the power supply electronics and the camera based vision system and controller is supplied to the customer. The camera vision system measures the room geometry and identifies room contents as described earlier via algorithms known in the art for measuring distances with a camera and pattern recognition techniques for identification. Based on the information garnered about the lighting application such as by following a computerized lighting application design questionnaire and checklist (activities performed in the room, age of the occupants etc), the lighting layout is specified and the lighting fixture design with the light source layout is determined using the lighting design software. The answers to the question are input via a speaker microphone system on the lighting fixture or via come other input device such as a computer or smart-phone in communication with the controller. Once the illumination needs have been determined and the fixture designed the rest of the light sources are ordered up and the DIY fixture similar to 470 in Fig. 24 is assembled

While the preferred embodiment of this invention comprises an adjustable luminaire having means for changing the spatial light distribution as well as the spectral light distribution, it is clear that embodiments of this invention may offer only the spatial light output distribution adjustability as for

example when using a single color spectrum LED for all the light sources or only color spectrum adjustability where spectrally differentiated light sources have been used but there is no means for adjusting the spatial light distribution. Many of the novel features of this invention disclosed herein in this continuation in part of the earlier disclosure of the Multiple light illuminating system included herein by reference apply to the lighting fixture embodiments of that disclosure as well.

CONCLUSION

We have been disclosed a luminaire with control of at least one of the light intensity, light spectrum and light direction and that further being combined with a controller and directional sensors such as a camera having an artificial vision system capability is uniquely able to effect the provision of lighting on an as needed basis in the optimal intensity, spectrum and placement.

There has thus been shown and described, among other things, a multiple-source lighting technology which allows for the design and construction of illuminating devices. Many changes, modifications, variations and other uses and applications of the subject invention will, however, become apparent to those skilled in the art after considering this specification and the accompanying drawings which disclose the preferred embodiments thereof. All such changes, modifications, variations and other uses and applications which do not depart from the spirit and scope of the invention are deemed to be covered by the invention without departing from the spirit or scope of the following claims.

Although a limited number of preferred embodiments of the present invention have been illustrated in the accompanying drawings and described in the foregoing detailed description, it is possible mix and combine the features of one embodiment with another to create a DLF with differing characteristics as taught in the method herein. Therefore, it will be understood that the invention is not limited to the embodiments disclosed, but is capable of numerous rearrangements, modifications, and substitutions without departing from the spirit of the invention as set forth and defined by the following claims. The invention should therefore not be limited by the above described embodiment, method, and examples, but by all embodiments and methods within the scope and spirit of the invention.

ABSTRACT OF DISCLOSURE

ABSTRACT: An illuminating device coupled with sensors or an image acquisition device and a logical controller allows illumination intensity and spectrum to be varied according to changing user needs. The system provides illumination to areas according to the principles of correct lighting practice for the optimal performance of visual tasks in the most efficient, cost effective manner. Aspects of the invention include: lighting fixtures which adapt to ambient lighting, movement, visual tasks being performed, and environmental and personal conditions affecting illumination requirements at any given instant. Lighting fixtures having spatial distribution of spectrum and intensity, providing both "background" room lighting, and "task" lighting.

WHAT IS CLAIMED IS:

1. An illuminating device which produces light to meet an illumination requirement of an illuminated area, comprising:

a light fixture including a multiplicity of directional light sources including at least two light sources pointing in different directions, the light sources having at least one of controllable light intensity and spectral light distribution;

a controller for adjusting at least one of a light intensity and light spectrum of the directional light sources;

one or more detectors for sensing at least one of objects, surfaces and people within the illuminated area and of passing the sensed information to the controller;

a processor for processing the sensed information and determining illumination requirements of the at least one of objects and people using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables and for directing the controller to adjust the directional light sources to meet the illumination requirement.

2. The illuminating device of claim 1 where the detector is comprising at least one of (i) a camera being a photo sensor array coupled with an optical lens, (ii) a photo sensor, (iii) an ultrasound transducer and sensor, (iv) microwave transducer and sensor, and (v) pyroelectric detectors.

3. The illumination device of claim 1, wherein the illuminated area is indoors and further comprising a detector for detecting variable illumination from daylight and/or sunlight entering indoors, wherein the controller taking into consideration the area now illuminated by the daylight and/or sunlight adjusts the light intensity of the directional light sources to meet the varied illumination requirement.

4. The illuminating device of claim 1, wherein the one or more detectors detects information regarding one or more individuals within the illuminated area, said information is at least one of (i)age, (ii) sex, and (iii) recognition of an individual for matching with stored data about that individual's needs and wherein the controller adjusts the light intensity and/or spectrum of the illumination provided to the one or more individuals based on illumination requirements from at least one of (i) best practices looked up and calculated from stored data, (ii) age and/or sex of the individual, (iii) personal preferences input to the controller and stored in memory, and (iv) commands received by the controller from an input device.

5. The illuminating device of claim 1 for optimally displaying food, wherein the one or more detectors detect an identity of one or more foods and wherein the controller adjusts the light intensity

and/or spectrum of the illumination on the one or more foods based on illumination requirements from the processor.

6. An illuminating device having automatic control of the light provided to an illuminated area comprising:

a structure for incorporating illuminating device elements;

one or more light sources incorporated in the structure and in communication with a power source;

electronic circuitry apparatus for the controlled powering of the light source and other illuminating device elements;

one or more cameras placed on the structure for detecting information about the illuminated area, said camera in communication with power and control device elements;

a controller integrated with the structure, in communication with the light source controlling power circuitry, said controller arranged to processes the information communicated from the camera and automatically control the light provided to the illuminated area.

7. The illumination device of claim 6, wherein the one or more detectors are configured to sense a presence of glare on a person's eyes in the illuminated area, and wherein the controller is programmed to adjust an intensity of the directional light sources to reduce the glare.

8. An illuminating device which provides light to meet an illumination requirement of an illuminated area in which visual activities are performed, comprising:

a light fixture including a multiplicity of directional light sources including at least two directional light sources pointing in different directions, the light fixture having movable structure for aiming the directional light sources mounted thereon in a defined direction;

a camera for obtaining images of the illuminated area functioning as a detector for at least one of (i) a light detector (ii) a spectrum detector, (iii) a motion detector, (iv) a measuring detector for sensing a geometry of the illuminated area, and (v) a detector for sensing at least one of work surfaces and road objects and at least one of vehicles and people;

a controller for adjusting a light intensity and a direction of each of the directional light sources;

a processor with stored algorithms and data for identifying at least one of (i) tasks being carried out by people, (ii) location of people, (iii) frequency of area usage by people, (iv) traffic density in the illuminated area from the sensed geometry, (v) work surfaces, (vi) road objects, people and/or vehicles, and (vii) roadway surface luminance any of which is used by said processor for determining illumination within the illuminated area using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables wherein said processer, upon calculating the

required illumination parameters, directs the controller to adjust the directional light sources to meet the illumination requirements of the visual activities.

9. The illuminating device of claim 8, further comprising the illumination requirement that different parts of the illuminated area to be illuminated at a different intensity and/or at a different spectrum than another part of the illuminated area.

10. The illuminating device of claim 8, adjustable by an installer based on room geometry and/or usage further comprising the light fixture having adjustable arms on which directional light sources are mounted for aiming the directional light sources within the illuminated area, where said detector and processor combination provides feedback to the installer so as to aim the light sources such that the illumination requirements can be met by the re-adjusted light source aimings.

11. The illumination device of claim 8, wherein the controller receives real time information from the camera and wherein the processor, using image recognition capability, directs the controller to adjust at least one of (i) the intensity, (ii) the spectral light distribution and, (iii) the direction of the light sources based on at least one of (i) where people requiring illumination are located, (ii)what object the person is viewing and (iii) what visual task the person needs to perform.

12. The illumination device of claim 8, further comprising at least one of the directional light sources mounted on the movable structure where the movement of the light source direction is automatically controlled by the controller.

13. The illumination device of claim 12, providing a different illumination to a sub-area based on usage wherein the controller interpreting images from the camera adjusts the moveable light sources such that they provide the required illumination in a sub-area proximate to the individuals as they move around in the illuminated area.

14. The illumination device of claim 8, wherein the illuminated area is a road and the objects include road signs.

15. The illumination device of claim 8, further comprising at least one of the directional light sources on an automatic swivel joint and providing spot lights of limited beam angle for task lighting while other light source provide general illumination to the illuminated area.

16. The illumination device of claim 8, further comprising a controller with communication capability to other devices, where the camera in one location obtains information and the controller process the information a communicates the camera obtained information to a second device.

17. The illumination device of claim 16, where the illuminated area is a road and the second device to where the camera obtained information is communicated to is a lighting fixture.

18. The illumination device of claim 17, where the processor uses information obtained from the cameras and exchanged between fixtures for identifying traffic requirements in the illuminated area and from the vehicles locations and geometry determining the illumination requirements of the illumination area thereby directing the controller to adjust the directional light sources to meet the illumination requirements.

19. The illumination device of claim 18, wherein the controller is programmed to adjust at least one of (i) increase illumination with an approach of a vehicle, and (ii) change beam cut-off levels as the vehicle advances toward the lighting fixture to eliminate glare.

20. An automated irradiating device for providing radiation to individuals within an area intended to provide a desired radiation in a sub-area proximate to the individuals, comprising:

an irradiation fixture including one or more directional radiation sources where the radiation is in a defined direction;

at least one detector for sensing a location of individuals in the area and feeding that information to a controller;

a controller for adjusting at least one of (i) a radiation intensity, and (ii) a direction of the irradiation based on sensed location,

whereby the desired radiation is provided proximate to individuals in the area.

21. The automated irradiating device of claim 20 intended to provide a desired heating to one or more individuals in an area, further comprising:

at least two directional heat radiation sources pointing in different directions;

the detector being a camera with capability for sensing at least one of (i) a presence of one or more individuals in the heated area, (ii) the identity of the individuals, and (iii) a body temperature of individuals present in the heated area;

the controller further having processing capability for determining the heating requirements of the individuals in the area from at least one of (i) algorithms to calculate radiation parameters, (ii) stored data of heating practices, (iii) image recognition algorithms for identifying the individual based on the camera information, and (iv) an identified individual's personal preferences.

22. The automated irradiating device of claim 20, further comprising:

One or more directional radiation sources capable of being moved so as to direct radiation in a defined direction;

the at least one detector capable of providing information on the present location of individuals in the area;

the controller programmed to process the detector information and move the radiating sources so as to follow the one or more individuals,

whereby the desired radiation is provided in a sub-area substantially proximate to the individuals.

23. The irradiation device of claim 21, further comprising;

the detector being a camera capable of providing images of different parts of the body of individuals to the controller for image processing;

the radiation sources being able to direct radiation to different parts of the body; and

the controller further programmed to run the image recognition algorithms to identify different parts of the body, to compute the desired radiation level to the different parts of the body and to adjust the radiation from sources directed at the different parts of the body.

24. The irradiation device of claim 21, further comprising the controller programmed to control the irradiation in time and intensity on the individual to maintain comfortable heating based on at least one of (i) best practices, (ii) feedback from the heat detector configured to detect body temperature of different parts of a body, (iii) personal preferences input to the controller and stored in memory and (iv) commands input from an input device.

25. The irradiation device of claim 21 where the irradiation instead of for heat is for therapeutic purposes and the radiation may be any of (i) UV radiation, (ii) red light therapy in the 620–660 nm range, and (iii) light therapy for SAD and other disorders, where the controller aims the radiation sources to the location where the individual is located and controls the time and intensity of the radiation.

26. The automated irradiating device of claim 20 further comprising where one or more of the irradiating sources is radiating visible light and one or more of the irradiating sources is designed to substantially radiate heat whereby the device is capable of providing both a desired light and heat radiation to the individuals.

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/357,549	01/24/2012	Yechezkal Evan Spero	

CONFIRMATION NO. 1905

37268
YECHEZKAL EVAN SPERO
74 MOSHAV TIFRACH
M. P. HANEGEV, 85102
ISRAEL

WITHDRAWAL NOTICE

OC000000053505683

Date Mailed: 04/03/2012

Letter Regarding a New Notice and/or the Status of the Application

If a new notice or Filing Receipt is enclosed, applicant may disregard the previous notice mailed on 02/08/2012. The time period for reply runs from the mail date of the new notice. Within the time period for reply, applicant is required to file a reply in compliance with the requirements set forth in the new notice to avoid abandonment of the application.

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If the reply is not filed electronically via EFS-Web, the reply must be accompanied by a copy of the new notice.

If the Office previously granted a petition to withdraw the holding of abandonment or a petition to revive under 37 CFR 1.137, the status of the application has been returned to pending status.

/hteffera/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/357,549	01/24/2012	Yechezkal Evan Spero	

CONFIRMATION NO. 1905

37268
YECHEZKAL EVAN SPERO
74 MOSHAV TIFRACH
M. P. HANEGEV, 85102
ISRAEL

WITHDRAWAL NOTICE

OC000000053505666

Date Mailed: 04/03/2012

Letter Regarding a New Notice and/or the Status of the Application

If a new notice or Filing Receipt is enclosed, applicant may disregard the previous notice mailed on 03/23/2012. The time period for reply runs from the mail date of the new notice. Within the time period for reply, applicant is required to file a reply in compliance with the requirements set forth in the new notice to avoid abandonment of the application.

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/hteffera/

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
13/357,549	01/24/2012	2875	900		26	4

CONFIRMATION NO. 1905

37268
YECHEZKAL EVAN SPERO
74 MOSHAV TIFRACH
M. P. HANEGEV, 85102
ISRAEL

FILING RECEIPT

OC000000053505722

Date Mailed: 04/03/2012

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. 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)

Yechezkal Evan Spero, Moshav Tifrach, ISRAEL;

Assignment For Published Patent Application

Yechezkal Evan Spero, Moshav Tifrach, ISRAEL

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CIP of 10/604,360 07/14/2003 PAT 8100552
and claims benefit of 61/535,981 09/17/2011

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)

If Required, Foreign Filing License Granted: 02/03/2012

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/357,549**

Projected Publication Date: To Be Determined - pending completion of Missing Parts

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****

Title

Detector Controlled Illuminating System

Preliminary Class

362

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.

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Title 37, Code of Federal Regulations, 5.11 & 5.15

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/357,549	01/24/2012	Yechezkal Evan Spero	

CONFIRMATION NO. 1905

37268
YECHEZKAL EVAN SPERO
74 MOSHAV TIFRACH
M. P. HANEGEV, 85102
ISRAEL

FORMALITIES LETTER

OC000000053505723

Date Mailed: 04/03/2012

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

Filing Date Granted

Items Required To Avoid Abandonment:

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

SUMMARY OF FEES DUE:

Total fee(s) required within **TWO MONTHS** from the date of this Notice is $**155** for a small entity

- The specification and drawings submitted electronically contain the equivalent of more than 100 pages. Applicant owes $**155** for **7** pages in excess of **100** pages for a small entity in compliance with 37 CFR 1.27.

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 13/357,549

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	95		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	310		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	125		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	26 minus 20 =	* 6	x 30 =	180	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	4 minus 3 =	* 1	x 125 =	125			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			155			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	990		TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)	OR	RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

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YECHEZKAL EVAN SPERO
Typed or printed name of person signing Certificate

37268
Registration Number, if applicable

972 8 996-0324
Telephone Number

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/357,549	01/24/2012	Yechezkal Evan Spero	

CONFIRMATION NO. 1905

37268
YECHEZKAL EVAN SPERO
74 MOSHAV TIFRACH
M. P. HANEGEV, 85102
ISRAEL

FORMALITIES LETTER

OC000000053505723

Date Mailed: 04/03/2012

NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

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Filing Date Granted

Items Required To Avoid Abandonment:

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04/26/2012 APEREZAM 00000009 13357549
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page 1 of 1

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Application or Docket Number

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BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A			N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	x =		OR	x =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	x =			x =	
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))			N/A			N/A	
			TOTAL			TOTAL	

* If the difference in column 1 is less than zero, enter "0" in column 2.

APPLICATION AS AMENDED – PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					N/A		OR	N/A	
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)	OR	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					N/A		OR	N/A	
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

This collection of information is required by 37 CFR 1.16. 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 12 minutes 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. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 13/357,549

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	95		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	310		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	125		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	26 minus 20 =	* 6	x 30 =	180	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	4 minus 3 =	* 1	x 125 =	125			
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MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	990		TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)	OR	RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
13/357,549	01/24/2012	2875	1055		26	4

CONFIRMATION NO. 1905

UPDATED FILING RECEIPT

37268
YECHEZKAL EVAN SPERO
74 MOSHAV TIFRACH
M. P. HANEGEV, 85102
ISRAEL

OC000000054122018

Date Mailed: 05/08/2012

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. 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)

Yechezkal Evan Spero, Moshav Tifrach, ISRAEL;

Assignment For Published Patent Application

Yechezkal Evan Spero, Moshav Tifrach, ISRAEL

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CIP of 10/604,360 07/14/2003 PAT 8100552
and claims benefit of 61/535,981 09/17/2011

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)

If Required, Foreign Filing License Granted: 02/03/2012

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/357,549**

Projected Publication Date: 08/16/2012

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****

Title

Detector Controlled Illuminating System

Preliminary Class

362

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

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
13/357,549	01/24/2012	Yechezkal Evan Spero	

CONFIRMATION NO. 1905

37268
YECHEZKAL EVAN SPERO
74 MOSHAV TIFRACH
M. P. HANEGEV, 85102
ISRAEL

PUBLICATION NOTICE

OC000000056010464

Title: Detector Controlled Illuminating System

Publication No.US-2012-0206050-A1
Publication Date:08/16/2012

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/357,549	01/24/2012	Yechezkal Evan Spero		1905

37268 7590 10/10/2014

YECHEZKAL EVAN SPERO
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ISRAEL

EXAMINER	
LOTTER, DAVID E	
ART UNIT	PAPER NUMBER
2844	

MAIL DATE	DELIVERY MODE
10/10/2014	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 13/357,549	Applicant(s) SPERO, YECHEZKAL EVAN	
	Examiner DAVID LOTTER	Art Unit 2844	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *3/27/2012*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-26* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-26* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☒ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *1/24/2012* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

Specification

The disclosure is objected to because of the following informalities: paragraph [0118] appears to show an incomplete part “HLMP25-ED-xxxx”. Appropriate correction is required.

Claim Objections

Claim 16 is objected to because of the following informalities: “…and the controller process the information a communicates the camera obtained information to a second device.” “a communicates" appears to be a typo. The Examiner interprets “a” to mean “and”. Appropriate correction is required.

Claim 25 is objected to because of the following informalities: The acronym “SAD” should be spelled out. The Examiner interprets SAD to mean “seasonal affective disorder.” Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of 35 U.S.C. 112(f):

> (f) Element in Claim for a Combination. – An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the

> corresponding structure, material, or acts described in the specification and equivalents thereof.

The following is a quotation of pre-AIA 35 U.S.C. 112, sixth paragraph:

> An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

Claim 4 recites the following limitation: "*the one or more detectors detects information regarding one or more individuals within the illuminated area, said information is at least one of (i) age, (ii) sex…"*

The claim limitation uses the term "detector" as a substitute for "means". In other words, the term is used as placeholder.

The placeholder is modified by functional language: "*detects information regarding one or more individuals within the illuminated area, said information is at least one of (i) age, (ii) sex…*"

The placeholder is not modified by sufficient structure or material or acts for performing their respective claimed functions. In other words, a detector alone is insufficient structure to achieve "detects information regarding one or more individuals within the illuminated area, said information is at least one of (i) age, (ii) sex." Since the above limitation invokes 35 U.S.C. 112, sixth paragraph, the limitation is interpreted to cover the corresponding structure described in the specification that achieves the claimed function, and equivalents thereof.

A review of the specification shows insufficient structure sufficient for achieving the claimed function is described in the specification (see generally paragraph [0246], Fig. 23). There is insufficient description explaining how the detector detects an

individual's age or sex. Specifically, the Specification states in paragraph [0246] that "using image recognition algorithms and artificial intelligence techniques known in the art, based on the appearance and movements of the occupants, the camera vision system will automatically guess their age and sex. The processor runs the computer vision routines to determine an occupants age or sex and sends instruction to a building's utility devices to provide individualized services such as heating and lighting on basis of age or sex." There are no algorithms or routines found that describe how the camera system will guess one's age or sex. The flow chart found in Fig. 23 states "run lighting algorithms to determine best practice illumination levels" but omits describing the corresponding algorithm.

If applicant wishes to provide further explanation or dispute the examiner's interpretation of the corresponding structure, applicant must identify the corresponding structure with reference to the specification by page and line number, and to the drawing, if any, by reference characters in response to this Office action.

If applicant does not intend to have the claim limitation(s) treated under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112 , sixth paragraph, applicant may amend the claim(s) so that it/they will clearly not invoke 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, or present a sufficient showing that the claim recites/recite sufficient structure, material, or acts for performing the claimed function to preclude application of 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph.

For more information, see MPEP § 2173 *et seq.* and *Supplementary Examination Guidelines for Determining Compliance With 35 U.S.C. 112 and for Treatment of Related Issues in Patent Applications*, 76 FR 7162, 7167 (Feb. 9, 2011).

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112(a):

> (a) IN GENERAL.—The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

The following is a quotation of the first paragraph of pre-AIA 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 4 is rejected under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor or a joint inventor, or for pre-AIA the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim 4

The claim is construed in accordance with 35 USC 112, 6th paragraph as noted above. There is insufficient written description of a structure sufficient to achieve the

claimed function "*detects information regarding one or more individuals within the illuminated area, said information is at least one of (i) age, (ii) sex…*" Thus the claim fails convey to one of ordinary skill in the art the invention had possession of the claimed invention. There is no description of structure by which the detectors detects information regarding one or more individuals within the illuminated area, said information is at least one of (i) age, (ii) sex… There is insufficient corresponding structure that detects information regarding an individual's age or sex. Paragraph [0246] states "using image recognition algorithms and artificial intelligence techniques known in the art, based on the appearance and movements of the occupants, the camera vision system will automatically guess their age and sex. The processor runs the computer vision routines to determine an occupants age or sex and sends instruction to a building's utility devices to provide individualized services such as heating and lighting on basis of age or sex."

The following is a quotation of 35 U.S.C. 112(b):
(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 20 and 25 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and

distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

Claim 20 recites in part the limitation "…and feeding that information to a controller; a controller for adjusting…" It is unclear if the second controller recited is the same controller previously cited or a second controller.

Claim 25 recites in part "the radiation may be any of… and (iii) light therapy for SAD and other disorders." Radiation related to light therapy for SAD and other disorders renders the claim vague and indefinite. First, light therapy for SAD is not defined. Second, the light therapy for "other disorders" renders the entire claim indefinite.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3, 5-24, 26 are rejected under pre-AIA 35 U.S.C. 102(b) as being anticipated by Spero (US 2004/0105264).

Regarding claim 1 Spero discloses an illuminating device which produces light to meet an illumination requirement of an illuminated area, comprising: a light fixture (paragraph [0045], Fig. 13A) including a multiplicity of directional light sources (paragraph [0045], Fig. 13A) including at least two light sources pointing in different directions (paragraph [0045], Fig. 13A), the light sources having at least one of controllable light intensity and spectral light distribution (paragraphs [0089], [0099]); a controller (paragraphs [0070], [0089]) for adjusting at least one of a light intensity and light spectrum of the directional light sources (paragraph [0089]); one or more detectors (paragraphs [0045], [0100]) for sensing at least one of objects, surfaces and people within the illuminated area and of passing the sensed information to the controller (paragraphs [0045], [0099], [0153]); a processor (paragraph [0070]) for processing the sensed information and determining illumination requirements of the at least one of objects and people using at least one of artificial intelligence (paragraph [0164]), pattern recognition (paragraph [0164]), video analytics, and look-up tables (paragraph [0149]) and for directing the controller to adjust the directional light sources to meet the illumination requirement (paragraphs [0045], [0099], [0149]).

Regarding claim 2 Spero discloses the illuminating device of claim 1 where the detector is comprising at least one of (i) a camera (paragraphs [0100]-[0101]) being a photo sensor array coupled with an optical lens (paragraph [0152]), (ii) a photo sensor, (iii) an ultrasound transducer and sensor, (iv) microwave transducer and sensor, and (v) pyroelectric detectors.

Regarding claim 3 Spero discloses the illumination device of claim 1, wherein the illuminated area is indoors (paragraph [0040]) and further comprising a detector (paragraph [0045]) for detecting variable illumination from daylight and/or sunlight entering indoors (paragraph [0157]), wherein the controller taking into consideration the area now illuminated by the daylight and/or sunlight adjusts the light intensity of the directional light sources to meet the varied illumination requirement (paragraphs [0089], [0157]).

Regarding claim 5 Spero discloses the illuminating device of claim 1 for optimally displaying food, wherein the one or more detectors detect an identity of one or more foods and wherein the controller adjusts the light intensity and/or spectrum of the illumination on the one or more foods based on illumination requirements from the processor (paragraph [0166], the Examiner interprets "..to initially lock-on and recognize a target attribute as is known in the art as object tracking" and "instantaneous control of almost infinite variation of spectrum and intensity" as reading on this claim language).

Regarding claim 6 Spero discloses an illuminating device having automatic control of the light provided to an illuminated area comprising: a structure (paragraph [0045], Fig. 1, at 4) for incorporating illuminating device elements (paragraph [0097], Fig. 1, at 3); one or more light sources incorporated in the structure (paragraph [0045]) and in communication with a power source (paragraph [0097], Fig. 1, at 10); electronic

circuitry apparatus (paragraphs [0097]-[0099], Fig. 1, at 7) for the controlled powering of the light source and other illuminating device elements (paragraph [0045], paragraph [0099], Fig. 1, at 7A); one or more cameras (paragraph [0152]) placed on the structure for detecting information about the illuminated area, said camera in communication with power and control device elements (paragraph [0152]); a controller (paragraphs [0070], [0089], [0152], Fig. 1, at 7) integrated with the structure (paragraph [0045], Fig. 1, at 7), in communication with the light source controlling power circuitry (paragraph [0045], Fig. 1, at 7 and 10), said controller arranged to processes the information communicated from the camera and automatically control the light provided to the illuminated area (paragraph [0089]).

Regarding claim 7 Spero discloses the illumination device of claim 6, wherein the one or more detectors (paragraph [0195], “camera”) are configured to sense a presence of glare on a person's eyes (paragraph [0195]) in the illuminated area, and wherein the controller (paragraph [0195], “computer logic system”) is programmed to adjust an intensity of the directional light sources to reduce the glare (paragraph [0195]).

Regarding claim 8 Spero discloses an illuminating device which provides light to meet an illumination requirement of an illuminated area in which visual activities are performed, comprising: a light fixture (paragraph [0097], Fig. 1, at 2) including a multiplicity of directional light sources (paragraph [0097], Fig. 1, at 3, Fig. 13A) including at least two directional light sources pointing in different directions (paragraph [0097],

Fig. 1, at 2, Fig. 13A), the light fixture having movable structure (paragraph [0152]) for aiming the directional light sources mounted thereon in a defined direction; a camera (paragraph [0166]) for obtaining images of the illuminated area functioning as a detector for at least one of (i) a light detector (ii) a spectrum detector, (iii) a motion detector (paragraph [0099]), (iv) a measuring detector for sensing a geometry of the illuminated area, and (v) a detector (paragraph [0097]) for sensing at least one of work surfaces and road objects and at least one of vehicles and people (paragraph [0171]); a controller (paragraph [0097], Fig. 1, at 7) for adjusting a light intensity (paragraph [0099]) and a direction (paragraphs [0099], [0152]) of each of the directional light sources (paragraph [0097], Fig. 1, at 3); a processor (paragraph [0097], Fig. 1, at 7) with stored algorithms (paragraph [0097], Fig. 1, at 7A) and data for identifying at least one of (i) tasks being carried out by people, (ii) location of people (paragraph [0166]), (iii) frequency of area usage by people (paragraph [0097]), (iv) traffic density in the illuminated area from the sensed geometry, (v) work surfaces, (vi) road objects, people and/or vehicles (paragraph [0171]), and (vii) roadway surface luminance any of which is used by said processor for determining illumination within the illuminated area using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables wherein said processer, upon calculating the required illumination parameters, directs the controller to adjust the directional light sources to meet the illumination requirements of the visual activities (paragraph [0099], Fig. 1, at 7, 7A).

Regarding claim 9 Spero discloses the illuminating device of claim 8, further comprising the illumination requirement that different parts of the illuminated area to be illuminated at a different intensity and/or at a different spectrum than another part of the illuminated area (paragraphs [0099], [0152]-[0153]).

Regarding claim 10 Spero discloses the illuminating device of claim 8, adjustable by an installer (paragraph [0081]) based on room geometry and/or usage further comprising the light fixture having adjustable arms (paragraphs [0084]) on which directional light sources are mounted for aiming the directional light sources within the illuminated area (paragraphs [0084]), where said detector and processor combination provides feedback to the installer so as to aim the light sources such that the illumination requirements can be met by the re-adjusted light source aimings (paragraph [0152]).

Regarding claim 11 Spero discloses the illumination device of claim 8, wherein the controller (paragraph [0164]) receives real time information (paragraph [0164]) from the camera and wherein the processor, using image recognition capability, directs the controller to adjust at least one of (i) the intensity (paragraph [0166]), (ii) the spectral light distribution (paragraph [0166]) and, (iii) the direction of the light sources based on at least one of (i) where people requiring illumination are located (paragraphs [0164], [0166]), (ii) what object the person is viewing and (iii) what visual task the person needs to perform (paragraph [0166]).

Regarding claim 12 Spero discloses the illumination device of claim 8, further comprising at least one of the directional light sources (paragraphs [0160]) mounted on the movable structure (paragraph [0152]) where the movement of the light source direction is automatically controlled by the controller (paragraph [0166]).

Regarding claim 13 Spero discloses the illumination device of claim 12, providing a different illumination to a sub-area based on usage wherein the controller interpreting images from the camera adjusts the moveable light sources such that they provide the required illumination in a sub-area proximate to the individuals as they move around in the illuminated area (paragraph [0166]).

Regarding claim 14 Spero discloses the illumination device of claim 8, wherein the illuminated area is a road and the objects include road signs (paragraph [0181]).

Regarding claim 15 Spero discloses the illumination device of claim 8, further comprising at least one of the directional light sources on an automatic swivel joint (paragraph [0113]) and providing spot lights of limited beam angle for task lighting while other light source provide general illumination to the illuminated area (paragraphs [0113], [0181]-[0182]).

Regarding claim 16 Spero discloses the illumination device of claim 8, further comprising a controller (paragraph [0160]) with communication capability to other devices, where the camera (paragraph [0156]) in one location obtains information and the controller process the information a communicates the camera obtained information to a second device (paragraphs [0160]).

Regarding claim 17 Spero discloses the illumination device of claim 16, where the illuminated area is a road (paragraph [0171]) and the second device to where the camera obtained information is communicated to is a lighting fixture (paragraph [0171]).

Regarding claim 18 Spero discloses the illumination device of claim 17, where the processor uses information obtained from the cameras and exchanged between fixtures for identifying traffic requirements in the illuminated area and from the vehicles locations and geometry determining the illumination requirements of the illumination area thereby directing the controller to adjust the directional light sources to meet the illumination requirements (paragraph [0171]).

Regarding claim 19 Spero discloses the illumination device of claim 18, wherein the controller is programmed to adjust at least one of (i) increase illumination with an approach of a vehicle (paragraphs [0191]-[0192]), and (ii) change beam cut-off levels as the vehicle advances toward the lighting fixture to eliminate glare (paragraphs [0177]-[0178], [0191]-[0192]).

Regarding claim 20 Spero discloses an automated irradiating device (paragraph [0045]) for providing radiation to individuals within an area intended to provide a desired radiation in a sub-area proximate to the individuals, comprising: an irradiation fixture (paragraph [0045]) including one or more directional radiation sources (paragraph [0153]) where the radiation is in a defined direction (paragraph [0045]); at least one detector (paragraph [0045]) for sensing a location of individuals in the area and feeding that information to a controller (paragraph [0153]); a controller (paragraph [0070]) for adjusting at least one of (i) a radiation intensity (paragraph [0045]), and (ii) a direction of the irradiation based on sensed location, whereby the desired radiation is provided proximate to individuals in the area (paragraph [0153]).

Regarding claim 21 Spero discloses the automated irradiating device of claim 20 intended to provide a desired heating to one or more individuals in an area, further comprising: at least two directional heat radiation sources pointing in different directions (paragraph [0045], Fig. 13A); the detector being a camera (paragraph [0152]) with capability for sensing at least one of (i) a presence of one or more individuals in the heated area, (ii) the identity of the individuals (paragraph [0166], “identify and track…”), and (iii) a body temperature of individuals present in the heated area; the controller further having processing capability for determining the heating requirements of the individuals in the area from at least one of (i) algorithms to calculate radiation parameters, (ii) stored data of heating practices, (iii) image recognition algorithms for

identifying the individual based on the camera information (paragraph [0166]), and (iv) an identified individual's personal preferences (paragraph [0153]).

Regarding claim 22 Spero discloses the automated irradiating device of claim 20, further comprising: One or more directional radiation sources capable of being moved so as to direct radiation in a defined direction (paragraph [0166]); the at least one detector(paragraph [0045] capable of providing information on the present location of individuals in the area (paragraph [0166]); the controller (paragraph [0166]) programmed to process the detector information and move the radiating sources so as to follow the one or more individuals, whereby the desired radiation is provided in a sub-area substantially proximate to the individuals (paragraph [0166]).

Regarding claim 23 Spero discloses the irradiation device of claim 21, further comprising; the detector being a camera paragraph [0166]) capable of providing images of different parts of the body of individuals to the controller for image processing (paragraph [0166], the Examiner interprets the object detection of a person or a part of a person as “object tracking”); the radiation sources being able to direct radiation to different parts of the body (paragraph [0166]) and the controller further programmed to run the image recognition algorithms to identify different parts of the body (paragraph [0166]), to compute the desired radiation level to the different parts of the body and to adjust the radiation from sources directed at the different parts of the body (paragraph [0166]).

Regarding claim 24 Spero discloses the irradiation device of claim 21, further comprising the controller programmed to control the irradiation in time and intensity on the individual to maintain comfortable heating based on at least one of (i) best practices (paragraph [0153]), (ii) feedback from the heat detector configured to detect body temperature of different parts of a body, (iii) personal preferences input to the controller and stored in memory (paragraph [0153]) and (iv) commands input from an input device (paragraph [0153]).

Regarding claim 26 Spero discloses the automated irradiating device of claim 20 further comprising where one or more of the irradiating sources is radiating visible light (paragraph [0064]) and one or more of the irradiating sources is designed to substantially radiate heat ([paragraph [0065] the Examiner views light sources as heat sources) whereby the device is capable of providing both a desired light and heat radiation to the individuals (paragraph [0045]).

Claim Rejections - 35 USC § 103

In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 4 as best understood is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Spero (US 2004/0105264) as applied to claim 1 above, and further in view of Kiyohara (US 2006/0222213).

Regarding claim 4 Spero discloses the illuminating device of claim 1, wherein the one or more detectors detects information regarding one or more individuals within the illuminated area, said information is at least one of (i) age, (ii) sex, and (iii) recognition of an individual for matching with stored data about that individual's needs and wherein the controller adjusts the light intensity and/or spectrum of the illumination provided to the one or more individuals based on illumination requirements from at least one of (i) best practices looked up and calculated from stored data, (ii) age and/or sex of the individual, (iii) personal preferences input to the controller and stored in memory, and (iv) commands received by the controller from an input device.

Spero does not disclose wherein the one or more detectors detects information regarding one or more individuals within the illuminated area, said information is at least one of (i) age, (ii) sex, and (iii) recognition of an individual for matching with stored data about that individual's needs and wherein the controller adjusts the light intensity and/or

spectrum of the illumination provided to the one or more individuals based on illumination requirements from at least one of (i) best practices looked up and calculated from stored data, (ii) age and/or sex of the individual, (iii) personal preferences input to the controller and stored in memory, and (iv) commands received by the controller from an input device.

Kiyohara discloses wherein the one or more detectors detects information regarding one or more individuals within the illuminated area, said information is at least one of (i) age, (ii) sex, and (iii) recognition of an individual for matching with stored data about that individual's needs and wherein the controller adjusts the light intensity and/or spectrum of the illumination provided to the one or more individuals based on illumination requirements from at least one of (i) best practices looked up and calculated from stored data, (ii) age and/or sex of the individual, (iii) personal preferences input to the controller and stored in memory, and (iv) commands received by the controller from an input device.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Spero in accordance with the teaching of Kiyohara regarding image processing data (Kiyohara, paragraph [0014]) in order to use image processing data with (Kiyohara, paragraph [0012]).

Claim 25 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Spero (US 2004/0105264) as applied to claim 21 above, and further in view of Savage (US 2004/0138726).

Regarding claim 25 Spero discloses the irradiation device of claim 21. Spero also discloses where controller aims the radiation sources to the location where the individual is located and controls the time and intensity of the radiation (paragraphs [0164], [0166]).

Spero does not disclose where the irradiation instead of for heat is for therapeutic purposes and the radiation may be any of (i) UV radiation, (ii) red light therapy in the 620-660 nm range, and (iii) light therapy for SAD and other disorders.

Savage discloses where the irradiation instead of for heat is for therapeutic purposes and the radiation may be any of (i) UV radiation, (ii) red light therapy in the 620-660 nm range, and (iii) light therapy for SAD and other disorders (paragraphs [0014], [0021]).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the illuminating system disclosed by Spero in accordance with the teaching of Savage regarding light therapy (Savage, paragraph [0003]) in order to use an illuminating system for light therapy (Savage, paragraph [0016]).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID LOTTER whose telephone number is (571)270-7422. The examiner can normally be reached on Monday-Friday 7:30am-5PM (off every other Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alex Taningco can be reached on 571-272-8048. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/DAVID LOTTER/
Examiner, Art Unit 2844

/ALEXANDER H TANINGCO/
Supervisory Patent Examiner, Art Unit 2844

Notice of References Cited	Application/Control No. 13/357,549	Applicant(s)/Patent Under Reexamination SPERO, YECHEZKAL EVAN	
	Examiner DAVID LOTTER	Art Unit 2844	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2002/0047628	04-2002	Morgan et al.	315/291
*	B	US-6,379,022	04-2002	Amerson et al.	362/231
*	C	US-6,385,352	05-2002	Roustaei, Alexander	382/324
*	D	US-2002/0057340	05-2002	Fernandez et al.	348/143
*	E	US-6,394,614	05-2002	Chang, Chia-Jung	359/604
*	F	US-5,785,243	07-1998	Cross, Andrew	236/47
*	G	US-2002/0022927	02-2002	Lemelson et al.	701/301
*	H	US-5,994,844	11-1999	Crawford et al.	315/151
*	I	US-6,166,496	12-2000	Lys et al.	315/316
*	J	US-2004/0105264	06-2004	Spero, Yechezkal Evan	362/276
*	K	US-2004/0138726	07-2004	Savage et al.	607/088
*	L	US-2006/0222213	10-2006	Kiyohara et al.	382/115
	M	US-			

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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
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	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13357549	SPERO, YECHEZKAL EVAN
	Examiner	Art Unit
	DAVID LOTTER	2844

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	08/12/2014								
	1	✓								
	2	✓								
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CONFIRMATION NO. 1905

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
13/357,549	01/24/2012 RULE	315	2844	

APPLICANTS

INVENTORS

Yechezkal Evan Spero, Moshav Tifrach, ISRAEL;

**** CONTINUING DATA ***************************

This application is a CIP of 10/604,360 07/14/2003 PAT 8100552
and claims benefit of 61/535,981 09/17/2011

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED **** ** SMALL ENTITY **
02/03/2012

Foreign Priority claimed	☐ Yes ☑ No	☐ Met after Allowance	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
35 USC 119(a-d) conditions met	☐ Yes ☑ No					
Verified and Acknowledged	/DAVID E LOTTER/ Examiner's Signature	Initials	ISRAEL	24	26	4

ADDRESS

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M. P. HANEGEV, 85102
ISRAEL

TITLE

Detector Controlled Illuminating System

FILING FEE RECEIVED		
1055	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	1	("6,385,352").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/09/26 19:59
L2	259	("3819938" | "3876900" | "4017732" | "4115703" | "4306147" | "4402017" | "4542528" | "4570057" | "4578571" | "4647766" | "4686363" | "4758717" | "4804949" | "4818847" | "4841132" | "4850009" | "4900907" | "5010241" | "5073954" | "5099110" | "5107100" | "5130520" | "5135160" | "5187356" | "5196684" | "5206492" | "5291009" | "5349172" | "5354977" | "5378882" | "5471533" | "5484994").PN. OR ("6385352").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/09/26 20:01
L3	652	(object and detect$4).ti,ab. and @pd<"20020712" and controller and sensor and processor	US-PGPUB; USPAT	OR	ON	2014/09/26 20:03
L4	191	(object and detect$4).ti,ab. and @pd<"20020712" and controller and sensor and processor and vehicle	US-PGPUB; USPAT	OR	ON	2014/09/26 21:29
S1	1	(13/357549).APP.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/04/04 13:40
S2	1845	h05b37/02.cpc.	US-PGPUB; USPAT	OR	OFF	2014/04/04 13:41
S3	755	h05b37/02.cpc. and @pd<"20110917"	US-PGPUB; USPAT	OR	OFF	2014/04/04 13:42
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S7	788	(315/152).ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/04 13:46
S8	2665127	S4 or "76"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/04 13:46
S9	3849	S4 or S7	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/04 13:46
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S23	3620	(315/152).ccls. or (362/276,234).ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/08/19 20:49
S24	163028	S22 or S23	US-PGPUB;	OR	ON	2014/08/19

			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			20:49
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S32	1	("6379022").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/08/24 17:18
S33	23990	(light or led or luminaire or solid adj2 state or light adj2 diode) and controller and processor and spectrum and (@ad<"20030714" or @rlad<"20030714")	US-PGPUB; USPAT	OR	ON	2014/08/24 17:23
S34	14102	(light or led or luminaire or solid adj2 state or light adj2 diode) and controller and processor and spectrum and (@ad<"2002071" or @rlad<"20020712")	US-PGPUB; USPAT	OR	ON	2014/08/24 17:24
S35	6538	(light or led or luminaire or solid adj2 state or light adj2 diode) and controller and processor and spectrum and intensity and (@ad<"2002071" or	US-PGPUB; USPAT	OR	ON	2014/08/24 17:25

		@rlad<"20020712")				
S36	28972	(B60Q1/04 B60Q1/085 B60Q1/1423 F21K9/13 F21K9/135 F21S4/008 F21V19/02 F21V23/0464 F21V23/0471 F21V23/0478 H05B33/0812 H05B33/0857 H05B33/0863 H05B37/02 B60Q2300/054 B60Q2300/112 B60Q2300/116 B60Q2300/122 B60Q2300/134 B60Q2300/142 B60Q2300/21 B60Q2300/23 B60Q2300/312 B60Q2300/314 B60Q2300/322 B60Q2300/41 B60Q2300/42 F21S48/10 F21V21/02; F21V21/30 F21V29/2206 F21W2101/10 F21W2111/023 F21W2111/027 F21W2111/08 F21W2131/103 F21W2131/40 F21Y2101/02 F21Y2113/00 Y02B20/343 Y02B20/383).cpc.	US-PGPUB; USPAT	OR	ON	2014/08/24 17:27
S37	98165	(B60Q1/04 B60Q1/085 B60Q1/1423 F21K9/13 F21K9/135 F21S4/008 F21V19/02 F21V23/0464 F21V23/0471 F21V23/0478 H05B33/0812 H05B33/0857 H05B33/0863 H05B37/02 B60Q2300/054 B60Q2300/112 B60Q2300/116 B60Q2300/122 B60Q2300/134 B60Q2300/142 B60Q2300/21 B60Q2300/23 B60Q2300/312 B60Q2300/314 B60Q2300/322 B60Q2300/41 B60Q2300/42 F21S48/10 F21V21/02; F21V21/30 F21V29/2206 F21W2101/10 F21W2111/023 F21W2111/027 F21W2111/08 F21W2131/103 F21W2131/40 F21Y2101/02 F21Y2113/00 Y02B20/343 Y02B20/383).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/08/24 17:27
S38	306	S35 and S37	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/08/24 17:27
S39	1	("6483439").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/08/24 18:07
S40	2	(("6820998") or ("6227679")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/08/24 18:10
S41	1	("5,803,579").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/08/24 18:42
S42	1	("6,528,954").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/08/24 18:43
S43	1	("20020047628").PN.	US-PGPUB; USOCR	OR	OFF	2014/08/24 19:03
S44	1709072	(light or led or luminaire or solid adj2	US-PGPUB;	OR	ON	2014/08/25

		state or light adj2 diode) and (controller or processor or microprocessor or cpu or computer)	USPAT			10:46
S45	7838	(light or led or luminaire or solid adj2 state or light adj2 diode) and (controller or processor or microprocessor or cpu or computer) and (food near10 (detect$4 or sens$3)) and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 10:47
S46	13	S45 and (B60Q1/04 B60Q1/085 B60Q1/1423 F21K9/13 F21K9/135 F21S4/008 F21V19/02 F21V23/0464 F21V23/0471 F21V23/0478 H05B33/0812 H05B33/0857 H05B33/0863 H05B37/02 B60Q2300/054 B60Q2300/112 B60Q2300/116 B60Q2300/122 B60Q2300/134 B60Q2300/142 B60Q2300/21 B60Q2300/23 B60Q2300/312 B60Q2300/314 B60Q2300/322 B60Q2300/41 B60Q2300/42 F21S48/10 F21V21/02; F21V21/30 F21V29/2206 F21W2101/10 F21W2111/023 F21W2111/027 F21W2111/08 F21W2131/103 F21W2131/40 F21Y2101/02 F21Y2113/00 Y02B20/343 Y02B20/383).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/08/25 10:48
S47	5956	(light or led or luminaire or solid adj2 state or light adj2 diode) and (controller or processor or microprocessor or cpu or computer) and (food near10 (sense or sensor or detector or detection))	US-PGPUB; USPAT	OR	ON	2014/08/25 10:52
S48	1	(light or led or luminaire or solid adj2 state or light adj2 diode) and (controller or processor or microprocessor or cpu or computer) and (food near10 (sense or sensor or detector or detection)) and (315/152).ccls.	US-PGPUB; USPAT	OR	ON	2014/08/25 10:52
S49	5660	(light or led or luminaire or solid adj2 state or light adj2 diode) and (controller or processor or microprocessor or cpu or computer) and (food near10 (sense or sensor or detector or detection)) and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 10:54
S50	480	(light or led or luminaire or solid adj2 state or light adj2 diode).ti,ab. and (controller or processor or microprocessor or cpu or computer) and (food near10 (sense or sensor or detector or detection)) and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 10:55
S52	13980	(food near10 (sense or sensor or detector or detection)) and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 11:06

S53	319	(food adj (sense or sensor or detector or detection)) and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 11:06
S54	8	(food adj (sense or sensor or detector or detection)).ti,ab. and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 11:06
S55	352	(facial adj recognition).ti,ab. and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 11:21
S56	1304	(image adj recognition).ti,ab. and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 11:22
S57	1	("7765231").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/08/25 11:25
S58	12	S56 and sex and controller	US-PGPUB; USPAT	OR	ON	2014/08/25 12:11
S59	92	(facial adj recognition).ti,ab. and (@ad<"20110917" or @rlad<"20110917") and age	US-PGPUB; USPAT	OR	ON	2014/08/25 12:13
S60	45	(facial adj recognition).ti,ab. and (@ad<"20110917" or @rlad<"20110917") and age and controller	US-PGPUB; USPAT	OR	ON	2014/08/25 12:14
S61	0	(camera and anti-glare).ti,ab. with glare near5 controller	US-PGPUB; USPAT	OR	OFF	2014/08/25 12:37
S62	0	(camera and antiglare).ti,ab. with glare near5 controller	US-PGPUB; USPAT	OR	OFF	2014/08/25 12:37
S63	2	(camera and glare).ti,ab. with glare near5 controller	US-PGPUB; USPAT	OR	OFF	2014/08/25 12:38
S64	4	(camera and glare) with glare near5 controller	US-PGPUB; USPAT	OR	OFF	2014/08/25 12:39
S65	101	(light or led or luminaire or solid adj2 state or light adj2 diode) and (controller or processor or microprocessor or cpu or computer) near10 (adjustable adj mount$3)	US-PGPUB; USPAT	OR	ON	2014/08/25 13:22
S66	99	(light or led or luminaire or solid adj2 state or light adj2 diode) and (controller or processor or microprocessor or cpu or computer) near10 (adjustable adj mount$3) and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 13:23
S67	60	(light or led or luminaire or solid adj2 state or light adj2 diode) and (controller or processor or microprocessor or cpu or computer) near10 (adjustable adj light) and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 13:27
S68	50	(light or led or luminaire or solid adj2 state or light adj2 diode) and (controller or processor or microprocessor or cpu or computer) near10 (movable adj light) and (@ad<"20110917" or	US-PGPUB; USPAT	OR	ON	2014/08/25 13:28

		@rlad<"20110917")				
S69	22128	(light or led or luminaire or solid adj2 state or light adj2 diode) and (controller or processor or microprocessor or cpu or computer) near10 (traffic) and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 13:53
S70	9041586	(light or led or luminaire or solid adj2 state or light adj2 diode) and (controller or processor or microprocessor or cpu or computer) near10 (traffic) and automobile adj3 light(@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 13:54
S71	73	(light or led or luminaire or solid adj2 state or light adj2 diode) and (controller or processor or microprocessor or cpu or computer) near10 (traffic) and automobile adj3 light and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 13:54
S72	428	radiation adj device and heating and sensor and detection and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 13:55
S73	68	(radiation adj device) and (sensor near5 heat$3) and detection and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 13:57
S74	730	(radiation adj device or heater) and (sensor near5 heat$3) and (sensor near (people or person or individual)) and detection and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 13:59
S75	161	(radiation adj device or heater) and (sensor near5 heat$3) and (sensor near (people or person or individual)) and detection and (@ad<"20110917" or @rlad<"20110917") and (heater or heating).ti,ab.	US-PGPUB; USPAT	OR	ON	2014/08/25 14:00
S76	9	(radiation adj device or heater) and (sensor near5 heat$3) and (sensor near (people or person or individual)) and detection and (@ad<"20110917" or @rlad<"20110917") and (heater or heating).ti,ab. and HVAC	US-PGPUB; USPAT	OR	ON	2014/08/25 14:04
S77	11264	(image adj2 (recognition or detection)).ti,ab. and (@ad<"20020712" or @rlad<"20020712")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:16
S78	0	(image adj2 (recognition or detection)).ti,ab. and (@ad<"20020712" or @rlad<"20020712")with led	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2014/09/08 18:17

			IBM_TDB			
S79	0	(image adj2 (recognition or detection)).ti,ab. and (@ad<"20020712" or @rlad<"20020712") with led	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:17
S80	0	(image adj2 (recognition or detection)).ti,ab. and (@ad<"20020712" or @rlad<"20020712") with light$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:17
S81	0	(image adj2 (recognition or detection)) and (@ad<"20020712" or @rlad<"20020712") with (light$3 or led or solid adj2 state)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:18
S82	28717	(image adj2 (recognition or detect$3 or sens$3)) and (@ad<"20020712" or @rlad<"20020712") and (light$3 or led or solid adj2 state) with (control$3 or cpu or copmputer or processor or microprocessor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:19
S83	31612	(image adj2 (recognition or detect$3 or sens$3)) and (@ad<"20020712" or @rlad<"20020712") and ((light$3 or led or solid adj2 state or luniaire or lamp) with (control$3 or cpu or computer or processor or microprocessor))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:20
S84	31612	(image adj2 (recognition or detect$3 or sens$3)) and (@ad<"20020712" or @rlad<"20020712") and ((light$3 or led or solid adj2 state or lumiaire or lamp) with (control$3 or cpu or computer or processor or microprocessor))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:20
S85	9386	(image adj2 (recognition or detect$3 or sens$3)).ti,ab. and (@ad<"20020712" or @rlad<"20020712") and ((light$3 or led or solid adj2 state or lumiaire or lamp) with (control$3 or cpu or computer or processor or microprocessor))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:21
S86	5176	(image adj2 (recognition or detect$3 or sens$3)).ti,ab. and (@ad<"20020712" or @rlad<"20020712") and ((light$3 or led or solid adj2 state or lumiaire or lamp) with (control$3 or cpu or computer or processor or microprocessor)).ti,ab.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:22
S87	4270	(image adj2 (recognition or detect$3 or sens$3)).ti,ab. and	US-PGPUB; USPAT;	OR	ON	2014/09/08 18:22

		(@pd<"20020712") and ((light$3 or led or solid adj2 state or lumiaire or lamp) with (control$3 or cpu or computer or processor or microprocessor)).ti,ab.	USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S88	6	(image adj2 (recognition or detect$3 or sens$3)).ti,ab. and (@pd<"20020712") and ((light$3 or led or solid adj2 state or lumiaire or lamp) with (control$3 or cpu or computer or processor or microprocessor)).ti,ab. and food	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:23
S89	318	(image adj2 (recognition or detect$3 or sens$3)).ti,ab. and (@pd<"20020712") and ((light$3 or led or solid adj2 state or lumiaire or lamp) with (control$3 or cpu or computer or processor or microprocessor)).ti,ab. and (restaurant or store)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:26
S90	319	(image adj2 (recognition or detect$3 or sens$3)).ti,ab. and (@pd<"20020712") and ((light$3 or led or solid adj2 state or lumiaire or lamp) with (control$3 or cpu or computer or processor or microprocessor)).ti,ab. and (restaurant or store or merchandise)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:26
S91	146	(image adj2 (recognition or detect$3 or sens$3)).ti,ab. and (@pd<"20020712") and ((light$3 or led or solid adj2 state or lumiaire or lamp) with (control$3 or cpu or computer or processor or microprocessor)).ti,ab. and (restaurant or store or merchandise) and camera	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:26
S92	276	(image adj2 (recognition or detect$3 or sens$3)).ti,ab. and (@pd<"20020712") and ((light$3 or led or lumiaire or lamp) with (control$3 or cpu or computer or processor or microprocessor)).ti,ab. and (restaurant or store)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:45
S93	151	S92 not S91	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:46
S94	6	(("6379022") or ("6340868") or ("5577832") or ("6498440") or ("6483439") or ("6820998")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/09/08 20:53
S95	7	heater with directed with people	US-PGPUB; USPAT	OR	OFF	2014/09/25 16:28
S96	12	heater with directed with motion	US-PGPUB; USPAT	OR	OFF	2014/09/25 16:29
S97	12	S96 not S95	US-PGPUB; USPAT	OR	OFF	2014/09/25 16:29
S98	3270	heat$3 with motion with detect$3	US-PGPUB;	OR	OFF	2014/09/25

			USPAT			16:29
S99	361	heat$3 with motion with detect$3 and @pd<"20020712"	US-PGPUB; USPAT	OR	OFF	2014/09/25 16:30
S100	16	("4360856" | "4386275" | "4485864" | "4992701" | "5127575" | "5281961" | "5476221").PN. OR ("5785243").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/09/25 16:42
S101	2678	led and network and camera and @pd<"20020712"	US-PGPUB; USPAT	OR	ON	2014/09/26 15:34
S102	386	led and network and camera.ti,ab. and @pd<"20020712"	US-PGPUB; USPAT	OR	ON	2014/09/26 15:34
S103	524	light$3.ti,ab. and network and camera.ti,ab. and @pd<"20020712"	US-PGPUB; USPAT	OR	ON	2014/09/26 15:37
S104	153	light$3.ti,ab. and network.ti,ab. and camera and @pd<"20020712"	US-PGPUB; USPAT	OR	ON	2014/09/26 15:38
S105	14	adamson.in. and @pd<"20020712"	US-PGPUB	OR	ON	2014/09/26 15:50
S106	296	glare with detect$4 and @pd<"20020712"	US-PGPUB; USPAT	OR	ON	2014/09/26 17:30
S107	11	glare.ti,ab. with detect$4 and @pd<"20020712"	US-PGPUB; USPAT	OR	ON	2014/09/26 17:51
S108	14	$5glare.ti,ab. with detect$4 and @pd<"20020712"	US-PGPUB; USPAT	OR	ON	2014/09/26 17:53
S109	10	"5,785,243"	US-PGPUB; USPAT	OR	ON	2014/09/26 18:06
S110	1	("5,785,243").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/09/26 18:06
S111	1	("6,385,352").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/09/26 18:18
S112	11697	(object and detect$4).ti,ab. and @pd<"20020712"	US-PGPUB; USPAT	OR	ON	2014/09/26 18:38
S113	2664	(object and detect$4).ti,ab. and @pd<"20020712" and controller	US-PGPUB; USPAT	OR	ON	2014/09/26 18:39
S114	1619	(object and detect$4).ti,ab. and @pd<"20020712" and controller and sensor	US-PGPUB; USPAT	OR	ON	2014/09/26 18:39
S116	89	(object and detect$4).ti,ab. and @pd<"20020712" and controller and sensor and processor and lighting	US-PGPUB; USPAT	OR	ON	2014/09/26 18:39

EAST Search History (Interference)

<This search history is empty>

9/26/2014 9:52:04 PM
C:\Users\dlotter\Documents\EAST\Workspaces\13357549.wsp

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13357549	SPERO, YECHEZKAL EVAN
	Examiner	Art Unit
	DAVID LOTTER	2844

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
315	152	8/19/2014	dl
362	276, 234	8/19/2014	dl

SEARCH NOTES		
Search Notes	Date	Examiner
inventor search	8/19/2014	dl
class subclass search	8/19/2014	dl
text search	8/19/2014	dl

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

In the United States Patent and Trademark Office

Application/CN: 13/357,549 Monday, January 12, 2015
Application Filed: 24 January 2012
Applicant: Spero, Yechezkal Evan
Title: Detector Controlled Illuminating System
Examiner: Lotter, David E
Art Unit: 2844

Reply to Office Action dated Oct. 10, 14

Mailstop: Amendment

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Dear Sir:

The application is being prosecuted by the Applicant pro se.

Certificate of Transmission Under 37 C.F.R. § 1.8

I hereby certify that this correspondence is being deposited electronically with the U.S. Patent and Trademark Office using the United States Patent and Trademark Office's EFS-Web system on **January 12, 2015**.

Signature
/Yechezkal Evan Spero/

Yechezkal Evan Spero

AMENDMENT UNDER 37 C.F.R. §1.111

In response to the Office Action mailed Oct. 10, 14, the following amendments and remarks are respectfully submitted in connection with the above-identified application.

Amendments to the Claims begin on page 2 of this Amendment.

Remarks begin on page 9 of this Amendment.

	Claims remaining after Amendment		**Highest number previously paid for**		**Present extra**
Total	26	-	20	=	0
Independent	4	-	4	=	0

AMENDMENTS TO THE CLAIMS

The following is a complete, marked-up listing of revised claims with a status identifier in parenthesis, underlined text indicating insertions, and strike through indicating deletions.

Full list of claims per 37 CFR 1.121

1. (Original) An illuminating device which produces light to meet an illumination requirement of an illuminated area, comprising: a light fixture including a multiplicity of directional light sources including at least two light sources pointing in different directions, the light sources having at least one of controllable light intensity and spectral light distribution; a controller for adjusting at least one of a light intensity and light spectrum of the directional light sources; one or more detectors for sensing at least one of objects, surfaces and people within the illuminated area and of passing the sensed information to the controller; a processor for processing the sensed information and determining illumination requirements of the at least one of objects and people using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables and for directing the controller to adjust the directional light sources to meet the illumination requirement.

2. (Original) The illuminating device of claim 1 where the detector is comprising at least one of (i) a camera being a photo sensor array coupled with an optical lens, (ii) a photo sensor, (iii) an ultrasound transducer and sensor, (iv) microwave transducer and sensor, and (v) pyroelectric detectors.

3. (Original) The illumination device of claim 1, wherein the illuminated area is indoors and further comprising a detector for detecting variable illumination from daylight and/or sunlight entering indoors, wherein the controller taking into consideration the area now illuminated by the daylight and/or sunlight adjusts the light intensity of the directional light sources to meet the varied illumination requirement.

4. (Original) The illuminating device of claim 1, wherein the one or more detectors detects information regarding one or more individuals within the illuminated area, said information is at least one of (i) age, (ii) sex, and (iii) recognition of an individual for matching with stored data about that individual's needs and wherein the controller adjusts the light intensity and/or spectrum of the illumination provided to the one or more individuals based on illumination requirements from at least one of (i) best practices looked up and calculated from stored data, (ii) age and/or sex of the individual, (iii) personal preferences input to the controller and stored in memory, and (iv) commands received by the controller from an input device.

5. (Original) The illuminating device of claim 1 for optimally displaying food, wherein the one or more detectors detect an identity of one or more foods and wherein the controller adjusts the light intensity and/or spectrum of the illumination on the one or more foods based on illumination requirements from the processor.

6. (Original) An illuminating device having automatic control of the light provided to an illuminated area comprising: a structure for incorporating illuminating device elements; one or more light sources incorporated in the structure and in communication with a power source; electronic circuitry apparatus for the controlled powering of the light source and other illuminating device elements; one or more cameras placed on the structure for detecting information about the illuminated area, said camera in communication with power and control device elements; a controller integrated with the structure, in communication with the light source controlling power circuitry, said controller arranged to processes the information communicated from the camera and automatically control the light provided to the illuminated area.

7. (Original) The illumination device of claim 6, wherein the one or more detectors are configured to sense a presence of glare on a person's eyes in the

illuminated area, and wherein the controller is programmed to adjust an intensity of the directional light sources to reduce the glare.

8. (Original) An illuminating device which provides light to meet an illumination requirement of an illuminated area in which visual activities are performed, comprising: a light fixture including a multiplicity of directional light sources including at least two directional light sources pointing in different directions, the light fixture having movable structure for aiming the directional light sources mounted thereon in a defined direction; a camera for obtaining images of the illuminated area functioning as a detector for at least one of (i) a light detector (ii) a spectrum detector, (iii) a motion detector, (iv) a measuring detector for sensing a geometry of the illuminated area, and (v) a detector for sensing at least one of work surfaces and road objects and at least one of vehicles and people; a controller for adjusting a light intensity and a direction of each of the directional light sources; a processor with stored algorithms and data for identifying at least one of (i) tasks being carried out by people, (ii) location of people, (iii) frequency of area usage by people, (iv) traffic density in the illuminated area from the sensed geometry, (v) work surfaces, (vi) road objects, people and/or vehicles, and (vii) roadway surface luminance any of which is used by said processor for determining illumination within the illuminated area using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables wherein said processer, upon calculating the required illumination parameters, directs the controller to adjust the directional light sources to meet the illumination requirements of the visual activities.

9. (Original) The illuminating device of claim 8, further comprising the illumination requirement that different parts of the illuminated area to be illuminated at a different intensity and/or at a different spectrum than another part of the illuminated area.

10. (Original) The illuminating device of claim 8, adjustable by an installer based

on room geometry and/or usage further comprising the light fixture having adjustable arms on which directional light sources are mounted for aiming the directional light sources within the illuminated area, where said detector and processor combination provides feedback to the installer so as to aim the light sources such that the illumination requirements can be met by the re-adjusted light source aimings.

11. (Original) The illumination device of claim 8, wherein the controller receives real time information from the camera and wherein the processor, using image recognition capability, directs the controller to adjust at least one of (i) the intensity, (ii) the spectral light distribution and, (iii) the direction of the light sources based on at least one of (i) where people requiring illumination are located, (ii) what object the person is viewing and (iii) what visual task the person needs to perform.

12. (Original) The illumination device of claim 8, further comprising at least one of the directional light sources mounted on the movable structure where the movement of the light source direction is automatically controlled by the controller.

13. (Original) The illumination device of claim 12, providing a different illumination to a sub-area based on usage wherein the controller interpreting images from the camera adjusts the moveable light sources such that they provide the required illumination in a sub-area proximate to the individuals as they move around in the illuminated area.

14. (Original) The illumination device of claim 8, wherein the illuminated area is a road and the objects include road signs.

15. (Original) The illumination device of claim 8, further comprising at least one of the directional light sources on an automatic swivel joint and providing spot

lights of limited beam angle for task lighting while other light source provide general illumination to the illuminated area.

16. (currently amended) The illumination device of claim 8, further comprising a controller with communication capability to other devices, where the camera in one location obtains information and the controller process the information and communicates the camera obtained information to a second device.

17. (Original) The illumination device of claim 16, where the illuminated area is a road and the second device to where the camera obtained information is communicated to is a lighting fixture.

18. (Original) The illumination device of claim 17, where the processor uses information obtained from the cameras and exchanged between fixtures for identifying traffic requirements in the illuminated area and from the vehicles locations and geometry determining the illumination requirements of the illumination area thereby directing the controller to adjust the directional light sources to meet the illumination requirements.

19. (Original) The illumination device of claim 18, wherein the controller is programmed to adjust at least one of (i) increase illumination with an approach of a vehicle, and (ii) change beam cut-off levels as the vehicle advances toward the lighting fixture to eliminate glare.

20. (currently amended) An automated irradiating device for providing radiation to individuals within an area, intended to provide a desired radiation in a sub-area proximate to the individuals, comprising: an irradiation fixture including one or more directional radiation sources where the radiation is in a defined direction; at least one detector for sensing a location of individuals in the area and ~~feeding~~ transferring that information to a controller; ~~a~~ where said controller ~~for adjusting~~ adjusts at least one of (i) a radiation intensity, and (ii) a direction of the irradiation

based on sensed location, whereby the desired radiation is provided proximate to individuals in the area.

21. (Original) The automated irradiating device of claim 20 intended to provide a desired heating to one or more individuals in an area, further comprising: at least two directional heat radiation sources pointing in different directions; the detector being a camera with capability for sensing at least one of (i) a presence of one or more individuals in the heated area, (ii) the identity of the individuals, and (iii) a body temperature of individuals present in the heated area; the controller further having processing capability for determining the heating requirements of the individuals in the area from at least one of (i) algorithms to calculate radiation parameters, (ii) stored data of heating practices, (iii) image recognition algorithms for identifying the individual based on the camera information, and (iv) an identified individual's personal preferences.

22. (Original) The automated irradiating device of claim 20, further comprising: One or more directional radiation sources capable of being moved so as to direct radiation in a defined direction; the at least one detector capable of providing information on the present location of individuals in the area; the controller programmed to process the detector information and move the radiating sources so as to follow the one or more individuals, whereby the desired radiation is provided in a sub-area substantially proximate to the individuals.

23. (Original) The irradiation device of claim 21, further comprising; the detector being a camera capable of providing images of different parts of the body of individuals to the controller for image processing; the radiation sources being able to direct radiation to different parts of the body; and the controller further programmed to run the image recognition algorithms to identify different parts of the body, to compute the desired radiation level to the different parts of the body and to adjust the radiation from sources directed at the different parts of the body.

24. (Original) The irradiation device of claim 21, further comprising the controller programmed to control the irradiation in time and intensity on the individual to maintain comfortable heating based on at least one of (i) best practices, (ii) feedback from the heat detector configured to detect body temperature of different parts of a body, (iii) personal preferences input to the controller and stored in memory and (iv) commands input from an input device.

25. (Currently Amended) The irradiation device of claim 21 where the irradiation instead of for heat is for therapeutic purposes and the radiation may be any of (i) UV radiation, (ii) red light therapy in the 620-660 nm range, and (iii) light therapy for ~~SAD and other~~ disorders selected from the group consisting of seasonal affective disorder, sleep disorders, circadian rhythm disorders, delayed sleep phase syndrome, vitamin D deficiency and skin disorders, where the controller aims the radiation sources to the location where the individual is located and controls the time and intensity of the radiation.

26. The automated irradiating device of claim 20 further comprising where one or more of the irradiating sources is radiating visible light and one or more of the irradiating sources is designed to substantially radiate heat whereby the device is capable of providing both a desired light and heat radiation to the individuals.

REMARKS

Favorable reconsideration of this application, in light of the remarks and following amendments, is respectfully requested. Claims 1- 26 are rejected in this application.

In reply to point 1: Specification (The disclosure is objected to because of the following informalities: paragraph [0118] appears to show an incomplete part "HLMP25-ED-xxxx". Appropriate correction is required.)

The Applicant respectfully points out that the part number is not incomplete as the HLMP25-ED is the major catalog heading for the LED part, it is so designated by the manufacturer and is sufficient for fully describing the construction of a dimmable LED lighting fixture. (The "xxxx" is the "bin" part of the catalog number and refers to the small differences in LED intensity and color performance which are insignificant to the inventive device's operation. Binning is a manufacturing sorting process which bins simlar LEDs into groups). Should the examiner prefer the "xxxx" may be removed.

In reply to point 2: Claim Objections

1) Claim 16 is objected to because of the following informalities: "a communicates" appears to be a typo.... The Examiner interprets "a" to mean "and". Appropriate correction is required.

The examiner is correct and the correction has been made in the new listing of claims.

→ Claim 16 has been currently amended changing the "a" to "and" and marked-up in the full list of claims.

2) Claim 25 is objected to because of the following informalities: The acronym "SAD" should be spelled out. Appropriate correction is required.

→ Claim 25 has been currently amended where SAD" is spelled out and marked-up in the full list of claims.

3) In reply to point 3: Claim Rejections - 35 USC § 112

"The following is a quotation of 35 U.S.C. 112(f): (f) Element in Claim for a Combination. Claim 4 recites the following limitation: "the one or more detectors detects information regarding one or more individuals within

the illuminated area, said information is at least one of (1) age, (ii) sex..." ... In other words, a detector alone is insufficient structure to achieve "detects information regarding one or more individuals within the illuminated area, said information is at least one of (i) age, (ii) sex." ... A review of the specification shows insufficient structure sufficient for achieving the claimed function is described in the specification (see generally paragraph [O246], Fig. 23)."

The Applicant respectfully disputes non-compliance with USC 112(f) or AIA 35 sixth paragraph and argues that recital of structure, material, or acts in support of how the detector "detects information regarding one or more individuals within the illuminated area, said information is at least one of (i) age, (ii) sex." are to found in the specification. The applicant herein quotes the relevant paragraph numbers followed by the actual text from the specification (applicant could not find line numbers in the publication so as to effectively communicate agreed line numbers with the examiner). The structure used to "detect" the age, sex of a person is a digital camera that communicates data to a processor which runs machine learning algorithms that it has stored in a memory device enabling it to perform image recognition using neural networks and other machine learning techniques known-in-the-art which after training is able to make a probabilistic guess that the image recognized person is belonging to group of people whose age is a factor in correct lighting practice and recall their data from memory. (Perhaps there was a misinterpretation of the term "age" as it is not necessary in lighting practice to know the real age in terms of exact years as the eye degradation is a continual process that anyway varies between individuals and thus even an approximation obtained from image recognition is useful for the logical controller to use with the lookup table which has a different lux value above for above 50 years.)

More specifically the specification support for: The processor, memory storage and sensor device is described in paragraph *[0101] the term "logical controller, controller or computer" can be broadly defined to encompass any device having control circuitry or a processor which executes instructions from a memory medium.* Where the integrated circuitries operation to run algorithms is shown in Fig 1 and described paragraph [0130] *In a preferred embodiment the DLF contains logic control electronics unit 7. Logic control electronics unit, 7, receives input and/or feedback from motion, intensity and/or spectral sensors 8... The control unit may include a DSP or computer with storage*

media, computer algorithms, signal input and output electronics, analog to digital converters, and communications elements to carry out intensity, distribution, dimming and color balance control. Computer algorithms and instruction sets 7A are induced by the logical controller to manipulate data, calculate results generate output signals and maintain the operating parameters within the specifications. Measured parameters are checked against the stored parameters and the control circuitry adjusts the power to SLS. The camera is disclosed in paragraph *[0131] Sensors 8 include any of the following: ... the detector may be a detector array of photodiode pixels.* The illuminating devices with a camera and controller depicted in Fig. 18 A and Fig 22 and described in paragraph *[0245] ... the camera chip transfers the image information to the logical controller. Using real time image processing methodologies with image and scene recognition technology known in the art, room or outdoor area elements, objects and people are identified. Using face recognition techniques an individual may be identified and personal lighting preferences or functions can be provided by the luminaire.* They are arranged to carry out the image recognition and control as further described in paragraph [0260] ... *The block diagram illustrates the power and communication connections between the elements. ... The logical controller 454 receives information from the input communications and sensors 453 and provides instructions to the power controls 455.* Thus in paragraph *[0262] The logical controller 454 ... calculates, using computer programs such as FIG. 23, how to best provide required illumination based on algorithms run on the processor 454 pulling stored lookup-data from the data storage of 454 ...* where the computer recognition techniques were disclosed earlier in paragraph *[0196] ...In the preferred embodiment, the addition of a machine vision system with pattern recognition capabilities as is known in the art, easily deduces room occupancy and usage. ... Pattern recognition methods known in the art, including neural networks, can provide a generalized stored application library of usages to the controller or the controller is an artificial intelligence controller and can learn the actual room usage with time. Outputs from the CCD arrays are analyzed by appropriate computational means employing trained pattern recognition technologies, to classify, identify or locate the contents. These techniques known in the art are covered in texts such as: Schalkhoff, Pattern Recognition, statistical, structural and neural approaches, John Wiley and Sons,*

New York, 1992 and Neural Networks for Pattern Recognition by Christopher M. Bishop, Chris Bishop, Oxford University Press; (January 1996) included herein by reference. Thus, the controller with or without human intervention will program the ADLF lighting system to carry out lighting within the realm of correct lighting practice. Advanced robotic vision techniques including object segmentation and selective-attention modeling (Itti, Visual attention and target detection in cluttered natural scenes in Optical Engineering, Vol. 40 No. 9, September 2001 included herein by reference) will aid in identifying various room objects and the lighting program 7A will associate with their location the visual tasks and recommended lighting characteristics.

The techniques for face recognition and training, learning and classification into common attribute sets such as age are known in the art. In his book, *Pattern Recognition, Statistical, Structural and Neural Approaches, Schalkhoff* writes on page 6: "The structure of a typical pattern recognition system is shown in Figure 2.

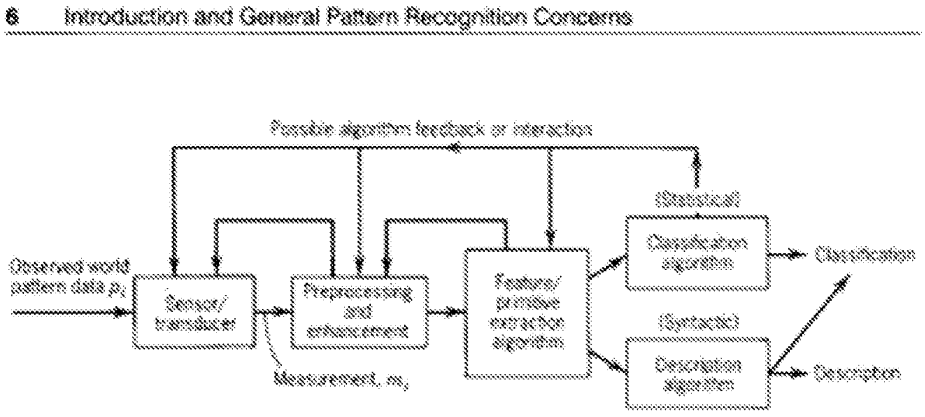


Figure 2: Typical pattern recognition system structures.

Notice that it consists of a sensor (an image sensor or camera, for example), a feature extraction mechanism (algorithm), and a classification or description algorithm (depending on the approach). In addition, usually some data that have already been classified or described are assumed available in order to train the system (the so-called training set)."

The applicant thus submits that the support in other sections of the specification shows sufficient structure allowing pattern recognition learning programs known in the art to achieve the claimed "detects" age function as described in the specification *[0246] A further capability of the digital lighting fixture using image recognition methodology known in the art that it can recognize the individuals and provide personal preference lighting conditions or determine the optimal lighting parameters as required by their age.*

4) In reply to point Claim Rejections - 35 USC § 112 (page 5 of OA)

"Claim 4 is rejected as failing to comply with the written description requirement."

The applicant respectfully disputes non-compliance with USC 112(a) or pre AIA 35 first paragraph and argues that recital of structure, material, or acts in support of how the detector "detects information regarding one or more individuals within the illuminated area, said information is at least one of (i) age, (ii) sex." are to found in the specification as covered in the section above. If in the section above the applicant's quoted structure recital arguments are insufficient for consideration under the sixth paragraph, and a claim revision is required for so as not to invoke 35 USC 112(f); the pro se applicant requests under MPEP § 707.07(j) the aid of the examiner in re-drafting claim 4 to be allowed if incorporated in the application by amendment.

5) In reply to point Claim Rejections - 35 USC § 112(b) (page 6 of OA) Conclusion. - The specification shall conclude ...Claims 20 and 25 are rejected under 35 USC § 112(b) as being indefinite... Claim 20 it is unclear second controller ...

→The applicant has amended claim 20 and marked "currently amended" in the full list of claims showing changes with markups

... Claim 25 recites in part "the radiation may be any of... light therapy for SAD and other disorders renders the claim indefinite"

→The applicant has amended claim 25 by using a Markush type of listing per MPEP § 2173.05(h) and marked it "currently amended" in the full list of claims showing changes with markups.

Point 6 –(page 7) Claim Rejections - 35 USC § 102 Claims 1-3 5-24, 26 are rejected

102(b) The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action: A continuation-in-part is an application filed during the lifetime of an earlier nonprovisional application, ...

The applicant points to section CROSS REFERENCE TO RELATED APPLICATIONS in US 2004/0105264 paragraph [0001] ... *this application is a continuation-in-part application of, and claims the benefit under 35 U.S.C. § 120 from, co-pending U.S. patent application Ser. No. 10/604,360, entitled "Multiple Light-Source Illuminating System" filed on Jul. 14, 2003, ...*

The examiner is respectfully asked to please note that the January 24th 2012 filing date is the same as the US 2004/0105264 issuance date (I do seem to remember asking the Inventors Assistance Center advisor and receiving advice that as long as the CIP was filed before issuance of the first patent on the 24th 2012 it would be considered pending).

According to MPEP 201.08: Continuation-in-Part Application (the bold type is the applicants emphasis)

- (B) The alleged continuation-in-part application was "**filed before the patenting** or abandonment of or termination of proceedings on the first application or an application similarly entitled to the benefit of the filing date of the first application"; and

35 U.S.C. 120 Benefit of earlier filing date in the United States.

An application for patent for an invention disclosed in the manner provided by the first paragraph of section 112 of this title in an application previously filed in the United States, or as provided by section 363 of this title, which is filed by an inventor or inventors named in the previously filed application **shall have the same effect, as to such invention, as though filed on the date of the prior application, if filed before the patenting** or abandonment of or termination of proceedings on the first application or on an application similarly entitled to the benefit of the filing date of the first application and if it contains or is amended to contain a specific reference to the earlier filed application.

The applicant thus respectfully requests that the material of US 2004/0105264 not be cited as prior art to the present daughter CIF and that the claims be allowed.

Point 7 - page 18 Claim 4 rejected... MPEP § 2173.05(h) 35 USC 103(a) Claim 4 ... rejected ... as being unpatentable over Spero (US 2004/0105264) as applied to claim 1 above, and further in view of Kiyohara US 20060222213 - Image processing apparatus, image processing system and recording medium for programs therefor. Kiyohara discloses wherein ... said information is at least one of (i) age, (ii) sex, and (iii) recognition of an individual... it would have been obvious...

The Applicant respectfully traverses the 103 rejection of claim 4 regarding Spero as explained above in point number 3. The Applicant respectfully traverses the 103 rejection of claim 4 regarding Kiyohara's patent with Spero for the following reasons: For an invention to be anticipated, it must be demonstrated that each and every element of the claimed invention is present in the "four corners" of a single prior art, either expressly described therein or under the principle of inherency. Kiyohara discloses *an image processing apparatus for processing an image captured by an imager device to output the processed image*- and no more. His intent is to provide *means for generating an output image based on the processed features.* The whole imaging and results process is in the virtual world - as are most of the new computer based advances in the world which remain virtual. A person knowledgeable in the art having a lighting fixture with a camera for occupancy detection would not, without a non-obvious, inventive-step connect the Kiyohara "age, sex" image recognition knowledge of to its intensity control which is certainly a new use. Note, the word control or anything practical doesn't appear in the entire Kiyohara patent.

Point 8 - page 19 Claim 25 rejected... AIA 35 USC 103(a)

Claim 25 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Spero (US 2004/0105264) as applied to claim 21 above, and further in view of Savage (US 2004/0138726).

The Applicant respectfully traverses the 103(a) rejection of claim 25 regarding Savage's patent with Spero for the reasons detailed below.

Savage discloses *A portable light-emitting device for delivering light to the blood supply of a human body of a subject through a non-ocular area of skin on the body, comprising: (a) a light delivery unit having multiple spaced-apart apertures therein for positioning on a portion of the body*

The present disclosure it is exactly an innovative attempt to escape the handheld therapy device described by Savage and free the occupant to receive therapy while they continue their daily activity. The at a distance operation is described in paragraph *[0314] As a further customization of the illumination characteristics, when utilizing the light source aim-ability feature of the FALM, one occupant of the room could receive controlled exposure to lighting conducive to melatonin production while other occupants in the room at the same time receive a normal, fuller spectrum illumination. Thus the right side spot light 544 could be of melatonin friendly light wavelengths for the individual receiving its light while a second individual in the second bed receives a full spectrum of light for reading from the left side spot light 549. And paragraph [0315] … As described earlier the spot light source 544 can be moved by actuators under the control of the logical controller 541 much as a moving head stage light follows actors on the stage. This is a unique feature of a computer/machine vision capable FAML irradiating device which can follow and irradiate the patient while they are carrying out their daily activities and is of major benefit….*

Conclusion

The applicant has revised the objected claims and requests that the above claims now be amended as in the new list of claims. The applicant submits that the claims are now in proper form to place the case in condition for allowance which action he respectfully solicits.

Conditional Request for Constructive Assistance

Should the examiner still prefer to have these or any or any other claims amended to more clearly highlight the uniqueness of the present invention, the pro se applicant

requests under M.P.E.P. § 2173.02 and §707.07(j) that the examiner should draft one or more claims for the applicant and indicate in his or her action that such claims would be allowed if incorporated in the application by amendment. This request is in order that the undersigned can place this application in allowable condition as soon as possible and without the need for further proceedings.

Very respectfully,

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January 12, 2015

Electronic Acknowledgement Receipt

EFS ID:	21189137
Application Number:	13357549
International Application Number:	
Confirmation Number:	1905
Title of Invention:	Detector Controlled Illuminating System
First Named Inventor/Applicant Name:	Yechezkal Evan Spero
Customer Number:	37268
Filer:	Yechezkal Evan Spero
Filer Authorized By:	
Attorney Docket Number:	
Receipt Date:	12-JAN-2015
Filing Date:	24-JAN-2012
Time Stamp:	19:28:37
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Applicant Arguments/Remarks Made in an Amendment	First_Reply_Non_Final_OA_10-10-14.pdf	207436 5795f3ef44a972f3cbdd23efc7b35d18d57975d4	no	17

Warnings:	
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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
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37268 e 2015-01-15

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Paper No.

Application No.:	**13/357,549**	**Date Mailed:**	**2015-01-15**
First Named Inventor:	Spero, Yechezkal, Evan	Examiner:	LOTTER, DAVID E
Attorney Docket No.:		Art Unit:	2844
Confirmation No.:	1905	Filing Date:	2012-01-24

Please find attached an Office communication concerning this application or proceeding.

Commissioner for Patents

PTO-90c (Rev.08-06)

Notice of Non-Compliant Amendment (37 CFR 1.121)	Application No. 13/357,549	Applicant(s) SPERO, YECHEZKAL EVAN
		Art Unit 2600

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

The amendment document filed on *12 January, 2015* is considered non-compliant because it has failed to meet the requirements of 37 CFR 1.121 or 1.4. In order for the amendment document to be compliant, correction of the following item(s) is required.

THE FOLLOWING MARKED (X) ITEM(S) CAUSE THE AMENDMENT DOCUMENT TO BE NON-COMPLIANT:

- ☐ 1. Amendments to the specification:
  - ☐ A. Amended paragraph(s) do not include markings.
  - ☐ B. New paragraph(s) should not be underlined.
  - ☐ C. Other _____.
- ☐ 2. Abstract:
  - ☐ A. Not presented on a separate sheet. 37 CFR 1.72.
  - ☐ B. Other _____.
- ☐ 3. Amendments to the drawings:
  - ☐ A. The drawings are not properly identified in the top margin as "Replacement Sheet," "New Sheet," or "Annotated Sheet" as required by 37 CFR 1.121(d).
  - ☐ B. The practice of submitting proposed drawing correction has been eliminated. Replacement drawings showing amended figures, without markings, in compliance with 37 CFR 1.84 are required.
  - ☐ C. Other _____.
- ☒ 4. Amendments to the claims:
  - ☐ A. A complete listing of all of the claims is not present.
  - ☐ B. The listing of claims does not include the text of all pending claims (including withdrawn claims)
  - ☒ C. Each claim has not been provided with the proper status identifier, and as such, the individual status of each claim cannot be identified. Note: the status of every claim must be indicated after its claim number by using one of the following status identifiers: (Original), (Currently amended), (Canceled), (Previously presented), (New), (Not entered), (Withdrawn) and (Withdrawn-currently amended).
  - ☐ D. The claims of this amendment paper have not been presented in ascending numerical order.
  - ☒ E. Other: *See claim 26*.
- ☐ 5. Other (e.g., the amendment is unsigned or not signed in accordance with 37 CFR 1.4): For further explanation of the amendment format required by 37 CFR 1.121, see MPEP § 714.

TIME PERIODS FOR FILING A REPLY TO THIS NOTICE:

1. Applicant is given **no new time period if the non-compliant amendment is an** after-final amendment or an amendment filed after allowance, or a drawing submission (only) If applicant wishes to resubmit the non-compliant after-final amendment with corrections, the **entire corrected amendment** must be resubmitted.

2. Applicant is given **two months** from the mail date of this notice to supply the correction, if the non-compliant amendment is one of the following: a preliminary amendment, a non-final amendment (including a submission for a request for continued examination (RCE) under 37 CFR 1.114), a supplemental amendment filed within a suspension period under 37 CFR 1.103(a) or (c), and an amendment filed in response to a Quayle action. If any of above boxes 1 to 4 are checked, the correction required is only the corrected section of the non-compliant amendment in compliance with 37 CFR 1.121.

Extensions of time are available under 37 CFR 1.136(a) only if the non-compliant amendment is a non-final amendment or an amendment filed in response to a *Quayle* action.

Failure to timely respond to this notice will result in:

Abandonment of the application if the non-compliant amendment is a non-final amendment or an amendment filed in response to a *Quayle* action; or

Non-entry of the amendment if the non-compliant amendment is a preliminary amendment or supplemental amendment.

Legal Instruments Examiner (LIE), if applicable /NICHELE PETERSON/ Telephone No: (571)272-7273

PTO/SB/06 (09-11)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/357,549	Filing Date 01/24/2012	☒ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT 01/12/2015

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 26	Minus	** 26	= 0	X $40 =	0
Independent (37 CFR 1.16(h))	* 4	Minus	***4	= 0	X $210 =	0
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	0

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/NICHELE PETERSON/

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In the United States Patent and Trademark Office

Application/CN: 13/357,549 Monday, March 16, 2015
Application Filed: 24 January 2012
Applicant: Spero, Yechezkal Evan
Title: Detector Controlled Illuminating System
Examiner: Lotter, David E
Art Unit: 2844

Reply to Notice of Non-compliant Amendment dated Jan. 12, 2015

AMENDMENT UNDER 37 C.F.R. §1.111

In response to the Notice of Non-compliant Amendment dated Jan. 12, 2015, "*each claim has not been provided proper status identifier See Claim 26"* the following corrected set of claims with amendment to the claims 26 is re-submitted"

Amendments to the Claims begin on page 2 of this Amendment.

Very respectfully,

/ Yechezkal Evan Spero/

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Certificate of Transmission Under 37 C.F.R. § 1.8

I hereby certify that this correspondence is being deposited electronically with the U.S. Patent and Trademark Office using the United States Patent and Trademark Office's EFS-Web system on **March 16, 2015**.

Signature
/Yechezkal Evan Spero/
Yechezkal Evan Spero

AMENDMENTS TO THE CLAIMS

The following is a complete, marked-up listing of revised claims with a status identifier in parenthesis, underlined text indicating insertions, and strike through indicating deletions.

Full list of claims per 37 CFR 1.121

1. (Original) An illuminating device which produces light to meet an illumination requirement of an illuminated area, comprising: a light fixture including a multiplicity of directional light sources including at least two light sources pointing in different directions, the light sources having at least one of controllable light intensity and spectral light distribution; a controller for adjusting at least one of a light intensity and light spectrum of the directional light sources; one or more detectors for sensing at least one of objects, surfaces and people within the illuminated area and of passing the sensed information to the controller; a processor for processing the sensed information and determining illumination requirements of the at least one of objects and people using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables and for directing the controller to adjust the directional light sources to meet the illumination requirement.

2. (Original) The illuminating device of claim 1 where the detector is comprising at least one of (i) a camera being a photo sensor array coupled with an optical lens, (ii) a photo sensor, (iii) an ultrasound transducer and sensor, (iv) microwave transducer and sensor, and (v) pyroelectric detectors.

3. (Original) The illumination device of claim 1, wherein the illuminated area is indoors and further comprising a detector for detecting variable illumination from daylight and/or sunlight entering indoors, wherein the controller taking into consideration the area now illuminated by the daylight and/or sunlight adjusts the light intensity of the directional light sources to meet the varied illumination requirement.

4. (Original) The illuminating device of claim 1, wherein the one or more detectors detects information regarding one or more individuals within the illuminated area, said information is at least one of (i) age, (ii) sex, and (iii) recognition of an individual for matching with stored data about that individual's needs and wherein the controller adjusts the light intensity and/or spectrum of the illumination provided to the one or more individuals based on illumination requirements from at least one of (i) best practices looked up and calculated from stored data, (ii) age and/or sex of the individual, (iii) personal preferences input to the controller and stored in memory, and (iv) commands received by the controller from an input device.

5. (Original) The illuminating device of claim 1 for optimally displaying food, wherein the one or more detectors detect an identity of one or more foods and wherein the controller adjusts the light intensity and/or spectrum of the illumination on the one or more foods based on illumination requirements from the processor.

6. (Original) An illuminating device having automatic control of the light provided to an illuminated area comprising: a structure for incorporating illuminating device elements; one or more light sources incorporated in the structure and in communication with a power source; electronic circuitry apparatus for the controlled powering of the light source and other illuminating device elements; one or more cameras placed on the structure for detecting information about the illuminated area, said camera in communication with power and control device elements; a controller integrated with the structure, in communication with the light source controlling power circuitry, said controller arranged to processes the information communicated from the camera and automatically control the light provided to the illuminated area.

7. (Original) The illumination device of claim 6, wherein the one or more detectors are configured to sense a presence of glare on a person's eyes in the

illuminated area, and wherein the controller is programmed to adjust an intensity of the directional light sources to reduce the glare.

8. (Original) An illuminating device which provides light to meet an illumination requirement of an illuminated area in which visual activities are performed, comprising: a light fixture including a multiplicity of directional light sources including at least two directional light sources pointing in different directions, the light fixture having movable structure for aiming the directional light sources mounted thereon in a defined direction; a camera for obtaining images of the illuminated area functioning as a detector for at least one of (i) a light detector (ii) a spectrum detector, (iii) a motion detector, (iv) a measuring detector for sensing a geometry of the illuminated area, and (v) a detector for sensing at least one of work surfaces and road objects and at least one of vehicles and people; a controller for adjusting a light intensity and a direction of each of the directional light sources; a processor with stored algorithms and data for identifying at least one of (i) tasks being carried out by people, (ii) location of people, (iii) frequency of area usage by people, (iv) traffic density in the illuminated area from the sensed geometry, (v) work surfaces, (vi) road objects, people and/or vehicles, and (vii) roadway surface luminance any of which is used by said processor for determining illumination within the illuminated area using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables wherein said processer, upon calculating the required illumination parameters, directs the controller to adjust the directional light sources to meet the illumination requirements of the visual activities.

9. (Original) The illuminating device of claim 8, further comprising the illumination requirement that different parts of the illuminated area to be illuminated at a different intensity and/or at a different spectrum than another part of the illuminated area.

10. (Original) The illuminating device of claim 8, adjustable by an installer based

on room geometry and/or usage further comprising the light fixture having adjustable arms on which directional light sources are mounted for aiming the directional light sources within the illuminated area, where said detector and processor combination provides feedback to the installer so as to aim the light sources such that the illumination requirements can be met by the re-adjusted light source aimings.

11. (Original) The illumination device of claim 8, wherein the controller receives real time information from the camera and wherein the processor, using image recognition capability, directs the controller to adjust at least one of (i) the intensity, (ii) the spectral light distribution and, (iii) the direction of the light sources based on at least one of (i) where people requiring illumination are located, (ii) what object the person is viewing and (iii) what visual task the person needs to perform.

12. (Original) The illumination device of claim 8, further comprising at least one of the directional light sources mounted on the movable structure where the movement of the light source direction is automatically controlled by the controller.

13. (Original) The illumination device of claim 12, providing a different illumination to a sub-area based on usage wherein the controller interpreting images from the camera adjusts the moveable light sources such that they provide the required illumination in a sub-area proximate to the individuals as they move around in the illuminated area.

14. (Original) The illumination device of claim 8, wherein the illuminated area is a road and the objects include road signs.

15. (Original) The illumination device of claim 8, further comprising at least one of the directional light sources on an automatic swivel joint and providing spot

lights of limited beam angle for task lighting while other light source provide general illumination to the illuminated area.

16. (currently amended) The illumination device of claim 8, further comprising a controller with communication capability to other devices, where the camera in one location obtains information and the controller process the information and communicates the camera obtained information to a second device.

17. (Original) The illumination device of claim 16, where the illuminated area is a road and the second device to where the camera obtained information is communicated to is a lighting fixture.

18. (Original) The illumination device of claim 17, where the processor uses information obtained from the cameras and exchanged between fixtures for identifying traffic requirements in the illuminated area and from the vehicles locations and geometry determining the illumination requirements of the illumination area thereby directing the controller to adjust the directional light sources to meet the illumination requirements.

19. (Original) The illumination device of claim 18, wherein the controller is programmed to adjust at least one of (i) increase illumination with an approach of a vehicle, and (ii) change beam cut-off levels as the vehicle advances toward the lighting fixture to eliminate glare.

20. (currently amended) An automated irradiating device for providing radiation to individuals within an area, intended to provide a desired radiation in a sub-area proximate to the individuals, comprising: an irradiation fixture including one or more directional radiation sources where the radiation is in a defined direction; at least one detector for sensing a location of individuals in the area and ~~feeding~~ transferring that information to a controller; ~~a~~ where said controller ~~for adjusting~~ adjusts at least one of (i) a radiation intensity, and (ii) a direction of the irradiation

based on sensed location, whereby the desired radiation is provided proximate to individuals in the area.

21. (Original) The automated irradiating device of claim 20 intended to provide a desired heating to one or more individuals in an area, further comprising: at least two directional heat radiation sources pointing in different directions; the detector being a camera with capability for sensing at least one of (i) a presence of one or more individuals in the heated area, (ii) the identity of the individuals, and (iii) a body temperature of individuals present in the heated area; the controller further having processing capability for determining the heating requirements of the individuals in the area from at least one of (i) algorithms to calculate radiation parameters, (ii) stored data of heating practices, (iii) image recognition algorithms for identifying the individual based on the camera information, and (iv) an identified individual's personal preferences.

22. (Original) The automated irradiating device of claim 20, further comprising: One or more directional radiation sources capable of being moved so as to direct radiation in a defined direction; the at least one detector capable of providing information on the present location of individuals in the area; the controller programmed to process the detector information and move the radiating sources so as to follow the one or more individuals, whereby the desired radiation is provided in a sub-area substantially proximate to the individuals.

23. (Original) The irradiation device of claim 21, further comprising; the detector being a camera capable of providing images of different parts of the body of individuals to the controller for image processing; the radiation sources being able to direct radiation to different parts of the body; and the controller further programmed to run the image recognition algorithms to identify different parts of the body, to compute the desired radiation level to the different parts of the body and to adjust the radiation from sources directed at the different parts of the body.

24. (Original) The irradiation device of claim 21, further comprising the controller programmed to control the irradiation in time and intensity on the individual to maintain comfortable heating based on at least one of (i) best practices, (ii) feedback from the heat detector configured to detect body temperature of different parts of a body, (iii) personal preferences input to the controller and stored in memory and (iv) commands input from an input device.

25. (Currently Amended) The irradiation device of claim 21 where the irradiation instead of for heat is for therapeutic purposes and the radiation may be any of (i) UV radiation, (ii) red light therapy in the 620-660 nm range, and (iii) light therapy for ~~SAD and other~~ disorders selected from the group consisting of seasonal affective disorder, sleep disorders, circadian rhythm disorders, delayed sleep phase syndrome, vitamin D deficiency and skin disorders, where the controller aims the radiation sources to the location where the individual is located and controls the time and intensity of the radiation.

26. (Original) The automated irradiating device of claim 20 further comprising where one or more of the irradiating sources is radiating visible light and one or more of the irradiating sources is designed to substantially radiate heat whereby the device is capable of providing both a desired light and heat radiation to the individuals.

Conclusion

The applicant has revised the claim identifier and requests that the above claims now be amended as in the new list of claims. The applicant submits that the claims are now in proper form to place the case in condition for allowance which action he respectfully solicits.

Very respectfully,
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March 16, 2015

Electronic Patent Application Fee Transmittal

Application Number:	13357549
Filing Date:	24-Jan-2012
Title of Invention:	Detector Controlled Illuminating System
First Named Inventor/Applicant Name:	Yechezkal Evan Spero
Filer:	Yechezkal Evan Spero
Attorney Docket Number:	

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 1 month with $0 paid	2251	1	100	100
Miscellaneous:				
		Total in USD ($)		**100**

Electronic Acknowledgement Receipt	
EFS ID:	21775855
Application Number:	13357549
International Application Number:	
Confirmation Number:	1905
Title of Invention:	Detector Controlled Illuminating System
First Named Inventor/Applicant Name:	Yechezkal Evan Spero
Customer Number:	37268
Filer:	Yechezkal Evan Spero
Filer Authorized By:	
Attorney Docket Number:	
Receipt Date:	16-MAR-2015
Filing Date:	24-JAN-2012
Time Stamp:	13:05:25
Application Type:	Utility under 35 USC 111(a)

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RAM confirmation Number	11098
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	Certificate_Trans_Correction.pdf	211205 4d7c3289b98744f92b6cb4883d6e928ef83519a2	no	2
Warnings:					
Information:					
2	Extension of Time	aia0022_time_Ext.pdf	162148 1b297be5bb060db0e86d6ac66940308c0b075a81	no	2
Warnings:					
Information:					
3		Correction_Non-Compliant_Reply_OA_10-10-14.pdf	74858 6443da9c00e0cda2919dd0a2729ef8643ad6ec1c	yes	9

Multipart Description/PDF files in .zip description

Document Description	Start	End
Miscellaneous Incoming Letter	1	1
Claims	2	9

Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	29742 786b08c28822d93778e8ad3a0e83513457b38389	no	2
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4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
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PTO/AIA/22 (03-13)
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PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)

Docket Number (Optional)

Application Number 13/357,549

Filed 24 January 2012

For One Month Time Extension

Art Unit 2844

Examiner Lotter, David E

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

	Fee	Small Entity Fee	Micro Entity Fee	
☑ One month (37 CFR 1.17(a)(1))	$200	$100	$50	$ 100
☐ Two months (37 CFR 1.17(a)(2))	$600	$300	$150	$
☐ Three months (37 CFR 1.17(a)(3))	$1,400	$700	$350	$
☐ Four months (37 CFR 1.17(a)(4))	$2,200	$1,100	$550	$
☐ Five months (37 CFR 1.17(a)(5))	$3,000	$1,500	$750	$

☑ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29.
Form PTO/SB/15A or B or equivalent must either be enclosed or have been submitted previously.

☐ A check in the amount of the fee is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

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I am the

☑ applicant.

☐ attorney or agent of record. Registration number _____.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

?Yechezkal Spero/ — Signature

3/16/2015 — Date

Yechezkal Evan Spero — Typed or printed name

+972-996-0324 — Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☐ * Total of 1 forms are submitted.

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The information provided by you in this form will be subject to the following routine uses:

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PTO/SB/06 (09-11)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/357,549	Filing Date 01/24/2012	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT 03/16/2015

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 26	Minus	** 26	= 0	X $40 =	0
Independent (37 CFR 1.16(h))	* 4	Minus	***4	= 0	X $210 =	0
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	0

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/CAROL BARNES/

This collection of information is required by 37 CFR 1.16. 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 12 minutes 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. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/357,549	01/24/2012	Yechezkal Evan Spero		1905

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EXAMINER	
LOTTER, DAVID E	

ART UNIT	PAPER NUMBER
2844	

MAIL DATE	DELIVERY MODE
06/23/2015	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 13/357,549	Applicant(s) SPERO, YECHEZKAL EVAN	
	Examiner DAVID LOTTER	Art Unit 2844	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *1/12/2015*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-26* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-26* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *1/24/2012* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of 35 U.S.C. 112(b):
(b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:
The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 7 recites the limitation "…intensity of the directional light sources". There is insufficient antecedent basis for this limitation in the claim. Independent claim 6 recites “one or more light sources incorporated in the light structure.” The Examiner interprets claim 7 as reading “one or more light sources incorporated in the light structure" as recited in claim 6.

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1 and 3 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646).

Regarding claim 1 Morgan discloses an illuminating device (e.g. paragraph 0019) which produces light to meet an illumination requirement of an illuminated area, comprising: a light fixture (paragraph 0019) including a multiplicity of light sources (Fig. 1, at 36A, 38A, 40A, paragraph 0020), the light sources having at least one of controllable light intensity and spectral light distribution (e.g., paragraphs 0040-0042); a controller (Fig. 1, at 26A) for adjusting at least one of a light intensity and light spectrum of the directional light sources (paragraph 0040); one or more detectors (Fig. 1, at 42) for sensing at least one of objects, surfaces and people (paragraph 0022) within the illuminated area and of passing the sensed information to the controller (paragraph 0022); a processor (Fig. 1, at 22) for processing the sensed information and determining illumination requirements of the at least one of objects and people using at least one of artificial intelligence (paragraph 0025), pattern recognition, video analytics, and look-up tables and for directing the controller to adjust the directional light sources to meet the illumination requirement (e.g. paragraph 0020).

Morgan discloses a light fixture but Morgan arguably may not explicitly disclose a light fixture including a multiplicity of directional light sources including at least two light sources pointing in different directions.

Lys discloses a light fixture including a multiplicity of directional light sources including at least two light sources pointing in different directions (e.g., Fig. 28C, paragraph 0206).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys regarding directional LEDs (Lys, paragraph 0206) in order to permit the light module to conform to an environment within which it is placed (Lys, paragraph 0206).

Regarding claim 3 Morgan further discloses the illumination device of claim 1, wherein the illuminated area is indoors (paragraph 0023) and further comprising a detector (paragraphs 0023-0024) for detecting variable illumination from daylight and/or sunlight entering indoors (paragraph 0023), wherein the controller taking into consideration the area now illuminated by the daylight and/or sunlight adjusts the light intensity of the directional light sources to meet the varied illumination requirement (paragraph 0023).

Claim 2 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) as applied to claim 1 above, and further in view of Amerson (US 6,379,022).

Regarding claim 2, Morgan as modified above discloses the illumination of claim 1. Morgan discloses a light sensor (paragraph 0022).

Morgan does not explicitly disclose where the detector is comprising at least one of (i) a camera being a photo sensor array coupled with an optical lens, (ii) a photo sensor, (iii) an ultrasound transducer and sensor, (iv) microwave transducer and sensor, and (v) pyroelectric detectors.

Amerson discloses where the detector is comprising at least one of (i) a camera being a photo sensor array coupled with an optical lens, (ii) a photo sensor (column 3, lines 17-26), (iii) an ultrasound transducer and sensor, (iv) microwave transducer and sensor, and (v) pyroelectric detectors.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Amerson regarding cameras used with LEDs (Amerson, column 3, lines 17-26) in order to vary the light output of the LEDs (Amerson, column 2, lines 29-33).

Claim 4 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) as applied to claim 1 above, and further in view of Kinjo (US 2002/0046100).

Regarding claim 4 Morgan discloses the illuminating device of claim 1. Morgan further discloses wherein the controller adjusts the light intensity and/or spectrum of the illumination provided to the one or more individuals based on illumination requirements

from at least one of (i) best practices looked up and calculated from stored data, (ii) age and/or sex of the individual, (iii) personal preferences input to the controller and stored in memory (paragraph 0036), and (iv) commands received by the controller from an input device (paragraphs 0036-0037).

Morgan does not explicitly disclose wherein the one or more detectors detects information regarding one or more individuals within the illuminated area, said information is at least one of (i) age, (ii) sex, and (iii) recognition of an individual for matching with stored data about that individual's needs.

Kinjo discloses wherein the one or more detectors (Fig. 1, at 12) detects information regarding one or more individuals within the illuminated area, said information is at least one of (i) age (paragraph 0012), (ii) sex (paragraph 0012), and (iii) recognition of an individual for matching with stored data about that individual's needs (e.g., paragraphs 0010-0013, Fig. 2). 3

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Kinjo regarding customer detection methods (Kinjo, paragraphs 0010-0012) in order to detect characteristics of a person (Kinjo, paragraph 0010).

Claim 5 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) as applied to claim 1 above, and further in view of Zampini (US 2008/0136356) and in further view of Bolle (US 5,546,475).

Regarding claim 5 Morgan as modified discloses the illuminating device of claim 1. Morgan also discloses a processor (Fig. 1, at 22) and a detector (Fig. 1, at 42).

Morgan does not explicitly disclose a device for optimally displaying food, wherein the controller adjusts the light intensity and/or spectrum of the illumination on the one or more foods based on illumination requirements from the processor.

Zampini discloses a device for optimally displaying food, wherein the controller adjusts the light intensity and/or spectrum of the illumination (paragraphs 0053-0054) on the one or more foods based on illumination requirements from the processor (paragraph 0055).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Zampini regarding detecting and controlling illumination requirements (Zampini, paragraphs 0053-0054) in order to improve marketability and enhance brand recognition (Zampini, paragraph 0002).

Lys in view of Zampini does not disclose wherein the one or more detectors detect an identity of one or more foods.

Bolle discloses wherein the one or more detectors detect an identity of one or more foods (Bolle, column 7, lines 37-48).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Zampini regarding detecting and controlling illumination requirements and in further accordance with the teachings of Bolle regarding one or more detectors detecting an identity of one or more foods (Bolle, column 7, lines 37-48) in order to recognize objects such as produce (Bolle, column 5, lines 50-51).

Claim 6 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Amerson (US 6,379,022).

Regarding claim 6 Morgan discloses an illuminating device having automatic control of the light provided to an illuminated area comprising:

a structure (Fig. 2, at 26) for incorporating illuminating device elements;

one or more light sources (e.g., Fig. 2, at 52A) incorporated in the structure and in communication with a power source (Fig. 2, at 44);

electronic circuitry apparatus for the controlled powering of the light source and other illuminating device elements (Fig. 2, at 50);

a controller (Fig. 2, at controller) integrated with the structure, in communication with the light source controlling power circuitry.

Morgan does not disclose one or more cameras placed on the structure for detecting information about the illuminated area, said camera in communication with power and control device elements; said controller arranged to processes the

information communicated from the camera and automatically control the light provided to the illuminated area.

Amerson discloses one or more cameras (Amerson, column 3, lines 17-26) placed on the structure for detecting information about the illuminated area, said camera in communication with power and control device elements (Amerson, column 3, lines 17-26); said controller arranged to processes the information communicated from the camera and automatically control the light provided to the illuminated area (Amerson, column 3, lines 17-26).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Amerson regarding cameras used with LEDs (Amerson, column 3, lines 17-26) in order to vary the light output of the LEDs (Amerson, column 2, lines 29-33).

Claim 7 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Amerson (US 6,379,022) as applied to claim 6 above, and further in view of Chang (US 2002/0039238).

Regarding claim 7 Morgan in view of Amerson discloses the illumination device of claim 6.

Morgan in view of Amerson does not disclose wherein the one or more detectors are configured to sense a presence of glare on a person's eyes in the illuminated area,

and wherein the controller is programmed to adjust an intensity of the directional light sources to reduce the glare.

Chang discloses wherein the one or more detectors (Fig. 2, at 10) are configured to sense a presence of glare on a person's eyes (Fig. 2, at 114) in the illuminated area, and wherein the controller (Fig. 2, at 110) is programmed to adjust an intensity of the directional light sources to reduce the glare (Fig. 2, at 12).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Chang regarding preventing glare (Chang, paragraph 0001) in order to automatically block out glare (Chang, paragraph 0005).

Claims 8-17 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) in further view of Amerson (US 6,379,022).

Regarding claim 8 Morgan discloses an illuminating device which provides light to meet an illumination requirement of an illuminated area in which visual activities are performed, comprising:

a light fixture (Fig. 2, at 24) including a multiplicity of light sources (Fig. 2, at 36A, 38A, 40A, paragraph 0020), a controller (paragraph 0022) for adjusting a light intensity (paragraph 0040) and a direction (paragraphs 0019-0020) of each of the directional light sources;

a processor (Fig. 2, at 22) with stored algorithms (paragraph 0040) and data for identifying at least one of (i) tasks being carried out by people, (ii) location of people (paragraph 0022), (iii) frequency of area usage by people, (iv) traffic density in the illuminated area from the sensed geometry, (v) work surfaces, (vi) road objects, people and/or vehicles, and (vii) roadway surface luminance any of which is used by said processor for determining illumination within the illuminated area using at least one of artificial intelligence (paragraph 0025), pattern recognition, video analytics, and look-up tables wherein said processer, upon calculating the required illumination parameters, directs the controller to adjust the directional light sources to meet the illumination requirements of the visual activities (paragraph 0020).

Morgan discloses two light sources but may not explicitly disclose including at least two directional light sources pointing in different directions.

Lys discloses including at least two directional light sources pointing in different directions (e.g., Fig. 28C, paragraph 0206) the light fixture having movable structure for aiming the light sources mounted thereon in a defined direction (e.g. Fig 90A, at 2010, paragraphs 0325-0326)

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys regarding directional light sources (Lys, paragraph 0206) in order to permit the light module to conform to an environment within which it is placed (Lys, paragraph 0206).

Morgan does not disclose a camera for obtaining images of the illuminated area functioning as a detector for at least one of (i) a light detector (ii) a spectrum detector, (iii) a motion detector, (iv) a measuring detector for sensing a geometry of the illuminated area, and (v) a detector for sensing at least one of work surfaces and road objects and at least one of vehicles and people; a controller for adjusting a light intensity and a direction of each of the directional light sources.

Amerson discloses a camera (column 3, lines 17-26) for obtaining images of the illuminated area functioning as a detector for at least one of (i) a light detector (column 3, lines 17-26) (ii) a spectrum detector, (iii) a motion detector, (iv) a measuring detector for sensing a geometry of the illuminated area, and (v) a detector for sensing at least one of work surfaces and road objects and at least one of vehicles and people.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Amerson regarding cameras used with LEDs (Amerson, column 3, lines 17-26) in order to vary the light output of the LEDs (Amerson, column 2, lines 29-33).

Regarding claim 9 Morgan further discloses the illuminating device of claim 8, further comprising the illumination requirement that different parts of the illuminated area to be illuminated at a different intensity and/or at a different spectrum than another part of the illuminated area (e.g., paragraphs 0020-0023).

Regarding claim 10 Morgan discloses the illuminating device of claim 8.

Morgan may not explicitly disclose the illuminating device of claim 8, adjustable by an installer based on room geometry and/or usage further comprising the light fixture having adjustable arms on which directional light sources are mounted for aiming the directional light sources within the illuminated area, where said detector and processor combination provides feedback to the installer so as to aim the light sources such that the illumination requirements can be met by the re-adjusted light source aimings.

Lys discloses an adjustable by an installer based on room geometry and/or usage further comprising the light fixture having adjustable arms (paragraphs 0325-0326) on which directional light sources are mounted for aiming the directional light sources within the illuminated area, where said detector and processor combination provides feedback (e.g., paragraphs 0256, 0281) to the installer so as to aim the light sources such that the illumination requirements can be met by the re-adjusted light source aimings (paragraphs 0281, 0325-0326).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys regarding directional light sources (Lys, paragraph 0206) in order to permit the light module to conform to an environment within which it is placed (Lys, paragraph 0206).

Regarding claim 11 Morgan further discloses the illumination device of claim 8.

Morgan does not disclose wherein the controller receives real time information from the camera and wherein the processor, using image recognition capability, directs

the controller to adjust at least one of (i) the intensity, (ii) the spectral light distribution and, (iii) the direction of the light sources based on at least one of (i) where people requiring illumination are located, (ii) what object the person is viewing and (iii) what visual task the person needs to perform.

Amerson discloses wherein the controller receives real time information from the camera (column 1, lines 11-12) and wherein the processor (column 3, lines 14-25), using image recognition capability, directs the controller to adjust at least one of (i) the intensity (column 2, lines 27-38), (ii) the spectral light distribution and, (iii) the direction of the light sources based on at least one of (i) where people requiring illumination are located, (ii) what object the person is viewing and (iii) what visual task the person needs to perform.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Amerson regarding cameras used with LEDs (Amerson, column 3, lines 17-26) in order to vary the light output of the LEDs (Amerson, column 2, lines 29-33).

Regarding claim 12 Morgan discloses the illumination device of claim 8.

Morgan may not explicitly disclose at least one of the directional light sources mounted on the movable structure where the movement of the light source direction is automatically controlled by the controller.

Lys discloses at least one of the directional light sources mounted on the movable structure where the movement of the light source direction is automatically controlled by the controller (paragraphs 0325-0326).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys regarding directional light sources (Lys, paragraphs 0206, 0325-0326) in order to permit the light module to conform to an environment within which it is placed (Lys, paragraph 0206).

Regarding claim 13 Morgan further discloses the illumination device of claim 12, providing a different illumination to a sub-area based on usage wherein the controller interpreting images from the sensor adjusts the moveable light sources such that they provide the required illumination in a sub-area proximate to the individuals as they move around in the illuminated area (paragraph 0019).

Morgan discloses using sensors but does not explicitly disclose using a camera.

Amerson discloses using a camera (Amerson, column 3, lines 17-26).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Amerson regarding cameras used with LEDs (Amerson, column 3, lines 17-26) in order to vary the light output of the LEDs (Amerson, column 2, lines 29-33).

Regarding claim 14 Morgan further discloses the illumination device of claim 8, wherein the illuminated area is a road and the objects include road signs (paragraph 0018 – the Examiner interprets “outdoor environments" as reading on this claim).

Regarding claim 15 Morgan discloses the illumination device of claim 8.

Morgan does not disclose at least one of the directional light sources on an automatic swivel joint and providing spot lights of limited beam angle for task lighting but Morgan discloses other light source that provide general illumination to the illuminated area (paragraph 0023).

Lys discloses at least one of the directional light sources on an automatic swivel joint (e.g., Fig. 90A, at 2034) and providing spot lights of limited beam angle for task lighting while other light source provide general illumination to the illuminated area (paragraphs 0256, 0326).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys regarding directional light sources (Lys, paragraph 0206) and spot lights (paragraph 0326) in order to permit the light module to conform to an environment within which it is placed (Lys, paragraph 0206).

Regarding claim 16 Morgan discloses the illumination device of claim 8.

Morgan does not explicitly disclose a controller with communication capability to other devices, where the camera in one location obtains information and the controller

process the information and communicates the camera obtained information to a second device.

Lys discloses a controller (Fig. 90A, at 2012) with communication capability to other devices (paragraph 0328), where the camera (paragraph 0327) in one location obtains information and the controller process the information and communicates the camera obtained information to a second device (paragraphs 0326-0328).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys regarding directional light sources (Lys, paragraph 0206) and cameras (Lys, paragraph 0327) in order to permit the light module to conform to an environment within which it is placed (Lys, paragraph 0206) in improve the accuracy of such systems (Lys, paragraph 0327).

Regarding claim 17 Morgan as modified further discloses the illumination device of claim 16 where the illuminated area is a road (paragraph 0018 “outdoor environments”).

Morgan does not disclose where the second device to where the camera obtained information is communicated to is a lighting fixture.

Lys discloses where the illuminated area is a road (paragraph 0245) and where the second device to where the camera obtained information is communicated to is a lighting fixture (Fig. 90A, paragraphs 0326-0328).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys regarding directional light sources (Lys, paragraph 0206) and cameras (Lys, paragraph 0327) in order to permit the light module to conform to an environment within which it is placed (Lys, paragraph 0206) and improve the accuracy of such systems (Lys, paragraph 0327).

Claims 18-19 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) in further view of Amerson (US 6,379,022) as applied to claim 17 above, and further in view of Lemelson (US 5,983,161).

Regarding claim 18 Morgan discloses the illumination device of claim 17,

Morgan as modified may not disclose where the processor uses information obtained from the cameras and exchanged between fixtures for identifying traffic requirements in the illuminated area and from the vehicles locations and geometry determining the illumination requirements of the illumination area thereby directing the controller to adjust the directional light sources to meet the illumination requirements.

Lemelson discloses where the processor uses information obtained from the cameras and exchanged between fixtures for identifying traffic requirements in the illuminated area and from the vehicles locations and geometry determining the illumination requirements of the illumination area thereby directing the controller to

adjust the directional light sources to meet the illumination requirements (e.g., column 20, line 55 – column 21, line 14).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys regarding directional light sources and cameras and in further accordance with Lemelson regarding cameras used in identifying traffic requirements in order to optimize the prevention of injury or damage (Lemelson, column 1, lines 45-50).

Regarding claim 19 Morgan as modified discloses the illumination device of claim 18.

Morgan may not disclose wherein the controller is programmed to adjust at least one of (i) increase illumination with an approach of a vehicle, and (ii) change beam cut-off levels as the vehicle advances toward the lighting fixture to eliminate glare.

Lemelson discloses wherein the controller is programmed to adjust at least one of (i) increase illumination with an approach of a vehicle (e.g., column 20, line 55 – column 21, line 14), and (ii) change beam cut-off levels as the vehicle advances toward the lighting fixture to eliminate glare.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys regarding directional light sources and cameras and in further accordance with Lemelson regarding cameras used in identifying traffic requirements in order to optimize the prevention of injury or damage (Lemelson, column 1, lines 45-50).

Claims 20-26 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646).

Regarding claim 20 Morgan discloses an automated irradiating device for providing radiation to individuals within an area intended to provide a desired radiation in a sub-area proximate to the individuals, comprising:

an irradiation fixture (Fig. 2, at 36A) including one or more directional radiation sources (paragraph 0023) where the radiation is in a defined direction (paragraph [0045]); at least one detector (Fig. 2, at 42) for sensing a location of individuals in the area and transferring that information to a controller (paragraph 0023);

where said controller (Fig. 2, at 26A) for adjusting at least one of (i) a radiation intensity (paragraph 0020), and (ii) a direction of the irradiation based on sensed location, whereby the desired radiation is provided proximate to individuals in the area (paragraph 0020).

Morgan discloses a light fixture but Morgan arguably may not explicitly disclose directional light sources.

Lys discloses a light fixture including a multiplicity of directional light sources including at least two light sources pointing in different directions (e.g., Fig. 28C, paragraph 0206).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the

teaching of Lys regarding directional lights (Lys, paragraph 0206) in order to permit the light module to conform to an environment within which it is placed (Lys, paragraph 0206).

Regarding claim 21 Morgan as modified discloses the automated irradiating device of claim 20 intended to provide a desired heating to one or more individuals in an area.

Morgan may not explicitly disclose: at least two directional heat radiation sources pointing in different directions; the detector being a camera with capability for sensing at least one of (i) a presence of one or more individuals in the heated area, (ii) the identity of the individuals, and (iii) a body temperature of individuals present in the heated area; the controller further having processing capability for determining the heating requirements of the individuals in the area from at least one of (i) algorithms to calculate radiation parameters, (ii) stored data of heating practices, (iii) image recognition algorithms for identifying the individual based on the camera information, and (iv) an identified individual's personal preferences.

Lys discloses: at least two directional heat radiation sources pointing in different directions (e.g., Fig. 28C); the detector being a camera (paragraph 0327) with capability for sensing at least one of (i) a presence of one or more individuals in the heated area (paragraph 0326), (ii) the identity of the individuals, and (iii) a body temperature of individuals present in the heated area; the controller further having processing capability for determining the heating requirements of the individuals in the area from at least one

of (i) algorithms to calculate radiation parameters (paragraphs 0326-0327), (ii) stored data of heating practices, (iii) image recognition algorithms for identifying the individual based on the camera information, and (iv) an identified individual's personal preferences (paragraph 0328).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the illuminating system disclosed by Morgan in accordance with the teaching of Lys regarding light therapy (Lys, paragraph 0360) in order to improve a patient's health or well-being (Lys, paragraph 0361).

Regarding claim 22 Morgan discloses the automated irradiating device of claim 20.

Morgan may not explicitly disclose one or more directional radiation sources capable of being moved so as to direct radiation in a defined direction; the at least one detector capable of providing information on the present location of individuals in the area; the controller programmed to process the detector information and move the radiating sources so as to follow the one or more individuals, whereby the desired radiation is provided in a sub-area substantially proximate to the individuals.

Lys discloses one or more directional radiation sources capable of being moved so as to direct radiation in a defined direction (e.g., Fig. 28C); the at least one detector (paragraph 0321) capable of providing information on the present location of individuals in the area (paragraph 0367); the controller (paragraph 0315) programmed to process the detector information and move the radiating sources so as to follow the one or more

individuals, whereby the desired radiation is provided in a sub-area substantially proximate to the individuals (paragraph 0314).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the illuminating system disclosed by Morgan in accordance with the teaching of Lys regarding light therapy (Lys, paragraph 0360) in order to improve a patient's health or well-being (Lys, paragraph 0361).

Regarding claim 23 Morgan discloses the irradiation device of claim 21.

Morgan may not explicitly disclose wherein the detector being a camera capable of providing images of different parts of the body of individuals to the controller for image processing the radiation sources being able to direct radiation to different parts of the body and the controller further programmed to run the image recognition algorithms to identify different parts of the body, to compute the desired radiation level to the different parts of the body and to adjust the radiation from sources directed at the different parts of the body.

Lys discloses wherein the detector being a camera (paragraph 0327) capable of providing images of different parts of the body of individuals to the controller for image processing (paragraph 0360), the radiation sources being able to direct radiation to different parts of the body (paragraph 0361) and the controller further programmed to run the image recognition algorithms to identify different parts of the body (paragraphs 0309-0310), to compute the desired radiation level to the different parts of the body and

to adjust the radiation from sources directed at the different parts of the body (paragraphs 0309, 0362).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the illuminating system disclosed by Morgan in accordance with the teaching of Lys regarding light therapy (Lys, paragraph 0360) in order to improve a patient's health or well-being (Lys, paragraph 0361).

Regarding claim 24 Morgan further discloses the irradiation device of claim 21, further comprising the controller programmed to control the irradiation in time and intensity on the individual to maintain comfortable heating based on at least one of (i) best practices, (ii) feedback from the heat detector configured to detect body temperature of different parts of a body, (iii) personal preferences input to the controller and stored in memory, and (iv) commands input from an input device (paragraphs 0016-0024).

Regarding claim 25 Morgan discloses the irradiation device of claim 21. Morgan also discloses where controller aims the radiation sources to the location where the individual is located and controls the time and intensity of the radiation (e.g. paragraphs 0016-0024).

Morgan does not disclose where the irradiation instead of for heat is for therapeutic purposes and the radiation may be any of (i) UV radiation, (ii) red light therapy in the 620-660 nm range, and (iii) light therapy for SAD and other disorders.

Lys discloses where the irradiation instead of for heat is for therapeutic purposes and the radiation may be any of (i) UV radiation, (ii) red light therapy in the 620-660 nm range, and (iii) light therapy for disorders selected from the group consisting of seasonal affective disorder, sleep disorders, circadian rhythm disorders, delayed sleep phase syndrome, vitamin D deficiency and skin disorders, and other disorders (paragraph 0360).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the illuminating system disclosed by Morgan in accordance with the teaching of Lys regarding light therapy (Lys, paragraph 0360) in order to improve a patient's health or well-being (Lys, paragraph 0361).

Regarding claim 26 Morgan discloses the automated irradiating device of claim 20 further comprising where one or more of the irradiating sources is radiating visible light (e.g., paragraphs 0016-0024, Fig. 2, at 36A) and one or more of the irradiating sources is designed to substantially radiate heat (paragraphs 0016-0024) the Examiner views light sources as heat sources) whereby the device is capable of providing both a desired light and heat radiation to the individuals (paragraphs 0016-0024).

Response to Arguments

Applicant's arguments, see pages 9-17, filed 1/15/2015, with respect to the rejection(s) of claim(s) 1-26 have been fully considered and are persuasive. Therefore,

the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of the references cited in the office action above.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Karnieli (US 2002/0022774) discloses identification of food items using photographic means.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID LOTTER whose telephone number is (571)270-7422. The examiner can normally be reached on Monday-Friday 7:30am-5PM (off every other Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alex Taningco can be reached on 571-272-8048. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/DAVID LOTTER/
Examiner, Art Unit 2844

/ALEXANDER H TANINGCO/
Supervisory Patent Examiner, Art Unit 2844

Notice of References Cited	Application/Control No. 13/357,549	Applicant(s)/Patent Under Reexamination SPERO, YECHEZKAL EVAN	
	Examiner DAVID LOTTER	Art Unit 2844	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2002/0047628	04-2002	Morgan et al.	315/291
*	B	US-5,983,161	11-1999	Lemelson et al.	701/301
*	C	US-2004/0105264	06-2004	Spero, Yechezkal Evan	362/276
*	D	US-2002/0047646	04-2002	Lys et al.	315/312
*	E	US-6,379,022	04-2002	Amerson et al.	362/231
*	F	US-2002/0039238	04-2002	Chang, Chia-Jung	359/604
*	G	US-2006/0222213	10-2006	Kiyohara et al.	382/115
*	H	US-2004/0138726	07-2004	Savage et al.	607/088
*	I	US-5,546,475	08-1996	Bolle et al.	382/190
*	J	US-5,969,754	10-1999	Zeman, Herbert D.	348/136
*	K	US-2002/0022774	02-2002	Karnieli, Eddy	600/300
*	L	US-2002/0046100	04-2002	Kinjo, Naoto	705/14
*	M	US-2008/0136356	06-2008	Zampini et al.	315/308

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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

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CONFIRMATION NO. 1905

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
13/357,549	01/24/2012 RULE	315	2844	

APPLICANTS

INVENTORS

Yechezkal Evan Spero, Moshav Tifrach, ISRAEL;

**** CONTINUING DATA ***************************

This application is a CIP of 10/604,360 07/14/2003 PAT 8100552
and claims benefit of 61/535,981 09/17/2011

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED **** ** SMALL ENTITY **
02/03/2012

Foreign Priority claimed	☐ Yes ☑ No	☐ Met after Allowance	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
35 USC 119(a-d) conditions met	☐ Yes ☑ No					
Verified and Acknowledged	/DAVID E LOTTER/ Examiner's Signature	Initials	ISRAEL	24	26	4

ADDRESS

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M. P. HANEGEV, 85102
ISRAEL

TITLE

Detector Controlled Illuminating System

FILING FEE RECEIVED		
1055	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13357549	SPERO, YECHEZKAL EVAN
	Examiner	Art Unit
	DAVID LOTTER	2844

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	08/12/2014	01/15/2015							
	1	✓	✓							
	2	✓	✓							
	3	✓	✓							
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	25	✓	✓							
	26	✓	✓							

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	1	(13/357549).APP.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/04/04 13:40
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S3	755	h05b37/02.cpc. and @pd<"20110917"	US-PGPUB; USPAT	OR	OFF	2014/04/04 13:42
S4	3092	h05b37/02.cpc. and @pd<"20110917"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2014/04/04 13:42
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S8	2665127	S4 or "76"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/04 13:46
S9	3849	S4 or S7	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/04/04 13:46
S10	3483	((315/152).ccls. or h05b37/02.cpc.)	US-PGPUB;	OR	ON	2014/04/04

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S17	1	("8100552").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/08/12 15:25
S18	2215	(362/276,234).ccls.	US-PGPUB; USPAT	OR	OFF	2014/08/12 15:27
S19	6	spero.in. near yechezkal	US-PGPUB; USPAT	OR	OFF	2014/08/12 15:28
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S23	3620	(315/152).ccls. or (362/276,234).ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/08/19 20:49
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S31	1	("5537433").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/08/24 16:42
S32	1	("6379022").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/08/24 17:18
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S37	98165	(B60Q1/04 B60Q1/085 B60Q1/1423 F21K9/13 F21K9/135 F21S4/008	US-PGPUB; USPAT;	OR	ON	2014/08/24 17:27

		F21V19/02 F21V23/0464 F21V23/0471 F21V23/0478 H05B33/0812 H05B33/0857 H05B33/0863 H05B37/02 B60Q2300/054 B60Q2300/112 B60Q2300/116 B60Q2300/122 B60Q2300/134 B60Q2300/142 B60Q2300/21 B60Q2300/23 B60Q2300/312 B60Q2300/314 B60Q2300/322 B60Q2300/41 B60Q2300/42 F21S48/10 F21V21/02; F21V21/30 F21V29/2206 F21W2101/10 F21W2111/023 F21W2111/027 F21W2111/08 F21W2131/103 F21W2131/40 F21Y2101/02 F21Y2113/00 Y02B20/343 Y02B20/383).cpc.	USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S38	306	S35 and S37	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/08/24 17:27
S39	1	("6483439").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/08/24 18:07
S40	2	(("6820998") or ("6227679")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/08/24 18:10
S41	1	("5,803,579").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/08/24 18:42
S42	1	("6,528,954").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/08/24 18:43
S43	1	("20020047628").PN.	US-PGPUB; USOCR	OR	OFF	2014/08/24 19:03
S44	1709072	(light or led or luminaire or solid adj2 state or light adj2 diode) and (controller or processor or microprocessor or cpu or computer)	US-PGPUB; USPAT	OR	ON	2014/08/25 10:46
S45	7838	(light or led or luminaire or solid adj2 state or light adj2 diode) and (controller or processor or microprocessor or cpu or computer) and (food near10 (detect$4 or sens$3)) and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 10:47
S46	13	S45 and (B60Q1/04 B60Q1/085 B60Q1/1423 F21K9/13 F21K9/135 F21S4/008 F21V19/02 F21V23/0464 F21V23/0471 F21V23/0478 H05B33/0812 H05B33/0857 H05B33/0863 H05B37/02 B60Q2300/054 B60Q2300/112 B60Q2300/116 B60Q2300/122 B60Q2300/134 B60Q2300/142 B60Q2300/21 B60Q2300/23 B60Q2300/312 B60Q2300/314 B60Q2300/322 B60Q2300/41	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/08/25 10:48

		B60Q2300/42 F21S48/10 F21V21/02; F21V21/30 F21V29/2206 F21W2101/10 F21W2111/023 F21W2111/027 F21W2111/08 F21W2131/103 F21W2131/40 F21Y2101/02 F21Y2113/00 Y02B20/343 Y02B20/383).cpc.				
S47	5956	(light or led or luminaire or solid adj2 state or light adj2 diode) and (controller or processor or microprocessor or cpu or computer) and (food near10 (sense or sensor or detector or detection))	US-PGPUB; USPAT	OR	ON	2014/08/25 10:52
S48	1	(light or led or luminaire or solid adj2 state or light adj2 diode) and (controller or processor or microprocessor or cpu or computer) and (food near10 (sense or sensor or detector or detection)) and (315/152).ccls.	US-PGPUB; USPAT	OR	ON	2014/08/25 10:52
S49	5660	(light or led or luminaire or solid adj2 state or light adj2 diode) and (controller or processor or microprocessor or cpu or computer) and (food near10 (sense or sensor or detector or detection)) and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 10:54
S50	480	(light or led or luminaire or solid adj2 state or light adj2 diode).ti,ab. and (controller or processor or microprocessor or cpu or computer) and (food near10 (sense or sensor or detector or detection)) and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 10:55
S52	13980	(food near10 (sense or sensor or detector or detection)) and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 11:06
S53	319	(food adj (sense or sensor or detector or detection)) and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 11:06
S54	8	(food adj (sense or sensor or detector or detection)).ti,ab. and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 11:06
S55	352	(facial adj recognition).ti,ab. and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 11:21
S56	1304	(image adj recognition).ti,ab. and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 11:22
S57	1	("7765231").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/08/25 11:25
S58	12	S56 and sex and controller	US-PGPUB; USPAT	OR	ON	2014/08/25 12:11
S59	92	(facial adj recognition).ti,ab. and (@ad<"20110917" or	US-PGPUB; USPAT	OR	ON	2014/08/25 12:13

		@rlad<"20110917") and age				
S60	45	(facial adj recognition).ti,ab. and (@ad<"20110917" or @rlad<"20110917") and age and controller	US-PGPUB; USPAT	OR	ON	2014/08/25 12:14
S61	0	(camera and anti-glare).ti,ab. with glare near5 controller	US-PGPUB; USPAT	OR	OFF	2014/08/25 12:37
S62	0	(camera and antiglare).ti,ab. with glare near5 controller	US-PGPUB; USPAT	OR	OFF	2014/08/25 12:37
S63	2	(camera and glare).ti,ab. with glare near5 controller	US-PGPUB; USPAT	OR	OFF	2014/08/25 12:38
S64	4	(camera and glare) with glare near5 controller	US-PGPUB; USPAT	OR	OFF	2014/08/25 12:39
S65	101	(light or led or luminaire or solid adj2 state or light adj2 diode) and (controller or processor or microprocessor or cpu or computer) near10 (adjustable adj mount$3)	US-PGPUB; USPAT	OR	ON	2014/08/25 13:22
S66	99	(light or led or luminaire or solid adj2 state or light adj2 diode) and (controller or processor or microprocessor or cpu or computer) near10 (adjustable adj mount$3) and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 13:23
S67	60	(light or led or luminaire or solid adj2 state or light adj2 diode) and (controller or processor or microprocessor or cpu or computer) near10 (adjustable adj light) and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 13:27
S68	50	(light or led or luminaire or solid adj2 state or light adj2 diode) and (controller or processor or microprocessor or cpu or computer) near10 (movable adj light) and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 13:28
S69	22128	(light or led or luminaire or solid adj2 state or light adj2 diode) and (controller or processor or microprocessor or cpu or computer) near10 (traffic) and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 13:53
S70	9041586	(light or led or luminaire or solid adj2 state or light adj2 diode) and (controller or processor or microprocessor or cpu or computer) near10 (traffic) and automobile adj3 light(@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 13:54
S71	73	(light or led or luminaire or solid adj2 state or light adj2 diode) and (controller or processor or microprocessor or cpu or computer) near10 (traffic) and automobile adj3 light and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 13:54

S72	428	radiation adj device and heating and sensor and detection and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 13:55
S73	68	(radiation adj device) and (sensor near5 heat$3) and detection and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 13:57
S74	730	(radiation adj device or heater) and (sensor near5 heat$3) and (sensor near (people or person or individual)) and detection and (@ad<"20110917" or @rlad<"20110917")	US-PGPUB; USPAT	OR	ON	2014/08/25 13:59
S75	161	(radiation adj device or heater) and (sensor near5 heat$3) and (sensor near (people or person or individual)) and detection and (@ad<"20110917" or @rlad<"20110917") and (heater or heating).ti,ab.	US-PGPUB; USPAT	OR	ON	2014/08/25 14:00
S76	9	(radiation adj device or heater) and (sensor near5 heat$3) and (sensor near (people or person or individual)) and detection and (@ad<"20110917" or @rlad<"20110917") and (heater or heating).ti,ab. and HVAC	US-PGPUB; USPAT	OR	ON	2014/08/25 14:04
S77	11264	(image adj2 (recognition or detection)).ti,ab. and (@ad<"20020712" or @rlad<"20020712")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:16
S78	0	(image adj2 (recognition or detection)).ti,ab. and (@ad<"20020712" or @rlad<"20020712")with led	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:17
S79	0	(image adj2 (recognition or detection)).ti,ab. and (@ad<"20020712" or @rlad<"20020712") with led	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:17
S80	0	(image adj2 (recognition or detection)).ti,ab. and (@ad<"20020712" or @rlad<"20020712") with light$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:17
S81	0	(image adj2 (recognition or detection)) and (@ad<"20020712" or @rlad<"20020712") with (light$3 or led or solid adj2 state)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:18

S82	28717	(image adj2 (recognition or detect$3 or sens$3)) and (@ad<"20020712" or @rlad<"20020712") and (light$3 or led or solid adj2 state) with (control$3 or cpu or copmputer or processor or microprocessor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:19
S83	31612	(image adj2 (recognition or detect$3 or sens$3)) and (@ad<"20020712" or @rlad<"20020712") and ((light$3 or led or solid adj2 state or luniaire or lamp) with (control$3 or cpu or computer or processor or microprocessor))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:20
S84	31612	(image adj2 (recognition or detect$3 or sens$3)) and (@ad<"20020712" or @rlad<"20020712") and ((light$3 or led or solid adj2 state or lumiaire or lamp) with (control$3 or cpu or computer or processor or microprocessor))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:20
S85	9386	(image adj2 (recognition or detect$3 or sens$3)).ti,ab. and (@ad<"20020712" or @rlad<"20020712") and ((light$3 or led or solid adj2 state or lumiaire or lamp) with (control$3 or cpu or computer or processor or microprocessor))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:21
S86	5176	(image adj2 (recognition or detect$3 or sens$3)).ti,ab. and (@ad<"20020712" or @rlad<"20020712") and ((light$3 or led or solid adj2 state or lumiaire or lamp) with (control$3 or cpu or computer or processor or microprocessor)).ti,ab.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:22
S87	4270	(image adj2 (recognition or detect$3 or sens$3)).ti,ab. and (@pd<"20020712") and ((light$3 or led or solid adj2 state or lumiaire or lamp) with (control$3 or cpu or computer or processor or microprocessor)).ti,ab.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:22
S88	6	(image adj2 (recognition or detect$3 or sens$3)).ti,ab. and (@pd<"20020712") and ((light$3 or led or solid adj2 state or lumiaire or lamp) with (control$3 or cpu or computer or processor or microprocessor)).ti,ab. and food	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:23
S89	318	(image adj2 (recognition or detect$3 or sens$3)).ti,ab. and (@pd<"20020712") and ((light$3 or led or solid adj2 state or lumiaire or lamp) with (control$3 or cpu or computer or processor or microprocessor)).ti,ab. and (restaurant or store)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:26
S90	319	(image adj2 (recognition or detect$3 or sens$3)).ti,ab. and	US-PGPUB; USPAT;	OR	ON	2014/09/08 18:26

		(@pd<"20020712") and ((light$3 or led or solid adj2 state or lumiaire or lamp) with (control$3 or cpu or computer or processor or microprocessor)).ti,ab. and (restaurant or store or merchandise)	USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			
S91	146	(image adj2 (recognition or detect$3 or sens$3)).ti,ab. and (@pd<"20020712") and ((light$3 or led or solid adj2 state or lumiaire or lamp) with (control$3 or cpu or computer or processor or microprocessor)).ti,ab. and (restaurant or store or merchandise) and camera	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:26
S92	276	(image adj2 (recognition or detect$3 or sens$3)).ti,ab. and (@pd<"20020712") and ((light$3 or led or lumiaire or lamp) with (control$3 or cpu or computer or processor or microprocessor)).ti,ab. and (restaurant or store)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:45
S93	151	S92 not S91	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2014/09/08 18:46
S94	6	(("6379022") or ("6340868") or ("5577832") or ("6498440") or ("6483439") or ("6820998")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/09/08 20:53
S95	7	heater with directed with people	US-PGPUB; USPAT	OR	OFF	2014/09/25 16:28
S96	12	heater with directed with motion	US-PGPUB; USPAT	OR	OFF	2014/09/25 16:29
S97	12	S96 not S95	US-PGPUB; USPAT	OR	OFF	2014/09/25 16:29
S98	3270	heat$3 with motion with detect$3	US-PGPUB; USPAT	OR	OFF	2014/09/25 16:29
S99	361	heat$3 with motion with detect$3 and @pd<"20020712"	US-PGPUB; USPAT	OR	OFF	2014/09/25 16:30
S100	16	("4360856" | "4386275" | "4485864" | "4992701" | "5127575" | "5281961" | "5476221").PN. OR ("5785243").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/09/25 16:42
S101	2678	led and network and camera and @pd<"20020712"	US-PGPUB; USPAT	OR	ON	2014/09/26 15:34
S102	386	led and network and camera.ti,ab. and @pd<"20020712"	US-PGPUB; USPAT	OR	ON	2014/09/26 15:34
S103	524	light$3.ti,ab. and network and camera.ti,ab. and @pd<"20020712"	US-PGPUB; USPAT	OR	ON	2014/09/26 15:37
S104	153	light$3.ti,ab. and network.ti,ab. and camera and @pd<"20020712"	US-PGPUB; USPAT	OR	ON	2014/09/26 15:38
S105	14	adamson.in. and @pd<"20020712"	US-PGPUB	OR	ON	2014/09/26 15:50
S106	296	glare with detect$4 and @pd<"20020712"	US-PGPUB; USPAT	OR	ON	2014/09/26 17:30
S107	11	glare.ti,ab. with detect$4 and	US-PGPUB;	OR	ON	2014/09/26

		@pd<"20020712"	USPAT			17:51
S108	14	$5glare.ti,ab. with detect$4 and @pd<"20020712"	US-PGPUB; USPAT	OR	ON	2014/09/26 17:53
S109	10	"5,785,243"	US-PGPUB; USPAT	OR	ON	2014/09/26 18:06
S110	1	("5,785,243").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/09/26 18:06
S111	1	("6,385,352").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/09/26 18:18
S112	11697	(object and detect$4).ti,ab. and @pd<"20020712"	US-PGPUB; USPAT	OR	ON	2014/09/26 18:38
S113	2664	(object and detect$4).ti,ab. and @pd<"20020712" and controller	US-PGPUB; USPAT	OR	ON	2014/09/26 18:39
S114	1619	(object and detect$4).ti,ab. and @pd<"20020712" and controller and sensor	US-PGPUB; USPAT	OR	ON	2014/09/26 18:39
S116	89	(object and detect$4).ti,ab. and @pd<"20020712" and controller and sensor and processor and lighting	US-PGPUB; USPAT	OR	ON	2014/09/26 18:39
S117	1	("6,385,352").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/09/26 19:59
S118	259	("3819938" | "3876900" | "4017732" | "4115703" | "4306147" | "4402017" | "4542528" | "4570057" | "4578571" | "4647766" | "4686363" | "4758717" | "4804949" | "4818847" | "4841132" | "4850009" | "4900907" | "5010241" | "5073954" | "5099110" | "5107100" | "5130520" | "5135160" | "5187356" | "5196684" | "5206492" | "5291009" | "5349172" | "5354977" | "5378882" | "5471533" | "5484994").PN. OR ("6385352").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/09/26 20:01
S119	652	(object and detect$4).ti,ab. and @pd<"20020712" and controller and sensor and processor	US-PGPUB; USPAT	OR	ON	2014/09/26 20:03
S120	191	(object and detect$4).ti,ab. and @pd<"20020712" and controller and sensor and processor and vehicle	US-PGPUB; USPAT	OR	ON	2014/09/26 21:29
S122	2202	camera and (photo adj2 sensor array or optical adj lens or photo adj sensor or ultrasound adj transducer or microwave adj transducer or pyroelectric) and (led or light adj2 diode or solid adj state) and @pd<"20020712" and controller and processor	US-PGPUB; USPAT	OR	ON	2014/09/30 11:29
S123	265	camera and (photo adj2 sensor adj array or optical adj lens or photo adj sensor or ultrasound adj transducer or microwave adj transducer or pyroelectric) and (led or light adj2 diode or solid adj state) and @pd<"20020712" and controller and processor	US-PGPUB; USPAT	OR	ON	2014/09/30 11:39

S124	366	spero.in.	US-PGPUB; USPAT	OR	ON	2014/09/30 11:55
S125	2970	seasonal adj affective adj disorder	US-PGPUB; USPAT	OR	ON	2014/10/01 18:35
S126	185	seasonal adj affective adj disorder with light adj therapy	US-PGPUB; USPAT	OR	ON	2014/10/01 18:36
S127	1	("5,562,719").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/01 18:38
S128	313782	lighting network with heating	US-PGPUB; USPAT	OR	ON	2014/10/01 20:18
S129	771	lighting with network and network with heating	US-PGPUB; USPAT	OR	ON	2014/10/01 20:18
S130	46	lighting with network and network with heating and heat$3.ti,ab.	US-PGPUB; USPAT	OR	ON	2014/10/01 20:20
S131	4752	heat$3.ti,ab. and heat$3 with network and heat$3 with direct$3	US-PGPUB; USPAT	OR	ON	2014/10/01 20:24
S132	907	infrared with filament with lamp	US-PGPUB; USPAT	OR	ON	2014/10/01 20:33
S133	2942299	infrared with filament with lamp and detect$3 or sens$4	US-PGPUB; USPAT	OR	ON	2014/10/01 20:37
S134	534	infrared with filament with lamp and (detect$3 or sens$4)	US-PGPUB; USPAT	OR	ON	2014/10/01 20:38
S135	94	infrared with filament with lamp and (detect$3 or sens$4) and network	US-PGPUB; USPAT	OR	ON	2014/10/01 20:38
S136	120	(infrared or ir) with filament with lamp and (detect$3 or sens$4) and network	US-PGPUB; USPAT	OR	ON	2014/10/01 20:38
S137	242	(infrared or ir) with filament with (lamp or luminaire or light$3) and (detect$3 or sens$4) and network	US-PGPUB; USPAT	OR	ON	2014/10/01 20:38
S138	793	(infrared or ir) with filament with (lamp or luminaire or light$3) and (detect$3 or sens$4) and (network$3 or connect$4)	US-PGPUB; USPAT	OR	ON	2014/10/01 20:39
S139	797	(infrared or ir) with filament with (lamp or luminaire or light$3) and (detect$3 or sens$4) and (network$3 or connect$4 ot HVAC)	US-PGPUB; USPAT	OR	ON	2014/10/01 20:39
S140	793	(infrared or ir) with filament with (lamp or luminaire or light$3) and (detect$3 or sens$4) and (network$3 or connect$4 or HVAC)	US-PGPUB; USPAT	OR	ON	2014/10/01 20:39
S141	603	(infrared or ir) with filament with (lamp or luminaire or light$3) and (detect$3 or sens$4) and (network$3 or connect$4 or HVAC) and @pd<"20110917"	US-PGPUB; USPAT	OR	ON	2014/10/01 20:40
S142	50	(sense or detect) with (age sex) with camera	US-PGPUB; USPAT	OR	ON	2014/10/01 21:23
S143	272	("3805238" | "3949741" | "4516262" | "4858000" | "4885702" | "4975969" | "5012522" | "5163094" | "5164992" | "5331544" | "5465308").PN. OR ("5781650").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/01 21:25
S144	2	(sense or detect) with (age and sex)	US-PGPUB;	OR	ON	2014/10/01

		with camera	USPAT			21:27
S145	19	(sense or detect) with (age and sex) with (camera or image)	US-PGPUB; USPAT	OR	ON	2014/10/01 21:28
S146	1	("20060222213").PN.	US-PGPUB	OR	OFF	2014/10/01 21:29
S147	2	(sens$3 or detect$3) with food with lighting with network	US-PGPUB; USPAT	OR	OFF	2014/10/02 10:54
S148	268586	food and (illuminat$3 or light$3 or XXX)	US-PGPUB; USPAT	OR	OFF	2014/10/02 10:56
S149	17067	food with (illuminat$3 or light$3 or XXX)	US-PGPUB; USPAT	OR	OFF	2014/10/02 10:57
S150	2921110	food with (illuminat$3 or light$3 or XXX) with detect$3 or sens$3	US-PGPUB; USPAT	OR	OFF	2014/10/02 10:57
S151	917	food with (illuminat$3 or light$3 or XXX) with (detect$3 or sens$3)	US-PGPUB; USPAT	OR	OFF	2014/10/02 10:57
S152	917	food with (illuminat$3 or light$3) with (detect$3 or sens$3)	US-PGPUB; USPAT	OR	OFF	2014/10/02 10:58
S153	4	2004/0138726	US-PGPUB; USPAT	OR	OFF	2014/10/02 18:36
S154	1	"20040138726"	US-PGPUB; USPAT	OR	OFF	2014/10/02 18:36
S155	0	(2004/0138726).CCLS.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/02 18:36
S156	1	("20040138726").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2014/10/02 18:36
S157	1	("8100852").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2015/01/12 17:20
S158	1	("8100552").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2015/01/12 17:20
S160	1	("6016038").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2015/01/15 15:09
S161	10	(color adj kinetics).as. and @pd<"20020712"	US-PGPUB; USPAT	OR	OFF	2015/01/15 15:13
S162	296	spero.in.	US-PGPUB; USPAT	OR	OFF	2015/01/15 15:16
S163	1	("6553296").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2015/01/15 16:21
S164	166	color.as. with kinetic$2	US-PGPUB; USPAT	OR	OFF	2015/03/09 17:33
S165	95642	(led or light adj2 diode or ssl or solid adj2 state).ti,ab.	US-PGPUB; USPAT	OR	OFF	2015/03/09 17:34
S166	4344	(image adj2 (recognition or detect$3 or sens$3)).ti,ab. and (@pd<"20020712") and ((light$3 or led or solid adj2 state or lumiaire or lamp) with (control$3 or cpu or computer or processor or microprocessor)).ti,ab.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2015/03/09 17:35
S167	19372	(led or light adj2 diode or ssl or solid adj2 state).ti,ab. and	US-PGPUB; USPAT	OR	OFF	2015/03/09 17:35

		@pd<"20020712"				
S168	84	S167 AND ((H01L2924/12041).CPC.)	US-PGPUB; USPAT	OR	OFF	2015/03/09 17:36
S169	49	S167 AND ((F21V23/0442 OR F21W2111/02).CPC.)	US-PGPUB; USPAT	OR	OFF	2015/03/09 17:39
S170	1	("6340868").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2015/03/09 17:45
S171	3	(("6340868") or ("5577832") or ("6498440")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2015/03/09 17:46
S172	1	("6483439").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2015/03/09 19:03
S173	1	("6227679").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2015/03/09 19:05
S174	1	("6820998").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2015/03/09 19:07
S175	40366	kobayashi.in.	US-PGPUB; USPAT	OR	OFF	2015/03/10 15:37
S176	1340	kobayashi.in. and collision	US-PGPUB; USPAT	OR	OFF	2015/03/10 15:38
S178	19	kobayashi.in. and collision and auto and light	US-PGPUB; USPAT	OR	OFF	2015/03/10 15:39
S179	3570	kobayashi.in. and auto$5 and (light or lamp)	US-PGPUB; USPAT	OR	OFF	2015/03/10 15:48
S180	4539	kobayashi.in. and auto$6 and (light or lamp)	US-PGPUB; USPAT	OR	OFF	2015/03/10 15:48
S181	3794	kobayashi.in. and auto$6 and (light or lamp) and control$3	US-PGPUB; USPAT	OR	OFF	2015/03/10 15:49
S182	291	kobayashi.in. and auto$6.ti,ab. and (light or lamp) and control$3	US-PGPUB; USPAT	OR	OFF	2015/03/10 15:49
S183	63969	auto$6.ti,ab. and (light or lamp) and control$3 and detect$3	US-PGPUB; USPAT	OR	OFF	2015/03/10 15:53
S184	0	auto$6.ti,ab. and (light or lamp).ti,ab. and control$3,ti,ab. and detect$3.ti,ab. and object.ti,ab.	US-PGPUB; USPAT	OR	OFF	2015/03/10 15:54
S185	0	auto$6.ti,ab. and (light or lamp).ti,ab. and control$3,ti,ab. and detect$3.ti,ab. and object	US-PGPUB; USPAT	OR	OFF	2015/03/10 15:54
S186	0	auto$6.ti,ab. and (light or lamp).ti,ab. and control$3,ti,ab. and detect$3 with object	US-PGPUB; USPAT	OR	OFF	2015/03/10 15:54
S187	1052	auto$6.ti,ab. and (light or lamp).ti,ab. and control$3.ti,ab. and detect$3 with object	US-PGPUB; USPAT	OR	OFF	2015/03/10 15:54
S188	225	auto$6.ti,ab. and (light or lamp).ti,ab. and control$3.ti,ab. and detect$3.ti,ab. with object.ti,ab.	US-PGPUB; USPAT	OR	OFF	2015/03/10 15:55
S189	84	(vehicle or car or automobile).ti,ab. and (light or lamp).ti,ab. and control$3.ti,ab. and detect$3.ti,ab. with object.ti,ab.	US-PGPUB; USPAT	OR	OFF	2015/03/10 15:56
S190	91	("3663937" | "3668625" | "3930735" |	US-PGPUB;	OR	OFF	2015/03/10

		"4214265" | "4433325" | "4490851" | "4709264" | "4847772").PN. OR ("5161107").URPN.	USPAT; USOCR			15:58
S191	20	(grocery or butcher) same image same light$3 same detect$4	US-PGPUB; USPAT	OR	ON	2015/03/25 10:46
S192	234	(grocery or butcher) same light$3 same detect$4	US-PGPUB; USPAT	OR	ON	2015/03/25 10:50
S193	214	S192 not S191	US-PGPUB; USPAT	OR	ON	2015/03/25 10:50
S194	2757	(grocery or butcher or supermarket or market) same light$3 same detect$4	US-PGPUB; USPAT	OR	ON	2015/03/25 11:10
S195	2543	S194 not S193	US-PGPUB; USPAT	OR	ON	2015/03/25 11:10
S196	563	(supermarket or market) same image same light$3 same detect$4	US-PGPUB; USPAT	OR	ON	2015/03/25 11:11
S197	118	(supermarket) same image same light$3 same detect$4	US-PGPUB; USPAT	OR	ON	2015/03/25 11:22
S198	7940	(supermarket or grocery or butcher$4) and (image or object) same detect$4 and light$3	US-PGPUB; USPAT	OR	ON	2015/03/25 11:38
S199	18117	(382/100,103,218,317).ccls.	US-PGPUB; USPAT	OR	ON	2015/03/25 11:43
S200	718	S199 AND ((G06K9/00362 OR G06K9/46 OR G06K2209/19 OR G06K9/00221 OR G06K9/00456 OR G06K9/4661 OR G06T2207/10004).CPC.)	US-PGPUB; USPAT	OR	ON	2015/03/25 11:46
S201	1	("5,546,475").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2015/03/25 17:31
S202	85382	(age or sex or fac$3) adj2 (object or detect$3)	US-PGPUB; USPAT; USOCR	OR	ON	2015/03/25 18:02
S203	15416	(age or sex or fac$3) adj2 (object or detect$3) same (look$3 adj up or data)	US-PGPUB; USPAT; USOCR	OR	ON	2015/03/25 18:02
S204	861	(age or sex or fac$3) adj2 (object or detect$3) same (look$3 adj up or data) same controller	US-PGPUB; USPAT; USOCR	OR	ON	2015/03/25 18:03
S205	92	(age or sex or fac$3) adj2 (object or detect$3) same (look$3 adj up or data) same controller and @pd<"20020712"	US-PGPUB; USPAT; USOCR	OR	ON	2015/03/25 18:04
S206	1911	(age or sex or fac$3) adj2 (object or detect$3) same (look$3 adj up or data) and @pd<"20020712"	US-PGPUB; USPAT; USOCR	OR	ON	2015/03/25 18:12
S207	68	(age or sex or fac$3) adj2 (object or detect$3) same (look$3 adj up or data) same (light$3 or illuminat$4 or luminat$4) same (intensity or spectrum or dim$4) and @pd<"20020712"	US-PGPUB; USPAT; USOCR	OR	ON	2015/03/25 18:13
S208	8015	(supermarket or grocery or butcher$4) and (image or object) same detect$4 and light$3	US-PGPUB; USPAT; USOCR	OR	ON	2015/04/03 21:34
S209	0	lys.inv. and object adj2 detection	US-PGPUB; USPAT	OR	OFF	2015/04/27 14:50

S210	233	lys.inv.	US-PGPUB; USPAT	OR	OFF	2015/04/27 14:51
S211	1348	object adj2 detect$3 and ("382"/$.ccls.) and @pd<"20020712"	US-PGPUB; USPAT; USOCR	OR	ON	2015/04/27 14:54
S212	114	S211 and (food or sex or age)	US-PGPUB; USPAT; USOCR	OR	ON	2015/04/27 14:54
S213	143	guess with age	US-PGPUB; USPAT	OR	OFF	2015/05/28 14:50
S214	11665	(estimat$3 or predict$3) with age and (pattern or camera or image)	US-PGPUB; USPAT	OR	OFF	2015/05/28 14:56
S215	714	(estimat$3 or predict$3) with age and (pattern or camera or image) and @pd<"20020712"	US-PGPUB; USPAT	OR	OFF	2015/05/28 14:57
S216	851	(estimat$3 or predict$3) with age and (pattern or camera or image) and @pd<"20020712"	US-PGPUB; USPAT	OR	ON	2015/05/28 14:57
S217	304	(estimat$3 or predict$3) with food and (pattern or camera or image) and @pd<"20020712"	US-PGPUB; USPAT	OR	ON	2015/05/28 16:22

EAST Search History (Interference)

<This search history is empty>

5/28/2015 7:29:11 PM
C:\Users\dlotter\Documents\EAST\Workspaces\13357549.wsp

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13357549	SPERO, YECHEZKAL EVAN
	Examiner	Art Unit
	DAVID LOTTER	2844

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
315	152	8/19/2014	dl
362	276, 234	8/19/2014	dl

SEARCH NOTES		
Search Notes	Date	Examiner
inventor search	8/19/2014	dl
class subclass search	8/19/2014	dl
text search	8/19/2014	dl
consulted TQAS regarding priority date	1/21/2015	dl
second search	3/9/2015	dl

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

/DAVID LOTTER/ Examiner.Art Unit 2844	

In the United States Patent and Trademark Office

Application/CN: 13/357,549 Wednesday, September 23, 2015
Application Filed: 24 January 2012
Applicant: Spero, Yechezkal Evan
Title: Detector Controlled Illuminating System
Examiner: Lotter, David E
Art Unit: 2844

Reply to Office Action dated June 23, 15

Mailstop: Amendment

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Dear Sir:

The application is being prosecuted by the Applicant pro se.

Certificate of Transmission Under 37 C.F.R. § 1.8

I hereby certify that this correspondence is being deposited electronically with the U.S. Patent and Trademark Office using the United States Patent and Trademark Office's EFS-Web system on **Sept. 23, 2015**.

Signature
/Yechezkal Evan Spero/

Yechezkal Evan Spero

AMENDMENT UNDER 37 C.F.R. §1.111

In response to the Office Action mailed June 23, 15, the following amendments and remarks are respectfully submitted in connection with the above-identified application.

Amendments to the Claims begin on page 2 of this Amendment.

Remarks begin on page 9 of this Amendment.

	Claims remaining after Amendment		**Highest number previously paid for**		**Present extra**
Total	26	-	20	=	0
Independent	4	-	4	=	0

AMENDMENTS TO THE CLAIMS

The following is a complete, marked-up listing of revised claims with a status identifier in parenthesis, underlined text indicating insertions, and strike through indicating deletions.

Full list of claims per 37 CFR 1.121

1. (Original) An illuminating device which produces light to meet an illumination requirement of an illuminated area, comprising: a light fixture including a multiplicity of directional light sources including at least two light sources pointing in different directions, the light sources having at least one of controllable light intensity and spectral light distribution; a controller for adjusting at least one of a light intensity and light spectrum of the directional light sources; one or more detectors for sensing at least one of objects, surfaces and people within the illuminated area and of passing the sensed information to the controller; a processor for processing the sensed information and determining illumination requirements of the at least one of objects and people using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables and for directing the controller to adjust the directional light sources to meet the illumination requirement.

2. (Original) The illuminating device of claim 1 where the detector is comprising at least one of (i) a camera being a photo sensor array coupled with an optical lens, (ii) a photo sensor, (iii) an ultrasound transducer and sensor, (iv) microwave transducer and sensor, and (v) pyroelectric detectors.

3. (Original) The illumination device of claim 1, wherein the illuminated area is indoors and further comprising a detector for detecting variable illumination from daylight and/or sunlight entering indoors, wherein the controller taking into consideration the area now illuminated by the daylight and/or sunlight adjusts the light intensity of the directional light sources to meet the varied illumination requirement.

4. (Original) The illuminating device of claim 1, wherein the one or more detectors detects information regarding one or more individuals within the illuminated area, said information is at least one of (i) age, (ii) sex, and (iii) recognition of an individual for matching with stored data about that individual's needs and wherein the controller adjusts the light intensity and/or spectrum of the illumination provided to the one or more individuals based on illumination requirements from at least one of (i) best practices looked up and calculated from stored data, (ii) age and/or sex of the individual, (iii) personal preferences input to the controller and stored in memory, and (iv) commands received by the controller from an input device.

5. (Original) The illuminating device of claim 1 for optimally displaying food, wherein the one or more detectors detect an identity of one or more foods and wherein the controller adjusts the light intensity and/or spectrum of the illumination on the one or more foods based on illumination requirements from the processor.

6. (Original) An illuminating device having automatic control of the light provided to an illuminated area comprising: a structure for incorporating illuminating device elements; one or more light sources incorporated in the structure and in communication with a power source; electronic circuitry apparatus for the controlled powering of the light source and other illuminating device elements; one or more cameras placed on the structure for detecting information about the illuminated area, said camera in communication with power and control device elements; a controller integrated with the structure, in communication with the light source controlling power circuitry, said controller arranged to processes the information communicated from the camera and automatically control the light provided to the illuminated area.

7. (currently amended) The illumination device of claim 6, <u>where one or more light sources are directional</u> wherein the one or more detectors are configured to

sense a presence of glare on a person's eyes in the illuminated area, and wherein the controller is programmed to adjust an intensity of the directional light sources to reduce the glare.

8. (Original) An illuminating device which provides light to meet an illumination requirement of an illuminated area in which visual activities are performed, comprising: a light fixture including a multiplicity of directional light sources including at least two directional light sources pointing in different directions, the light fixture having movable structure for aiming the directional light sources mounted thereon in a defined direction; a camera for obtaining images of the illuminated area functioning as a detector for at least one of (i) a light detector (ii) a spectrum detector, (iii) a motion detector, (iv) a measuring detector for sensing a geometry of the illuminated area, and (v) a detector for sensing at least one of work surfaces and road objects and at least one of vehicles and people; a controller for adjusting a light intensity and a direction of each of the directional light sources; a processor with stored algorithms and data for identifying at least one of (i) tasks being carried out by people, (ii) location of people, (iii) frequency of area usage by people, (iv) traffic density in the illuminated area from the sensed geometry, (v) work surfaces, (vi) road objects, people and/or vehicles, and (vii) roadway surface luminance any of which is used by said processor for determining illumination within the illuminated area using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables wherein said processer, upon calculating the required illumination parameters, directs the controller to adjust the directional light sources to meet the illumination requirements of the visual activities.

9. (Original) The illuminating device of claim 8, further comprising the illumination requirement that different parts of the illuminated area to be illuminated at a different intensity and/or at a different spectrum than another part of the illuminated area.

10. (Original) The illuminating device of claim 8, adjustable by an installer based on room geometry and/or usage further comprising the light fixture having adjustable arms on which directional light sources are mounted for aiming the directional light sources within the illuminated area, where said detector and processor combination provides feedback to the installer so as to aim the light sources such that the illumination requirements can be met by the re-adjusted light source aimings.

11. (Original) The illumination device of claim 8, wherein the controller receives real time information from the camera and wherein the processor, using image recognition capability, directs the controller to adjust at least one of (i) the intensity, (ii) the spectral light distribution and, (iii) the direction of the light sources based on at least one of (i) where people requiring illumination are located, (ii) what object the person is viewing and (iii) what visual task the person needs to perform.

12. (Original) The illumination device of claim 8, further comprising at least one of the directional light sources mounted on the movable structure where the movement of the light source direction is automatically controlled by the controller.

13. (Original) The illumination device of claim 12, providing a different illumination to a sub-area based on usage wherein the controller interpreting images from the camera adjusts the moveable light sources such that they provide the required illumination in a sub-area proximate to the individuals as they move around in the illuminated area.

14. (Original) The illumination device of claim 8, wherein the illuminated area is a road and the objects include road signs.

15. (Original) The illumination device of claim 8, further comprising at least one

of the directional light sources on an automatic swivel joint and providing spot lights of limited beam angle for task lighting while other light source provide general illumination to the illuminated area.

16. (Original) The illumination device of claim 8, further comprising a controller with communication capability to other devices, where the camera in one location obtains information and the controller process the information and communicates the camera obtained information to a second device.

17. (Original) The illumination device of claim 16, where the illuminated area is a road and the second device to where the camera obtained information is communicated to is a lighting fixture.

18. (Original) The illumination device of claim 17, where the processor uses information obtained from the cameras and exchanged between fixtures for identifying traffic requirements in the illuminated area and from the vehicles locations and geometry determining the illumination requirements of the illumination area thereby directing the controller to adjust the directional light sources to meet the illumination requirements.

19. (Original) The illumination device of claim 18, wherein the controller is programmed to adjust at least one of (i) increase illumination with an approach of a vehicle, and (ii) change beam cut-off levels as the vehicle advances toward the lighting fixture to eliminate glare.

20. (Original) An automated irradiating device for providing radiation to individuals within an area, intended to provide a desired radiation in a sub-area proximate to the individuals, comprising: an irradiation fixture including one or more directional radiation sources where the radiation is in a defined direction; at least one detector for sensing a location of individuals in the area and feeding transferring that information to a controller; a where said controller for adjusting

adjusts at least one of (i) a radiation intensity, and (ii) a direction of the irradiation based on sensed location, whereby the desired radiation is provided proximate to individuals in the area.

21. (Original) The automated irradiating device of claim 20 intended to provide a desired heating to one or more individuals in an area, further comprising: at least two directional heat radiation sources pointing in different directions; the detector being a camera with capability for sensing at least one of (i) a presence of one or more individuals in the heated area, (ii) the identity of the individuals, and (iii) a body temperature of individuals present in the heated area; the controller further having processing capability for determining the heating requirements of the individuals in the area from at least one of (i) algorithms to calculate radiation parameters, (ii) stored data of heating practices, (iii) image recognition algorithms for identifying the individual based on the camera information, and (iv) an identified individual's personal preferences.

22. (Original) The automated irradiating device of claim 20, further comprising: One or more directional radiation sources capable of being moved so as to direct radiation in a defined direction; the at least one detector capable of providing information on the present location of individuals in the area; the controller programmed to process the detector information and move the radiating sources so as to follow the one or more individuals, whereby the desired radiation is provided in a sub-area substantially proximate to the individuals.

23. (Original) The irradiation device of claim 21, further comprising; the detector being a camera capable of providing images of different parts of the body of individuals to the controller for image processing; the radiation sources being able to direct radiation to different parts of the body; and the controller further programmed to run the image recognition algorithms to identify different parts of the body, to compute the desired radiation level to the different parts of the body and to adjust the radiation from sources directed at the different parts of the body.

24. (Original) The irradiation device of claim 21, further comprising the controller programmed to control the irradiation in time and intensity on the individual to maintain comfortable heating based on at least one of (i) best practices, (ii) feedback from the heat detector configured to detect body temperature of different parts of a body, (iii) personal preferences input to the controller and stored in memory and (iv) commands input from an input device.

25. (Original) The irradiation device of claim 21 where the irradiation instead of for heat is for therapeutic purposes and the radiation may be any of (i) UV radiation, (ii) red light therapy in the 620-660 nm range, and (iii) light therapy for SAD and other disorders selected from the group consisting of seasonal affective disorder, sleep disorders, circadian rhythm disorders, delayed sleep phase syndrome, vitamin D deficiency and skin disorders, where the controller aims the radiation sources to the location where the individual is located and controls the time and intensity of the radiation.

26. The automated irradiating device of claim 20 further comprising where one or more of the irradiating sources is radiating visible light and one or more of the irradiating sources is designed to substantially radiate heat whereby the device is capable of providing both a desired light and heat radiation to the individuals.

REMARKS

Favorable reconsideration of this application, in light of the remarks and following amendments, is respectfully requested.

In reply to point 1: Claim Rejections - 35 USC § 1 12(b): distinctly claiming the subject matter … Claim 7 recites the limitation "...intensity of the directional light sources". There is insufficient antecedent basis for this limitation in the claim. Independent claim 6 recites "one or more light sources incorporated in the light structure." The Examiner interprets claim 7 as reading "one or more light sources incorporated in the light structure" as recited in claim 6.

The Applicant has amended claim 7 and a marked up version with the words "where one or more light sources are directional" to better claim the glare reduction feature disclosed in the specification. An example of a preferred embodiment is described in [0249]: *In a preferred embodiment of this invention the lighting fixture is equipped with a camera vision system comprised of the digital camera 429 and logical controller 428 having computer algorithms for performing computer vision and has the capability of identifying the eyes of occupants in a room* and is *… capable of detecting glare causing visual discomfort on the eyes of room occupants caused by the lighting fixture and the logical controller will accordingly reduce the intensity of the illumination reaching the eyes from the responsible light source.*

In reply to point 2: Claim Rejections - 35 USC §103(a) which forms the basis for all obviousness rejections … Claims 1 and 3 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) … and further in view of Amerson (US 6,379,022)..

To point out the non-obviousness, the applicant presents an informal introduction to help better understand the innovative aspects of the device claimed able "to meet an illumination requirement of an illuminated area" of the present disclosure. In prior art, to illuminate an area correctly and efficiently (see para. [0009] for definition of "correct") a human designer in a calculated design process, knowing the distances and the angles from the light fixture to the surfaces to be illuminated and using the defining laws of physics, Lambert's-Law and the Inverse-square Law, $E = \frac{I \cos\theta}{D^2}$ arranges light-sources relative to the surfaces to be illuminated. These light-sources have a pre-defined spatial light distribution and are placed in the room at specific locations to correctly meet expected illumination requirements for the visual tasks typically carried out in the specific area to be illuminated. Based on this combined spatial and visual tasks knowledge and in addition, knowledge of the intended room usage such as the age, sex, personal preferences of the users, the colors of the furniture placed therein etc. a designer can adjust light source placement, intensity, spectrum, and angle of incident light to achieve a more correct illumination. Because surface illumination varies with the distance

squared from the light source, is very difficult to achieve high light-utilization efficiencies using prior art monolithic light sources and most often, near the light fixtures there is a greater illuminance intensity that what is required while furthest away, there is a deficiency and the lighting in not "correct".
Each sub-area in a room can have its specific use and optimal illumination level. This task lighting requirement is served today by having a separate light fixture e.g. table lamp, or spot from above and a manually adjusted dimmer to meet changes in the local illumination requirements. Most room lighting applications require a combination of general and task lighting. As opposed to area or task lighting, in a point lighting application such as for camera flash or stage lighting application, the lighting is pointed at the object to be illuminated and has different considerations.

However, in the real world, light usage is dynamic and theoretically, to do it right, a designer would need to be on the scene to see the immediate lighting requirements and rearrange the light source aiming's, intensity spectrum etc. to meet the changes. While an advanced system (per Morgan) could use - networked sensors to detect the occurrence of an event, such as a change in the environment or occupancy and communicate (per Lys) to a networked plurality of LEDs in a "three-dimensional structure 4024" - to alter the illumination, it would still not substantially improve on meeting the actual illumination requirements unless it was controlling correctly arranged light sources. Even if those light sources were (per Amerson) arranged to provide an adjustable color temperature they would not produce spectrally correct illumination to meet an illumination requirement for an area (for a non-area, spot lighting application, yes, but to correctly illuminate an area where the distance and the angle to the surfaces from the LED vary, no)

A more accurate and convenient light fixture system based on actual room-occupant location and usage would use sensors to provide information to a processor running algorithms to determine the occupant's illumination requirements in real-time and correctly drive properly arranged light sources of controlled light distribution to provide the correct illumination that is required to fulfill those requirements. The first inventive step is to use more than one spatially differentiated light source to correctly illuminate each sub-area. The second inventive step would be to have spatially differentiated sensors to obtain the necessary information to grant the processor knowledge necessary to determine the requirements of each sub-area and a third non-obvious step would be to program the processor to "know" which light source illuminates that area (versus another sub-area that it does not illuminate) and to power it as necessary to meet the illumination requirement for that area. Each inventive step generated the need for the next step where the solution was not obvious. In some cases at the outset, the necessary technology did not exist and certainly, the combination of steps necessary to yield this unique resulting functionality could not have been foreseen by one of ordinary skill in the art. Only in

hindsight, is it apparent that the claimed device, comprised of a unique combination of hardware and software, actually mimics best lighting practice as performed by a human designer it in real time. The applicant below will show that the mere combination of the cited prior art patents would not lead to the apparatus nor functionality of the claimed device.

Therefore, the disclosure of a sensor controlled illuminating device that: a) has at least two light sources, arranged such that each light source illuminates a different area of the room and where b) that sensor has spatially differentiated detection means and c) where the processor running code uses the detected information to "know" the area of the room that requires a specific type of illumination versus those that do not require that illumination and d) the processor, using instruction sets, then "knows" which of the "directional-light-sources" deliver light to the area to be illuminated and then e) the processor using code determines the intensities to drives those specific sources to obtain the specific, localized-effect, so as to fulfill the sensor detected illumination requirement according to best practice – surely comprises a non-obvious, new to the world device. A device capable of differentiated delivery of energy or mass within a room, synergistically equipped with a sensor such as a camera capable of providing location coordinate information to a processor to operate localized delivery, (versus the prior-art's, non-spatially-differentiated sensor and light delivery apparatus) provides unpredictable functional and/or energy saving benefit well beyond a combination of prior art systems.

More specifically: regarding Claims 1 and 3 are rejected ... as being unpatentable over Morgan in view of Lys the applicant respectfully points out that, although per Morgan (abstract) the "Individual light sources or groups of light sources may be controlled independently of one another based on data transported throughout the network from sensors", and in view of Lys, Fig. 28C para. [0206] "the modular LED unit 4000, may be flexible, so as to permit the light module 4002 to conform to an environment within which it is placed" do not disclose the requisite spatially differentiated sensing and physical light distribution apparatus needed for the localization of the effect to an *illuminated area* as is disclosed numerous times in the specification. For example, Fig 12 is described: [0183] *The adaptive or intelligent DLF 190 shown in FIG. 12 has multiple light sources 191 placed about the body 192 having a geometric shape... a photodetector array which is equipped with a lens which can be a 360 degree lens or a fisheye lens is placed with a field of view of the area to be illuminated. ... such that an asymmetric lighting pattern is produced for the provision of a non-circular lighting pattern in a typically rectangular room; and [0184] Spatially differentiated motion detectors.* Therefore, without disclosing a geometrically coordinated sensor Morgan in view of Lys would not teach towards the inventiveness of the present invention in Claim 1.

For illumination to reach an area to be illuminated in a substantially required amount (just not some approximation but a design goal) its directionality of light distribution would need to be known and it would need to be positioned and aimed at that area and when there are more than one light sources the controller would need to "know" which light source under its control illuminates what area. The *directional light sources*" of Claim 1 per Spero [0280] has the *"capability of delivering spatially differentiated illumination"*. Again, nowhere within the disclosure does Lys' device teach the physical requirement of Claim 1 in order to derive the desired controllable lighting effect*:" to meet an illumination requirement of an illuminated area ... a light fixture including a multiplicity of directional light sources including at least two light sources pointing in different directions"*. The unplanned placement of Morgan's light sources of Fig. 1-3, and Lys' in Fig. 28C while uniquely addressable, are not physically arranged to produce any degree of an area-specific illumination which must follow Lamberts Law in relation to the angle and distance of the surface to be illuminated. In the present disclosure the system's manually and even automatic spatial ascertaining capability is described as how the controller will "know" which local area each of the multiple light sources illuminates. *[0196] In a preferred embodiment, using pattern recognition techniques ... An automatic routine as in 7A uses timed firing of a coordinate-specific light source, or array of light sources and the following reading of the camera detector of light reflected to that specific coordinates pixel, or set of pixels to corroborate action between light sources and the detectors.* Without this spatially differentiated sensing and delivering capacity and the novel corroboration of the area sensed with the area served by the directional light source, there is no way an inferred Morgan in view of Lys system could perform as Claim 1 and Claim 3. In Claim 3, *the controller taking into consideration the area now illuminated by the daylight and/or sunlight adjusts the light intensity of the directional light sources to meet the varied illumination requirement*. This inventive step, where on the fly a system can sense a sub-areas specific requirement and coordinate it to an illumination delivery device that illuminate that area according to a new requirement is clearly missing from the Morgan in view of Lys disclosures.

In the present disclosure the light fixture has [0054]) *...one or more discrete light sources in an integrated illuminating element where the overall lighting effect is the result of the combination of these multiple sources*. Instead, Morgan, Lys and other prior art, deal with either: 1) monolithic general lighting or 2) spot lighting concepts. It can be noted that even where there are multiple light sources, a) they often cover the same area, as do Morgan's light sources of Figs. 1-3, or b) the separate sources are arranged such that there is an uncontrolled melding of light from one light source with that of another. That is, the effect of the light sources is not substantially exclusive to an *illuminated area* within a room. In the referenced spot lighting concepts, which provide accent to a specific stage performer or features in the room the individual spots are not arranged to combine build

an overall room illumination. Nowhere in the disclosure do either Morgan or Lys mention the inventive step of controlling an area-specific illumination effect by using *directional-light-sources* that have a focused, localized or directional aspect. Such a teaching is, a prerequisite for the novel, spatial controllability of the present inventive device see Fig 2b, allowing it to "meet the illumination requirement of an illuminated area". Instead, Lys' device Figs. 28, other than when used as a spot light will not correctly illuminate an area. To the contrary, for an average illumination requirement, it illuminates areas with greater than needed intensity closer to the light source and less intensity further away. Morgan in view of Lys would illuminate well beyond the localized lighting needed for a detected individual of Morgan. The applicant also suggests that in most probability, Lys' "conform to an environment" statement in para. [0206] is referring to solving an electronics packaging problem, not the illumination requirements of surfaces in the environment. This, as Lys uses a positioner to illuminate the material of interest directly-on angle and light distribution properties are not mentioned in the entire disclosure. Similarly, nowhere in the Morgan disclosure is the word direction, area, aim, spatial distribution or sub-area mentioned and there would be nothing to teach anyone skilled in the art the localization capability of the present disclosure. As there is no teaching or suggestion supporting the combination in the cited prior art references, Morgan in view of Lys should not be deemed obvious and the applicant respectfully requests allowance of the claim.

Regarding Claim 2 is rejected ... as being unpatentable over Morgan in view of Lys as applied to claim 1 above, and further in view of Amerson (US 6,379,022).
Amerson is using the LED light sources to provide an adjustable color temperature. The camera mentioned by Amerson uses the spectrally corrected light for a camera flash function. The only sensor use of the camera mentioned Column 3 Line 17 "Another way is for the camera or an auxiliary device to measure the current light in the scene and determine the type of illumination" does not teach towards a spatially differentiated sensing. That is a capability to measure the "current light" in one area of the scene versus measuring the "current light" in a second area of the scene. Therefore, as Amerson's camera is disclosed only as a spectral sensor of the "current light" it does not teach towards the spatially differentiated sensors of claim 2 of the present disclosure. Any practitioner skilled in the art who would want to use a camera to gain the coordinates of the sensed event would need first a spatially differentiated delivery device to want to have a spatially differentiated sensor and computer programs to assess the data. Then they would require apparatus and software to correlate the sensed coordinates to the delivery coordinated. Any suggestion to any of these inventive steps are missing and therefore the present disclosure is non-obvious.

Regarding Claim 4 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) as applied to claim 1 above, and further in view of Kinjo (US 2002/0046100). The applicant does not claim to have invented

pattern recognition, nor does Kinjo, who is using the information derived from images [0002] to enhance an advertisement effect, by which advertisement contents are switched in accordance with the viewer so as to display an advertisement suitable for the viewer of the advertisement. It should be noted that the application for Kinjo's detected characteristic remains in the virtual world [0010] ... and switching an image displayed on an image display medium in accordance with the first characteristic of the extracted person. This new use for a known pattern recognition process is typical of recent technological advances where "virtual" product development outpaces "physical" product developments which are often more difficult to foresee and implement. In the case of these cited references which primarily deal with control signal and networks would actually teach away from the device because the cost of the added physical device, wiring, networking complexity.

In addition, the prior-art use of image recognition developed security purposes in identifying terrorists was conceptually limited at the time of the disclosure to systems making use of the information for the observers benefit, often at the expense of the person being observed. That is, the information on the observed individual is used by the observing entity for its own benefit be it security or advancing sales. In the present disclosure the pattern recognition is being used by the user themselves to gain a personalized non-virtual illumination benefit per [0051] *A number of unique illuminating device embodiments are achievable using the basic elements presented above...as well as the ability to provide individualized lighting to each person.*

The applicant submits that certainly, a disclosure of a lighting fixture which is able to automatically tailor the illumination to the person it is illuminating for, is a case of an improvement patent. The applicant submits that this new development would not be obvious to a "person of ordinary skill in the art", even if that person had prior knowledge of all the documentation available in the world at the time of the application in the many different arts that are needed for this device to be constructed to produce the desired result. This is because a "person of ordinary skill in the art", refers to a practitioner of one art, not a practitioner of all the arts. In this claimed novel illumination device, the individual inventor's combination of skills in electronics, programming, artificial intelligence, human factors engineering and lighting science that need to be combined in order to contrive a machine capable of automatically illuminating in accordance with good lighting practice is non-ordinary.

In addition regarding Kinjo's use of personal characteristics for advertising it is claimed that [0196] *the addition of a machine vision system with pattern recognition capabilities as is known in the art,* combined with a physically differentiated lighting apparatus with using skills of multiple arts qualifies under 35 U.S.C. 100(b) as a new use of a known process, machine, manufacture. The applicant submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to

combine the relevant prior art teachings to the new use of the known processes in the manner claimed. To conclude, there is nothing in the cited prior art of Morgan or Kinjo that would have incited towards the concept of a pattern recognition based processor knowing data controlling and correctly controlling an illuminating device. As stated by Winner Int'l Royalty Corp. v. Wang, 202 F.3d. 1340, 1348 (Fed. Cir., 2000), there must be a suggestion or teaching in the prior art to combine elements shown in the prior art in order to find a patent obvious.

Regarding Claim 5 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) as applied to claim 1 above, and further in view of Zampini (US 2008/0136356) and in further view of Bolle (US 5,546,475).
The applicant argues that the claimed area-specific food-illumination system for use in dynamic settings such as restaurants for *optimally displaying food,* is not obvious from the prior art for the illumination objects in a display case. From the specification: [0282] *The lighting fixture 490 has means to illuminate separate portions at a table comprised of directable or aim-able lighting modules 491. The lighting fixture 490 also has computational means of providing the optimal color and intensity of light so as to render people, food, objects in their best light as well as to build a dining room ambience through lighting according to recommended practice or user preferences.* Zampini in his disclosure for a solution states: [0007] The present solution described herein provides systems and methods to coordinate and control the lighting of areas of a display . The area inside the case is fixed and is not dynamic in terms of persons, objects and activities carried out. Zampini's detector is not spatially differentiated such as a multi-pixel photodetector array capable of producing coordinate information necessary for a room illumination system able to focus on a food and render it under optimal lighting. And again, Zampini does not disclose the corroboratory area sensing and delivery routine necessary to have an imaging detection routine drive a specific light source to illuminate food on a restaurant table located anywhere in the room. The present disclosure can identify and illuminate anywhere in the living space and not just in a display case which is a totally different lighting application. Regarding Bolle who describes an apparatus that uses image processing to recognize objects such as produce within a scene which is indeed pattern recognition prior art that the disclosure relied upon. The combination of the cited references would not suggest the presently disclosed robust system of Fig. 26. Its unique structure offers a complete restaurant lighting application solution where: *[0280] As an example of the luminaire's benefits and agility to provide correct lighting where it is needed at minimal energy consumption, an embodiment of the invention, a spatially and spectrally adjustable restaurant lighting fixture is presented in FIG. 26. In a restaurant lighting application it would be beneficial for the customer experience if those dining, the food and ambience would all appear at their best.* The present application discloses a complete solution beyond the simple display and food recognition application by operating area specific within a larger area comprising people as well as food and other

objects each identified for its optimal illumination. Thereby, the camera based system is uniquely capable of illuminating food within a living space which an application not taught by the combination of cited references.

Regarding Claim 6 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Amerson (US 6,379,022).

The applicant respectfully differs with the examiner's interpretation of the term camera used throughout by Amerson and instead sees it once used as a light sensor column 3, line 18, to control the instantaneous color temperature of a camera flash that does not teach towards an area illumination application. Amerson describes in the Field of the Invention, column 1 lines 6-8 "The present invention relates generally to digital cameras and more specifically to an auxiliary illuminating device that has an adjustable color temperature". One will note that even in the days of film cameras, the camera used a light meter to control the flash and using it to detect spectrum is a stepwise improvement. The applicant views the present disclosure as a further significant inventive step moving from the camera of Amerson , column 3, lines 17-26 .... "Another way is for the camera or an auxiliary device to measure the current light in the scene and determine the type of illumination" to the multifarious camera of claim 6 used to supply information to a *"controller arranged to processes the information communicated from the camera and automatically control the light provided to the illuminated area"*.

Amerson's illumination is point illumination for a specific digital camera lighting application and is not expanded by Morgan's networked sensors beyond that functionality. One must note that in a flash application the user points the camera at the limited scene to be captured by the camera. The flash will not evenly cover an area larger than the limited field of view. However, in a room illumination application with a fixed sensor placement the processor program to efficiently *"automatically control the light provided to the illuminated area"* must be arranged and programmed to obtain pertinent information from the area to be illuminated.. This is disclosed in the specification for example in an embodiment: [0184] *Spatially differentiated motion detectors.... The DLF controller acts to provide heightened lightning to the occupants' present locations. The controller has stored look-up-tables, instruction sets and algorithms which it uses to processes the information communicated from the sensors or a camera and in response control the light provided to the illuminated area.* Even had a camera sensor technique been used to improve the camera flash, a person of ordinary skill in the art of illuminating for cameras would not recognize that it could improve area lighting devices in the same way, as an area based algorithmic processing step would also be needed, a step whose actual application would be beyond their ordinary skill. The applicant therefore traverses the claimed obviousness as there is no provision or suggestion in either of the cited references for "*said controller arranged to processes the information communicated from the camera*".

Regarding Claim 7 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Amerson (US 6,379,022) as applied to claim 6 above, and further in view of Chang (US 2002/0039238).

The applicant respectfully points out that Chang uses a detector of radiation on the rearview mirror; as per paraa. [0005] Accordingly, the primary object of the present invention is to provide a vehicle automatic anti-glare device, wherein a rear-view mirror is provided for which automatically blocks out glare, in accordance with the intensity of the light cast upon the mirrors. Nowhere in Chang's disclosure is sensing the existence of glare reaching the eyes mentioned. The word eye does not appear in the entire specification and there is nothing in the combination of the cited references to teach to a system of the present disclosure which *[0249] In a preferred embodiment of this invention the lighting fixture is equipped with a camera vision system.... The camera vision system is capable of detecting glare causing visual discomfort on the eyes of room occupants caused by the lighting fixture and the logical controller will accordingly reduce the intensity of the illumination reaching the eyes from the responsible light source.* Chang's simple system actually teaches away from the use of an expensive camera to determine the disturbing glare event via the rear view mirror. Thus in a non-obvious development, the very same logic system which controls an illumination device that helps people to see as well as creating glare now has been configured to be able to illuminate without glare. This is a radical improvement over prior art and there is no teaching, suggestion, or motivation in the cited references that would have led a person of ordinary skill in the art to combine the relevant prior art teachings in the manner of claim 7. The applicant thus respectfully request allowance of claim 7.

Regarding Claims 8-17 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) in further view of Amerson (US 6,379,022).

Claim 8 and its dependents are referring to an invention (an example of which is disclosed in Fig. 24 and in the specification) of an automated illuminating device capable meeting *illumination requirements of the visual activities.* Disclosed in para. *[0273] In another embodiment one or more light sources, acting as a spot light 482 of limited beam angle... The controller 454 receiving input from the camera and using computational image recognition algorithms in a program as in FIG. 23 ....where computer vision is used ... recognize activities as they happen in real-time which enables the controller to determine any of the following: a change in the persons activity, in what direction the eyes may be directed, what objects the person is viewing and what visual task the person needs to perform. Based on that information the controller 454 powers the spot light sources 482 and general lighting sources 472 to provide the correct lighting for the specific visual task undertaken, be it reading a book or watching TV.* The applicant points out that Mogan discloses a (title) Methods and apparatus for controlling devices in a networked

lighting system. In a thorough reading of the Morgan patent application the applicant could not find any reference to the directional light sources (paragraphs 0019-0020) or a processor (Fig. 2, at 22) with stored algorithms (paragraph 0040) or any equivalent apparatus to recognize and deliver activity specific illumination per Claim 8 "visual *activities... said processer, upon calculating the required illumination parameters, directs the controller to adjust the directional light sources to meet the illumination requirements of the visual activities*. Again, a thorough reading of the Lys and Amerson patent applications finds no description of a device that can calculate *required illumination parameters* per detected visual activity. In Lys, even the re-positionable light fixture having movable structure for aiming the light sources mounted thereon in a defined direction (e.g. Fig 90A, at 2010, paragraphs 0325-0326) is typical of point lighting applications with the addition of sensed data controlling the positioning device. It does not teach towards the apparatus of Claim 8 where the applicant discloses *at least two directional light sources pointing in different directions* a necessary criterion for a novel, automated combined task and area illuminating system which is a different illumination art operating under a different set of defining equations.

As the disclosed system as claimed has spatially differentiated detection, calculating means and spatially differentiated delivery of illumination and none of the cited reference teach any of those necessary features necessary to fulfill *illumination requirements of the visual activities.* The applicant respectfully submits that the present invention is totally unpredictable under the prior art references. Therefore it would not have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Amerson regarding cameras used with LEDs (Amerson, column 3, lines 17- 26) in order to vary the light output of the LEDs (Amerson, column 2, lines 29-33) and Claims 8-17 should be allowed.

Regarding claim 9 Morgan further discloses the illuminating device of claim 8, further comprising the illumination requirement that different parts of the illuminated area to be illuminated at a different intensity and/or at a different spectrum than another part of the illuminated area (e.g., paragraphs 0020-0023). While Morgan states in [0023] According to one embodiment of the invention in which one or more sensors are employed, a networked lighting system may be implemented to facilitate automated computer-controlled operation of multiple light sources and devices in response to various feedback stimuli, for a variety of space-illumination applications. For example, automated lighting applications for home, office, retail environments and the like may be implemented based on a variety of feedback stimuli (e.g., changes in temperature or natural ambient lighting, sound or music, human movement or other motion, etc.) as shown earlier Morgan does not illustrate nor disclose apparatus for spatially differentiated detection or illumination resulting from direction light sources of Claim 8 where the illumination result is more functionally correct, convenient and energy saving. An example of this disclosed in the specification para. [0265] *In a preferred embodiment of the invention the logical controller 454 receiving image input from the camera 453 and running pattern recognition software will identify what is the visual task a person is*

trying to perform. The computer routine receives images from the camera and by determining the proximity of persons to objects such as books, newspapers, computer screens, telephones, televisions, cereal bowls, a writing pad, etc that are recognized by the computer vision techniques predicts what visual task the user is trying to perform. The logical controller 454 then drives the light sources 457 according to recommended lighting practice levels stored in its data storage. ... Unique to this invention, people are able to choose the lighting that suits them best and the fixture, having differentiated light delivery, can provide a first user with one type of chromacity and/or intensity and a second type for a different user in a different area.

The applicant respectfully submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to combine the cited prior art teachings to construct the disclosed device and therefore Claim 9 should be allowed.

Regarding claim 10 Morgan discloses the illuminating device ... Lys discloses an adjustable by an installer based on room geometry... to conform to an environment (Lys, paragraph 0206). Amerson .... Amerson discloses wherein the controller receives real time information from the camera (column 1, lines 11-12) .... using image recognition capability, directs the controller to adjust ....

The applicant has stated above in arguments for claims 1-9 the difference between a networked system that uses a camera as a light sensor for a scene for use with a single point flash light source (vs. area illumination) which is a different art with a different information set needed to automatically solve the defining equations. As far as the to conform to an environment of Lys, as there is no spatially differentiated illumination device described as well as no image recognition capability in Amerson such that the present disclosure functionality and structure would not be obvious. As can be seen from an example of the needed considerations for an area lighting application as claimed, cite the specification: [0267] *Yet another feature of the present invention logical controller and software is that the lighting fixture 450 has apparatus to check the illumination level of the lighting set-up upon installation and provide feedback so that manually made aimings are directed to obtain a desired illumination or luminance. The camera 453 serving as a light meter obtains luminance readings on surfaces in the living space. It inputs data to the controller 454 which provides readout either on a display on the FAML 450 or communicated to another device having a display. The installer using a calibrated reference reflective sheet of known color and reflectance values placed on surfaces at particular aimings will check if the desired illumination and chromacity is being provided. The reference sheets can also be used to calibrate the room surfaces for future camera sensor 453 readings by storing in 454 the actual surface readings vs. those of the reference sheet. Once the camera 453 is calibrated as to the reflectance and color of room surfaces the FAML 450, in a servomechanism enabled embodiment, with automatically movable light sources 457, will perform its own re-configuration to reach optimal light provision. The calibration is affected by using the camera array 453 to*

detect luminance as a measure of the lighting fixture instantaneous illuminance in that direction vs. the power level at which the light source is being driven. To calibrate the illumination system, the logical controller 454 can use a given LED installed on the fixture which serves as a light source standard when driven at known voltage and current. Alternately, an additional light sensor of superior accuracy stability is provided for in the sensor pack 453 and can be used to calibrate the camera sensor array.
The applicant respectfully submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to combine the cited prior art teachings to construct the disclosed device and therefore Claim 10 should be allowed.

11. (Original) The illumination device of claim 8, wherein the controller receives real time information from the camera and wherein the processor, using image recognition capability, directs the controller to adjust at least one of (i) the intensity, (ii) the spectral light distribution and, (iii) the direction of the light sources based on at least one of (i) where people requiring illumination are located, (ii) what object the person is viewing and (iii) what visual task the person needs to perform.

Regarding claim 11 Morgan further discloses the illumination device of claim 8. Morgan does not disclose wherein the controller receives real time information ...Amerson discloses wherein the controller receives real time information from the camera (column 1, lines 11-12) and wherein the processor (column 3, lines 14-25), using image recognition capability.
As the applicant has shown above in claims 1-10 there is no mention in Amerson's cited reference of image recognition routines. (column 3, lines 14-25), "For the array of LEDs to simulate the color temperature of the ambient light, the type of illumination to be matched must be known. One way is for the user to select the type of lighting from a list of choices. Another way is for the camera or an auxiliary device to measure the current light in the scene and determine the type of illumination. Once the type of illumination to be matched has been determined, the amount of light coming from each set of color LEDs is adjusted such that the total amount of light coming from the LED array is a calorimetric match to the ambient illumination source. Each type of ambient light source would typically have a different ratio of light coming from the sets of color LEDs. The inventive step regarding Claim 11 may be seen in the disclosure: *[0196] In a preferred embodiment, using pattern recognition techniques the ADLF 190 is semi or fully automatic in programming itself to correctly function where installed. The DLFs or ADLFs will adapt to the seating arrangement of room occupants* ***in real time****. In the preferred embodiment, the addition of a machine vision system with pattern recognition capabilities as is known in the art, easily deduces room occupancy and usage.*
The applicant respectfully submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to combine the cited prior art teachings to construct the disclosed device and therefore Claim 11 should be allowed.

Regarding claim 12 Morgan ... Lys discloses at least one of the directional light sources mounted on the movable structure ...in order to permit the light module to conform to an environment within which it is placed (Lys, paragraph 0206). The applicant points out that Lys is conforming to a geometrical environment in terms of the illuminating deviceas stated in para.s [0209]-[0246] a" Another such environment" and again in [0251] "In fact, the housing 703 could take any geometric configuration appropriate for a particular illumination or display environment" and not a geometric environment or visual task as it related to illumination. The applicant respectfully submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to combine the cited prior art teachings to construct the disclosed device and therefore Claim 12 should be allowed.

Regarding claim 13 Morgan further discloses the illumination device of claim 12, providing a different illumination to a sub-area... based on usage wherein the controller interpreting images (paragraph 0019).
The Applicant quotes Morgan [0019] "Accordingly, one embodiment of the present invention is directed generally to networked lighting systems, and to various methods and apparatus for computer-based control of various light sources and other devices that may be coupled together to form a networked lighting system. In one aspect of the invention, conventional light sources are employed in combination with LED-based (e.g., variable color) light sources to realize enhanced lighting effects. For example, in one embodiment, one or more computer-controllable (e.g., microprocessor-based) light sources conventionally used in various space-illumination applications and LED-based light sources are combined in a single fixture (hereinafter, a "combined" fixture), wherein the conventional light sources and the LED-based sources may be controlled independently. In another embodiment, dedicated computer-controllable light fixtures including conventional space-illumination light sources and LED-based light fixtures, as well as combined fixtures, may be distributed throughout a space and coupled together as a network to facilitate computer control of the fixtures." The applicant fails to discern any sub-area capability of Morgan's devices. In the present disclosure it would refer to a capability of direction light sources to illuminate in a sub-area where an occupant may be located vs. an illumination in the rest of the room. Per an example from the specification *[0184] Spatially differentiated motion detectors 200 are provided on the Adaptive Digital Lighting Fixture along with the light sources 191 and light sensors 196. Typically motion detectors have been associated with lighting in motel rooms to shut off the lighting if there is no activity. There is another level of control that can include matching the lighting to type and amount of activity. Taken to the extreme, one or more limited field-of-view motion detectors 200, or camera 197, can be used to follow the whereabouts of room occupants. The DLF controller acts to provide heightened lightning to the occupants" present locations. The controller has stored look-up-tables, instruction sets and algorithms which it uses to processes the information communicated from the sensors or a camera and in response control the light provided to the illuminated area. .* This is especially evident unless the use of non-monolithic directional light sources are indicated. The applicant respectfully submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to combine the cited

prior art teachings to construct the disclosed device and therefore Claim 13 should be allowed.

Regarding claim 14 Morgan further discloses the illumination device of claim 8, wherein the illuminated area is a road and the objects include road signs (paragraph 0018 - the Examiner interprets "outdoor environments" as reading on this claim).
The applicant traverses the rejection based on the fact that the networked light sources of Morgan are not taught as being directional and being capable of illuminating in substantially different directions. Neither is there a spatially differentiated a camera sensor nor a processor with algorithms for detecting objects. An example of such a device from the specification backing the claim is *[0203] When artificial intelligence methods known in the art is combined with the fine control and functional flexibility of the DLF additional advantages are realized. A detector or camera 258 in concert with a logic controller 246 is capable of providing the road lighting needs to a driver or group of drivers in according to the time of day, needs of the roadway layout and usage at any moment.*
If the examiner's rejection is based on 35 U.S. Code § 102 – Novelty, the applicant submits that Morgan as prior at does not read on claim 14 and the applicant respectfully request its allowance. If the rejection is based on obviousness the applicant submits respectfully submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to combine the cited prior art teachings to construct the disclosed device and therefore Claim 14 should be allowed.

Regarding claim 15 Morgan... Lys, paragraph 0206).
The applicant has shown in arguments regarding claim 8 above that Morgan, while having more than one light source does not teach towards spatially differentiated sensors and illumination so as to provide concurrent general and task lighting thereby substantially meeting the "*illumination requirement of an illuminated area*". An esoteric illumination example is brought from the specification *[0251] Actual vision and perception is not only a function of the illuminance falling on the object being observed but also of the luminance of surfaces in the surround, spectral distributions of the object and background and the general illuminance level to which the eye has adapted. Veiling luminance and veiling reflections may even be as interfering so as to disturb the ability to see. Described is a method of using the an embodiment of multiple light source lighting fixture of the present invention with finely controlled light delivery to assist people to better see objects or carry out visual tasks such as reading. The method comprises altering the intensity and/or color of the illumination delivered to the task versus other surfaces in the visual surround (that is they are in the viewer's field of view) such that the luminance of the object, the luminance of the background, the contrast and the veiling reflections are controlled so as to produce optimal vision conditions. To accomplish the spatially differentiated light delivery to the object of the visual task such as a book or*

computer screen the light sources to produce task lighting have multiple, narrow beams with minimal spill light. The limited coverage area of each beam and sharp cutoff is such that the lighting fixture controller can target a book while not substantially illuminating the desk. Other light sources illuminate the desk and other surfaces in the visual surround at an optimal background level luminance. The background level is determined by factors such as whether it is an office environment where others are present and a dark office is unpleasant or if the reading is at home and a lower background can be tolerated. .While Lys does show a moveable spot light source it is also not in conjunction with other spatially light sources nor is there disclosure of a spatially differentiated sensor and controller with the necessary processing. The applicant submits that it would not have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys and therefore respectfully requests the allowance of claim 15.

Regarding claim 16 Morgan discloses the illumination device of claim 8. Lys discloses a controller (Fig. 90A, at 2012) with communication capability to other devices … process the information and communicates the camera obtained information to a second device (paragraphs 0326-0328).

The applicant read but could not find the inter lighting-fixture camera-data communication-functionality disclosure for Lys' "robotic camera" in the referenced paragraphs or anywhere else in the disclosure. However, even if it did mention one, it would not teach towards the present invention's gainful illumination delivery usage of the communications anyway as shown in an exemplary embodiment *[0192] According to the teachings of the present disclosure, the room lighting needs are provided by one or more DLFs or ADLFs including satellites or combinations thereof placed such that they are capable of providing lighting at the correct non-glaring angles for the lighting tasks at hand. The ADLFs and DLF can communicate with each other and an ADLF can control a DLF and vise versa so that level lighting is accomplished in the room. Two or more DLFs can share in the illumination requirements of a location located between them. The DLF turns off its illumination towards a specific location, reads the ambient luminance and then correctly powers the SLS to provide the additional illumination.* The communications requirement is unique as a result of the controlled light distribution resulting from the directional light sources arranged to illuminate a local area. The independent illumination capability of each fixture would require such a communication of spatially differentiated sensor data which as has been pointed out is lacking from the Morgan and Lys disclosures. Lys' disclosure would need to mention sensor obtained data for analysis by the processor and the concept of multiple spatially differentiated sensors in order to teach towards meaningful sensor communications and it does not. Therefore it would not have been obvious to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys. The applicant respectfully submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary

skill in the art to combine the cited prior art teachings to construct the disclosed device and therefore Claim 16 should be allowed.

Regarding claim 17 Morgan as modified further discloses the illumination device of claim 16 Lys discloses where the illuminated area is a road (paragraph 0245) and where the second device to where the camera obtained information is communicated to is a lighting fixture (Fig. 90A, paragraphs 0326-0328).
To better understand the difference between the Morgan and Lys prior art and the present invention the applicant quotes from the specification: *[0203] ....In an alternate embodiment the roadway lighting can be dimmed if there are no approaching vehicles. The detector or camera 258 is capable of detecting oncoming and retreating traffic. The headlights and backlights are used or more sophisticated pattern recognition is used to determine traffic on the roadway. ...Taken to the extreme the controllability of the DLFs or series of communicating DLF street lights allows for the lighting to precede the vehicle by the stopping distance, say 300 ft. at 65 MPH (91 meters), and dim the unused lighting behind the driver if it is not necessary for other drivers.* In its own right the use of image processing to illuminate before a driver but not behind them thereby saving energy is a novel development and cannot be imagined from either of the disclosures. Lys' disclosure would need to mention sensor obtained data for analysis by the processor and the concept of multiple spatially differentiated sensors in order to teach towards meaningful sensor communications and it does not. Therefore it would not have been obvious to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys. The applicant respectfully submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to combine the cited prior art teachings to construct the disclosed device and therefore Claim 17 should be allowed.

Regarding Claims 18-19 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) in further view of Amerson (US 6,379,022) as applied to claim 17 above, and further in view of Lemelson (US 5,983,161).
Regarding Morgan and Lys the applicant has explained in claims 16 and 17 why they would not teach to the present disclosure. Regarding Amerson the applicant has explained in claims 2 and others regarding the specific flash usage of the sensor. Regarding Lemelson "discloses where the processor uses information obtained from the cameras and exchanged between fixtures." The applicant has read Lemelson (US 5,983,161) titled: GPS vehicle collision avoidance warning and control system and method. The camera is mounted on a vehicle and not a light fixture; column 20 Lines 55-56, A television camera(s) 54 having a wide angle lens is mounted at the front of the vehicle. Communication of traffic data between vehicles used for traffic vehicle avoidance is a totally different art as explained above regarding obviousness in claim 4 above. Regarding claim 19 the concept of real-time lighting and illumination control is not mentioned in the paragraphs cited and where it is mentioned it refers to a GPS location based lighting of the vehicles

healdlamps. In the entire disclosure and the word "glare" does not appear anywhere and therefore Lemeoson's GPS vehicle collision avoidance warning and control system cannot teach towards the present disclosure .
The applicant submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to combine the relevant prior art teachings to the new use of the known processes in the manner claimed. As there is nothing in the cited prior art of Morgan in view of Lys in further view of Amerson as applied to claim 17 above, and further in view of Lemelson that would have incited towards the concept of a sensor based processor in a lighting fixture "knowing" visual task data and correctly controlling a multiple directional light source illuminating device, the applicant requests that claim 18 be allowed.

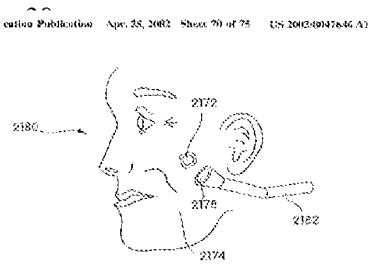
Regarding Claims 20-26 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646)... claim 20 Morgan discloses an automated irradiating device for providing radiation to individuals within an area. The applicant submits that Morgan is referring to a radiation device para. 0023 in the visible light spectrum used for seeing and not heating. [0023] ... computer-controlled operation of multiple light sources and devices in response to various feedback stimuli, for a variety of space-illumination applications. Lys discloses a light fixture including a multiplicity of directional light sources. The applicant finds no spatially differentiated sensor or computational mechanism in Lys that would allow his light source to provide "radiation in a sub-area proximate to the individuals" and certainly not for a heating application. From the present disclosure one example of the heating application shown in Fig. 23 is *[0274] An irradiation device embodiment of this FAML invention can use the computer vision and aim-ability function to provide infrared heating to individuals in indoor and outdoor settings. The heat radiation sources can be infrared filament lamps or infrared LEDs in addition to other wavelengths. The irradiating devices 472 mounted on the irradiation fixture can provide general area heating or spot heating 482 to people or objects.* Another is *"[0246] Light entering the digital camera 429 through its lens 427 is converted into electric signals... The processor runs the computer vision routines to determine an occupants age or sex and sends instruction to a building's utility devices to provide individualized services such as heating and lighting on basis of age or sex.* Therefore, it would not have been obvious to one of ordinary skill in the art of illumination at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys regarding directional lights (Lys, paragraph 0206) in order to permit the light module to conform to an environment within which it is placed (Lys, paragraph 0206) and the applicant requests that claim 20 be allowed.

Regarding claim 21 Morgan as modified discloses ... Lys discloses: the detector being a camera (paragraph 0327) with capability for sensing at least one of ... The applicant has read Lys

[0327] An embodiment of the illumination system can be used for taking photomicrographs. In another embodiment of the present invention, the illumination system 2020 may be used to improve the quality of robotic vision applications. Different lighting conditions can have a dramatic effect on such vision systems. permits a higher resolution by the robotic camera of the image required for robotic vision", the applicant submits that Lys is not using the camera as a detector but an alternate use for the "Lighting entertainment system" to "improve the quality of robotic vision applications" Therefore, as Lys does not teach towards a "sensing detector" and it would not have been obvious to one of ordinary skill in the art of illumination at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys regarding "sensing detector" (Lys, paragraph 0327) and the applicant requests that claim 21 be allowed.

Regarding claim 22 Morgan discloses and Lys discloses one or more directional radiation sources capable of being moved …
The applicant submits that in order for Lys's device, Fig. 90 to track a moving individual in the room there would need to be a camera detector with said camera detector providing coordinate data to a processor running algorithms to follow or track the individual around the room. As this is missing from Lys's disclosure as explained in claim 21 the applicant submits that claim 22 is not obvious and asks that it be allowed.

Regarding claim 23 Morgan discloses, Lys discloses directed at the different parts of the body (paragraphs 0309, 0362).The applicant submits that the presently disclosed system is not similar. As claimed, it is able "*to identify different parts of the body, to compute the desired radiation level to the different parts of the body and to adjust the radiation from sources directed at the different parts of the body*". From Fig. 24 and specification *[0274] … The camera and controller processor system can use image recognition to identify parts of the body and the controller can provide a different radiation level to the head vs. the rest of the body. Other people feel the cold in the legs etc.*



The cited Fig. 94 from Lys shown to the right clearly shows that it is referring specifically to a single irradiation device which is designed to perform on a predetermined part of the body. The applicant points out that nowhere in the Morgan or Lys disclosures is there any description of multiple spatially differentiated radiation delivery sources controlled by a processor running algorithms to analyze data from a spatially differentiated sensor, aka camera, *to identify parts of the body*. As these capabilities are missing from the referenced disclosures as explained in claim 21 and in preceding claims, the applicant submits that claim 23 is not obvious to one of ordinary

skill in the art at the time of the invention to modify the illuminating system disclosed by Morgan in accordance with the teaching of Lys and asks that it be allowed.

Regarding claim 24 Morgan further discloses the irradiation device of claim 21, further comprising the controller programmed to control the irradiation in time and intensity on the individual to maintain comfortable heating based on at least one of (i) best practices, (ii) feedback from the heat detector configured to detect body temperature of different parts of a body, (iii) personal preferences input to the controller and stored in memory, and (iv) commands input from an input device (paragraphs 0016- 0024).
The applicant first explains what claim 24 is referring to by quoting an exemplary embodiment from the specification *[0274] An irradiation device embodiment of this FAML invention can use the computer vision and aim-ability function to provide infrared heating to individuals in indoor and outdoor settings. Using face recognition algorithms and stored personal preferences from the data storage, the logical controller 454 will aim the heating rays specifically where on their body they prefer to be heated as well as in what amount and at what times. The camera 475 has sensors sensitive to infra-red wavelengths around 12 μm (micrometers) radiated from people. The controller obtaining the information from the body temperature sensor will run algorithms to calculate radiation parameters and will control the irradiation in time and intensity on the individual to maintain comfortable heating per best practice standards, drawing on stored data of heating practices, or personally input preferences.* The applicant submits that in the Morgan disclosure the word "heating" is not to be found (heat is found 3 times in reference to a heat sensor but there is no reference to a device for providing heat). As in addition, Morgan has not disclosed the computer vision hardware and logic system of claim 24 nor the heating application, the applicant respectfully submits that the claim should be allowed.

Regarding claim 25 Morgan discloses the irradiation device of claim 21. Morgan also discloses where controller aims the radiation sources to the location where the individual is located and controls the time and intensity of the radiation (e.g. paragraphs 0016-0024).
Lys discloses where the irradiation instead of for heat is for therapeutic purposes
The applicant respectfully submits that as explained above in claims 21, 22, 23 Lys does not show or describe a system capable of identifying the location of the individual "where the controller aims the radiation sources to the location where the individual is located" Lys has no spatially differentiated sensor or processor running image recognition programs. (Lys in [0327] mentions robotic vision in terms of illumination "...In another embodiment of the present invention, the illumination system 2020 may be used to improve the quality of robotic vision applications. As explained in claim 2 Morgan does not teach towards spatial differentiation and has no idea where in area an individual is located to aim anything towards them.

Therefore, the applicant submits that it would not have been obvious to one of ordinary skill in the art at the time of the invention to modify the illuminating system disclosed by Morgan in accordance with the teaching of Lys regarding light therapy in order to improve a patient's health or well-being. The applicant respectfully submits that claim 25 should be allowed.

Regarding claim 26 Morgan discloses ... the Examiner views light sources as heat sources) whereby the device is capable of providing both a desired light and heat radiation to the individuals (paragraphs 0016-0024).

The applicant respectfully submits that the novel system is capable of concurrently delivering both the heat and visible light. *[0275] "In an embodiment of the FAML the infrared radiation sources are added to the light source and can work together when necessary to provide heat and light. Thus in a living room fixture where the house heating has been turned down to energy saving levels an individual can receive concentrated light for reading as well as concentrated beam of infrared heating."* Even if the Examiner views light sources as heat sources, they are the same light functionality, the same "art". This novel and beneficial combination of two functionalities is a unique inventive step as the expensive camera vision system is now providing for simultaneous functionalities needed in the same space by the same or different individuals. The applicant submits that it would not have been obvious to one of ordinary skill in the art of either heating or illumination at the time of the invention to develop the presently claimed combinational and new use device and the applicant requests that claim 26 be allowed.

Conclusion

The applicant has revised the objected claim and requests that the above claims now be amended as in the new list of claims. The applicant submits that the claims are now in proper form to place the case in condition for allowance which action he respectfully solicits.

Conditional Request for Constructive Assistance

Should the examiner still prefer to have these or any or any other claims amended to more clearly highlight the uniqueness of the present invention, the pro se applicant requests under M.P.E.P. § 2173.02 and §707.07(j) that the examiner should draft one or more claims for the applicant and indicate in his or her action that such claims would be allowed if incorporated in the application by amendment. This request is in order that the

undersigned can place this application in allowable condition as soon as possible and without the need for further proceedings.

Very respectfully,

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September 23, 2015

Electronic Acknowledgement Receipt

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Application Number:	13357549
International Application Number:	
Confirmation Number:	1905
Title of Invention:	Detector Controlled Illuminating System
First Named Inventor/Applicant Name:	Yechezkal Evan Spero
Customer Number:	37268
Filer:	Yechezkal Evan Spero
Filer Authorized By:	
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Receipt Date:	23-SEP-2015
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Application Type:	Utility under 35 USC 111(a)

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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Applicant Arguments/Remarks Made in an Amendment	Reply_NF_OA_06-23-15.pdf	246193 e9c060c482968300ed9a63eaa529b618111e47ca	no	29
Warnings:					
Information:					

Total Files Size (in bytes):	246193

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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.

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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.

In the United States Patent and Trademark Office

Application/CN: 13/357,549 Wednesday, September 23, 2015
Application Filed: 24 January 2012
Applicant: Spero, Yechezkal Evan
Title: Detector Controlled Illuminating System
Examiner: Lotter, David E
Art Unit: 2844

Reply to Office Action dated June 23, 15

Mailstop: Amendment

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Dear Sir:

The application is being prosecuted by the Applicant pro se.

Certificate of Transmission Under 37 C.F.R. § 1.8

I hereby certify that this correspondence is being deposited electronically with the U.S. Patent and Trademark Office using the United States Patent and Trademark Office's EFS-Web system on **Sept. 23, 2015**.

Signature
/Yechezkal Evan Spero/

Yechezkal Evan Spero

AMENDMENT UNDER 37 C.F.R. §1.111

In response to the Office Action mailed June 23, 15, the following amendments and remarks are respectfully submitted in connection with the above-identified application.

Amendments to the Claims begin on page 2 of this Amendment.

Remarks begin on page 9 of this Amendment.

	Claims remaining after Amendment		**Highest number previously paid for**		**Present extra**
Total	26	-	20	=	0
Independent	4	-	4	=	0

AMENDMENTS TO THE CLAIMS

The following is a complete, marked-up listing of revised claims with a status identifier in parenthesis, underlined text indicating insertions, and strike through indicating deletions.

Full list of claims per 37 CFR 1.121

1. (Original) An illuminating device which produces light to meet an illumination requirement of an illuminated area, comprising: a light fixture including a multiplicity of directional light sources including at least two light sources pointing in different directions, the light sources having at least one of controllable light intensity and spectral light distribution; a controller for adjusting at least one of a light intensity and light spectrum of the directional light sources; one or more detectors for sensing at least one of objects, surfaces and people within the illuminated area and of passing the sensed information to the controller; a processor for processing the sensed information and determining illumination requirements of the at least one of objects and people using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables and for directing the controller to adjust the directional light sources to meet the illumination requirement.

2. (Original) The illuminating device of claim 1 where the detector is comprising at least one of (i) a camera being a photo sensor array coupled with an optical lens, (ii) a photo sensor, (iii) an ultrasound transducer and sensor, (iv) microwave transducer and sensor, and (v) pyroelectric detectors.

3. (Original) The illumination device of claim 1, wherein the illuminated area is indoors and further comprising a detector for detecting variable illumination from daylight and/or sunlight entering indoors, wherein the controller taking into consideration the area now illuminated by the daylight and/or sunlight adjusts the light intensity of the directional light sources to meet the varied illumination requirement.

4. (Original) The illuminating device of claim 1, wherein the one or more detectors detects information regarding one or more individuals within the illuminated area, said information is at least one of (i) age, (ii) sex, and (iii) recognition of an individual for matching with stored data about that individual's needs and wherein the controller adjusts the light intensity and/or spectrum of the illumination provided to the one or more individuals based on illumination requirements from at least one of (i) best practices looked up and calculated from stored data, (ii) age and/or sex of the individual, (iii) personal preferences input to the controller and stored in memory, and (iv) commands received by the controller from an input device.

5. (Original) The illuminating device of claim 1 for optimally displaying food, wherein the one or more detectors detect an identity of one or more foods and wherein the controller adjusts the light intensity and/or spectrum of the illumination on the one or more foods based on illumination requirements from the processor.

6. (Original) An illuminating device having automatic control of the light provided to an illuminated area comprising: a structure for incorporating illuminating device elements; one or more light sources incorporated in the structure and in communication with a power source; electronic circuitry apparatus for the controlled powering of the light source and other illuminating device elements; one or more cameras placed on the structure for detecting information about the illuminated area, said camera in communication with power and control device elements; a controller integrated with the structure, in communication with the light source controlling power circuitry, said controller arranged to processes the information communicated from the camera and automatically control the light provided to the illuminated area.

7. (currently amended) The illumination device of claim 6, <u>where one or more light sources are directional</u> wherein the one or more detectors are configured to

sense a presence of glare on a person's eyes in the illuminated area, and wherein the controller is programmed to adjust an intensity of the directional light sources to reduce the glare.

8. (Original) An illuminating device which provides light to meet an illumination requirement of an illuminated area in which visual activities are performed, comprising: a light fixture including a multiplicity of directional light sources including at least two directional light sources pointing in different directions, the light fixture having movable structure for aiming the directional light sources mounted thereon in a defined direction; a camera for obtaining images of the illuminated area functioning as a detector for at least one of (i) a light detector (ii) a spectrum detector, (iii) a motion detector, (iv) a measuring detector for sensing a geometry of the illuminated area, and (v) a detector for sensing at least one of work surfaces and road objects and at least one of vehicles and people; a controller for adjusting a light intensity and a direction of each of the directional light sources; a processor with stored algorithms and data for identifying at least one of (i) tasks being carried out by people, (ii) location of people, (iii) frequency of area usage by people, (iv) traffic density in the illuminated area from the sensed geometry, (v) work surfaces, (vi) road objects, people and/or vehicles, and (vii) roadway surface luminance any of which is used by said processor for determining illumination within the illuminated area using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables wherein said processer, upon calculating the required illumination parameters, directs the controller to adjust the directional light sources to meet the illumination requirements of the visual activities.

9. (Original) The illuminating device of claim 8, further comprising the illumination requirement that different parts of the illuminated area to be illuminated at a different intensity and/or at a different spectrum than another part of the illuminated area.

10. (Original) The illuminating device of claim 8, adjustable by an installer based on room geometry and/or usage further comprising the light fixture having adjustable arms on which directional light sources are mounted for aiming the directional light sources within the illuminated area, where said detector and processor combination provides feedback to the installer so as to aim the light sources such that the illumination requirements can be met by the re-adjusted light source aimings.

11. (Original) The illumination device of claim 8, wherein the controller receives real time information from the camera and wherein the processor, using image recognition capability, directs the controller to adjust at least one of (i) the intensity, (ii) the spectral light distribution and, (iii) the direction of the light sources based on at least one of (i) where people requiring illumination are located, (ii) what object the person is viewing and (iii) what visual task the person needs to perform.

12. (Original) The illumination device of claim 8, further comprising at least one of the directional light sources mounted on the movable structure where the movement of the light source direction is automatically controlled by the controller.

13. (Original) The illumination device of claim 12, providing a different illumination to a sub-area based on usage wherein the controller interpreting images from the camera adjusts the moveable light sources such that they provide the required illumination in a sub-area proximate to the individuals as they move around in the illuminated area.

14. (Original) The illumination device of claim 8, wherein the illuminated area is a road and the objects include road signs.

15. (Original) The illumination device of claim 8, further comprising at least one

of the directional light sources on an automatic swivel joint and providing spot lights of limited beam angle for task lighting while other light source provide general illumination to the illuminated area.

16. (Original) The illumination device of claim 8, further comprising a controller with communication capability to other devices, where the camera in one location obtains information and the controller process the information and communicates the camera obtained information to a second device.

17. (Original) The illumination device of claim 16, where the illuminated area is a road and the second device to where the camera obtained information is communicated to is a lighting fixture.

18. (Original) The illumination device of claim 17, where the processor uses information obtained from the cameras and exchanged between fixtures for identifying traffic requirements in the illuminated area and from the vehicles locations and geometry determining the illumination requirements of the illumination area thereby directing the controller to adjust the directional light sources to meet the illumination requirements.

19. (Original) The illumination device of claim 18, wherein the controller is programmed to adjust at least one of (i) increase illumination with an approach of a vehicle, and (ii) change beam cut-off levels as the vehicle advances toward the lighting fixture to eliminate glare.

20. (Original) An automated irradiating device for providing radiation to individuals within an area, intended to provide a desired radiation in a sub-area proximate to the individuals, comprising: an irradiation fixture including one or more directional radiation sources where the radiation is in a defined direction; at least one detector for sensing a location of individuals in the area and feeding transferring that information to a controller; a where said controller for adjusting

adjusts at least one of (i) a radiation intensity, and (ii) a direction of the irradiation based on sensed location, whereby the desired radiation is provided proximate to individuals in the area.

21. (Original) The automated irradiating device of claim 20 intended to provide a desired heating to one or more individuals in an area, further comprising: at least two directional heat radiation sources pointing in different directions; the detector being a camera with capability for sensing at least one of (i) a presence of one or more individuals in the heated area, (ii) the identity of the individuals, and (iii) a body temperature of individuals present in the heated area; the controller further having processing capability for determining the heating requirements of the individuals in the area from at least one of (i) algorithms to calculate radiation parameters, (ii) stored data of heating practices, (iii) image recognition algorithms for identifying the individual based on the camera information, and (iv) an identified individual's personal preferences.

22. (Original) The automated irradiating device of claim 20, further comprising: One or more directional radiation sources capable of being moved so as to direct radiation in a defined direction; the at least one detector capable of providing information on the present location of individuals in the area; the controller programmed to process the detector information and move the radiating sources so as to follow the one or more individuals, whereby the desired radiation is provided in a sub-area substantially proximate to the individuals.

23. (Original) The irradiation device of claim 21, further comprising; the detector being a camera capable of providing images of different parts of the body of individuals to the controller for image processing; the radiation sources being able to direct radiation to different parts of the body; and the controller further programmed to run the image recognition algorithms to identify different parts of the body, to compute the desired radiation level to the different parts of the body and to adjust the radiation from sources directed at the different parts of the body.

24. (Original) The irradiation device of claim 21, further comprising the controller programmed to control the irradiation in time and intensity on the individual to maintain comfortable heating based on at least one of (i) best practices, (ii) feedback from the heat detector configured to detect body temperature of different parts of a body, (iii) personal preferences input to the controller and stored in memory and (iv) commands input from an input device.

25. (Original) The irradiation device of claim 21 where the irradiation instead of for heat is for therapeutic purposes and the radiation may be any of (i) UV radiation, (ii) red light therapy in the 620-660 nm range, and (iii) light therapy for SAD and other disorders selected from the group consisting of seasonal affective disorder, sleep disorders, circadian rhythm disorders, delayed sleep phase syndrome, vitamin D deficiency and skin disorders, where the controller aims the radiation sources to the location where the individual is located and controls the time and intensity of the radiation.

26. The automated irradiating device of claim 20 further comprising where one or more of the irradiating sources is radiating visible light and one or more of the irradiating sources is designed to substantially radiate heat whereby the device is capable of providing both a desired light and heat radiation to the individuals.

REMARKS

Favorable reconsideration of this application, in light of the remarks and following amendments, is respectfully requested.

In reply to point 1: Claim Rejections - 35 USC § 1 12(b): distinctly claiming the subject matter … Claim 7 recites the limitation "...intensity of the directional light sources". There is insufficient antecedent basis for this limitation in the claim. Independent claim 6 recites "one or more light sources incorporated in the light structure." The Examiner interprets claim 7 as reading "one or more light sources incorporated in the light structure" as recited in claim 6.

The Applicant has amended claim 7 and a marked up version with the words "where one or more light sources are directional" to better claim the glare reduction feature disclosed in the specification. An example of a preferred embodiment is described in [0249]: *In a preferred embodiment of this invention the lighting fixture is equipped with a camera vision system comprised of the digital camera 429 and logical controller 428 having computer algorithms for performing computer vision and has the capability of identifying the eyes of occupants in a room* and is *… capable of detecting glare causing visual discomfort on the eyes of room occupants caused by the lighting fixture and the logical controller will accordingly reduce the intensity of the illumination reaching the eyes from the responsible light source.*

In reply to point 2: Claim Rejections - 35 USC §103(a) which forms the basis for all obviousness rejections … Claims 1 and 3 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) … and further in view of Amerson (US 6,379,022)..

To point out the non-obviousness, the applicant presents an informal introduction to help better understand the innovative aspects of the device claimed able "to meet an illumination requirement of an illuminated area" of the present disclosure. In prior art, to illuminate an area correctly and efficiently (see para. [0009] for definition of "correct") a human designer in a calculated design process, knowing the distances and the angles from the light fixture to the surfaces to be illuminated and using the defining laws of physics, Lambert's-Law and the Inverse-square Law, $E = \frac{I \cos\theta}{D^2}$ arranges light-sources relative to the surfaces to be illuminated. These light-sources have a pre-defined spatial light distribution and are placed in the room at specific locations to correctly meet expected illumination requirements for the visual tasks typically carried out in the specific area to be illuminated. Based on this combined spatial and visual tasks knowledge and in addition, knowledge of the intended room usage such as the age, sex, personal preferences of the users, the colors of the furniture placed therein etc. a designer can adjust light source placement, intensity, spectrum, and angle of incident light to achieve a more correct illumination. Because surface illumination varies with the distance

squared from the light source, is very difficult to achieve high light-utilization efficiencies using prior art monolithic light sources and most often, near the light fixtures there is a greater illuminance intensity that what is required while furthest away, there is a deficiency and the lighting in not "correct".
Each sub-area in a room can have its specific use and optimal illumination level. This task lighting requirement is served today by having a separate light fixture e.g. table lamp, or spot from above and a manually adjusted dimmer to meet changes in the local illumination requirements. Most room lighting applications require a combination of general and task lighting. As opposed to area or task lighting, in a point lighting application such as for camera flash or stage lighting application, the lighting is pointed at the object to be illuminated and has different considerations.

However, in the real world, light usage is dynamic and theoretically, to do it right, a designer would need to be on the scene to see the immediate lighting requirements and rearrange the light source aiming's, intensity spectrum etc. to meet the changes. While an advanced system (per Morgan) could use - networked sensors to detect the occurrence of an event, such as a change in the environment or occupancy and communicate (per Lys) to a networked plurality of LEDs in a "three-dimensional structure 4024" - to alter the illumination, it would still not substantially improve on meeting the actual illumination requirements unless it was controlling correctly arranged light sources. Even if those light sources were (per Amerson) arranged to provide an adjustable color temperature they would not produce spectrally correct illumination to meet an illumination requirement for an area (for a non-area, spot lighting application, yes, but to correctly illuminate an area where the distance and the angle to the surfaces from the LED vary, no)

A more accurate and convenient light fixture system based on actual room-occupant location and usage would use sensors to provide information to a processor running algorithms to determine the occupant's illumination requirements in real-time and correctly drive properly arranged light sources of controlled light distribution to provide the correct illumination that is required to fulfill those requirements. The first inventive step is to use more than one spatially differentiated light source to correctly illuminate each sub-area. The second inventive step would be to have spatially differentiated sensors to obtain the necessary information to grant the processor knowledge necessary to determine the requirements of each sub-area and a third non-obvious step would be to program the processor to "know" which light source illuminates that area (versus another sub-area that it does not illuminate) and to power it as necessary to meet the illumination requirement for that area. Each inventive step generated the need for the next step where the solution was not obvious. In some cases at the outset, the necessary technology did not exist and certainly, the combination of steps necessary to yield this unique resulting functionality could not have been foreseen by one of ordinary skill in the art. Only in

hindsight, is it apparent that the claimed device, comprised of a unique combination of hardware and software, actually mimics best lighting practice as performed by a human designer it in real time. The applicant below will show that the mere combination of the cited prior art patents would not lead to the apparatus nor functionality of the claimed device.

Therefore, the disclosure of a sensor controlled illuminating device that: a) has at least two light sources, arranged such that each light source illuminates a different area of the room and where b) that sensor has spatially differentiated detection means and c) where the processor running code uses the detected information to "know" the area of the room that requires a specific type of illumination versus those that do not require that illumination and d) the processor, using instruction sets, then "knows" which of the "directional-light-sources" deliver light to the area to be illuminated and then e) the processor using code determines the intensities to drives those specific sources to obtain the specific, localized-effect, so as to fulfill the sensor detected illumination requirement according to best practice – surely comprises a non-obvious, new to the world device. A device capable of differentiated delivery of energy or mass within a room, synergistically equipped with a sensor such as a camera capable of providing location coordinate information to a processor to operate localized delivery, (versus the prior-art's, non-spatially-differentiated sensor and light delivery apparatus) provides unpredictable functional and/or energy saving benefit well beyond a combination of prior art systems.

More specifically: regarding Claims 1 and 3 are rejected ... as being unpatentable over Morgan in view of Lys the applicant respectfully points out that, although per Morgan (abstract) the "Individual light sources or groups of light sources may be controlled independently of one another based on data transported throughout the network from sensors", and in view of Lys, Fig. 28C para. [0206] "the modular LED unit 4000, may be flexible, so as to permit the light module 4002 to conform to an environment within which it is placed" do not disclose the requisite spatially differentiated sensing and physical light distribution apparatus needed for the localization of the effect to an *illuminated area* as is disclosed numerous times in the specification. For example, Fig 12 is described: [0183] *The adaptive or intelligent DLF 190 shown in FIG. 12 has multiple light sources 191 placed about the body 192 having a geometric shape... a photodetector array which is equipped with a lens which can be a 360 degree lens or a fisheye lens is placed with a field of view of the area to be illuminated. ... such that an asymmetric lighting pattern is produced for the provision of a non-circular lighting pattern in a typically rectangular room; and [0184] Spatially differentiated motion detectors.* Therefore, without disclosing a geometrically coordinated sensor Morgan in view of Lys would not teach towards the inventiveness of the present invention in Claim 1.

For illumination to reach an area to be illuminated in a substantially required amount (just not some approximation but a design goal) its directionality of light distribution would need to be known and it would need to be positioned and aimed at that area and when there are more than one light sources the controller would need to "know" which light source under its control illuminates what area. The *directional light sources*" of Claim 1 per Spero [0280] has the *"capability of delivering spatially differentiated illumination"*. Again, nowhere within the disclosure does Lys' device teach the physical requirement of Claim 1 in order to derive the desired controllable lighting effect*:" to meet an illumination requirement of an illuminated area ... a light fixture including a multiplicity of directional light sources including at least two light sources pointing in different directions"*. The unplanned placement of Morgan's light sources of Fig. 1-3, and Lys' in Fig. 28C while uniquely addressable, are not physically arranged to produce any degree of an area-specific illumination which must follow Lamberts Law in relation to the angle and distance of the surface to be illuminated. In the present disclosure the system's manually and even automatic spatial ascertaining capability is described as how the controller will "know" which local area each of the multiple light sources illuminates. *[0196] In a preferred embodiment, using pattern recognition techniques ... An automatic routine as in 7A uses timed firing of a coordinate-specific light source, or array of light sources and the following reading of the camera detector of light reflected to that specific coordinates pixel, or set of pixels to corroborate action between light sources and the detectors.* Without this spatially differentiated sensing and delivering capacity and the novel corroboration of the area sensed with the area served by the directional light source, there is no way an inferred Morgan in view of Lys system could perform as Claim 1 and Claim 3. In Claim 3, *the controller taking into consideration the area now illuminated by the daylight and/or sunlight adjusts the light intensity of the directional light sources to meet the varied illumination requirement.* This inventive step, where on the fly a system can sense a sub-areas specific requirement and coordinate it to an illumination delivery device that illuminate that area according to a new requirement is clearly missing from the Morgan in view of Lys disclosures.

In the present disclosure the light fixture has [0054]) *...one or more discrete light sources in an integrated illuminating element where the overall lighting effect is the result of the combination of these multiple sources*. Instead, Morgan, Lys and other prior art, deal with either: 1) monolithic general lighting or 2) spot lighting concepts. It can be noted that even where there are multiple light sources, a) they often cover the same area, as do Morgan's light sources of Figs. 1-3, or b) the separate sources are arranged such that there is an uncontrolled melding of light from one light source with that of another. That is, the effect of the light sources is not substantially exclusive to an *illuminated area* within a room. In the referenced spot lighting concepts, which provide accent to a specific stage performer or features in the room the individual spots are not arranged to combine build

an overall room illumination. Nowhere in the disclosure do either Morgan or Lys mention the inventive step of controlling an area-specific illumination effect by using *directional-light-sources* that have a focused, localized or directional aspect. Such a teaching is, a prerequisite for the novel, spatial controllability of the present inventive device see Fig 2b, allowing it to "meet the illumination requirement of an illuminated area". Instead, Lys' device Figs. 28, other than when used as a spot light will not correctly illuminate an area. To the contrary, for an average illumination requirement, it illuminates areas with greater than needed intensity closer to the light source and less intensity further away. Morgan in view of Lys would illuminate well beyond the localized lighting needed for a detected individual of Morgan. The applicant also suggests that in most probability, Lys' "conform to an environment" statement in para. [0206] is referring to solving an electronics packaging problem, not the illumination requirements of surfaces in the environment. This, as Lys uses a positioner to illuminate the material of interest directly-on angle and light distribution properties are not mentioned in the entire disclosure. Similarly, nowhere in the Morgan disclosure is the word direction, area, aim, spatial distribution or sub-area mentioned and there would be nothing to teach anyone skilled in the art the localization capability of the present disclosure. As there is no teaching or suggestion supporting the combination in the cited prior art references, Morgan in view of Lys should not be deemed obvious and the applicant respectfully requests allowance of the claim.

Regarding Claim 2 is rejected ... as being unpatentable over Morgan in view of Lys as applied to claim 1 above, and further in view of Amerson (US 6,379,022).
Amerson is using the LED light sources to provide an adjustable color temperature. The camera mentioned by Amerson uses the spectrally corrected light for a camera flash function. The only sensor use of the camera mentioned Column 3 Line 17 "Another way is for the camera or an auxiliary device to measure the current light in the scene and determine the type of illumination" does not teach towards a spatially differentiated sensing. That is a capability to measure the "current light" in one area of the scene versus measuring the "current light" in a second area of the scene. Therefore, as Amerson's camera is disclosed only as a spectral sensor of the "current light" it does not teach towards the spatially differentiated sensors of claim 2 of the present disclosure. Any practitioner skilled in the art who would want to use a camera to gain the coordinates of the sensed event would need first a spatially differentiated delivery device to want to have a spatially differentiated sensor and computer programs to assess the data. Then they would require apparatus and software to correlate the sensed coordinates to the delivery coordinated. Any suggestion to any of these inventive steps are missing and therefore the present disclosure is non-obvious.

Regarding Claim 4 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) as applied to claim 1 above, and further in view of Kinjo (US 2002/0046100). The applicant does not claim to have invented

pattern recognition, nor does Kinjo, who is using the information derived from images [0002] to enhance an advertisement effect, by which advertisement contents are switched in accordance with the viewer so as to display an advertisement suitable for the viewer of the advertisement. It should be noted that the application for Kinjo's detected characteristic remains in the virtual world [0010] ... and switching an image displayed on an image display medium in accordance with the first characteristic of the extracted person. This new use for a known pattern recognition process is typical of recent technological advances where "virtual" product development outpaces "physical" product developments which are often more difficult to foresee and implement. In the case of these cited references which primarily deal with control signal and networks would actually teach away from the device because the cost of the added physical device, wiring, networking complexity.

In addition, the prior-art use of image recognition developed security purposes in identifying terrorists was conceptually limited at the time of the disclosure to systems making use of the information for the observers benefit, often at the expense of the person being observed. That is, the information on the observed individual is used by the observing entity for its own benefit be it security or advancing sales. In the present disclosure the pattern recognition is being used by the user themselves to gain a personalized non-virtual illumination benefit per [0051] *A number of unique illuminating device embodiments are achievable using the basic elements presented above...as well as the ability to provide individualized lighting to each person.*

The applicant submits that certainly, a disclosure of a lighting fixture which is able to automatically tailor the illumination to the person it is illuminating for, is a case of an improvement patent. The applicant submits that this new development would not be obvious to a "person of ordinary skill in the art", even if that person had prior knowledge of all the documentation available in the world at the time of the application in the many different arts that are needed for this device to be constructed to produce the desired result. This is because a "person of ordinary skill in the art", refers to a practitioner of one art, not a practitioner of all the arts. In this claimed novel illumination device, the individual inventor's combination of skills in electronics, programming, artificial intelligence, human factors engineering and lighting science that need to be combined in order to contrive a machine capable of automatically illuminating in accordance with good lighting practice is non-ordinary.

In addition regarding Kinjo's use of personal characteristics for advertising it is claimed that [0196] *the addition of a machine vision system with pattern recognition capabilities as is known in the art,* combined with a physically differentiated lighting apparatus with using skills of multiple arts qualifies under 35 U.S.C. 100(b) as a new use of a known process, machine, manufacture. The applicant submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to

combine the relevant prior art teachings to the new use of the known processes in the manner claimed. To conclude, there is nothing in the cited prior art of Morgan or Kinjo that would have incited towards the concept of a pattern recognition based processor knowing data controlling and correctly controlling an illuminating device. As stated by Winner Int'l Royalty Corp. v. Wang, 202 F.3d. 1340, 1348 (Fed. Cir., 2000), there must be a suggestion or teaching in the prior art to combine elements shown in the prior art in order to find a patent obvious.

Regarding Claim 5 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) as applied to claim 1 above, and further in view of Zampini (US 2008/0136356) and in further view of Bolle (US 5,546,475).
The applicant argues that the claimed area-specific food-illumination system for use in dynamic settings such as restaurants for *optimally displaying food,* is not obvious from the prior art for the illumination objects in a display case. From the specification: [0282] *The lighting fixture 490 has means to illuminate separate portions at a table comprised of directable or aim-able lighting modules 491. The lighting fixture 490 also has computational means of providing the optimal color and intensity of light so as to render people, food, objects in their best light as well as to build a dining room ambience through lighting according to recommended practice or user preferences.* Zampini in his disclosure for a solution states: [0007] The present solution described herein provides systems and methods to coordinate and control the lighting of areas of a display . The area inside the case is fixed and is not dynamic in terms of persons, objects and activities carried out. Zampini's detector is not spatially differentiated such as a multi-pixel photodetector array capable of producing coordinate information necessary for a room illumination system able to focus on a food and render it under optimal lighting. And again, Zampini does not disclose the corroboratory area sensing and delivery routine necessary to have an imaging detection routine drive a specific light source to illuminate food on a restaurant table located anywhere in the room. The present disclosure can identify and illuminate anywhere in the living space and not just in a display case which is a totally different lighting application. Regarding Bolle who describes an apparatus that uses image processing to recognize objects such as produce within a scene which is indeed pattern recognition prior art that the disclosure relied upon. The combination of the cited references would not suggest the presently disclosed robust system of Fig. 26. Its unique structure offers a complete restaurant lighting application solution where: *[0280] As an example of the luminaire's benefits and agility to provide correct lighting where it is needed at minimal energy consumption, an embodiment of the invention, a spatially and spectrally adjustable restaurant lighting fixture is presented in FIG. 26. In a restaurant lighting application it would be beneficial for the customer experience if those dining, the food and ambience would all appear at their best.* The present application discloses a complete solution beyond the simple display and food recognition application by operating area specific within a larger area comprising people as well as food and other

objects each identified for its optimal illumination. Thereby, the camera based system is uniquely capable of illuminating food within a living space which an application not taught by the combination of cited references.

Regarding Claim 6 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Amerson (US 6,379,022).
The applicant respectfully differs with the examiner's interpretation of the term camera used throughout by Amerson and instead sees it once used as a light sensor column 3, line 18, to control the instantaneous color temperature of a camera flash that does not teach towards an area illumination application. Amerson describes in the Field of the Invention, column 1 lines 6-8 "The present invention relates generally to digital cameras and more specifically to an auxiliary illuminating device that has an adjustable color temperature". One will note that even in the days of film cameras, the camera used a light meter to control the flash and using it to detect spectrum is a stepwise improvement. The applicant views the present disclosure as a further significant inventive step moving from the camera of Amerson , column 3, lines 17-26 .... "Another way is for the camera or an auxiliary device to measure the current light in the scene and determine the type of illumination" to the multifarious camera of claim 6 used to supply information to a *"controller arranged to processes the information communicated from the camera and automatically control the light provided to the illuminated area"*.

Amerson's illumination is point illumination for a specific digital camera lighting application and is not expanded by Morgan's networked sensors beyond that functionality. One must note that in a flash application the user points the camera at the limited scene to be captured by the camera. The flash will not evenly cover an area larger than the limited field of view. However, in a room illumination application with a fixed sensor placement the processor program to efficiently *"automatically control the light provided to the illuminated area"* must be arranged and programmed to obtain pertinent information from the area to be illuminated.. This is disclosed in the specification for example in an embodiment: [0184] *Spatially differentiated motion detectors.... The DLF controller acts to provide heightened lightning to the occupants' present locations. The controller has stored look-up-tables, instruction sets and algorithms which it uses to processes the information communicated from the sensors or a camera and in response control the light provided to the illuminated area.* Even had a camera sensor technique been used to improve the camera flash, a person of ordinary skill in the art of illuminating for cameras would not recognize that it could improve area lighting devices in the same way, as an area based algorithmic processing step would also be needed, a step whose actual application would be beyond their ordinary skill. The applicant therefore traverses the claimed obviousness as there is no provision or suggestion in either of the cited references for "*said controller arranged to processes the information communicated from the camera*".

Regarding Claim 7 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Amerson (US 6,379,022) as applied to claim 6 above, and further in view of Chang (US 2002/0039238).

The applicant respectfully points out that Chang uses a detector of radiation on the rearview mirror; as per paraa. [0005] Accordingly, the primary object of the present invention is to provide a vehicle automatic anti-glare device, wherein a rear-view mirror is provided for which automatically blocks out glare, in accordance with the intensity of the light cast upon the mirrors. Nowhere in Chang's disclosure is sensing the existence of glare reaching the eyes mentioned. The word eye does not appear in the entire specification and there is nothing in the combination of the cited references to teach to a system of the present disclosure which *[0249] In a preferred embodiment of this invention the lighting fixture is equipped with a camera vision system.... The camera vision system is capable of detecting glare causing visual discomfort on the eyes of room occupants caused by the lighting fixture and the logical controller will accordingly reduce the intensity of the illumination reaching the eyes from the responsible light source.* Chang's simple system actually teaches away from the use of an expensive camera to determine the disturbing glare event via the rear view mirror. Thus in a non-obvious development, the very same logic system which controls an illumination device that helps people to see as well as creating glare now has been configured to be able to illuminate without glare. This is a radical improvement over prior art and there is no teaching, suggestion, or motivation in the cited references that would have led a person of ordinary skill in the art to combine the relevant prior art teachings in the manner of claim 7. The applicant thus respectfully request allowance of claim 7.

Regarding Claims 8-17 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) in further view of Amerson (US 6,379,022).

Claim 8 and its dependents are referring to an invention (an example of which is disclosed in Fig. 24 and in the specification) of an automated illuminating device capable meeting *illumination requirements of the visual activities.* Disclosed in para. *[0273] In another embodiment one or more light sources, acting as a spot light 482 of limited beam angle... The controller 454 receiving input from the camera and using computational image recognition algorithms in a program as in FIG. 23 ....where computer vision is used ... recognize activities as they happen in real-time which enables the controller to determine any of the following: a change in the persons activity, in what direction the eyes may be directed, what objects the person is viewing and what visual task the person needs to perform. Based on that information the controller 454 powers the spot light sources 482 and general lighting sources 472 to provide the correct lighting for the specific visual task undertaken, be it reading a book or watching TV.* The applicant points out that Mogan discloses a (title) Methods and apparatus for controlling devices in a networked

lighting system. In a thorough reading of the Morgan patent application the applicant could not find any reference to the directional light sources (paragraphs 0019-0020) or a processor (Fig. 2, at 22) with stored algorithms (paragraph 0040) or any equivalent apparatus to recognize and deliver activity specific illumination per Claim 8 "visual *activities... said processer, upon calculating the required illumination parameters, directs the controller to adjust the directional light sources to meet the illumination requirements of the visual activities*. Again, a thorough reading of the Lys and Amerson patent applications finds no description of a device that can calculate *required illumination parameters* per detected visual activity. In Lys, even the re-positionable light fixture having movable structure for aiming the light sources mounted thereon in a defined direction (e.g. Fig 90A, at 2010, paragraphs 0325-0326) is typical of point lighting applications with the addition of sensed data controlling the positioning device. It does not teach towards the apparatus of Claim 8 where the applicant discloses *at least two directional light sources pointing in different directions* a necessary criterion for a novel, automated combined task and area illuminating system which is a different illumination art operating under a different set of defining equations.

As the disclosed system as claimed has spatially differentiated detection, calculating means and spatially differentiated delivery of illumination and none of the cited reference teach any of those necessary features necessary to fulfill *illumination requirements of the visual activities.* The applicant respectfully submits that the present invention is totally unpredictable under the prior art references. Therefore it would not have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Amerson regarding cameras used with LEDs (Amerson, column 3, lines 17- 26) in order to vary the light output of the LEDs (Amerson, column 2, lines 29-33) and Claims 8-17 should be allowed.

Regarding claim 9 Morgan further discloses the illuminating device of claim 8, further comprising the illumination requirement that different parts of the illuminated area to be illuminated at a different intensity and/or at a different spectrum than another part of the illuminated area (e.g., paragraphs 0020-0023). While Morgan states in [0023] According to one embodiment of the invention in which one or more sensors are employed, a networked lighting system may be implemented to facilitate automated computer-controlled operation of multiple light sources and devices in response to various feedback stimuli, for a variety of space-illumination applications. For example, automated lighting applications for home, office, retail environments and the like may be implemented based on a variety of feedback stimuli (e.g., changes in temperature or natural ambient lighting, sound or music, human movement or other motion, etc.) as shown earlier Morgan does not illustrate nor disclose apparatus for spatially differentiated detection or illumination resulting from direction light sources of Claim 8 where the illumination result is more functionally correct, convenient and energy saving. An example of this disclosed in the specification para. [0265] *In a preferred embodiment of the invention the logical controller 454 receiving image input from the camera 453 and running pattern recognition software will identify what is the visual task a person is*

trying to perform. The computer routine receives images from the camera and by determining the proximity of persons to objects such as books, newspapers, computer screens, telephones, televisions, cereal bowls, a writing pad, etc that are recognized by the computer vision techniques predicts what visual task the user is trying to perform. The logical controller 454 then drives the light sources 457 according to recommended lighting practice levels stored in its data storage. ... Unique to this invention, people are able to choose the lighting that suits them best and the fixture, having differentiated light delivery, can provide a first user with one type of chromacity and/or intensity and a second type for a different user in a different area.

The applicant respectfully submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to combine the cited prior art teachings to construct the disclosed device and therefore Claim 9 should be allowed.

Regarding claim 10 Morgan discloses the illuminating device ... Lys discloses an adjustable by an installer based on room geometry... to conform to an environment (Lys, paragraph 0206). Amerson .... Amerson discloses wherein the controller receives real time information from the camera (column 1, lines 11-12) .... using image recognition capability, directs the controller to adjust ....

The applicant has stated above in arguments for claims 1-9 the difference between a networked system that uses a camera as a light sensor for a scene for use with a single point flash light source (vs. area illumination) which is a different art with a different information set needed to automatically solve the defining equations. As far as the to conform to an environment of Lys, as there is no spatially differentiated illumination device described as well as no image recognition capability in Amerson such that the present disclosure functionality and structure would not be obvious. As can be seen from an example of the needed considerations for an area lighting application as claimed, cite the specification: [0267] *Yet another feature of the present invention logical controller and software is that the lighting fixture 450 has apparatus to check the illumination level of the lighting set-up upon installation and provide feedback so that manually made aimings are directed to obtain a desired illumination or luminance. The camera 453 serving as a light meter obtains luminance readings on surfaces in the living space. It inputs data to the controller 454 which provides readout either on a display on the FAML 450 or communicated to another device having a display. The installer using a calibrated reference reflective sheet of known color and reflectance values placed on surfaces at particular aimings will check if the desired illumination and chromacity is being provided. The reference sheets can also be used to calibrate the room surfaces for future camera sensor 453 readings by storing in 454 the actual surface readings vs. those of the reference sheet. Once the camera 453 is calibrated as to the reflectance and color of room surfaces the FAML 450, in a servomechanism enabled embodiment, with automatically movable light sources 457, will perform its own re-configuration to reach optimal light provision. The calibration is affected by using the camera array 453 to*

detect luminance as a measure of the lighting fixture instantaneous illuminance in that direction vs. the power level at which the light source is being driven. To calibrate the illumination system, the logical controller 454 can use a given LED installed on the fixture which serves as a light source standard when driven at known voltage and current. Alternately, an additional light sensor of superior accuracy stability is provided for in the sensor pack 453 and can be used to calibrate the camera sensor array.
The applicant respectfully submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to combine the cited prior art teachings to construct the disclosed device and therefore Claim 10 should be allowed.

11. (Original) The illumination device of claim 8, wherein the controller receives real time information from the camera and wherein the processor, using image recognition capability, directs the controller to adjust at least one of (i) the intensity, (ii) the spectral light distribution and, (iii) the direction of the light sources based on at least one of (i) where people requiring illumination are located, (ii) what object the person is viewing and (iii) what visual task the person needs to perform.

Regarding claim 11 Morgan further discloses the illumination device of claim 8. Morgan does not disclose wherein the controller receives real time information ...Amerson discloses wherein the controller receives real time information from the camera (column 1, lines 11-12) and wherein the processor (column 3, lines 14-25), using image recognition capability.
As the applicant has shown above in claims 1-10 there is no mention in Amerson's cited reference of image recognition routines. (column 3, lines 14-25), "For the array of LEDs to simulate the color temperature of the ambient light, the type of illumination to be matched must be known. One way is for the user to select the type of lighting from a list of choices. Another way is for the camera or an auxiliary device to measure the current light in the scene and determine the type of illumination. Once the type of illumination to be matched has been determined, the amount of light coming from each set of color LEDs is adjusted such that the total amount of light coming from the LED array is a calorimetric match to the ambient illumination source. Each type of ambient light source would typically have a different ratio of light coming from the sets of color LEDs. The inventive step regarding Claim 11 may be seen in the disclosure: *[0196] In a preferred embodiment, using pattern recognition techniques the ADLF 190 is semi or fully automatic in programming itself to correctly function where installed. The DLFs or ADLFs will adapt to the seating arrangement of room occupants* ***in real time****. In the preferred embodiment, the addition of a machine vision system with pattern recognition capabilities as is known in the art, easily deduces room occupancy and usage.*
The applicant respectfully submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to combine the cited prior art teachings to construct the disclosed device and therefore Claim 11 should be allowed.

Regarding claim 12 Morgan ... Lys discloses at least one of the directional light sources mounted on the movable structure ...in order to permit the light module to conform to an environment within which it is placed (Lys, paragraph 0206). The applicant points out that Lys is conforming to a geometrical environment in terms of the illuminating deviceas stated in para.s [0209]-[0246] a" Another such environment" and again in [0251] "In fact, the housing 703 could take any geometric configuration appropriate for a particular illumination or display environment" and not a geometric environment or visual task as it related to illumination. The applicant respectfully submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to combine the cited prior art teachings to construct the disclosed device and therefore Claim 12 should be allowed.

Regarding claim 13 Morgan further discloses the illumination device of claim 12, providing a different illumination to a sub-area... based on usage wherein the controller interpreting images (paragraph 0019).
The Applicant quotes Morgan [0019] "Accordingly, one embodiment of the present invention is directed generally to networked lighting systems, and to various methods and apparatus for computer-based control of various light sources and other devices that may be coupled together to form a networked lighting system. In one aspect of the invention, conventional light sources are employed in combination with LED-based (e.g., variable color) light sources to realize enhanced lighting effects. For example, in one embodiment, one or more computer-controllable (e.g., microprocessor-based) light sources conventionally used in various space-illumination applications and LED-based light sources are combined in a single fixture (hereinafter, a "combined" fixture), wherein the conventional light sources and the LED-based sources may be controlled independently. In another embodiment, dedicated computer-controllable light fixtures including conventional space-illumination light sources and LED-based light fixtures, as well as combined fixtures, may be distributed throughout a space and coupled together as a network to facilitate computer control of the fixtures." The applicant fails to discern any sub-area capability of Morgan's devices. In the present disclosure it would refer to a capability of direction light sources to illuminate in a sub-area where an occupant may be located vs. an illumination in the rest of the room. Per an example from the specification *[0184] Spatially differentiated motion detectors 200 are provided on the Adaptive Digital Lighting Fixture along with the light sources 191 and light sensors 196. Typically motion detectors have been associated with lighting in motel rooms to shut off the lighting if there is no activity. There is another level of control that can include matching the lighting to type and amount of activity. Taken to the extreme, one or more limited field-of-view motion detectors 200, or camera 197, can be used to follow the whereabouts of room occupants. The DLF controller acts to provide heightened lightning to the occupants" present locations. The controller has stored look-up-tables, instruction sets and algorithms which it uses to processes the information communicated from the sensors or a camera and in response control the light provided to the illuminated area. .* This is especially evident unless the use of non-monolithic directional light sources are indicated. The applicant respectfully submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to combine the cited

prior art teachings to construct the disclosed device and therefore Claim 13 should be allowed.

Regarding claim 14 Morgan further discloses the illumination device of claim 8, wherein the illuminated area is a road and the objects include road signs (paragraph 0018 - the Examiner interprets "outdoor environments" as reading on this claim).
The applicant traverses the rejection based on the fact that the networked light sources of Morgan are not taught as being directional and being capable of illuminating in substantially different directions. Neither is there a spatially differentiated a camera sensor nor a processor with algorithms for detecting objects. An example of such a device from the specification backing the claim is *[0203] When artificial intelligence methods known in the art is combined with the fine control and functional flexibility of the DLF additional advantages are realized. A detector or camera 258 in concert with a logic controller 246 is capable of providing the road lighting needs to a driver or group of drivers in according to the time of day, needs of the roadway layout and usage at any moment.*
If the examiner's rejection is based on 35 U.S. Code § 102 – Novelty, the applicant submits that Morgan as prior at does not read on claim 14 and the applicant respectfully request its allowance. If the rejection is based on obviousness the applicant submits respectfully submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to combine the cited prior art teachings to construct the disclosed device and therefore Claim 14 should be allowed.

Regarding claim 15 Morgan... Lys, paragraph 0206).
The applicant has shown in arguments regarding claim 8 above that Morgan, while having more than one light source does not teach towards spatially differentiated sensors and illumination so as to provide concurrent general and task lighting thereby substantially meeting the "*illumination requirement of an illuminated area*". An esoteric illumination example is brought from the specification *[0251] Actual vision and perception is not only a function of the illuminance falling on the object being observed but also of the luminance of surfaces in the surround, spectral distributions of the object and background and the general illuminance level to which the eye has adapted. Veiling luminance and veiling reflections may even be as interfering so as to disturb the ability to see. Described is a method of using the an embodiment of multiple light source lighting fixture of the present invention with finely controlled light delivery to assist people to better see objects or carry out visual tasks such as reading. The method comprises altering the intensity and/or color of the illumination delivered to the task versus other surfaces in the visual surround (that is they are in the viewer's field of view) such that the luminance of the object, the luminance of the background, the contrast and the veiling reflections are controlled so as to produce optimal vision conditions. To accomplish the spatially differentiated light delivery to the object of the visual task such as a book or*

computer screen the light sources to produce task lighting have multiple, narrow beams with minimal spill light. The limited coverage area of each beam and sharp cutoff is such that the lighting fixture controller can target a book while not substantially illuminating the desk. Other light sources illuminate the desk and other surfaces in the visual surround at an optimal background level luminance. The background level is determined by factors such as whether it is an office environment where others are present and a dark office is unpleasant or if the reading is at home and a lower background can be tolerated. .While Lys does show a moveable spot light source it is also not in conjunction with other spatially light sources nor is there disclosure of a spatially differentiated sensor and controller with the necessary processing. The applicant submits that it would not have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys and therefore respectfully requests the allowance of claim 15.

Regarding claim 16 Morgan discloses the illumination device of claim 8. Lys discloses a controller (Fig. 90A, at 2012) with communication capability to other devices … process the information and communicates the camera obtained information to a second device (paragraphs 0326-0328).

The applicant read but could not find the inter lighting-fixture camera-data communication-functionality disclosure for Lys' "robotic camera" in the referenced paragraphs or anywhere else in the disclosure. However, even if it did mention one, it would not teach towards the present invention's gainful illumination delivery usage of the communications anyway as shown in an exemplary embodiment *[0192] According to the teachings of the present disclosure, the room lighting needs are provided by one or more DLFs or ADLFs including satellites or combinations thereof placed such that they are capable of providing lighting at the correct non-glaring angles for the lighting tasks at hand. The ADLFs and DLF can communicate with each other and an ADLF can control a DLF and vise versa so that level lighting is accomplished in the room. Two or more DLFs can share in the illumination requirements of a location located between them. The DLF turns off its illumination towards a specific location, reads the ambient luminance and then correctly powers the SLS to provide the additional illumination.* The communications requirement is unique as a result of the controlled light distribution resulting from the directional light sources arranged to illuminate a local area. The independent illumination capability of each fixture would require such a communication of spatially differentiated sensor data which as has been pointed out is lacking from the Morgan and Lys disclosures. Lys' disclosure would need to mention sensor obtained data for analysis by the processor and the concept of multiple spatially differentiated sensors in order to teach towards meaningful sensor communications and it does not. Therefore it would not have been obvious to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys. The applicant respectfully submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary

skill in the art to combine the cited prior art teachings to construct the disclosed device and therefore Claim 16 should be allowed.

Regarding claim 17 Morgan as modified further discloses the illumination device of claim 16 Lys discloses where the illuminated area is a road (paragraph 0245) and where the second device to where the camera obtained information is communicated to is a lighting fixture (Fig. 90A, paragraphs 0326-0328).
To better understand the difference between the Morgan and Lys prior art and the present invention the applicant quotes from the specification: *[0203] ....In an alternate embodiment the roadway lighting can be dimmed if there are no approaching vehicles. The detector or camera 258 is capable of detecting oncoming and retreating traffic. The headlights and backlights are used or more sophisticated pattern recognition is used to determine traffic on the roadway. ...Taken to the extreme the controllability of the DLFs or series of communicating DLF street lights allows for the lighting to precede the vehicle by the stopping distance, say 300 ft. at 65 MPH (91 meters), and dim the unused lighting behind the driver if it is not necessary for other drivers.* In its own right the use of image processing to illuminate before a driver but not behind them thereby saving energy is a novel development and cannot be imagined from either of the disclosures. Lys' disclosure would need to mention sensor obtained data for analysis by the processor and the concept of multiple spatially differentiated sensors in order to teach towards meaningful sensor communications and it does not. Therefore it would not have been obvious to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys. The applicant respectfully submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to combine the cited prior art teachings to construct the disclosed device and therefore Claim 17 should be allowed.

Regarding Claims 18-19 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) in further view of Amerson (US 6,379,022) as applied to claim 17 above, and further in view of Lemelson (US 5,983,161).
Regarding Morgan and Lys the applicant has explained in claims 16 and 17 why they would not teach to the present disclosure. Regarding Amerson the applicant has explained in claims 2 and others regarding the specific flash usage of the sensor. Regarding Lemelson "discloses where the processor uses information obtained from the cameras and exchanged between fixtures." The applicant has read Lemelson (US 5,983,161) titled: GPS vehicle collision avoidance warning and control system and method. The camera is mounted on a vehicle and not a light fixture; column 20 Lines 55-56, A television camera(s) 54 having a wide angle lens is mounted at the front of the vehicle. Communication of traffic data between vehicles used for traffic vehicle avoidance is a totally different art as explained above regarding obviousness in claim 4 above. Regarding claim 19 the concept of real-time lighting and illumination control is not mentioned in the paragraphs cited and where it is mentioned it refers to a GPS location based lighting of the vehicles

healdlamps. In the entire disclosure and the word "glare" does not appear anywhere and therefore Lemeoson's GPS vehicle collision avoidance warning and control system cannot teach towards the present disclosure .
The applicant submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to combine the relevant prior art teachings to the new use of the known processes in the manner claimed. As there is nothing in the cited prior art of Morgan in view of Lys in further view of Amerson as applied to claim 17 above, and further in view of Lemelson that would have incited towards the concept of a sensor based processor in a lighting fixture "knowing" visual task data and correctly controlling a multiple directional light source illuminating device, the applicant requests that claim 18 be allowed.

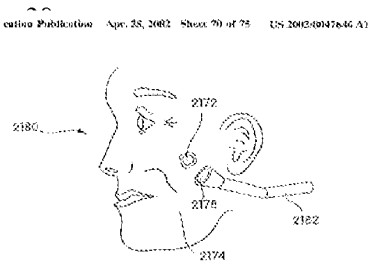
Regarding Claims 20-26 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646)... claim 20 Morgan discloses an automated irradiating device for providing radiation to individuals within an area. The applicant submits that Morgan is referring to a radiation device para. 0023 in the visible light spectrum used for seeing and not heating. [0023] ... computer-controlled operation of multiple light sources and devices in response to various feedback stimuli, for a variety of space-illumination applications. Lys discloses a light fixture including a multiplicity of directional light sources. The applicant finds no spatially differentiated sensor or computational mechanism in Lys that would allow his light source to provide "radiation in a sub-area proximate to the individuals" and certainly not for a heating application. From the present disclosure one example of the heating application shown in Fig. 23 is *[0274] An irradiation device embodiment of this FAML invention can use the computer vision and aim-ability function to provide infrared heating to individuals in indoor and outdoor settings. The heat radiation sources can be infrared filament lamps or infrared LEDs in addition to other wavelengths. The irradiating devices 472 mounted on the irradiation fixture can provide general area heating or spot heating 482 to people or objects.* Another is *"[0246] Light entering the digital camera 429 through its lens 427 is converted into electric signals... The processor runs the computer vision routines to determine an occupants age or sex and sends instruction to a building's utility devices to provide individualized services such as heating and lighting on basis of age or sex.* Therefore, it would not have been obvious to one of ordinary skill in the art of illumination at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys regarding directional lights (Lys, paragraph 0206) in order to permit the light module to conform to an environment within which it is placed (Lys, paragraph 0206) and the applicant requests that claim 20 be allowed.

Regarding claim 21 Morgan as modified discloses ... Lys discloses: the detector being a camera (paragraph 0327) with capability for sensing at least one of ... The applicant has read Lys

[0327] An embodiment of the illumination system can be used for taking photomicrographs. In another embodiment of the present invention, the illumination system 2020 may be used to improve the quality of robotic vision applications. Different lighting conditions can have a dramatic effect on such vision systems. permits a higher resolution by the robotic camera of the image required for robotic vision", the applicant submits that Lys is not using the camera as a detector but an alternate use for the "Lighting entertainment system" to "improve the quality of robotic vision applications" Therefore, as Lys does not teach towards a "sensing detector" and it would not have been obvious to one of ordinary skill in the art of illumination at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys regarding "sensing detector" (Lys, paragraph 0327) and the applicant requests that claim 21 be allowed.

Regarding claim 22 Morgan discloses and Lys discloses one or more directional radiation sources capable of being moved …
The applicant submits that in order for Lys's device, Fig. 90 to track a moving individual in the room there would need to be a camera detector with said camera detector providing coordinate data to a processor running algorithms to follow or track the individual around the room. As this is missing from Lys's disclosure as explained in claim 21 the applicant submits that claim 22 is not obvious and asks that it be allowed.

Regarding claim 23 Morgan discloses, Lys discloses directed at the different parts of the body (paragraphs 0309, 0362).The applicant submits that the presently disclosed system is not similar. As claimed, it is able "*to identify different parts of the body, to compute the desired radiation level to the different parts of the body and to adjust the radiation from sources directed at the different parts of the body*". From Fig. 24 and specification *[0274] … The camera and controller processor system can use image recognition to identify parts of the body and the controller can provide a different radiation level to the head vs. the rest of the body. Other people feel the cold in the legs etc.*



The cited Fig. 94 from Lys shown to the right clearly shows that it is referring specifically to a single irradiation device which is designed to perform on a predetermined part of the body. The applicant points out that nowhere in the Morgan or Lys disclosures is there any description of multiple spatially differentiated radiation delivery sources controlled by a processor running algorithms to analyze data from a spatially differentiated sensor, aka camera, *to identify parts of the body*. As these capabilities are missing from the referenced disclosures as explained in claim 21 and in preceding claims, the applicant submits that claim 23 is not obvious to one of ordinary

skill in the art at the time of the invention to modify the illuminating system disclosed by Morgan in accordance with the teaching of Lys and asks that it be allowed.

Regarding claim 24 Morgan further discloses the irradiation device of claim 21, further comprising the controller programmed to control the irradiation in time and intensity on the individual to maintain comfortable heating based on at least one of (i) best practices, (ii) feedback from the heat detector configured to detect body temperature of different parts of a body, (iii) personal preferences input to the controller and stored in memory, and (iv) commands input from an input device (paragraphs 0016- 0024).

The applicant first explains what claim 24 is referring to by quoting an exemplary embodiment from the specification *[0274] An irradiation device embodiment of this FAML invention can use the computer vision and aim-ability function to provide infrared heating to individuals in indoor and outdoor settings. Using face recognition algorithms and stored personal preferences from the data storage, the logical controller 454 will aim the heating rays specifically where on their body they prefer to be heated as well as in what amount and at what times. The camera 475 has sensors sensitive to infra-red wavelengths around 12 μm (micrometers) radiated from people. The controller obtaining the information from the body temperature sensor will run algorithms to calculate radiation parameters and will control the irradiation in time and intensity on the individual to maintain comfortable heating per best practice standards, drawing on stored data of heating practices, or personally input preferences.* The applicant submits that in the Morgan disclosure the word "heating" is not to be found (heat is found 3 times in reference to a heat sensor but there is no reference to a device for providing heat). As in addition, Morgan has not disclosed the computer vision hardware and logic system of claim 24 nor the heating application, the applicant respectfully submits that the claim should be allowed.

Regarding claim 25 Morgan discloses the irradiation device of claim 21. Morgan also discloses where controller aims the radiation sources to the location where the individual is located and controls the time and intensity of the radiation (e.g. paragraphs 0016-0024).

Lys discloses where the irradiation instead of for heat is for therapeutic purposes

The applicant respectfully submits that as explained above in claims 21, 22, 23 Lys does not show or describe a system capable of identifying the location of the individual "where the controller aims the radiation sources to the location where the individual is located" Lys has no spatially differentiated sensor or processor running image recognition programs. (Lys in [0327] mentions robotic vision in terms of illumination "...In another embodiment of the present invention, the illumination system 2020 may be used to improve the quality of robotic vision applications. As explained in claim 2 Morgan does not teach towards spatial differentiation and has no idea where in area an individual is located to aim anything towards them.

Therefore, the applicant submits that it would not have been obvious to one of ordinary skill in the art at the time of the invention to modify the illuminating system disclosed by Morgan in accordance with the teaching of Lys regarding light therapy in order to improve a patient's health or well-being. The applicant respectfully submits that claim 25 should be allowed.

Regarding claim 26 Morgan discloses ... the Examiner views light sources as heat sources) whereby the device is capable of providing both a desired light and heat radiation to the individuals (paragraphs 0016-0024).

The applicant respectfully submits that the novel system is capable of concurrently delivering both the heat and visible light. *[0275] "In an embodiment of the FAML the infrared radiation sources are added to the light source and can work together when necessary to provide heat and light. Thus in a living room fixture where the house heating has been turned down to energy saving levels an individual can receive concentrated light for reading as well as concentrated beam of infrared heating."* Even if the Examiner views light sources as heat sources, they are the same light functionality, the same "art". This novel and beneficial combination of two functionalities is a unique inventive step as the expensive camera vision system is now providing for simultaneous functionalities needed in the same space by the same or different individuals. The applicant submits that it would not have been obvious to one of ordinary skill in the art of either heating or illumination at the time of the invention to develop the presently claimed combinational and new use device and the applicant requests that claim 26 be allowed.

Conclusion

The applicant has revised the objected claim and requests that the above claims now be amended as in the new list of claims. The applicant submits that the claims are now in proper form to place the case in condition for allowance which action he respectfully solicits.

Conditional Request for Constructive Assistance

Should the examiner still prefer to have these or any or any other claims amended to more clearly highlight the uniqueness of the present invention, the pro se applicant requests under M.P.E.P. § 2173.02 and §707.07(j) that the examiner should draft one or more claims for the applicant and indicate in his or her action that such claims would be allowed if incorporated in the application by amendment. This request is in order that the

undersigned can place this application in allowable condition as soon as possible and without the need for further proceedings.

Very respectfully,

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In the United States Patent and Trademark Office

Application/CN: 13/357,549 Wednesday, September 23, 2015
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Applicant: Spero, Yechezkal Evan
Title: Detector Controlled Illuminating System
Examiner: Lotter, David E
Art Unit: 2844

Reply to Office Action dated June 23, 15

Mailstop: Amendment

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Dear Sir:

The application is being prosecuted by the Applicant pro se.

Certificate of Transmission Under 37 C.F.R. § 1.8

I hereby certify that this correspondence is being deposited electronically with the U.S. Patent and Trademark Office using the United States Patent and Trademark Office's EFS-Web system on **Sept. 23, 2015**.

Signature
/Yechezkal Evan Spero/

Yechezkal Evan Spero

AMENDMENT UNDER 37 C.F.R. §1.111

In response to the Office Action mailed June 23, 15, the following amendments and remarks are respectfully submitted in connection with the above-identified application.

Amendments to the Claims begin on page 2 of this Amendment.

Remarks begin on page 9 of this Amendment.

	Claims remaining after Amendment		**Highest number previously paid for**		**Present extra**
Total	26	-	20	=	0
Independent	4	-	4	=	0

AMENDMENTS TO THE CLAIMS

The following is a complete, marked-up listing of revised claims with a status identifier in parenthesis, underlined text indicating insertions, and strike through indicating deletions.

Full list of claims per 37 CFR 1.121

1. (Original) An illuminating device which produces light to meet an illumination requirement of an illuminated area, comprising: a light fixture including a multiplicity of directional light sources including at least two light sources pointing in different directions, the light sources having at least one of controllable light intensity and spectral light distribution; a controller for adjusting at least one of a light intensity and light spectrum of the directional light sources; one or more detectors for sensing at least one of objects, surfaces and people within the illuminated area and of passing the sensed information to the controller; a processor for processing the sensed information and determining illumination requirements of the at least one of objects and people using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables and for directing the controller to adjust the directional light sources to meet the illumination requirement.

2. (Original) The illuminating device of claim 1 where the detector is comprising at least one of (i) a camera being a photo sensor array coupled with an optical lens, (ii) a photo sensor, (iii) an ultrasound transducer and sensor, (iv) microwave transducer and sensor, and (v) pyroelectric detectors.

3. (Original) The illumination device of claim 1, wherein the illuminated area is indoors and further comprising a detector for detecting variable illumination from daylight and/or sunlight entering indoors, wherein the controller taking into consideration the area now illuminated by the daylight and/or sunlight adjusts the light intensity of the directional light sources to meet the varied illumination requirement.

4. (Original) The illuminating device of claim 1, wherein the one or more detectors detects information regarding one or more individuals within the illuminated area, said information is at least one of (i) age, (ii) sex, and (iii) recognition of an individual for matching with stored data about that individual's needs and wherein the controller adjusts the light intensity and/or spectrum of the illumination provided to the one or more individuals based on illumination requirements from at least one of (i) best practices looked up and calculated from stored data, (ii) age and/or sex of the individual, (iii) personal preferences input to the controller and stored in memory, and (iv) commands received by the controller from an input device.

5. (Original) The illuminating device of claim 1 for optimally displaying food, wherein the one or more detectors detect an identity of one or more foods and wherein the controller adjusts the light intensity and/or spectrum of the illumination on the one or more foods based on illumination requirements from the processor.

6. (Original) An illuminating device having automatic control of the light provided to an illuminated area comprising: a structure for incorporating illuminating device elements; one or more light sources incorporated in the structure and in communication with a power source; electronic circuitry apparatus for the controlled powering of the light source and other illuminating device elements; one or more cameras placed on the structure for detecting information about the illuminated area, said camera in communication with power and control device elements; a controller integrated with the structure, in communication with the light source controlling power circuitry, said controller arranged to processes the information communicated from the camera and automatically control the light provided to the illuminated area.

7. (currently amended) The illumination device of claim 6, <u>where one or more light sources are directional</u> wherein the one or more detectors are configured to

sense a presence of glare on a person's eyes in the illuminated area, and wherein the controller is programmed to adjust an intensity of the directional light sources to reduce the glare.

8. (Original) An illuminating device which provides light to meet an illumination requirement of an illuminated area in which visual activities are performed, comprising: a light fixture including a multiplicity of directional light sources including at least two directional light sources pointing in different directions, the light fixture having movable structure for aiming the directional light sources mounted thereon in a defined direction; a camera for obtaining images of the illuminated area functioning as a detector for at least one of (i) a light detector (ii) a spectrum detector, (iii) a motion detector, (iv) a measuring detector for sensing a geometry of the illuminated area, and (v) a detector for sensing at least one of work surfaces and road objects and at least one of vehicles and people; a controller for adjusting a light intensity and a direction of each of the directional light sources; a processor with stored algorithms and data for identifying at least one of (i) tasks being carried out by people, (ii) location of people, (iii) frequency of area usage by people, (iv) traffic density in the illuminated area from the sensed geometry, (v) work surfaces, (vi) road objects, people and/or vehicles, and (vii) roadway surface luminance any of which is used by said processor for determining illumination within the illuminated area using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables wherein said processer, upon calculating the required illumination parameters, directs the controller to adjust the directional light sources to meet the illumination requirements of the visual activities.

9. (Original) The illuminating device of claim 8, further comprising the illumination requirement that different parts of the illuminated area to be illuminated at a different intensity and/or at a different spectrum than another part of the illuminated area.

10. (Original) The illuminating device of claim 8, adjustable by an installer based on room geometry and/or usage further comprising the light fixture having adjustable arms on which directional light sources are mounted for aiming the directional light sources within the illuminated area, where said detector and processor combination provides feedback to the installer so as to aim the light sources such that the illumination requirements can be met by the re-adjusted light source aimings.

11. (Original) The illumination device of claim 8, wherein the controller receives real time information from the camera and wherein the processor, using image recognition capability, directs the controller to adjust at least one of (i) the intensity, (ii) the spectral light distribution and, (iii) the direction of the light sources based on at least one of (i) where people requiring illumination are located, (ii) what object the person is viewing and (iii) what visual task the person needs to perform.

12. (Original) The illumination device of claim 8, further comprising at least one of the directional light sources mounted on the movable structure where the movement of the light source direction is automatically controlled by the controller.

13. (Original) The illumination device of claim 12, providing a different illumination to a sub-area based on usage wherein the controller interpreting images from the camera adjusts the moveable light sources such that they provide the required illumination in a sub-area proximate to the individuals as they move around in the illuminated area.

14. (Original) The illumination device of claim 8, wherein the illuminated area is a road and the objects include road signs.

15. (Original) The illumination device of claim 8, further comprising at least one

of the directional light sources on an automatic swivel joint and providing spot lights of limited beam angle for task lighting while other light source provide general illumination to the illuminated area.

16. (Original) The illumination device of claim 8, further comprising a controller with communication capability to other devices, where the camera in one location obtains information and the controller process the information and communicates the camera obtained information to a second device.

17. (Original) The illumination device of claim 16, where the illuminated area is a road and the second device to where the camera obtained information is communicated to is a lighting fixture.

18. (Original) The illumination device of claim 17, where the processor uses information obtained from the cameras and exchanged between fixtures for identifying traffic requirements in the illuminated area and from the vehicles locations and geometry determining the illumination requirements of the illumination area thereby directing the controller to adjust the directional light sources to meet the illumination requirements.

19. (Original) The illumination device of claim 18, wherein the controller is programmed to adjust at least one of (i) increase illumination with an approach of a vehicle, and (ii) change beam cut-off levels as the vehicle advances toward the lighting fixture to eliminate glare.

20. (Original) An automated irradiating device for providing radiation to individuals within an area, intended to provide a desired radiation in a sub-area proximate to the individuals, comprising: an irradiation fixture including one or more directional radiation sources where the radiation is in a defined direction; at least one detector for sensing a location of individuals in the area and feeding transferring that information to a controller; a where said controller for adjusting

adjusts at least one of (i) a radiation intensity, and (ii) a direction of the irradiation based on sensed location, whereby the desired radiation is provided proximate to individuals in the area.

21. (Original) The automated irradiating device of claim 20 intended to provide a desired heating to one or more individuals in an area, further comprising: at least two directional heat radiation sources pointing in different directions; the detector being a camera with capability for sensing at least one of (i) a presence of one or more individuals in the heated area, (ii) the identity of the individuals, and (iii) a body temperature of individuals present in the heated area; the controller further having processing capability for determining the heating requirements of the individuals in the area from at least one of (i) algorithms to calculate radiation parameters, (ii) stored data of heating practices, (iii) image recognition algorithms for identifying the individual based on the camera information, and (iv) an identified individual's personal preferences.

22. (Original) The automated irradiating device of claim 20, further comprising: One or more directional radiation sources capable of being moved so as to direct radiation in a defined direction; the at least one detector capable of providing information on the present location of individuals in the area; the controller programmed to process the detector information and move the radiating sources so as to follow the one or more individuals, whereby the desired radiation is provided in a sub-area substantially proximate to the individuals.

23. (Original) The irradiation device of claim 21, further comprising; the detector being a camera capable of providing images of different parts of the body of individuals to the controller for image processing; the radiation sources being able to direct radiation to different parts of the body; and the controller further programmed to run the image recognition algorithms to identify different parts of the body, to compute the desired radiation level to the different parts of the body and to adjust the radiation from sources directed at the different parts of the body.

24. (Original) The irradiation device of claim 21, further comprising the controller programmed to control the irradiation in time and intensity on the individual to maintain comfortable heating based on at least one of (i) best practices, (ii) feedback from the heat detector configured to detect body temperature of different parts of a body, (iii) personal preferences input to the controller and stored in memory and (iv) commands input from an input device.

25. (Original) The irradiation device of claim 21 where the irradiation instead of for heat is for therapeutic purposes and the radiation may be any of (i) UV radiation, (ii) red light therapy in the 620-660 nm range, and (iii) light therapy for SAD and other disorders selected from the group consisting of seasonal affective disorder, sleep disorders, circadian rhythm disorders, delayed sleep phase syndrome, vitamin D deficiency and skin disorders, where the controller aims the radiation sources to the location where the individual is located and controls the time and intensity of the radiation.

26. The automated irradiating device of claim 20 further comprising where one or more of the irradiating sources is radiating visible light and one or more of the irradiating sources is designed to substantially radiate heat whereby the device is capable of providing both a desired light and heat radiation to the individuals.

REMARKS

Favorable reconsideration of this application, in light of the remarks and following amendments, is respectfully requested.

In reply to point 1: Claim Rejections - 35 USC § 1 12(b): distinctly claiming the subject matter … Claim 7 recites the limitation "...intensity of the directional light sources". There is insufficient antecedent basis for this limitation in the claim. Independent claim 6 recites "one or more light sources incorporated in the light structure." The Examiner interprets claim 7 as reading "one or more light sources incorporated in the light structure" as recited in claim 6.

The Applicant has amended claim 7 and a marked up version with the words "where one or more light sources are directional" to better claim the glare reduction feature disclosed in the specification. An example of a preferred embodiment is described in [0249]: *In a preferred embodiment of this invention the lighting fixture is equipped with a camera vision system comprised of the digital camera 429 and logical controller 428 having computer algorithms for performing computer vision and has the capability of identifying the eyes of occupants in a room* and is *… capable of detecting glare causing visual discomfort on the eyes of room occupants caused by the lighting fixture and the logical controller will accordingly reduce the intensity of the illumination reaching the eyes from the responsible light source.*

In reply to point 2: Claim Rejections - 35 USC §103(a) which forms the basis for all obviousness rejections … Claims 1 and 3 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) … and further in view of Amerson (US 6,379,022)..

To point out the non-obviousness, the applicant presents an informal introduction to help better understand the innovative aspects of the device claimed able "to meet an illumination requirement of an illuminated area" of the present disclosure. In prior art, to illuminate an area correctly and efficiently (see para. [0009] for definition of "correct") a human designer in a calculated design process, knowing the distances and the angles from the light fixture to the surfaces to be illuminated and using the defining laws of physics, Lambert's-Law and the Inverse-square Law, $E = \frac{I \cos\theta}{D^2}$ arranges light-sources relative to the surfaces to be illuminated. These light-sources have a pre-defined spatial light distribution and are placed in the room at specific locations to correctly meet expected illumination requirements for the visual tasks typically carried out in the specific area to be illuminated. Based on this combined spatial and visual tasks knowledge and in addition, knowledge of the intended room usage such as the age, sex, personal preferences of the users, the colors of the furniture placed therein etc. a designer can adjust light source placement, intensity, spectrum, and angle of incident light to achieve a more correct illumination. Because surface illumination varies with the distance

squared from the light source, is very difficult to achieve high light-utilization efficiencies using prior art monolithic light sources and most often, near the light fixtures there is a greater illuminance intensity that what is required while furthest away, there is a deficiency and the lighting in not "correct".
Each sub-area in a room can have its specific use and optimal illumination level. This task lighting requirement is served today by having a separate light fixture e.g. table lamp, or spot from above and a manually adjusted dimmer to meet changes in the local illumination requirements. Most room lighting applications require a combination of general and task lighting. As opposed to area or task lighting, in a point lighting application such as for camera flash or stage lighting application, the lighting is pointed at the object to be illuminated and has different considerations.

However, in the real world, light usage is dynamic and theoretically, to do it right, a designer would need to be on the scene to see the immediate lighting requirements and rearrange the light source aiming's, intensity spectrum etc. to meet the changes. While an advanced system (per Morgan) could use - networked sensors to detect the occurrence of an event, such as a change in the environment or occupancy and communicate (per Lys) to a networked plurality of LEDs in a "three-dimensional structure 4024" - to alter the illumination, it would still not substantially improve on meeting the actual illumination requirements unless it was controlling correctly arranged light sources. Even if those light sources were (per Amerson) arranged to provide an adjustable color temperature they would not produce spectrally correct illumination to meet an illumination requirement for an area (for a non-area, spot lighting application, yes, but to correctly illuminate an area where the distance and the angle to the surfaces from the LED vary, no)

A more accurate and convenient light fixture system based on actual room-occupant location and usage would use sensors to provide information to a processor running algorithms to determine the occupant's illumination requirements in real-time and correctly drive properly arranged light sources of controlled light distribution to provide the correct illumination that is required to fulfill those requirements. The first inventive step is to use more than one spatially differentiated light source to correctly illuminate each sub-area. The second inventive step would be to have spatially differentiated sensors to obtain the necessary information to grant the processor knowledge necessary to determine the requirements of each sub-area and a third non-obvious step would be to program the processor to "know" which light source illuminates that area (versus another sub-area that it does not illuminate) and to power it as necessary to meet the illumination requirement for that area. Each inventive step generated the need for the next step where the solution was not obvious. In some cases at the outset, the necessary technology did not exist and certainly, the combination of steps necessary to yield this unique resulting functionality could not have been foreseen by one of ordinary skill in the art. Only in

hindsight, is it apparent that the claimed device, comprised of a unique combination of hardware and software, actually mimics best lighting practice as performed by a human designer it in real time. The applicant below will show that the mere combination of the cited prior art patents would not lead to the apparatus nor functionality of the claimed device.

Therefore, the disclosure of a sensor controlled illuminating device that: a) has at least two light sources, arranged such that each light source illuminates a different area of the room and where b) that sensor has spatially differentiated detection means and c) where the processor running code uses the detected information to "know" the area of the room that requires a specific type of illumination versus those that do not require that illumination and d) the processor, using instruction sets, then "knows" which of the "directional-light-sources" deliver light to the area to be illuminated and then e) the processor using code determines the intensities to drives those specific sources to obtain the specific, localized-effect, so as to fulfill the sensor detected illumination requirement according to best practice – surely comprises a non-obvious, new to the world device. A device capable of differentiated delivery of energy or mass within a room, synergistically equipped with a sensor such as a camera capable of providing location coordinate information to a processor to operate localized delivery, (versus the prior-art's, non-spatially-differentiated sensor and light delivery apparatus) provides unpredictable functional and/or energy saving benefit well beyond a combination of prior art systems.

More specifically: regarding Claims 1 and 3 are rejected ... as being unpatentable over Morgan in view of Lys the applicant respectfully points out that, although per Morgan (abstract) the "Individual light sources or groups of light sources may be controlled independently of one another based on data transported throughout the network from sensors", and in view of Lys, Fig. 28C para. [0206] "the modular LED unit 4000, may be flexible, so as to permit the light module 4002 to conform to an environment within which it is placed" do not disclose the requisite spatially differentiated sensing and physical light distribution apparatus needed for the localization of the effect to an *illuminated area* as is disclosed numerous times in the specification. For example, Fig 12 is described: [0183] *The adaptive or intelligent DLF 190 shown in FIG. 12 has multiple light sources 191 placed about the body 192 having a geometric shape... a photodetector array which is equipped with a lens which can be a 360 degree lens or a fisheye lens is placed with a field of view of the area to be illuminated. ... such that an asymmetric lighting pattern is produced for the provision of a non-circular lighting pattern in a typically rectangular room; and [0184] Spatially differentiated motion detectors.* Therefore, without disclosing a geometrically coordinated sensor Morgan in view of Lys would not teach towards the inventiveness of the present invention in Claim 1.

For illumination to reach an area to be illuminated in a substantially required amount (just not some approximation but a design goal) its directionality of light distribution would need to be known and it would need to be positioned and aimed at that area and when there are more than one light sources the controller would need to "know" which light source under its control illuminates what area. The *directional light sources*" of Claim 1 per Spero [0280] has the *"capability of delivering spatially differentiated illumination"*. Again, nowhere within the disclosure does Lys' device teach the physical requirement of Claim 1 in order to derive the desired controllable lighting effect*:" to meet an illumination requirement of an illuminated area ... a light fixture including a multiplicity of directional light sources including at least two light sources pointing in different directions"*. The unplanned placement of Morgan's light sources of Fig. 1-3, and Lys' in Fig. 28C while uniquely addressable, are not physically arranged to produce any degree of an area-specific illumination which must follow Lamberts Law in relation to the angle and distance of the surface to be illuminated. In the present disclosure the system's manually and even automatic spatial ascertaining capability is described as how the controller will "know" which local area each of the multiple light sources illuminates. *[0196] In a preferred embodiment, using pattern recognition techniques ... An automatic routine as in 7A uses timed firing of a coordinate-specific light source, or array of light sources and the following reading of the camera detector of light reflected to that specific coordinates pixel, or set of pixels to corroborate action between light sources and the detectors.* Without this spatially differentiated sensing and delivering capacity and the novel corroboration of the area sensed with the area served by the directional light source, there is no way an inferred Morgan in view of Lys system could perform as Claim 1 and Claim 3. In Claim 3, *the controller taking into consideration the area now illuminated by the daylight and/or sunlight adjusts the light intensity of the directional light sources to meet the varied illumination requirement*. This inventive step, where on the fly a system can sense a sub-areas specific requirement and coordinate it to an illumination delivery device that illuminate that area according to a new requirement is clearly missing from the Morgan in view of Lys disclosures.

In the present disclosure the light fixture has [0054]) *...one or more discrete light sources in an integrated illuminating element where the overall lighting effect is the result of the combination of these multiple sources*. Instead, Morgan, Lys and other prior art, deal with either: 1) monolithic general lighting or 2) spot lighting concepts. It can be noted that even where there are multiple light sources, a) they often cover the same area, as do Morgan's light sources of Figs. 1-3, or b) the separate sources are arranged such that there is an uncontrolled melding of light from one light source with that of another. That is, the effect of the light sources is not substantially exclusive to an *illuminated area* within a room. In the referenced spot lighting concepts, which provide accent to a specific stage performer or features in the room the individual spots are not arranged to combine build

an overall room illumination. Nowhere in the disclosure do either Morgan or Lys mention the inventive step of controlling an area-specific illumination effect by using *directional-light-sources* that have a focused, localized or directional aspect. Such a teaching is, a prerequisite for the novel, spatial controllability of the present inventive device see Fig 2b, allowing it to "meet the illumination requirement of an illuminated area". Instead, Lys' device Figs. 28, other than when used as a spot light will not correctly illuminate an area. To the contrary, for an average illumination requirement, it illuminates areas with greater than needed intensity closer to the light source and less intensity further away. Morgan in view of Lys would illuminate well beyond the localized lighting needed for a detected individual of Morgan. The applicant also suggests that in most probability, Lys' "conform to an environment" statement in para. [0206] is referring to solving an electronics packaging problem, not the illumination requirements of surfaces in the environment. This, as Lys uses a positioner to illuminate the material of interest directly-on angle and light distribution properties are not mentioned in the entire disclosure. Similarly, nowhere in the Morgan disclosure is the word direction, area, aim, spatial distribution or sub-area mentioned and there would be nothing to teach anyone skilled in the art the localization capability of the present disclosure. As there is no teaching or suggestion supporting the combination in the cited prior art references, Morgan in view of Lys should not be deemed obvious and the applicant respectfully requests allowance of the claim.

Regarding Claim 2 is rejected ... as being unpatentable over Morgan in view of Lys as applied to claim 1 above, and further in view of Amerson (US 6,379,022).
Amerson is using the LED light sources to provide an adjustable color temperature. The camera mentioned by Amerson uses the spectrally corrected light for a camera flash function. The only sensor use of the camera mentioned Column 3 Line 17 "Another way is for the camera or an auxiliary device to measure the current light in the scene and determine the type of illumination" does not teach towards a spatially differentiated sensing. That is a capability to measure the "current light" in one area of the scene versus measuring the "current light" in a second area of the scene. Therefore, as Amerson's camera is disclosed only as a spectral sensor of the "current light" it does not teach towards the spatially differentiated sensors of claim 2 of the present disclosure. Any practitioner skilled in the art who would want to use a camera to gain the coordinates of the sensed event would need first a spatially differentiated delivery device to want to have a spatially differentiated sensor and computer programs to assess the data. Then they would require apparatus and software to correlate the sensed coordinates to the delivery coordinated. Any suggestion to any of these inventive steps are missing and therefore the present disclosure is non-obvious.

Regarding Claim 4 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) as applied to claim 1 above, and further in view of Kinjo (US 2002/0046100). The applicant does not claim to have invented

pattern recognition, nor does Kinjo, who is using the information derived from images [0002] to enhance an advertisement effect, by which advertisement contents are switched in accordance with the viewer so as to display an advertisement suitable for the viewer of the advertisement. It should be noted that the application for Kinjo's detected characteristic remains in the virtual world [0010] ... and switching an image displayed on an image display medium in accordance with the first characteristic of the extracted person. This new use for a known pattern recognition process is typical of recent technological advances where "virtual" product development outpaces "physical" product developments which are often more difficult to foresee and implement. In the case of these cited references which primarily deal with control signal and networks would actually teach away from the device because the cost of the added physical device, wiring, networking complexity.

In addition, the prior-art use of image recognition developed security purposes in identifying terrorists was conceptually limited at the time of the disclosure to systems making use of the information for the observers benefit, often at the expense of the person being observed. That is, the information on the observed individual is used by the observing entity for its own benefit be it security or advancing sales. In the present disclosure the pattern recognition is being used by the user themselves to gain a personalized non-virtual illumination benefit per [0051] *A number of unique illuminating device embodiments are achievable using the basic elements presented above...as well as the ability to provide individualized lighting to each person.*

The applicant submits that certainly, a disclosure of a lighting fixture which is able to automatically tailor the illumination to the person it is illuminating for, is a case of an improvement patent. The applicant submits that this new development would not be obvious to a "person of ordinary skill in the art", even if that person had prior knowledge of all the documentation available in the world at the time of the application in the many different arts that are needed for this device to be constructed to produce the desired result. This is because a "person of ordinary skill in the art", refers to a practitioner of one art, not a practitioner of all the arts. In this claimed novel illumination device, the individual inventor's combination of skills in electronics, programming, artificial intelligence, human factors engineering and lighting science that need to be combined in order to contrive a machine capable of automatically illuminating in accordance with good lighting practice is non-ordinary.

In addition regarding Kinjo's use of personal characteristics for advertising it is claimed that [0196] *the addition of a machine vision system with pattern recognition capabilities as is known in the art,* combined with a physically differentiated lighting apparatus with using skills of multiple arts qualifies under 35 U.S.C. 100(b) as a new use of a known process, machine, manufacture. The applicant submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to

combine the relevant prior art teachings to the new use of the known processes in the manner claimed. To conclude, there is nothing in the cited prior art of Morgan or Kinjo that would have incited towards the concept of a pattern recognition based processor knowing data controlling and correctly controlling an illuminating device. As stated by Winner Int'l Royalty Corp. v. Wang, 202 F.3d. 1340, 1348 (Fed. Cir., 2000), there must be a suggestion or teaching in the prior art to combine elements shown in the prior art in order to find a patent obvious.

Regarding Claim 5 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) as applied to claim 1 above, and further in view of Zampini (US 2008/0136356) and in further view of Bolle (US 5,546,475).
The applicant argues that the claimed area-specific food-illumination system for use in dynamic settings such as restaurants for *optimally displaying food,* is not obvious from the prior art for the illumination objects in a display case. From the specification: [0282] *The lighting fixture 490 has means to illuminate separate portions at a table comprised of directable or aim-able lighting modules 491. The lighting fixture 490 also has computational means of providing the optimal color and intensity of light so as to render people, food, objects in their best light as well as to build a dining room ambience through lighting according to recommended practice or user preferences.* Zampini in his disclosure for a solution states: [0007] The present solution described herein provides systems and methods to coordinate and control the lighting of areas of a display . The area inside the case is fixed and is not dynamic in terms of persons, objects and activities carried out. Zampini's detector is not spatially differentiated such as a multi-pixel photodetector array capable of producing coordinate information necessary for a room illumination system able to focus on a food and render it under optimal lighting. And again, Zampini does not disclose the corroboratory area sensing and delivery routine necessary to have an imaging detection routine drive a specific light source to illuminate food on a restaurant table located anywhere in the room. The present disclosure can identify and illuminate anywhere in the living space and not just in a display case which is a totally different lighting application. Regarding Bolle who describes an apparatus that uses image processing to recognize objects such as produce within a scene which is indeed pattern recognition prior art that the disclosure relied upon. The combination of the cited references would not suggest the presently disclosed robust system of Fig. 26. Its unique structure offers a complete restaurant lighting application solution where: *[0280] As an example of the luminaire's benefits and agility to provide correct lighting where it is needed at minimal energy consumption, an embodiment of the invention, a spatially and spectrally adjustable restaurant lighting fixture is presented in FIG. 26. In a restaurant lighting application it would be beneficial for the customer experience if those dining, the food and ambience would all appear at their best.* The present application discloses a complete solution beyond the simple display and food recognition application by operating area specific within a larger area comprising people as well as food and other

objects each identified for its optimal illumination. Thereby, the camera based system is uniquely capable of illuminating food within a living space which an application not taught by the combination of cited references.

Regarding Claim 6 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Amerson (US 6,379,022).
The applicant respectfully differs with the examiner's interpretation of the term camera used throughout by Amerson and instead sees it once used as a light sensor column 3, line 18, to control the instantaneous color temperature of a camera flash that does not teach towards an area illumination application. Amerson describes in the Field of the Invention, column 1 lines 6-8 "The present invention relates generally to digital cameras and more specifically to an auxiliary illuminating device that has an adjustable color temperature". One will note that even in the days of film cameras, the camera used a light meter to control the flash and using it to detect spectrum is a stepwise improvement. The applicant views the present disclosure as a further significant inventive step moving from the camera of Amerson , column 3, lines 17-26 .... "Another way is for the camera or an auxiliary device to measure the current light in the scene and determine the type of illumination" to the multifarious camera of claim 6 used to supply information to a *"controller arranged to processes the information communicated from the camera and automatically control the light provided to the illuminated area"*.

Amerson's illumination is point illumination for a specific digital camera lighting application and is not expanded by Morgan's networked sensors beyond that functionality. One must note that in a flash application the user points the camera at the limited scene to be captured by the camera. The flash will not evenly cover an area larger than the limited field of view. However, in a room illumination application with a fixed sensor placement the processor program to efficiently *"automatically control the light provided to the illuminated area"* must be arranged and programmed to obtain pertinent information from the area to be illuminated.. This is disclosed in the specification for example in an embodiment: [0184] *Spatially differentiated motion detectors.... The DLF controller acts to provide heightened lightning to the occupants' present locations. The controller has stored look-up-tables, instruction sets and algorithms which it uses to processes the information communicated from the sensors or a camera and in response control the light provided to the illuminated area.* Even had a camera sensor technique been used to improve the camera flash, a person of ordinary skill in the art of illuminating for cameras would not recognize that it could improve area lighting devices in the same way, as an area based algorithmic processing step would also be needed, a step whose actual application would be beyond their ordinary skill. The applicant therefore traverses the claimed obviousness as there is no provision or suggestion in either of the cited references for "*said controller arranged to processes the information communicated from the camera*".

Regarding Claim 7 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Amerson (US 6,379,022) as applied to claim 6 above, and further in view of Chang (US 2002/0039238).

The applicant respectfully points out that Chang uses a detector of radiation on the rearview mirror; as per paraa. [0005] Accordingly, the primary object of the present invention is to provide a vehicle automatic anti-glare device, wherein a rear-view mirror is provided for which automatically blocks out glare, in accordance with the intensity of the light cast upon the mirrors. Nowhere in Chang's disclosure is sensing the existence of glare reaching the eyes mentioned. The word eye does not appear in the entire specification and there is nothing in the combination of the cited references to teach to a system of the present disclosure which *[0249] In a preferred embodiment of this invention the lighting fixture is equipped with a camera vision system.... The camera vision system is capable of detecting glare causing visual discomfort on the eyes of room occupants caused by the lighting fixture and the logical controller will accordingly reduce the intensity of the illumination reaching the eyes from the responsible light source.* Chang's simple system actually teaches away from the use of an expensive camera to determine the disturbing glare event via the rear view mirror. Thus in a non-obvious development, the very same logic system which controls an illumination device that helps people to see as well as creating glare now has been configured to be able to illuminate without glare. This is a radical improvement over prior art and there is no teaching, suggestion, or motivation in the cited references that would have led a person of ordinary skill in the art to combine the relevant prior art teachings in the manner of claim 7. The applicant thus respectfully request allowance of claim 7.

Regarding Claims 8-17 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) in further view of Amerson (US 6,379,022).

Claim 8 and its dependents are referring to an invention (an example of which is disclosed in Fig. 24 and in the specification) of an automated illuminating device capable meeting *illumination requirements of the visual activities.* Disclosed in para. *[0273] In another embodiment one or more light sources, acting as a spot light 482 of limited beam angle... The controller 454 receiving input from the camera and using computational image recognition algorithms in a program as in FIG. 23 ....where computer vision is used ... recognize activities as they happen in real-time which enables the controller to determine any of the following: a change in the persons activity, in what direction the eyes may be directed, what objects the person is viewing and what visual task the person needs to perform. Based on that information the controller 454 powers the spot light sources 482 and general lighting sources 472 to provide the correct lighting for the specific visual task undertaken, be it reading a book or watching TV.* The applicant points out that Mogan discloses a (title) Methods and apparatus for controlling devices in a networked

lighting system. In a thorough reading of the Morgan patent application the applicant could not find any reference to the directional light sources (paragraphs 0019-0020) or a processor (Fig. 2, at 22) with stored algorithms (paragraph 0040) or any equivalent apparatus to recognize and deliver activity specific illumination per Claim 8 "visual *activities... said processer, upon calculating the required illumination parameters, directs the controller to adjust the directional light sources to meet the illumination requirements of the visual activities*. Again, a thorough reading of the Lys and Amerson patent applications finds no description of a device that can calculate *required illumination parameters* per detected visual activity. In Lys, even the re-positionable light fixture having movable structure for aiming the light sources mounted thereon in a defined direction (e.g. Fig 90A, at 2010, paragraphs 0325-0326) is typical of point lighting applications with the addition of sensed data controlling the positioning device. It does not teach towards the apparatus of Claim 8 where the applicant discloses *at least two directional light sources pointing in different directions* a necessary criterion for a novel, automated combined task and area illuminating system which is a different illumination art operating under a different set of defining equations.

As the disclosed system as claimed has spatially differentiated detection, calculating means and spatially differentiated delivery of illumination and none of the cited reference teach any of those necessary features necessary to fulfill *illumination requirements of the visual activities.* The applicant respectfully submits that the present invention is totally unpredictable under the prior art references. Therefore it would not have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Amerson regarding cameras used with LEDs (Amerson, column 3, lines 17- 26) in order to vary the light output of the LEDs (Amerson, column 2, lines 29-33) and Claims 8-17 should be allowed.

Regarding claim 9 Morgan further discloses the illuminating device of claim 8, further comprising the illumination requirement that different parts of the illuminated area to be illuminated at a different intensity and/or at a different spectrum than another part of the illuminated area (e.g., paragraphs 0020-0023). While Morgan states in [0023] According to one embodiment of the invention in which one or more sensors are employed, a networked lighting system may be implemented to facilitate automated computer-controlled operation of multiple light sources and devices in response to various feedback stimuli, for a variety of space-illumination applications. For example, automated lighting applications for home, office, retail environments and the like may be implemented based on a variety of feedback stimuli (e.g., changes in temperature or natural ambient lighting, sound or music, human movement or other motion, etc.) as shown earlier Morgan does not illustrate nor disclose apparatus for spatially differentiated detection or illumination resulting from direction light sources of Claim 8 where the illumination result is more functionally correct, convenient and energy saving. An example of this disclosed in the specification para. [0265] *In a preferred embodiment of the invention the logical controller 454 receiving image input from the camera 453 and running pattern recognition software will identify what is the visual task a person is*

trying to perform. The computer routine receives images from the camera and by determining the proximity of persons to objects such as books, newspapers, computer screens, telephones, televisions, cereal bowls, a writing pad, etc that are recognized by the computer vision techniques predicts what visual task the user is trying to perform. The logical controller 454 then drives the light sources 457 according to recommended lighting practice levels stored in its data storage. ... Unique to this invention, people are able to choose the lighting that suits them best and the fixture, having differentiated light delivery, can provide a first user with one type of chromacity and/or intensity and a second type for a different user in a different area.

The applicant respectfully submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to combine the cited prior art teachings to construct the disclosed device and therefore Claim 9 should be allowed.

Regarding claim 10 Morgan discloses the illuminating device ... Lys discloses an adjustable by an installer based on room geometry... to conform to an environment (Lys, paragraph 0206). Amerson .... Amerson discloses wherein the controller receives real time information from the camera (column 1, lines 11-12) .... using image recognition capability, directs the controller to adjust ....

The applicant has stated above in arguments for claims 1-9 the difference between a networked system that uses a camera as a light sensor for a scene for use with a single point flash light source (vs. area illumination) which is a different art with a different information set needed to automatically solve the defining equations. As far as the to conform to an environment of Lys, as there is no spatially differentiated illumination device described as well as no image recognition capability in Amerson such that the present disclosure functionality and structure would not be obvious. As can be seen from an example of the needed considerations for an area lighting application as claimed, cite the specification: [0267] *Yet another feature of the present invention logical controller and software is that the lighting fixture 450 has apparatus to check the illumination level of the lighting set-up upon installation and provide feedback so that manually made aimings are directed to obtain a desired illumination or luminance. The camera 453 serving as a light meter obtains luminance readings on surfaces in the living space. It inputs data to the controller 454 which provides readout either on a display on the FAML 450 or communicated to another device having a display. The installer using a calibrated reference reflective sheet of known color and reflectance values placed on surfaces at particular aimings will check if the desired illumination and chromacity is being provided. The reference sheets can also be used to calibrate the room surfaces for future camera sensor 453 readings by storing in 454 the actual surface readings vs. those of the reference sheet. Once the camera 453 is calibrated as to the reflectance and color of room surfaces the FAML 450, in a servomechanism enabled embodiment, with automatically movable light sources 457, will perform its own re-configuration to reach optimal light provision. The calibration is affected by using the camera array 453 to*

detect luminance as a measure of the lighting fixture instantaneous illuminance in that direction vs. the power level at which the light source is being driven. To calibrate the illumination system, the logical controller 454 can use a given LED installed on the fixture which serves as a light source standard when driven at known voltage and current. Alternately, an additional light sensor of superior accuracy stability is provided for in the sensor pack 453 and can be used to calibrate the camera sensor array.
The applicant respectfully submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to combine the cited prior art teachings to construct the disclosed device and therefore Claim 10 should be allowed.

11. (Original) The illumination device of claim 8, wherein the controller receives real time information from the camera and wherein the processor, using image recognition capability, directs the controller to adjust at least one of (i) the intensity, (ii) the spectral light distribution and, (iii) the direction of the light sources based on at least one of (i) where people requiring illumination are located, (ii) what object the person is viewing and (iii) what visual task the person needs to perform.

Regarding claim 11 Morgan further discloses the illumination device of claim 8. Morgan does not disclose wherein the controller receives real time information ...Amerson discloses wherein the controller receives real time information from the camera (column 1, lines 11-12) and wherein the processor (column 3, lines 14-25), using image recognition capability.
As the applicant has shown above in claims 1-10 there is no mention in Amerson's cited reference of image recognition routines. (column 3, lines 14-25), "For the array of LEDs to simulate the color temperature of the ambient light, the type of illumination to be matched must be known. One way is for the user to select the type of lighting from a list of choices. Another way is for the camera or an auxiliary device to measure the current light in the scene and determine the type of illumination. Once the type of illumination to be matched has been determined, the amount of light coming from each set of color LEDs is adjusted such that the total amount of light coming from the LED array is a calorimetric match to the ambient illumination source. Each type of ambient light source would typically have a different ratio of light coming from the sets of color LEDs. The inventive step regarding Claim 11 may be seen in the disclosure: *[0196] In a preferred embodiment, using pattern recognition techniques the ADLF 190 is semi or fully automatic in programming itself to correctly function where installed. The DLFs or ADLFs will adapt to the seating arrangement of room occupants* ***in real time****. In the preferred embodiment, the addition of a machine vision system with pattern recognition capabilities as is known in the art, easily deduces room occupancy and usage.*
The applicant respectfully submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to combine the cited prior art teachings to construct the disclosed device and therefore Claim 11 should be allowed.

Regarding claim 12 Morgan ... Lys discloses at least one of the directional light sources mounted on the movable structure ...in order to permit the light module to conform to an environment within which it is placed (Lys, paragraph 0206). The applicant points out that Lys is conforming to a geometrical environment in terms of the illuminating deviceas stated in para.s [0209]-[0246] a" Another such environment" and again in [0251] "In fact, the housing 703 could take any geometric configuration appropriate for a particular illumination or display environment" and not a geometric environment or visual task as it related to illumination. The applicant respectfully submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to combine the cited prior art teachings to construct the disclosed device and therefore Claim 12 should be allowed.

Regarding claim 13 Morgan further discloses the illumination device of claim 12, providing a different illumination to a sub-area... based on usage wherein the controller interpreting images (paragraph 0019).
The Applicant quotes Morgan [0019] "Accordingly, one embodiment of the present invention is directed generally to networked lighting systems, and to various methods and apparatus for computer-based control of various light sources and other devices that may be coupled together to form a networked lighting system. In one aspect of the invention, conventional light sources are employed in combination with LED-based (e.g., variable color) light sources to realize enhanced lighting effects. For example, in one embodiment, one or more computer-controllable (e.g., microprocessor-based) light sources conventionally used in various space-illumination applications and LED-based light sources are combined in a single fixture (hereinafter, a "combined" fixture), wherein the conventional light sources and the LED-based sources may be controlled independently. In another embodiment, dedicated computer-controllable light fixtures including conventional space-illumination light sources and LED-based light fixtures, as well as combined fixtures, may be distributed throughout a space and coupled together as a network to facilitate computer control of the fixtures." The applicant fails to discern any sub-area capability of Morgan's devices. In the present disclosure it would refer to a capability of direction light sources to illuminate in a sub-area where an occupant may be located vs. an illumination in the rest of the room. Per an example from the specification *[0184] Spatially differentiated motion detectors 200 are provided on the Adaptive Digital Lighting Fixture along with the light sources 191 and light sensors 196. Typically motion detectors have been associated with lighting in motel rooms to shut off the lighting if there is no activity. There is another level of control that can include matching the lighting to type and amount of activity. Taken to the extreme, one or more limited field-of-view motion detectors 200, or camera 197, can be used to follow the whereabouts of room occupants. The DLF controller acts to provide heightened lightning to the occupants" present locations. The controller has stored look-up-tables, instruction sets and algorithms which it uses to processes the information communicated from the sensors or a camera and in response control the light provided to the illuminated area. .* This is especially evident unless the use of non-monolithic directional light sources are indicated. The applicant respectfully submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to combine the cited

prior art teachings to construct the disclosed device and therefore Claim 13 should be allowed.

Regarding claim 14 Morgan further discloses the illumination device of claim 8, wherein the illuminated area is a road and the objects include road signs (paragraph 0018 - the Examiner interprets "outdoor environments" as reading on this claim).
The applicant traverses the rejection based on the fact that the networked light sources of Morgan are not taught as being directional and being capable of illuminating in substantially different directions. Neither is there a spatially differentiated a camera sensor nor a processor with algorithms for detecting objects. An example of such a device from the specification backing the claim is *[0203] When artificial intelligence methods known in the art is combined with the fine control and functional flexibility of the DLF additional advantages are realized. A detector or camera 258 in concert with a logic controller 246 is capable of providing the road lighting needs to a driver or group of drivers in according to the time of day, needs of the roadway layout and usage at any moment.*
If the examiner's rejection is based on 35 U.S. Code § 102 – Novelty, the applicant submits that Morgan as prior at does not read on claim 14 and the applicant respectfully request its allowance. If the rejection is based on obviousness the applicant submits respectfully submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to combine the cited prior art teachings to construct the disclosed device and therefore Claim 14 should be allowed.

Regarding claim 15 Morgan... Lys, paragraph 0206).
The applicant has shown in arguments regarding claim 8 above that Morgan, while having more than one light source does not teach towards spatially differentiated sensors and illumination so as to provide concurrent general and task lighting thereby substantially meeting the "*illumination requirement of an illuminated area*". An esoteric illumination example is brought from the specification *[0251] Actual vision and perception is not only a function of the illuminance falling on the object being observed but also of the luminance of surfaces in the surround, spectral distributions of the object and background and the general illuminance level to which the eye has adapted. Veiling luminance and veiling reflections may even be as interfering so as to disturb the ability to see. Described is a method of using the an embodiment of multiple light source lighting fixture of the present invention with finely controlled light delivery to assist people to better see objects or carry out visual tasks such as reading. The method comprises altering the intensity and/or color of the illumination delivered to the task versus other surfaces in the visual surround (that is they are in the viewer's field of view) such that the luminance of the object, the luminance of the background, the contrast and the veiling reflections are controlled so as to produce optimal vision conditions. To accomplish the spatially differentiated light delivery to the object of the visual task such as a book or*

computer screen the light sources to produce task lighting have multiple, narrow beams with minimal spill light. The limited coverage area of each beam and sharp cutoff is such that the lighting fixture controller can target a book while not substantially illuminating the desk. Other light sources illuminate the desk and other surfaces in the visual surround at an optimal background level luminance. The background level is determined by factors such as whether it is an office environment where others are present and a dark office is unpleasant or if the reading is at home and a lower background can be tolerated. .While Lys does show a moveable spot light source it is also not in conjunction with other spatially light sources nor is there disclosure of a spatially differentiated sensor and controller with the necessary processing. The applicant submits that it would not have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys and therefore respectfully requests the allowance of claim 15.

Regarding claim 16 Morgan discloses the illumination device of claim 8. Lys discloses a controller (Fig. 90A, at 2012) with communication capability to other devices … process the information and communicates the camera obtained information to a second device (paragraphs 0326-0328).

The applicant read but could not find the inter lighting-fixture camera-data communication-functionality disclosure for Lys' "robotic camera" in the referenced paragraphs or anywhere else in the disclosure. However, even if it did mention one, it would not teach towards the present invention's gainful illumination delivery usage of the communications anyway as shown in an exemplary embodiment *[0192] According to the teachings of the present disclosure, the room lighting needs are provided by one or more DLFs or ADLFs including satellites or combinations thereof placed such that they are capable of providing lighting at the correct non-glaring angles for the lighting tasks at hand. The ADLFs and DLF can communicate with each other and an ADLF can control a DLF and vise versa so that level lighting is accomplished in the room. Two or more DLFs can share in the illumination requirements of a location located between them. The DLF turns off its illumination towards a specific location, reads the ambient luminance and then correctly powers the SLS to provide the additional illumination.* The communications requirement is unique as a result of the controlled light distribution resulting from the directional light sources arranged to illuminate a local area. The independent illumination capability of each fixture would require such a communication of spatially differentiated sensor data which as has been pointed out is lacking from the Morgan and Lys disclosures. Lys' disclosure would need to mention sensor obtained data for analysis by the processor and the concept of multiple spatially differentiated sensors in order to teach towards meaningful sensor communications and it does not. Therefore it would not have been obvious to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys. The applicant respectfully submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary

skill in the art to combine the cited prior art teachings to construct the disclosed device and therefore Claim 16 should be allowed.

Regarding claim 17 Morgan as modified further discloses the illumination device of claim 16 Lys discloses where the illuminated area is a road (paragraph 0245) and where the second device to where the camera obtained information is communicated to is a lighting fixture (Fig. 90A, paragraphs 0326-0328).
To better understand the difference between the Morgan and Lys prior art and the present invention the applicant quotes from the specification: *[0203] ....In an alternate embodiment the roadway lighting can be dimmed if there are no approaching vehicles. The detector or camera 258 is capable of detecting oncoming and retreating traffic. The headlights and backlights are used or more sophisticated pattern recognition is used to determine traffic on the roadway. ...Taken to the extreme the controllability of the DLFs or series of communicating DLF street lights allows for the lighting to precede the vehicle by the stopping distance, say 300 ft. at 65 MPH (91 meters), and dim the unused lighting behind the driver if it is not necessary for other drivers.* In its own right the use of image processing to illuminate before a driver but not behind them thereby saving energy is a novel development and cannot be imagined from either of the disclosures. Lys' disclosure would need to mention sensor obtained data for analysis by the processor and the concept of multiple spatially differentiated sensors in order to teach towards meaningful sensor communications and it does not. Therefore it would not have been obvious to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys. The applicant respectfully submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to combine the cited prior art teachings to construct the disclosed device and therefore Claim 17 should be allowed.

Regarding Claims 18-19 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) in further view of Amerson (US 6,379,022) as applied to claim 17 above, and further in view of Lemelson (US 5,983,161).
Regarding Morgan and Lys the applicant has explained in claims 16 and 17 why they would not teach to the present disclosure. Regarding Amerson the applicant has explained in claims 2 and others regarding the specific flash usage of the sensor. Regarding Lemelson "discloses where the processor uses information obtained from the cameras and exchanged between fixtures." The applicant has read Lemelson (US 5,983,161) titled: GPS vehicle collision avoidance warning and control system and method. The camera is mounted on a vehicle and not a light fixture; column 20 Lines 55-56, A television camera(s) 54 having a wide angle lens is mounted at the front of the vehicle. Communication of traffic data between vehicles used for traffic vehicle avoidance is a totally different art as explained above regarding obviousness in claim 4 above. Regarding claim 19 the concept of real-time lighting and illumination control is not mentioned in the paragraphs cited and where it is mentioned it refers to a GPS location based lighting of the vehicles

healdlamps. In the entire disclosure and the word "glare" does not appear anywhere and therefore Lemeoson's GPS vehicle collision avoidance warning and control system cannot teach towards the present disclosure .
The applicant submits that there is no teaching, suggestion, or motivation that would have led a person of ordinary skill in the art to combine the relevant prior art teachings to the new use of the known processes in the manner claimed. As there is nothing in the cited prior art of Morgan in view of Lys in further view of Amerson as applied to claim 17 above, and further in view of Lemelson that would have incited towards the concept of a sensor based processor in a lighting fixture "knowing" visual task data and correctly controlling a multiple directional light source illuminating device, the applicant requests that claim 18 be allowed.

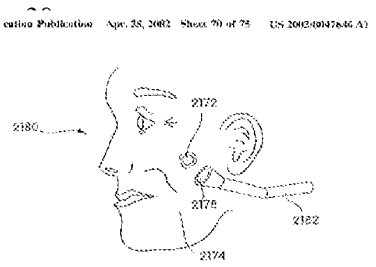
Regarding Claims 20-26 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646)... claim 20 Morgan discloses an automated irradiating device for providing radiation to individuals within an area. The applicant submits that Morgan is referring to a radiation device para. 0023 in the visible light spectrum used for seeing and not heating. [0023] ... computer-controlled operation of multiple light sources and devices in response to various feedback stimuli, for a variety of space-illumination applications. Lys discloses a light fixture including a multiplicity of directional light sources. The applicant finds no spatially differentiated sensor or computational mechanism in Lys that would allow his light source to provide "radiation in a sub-area proximate to the individuals" and certainly not for a heating application. From the present disclosure one example of the heating application shown in Fig. 23 is *[0274] An irradiation device embodiment of this FAML invention can use the computer vision and aim-ability function to provide infrared heating to individuals in indoor and outdoor settings. The heat radiation sources can be infrared filament lamps or infrared LEDs in addition to other wavelengths. The irradiating devices 472 mounted on the irradiation fixture can provide general area heating or spot heating 482 to people or objects.* Another is *"[0246] Light entering the digital camera 429 through its lens 427 is converted into electric signals... The processor runs the computer vision routines to determine an occupants age or sex and sends instruction to a building's utility devices to provide individualized services such as heating and lighting on basis of age or sex.* Therefore, it would not have been obvious to one of ordinary skill in the art of illumination at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys regarding directional lights (Lys, paragraph 0206) in order to permit the light module to conform to an environment within which it is placed (Lys, paragraph 0206) and the applicant requests that claim 20 be allowed.

Regarding claim 21 Morgan as modified discloses ... Lys discloses: the detector being a camera (paragraph 0327) with capability for sensing at least one of ... The applicant has read Lys

[0327] An embodiment of the illumination system can be used for taking photomicrographs. In another embodiment of the present invention, the illumination system 2020 may be used to improve the quality of robotic vision applications. Different lighting conditions can have a dramatic effect on such vision systems. permits a higher resolution by the robotic camera of the image required for robotic vision", the applicant submits that Lys is not using the camera as a detector but an alternate use for the "Lighting entertainment system" to "improve the quality of robotic vision applications" Therefore, as Lys does not teach towards a "sensing detector" and it would not have been obvious to one of ordinary skill in the art of illumination at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys regarding "sensing detector" (Lys, paragraph 0327) and the applicant requests that claim 21 be allowed.

Regarding claim 22 Morgan discloses and Lys discloses one or more directional radiation sources capable of being moved …
The applicant submits that in order for Lys's device, Fig. 90 to track a moving individual in the room there would need to be a camera detector with said camera detector providing coordinate data to a processor running algorithms to follow or track the individual around the room. As this is missing from Lys's disclosure as explained in claim 21 the applicant submits that claim 22 is not obvious and asks that it be allowed.

Regarding claim 23 Morgan discloses, Lys discloses directed at the different parts of the body (paragraphs 0309, 0362).The applicant submits that the presently disclosed system is not similar. As claimed, it is able "*to identify different parts of the body, to compute the desired radiation level to the different parts of the body and to adjust the radiation from sources directed at the different parts of the body*". From Fig. 24 and specification *[0274] … The camera and controller processor system can use image recognition to identify parts of the body and the controller can provide a different radiation level to the head vs. the rest of the body. Other people feel the cold in the legs etc.*



The cited Fig. 94 from Lys shown to the right clearly shows that it is referring specifically to a single irradiation device which is designed to perform on a predetermined part of the body. The applicant points out that nowhere in the Morgan or Lys disclosures is there any description of multiple spatially differentiated radiation delivery sources controlled by a processor running algorithms to analyze data from a spatially differentiated sensor, aka camera, *to identify parts of the body*. As these capabilities are missing from the referenced disclosures as explained in claim 21 and in preceding claims, the applicant submits that claim 23 is not obvious to one of ordinary

skill in the art at the time of the invention to modify the illuminating system disclosed by Morgan in accordance with the teaching of Lys and asks that it be allowed.

Regarding claim 24 Morgan further discloses the irradiation device of claim 21, further comprising the controller programmed to control the irradiation in time and intensity on the individual to maintain comfortable heating based on at least one of (i) best practices, (ii) feedback from the heat detector configured to detect body temperature of different parts of a body, (iii) personal preferences input to the controller and stored in memory, and (iv) commands input from an input device (paragraphs 0016- 0024).

The applicant first explains what claim 24 is referring to by quoting an exemplary embodiment from the specification *[0274] An irradiation device embodiment of this FAML invention can use the computer vision and aim-ability function to provide infrared heating to individuals in indoor and outdoor settings. Using face recognition algorithms and stored personal preferences from the data storage, the logical controller 454 will aim the heating rays specifically where on their body they prefer to be heated as well as in what amount and at what times. The camera 475 has sensors sensitive to infra-red wavelengths around 12 μm (micrometers) radiated from people. The controller obtaining the information from the body temperature sensor will run algorithms to calculate radiation parameters and will control the irradiation in time and intensity on the individual to maintain comfortable heating per best practice standards, drawing on stored data of heating practices, or personally input preferences.* The applicant submits that in the Morgan disclosure the word "heating" is not to be found (heat is found 3 times in reference to a heat sensor but there is no reference to a device for providing heat). As in addition, Morgan has not disclosed the computer vision hardware and logic system of claim 24 nor the heating application, the applicant respectfully submits that the claim should be allowed.

Regarding claim 25 Morgan discloses the irradiation device of claim 21. Morgan also discloses where controller aims the radiation sources to the location where the individual is located and controls the time and intensity of the radiation (e.g. paragraphs 0016-0024).

Lys discloses where the irradiation instead of for heat is for therapeutic purposes

The applicant respectfully submits that as explained above in claims 21, 22, 23 Lys does not show or describe a system capable of identifying the location of the individual "where the controller aims the radiation sources to the location where the individual is located" Lys has no spatially differentiated sensor or processor running image recognition programs. (Lys in [0327] mentions robotic vision in terms of illumination "...In another embodiment of the present invention, the illumination system 2020 may be used to improve the quality of robotic vision applications. As explained in claim 2 Morgan does not teach towards spatial differentiation and has no idea where in area an individual is located to aim anything towards them.

Therefore, the applicant submits that it would not have been obvious to one of ordinary skill in the art at the time of the invention to modify the illuminating system disclosed by Morgan in accordance with the teaching of Lys regarding light therapy in order to improve a patient's health or well-being. The applicant respectfully submits that claim 25 should be allowed.

Regarding claim 26 Morgan discloses ... the Examiner views light sources as heat sources) whereby the device is capable of providing both a desired light and heat radiation to the individuals (paragraphs 0016-0024).

The applicant respectfully submits that the novel system is capable of concurrently delivering both the heat and visible light. *[0275] "In an embodiment of the FAML the infrared radiation sources are added to the light source and can work together when necessary to provide heat and light. Thus in a living room fixture where the house heating has been turned down to energy saving levels an individual can receive concentrated light for reading as well as concentrated beam of infrared heating."* Even if the Examiner views light sources as heat sources, they are the same light functionality, the same "art". This novel and beneficial combination of two functionalities is a unique inventive step as the expensive camera vision system is now providing for simultaneous functionalities needed in the same space by the same or different individuals. The applicant submits that it would not have been obvious to one of ordinary skill in the art of either heating or illumination at the time of the invention to develop the presently claimed combinational and new use device and the applicant requests that claim 26 be allowed.

Conclusion

The applicant has revised the objected claim and requests that the above claims now be amended as in the new list of claims. The applicant submits that the claims are now in proper form to place the case in condition for allowance which action he respectfully solicits.

Conditional Request for Constructive Assistance

Should the examiner still prefer to have these or any or any other claims amended to more clearly highlight the uniqueness of the present invention, the pro se applicant requests under M.P.E.P. § 2173.02 and §707.07(j) that the examiner should draft one or more claims for the applicant and indicate in his or her action that such claims would be allowed if incorporated in the application by amendment. This request is in order that the

undersigned can place this application in allowable condition as soon as possible and without the need for further proceedings.

Very respectfully,

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EXAMINER	
LOTTER, DAVID E	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 13/357,549	Applicant(s) SPERO, YECHEZKAL EVAN	
	Examiner DAVID LOTTER	Art Unit 2844	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *9/23/2015*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-26* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-26* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *1/24/2012, 1/24/2012* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1 and 3 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646).

Regarding claim 1 Morgan discloses an illuminating device (e.g. paragraph 0019) which produces light to meet an illumination requirement of an illuminated area, comprising: a light fixture (paragraph 0019) including a multiplicity of light sources (Fig. 1, at 36A, 38A, 40A, paragraph 0020), the light sources having at least one of controllable light intensity and spectral light distribution (e.g., paragraphs 0040-0042); a controller (Fig. 1, at 26A) for adjusting at least one of a light intensity and light spectrum of the directional light sources (paragraph 0040); one or more detectors (Fig. 1, at 42) for sensing at least one of objects, surfaces and people (paragraph 0022) within the illuminated area and of passing the sensed information to the controller (paragraph 0022); a processor (Fig. 1, at 22) for processing the sensed information and determining

illumination requirements of the at least one of objects and people using at least one of artificial intelligence (paragraph 0025), pattern recognition, video analytics, and look-up tables and for directing the controller to adjust the directional light sources to meet the illumination requirement (e.g. paragraph 0020).

Morgan discloses a light fixture but Morgan arguably may not explicitly disclose a light fixture including a multiplicity of directional light sources including at least two light sources pointing in different directions.

Lys discloses a light fixture including a multiplicity of directional light sources including at least two light sources pointing in different directions (e.g., Fig. 28C, paragraph 0206).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys regarding directional LEDs (Lys, paragraph 0206) in order to permit the light module to conform to an environment within which it is placed (Lys, paragraph 0206).

Regarding claim 3 Morgan further discloses the illumination device of claim 1, wherein the illuminated area is indoors (paragraph 0023) and further comprising a detector (paragraphs 0023-0024) for detecting variable illumination from daylight and/or sunlight entering indoors (paragraph 0023), wherein the controller taking into consideration the area now illuminated by the daylight and/or sunlight adjusts the light

intensity of the directional light sources to meet the varied illumination requirement (paragraph 0023).

Claim 2 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) as applied to claim 1 above, and further in view of Amerson (US 6,379,022).

Regarding claim 2, Morgan as modified above discloses the illumination of claim 1. Morgan discloses a light sensor (paragraph 0022).

Morgan does not explicitly disclose where the detector is comprising at least one of (i) a camera being a photo sensor array coupled with an optical lens, (ii) a photo sensor, (iii) an ultrasound transducer and sensor, (iv) microwave transducer and sensor, and (v) pyroelectric detectors.

Amerson discloses where the detector is comprising at least one of (i) a camera being a photo sensor array coupled with an optical lens, (ii) a photo sensor (column 3, lines 17-26), (iii) an ultrasound transducer and sensor, (iv) microwave transducer and sensor, and (v) pyroelectric detectors.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Amerson regarding cameras used with LEDs (Amerson, column 3, lines 17-26) in order to vary the light output of the LEDs (Amerson, column 2, lines 29-33).

Claim 4 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) as applied to claim 1 above, and further in view of Kinjo (US 2002/0046100).

Regarding claim 4 Morgan discloses the illuminating device of claim 1. Morgan further discloses wherein the controller adjusts the light intensity and/or spectrum of the illumination provided to the one or more individuals based on illumination requirements from at least one of (i) best practices looked up and calculated from stored data, (ii) age and/or sex of the individual, (iii) personal preferences input to the controller and stored in memory (paragraph 0036), and (iv) commands received by the controller from an input device (paragraphs 0036-0037).

Morgan does not explicitly disclose wherein the one or more detectors detects information regarding one or more individuals within the illuminated area, said information is at least one of (i) age, (ii) sex, and (iii) recognition of an individual for matching with stored data about that individual's needs.

Kinjo discloses wherein the one or more detectors (Fig. 1, at 12) detects information regarding one or more individuals within the illuminated area, said information is at least one of (i) age (paragraph 0012), (ii) sex (paragraph 0012), and (iii) recognition of an individual for matching with stored data about that individual's needs (e.g., paragraphs 0010-0013, Fig. 2).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the

teaching of Kinjo regarding customer detection methods (Kinjo, paragraphs 0010-0012) in order to detect characteristics of a person (Kinjo, paragraph 0010).

Claim 5 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) as applied to claim 1 above, and further in view of Zampini (US 2008/0136356) and in further view of Bolle (US 5,546,475).

Regarding claim 5 Morgan as modified discloses the illuminating device of claim 1. Morgan also discloses a processor (Fig. 1, at 22) and a detector (Fig. 1, at 42).

Morgan does not explicitly disclose a device for optimally displaying food, wherein the controller adjusts the light intensity and/or spectrum of the illumination on the one or more foods based on illumination requirements from the processor.

Zampini discloses a device for optimally displaying food, wherein the controller adjusts the light intensity and/or spectrum of the illumination (paragraphs 0053-0054) on the one or more foods based on illumination requirements from the processor (paragraph 0055).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Zampini regarding detecting and controlling illumination requirements (Zampini, paragraphs 0053-0054) in order to improve marketability and enhance brand recognition (Zampini, paragraph 0002).

Lys in view of Zampini does not disclose wherein the one or more detectors detect an identity of one or more foods.

Bolle discloses wherein the one or more detectors detect an identity of one or more foods (Bolle, column 7, lines 37-48).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Zampini regarding detecting and controlling illumination requirements and in further accordance with the teachings of Bolle regarding one or more detectors detecting an identity of one or more foods (Bolle, column 7, lines 37-48) in order to recognize objects such as produce (Bolle, column 5, lines 50-51).

Claim 6 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Amerson (US 6,379,022).

Regarding claim 6 Morgan discloses an illuminating device having automatic control of the light provided to an illuminated area comprising:

a structure (Fig. 2, at 26) for incorporating illuminating device elements;

one or more light sources (e.g., Fig. 2, at 52A) incorporated in the structure and in communication with a power source (Fig. 2, at 44);

electronic circuitry apparatus for the controlled powering of the light source and other illuminating device elements (Fig. 2, at 50);

a controller (Fig. 2, at controller) integrated with the structure, in communication with the light source controlling power circuitry.

Morgan does not disclose one or more cameras placed on the structure for detecting information about the illuminated area, said camera in communication with power and control device elements; said controller arranged to processes the information communicated from the camera and automatically control the light provided to the illuminated area.

Amerson discloses one or more cameras (Amerson, column 3, lines 17-26) placed on the structure for detecting information about the illuminated area, said camera in communication with power and control device elements (Amerson, column 3, lines 17-26); said controller arranged to processes the information communicated from the camera and automatically control the light provided to the illuminated area (Amerson, column 3, lines 17-26).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Amerson regarding cameras used with LEDs (Amerson, column 3, lines 17-26) in order to vary the light output of the LEDs (Amerson, column 2, lines 29-33).

Claim 7 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Amerson (US 6,379,022) as applied to claim 6 above, and further in view of Chang (US 2002/0039238) and in further view of Lys (US 2002/0047646).

Regarding claim 7 Morgan in view of Amerson discloses the illumination device of claim 6.

Morgan in view of Amerson does not disclose wherein the one or more detectors are configured to sense a presence of glare on a person's eyes in the illuminated area, and wherein the controller is programmed to adjust an intensity of the directional light sources to reduce the glare.

Chang discloses wherein the one or more detectors (Fig. 2, at 10) are configured to sense a presence of glare on a person's eyes (Fig. 2, at 114) in the illuminated area, and wherein the controller (Fig. 2, at 110) is programmed to adjust an intensity of the directional light sources to reduce the glare (Fig. 2, at 12).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Chang regarding preventing glare (Chang, paragraph 0001) in order to automatically block out glare (Chang, paragraph 0005).

Morgan as modified discloses a light fixture but Morgan arguably may not explicitly disclose directional light sources.

Lys discloses where one or more light sources are directional (e.g., Fig. 28C, paragraph 0206).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys regarding directional lights (Lys, paragraph 0206) in order to permit the

light module to conform to an environment within which it is placed (Lys, paragraph 0206).

Claims 8-17 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) in further view of Amerson (US 6,379,022).

Regarding claim 8 Morgan discloses an illuminating device which provides light to meet an illumination requirement of an illuminated area in which visual activities are performed, comprising:

a light fixture (Fig. 2, at 24) including a multiplicity of light sources (Fig. 2, at 36A, 38A, 40A, paragraph 0020), a controller (paragraph 0022) for adjusting a light intensity (paragraph 0040) and a direction (paragraphs 0019-0020) of each of the directional light sources;

a processor (Fig. 2, at 22) with stored algorithms (paragraph 0040) and data for identifying at least one of (i) tasks being carried out by people, (ii) location of people (paragraph 0022), (iii) frequency of area usage by people, (iv) traffic density in the illuminated area from the sensed geometry, (v) work surfaces, (vi) road objects, people and/or vehicles, and (vii) roadway surface luminance any of which is used by said processor for determining illumination within the illuminated area using at least one of artificial intelligence (paragraph 0025), pattern recognition, video analytics, and look-up tables wherein said processer, upon calculating the required illumination parameters,

directs the controller to adjust the directional light sources to meet the illumination requirements of the visual activities (paragraph 0020).

Morgan discloses two light sources but may not explicitly disclose including at least two directional light sources pointing in different directions.

Lys discloses including at least two directional light sources pointing in different directions (e.g., Fig. 28C, paragraph 0206) the light fixture having movable structure for aiming the light sources mounted thereon in a defined direction (e.g. Fig 90A, at 2010, paragraphs 0325-0326)

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys regarding directional light sources (Lys, paragraph 0206) in order to permit the light module to conform to an environment within which it is placed (Lys, paragraph 0206).

Morgan does not disclose a camera for obtaining images of the illuminated area functioning as a detector for at least one of (i) a light detector (ii) a spectrum detector, (iii) a motion detector, (iv) a measuring detector for sensing a geometry of the illuminated area, and (v) a detector for sensing at least one of work surfaces and road objects and at least one of vehicles and people; a controller for adjusting a light intensity and a direction of each of the directional light sources.

Amerson discloses a camera (column 3, lines 17-26) for obtaining images of the illuminated area functioning as a detector for at least one of (i) a light detector (column 3, lines 17-26) (ii) a spectrum detector, (iii) a motion detector, (iv) a measuring detector

for sensing a geometry of the illuminated area, and (v) a detector for sensing at least one of work surfaces and road objects and at least one of vehicles and people.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Amerson regarding cameras used with LEDs (Amerson, column 3, lines 17-26) in order to vary the light output of the LEDs (Amerson, column 2, lines 29-33).

Regarding claim 9 Morgan further discloses the illuminating device of claim 8, further comprising the illumination requirement that different parts of the illuminated area to be illuminated at a different intensity and/or at a different spectrum than another part of the illuminated area (e.g., paragraphs 0020-0023).

Regarding claim 10 Morgan discloses the illuminating device of claim 8.

Morgan may not explicitly disclose the illuminating device of claim 8, adjustable by an installer based on room geometry and/or usage further comprising the light fixture having adjustable arms on which directional light sources are mounted for aiming the directional light sources within the illuminated area, where said detector and processor combination provides feedback to the installer so as to aim the light sources such that the illumination requirements can be met by the re-adjusted light source aimings.

Lys discloses an adjustable by an installer based on room geometry and/or usage further comprising the light fixture having adjustable arms (paragraphs 0325-0326) on which directional light sources are mounted for aiming the directional light

sources within the illuminated area, where said detector and processor combination provides feedback (e.g., paragraphs 0256, 0281) to the installer so as to aim the light sources such that the illumination requirements can be met by the re-adjusted light source aimings (paragraphs 0281, 0325-0326).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys regarding directional light sources (Lys, paragraph 0206) in order to permit the light module to conform to an environment within which it is placed (Lys, paragraph 0206).

Regarding claim 11 Morgan further discloses the illumination device of claim 8.

Morgan does not disclose wherein the controller receives real time information from the camera and wherein the processor, using image recognition capability, directs the controller to adjust at least one of (i) the intensity, (ii) the spectral light distribution and, (iii) the direction of the light sources based on at least one of (i) where people requiring illumination are located, (ii) what object the person is viewing and (iii) what visual task the person needs to perform.

Amerson discloses wherein the controller receives real time information from the camera (column 1, lines 11-12) and wherein the processor (column 3, lines 14-25), using image recognition capability, directs the controller to adjust at least one of (i) the intensity (column 2, lines 27-38), (ii) the spectral light distribution and, (iii) the direction of the light sources based on at least one of (i) where people requiring illumination are

located, (ii) what object the person is viewing and (iii) what visual task the person needs to perform.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Amerson regarding cameras used with LEDs (Amerson, column 3, lines 17-26) in order to vary the light output of the LEDs (Amerson, column 2, lines 29-33).

Regarding claim 12 Morgan discloses the illumination device of claim 8.

Morgan may not explicitly disclose at least one of the directional light sources mounted on the movable structure where the movement of the light source direction is automatically controlled by the controller.

Lys discloses at least one of the directional light sources mounted on the movable structure where the movement of the light source direction is automatically controlled by the controller (paragraphs 0325-0326).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys regarding directional light sources (Lys, paragraphs 0206, 0325-0326) in order to permit the light module to conform to an environment within which it is placed (Lys, paragraph 0206).

Regarding claim 13 Morgan further discloses the illumination device of claim 12, providing a different illumination to a sub-area based on usage wherein the controller

interpreting images from the sensor adjusts the moveable light sources such that they provide the required illumination in a sub-area proximate to the individuals as they move around in the illuminated area (paragraph 0019).

Morgan discloses using sensors but does not explicitly disclose using a camera.

Amerson discloses using a camera (Amerson, column 3, lines 17-26).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Amerson regarding cameras used with LEDs (Amerson, column 3, lines 17-26) in order to vary the light output of the LEDs (Amerson, column 2, lines 29-33).

Regarding claim 14 Morgan further discloses the illumination device of claim 8, wherein the illuminated area is a road and the objects include road signs (paragraph 0018 – the Examiner interprets “outdoor environments" as reading on this claim).

Regarding claim 15 Morgan discloses the illumination device of claim 8.

Morgan does not disclose at least one of the directional light sources on an automatic swivel joint and providing spot lights of limited beam angle for task lighting but Morgan discloses other light source that provide general illumination to the illuminated area (paragraph 0023).

Lys discloses at least one of the directional light sources on an automatic swivel joint (e.g., Fig. 90A, at 2034) and providing spot lights of limited beam angle for task

lighting while other light source provide general illumination to the illuminated area (paragraphs 0256, 0326).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys regarding directional light sources (Lys, paragraph 0206) and spot lights (paragraph 0326) in order to permit the light module to conform to an environment within which it is placed (Lys, paragraph 0206).

Regarding claim 16 Morgan discloses the illumination device of claim 8.

Morgan does not explicitly disclose a controller with communication capability to other devices, where the camera in one location obtains information and the controller process the information and communicates the camera obtained information to a second device.

Lys discloses a controller (Fig. 90A, at 2012) with communication capability to other devices (paragraph 0328), where the camera (paragraph 0327) in one location obtains information and the controller process the information and communicates the camera obtained information to a second device (paragraphs 0326-0328).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys regarding directional light sources (Lys, paragraph 0206) and cameras (Lys, paragraph 0327) in order to permit the light module to conform to an environment

within which it is placed (Lys, paragraph 0206) in improve the accuracy of such systems (Lys, paragraph 0327).

Regarding claim 17 Morgan as modified further discloses the illumination device of claim 16 where the illuminated area is a road (paragraph 0018 “outdoor environments”).

Morgan does not disclose where the second device to where the camera obtained information is communicated to is a lighting fixture.

Lys discloses where the illuminated area is a road (paragraph 0245) and where the second device to where the camera obtained information is communicated to is a lighting fixture (Fig. 90A, paragraphs 0326-0328).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys regarding directional light sources (Lys, paragraph 0206) and cameras (Lys, paragraph 0327) in order to permit the light module to conform to an environment within which it is placed (Lys, paragraph 0206) and improve the accuracy of such systems (Lys, paragraph 0327).

Claims 18-19 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) in further view of Amerson (US 6,379,022) as applied to claim 17 above, and further in view of Lemelson (US 5,983,161).

Regarding claim 18 Morgan discloses the illumination device of claim 17,

Morgan as modified may not disclose where the processor uses information obtained from the cameras and exchanged between fixtures for identifying traffic requirements in the illuminated area and from the vehicles locations and geometry determining the illumination requirements of the illumination area thereby directing the controller to adjust the directional light sources to meet the illumination requirements.

Lemelson discloses where the processor uses information obtained from the cameras and exchanged between fixtures for identifying traffic requirements in the illuminated area and from the vehicles locations and geometry determining the illumination requirements of the illumination area thereby directing the controller to adjust the directional light sources to meet the illumination requirements (e.g., column 20, line 55 – column 21, line 14).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys regarding directional light sources and cameras and in further accordance with Lemelson regarding cameras used in identifying traffic requirements in order to optimize the prevention of injury or damage (Lemelson, column 1, lines 45-50).

Regarding claim 19 Morgan as modified discloses the illumination device of claim 18.

Morgan may not disclose wherein the controller is programmed to adjust at least one of (i) increase illumination with an approach of a vehicle, and (ii) change beam cut-off levels as the vehicle advances toward the lighting fixture to eliminate glare.

Lemelson discloses wherein the controller is programmed to adjust at least one of (i) increase illumination with an approach of a vehicle (e.g., column 20, line 55 – column 21, line 14), and (ii) change beam cut-off levels as the vehicle advances toward the lighting fixture to eliminate glare.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys regarding directional light sources and cameras and in further accordance with Lemelson regarding cameras used in identifying traffic requirements in order to optimize the prevention of injury or damage (Lemelson, column 1, lines 45-50).

Claims 20-26 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646).

Regarding claim 20 Morgan discloses an automated irradiating device for providing radiation to individuals within an area intended to provide a desired radiation in a sub-area proximate to the individuals, comprising:

an irradiation fixture (Fig. 2, at 36A) including one or more directional radiation sources (paragraph 0023) where the radiation is in a defined direction (paragraph

[0045]); at least one detector (Fig. 2, at 42) for sensing a location of individuals in the area and transferring that information to a controller (paragraph 0023);

where said controller (Fig. 2, at 26A) for adjusting at least one of (i) a radiation intensity (paragraph 0020), and (ii) a direction of the irradiation based on sensed location, whereby the desired radiation is provided proximate to individuals in the area (paragraph 0020).

Morgan discloses a light fixture but Morgan arguably may not explicitly disclose directional light sources.

Lys discloses a light fixture including a multiplicity of directional light sources including at least two light sources pointing in different directions (e.g., Fig. 28C, paragraph 0206).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the lighting network disclosed by Morgan in accordance with the teaching of Lys regarding directional lights (Lys, paragraph 0206) in order to permit the light module to conform to an environment within which it is placed (Lys, paragraph 0206).

Regarding claim 21 Morgan as modified discloses the automated irradiating device of claim 20 intended to provide a desired heating to one or more individuals in an area.

Morgan may not explicitly disclose: at least two directional heat radiation sources pointing in different directions; the detector being a camera with capability for sensing at

least one of (i) a presence of one or more individuals in the heated area, (ii) the identity of the individuals, and (iii) a body temperature of individuals present in the heated area; the controller further having processing capability for determining the heating requirements of the individuals in the area from at least one of (i) algorithms to calculate radiation parameters, (ii) stored data of heating practices, (iii) image recognition algorithms for identifying the individual based on the camera information, and (iv) an identified individual's personal preferences.

Lys discloses: at least two directional heat radiation sources pointing in different directions (e.g., Fig. 28C); the detector being a camera (paragraph 0327) with capability for sensing at least one of (i) a presence of one or more individuals in the heated area (paragraph 0326), (ii) the identity of the individuals, and (iii) a body temperature of individuals present in the heated area; the controller further having processing capability for determining the heating requirements of the individuals in the area from at least one of (i) algorithms to calculate radiation parameters (paragraphs 0326-0327), (ii) stored data of heating practices, (iii) image recognition algorithms for identifying the individual based on the camera information, and (iv) an identified individual's personal preferences (paragraph 0328).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the illuminating system disclosed by Morgan in accordance with the teaching of Lys regarding light therapy (Lys, paragraph 0360) in order to improve a patient’s health or well-being (Lys, paragraph 0361).

Regarding claim 22 Morgan discloses the automated irradiating device of claim 20.

Morgan may not explicitly disclose one or more directional radiation sources capable of being moved so as to direct radiation in a defined direction; the at least one detector capable of providing information on the present location of individuals in the area; the controller programmed to process the detector information and move the radiating sources so as to follow the one or more individuals, whereby the desired radiation is provided in a sub-area substantially proximate to the individuals.

Lys discloses one or more directional radiation sources capable of being moved so as to direct radiation in a defined direction (e.g., Fig. 28C); the at least one detector (paragraph 0321) capable of providing information on the present location of individuals in the area (paragraph 0367); the controller (paragraph 0315) programmed to process the detector information and move the radiating sources so as to follow the one or more individuals, whereby the desired radiation is provided in a sub-area substantially proximate to the individuals (paragraph 0314).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the illuminating system disclosed by Morgan in accordance with the teaching of Lys regarding light therapy (Lys, paragraph 0360) in order to improve a patient's health or well-being (Lys, paragraph 0361).

Regarding claim 23 Morgan discloses the irradiation device of claim 21.

Morgan may not explicitly disclose wherein the detector being a camera capable of providing images of different parts of the body of individuals to the controller for image processing the radiation sources being able to direct radiation to different parts of the body and the controller further programmed to run the image recognition algorithms to identify different parts of the body, to compute the desired radiation level to the different parts of the body and to adjust the radiation from sources directed at the different parts of the body.

Lys discloses wherein the detector being a camera (paragraph 0327) capable of providing images of different parts of the body of individuals to the controller for image processing (paragraph 0360), the radiation sources being able to direct radiation to different parts of the body (paragraph 0361) and the controller further programmed to run the image recognition algorithms to identify different parts of the body (paragraphs 0309-0310), to compute the desired radiation level to the different parts of the body and to adjust the radiation from sources directed at the different parts of the body (paragraphs 0309, 0362).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the illuminating system disclosed by Morgan in accordance with the teaching of Lys regarding light therapy (Lys, paragraph 0360) in order to improve a patient's health or well-being (Lys, paragraph 0361).

Regarding claim 24 Morgan further discloses the irradiation device of claim 21, further comprising the controller programmed to control the irradiation in time and

intensity on the individual to maintain comfortable heating based on at least one of (i) best practices, (ii) feedback from the heat detector configured to detect body temperature of different parts of a body, (iii) personal preferences input to the controller and stored in memory, and (iv) commands input from an input device (paragraphs 0016-0024).

Regarding claim 25 Morgan discloses the irradiation device of claim 21. Morgan also discloses where controller aims the radiation sources to the location where the individual is located and controls the time and intensity of the radiation (e.g. paragraphs 0016-0024).

Morgan does not disclose where the irradiation instead of for heat is for therapeutic purposes and the radiation may be any of (i) UV radiation, (ii) red light therapy in the 620-660 nm range, and (iii) light therapy for SAD and other disorders.

Lys discloses where the irradiation instead of for heat is for therapeutic purposes and the radiation may be any of (i) UV radiation, (ii) red light therapy in the 620-660 nm range, and (iii) light therapy for disorders selected from the group consisting of seasonal affective disorder, sleep disorders, circadian rhythm disorders, delayed sleep phase syndrome, vitamin D deficiency and skin disorders, and other disorders (paragraph 0360).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the illuminating system disclosed by Morgan in accordance with the

teaching of Lys regarding light therapy (Lys, paragraph 0360) in order to improve a patient's health or well-being (Lys, paragraph 0361).

Regarding claim 26 Morgan discloses the automated irradiating device of claim 20 further comprising where one or more of the irradiating sources is radiating visible light (e.g., paragraphs 0016-0024, Fig. 2, at 36A) and one or more of the irradiating sources is designed to substantially radiate heat (paragraphs 0016-0024) the Examiner views light sources as heat sources) whereby the device is capable of providing both a desired light and heat radiation to the individuals (paragraphs 0016-0024).

Response to Arguments

Applicant's arguments filed 9/23/2015 have been fully considered but they are not persuasive.

First, the claims are read with the broadest reasonable interpretation. For Example, regarding claim 1 the Examiner notes the recited claimed language "1. An illuminating device which produces light to meet an illumination requirement of an illuminated area, comprising: a light fixture including a multiplicity of directional light sources including **at least two light sources** pointing in different directions, the light sources having **at least one of** controllable light intensity and spectral light distribution; a controller for adjusting at least one of a light intensity and light spectrum of the directional light sources; one or more detectors for sensing at least one of objects,

surfaces and people within the illuminated area and of passing the sensed information to the controller; a processor for processing the sensed information and determining illumination requirements of the **at least one of** objects and people using **at least one of** artificial intelligence, pattern recognition, video analytics, and look-up tables and for directing the controller to adjust the directional light sources to meet the illumination requirement" is interpreted much more narrowly than is appropriate.

The multiple uses of the language "**at least one of**" greatly expands the scope of the claim. Furthermore, the recitation "a light fixture including a multiplicity of directional light sources including at least two light sources pointing in different directions" is an example of language that can be broadly interpreted. The claimed language merely requires a light fixture with two lights pointed in different directions. The Applicant appears to suggest a more complex lighting device in the Specification but the claims as written are too broad.

For another example Applicant argues on page 9 that claim 7 is amended by adding the recitation "where one or more light sources are directional" to describe the features recited in the Specification [paragraph 0249] where "in a preferred embodiment of this invention the lighting fixture is equipped with a camera vision system comprised of the digital camera and logical controller having computer algorithms for performing computer vision and has the capability of identifying eyes of occupants in a room…". The Examiner suggests adding the features described in [paragraph 0249] directly into claim 7. The amended claim language "where one or more light sources are directional" does not describe the features found in paragraph 0249 of the Specification as argued

by the Applicant. Also, amending the claim to add "where one or more light sources are directional" is not novel. Directional lighting is universal.

These examples are meant as general guidance.

Continuing to the Response to Arguments:

Regarding claims 1 and 3 in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., page 11, at lines 31-37) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

In response to applicant's argument that there is no teaching, suggestion, or motivation to combine the references, the examiner recognizes that obviousness may be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988), *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992), and *KSR International Co. v. Teleflex, Inc.*, 550 U.S. 398, 82 USPQ2d 1385 (2007). In this case, regarding Applicant's argument that there is no motivation to combine the Examiner notes that the Applicant is reading the Specification into the claim. Furthermore, the

Examiner maintains the all of the original motivations to combine provided in the most recent Office Action sent June 23, 2015.

Regarding claim 2 in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., page 13, at lines 29-30 re: "spatially differentiated sensors") are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Regarding claim 4 in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., page 14, at lines 19-21) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Regarding claim 4 in response to applicant's argument that there is no teaching, suggestion, or motivation to combine the references, the examiner recognizes that obviousness may be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988), *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992), and *KSR International Co. v. Teleflex, Inc.*, 550 U.S. 398, 82 USPQ2d 1385

(2007). In this case, pattern recognition is knowledge generally known in the art. The use of pattern recognition in combination with a lighting network merely requires a matching of a data input to a data output.

Regarding claim 5 in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., page 15, at lines 14-19) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993

Regarding claim 6 in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., page 16, at lines 30-34) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Regarding claim 7 in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., page 17, at lines 12-16) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Furthermore, the applicant argues that Chang does not

mention the word “glare" but the title of Chang’s patent publication states "Vehicle Automatic Anti-Glare Device".

Regarding claims 8-17 in response to applicant's argument that the references fail to show “two directional light sources pointing in a different direction" the Examiner respectfully notes that the broadest reasonable interpretation of the recited claim language merely requires two lights pointing in a different direction.

Regarding claim 9 in response to applicant's argument that the references fail to show certain features of applicant’s invention, it is noted that the features upon which applicant relies (i.e., page 18, at lines 40-42) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Regarding claim 10 in response to applicant's argument that the references fail to show certain features of applicant’s invention, it is noted that the features upon which applicant relies (i.e., page 19, at lines 26-41) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Regarding claim 11 in response to applicant's argument that the references fail to show certain features of applicant’s invention, it is noted that the features upon which applicant relies (i.e., page 20, at lines 33-38) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the

specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Regarding Applicant's argument that there is no motivation to combine the Examiner notes that the Applicant is reading the Specification into the claim.

Regarding claim 12 in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., page 17, at lines 12-16) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Regarding claim 13 in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., page 21, at lines 30-40) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Regarding claim 14 in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., page 22, at lines 10-15) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Regarding claim 15 in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., page 21, at lines 29-41) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Regarding claim 16 in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., page 23, at lines 23-31) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Regarding claim 17 in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., page 24, at lines 9-16) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Regarding claims 18-19 in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., page 25, at lines 8-11 re: "a light fixture knowing") are not recited in the rejected claim(s). Although the claims are interpreted in light of the

specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Regarding the Applicant's argument that the word "glare" does not appear anywhere the Examiner notes the recited claimed language " wherein the controller is programmed to adjust **at least one of** (i) increase illumination with an approach of a vehicle (e.g., column 20, line 55 – column 21, line 14), and (ii) change beam cut-off levels as the vehicle advances toward the lighting fixture to eliminate glare."

Regarding claims 20-26 in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., page 24, at lines 23-34) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Regarding claim 21 in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., page 26, at lines 7-8 re: "sensing detector") are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Regarding Applicant's argument that there is no motivation to combine the Examiner notes that the Applicant is reading the Specification into the claim. Furthermore, the Examiner does not follow the reasoning outlined by the Applicant on page 26, lines 5-7 concerning that "the robotic vision" is an

alternate use of “the lighting entertainment system”. Lys discloses the robotic vision system as a separate and distinct concept from the lighting entertainment system.

Regarding claim 22 in response to applicant's argument that the references fail to show certain features of applicant’s invention, it is noted that the features upon which applicant relies (i.e., page 26, at lines 16-18 re: “providing coordinate data to a processor running algorithms to follow or track around the room”) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Finally, the claim recites in part " with capability for sensing **at least one of**…". The Applicant is arguing features that are missing because the claim requires only one of the recited claimed features - not all.

Regarding claim 23 in response to applicant's argument that the references fail to show certain features of applicant’s invention, it is noted that the features upon which applicant relies (i.e., page 26, at lines 25-28) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Regarding claim 24 in response to applicant's argument that the references fail to show certain features of applicant’s invention, it is noted that the features upon which applicant relies (i.e., page 27, at lines 11-21) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26

USPQ2d 1057 (Fed. Cir. 1993). Regarding Applicant's argument that there is no device that produces heat the Examiner under the broadest reasonable interpretation of the claims interprets the “irradiation device” as a lighting device. Lighting devices produce heat.

Regarding claim 25 in response to applicant's argument that the references fail to show certain features of applicant’s invention the Examiner notes that Applicant’s arguments regarding claims 21-23 are unclear or in error. Furthermore, the Applicant refers to claim 2 regarding "spatial differentiation". The arguments provided for claim 2 applies here.

Regarding claim 26 in response to applicant's argument that the references fail to show certain features of applicant’s invention, it is noted that the features upon which applicant relies (i.e., page 28, at lines 14-18) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID LOTTER whose telephone number is (571)270-7422. The examiner can normally be reached on Monday-Friday 7:30am-5PM (off every other Friday).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alex Taningco can be reached on 571-272-8048. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/DAVID LOTTER/
Examiner, Art Unit 2844

/ALEXANDER H TANINGCO/
Supervisory Patent Examiner, Art Unit 2844

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13357549	SPERO, YECHEZKAL EVAN
	Examiner	Art Unit
	DAVID LOTTER	2844

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
315	152	8/19/2014	dl
362	276, 234	8/19/2014	dl

SEARCH NOTES		
Search Notes	Date	Examiner
inventor search	8/19/2014	dl
class subclass search	8/19/2014	dl
text search	8/19/2014	dl
consulted TQAS regarding priority date	1/21/2015	dl
second search	3/9/2015	dl

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13357549	SPERO, YECHEZKAL EVAN
	Examiner	Art Unit
	DAVID LOTTER	2844

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	08/12/2014	01/15/2015	09/25/2015						
	1	✓	✓	✓						
	2	✓	✓	✓						
	3	✓	✓	✓						
	4	✓	✓	✓						
	5	✓	✓	✓						
	6	✓	✓	✓						
	7	✓	✓	✓						
	8	✓	✓	✓						
	9	✓	✓	✓						
	10	✓	✓	✓						
	11	✓	✓	✓						
	12	✓	✓	✓						
	13	✓	✓	✓						
	14	✓	✓	✓						
	15	✓	✓	✓						
	16	✓	✓	✓						
	17	✓	✓	✓						
	18	✓	✓	✓						
	19	✓	✓	✓						
	20	✓	✓	✓						
	21	✓	✓	✓						
	22	✓	✓	✓						
	23	✓	✓	✓						
	24	✓	✓	✓						
	25	✓	✓	✓						
	26	✓	✓	✓						

Electronic Patent Application Fee Transmittal

Application Number:	13357549
Filing Date:	24-Jan-2012
Title of Invention:	Detector Controlled Illuminating System
First Named Inventor/Applicant Name:	Yechezkal Evan Spero
Filer:	Yechezkal Evan Spero
Attorney Docket Number:	

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 1 month with $0 paid	2251	1	100	100
Miscellaneous:				
		Total in USD ($)		**100**

Electronic Acknowledgement Receipt

EFS ID:	24531550
Application Number:	13357549
International Application Number:	
Confirmation Number:	1905
Title of Invention:	Detector Controlled Illuminating System
First Named Inventor/Applicant Name:	Yechezkal Evan Spero
Customer Number:	37268
Filer:	Yechezkal Evan Spero
Filer Authorized By:	
Attorney Docket Number:	
Receipt Date:	05-JAN-2016
Filing Date:	24-JAN-2012
Time Stamp:	16:04:10
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$100
RAM confirmation Number	2564
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Fee Worksheet (SB06)	fee-info.pdf	29742 2ab78e52835b45fd2f7350433200e95786473927	no	2

Warnings:	
Information:	
Total Files Size (in bytes):	29742

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.

In the United States Patent and Trademark Office

Application/CN: 13/357,549 Friday, February 5, 2016
Application Filed: 24 January 2012
Applicant: Spero, Yechezkal Evan
Title: Detector Controlled Illuminating System
Examiner: Lotter, David E
Art Unit: 2844

Reply to Final Office Action dated October 5, 2015

Mailstop: Amendment

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Dear Sir:

The application is being prosecuted by the Applicant pro se.

Certificate of Transmission Under 37 C.F.R. § 1.8

I hereby certify that this correspondence is being deposited electronically with the U.S. Patent and Trademark Office using the United States Patent and Trademark Office's EFS-Web system on **Feb 5, 2016**.

Signature

/Yechezkal Evan Spero/

Yechezkal Evan Spero

AMENDMENT UNDER 37 C.F.R. §1.111

In response to the Office Action mailed October 5, 15, the following amendments and remarks are respectfully submitted in connection with the above-identified application.

Amendments to the Claims begin on page 2 of this Amendment.

Remarks begin on page 9 of this Amendment.

	Claims remaining after Amendment		**Highest number previously paid for**		**Present extra**
Total	26	-	20	=	0
Independent	4	-	4	=	0

AMENDMENTS TO THE CLAIMS

The following is a complete, marked-up listing of revised claims with a status identifier in parenthesis, underlined text indicating insertions, and strike through indicating deletions.

Full list of claims per 37 CFR 1.121

1. (Currently amended) A~~n~~ light fixture ~~illuminating device which produces light to meet~~ for illuminating an area to be lit capable of automatically meeting specific ~~an~~ illumination requirements of different sub-areas within the area to be lit ~~an illuminated area~~, comprising:
   a. a ~~light fixture including~~ multiplicity of independently controllable ~~directional~~ light sources, including at least two light sources ~~pointing in different directions~~of directional light output, such that each said source substantially illuminates a different sub-area within the area to be lit, the light sources having at least one of controllable light intensity and spectral light distribution;
   b. a controller for adjusting at least one of a light intensity and light spectrum of the light sources;
   c. one or more detectors for sensing at least one of objects, surfaces and ~~people~~ beings within the ~~illuminated~~ area to be lit including the specific sub-area location information and of passing the sensed information to the controller;
   d. a processor for processing the sensed information and determining illumination requirements of the at least one of objects, surfaces and ~~people~~ beings using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables and for directing the controller to adjust the light source for that sub-area to meet the specific illumination requirement.

2. (Original) The illuminating device of claim 1 where the detector is comprising at least one of (i) a camera being a photo sensor array coupled with an optical lens, (ii) a photo sensor, (iii) an ultrasound transducer and sensor, (iv) microwave

transducer and sensor, and (v) pyroelectric detectors.

3. (Currently amended) The illumination device of claim 1, wherein the illuminated area is indoors and further comprising a detector for detecting variable illumination from daylight and/or sunlight entering indoors, wherein the controller taking into consideration the intensity variations over the area now illuminated by the daylight and/or sunlight adjusts the light intensity of the directional light sources to meet the varied illumination requirement.

4. (Original) The illuminating device of claim 1, wherein the one or more detectors detects information regarding one or more individuals within the illuminated area, said information is at least one of (i) age, (ii) sex, and (iii) recognition of an individual for matching with stored data about that individual's needs and wherein the controller adjusts the light intensity and/or spectrum of the illumination provided to the one or more individuals based on illumination requirements from at least one of (i) best practices looked up and calculated from stored data, (ii) age and/or sex of the individual, (iii) personal preferences input to the controller and stored in memory, and (iv) commands received by the controller from an input device.

5. (Currently amended) The illuminating device of claim 1 for optimally displaying food, wherein the one or more detectors detect an identity of one or more foods in a sub-area and wherein the controller adjusts the light intensity and/or spectrum of the illumination on the one or more foods based on illumination requirements from the processor.

6. (Currently amended) An illuminating device having automatic control of the light provided to an illuminated area comprising: a structure for incorporating illuminating device elements; one or more light sources incorporated in the structure and in communication with a power source; electronic circuitry apparatus for the controlled powering of the light source and other illuminating

device elements; one or more cameras placed on the structure for detecting coordinate-specific information about the illuminated area, said camera in communication with power and control device elements; a controller integrated with the structure, in communication with the light source controlling power circuitry, said controller arranged to processes the information communicated from the camera and automatically control the light provided to the illuminated area.

7. (currently amended) The illumination device of claim 6, where one or more light sources are directional wherein the one or more detectors are configured to sense a presence of glare on a person's eyes in the illuminated area, and wherein the controller is programmed to adjust an intensity of the directional light sources to reduce the glare.

8. (Currently amended) An illuminating device which provides light to meet an illumination requirement of an illuminated area in which visual activities are performed, where different sub-areas of the illuminated area need to be illuminated at a different intensity and/or at a different spectrum than another sub-area of the illuminated area, comprising: a light fixture including a multiplicity of directional light sources including at least two directional light sources pointing in different directions thereby illuminating different sub-areas of the illuminated area, the light fixture having movable structure for aiming the directional light sources mounted thereon in a defined direction; a camera for obtaining images of the illuminated area functioning as a detector for at least one of (i) a light detector (ii) a spectrum detector, (iii) a motion detector, (iv) a measuring detector for sensing a geometry of the illuminated area, and (v) a detector for sensing at least one of work surfaces and road objects and at least one of vehicles and people; a controller for adjusting a light intensity and a direction of each of the directional light sources; a processor with stored algorithms and data for identifying at least one of (i) tasks being carried out by people, (ii) location of people, (iii) frequency of area usage by people, (iv) traffic density in the illuminated area from the sensed geometry, (v) work surfaces, (vi) road

objects, people and/or vehicles, and (vii) roadway surface luminance any of which is used by said processor for determining illumination within the illuminated area using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables wherein said processer, upon calculating the required illumination parameters according to best practice standards, directs the controller to adjust the directional light sources that illuminates the specific sub-areas to meet the illumination requirements of the visual activities.

~~9.~~(Canceled) The illuminating device of claim 8, further comprising the illumination requirement that different parts of the illuminated area to be illuminated at a different intensity and/or at a different spectrum than another part of the illuminated area.

~~10~~9. (Original) The illuminating device of claim 8, adjustable by an installer based on room geometry and/or usage further comprising the light fixture having adjustable arms on which directional light sources are mounted for aiming the directional light sources within the illuminated area, where said detector and processor combination provides feedback to the installer so as to aim the light sources such that the illumination requirements can be met by the re-adjusted light source aimings.

~~11~~10. (Original) The illumination device of claim 8, wherein the controller receives real time information from the camera and wherein the processor, using image recognition capability, directs the controller to adjust at least one of (i) the intensity, (ii) the spectral light distribution and, (iii) the direction of the light sources based on at least one of (i) where people requiring illumination are located, (ii) what object the person is viewing and (iii) what visual task the person needs to perform.

~~12~~11. (Original) The illumination device of claim 8, further comprising at least one of the directional light sources mounted on the movable structure where the movement of the light source direction is automatically controlled by the controller.

~~13~~12. (Original) The illumination device of claim ~~12~~11, providing a different

illumination to a sub-area based on usage wherein the controller interpreting images from the camera adjusts the moveable light sources such that they provide the required illumination in a sub-area proximate to the individuals as they move around in the illuminated area.

~~14~~13. (Original) The illumination device of claim 8, wherein the illuminated area is a road and the objects include road signs.

~~15~~14. (Original) The illumination device of claim 8, further comprising at least one of the directional light sources on an automatic swivel joint and providing spot lights of limited beam angle for task lighting while other light source provide general illumination to the illuminated area.

~~16~~15. (Original) The illumination device of claim 8, further comprising a controller with communication capability to other devices, where the camera in one location obtains information and the controller process the information and communicates the camera obtained information to a second device.

~~17~~16. (Original) The illumination device of claim ~~16~~15, where the illuminated area is a road and the second device to where the camera obtained information is communicated to is a lighting fixture.

~~18~~17. (Original) The illumination device of claim ~~17~~16, where the processor uses information obtained from the cameras and exchanged between fixtures for identifying traffic requirements in the illuminated area and from the vehicles locations and geometry determining the illumination requirements of the illumination area thereby directing the controller to adjust the directional light sources to meet the illumination requirements.

~~19~~18. (Original) The illumination device of claim ~~18~~17, wherein the controller is programmed to adjust at least one of (i) increase illumination with an approach of a

vehicle, and (ii) change beam cut-off levels as the vehicle advances toward the lighting fixture to eliminate glare.

~~20~~19. (Original) An automated irradiating device for providing radiation to individuals within an area, intended to provide a desired radiation in a sub-area proximate to the individuals, comprising: an irradiation fixture including one or more directional radiation sources where the radiation is in a defined direction; at least one detector for sensing a location of individuals in the area and feeding transferring that information to a controller; a where said controller for adjusting adjusts at least one of (i) a radiation intensity, and (ii) a direction of the irradiation based on sensed location, whereby the desired radiation is provided proximate to individuals in the area.

~~21~~20. (Original) The automated irradiating device of claim 20 intended to provide a desired heating to one or more individuals in an area, further comprising: at least two directional heat radiation sources pointing in different directions; the detector being a camera with capability for sensing at least one of (i) a presence of one or more individuals in the heated area, (ii) the identity of the individuals, and (iii) a body temperature of individuals present in the heated area; the controller further having processing capability for determining the heating requirements of the individuals in the area from at least one of (i) algorithms to calculate radiation parameters, (ii) stored data of heating practices, (iii) image recognition algorithms for identifying the individual based on the camera information, and (iv) an identified individual's personal preferences.

~~22~~21. (Original) The automated irradiating device of claim 20, further comprising: One or more directional radiation sources capable of being moved so as to direct radiation in a defined direction; the at least one detector capable of providing information on the present location of individuals in the area; the controller programmed to process the detector information and move the radiating sources so as to follow the one or more individuals, whereby the desired radiation is provided in a sub-area substantially proximate to the individuals.

~~23~~22. (Original) The irradiation device of claim 21, further comprising; the detector being a camera capable of providing images of different parts of the body of individuals to the controller for image processing; the radiation sources being able to direct radiation to different parts of the body; and the controller further programmed to run the image recognition algorithms to identify different parts of the body, to compute the desired radiation level to the different parts of the body and to adjust the radiation from sources directed at the different parts of the body.

~~24~~23. (Original) The irradiation device of claim 21, further comprising the controller programmed to control the irradiation in time and intensity on the individual to maintain comfortable heating based on at least one of (i) best practices, (ii) feedback from the heat detector configured to detect body temperature of different parts of a body, (iii) personal preferences input to the controller and stored in memory and (iv) commands input from an input device.

~~25~~24. (Original) The irradiation device of claim 21 where the irradiation instead of for heat is for therapeutic purposes and the radiation may be any of (i) UV radiation, (ii) red light therapy in the 620-660 nm range, and (iii) light therapy for SAD and other disorders selected from the group consisting of seasonal affective disorder, sleep disorders, circadian rhythm disorders, delayed sleep phase syndrome, vitamin D deficiency and skin disorders, where the controller aims the radiation sources to the location where the individual is located and controls the time and intensity of the radiation.

~~26~~25. The automated irradiating device of claim 20 further comprising where one or more of the irradiating sources is radiating visible light and one or more of the irradiating sources is designed to substantially radiate heat whereby the device is capable of providing both a desired light and heat radiation to the individuals.

REMARKS

Favorable reconsideration of this application, in light of the remarks and following amendments, is respectfully requested.

In reply to point 1: Claim Rejections *Claims 1 and 3 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646). Regarding claim 1 Morgan discloses an illuminating device (e.g. paragraph 0019) which produces light to meet an illumination requirement of an illuminated area, comprising: a light fixture (paragraph 0019) including a multiplicity of light sources…*

The applicant has amended claim 1 to explicitly differentiate it from the prior art of Morgan and Lys by stating the requisite spatially differentiated sensing and physical light distribution apparatus needed for the localization of the specifically required lighting or irradiation effect to **a specific sub-area within the overall area to be lit by the lighting fixture as detected by the coordinate specific detection device.** These capabilities are novel to the novel invention and are not obvious form the prior art.

In reply to point 2 **Regarding** *Claim 2 is rejected as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) as applied to claim 1 above, and further in view of Amerson (US 6,379,022). Claim 4 is rejected of Kinjo (US 2002/0046100). and further in view of Zampini (US 2008/0136356) and in further view of Bolle (US 5,546,475). Regarding claim 5, Bolle discloses … Claim 6 is rejected in view of Amerson (US 6,379,022). Regarding claim 7 … Chang discloses*

The applicant has amended claim 1 and thus the dependent claims to explicitly differentiate it from the prior art of Morgan and Lys, Amerson, Zampini, Bolle and Chang by stating the requisite spatially differentiated sensing and physical light distribution apparatus needed for the localization of the specifically required lighting or irradiation effect to **a specific sub-area within the overall area to be lit.** These capabilities are novel to the novel invention and are not obvious form the prior art.

Regarding Claims 8-17 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Morgan (US 2002/0047628) in view of Lys (US 2002/0047646) in further view of Amerson (US 6,379,022) above, and further in view of Lemelson (US 5,983,161).

The applicant has amended claim 8 and thus the dependent claims to explicitly differentiate it from the prior art of Morgan and Lys, Amerson, Lemelson and Chang by stating the requisite spatially differentiated sensing and physical light distribution apparatus needed for the localization of the specifically required lighting or irradiation effect to **a specific sub-area within the overall area to be lit.** These capabilities are novel to the novel invention and are not obvious form the prior art. The applicant has canceled claim 9.

Regarding claim 18 -*25 Morgan discloses the illumination device of claim 17, Morgan as modified may not disclose where the processor uses information obtained from the cameras and exchanged*

The applicant has amended the basic claim and thus the dependent claims to explicitly differentiate it from the prior art of Morgan and Lys, etc. The applicant submits that it would not have been obvious to one of ordinary skill in the art of either heating or illumination at the time of the invention to develop the presently claimed combinational and new use device and the applicant requests that claim 26 be allowed.

Conclusion

The applicant has revised the objected claim and requests that the above claims now be amended as in the new list of claims. The applicant submits that the claims are now in proper form to place the case in condition for allowance which action he respectfully solicits.

Conditional Request for Constructive Assistance

Should the examiner still prefer to have these or any or any other claims amended to more clearly highlight the uniqueness of the present invention, the pro se applicant requests under M.P.E.P. § 2173.02 and §707.07(j) that the examiner should draft one or more claims for the applicant and indicate in his or her action that such claims would be allowed if incorporated in the application by amendment. This request is in order that the

undersigned can place this application in allowable condition as soon as possible and without the need for further proceedings.

Very respectfully,

/ Yechezkal Evan Spero/

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February 5, 2016

Electronic Acknowledgement Receipt

EFS ID:	24831407
Application Number:	13357549
International Application Number:	
Confirmation Number:	1905
Title of Invention:	Detector Controlled Illuminating System
First Named Inventor/Applicant Name:	Yechezkal Evan Spero
Customer Number:	37268
Filer:	Yechezkal Evan Spero
Filer Authorized By:	
Attorney Docket Number:	
Receipt Date:	05-FEB-2016
Filing Date:	24-JAN-2012
Time Stamp:	09:58:36
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Applicant Arguments/Remarks Made in an Amendment	ReplytoFinal_OA_Oct-5-15.pdf	92649 034770af0feb28342a6f04e8c5827fb81967c e0e	no	11
Warnings:					
Information:					

Total Files Size (in bytes):	92649

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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.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/357,549	Filing Date 01/24/2012	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT 02/05/2016

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 26	Minus	** 26	= 0	X $40 =	0
Independent (37 CFR 1.16(h))	* 4	Minus	***4	= 0	X $210 =	0
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	0

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/CHARRISSA BROWN/

This collection of information is required by 37 CFR 1.16. 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 12 minutes 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. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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 NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/357,549	01/24/2012	Yechezkal Evan Spero		1905

37268 7590 02/26/2016

YECHEZKAL EVAN SPERO
74 MOSHAV TIFRACH
M. P. HANEGEV, 85102
ISRAEL

EXAMINER	
LOTTER, DAVID E	

ART UNIT	PAPER NUMBER
2844	

MAIL DATE	DELIVERY MODE
02/26/2016	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Advisory Action Before the Filing of an Appeal Brief	**Application No.** *13/357,549*	**Applicant(s)** SPERO, YECHEZKAL EVAN	
	Examiner DAVID LOTTER	**Art Unit** 2844	**AIA (First Inventor to File) Status** No

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 05 February 2016 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

NO NOTICE OF APPEAL FILED

1. ☒ The reply was filed after a final rejection. No Notice of Appeal has been filed. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance;
(2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114 if this is a utility or plant application. Note that RCEs are not permitted in design applications. The reply must be filed within one of the following time periods:
   a) ☒ The period for reply expires *3* months from the mailing date of the final rejection.
   b) ☐ The period for reply expires on: (1) the mailing date of this Advisory Action; or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.
   c) ☐ A prior Advisory Action was mailed more than 3 months after the mailing date of the final rejection in response to a first after-final reply filed within 2 months of the mailing date of the final rejection. The current period for reply expires months from the mailing date of *the prior Advisory Action* or SIX MONTHS from the mailing date of the final rejection, whichever is earlier.
   Examiner Note: If box 1 is checked, check either box (a), (b) or (c). ONLY CHECK BOX (b) WHEN THIS ADVISORY ACTION IS THE FIRST RESPONSE TO APPLICANT'S FIRST AFTER-FINAL REPLY WHICH WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. ONLY CHECK BOX (c) IN THE LIMITED SITUATION SET FORTH UNDER BOX (c). See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) or (c) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

AMENDMENTS

3. ☒ The proposed amendments filed after a final rejection, but prior to the date of filing a brief, will not be entered because
   a) ☒ They raise new issues that would require further consideration and/or search (see NOTE below);
   b) ☐ They raise the issue of new matter (see NOTE below);
   c) ☐ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
   d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.
   NOTE: _____. (See 37 CFR 1.116 and 41.33(a)).
4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).
5. ☐ Applicant's reply has overcome the following rejection(s): _____.
6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).
7. ☒ For purposes of appeal, the proposed amendment(s): (a) ☒ will not be entered, or (b) ☐ will be entered, and an explanation of how the new or amended claims would be rejected is provided below or appended.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.
9. ☐ The affidavit or other evidence filed after final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).
10. ☐ The affidavit or other evidence filed after the date of filing the Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing of good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).
11. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

12. ☐ The request for reconsideration has been considered but does NOT place the application in condition for allowance because:
_____.
13. ☐ Note the attached Information *Disclosure Statement*(s). (PTO/SB/08) Paper No(s). _____
14. ☐ Other: _____.

STATUS OF CLAIMS

15. The status of the claim(s) is (or will be) as follows:
Claim(s) allowed: .
Claim(s) objected to: .
Claim(s) rejected: 1-26.
Claim(s) withdrawn from consideration: .

/ALEXANDER H TANINGCO/ Supervisory Patent Examiner, Art Unit 2844	/DAVID LOTTER/ Examiner, Art Unit 2844

Continuation of 3. The newly proposed claims submitted 2/05/2016 would require a new search and/or consideration for determining novelty.Furthermore, the claims after cancelled claim 9 are not properly presented. Specifically, claims 10-26 should not be renumbered. They should remain claims 10-26.

DO NOT ENTER: /D.L./

In the United States Patent and Trademark Office

Application/CN: 13/357,549 Friday, February 5, 2016
Application Filed: 24 January 2012
Applicant: Spero, Yechezkal Evan
Title: Detector Controlled Illuminating System
Examiner: Lotter, David E
Art Unit: 2844

Reply to Final Office Action dated October 5, 2015

Mailstop: Amendment

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Dear Sir:

The application is being prosecuted by the Applicant pro se.

Certificate of Transmission Under 37 C.F.R. § 1.8

I hereby certify that this correspondence is being deposited electronically with the U.S. Patent and Trademark Office using the United States Patent and Trademark Office's EFS-Web system on **Feb 5, 2016**.

Signature

/Yechezkal Evan Spero/

Yechezkal Evan Spero

AMENDMENT UNDER 37 C.F.R. §1.111

In response to the Office Action mailed October 5, 15, the following amendments and remarks are respectfully submitted in connection with the above-identified application.

Amendments to the Claims begin on page 2 of this Amendment.

Remarks begin on page 9 of this Amendment.

	Claims remaining after Amendment		**Highest number previously paid for**		**Present extra**
Total	26	-	20	=	0
Independent	4	-	4	=	0

Doc code: RCEX
Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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.

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	15/357,549	Filing Date	2012-01-24	Docket Number (if applicable)		Art Unit	2844
First Named Inventor	Yechezkal Evan Spero			Examiner Name	David E. Lotter		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☒ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

☐ Other _____

☐ Enclosed

☐ Amendment/Reply

☐ Information Disclosure Statement (IDS)

☐ Affidavit(s)/ Declaration(s)

☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months _____ (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

☐ **The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.**
The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to Deposit Account No _____

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

Patent Practitioner Signature

X Applicant Signature

PTO/SB/30EFS (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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.

Applicant Signature			
Applicant 1		Remove	
Signature	/Yechezkal Evan Spero /	Date (YYYY-MM-DD)	2016-05-26
Name	Yechezkal Evan Spero		
Click ADD for additional Applicant Signature		Add	

This collection of information is required by 37 CFR 1.114. 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 12 minutes 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.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	13357549
Filing Date:	24-Jan-2012
Title of Invention:	Detector Controlled Illuminating System
First Named Inventor/Applicant Name:	Yechezkal Evan Spero
Filer:	Yechezkal Evan Spero
Attorney Docket Number:	

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Request for Continued Examination	2801	1	600	600
		Total in USD ($)		**600**

Electronic Acknowledgement Receipt

EFS ID:	25901271
Application Number:	13357549
International Application Number:	
Confirmation Number:	1905
Title of Invention:	Detector Controlled Illuminating System
First Named Inventor/Applicant Name:	Yechezkal Evan Spero
Customer Number:	37268
Filer:	Yechezkal Evan Spero
Filer Authorized By:	
Attorney Docket Number:	
Receipt Date:	26-MAY-2016
Filing Date:	24-JAN-2012
Time Stamp:	17:52:25
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$600
RAM confirmation Number	4555
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	sb0030e_RCE-13-357549.pdf	697615 1e5b4171093b465864e30927d773c3c2b238c2ab	no	3
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30079 917371afd2fd31d69056a6f039dca755ee5e075b	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	727694		

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
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/357,549	01/24/2012	Yechezkal Evan Spero		1905

37268 7590 08/15/2016

YECHEZKAL EVAN SPERO
74 MOSHAV TIFRACH
M. P. HANEGEV, 85102
ISRAEL

EXAMINER	
LE, TUNG X	

ART UNIT	PAPER NUMBER
2844	

MAIL DATE	DELIVERY MODE
08/15/2016	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 13/357,549	Applicant(s) SPERO, YECHEZKAL EVAN	
	Examiner TUNG X. LE	Art Unit 2844	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05/26/2016*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-25* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☒ Claim(s) *8-18* is/are allowed.

7)☒ Claim(s) *1,2,5-7,19,21 and 25* is/are rejected.

8)☒ Claim(s) *3,4,20 and 22-24* is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

This Office Action is in response to the Applicant's request for continued examination (RCE) filed on May 26, 2016. In virtue of this filing, claims 1-25 are now pending in the instant application.

Continued Examination

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 05/26/2016 has been entered.

Claim Objections

2. Claims 1 and 20-25 are objected to because of the following informalities:

Claim 1, in line 16, --and-- should be inserted after "controller;"

Claim 20, in line 1, "claim 20" should be changed to --claim 19--;

Claim 21, in line 1, "claim 20" should be changed to --claim 19--;

Claim 21, in line 2, "One" should be changed to --one--;

Claims 22-24, in line 1, "claim 21" should be changed to --claim 20--;

Claim 25, in line 1, "claim 20" should be changed to --claim 19--;

Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-2, 5-7, 19 and 21-25 are rejected under pre-AIA 35 U.S.C. 102(e) as being anticipated by Kuhlman et al. – US 2012/0287493.

With respect to claim 1, Kuhlman discloses in figure 1 a light fixture for illuminating an area (24) to be lit capable of automatically meeting specific illumination requirements of different sub-areas (22A-22C) within the area to be lit (figure 1), comprising a. multiplicity of independently controllable light sources (12A-12C), including at least two light source (12A-12B) of directional light output (D1-D2), such that each said source substantially illuminates a different sub-area within the area to be lit (see figure 1), the light sources having at least one of controllable light intensity and spectral light distribution (paragraph 0021, e.g., “a pattern of light formed by light distribution patterns 22A-22C may be varied by the controller 16”); b. a controller (16) for adjusting at least one of a light intensity and light spectrum of the light sources (paragraph 0021); c. one or more detectors (40) for sensing at least one of objects (42); surfaces and beings (58) within the area to be lit including the specific sub-area location

information and of passing the sensed information to the controller (figures 1 and 2); d. a processor (paragraph 0016, e.g., the controller 16 may include a processor, not shown") for processing the sensed information and determining illumination requirements of the at least one of objects (42), surfaces and beings using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables and for directing the controller to adjust the light source for that sub-area to meet the specific illumination requirement (see paragraphs 0021-0023).

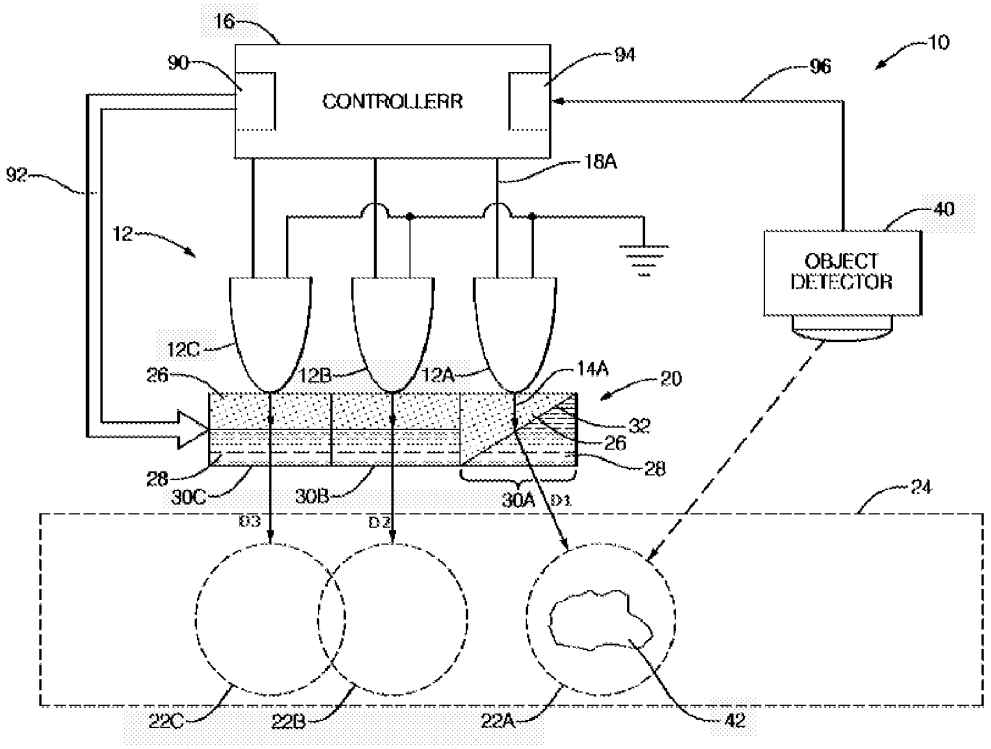


FIG. 1

With respect to claim 2, Kuhlman discloses that where the detector is comprising at least one of (i) a camera being a photo sensor array coupled with an optical lens, (ii)

a photo sensor, (iii) an ultrasound transducer and sensor, (iv) microwave transducer and sensor, and (v) pyroelectric detectors (figure 1, e.g., 40 is a camera photo sensor).

With respect to claim 5, Kuhlman discloses that for optimally displaying food, wherein the one or more detectors detect an identity of one or more foods in a sub-area and wherein the controller adjusts the light intensity and/or spectrum of the illumination on the one or more foods based on illumination requirements from the processor (paragraphs 0017-0018, e.g., the lighting system 10 is being used in indoor or outdoor environment areas).

With respect to claim 6, Kuhlman discloses in figure 1 an illuminating device having automatic control of the light provided to an illuminated area (24) comprising: a structure (10) for incorporating illuminating device elements (12A-12C); one or more light sources (12A) incorporated in the structure and in communication with a power source (having a power supply, not shown, to provide power to light the light sources 12A-12B); electronic circuitry apparatus (12, 26, 40) for the controlled powering of the light source and other illuminating device elements (see figure 1); one or more cameras (40) placed on the structure for detecting coordinate-specific information about the illuminated area (figure 1, e.g., detecting an object 42 or figure 2, e.g., detecting an object 58), said camera in communication with power and control device elements (figure 1 and paragraph 0015); a controller (16) integrated with the structure, in communication with the light source controlling power circuitry, said controller arranged to processes the information communicated from the camera and automatically control the light provided to the illuminated area (see paragraphs 0015-0016).

With respect to claim 7, Kuhlman discloses that where one or more light sources are directional wherein the one or more detectors are configured to sense a presence of glare on a person's eyes in the illuminated area (figure 2, e.g., a person 58), and wherein the controller is programmed to adjust an intensity of the directional light sources to reduce the glare (paragraph 0016).

With respect to claim 19, Kuhlman discloses in figure 1 an automated irradiating device for providing radiation to individuals (22A-22C) within an area (24), intended to provide a desired radiation in a sub-area (22A) proximate to the individuals, comprising: an irradiation fixture (12) including one or more directional radiation sources (12A-12C) where the radiation is in a defined direction (D1); at least one detector (40) for sensing a location (at location 22A) of individuals in the area and feeding transferring that information to a controller (having a sensing signal 96 to provide information to the controller 16); a where said controller (16) for adjusting adjusts at least one of (i) a radiation intensity (paragraph 0005, e.g., “the output is configured for outputting a control signal to an electrowetting lens operable to vary a light distribution pattern of light from a light source arriving in the area …”), and (ii) a direction of the irradiation based on sensed location, whereby the desired radiation is provided proximate to individuals in the area (paragraph 0005).

With respect to claim 21, Kuhlman discloses that further comprising one or more directional radiation sources (30A-30C) capable of being moved so as to direct radiation in a defined direction (see figure 1); the at least one detector capable of providing information on the present location of individuals in the area (figure 1); the

controller programmed to process the detector information and move the radiating sources so as to follow the one or more individuals (paragraph 0016, e.g., “the controller 16 may include a processor, not shown, ... memory, not shown, ... such as electrically erasable programmable read-only memory, EEPROM, for storing one or more routines, thresholds and captured data... "), whereby the desired radiation is provided in a sub-area substantially proximate to the individuals (see figure 1).

With respect to claim 25, Kuhlman discloses that further comprising where one or more of the irradiating sources (30A-30C) is radiating visible light and one or more of the irradiating sources is designed to substantially radiate heat (see figure 1) whereby the device is capable of providing both a desired light and heat radiation to the individuals (see paragraph 0017).

Allowable Subject Matter

5. Claims 8-18 are allowed.

6. Claims 3-4 and 20-24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

7. The following is a statement of reasons for the indication of allowable subject matter:

Prior art of record fails to disclose or fairly suggest the following limitations:

An illuminating …, comprising … “a controller for adjusting a light intensity and a direction of each of the directional light sources; a processor with stored algorithms and data for identifying at least one of (i) tasks being carried out by people, (ii) location of

people, (iii) frequency of area usage by people, (iv) traffic density in the illuminated area from the sensed geometry, (v) work surfaces, (vi) road objects, people and/or vehicles, and (vii) roadway surface luminance any of which is used by said processor for determining illumination within the illuminated area using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables wherein said processer, upon calculating the required illumination parameters according to best practice standards, directs the controller to adjust the directional light sources that illuminates the specific sub-areas to meet the illumination requirements of the visual activities", in combination with the remaining claimed limitations as claimed in independent claim 8 (claims 9-18 would be allowable as being dependent on claim 8).

Response to Arguments

8. Applicant's arguments with respect to claims 1-2, 5-7, 19 and 21-25 have been considered but are moot because the arguments do not apply to any of the references being used in the current rejection.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Prior art Doublet – US 2011/0211110

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to TUNG X. LE whose telephone number is (571)272-6010. The examiner can normally be reached on 8:30 AM - 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Douglas Owens can be reached on 571-272-1662. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TUNG X. LE/
Primary Examiner, Art Unit 2844
August 12, 2016

Notice of References Cited	Application/Control No. 13/357,549	Applicant(s)/Patent Under Reexamination SPERO, YECHEZKAL EVAN	
	Examiner TUNG X. LE	Art Unit 2844	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2012/0287493 A1	11-2012	KUHLMAN; FREDERICK F.	B60Q1/085	359/228
*	B	US-2011/0211110 A1	09-2011	Doublet; Antoine	H04N7/188	348/370
	C	US-				
	D	US-				
	E	US-				
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13357549	SPERO, YECHEZKAL EVAN
	Examiner	Art Unit
	TUNG X. LE	2844

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	08/12/2014	01/15/2015	09/25/2015	08/12/2016					
	1	✓	✓	✓	✓					
	2	✓	✓	✓	✓					
	3	✓	✓	✓	O					
	4	✓	✓	✓	O					
	5	✓	✓	✓	✓					
	6	✓	✓	✓	✓					
	7	✓	✓	✓	✓					
	8	✓	✓	✓	=					
	9	✓	✓	✓	=					
	10	✓	✓	✓	=					
	11	✓	✓	✓	=					
	12	✓	✓	✓	=					
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	16	✓	✓	✓	=					
	17	✓	✓	✓	=					
	18	✓	✓	✓	=					
	19	✓	✓	✓	✓					
	20	✓	✓	✓	O					
	21	✓	✓	✓	✓					
	22	✓	✓	✓	O					
	23	✓	✓	✓	O					
	24	✓	✓	✓	O					
	25	✓	✓	✓	✓					

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L7	84215	(H05B37/02$2 or H05B33/08$2 or B60Q1/04).CPC.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/12 00:23
L8	13382	315/77,152,307,312.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/12 00:23
L9	411	8 and ((camera or photo) near2 sensor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/12 00:23
S1	2	"13357549"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/10 14:56
S2	714	(light$3 near2 (system or network or fixture)) and ((motion near2 sensor) with (object or people or user)) and (area or location or environment) and ($5processor or $5controller) and (adjust$3 with (intensity or brightness or spectral or spectrum))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/10 15:06
S3	372	S2 and ((camera or photo) near2 sensor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/10 15:08
S4	354	S3 and program$7	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/10 15:12
S5	69	S3 and program$7 and irradiat$3	US-PGPUB;	OR	ON	2016/08/10

			USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			15:13
S6	285	S4 not S5	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/10 15:25
S7	342	S2 not S3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/10 16:37
S8	50	("20020047628" | "20040105264" | "5785243" | "6166496" | "20020039238" | "20080136356" | "20020022927" | "5983161" | "6394614" | "20040138726" | "5994844" | "6379022" | "6385352" | "20020046100" | "20020047646" | "20020057340" | "20060222213" | "20020022774" | "5546475" | "5969754").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/10 18:53
S9	8	S8 and ((sens$3 or detect$3) near3 motion)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/10 18:56
S10	16	"8100552".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/10 18:59
S11	81	("20010014019" | "5561346" | "5577832" | "5749646" | "5921660" | "6149283" | "6227679" | "6340868" | "6379022" | "6483439" | "6498440" | "6499860" | "6820998").PN. OR ("8100552").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2016/08/10 19:02
S12	18436	(light$3 near2 (system or network or fixture)) and ($5processor or $5controller) and (adjust$3 with (intensity or brightness or spectral or spectrum))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/11 10:55
S13	2476	S12 and ((sens$3 or detect$3) with (motion or object or people or person) with (area or (sub adj1 area) or zone or location))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT;	OR	ON	2016/08/11 10:57

			IBM_TDB			
S14	524	S13 and ((first or second) near2 (lamp or (light near2 source)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/11 10:58
S15	715	(light$3 near2 (system or network or fixture)) and ((motion near2 sensor) with (object or people or user)) and (area or location or environment) and ($5processor or $5controller) and (adjust$3 with (intensity or brightness or spectral or spectrum))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/11 10:59
S16	437	S14 not S15	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/11 10:59
S17	29	("20020138156" | "20030040815" | "20040207342" | "20050090907" | "20050132408" | "20060173560" | "20070208460" | "20080079568" | "20080265799" | "20090160354" | "20110270446" | "20110276193" | "20110320013" | "20120206050" | "20120212138" | "20130030589" | "20130079911" | "20130321637" | "20140006506" | "20140217903" | "3898643" | "5962989" | "6069926" | "7734356" | "7774073" | "7948189" | "8055386" | "8265776" | "8884203").PN. OR ("9414464").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2016/08/11 11:53
S18	386	S12 and ((sens$3 or detect$3) with (motion or object or people or person) with (area or (sub adj1 area) or zone or location) with camera)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/11 12:15
S19	386	S18 and ((sens$3 or detect$3) with (motion or object or people or person) with (area or (sub adj1 area) or zone or location))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/11 12:16
S20	97	S19 and ((first or second) near2 (lamp or (light near2 source)))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/11 12:16
S21	289	S19 not S20	US-PGPUB; USPAT; USOCR; FPRS;	OR	ON	2016/08/11 12:24

			EPO; JPO; DERWENT; IBM_TDB			

8/ 12/ 2016 12:33:07 AM
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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13357549	SPERO, YECHEZKAL EVAN
	Examiner	Art Unit
	TUNG X. LE	2844

CPC- SEARCHED		
Symbol	Date	Examiner
H05B: 33/08, 37/02	08/12/2016	TXL
B60Q1/04	08/12/2016	TXL

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
315	77, 152, 307, 312	08/12/2016	TXL

SEARCH NOTES		
Search Notes	Date	Examiner
EAST (see search history printout)	08/12/2016	TXL
CPC and USPC Searches	08/12/2016	TXL

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

/DAVID LOTTER/ Examiner.Art Unit 2844	

In the United States Patent and Trademark Office

Application/CN: 13/357,549 Monday, January 16, 2017
Application Filed: 24 January 2012
Applicant: Spero, Yechezkal Evan
Title: Detector Controlled Illuminating System
Examiner: Le Tung X
Art Unit: 2844

Reply to Non-Final Office Action dated Aug. 15, 2016

Mailstop: Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

The application is being prosecuted by the Applicant pro se.

Certificate of Transmission Under 37 C.F.R. § 1.8

I hereby certify that this correspondence is being deposited electronically with the U.S. Patent and Trademark Office using the United States Patent and Trademark Office's EFS-Web system on Jan. 16, 2017

Signature
/Yechezkal Evan Spero/

Yechezkal Evan Spero

AMENDMENT UNDER 37 C.F.R. §1.111

In response to the Office Action mailed October 5, 15, the following amendments and remarks are respectfully submitted in connection with the above-identified application.

Amendments to the Claims begin on page 2 of this Amendment.

Remarks begin on page 9 of this Amendment.

	Claims remaining after Amendment		Highest number previously paid for		Present extra
Total	25	-	25	=	0
Independent	4	-	4	=	0

AMENDMENTS TO THE CLAIMS

The following is a complete, marked-up listing of revised claims with a status identifier in parenthesis, underlined text indicating insertions, and strike through indicating deletions.

Full list of claims per 37 CFR 1.121

1. (Currently amended) A light fixture for illuminating an area to be lit capable of automatically meeting specific illumination requirements of different sub-areas within the area to be lit, comprising:
    a. a multiplicity of independently controllable light sources, including at least two light sources of directional light output, such that each said source substantially illuminates a different sub-area within the area to be lit, the light sources having at least one of controllable light intensity and spectral light distribution;
    b. a controller for adjusting at least one of a light intensity and light spectrum of the light sources;
    c. one or more detectors for sensing at least one of objects, surfaces and beings within the area to be lit including the specific sub-area location information and of passing the sensed information to the controller and;
    d. a processor for processing the sensed information and determining illumination requirements of the at least one of objects, surfaces and beings using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables and for directing the controller to adjust the light source for that sub-area to meet the specific illumination requirement.

2. (Original) The illuminating device of claim 1 where the detector is comprising at least one of (i) a camera being a photo sensor array coupled with an optical lens, (ii) a photo sensor, (iii) an ultrasound transducer and sensor, (iv) microwave transducer and sensor, and (v) pyroelectric detectors.

3. (Original) The illumination device of claim 1, wherein the illuminated area is

indoors and further comprising a detector for detecting variable illumination from daylight and/or sunlight entering indoors, wherein the controller taking into consideration the intensity variations over the area now illuminated by the daylight and/or sunlight adjusts the light intensity of the directional light sources to meet the varied illumination requirement.

4. (Original) The illuminating device of claim 1, wherein the one or more detectors detects information regarding one or more individuals within the illuminated area, said information is at least one of (i) age, (ii) sex, and (iii) recognition of an individual for matching with stored data about that individual's needs and wherein the controller adjusts the light intensity and/or spectrum of the illumination provided to the one or more individuals based on illumination requirements from at least one of (i) best practices looked up and calculated from stored data, (ii) age and/or sex of the individual, (iii) personal preferences input to the controller and stored in memory, and (iv) commands received by the controller from an input device.

5. (Original) The illuminating device of claim 1 for optimally displaying food, wherein the one or more detectors detect an identity of one or more foods in a sub-area and wherein the controller adjusts the light intensity and/or spectrum of the illumination on the one or more foods based on illumination requirements from the processor.

6. (Original) An illuminating device having automatic control of the light provided to an illuminated area comprising: a structure for incorporating illuminating device elements; one or more light sources incorporated in the structure and in communication with a power source; electronic circuitry apparatus for the controlled powering of the light source and other illuminating device elements; one or more cameras placed on the structure for detecting coordinate-specific information about the illuminated area, said camera in communication with power and control device elements; a controller integrated

with the structure, in communication with the light source controlling power circuitry, said controller arranged to processes the information communicated from the camera and automatically control the light provided to the illuminated area.

7. (Original) The illumination device of claim 6, where one or more light sources are directional wherein the one or more detectors are configured to sense a presence of glare on a person's eyes in the illuminated area, and wherein the controller is programmed to adjust an intensity of the directional light sources to reduce the glare.

8. (Original) An illuminating device which provides light to meet an illumination requirement of an illuminated area in which visual activities are performed, where different sub-areas of the illuminated area need to be illuminated at a different intensity and/or at a different spectrum than another sub-area of the illuminated area, comprising: a light fixture including a multiplicity of directional light sources including at least two directional light sources pointing in different directions thereby illuminating different sub-areas of the illuminated area, the light fixture having movable structure for aiming the directional light sources mounted thereon in a defined direction; a camera for obtaining images of the illuminated area functioning as a detector for at least one of (i) a light detector (ii) a spectrum detector, (iii) a motion detector, (iv) a measuring detector for sensing a geometry of the illuminated area, and (v) a detector for sensing at least one of work surfaces and road objects and at least one of vehicles and people; a controller for adjusting a light intensity and a direction of each of the directional light sources; a processor with stored algorithms and data for identifying at least one of (i) tasks being carried out by people, (ii) location of people, (iii) frequency of area usage by people, (iv) traffic density in the illuminated area from the sensed geometry, (v) work surfaces, (vi) road objects, people and/or vehicles, and (vii) roadway surface luminance any of which is used by said processor for determining illumination within the illuminated area using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables wherein said processer, upon calculating the required illumination parameters

according to best practice standards, directs the controller to adjust the directional light sources that illuminates the specific sub-areas to meet the illumination requirements of the visual activities.

9. (Original) The illuminating device of claim 8, adjustable by an installer based on room geometry and/or usage further comprising the light fixture having adjustable arms on which directional light sources are mounted for aiming the directional light sources within the illuminated area, where said detector and processor combination provides feedback to the installer so as to aim the light sources such that the illumination requirements can be met by the re-adjusted light source aimings.

10. (Original) The illumination device of claim 8, wherein the controller receives real time information from the camera and wherein the processor, using image recognition capability, directs the controller to adjust at least one of (i) the intensity, (ii) the spectral light distribution and, (iii) the direction of the light sources based on at least one of (i) where people requiring illumination are located, (ii) what object the person is viewing and (iii) what visual task the person needs to perform.

11. (Original) The illumination device of claim 8, further comprising at least one of the directional light sources mounted on the movable structure where the movement of the light source direction is automatically controlled by the controller.

12. (Original) The illumination device of claim 11, providing a different illumination to a sub-area based on usage wherein the controller interpreting images from the camera adjusts the moveable light sources such that they provide the required illumination in a sub-area proximate to the individuals as they move around in the illuminated area.

13. (Original) The illumination device of claim 8, wherein the illuminated area is a road and the objects include road signs.

14. (Original) The illumination device of claim 8, further comprising at least one of the directional light sources on an automatic swivel joint and providing spot lights of limited beam angle for task lighting while other light source provide general illumination to the illuminated area.

15. (Original) The illumination device of claim 8, further comprising a controller with communication capability to other devices, where the camera in one location obtains information and the controller process the information and communicates the camera obtained information to a second device.

16. (Original) The illumination device of claim 15, where the illuminated area is a road and the second device to where the camera obtained information is communicated to is a lighting fixture.

17. (Original) The illumination device of claim 16, where the processor uses information obtained from the cameras and exchanged between fixtures for identifying traffic requirements in the illuminated area and from the vehicles locations and geometry determining the illumination requirements of the illumination area thereby directing the controller to adjust the directional light sources to meet the illumination requirements.

18. (Original) The illumination device of claim 17, wherein the controller is programmed to adjust at least one of (i) increase illumination with an approach of a vehicle, and (ii) change beam cut-off levels as the vehicle advances toward the lighting fixture to eliminate glare.

19. (Original) An automated irradiating device for providing radiation to individuals within an area, intended to provide a desired radiation in a sub-area proximate to the individuals, comprising: an irradiation fixture including one or more directional radiation sources where the radiation is in a defined direction; at least one detector for sensing a location of individuals in the area and feeding transferring that information

to a controller; a where said controller for adjusting adjusts at least one of (i) a radiation intensity, and (ii) a direction of the irradiation based on sensed location, whereby the desired radiation is provided proximate to individuals in the area.

20. (Currently Amended) The automated irradiating device of claim 1920 intended to provide a desired heating to one or more individuals in an area, further comprising: at least two directional heat radiation sources pointing in different directions; the detector being a camera with capability for sensing at least one of (i) a presence of one or more individuals in the heated area, (ii) the identity of the individuals, and (iii) a body temperature of individuals present in the heated area; the controller further having processing capability for determining the heating requirements of the individuals in the area from at least one of (i) algorithms to calculate radiation parameters, (ii) stored data of heating practices, (iii) image recognition algorithms for identifying the individual based on the camera information, and (iv) an identified individual's personal preferences.

21. (Currently Amended) The automated irradiating device of claim 2019, further comprising: ~~One~~ one or more directional radiation sources capable of being moved so as to direct radiation in a defined direction; the at least one detector capable of providing information on the present location of individuals in the area; the controller programmed to process the detector information and move the radiating sources so as to follow the one or more individuals, whereby the desired radiation is provided in a sub-area substantially proximate to the individuals.

22. (Currently Amended) The irradiation device of claim 2120, further comprising; the detector being a camera capable of providing images of different parts of the body of individuals to the controller for image processing; the radiation sources being able to direct radiation to different parts of the body; and the controller further programmed to run the image recognition algorithms to identify different parts of the body, to compute the desired radiation level to the different parts of the body and to adjust the radiation from sources directed at the different parts of the body.

23. (Currently Amended) The irradiation device of claim ~~21~~20, further comprising the controller programmed to control the irradiation in time and intensity on the individual to maintain comfortable heating based on at least one of (i) best practices, (ii) feedback from the heat detector configured to detect body temperature of different parts of a body, (iii) personal preferences input to the controller and stored in memory and (iv) commands input from an input device.

24. (Currently Amended) The irradiation device of claim ~~21~~20 where the irradiation instead of for heat is for therapeutic purposes and the radiation may be any of (i) UV radiation, (ii) red light therapy in the 620-660 nm range, and (iii) light therapy for SAD and other disorders selected from the group consisting of seasonal affective disorder, sleep disorders, circadian rhythm disorders, delayed sleep phase syndrome, vitamin D deficiency and skin disorders, where the controller aims the radiation sources to the location where the individual is located and controls the time and intensity of the radiation.

25. (Currently Amended) The automated irradiating device of claim 2019 further comprising where one or more of the irradiating sources is radiating visible light and one or more of the irradiating sources is designed to substantially radiate heat whereby the device is capable of providing both a desired light and heat radiation to the individuals.

REMARKS

Favorable reconsideration of this application, in light of the remarks and following amendments, is respectfully requested.

In reply to point 1 Claim Objections

1) Claim 1, in line 16, --and-- should be inserted after "controller;"

The examiner requested corrections have been made in the new listing of claims.

→ Claim 1 has been currently amended by adding "and" after the word *"controller"* and marked-up in the full list of claims.

2) Claim 20, in line 1, "claim 20" should be changed to --claim 19

The examiner requested correction has been made in the new listing of claims.

→ Claim 20 has been currently changed to Claim19 and marked-up in the full list of claims.

3) Claim 21, in line 1, "claim 20" should be changed to --claim 19

The examiner requested correction has been made in the new listing of claims.

→ Claim 21 has been currently amended and marked-up in the full list of claims.

4) Claim 21, in line 2, "One" should be changed to --one--;

→ Claim 21 has been currently amended and marked-up in the full list of claims.

5) Claims 22-24, in line 1, "claim 21" should be changed to --claim 20--;

→ Claims 22-24 have been currently amended and marked-up in the full list of claims.

6) Claim 25, in line 1, "claim 20" should be changed to --claim 19--;

→ Claim 25 has been currently amended and marked-up in the full list of claims.

Claim Rejections - 35 USC § 102

***In reply to point* 3:** The following is a quotation of of pre-AIA 35 U.S.C. 102 basis for the rejections in this Office action:

> A person shall be entitled to a patent unless —(e) the invention was described in (1) an

> application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent...

The applicant wishes to note, that the present application is a Continuation in Part, CIP of a Patent Titled "Multiple light source illumination system" filed on July 14, 2003 and published in June 3, 2004. The applicant respectfully asks if the filing date of the Kuhlman et al. — US 2012/0287493 which is from May 12, 2011 can anticipate material in the CIP that was filed on an earlier date. If it cannot, the applicant asserts that Kuhlman, besides not reading on the content of the present application because of being a different apparatus (as explained in point 4 below), is not anticipatory regarding the invention Claimed 1 and 2. The content of those claims in the CIP are already contained in the specification of the 2003 disclosure. In that patent application, the multiple light sources are controlled by a processor to illuminate sub-areas of the room differently based on usage as detected. From paragraph [0164] "*This includes providing the correct illumination in real-time based on occupant whereabouts, activity being performed and outside factors*". The applicant therefore submits that based on the earlier filing date of the parent application, Kuhlman could have had the present applicant's specification before him when developing his invention and therefore could not qualify under 35 USC § 102 as prior art. The applicant submits that the claimed device is a novel machine and requests that the claims and their dependent claims be allowed.

In reply to point 4

> Claims 1-2, 5-7, 19 and 21-25 are rejected under pre-AIA 35 U.S.C. 102(e) as being anticipated by Kuhlman et al. — US 2012/0287493. With respect to claim 1,

Regarding claims 1 & 2 the applicant undertakes to describe the difference in the apparatuses disclosed: While Kuhlman accomplishes the same goal of illumining different sub-areas of a room differently based on the detection of a person in an area, Kuhlman does it with a dynamic light refracting element he calls an "electrowetting lens". The present disclosure uses multiple LEDs having fixed refracting optics at different angular aiming to accomplish the sub-area illumination task as in Fig. FIG. 2B described in para. *[0143]: ... the light distribution can be nonsymmetrical and tailored to the needs of the room. The screw base 17 has a detent or pin 26 that coincides with the stop point on the socket, which is mounted in a specific location radially around the lamp at an angle .beta., 27 in reference to pin 26 and a design start point on the circumference of body 24. The SLS are placed at an angle .beta. horizontally and vertically angled .alpha. to illuminate specific areas and also have their own spatial light distribution angle .theta.1 28A.*

The controller's algorithms can use the one or more LEDs aimed at the sub-area to change the intensity and spectrum of the light as is required by the visual task at hand: *[0056] The present invention also relates to lighting fixtures comprised of many directional light*

sources that are mounted with different aimings so as to correctly illuminate an area. This unique apparatus uses camera obtained information supplied to the artificial intelligence logic to control in real time per [0059] *To effect the provision of lighting that is in concert with the actual illumination needs at a given time,... a camera serves as a sensor capable of detecting light, color and contents of the living space. The fixture is equipped with a logical controller. Using computer vision technology to recognize people, objects and surroundings the lighting fixture can provide the lighting requirements needed in the room at that moment in time. The computer vision system has been taught to recognize different visual tasks such as an individual operating a machine, reading a book or watching TV. The logical controller has instruction sets as to what color lighting at what intensity is preferable for that specific visual task. Thus if no one is in the room the lighting is off or a dimmed, aesthetic lighting is provided for the good feeling of those looking in. When people enter the room, immediately general room lighting is turned on and following that, specific task lighting is provided and adjusted to the right level and color based on where they are in the room and what they are doing.* In the present disclosure, to accomplish dynamism of the light distribution pattern, in place of a variable "electrowetting lens" it uses mechanical movement as per paragraph [200] of the present disclosure ([0168] of the 2003 disclosure): *In a preferred embodiment the DLF or ADLF is rotated about an axis... The positionally correlated timed firings of the rotating DLF will illuminate as need per location per usage requirements in real time.* While Kuhlman's device and the one in the present disclosure can do many of the same things using a camera or similar detector, the present invention is a totally different physical apparatus that was not described in the prior art. The applicant requests that the claims 1 and 2 be allowed.

In reply to With respect to claim 5, Kuhlman discloses that for optimally displaying food, where ... based on illumination requirements from the processor (paragraphs 0017-0018, e.g., the lighting system 10...

The present disclosure describes apparatus and method for optimally displaying food. E.g.: [0280] *Using programmed scene recognition algorithms, the luminaire's computer vision system comprised of the camera sensor 496 and logical controller 494 identifies the food on the plate, looks-up in storage the recommended CCT and powers each of the different colored LED chips aimed thereon at the correct power level in order to provide the optimal color illumination.* The applicant could not find any description of a new use for their device to optimally display food in the cited paragraphs nor in the entire specification. The "indoor use" alone would not describe the control logic nor apparatus needed to effect the illumination. These capabilities are unique to the novel invention and are not taught by Kuhlman's disclosure. The applicant therefore requests that the claim 5 be allowed.

In reply to: With respect to claim 6, Kuhlman discloses in figure 1 an illuminating device having automatic control of the light provided to an illuminated area (24) comprising: a structure ...said

controller arranged to processes ... from the camera and automatically control the light provided to the illuminated area (see paragraphs 0015-0016).
The applicant submits that as in reply to point 3 above that the multiple LED device of the present CIP disclosure has an earlier filing date than that of Kuhlman and askes that claim 6 be allowed.

Regarding: claim 7, Kuhlman discloses that where one or more light sources are directional ...detectors are configured to sense a presence of glare on a person's eyes in the illuminated area (figure 2, e.g., a person 58), and wherein the controller is programmed to ....reduce the glare (paragraph 0016).

The present disclosure mentions glare 101 times and has numerous arrangements of physical light sources processing devices and algorithms to prevent glare. For example para. [0266] : *The logical controller 454 provides its own feedback by checking in real time via the sensors 453 if the illumination provided by driving the light sources at the current setting is in accordance with recommended lighting levels and chromacity. In addition by using pattern recognition and knowing the location of the user's eyes the logical controller can determine if the illumination is causing glare discomfort or veiling reflections. The logical controller by comparing new images with previous images detects if there is a change in the lighting requirements. If changes have occurred, the illumination determining process of FIG. 23 is repeated and a new configuration of driver settings and/or light source aimings is obtained.*
The applicant has searched Kuhlman, the cited paragraph as well as the rest of the specification for an apparatus arranged to detect disabling illumination such as glare and found no mention. The new use for the detector and optical apparatus of claim 7 explicitly differentiates it from the prior art of Kuhlman whose disclosure lacks the requisite sensing and physical light distribution apparatus needed to reduce glare. The present invention is a totally new use for a lighting apparatus that was not described in the prior art. The applicant requests that the claim 7 be allowed.

Regarding: With respect to claim 19, Kuhlman discloses in figure 1 an automated irradiating device for providing radiation to individuals (22A-22C) within an area (24), intended to provide a desired radiation in a sub-area (22A) proximate to the individuals, comprising: an irradiation fixture (12)
The applicant submits that the use of the device for infrared heating in a sub-area as described in the present disclosure is not covered in the prior art of Kuhlman.
The specification describes in Fig 23 and para. [0274] *An irradiation device embodiment of this FAML invention can use the computer vision and aim-ability function to provide infrared heating to individuals in indoor and outdoor settings. The heat radiation sources can be infrared filament lamps or infrared LEDs in addition to other wavelengths. The irradiating devices 472 mounted on the irradiation fixture can provide general area heating or spot heating 482 to people or objects. ... It is to be understood that the irradiating source can be supplying UV radiation, visible light, or any other Kuhlman for*

therapeutic, pleasure or manufacturing purposes such as UV, EB or heat curing adhesives etc.

Nowhere in the Kuhlman specification is radiation, heat or UV to be found and for good reason. The applicant contends that space heating and other irradiation is not possible using the device described by Kuhlman in para. [0014] *The system 10 may include an electrowetting lens 20 operable to vary a light distribution pattern 22A of light from the light source 12A into an area 24. In general, electrowetting lenses, also known as liquid lenses, contain two fluids: an aqueous fluid, commonly referred to as the water layer and indicated as water 26; and a hydrophobic dielectric fluid, commonly referred to as the oil layer and indicated as oil 28.* The amount of energy absorbed by the liquid lens would cause it to boil. Using UV radiation would not be possible as it is absorbed in the liquid lens, Thus the use of radiation for heating and health applications would not be anticipated in Kuhlman's invention. The applicant therefore submits that the new use of the sub-area delivery device for irradiation is novel and requests that claim 19 be allowed.

Regarding: With respect to claim 21, Kuhlman discloses that further comprising one or more directional radiation sources (30A-30C) capable of being moved

The present specification describes in para. [0274] *The irradiating devices 472 mounted on the irradiation fixture can provide general area heating or spot heating 482 to people or objects. Just as moveable head stage lighting follows the performer about the stage the camera/controller vision system follows the person around the room or outdoors and keeps them warm with an infra-red lamp 482.* As described relating to claim 19 the heating application with a moving distribution effected by a liquid lens could not be foreseen by Kuhlman as the physics involved would prevent it from working. Therefore the necessary words of description for radiation or heat are not to be found in the specification or any figure.

Thus as the apparatus of the present specification is totally different machine with fixed refractors and the new use of radiation for heating and health applications could not be anticipated in Kuhlman's invention the applicant requests that claim 21 be allowed.

Regarding: With respect to claim 25, Kuhlman discloses that further comprising where one or more of the irradiating sources (30A-30C) is radiating visible light and one or more of the irradiating sources is designed to substantially radiate heat (see figure 1) …

The claim is of a combined dual spectrum radiation device for providing both heat and light focused on a detected room resident per para. *[0275] In an embodiment of the FAML the infrared radiation sources are added to the light source and can work together when necessary to provide heat and light.* As described earlier relating to claim 19, the heating application with effected by a liquid lens could not be foreseen by Kuhlman as

the physics involved would prevent it from working. Therefore the necessary words of description for radiation or heat are not to be found in the specification or any figure. Thus as the apparatus of the present specification is totally different machine with fixed refractors, with combined dual radiation sources mounted coaxially and the new use of radiation for heating applications could not be anticipated in Kuhlman's invention the applicant requests that claim 25 be allowed.

In reply to Point 6. Claims 3-4 and 20-24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The pro-se applicant is not familiar enough with the re-writing of the claims for allowance and would like to discuss it with the examiner in the next office action.

Conclusion

The applicant has revised the objected claims and requests that the above claims now be amended as in the new list of claims. The applicant submits that the claims are now in proper form to place the case in condition for allowance which action he respectfully solicits.

Conditional Request for Constructive Assistance

Should the examiner still prefer to have these or any or any other claims amended to more clearly highlight the uniqueness of the present invention, the pro se applicant requests under M.P.E.P. § 2173.02 and §707.07(j) that the examiner should draft one or more claims for the applicant and indicate in his or her action that such claims would be allowed if incorporated in the application by amendment. This request is in order that the undersigned can place this application in allowable condition as soon as possible and without the need for further proceedings.

Very respectfully,

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Monday, January 16, 2017

Electronic Patent Application Fee Transmittal

Application Number:	13357549
Filing Date:	24-Jan-2012
Title of Invention:	Detector Controlled Illuminating System
First Named Inventor/Applicant Name:	Yechezkal Evan Spero
Filer:	Yechezkal Evan Spero
Attorney Docket Number:	

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 3 months with $0 paid	2253	1	700	700
Miscellaneous:				
		Total in USD ($)		**700**

Electronic Acknowledgement Receipt

EFS ID:	28072871
Application Number:	13357549
International Application Number:	
Confirmation Number:	1905
Title of Invention:	Detector Controlled Illuminating System
First Named Inventor/Applicant Name:	Yechezkal Evan Spero
Customer Number:	37268
Filer:	Yechezkal Evan Spero
Filer Authorized By:	
Attorney Docket Number:	
Receipt Date:	16-JAN-2017
Filing Date:	24-JAN-2012
Time Stamp:	19:59:02
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$700
RAM confirmation Number	011717INTEFSW20050500
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Applicant Arguments/Remarks Made in an Amendment	Reply_OA_Aug-15-16.pdf	141415 7ebdc88b84281a38e3f1cfc3276d08daa11312ea	no	14
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	29784 c7a779bab990783bf263078bd57d398da3578435	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	171199		

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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.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/357,549	Filing Date 01/24/2012	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	01/16/2017	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 25	Minus	** 26	= 0	X $40 =	0
	Independent (37 CFR 1.16(h))	* 4	Minus	***4	= 0	X $210 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
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This collection of information is required by 37 CFR 1.16. 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 12 minutes 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. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/357,549	01/24/2012	Yechezkal Evan Spero		1905

37268 7590 05/01/2017

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EXAMINER	
LE, TUNG X	

ART UNIT	PAPER NUMBER
2844	

MAIL DATE	DELIVERY MODE
05/01/2017	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 13/357,549	Applicant(s) SPERO, YECHEZKAL EVAN	
	Examiner TUNG X. LE	Art Unit 2844	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01/16/2017*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-25* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☒ Claim(s) *1-18* is/are allowed.

7)☒ Claim(s) *19 and 25* is/are rejected.

8)☒ Claim(s) *20-24* is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

This Office Action is in response to the Applicant's amendment submitted on January 16, 2017. In virtue of this amendment, claims 1-25 are now pending in the instant application.

Claim Objections

1. Claim 19 is objected to because of the following informalities:

In line 6, "a where said controller for adjusting adjusts" should be changed to --wherein said controller for adjusting--

Appropriate correction is required.

Drawings

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "power and control device elements" recited in line 8 of claim 6 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet,

and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 19 and 25 are rejected under pre-AIA 35 U.S.C. 102(e) as being anticipated by Mueller et al. (US 2004/0052076).

With respect to claim 19, Mueller discloses in figures 9 and 39 an automated irradiating device for providing radiation to individuals within an area (3804, e.g., a counter or workspace described in paragraph 0268), intended to provide a desired radiation in a sub-area (figure 39 shows each of light fixtures 100 provides a desired radiation in a sub-area itself) proximate to the individuals, comprising: an irradiation

fixture (100, e.g., a lighting unit) including one or more directional radiation sources (LED01-LED05) where the radiation is in a defined direction (D); at least one detector (124) for sensing a location of individuals in the area (paragraph 0185, e.g., the sensor is a motion sensor for sensing the environment conditions) and feeding transferring that information to a controller (102, e.g., a processor for receiving the sensing information from the sensor 124); a where said controller for adjusting adjusts at least one of (i) a radiation intensity (paragraph 0300, e.g., “a closed loop system can read spectral properties and adjust color rendering index, color temperature, color, intensity, or other lighting characteristics"), and (ii) a direction of the irradiation based on sensed location, whereby the desired radiation is provided proximate to individuals in the area (see paragraph 0178).

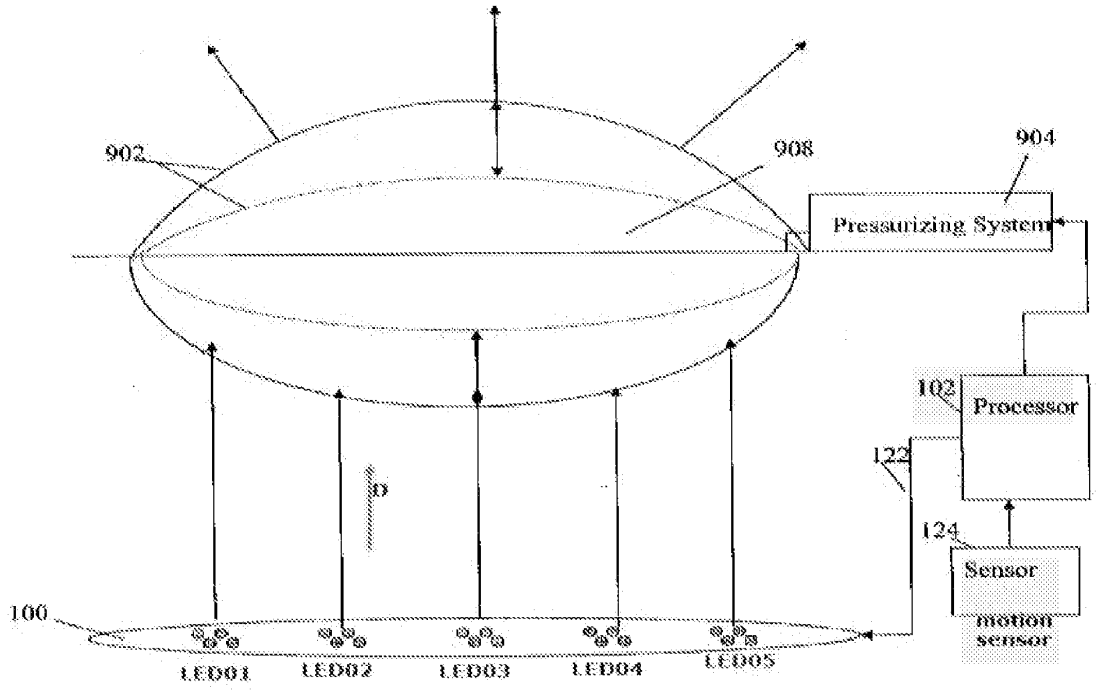


Fig. 9

With respect to claim 25, Mueller discloses that further comprising where one or more of the irradiating sources is radiating visible light and one or more of the irradiating sources is designed to substantially radiate heat whereby the device is capable of providing both a desired light and heat radiation to the individuals (see paragraph 0224).

Allowable Subject Matter

5. Claims 1-5, 8-18 are allowed.

6. Claims 6-7 would be allowable if overcome the objection set forth above.

7. Claims 20-24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

8. The following is a statement of reasons for the indication of allowable subject matter:

Prior art of record fails to disclose or fairly suggest the following limitations:

- A light fixture for illuminating an area to be lit capable of automatically meeting specific illumination requirements of different sub-areas within the area to be lit, comprising … “d. a processor for processing the sensed information and determining illumination requirements of the at least one of objects, surfaces and beings using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables and for directing the controller to adjust the light source for that sub-area to meet the specific illumination requirement”, in combination with the remaining claimed limitations as claimed in independent claim 1 (claims 2-5 would be allowable as being dependent on claim 1).

- Reasons for indicating the allowable subject matter of claims 8-18 were provided in the previous office action.

Response to Arguments

9. Applicant's arguments with respect to claims 19 and 25 have been considered but are moot because the arguments do not apply to any of the references being used in the current rejection.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to TUNG X. LE whose telephone number is (571)272-6010. The examiner can normally be reached on 8:30 AM - 5:30 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Douglas Owens can be reached on 571-272-1662. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TUNG X. LE/
Primary Examiner, Art Unit 2844
April 26, 2017

Notice of References Cited	Application/Control No. 13/357,549	Applicant(s)/Patent Under Reexamination SPERO, YECHEZKAL EVAN	
	Examiner TUNG X. LE	Art Unit 2844	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2004/0052076 A1	03-2004	Mueller, George G.	F21V23/0442	362/293
	B	US-				
	C	US-				
	D	US-				
	E	US-				
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13357549	SPERO, YECHEZKAL EVAN
	Examiner	Art Unit
	TUNG X. LE	2844

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	08/12/2014	01/15/2015	09/25/2015	08/12/2016	04/26/2017				
	1	✓	✓	✓	✓	=				
	2	✓	✓	✓	✓	=				
	3	✓	✓	✓	O	=				
	4	✓	✓	✓	O	=				
	5	✓	✓	✓	✓	=				
	6	✓	✓	✓	✓	=				
	7	✓	✓	✓	✓	=				
	8	✓	✓	✓	=	=				
	9	✓	✓	✓	=	=				
	10	✓	✓	✓	=	=				
	11	✓	✓	✓	=	=				
	12	✓	✓	✓	=	=				
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	14	✓	✓	✓	=	=				
	15	✓	✓	✓	=	=				
	16	✓	✓	✓	=	=				
	17	✓	✓	✓	=	=				
	18	✓	✓	✓	=	=				
	19	✓	✓	✓	✓	✓				
	20	✓	✓	✓	O	O				
	21	✓	✓	✓	✓	O				
	22	✓	✓	✓	O	O				
	23	✓	✓	✓	O	O				
	24	✓	✓	✓	O	O				
	25	✓	✓	✓	✓	✓				

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S26	20207	(light$3 near2 (system or network or fixture)) and ($5processor or $5controller) and (adjust$3 with (intensity or brightness or spectral or spectrum))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/25 11:39
S27	5837	S26 and ((sens$3 or detect$3) near3 (object or motion))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/25 11:40
S28	1363	S26 and (((sens$3 or detect$3) near3 (object or motion)) with camera)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/25 11:41
S29	770	S28 and (area or zone or location or surface or region) and table	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/25 11:43
S30	5	S29 and (adjust$4 near2 (intensity and spectr$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/25 11:44
S31	576	S29 and (adjust$4 near2 (intensity or brightness or spectr$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/25 11:46
S32	85153	(light$3 or lamp) and ($5processor or $5controller) and (adjust$3 with (intensity or brightness or spectral or spectrum))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/25 16:23
S33	85153	(light$3 or lamp) and ($5processor or $5controller) and (adjust$3 with (intensity or brightness or spectral or spectrum))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/25 17:55
S34	19501	S33 and ((sens$3 or detect$3) near3 (object or motion))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/25 17:56
S35	10126	S34 and (area or zone or location or surface or region) and table	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/25 17:57

S36	3759	S33 and (((sens$3 or detect$3) near3 (object or motion)) with camera)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/25 18:08
S37	2629	S36 and ((area or zone or location or surface or region) with camera)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/25 18:10
S38	1683	S37 and (adjust$4 near2 (intensity or brightness or spectr$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/25 18:10
S39	383	S37 and (adjust$4 near2 (intensity or brightness or spectr$3)) and glare	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/25 18:20
S40	242	S37 and ((adjust$4 near2 (intensity or brightness or spectr$3)) with (area or location or zone))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/25 18:45
S41	217	S40 not S39	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/25 18:46
S42	2177	(light$3 near2 fixture) and ($5processor or $5controller) and (adjust$3 near2 (intensity or brightness or spectral or spectrum))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/25 22:43
S43	897	S42 and ((sens$3 or detect$3) near3 (object or motion))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/25 22:43
S44	361	S43 and radiat$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/25 22:44
S45	897	(light$3 near2 fixture) and ($5processor or $5controller) and (adjust$3 near2 (intensity or brightness or spectral or spectrum)) and ((sens$3 or detect$3) near3 (object or motion))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/04/26 07:30

4/26/2017 10:38:11 AM
C:\Users\tle16\Documents\EAST\Workspaces\13357549.wsp

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13357549	SPERO, YECHEZKAL EVAN
	Examiner	Art Unit
	TUNG X. LE	2844

CPC- SEARCHED		
Symbol	Date	Examiner
H05B: 33/08, 37/02	08/12/2016	TXL
B60Q1/04	08/12/2016	TXL

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
315	77, 152, 307, 312	08/12/2016	TXL

SEARCH NOTES		
Search Notes	Date	Examiner
EAST (see search history printout)	08/12/2016	TXL
CPC and USPC Searches	08/12/2016	TXL
EAST (see search history printout)	04/25/2017	TXL

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

/DAVID LOTTER/ Examiner.Art Unit 2844	

In the United States Patent and Trademark Office

Application/CN: 13/357,549 Tuesday, August 1, 2017
Application Filed: 24 January 2012
Applicant: Spero, Yechezkal Evan
Title: Detector Controlled Illuminating System
Examiner: Le Tung X
Art Unit: 2844

Reply to Non-Final Office Action dated May 1, 17

Mailstop: Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

The application is being prosecuted by the Applicant pro se.

Certificate of Transmission Under 37 C.F.R. § 1.8

I hereby certify that this correspondence is being deposited electronically with the U.S. Patent and Trademark Office using the United States Patent and Trademark Office's EFS-Web system on August 1, 2017

Signature
/Yechezkal Evan Spero/

Yechezkal Evan Spero

AMENDMENT UNDER 37 C.F.R. §1.111

In response to the Office Action mailed May 1, 17, the following amendments and remarks are respectfully submitted in connection with the above-identified application.

Amendments to the Claims begin on page 2 of this Amendment.

Remarks begin on page 9 of this Amendment.

	Claims remaining after Amendment		Highest number previously paid for		Present extra
Total	25	-	25	=	0
Independent	4	-	4	=	0

AMENDMENTS TO THE CLAIMS

The following is a complete, marked-up listing of revised claims with a status identifier in parenthesis, underlined text indicating insertions, and strike through indicating deletions.

Full list of claims per 37 CFR 1.121

1. (Original) A light fixture for illuminating an area to be lit capable of automatically meeting specific illumination requirements of different sub-areas within the area to be lit, comprising:
   a. a multiplicity of independently controllable light sources, including at least two light sources of directional light output, such that each said source substantially illuminates a different sub-area within the area to be lit, the light sources having at least one of controllable light intensity and spectral light distribution;
   b. a controller for adjusting at least one of a light intensity and light spectrum of the light sources;
   c. one or more detectors for sensing at least one of objects, surfaces and beings within the area to be lit including the specific sub-area location information and of passing the sensed information to the controller and;
   d. a processor for processing the sensed information and determining illumination requirements of the at least one of objects, surfaces and beings using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables and for directing the controller to adjust the light source for that sub-area to meet the specific illumination requirement.

2. (Original) The illuminating device of claim 1 where the detector is comprising at least one of (i) a camera being a photo sensor array coupled with an optical lens, (ii) a photo sensor, (iii) an ultrasound transducer and sensor, (iv) microwave transducer and sensor, and (v) pyroelectric detectors.

3. (Original) The illumination device of claim 1, wherein the illuminated area is

indoors and further comprising a detector for detecting variable illumination from daylight and/or sunlight entering indoors, wherein the controller taking into consideration the intensity variations over the area now illuminated by the daylight and/or sunlight adjusts the light intensity of the directional light sources to meet the varied illumination requirement.

4. (Original) The illuminating device of claim 1, wherein the one or more detectors detects information regarding one or more individuals within the illuminated area, said information is at least one of (i) age, (ii) sex, and (iii) recognition of an individual for matching with stored data about that individual's needs and wherein the controller adjusts the light intensity and/or spectrum of the illumination provided to the one or more individuals based on illumination requirements from at least one of (i) best practices looked up and calculated from stored data, (ii) age and/or sex of the individual, (iii) personal preferences input to the controller and stored in memory, and (iv) commands received by the controller from an input device.

5. (Original) The illuminating device of claim 1 for optimally displaying food, wherein the one or more detectors detect an identity of one or more foods in a sub-area and wherein the controller adjusts the light intensity and/or spectrum of the illumination on the one or more foods based on illumination requirements from the processor.

6. (Original) An illuminating device having automatic control of the light provided to an illuminated area comprising: a structure for incorporating illuminating device elements; one or more light sources incorporated in the structure and in communication with a power source; electronic circuitry apparatus for the controlled powering of the light source and other illuminating device elements; one or more cameras placed on the structure for detecting coordinate-specific information about the illuminated area, said camera in communication with power and control device elements; a controller integrated

with the structure, in communication with the light source controlling power circuitry, said controller arranged to processes the information communicated from the camera and automatically control the light provided to the illuminated area.

7. (Original) The illumination device of claim 6, where one or more light sources are directional wherein the one or more detectors are configured to sense a presence of glare on a person's eyes in the illuminated area, and wherein the controller is programmed to adjust an intensity of the directional light sources to reduce the glare.

8. (Original) An illuminating device which provides light to meet an illumination requirement of an illuminated area in which visual activities are performed, where different sub-areas of the illuminated area need to be illuminated at a different intensity and/or at a different spectrum than another sub-area of the illuminated area, comprising: a light fixture including a multiplicity of directional light sources including at least two directional light sources pointing in different directions thereby illuminating different sub-areas of the illuminated area, the light fixture having movable structure for aiming the directional light sources mounted thereon in a defined direction; a camera for obtaining images of the illuminated area functioning as a detector for at least one of (i) a light detector (ii) a spectrum detector, (iii) a motion detector, (iv) a measuring detector for sensing a geometry of the illuminated area, and (v) a detector for sensing at least one of work surfaces and road objects and at least one of vehicles and people; a controller for adjusting a light intensity and a direction of each of the directional light sources; a processor with stored algorithms and data for identifying at least one of (i) tasks being carried out by people, (ii) location of people, (iii) frequency of area usage by people, (iv) traffic density in the illuminated area from the sensed geometry, (v) work surfaces, (vi) road objects, people and/or vehicles, and (vii) roadway surface luminance any of which is used by said processor for determining illumination within the illuminated area using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables wherein said processer, upon calculating the required illumination parameters

according to best practice standards, directs the controller to adjust the directional light sources that illuminates the specific sub-areas to meet the illumination requirements of the visual activities.

9. (Original) The illuminating device of claim 8, adjustable by an installer based on room geometry and/or usage further comprising the light fixture having adjustable arms on which directional light sources are mounted for aiming the directional light sources within the illuminated area, where said detector and processor combination provides feedback to the installer so as to aim the light sources such that the illumination requirements can be met by the re-adjusted light source aimings.

10. (Original) The illumination device of claim 8, wherein the controller receives real time information from the camera and wherein the processor, using image recognition capability, directs the controller to adjust at least one of (i) the intensity, (ii) the spectral light distribution and, (iii) the direction of the light sources based on at least one of (i) where people requiring illumination are located, (ii) what object the person is viewing and (iii) what visual task the person needs to perform.

11. (Original) The illumination device of claim 8, further comprising at least one of the directional light sources mounted on the movable structure where the movement of the light source direction is automatically controlled by the controller.

12. (Original) The illumination device of claim 11, providing a different illumination to a sub-area based on usage wherein the controller interpreting images from the camera adjusts the moveable light sources such that they provide the required illumination in a sub-area proximate to the individuals as they move around in the illuminated area.

13. (Original) The illumination device of claim 8, wherein the illuminated area is a road and the objects include road signs.

14. (Original) The illumination device of claim 8, further comprising at least one of

the directional light sources on an automatic swivel joint and providing spot lights of limited beam angle for task lighting while other light source provide general illumination to the illuminated area.

15. (Original) The illumination device of claim 8, further comprising a controller with communication capability to other devices, where the camera in one location obtains information and the controller process the information and communicates the camera obtained information to a second device.

16. (Original) The illumination device of claim 15, where the illuminated area is a road and the second device to where the camera obtained information is communicated to is a lighting fixture.

17. (Original) The illumination device of claim 16, where the processor uses information obtained from the cameras and exchanged between fixtures for identifying traffic requirements in the illuminated area and from the vehicles locations and geometry determining the illumination requirements of the illumination area thereby directing the controller to adjust the directional light sources to meet the illumination requirements.

18. (Original) The illumination device of claim 17, wherein the controller is programmed to adjust at least one of (i) increase illumination with an approach of a vehicle, and (ii) change beam cut-off levels as the vehicle advances toward the lighting fixture to eliminate glare.

19. (Currently Amended) An automated irradiating device for providing radiation to individuals within an area, intended to provide a desired radiation in a sub-area proximate to the individuals, comprising: an irradiation fixture including one or more directional radiation sources where the radiation is in a defined direction; at least one detector for sensing a location of individuals in the area and feeding transferring that information to a controller; a ~~where~~ wherein said controller for adjusting, adjusts at

least one of (i) a radiation intensity, and (ii) a direction of the irradiation based on sensed location, whereby the desired radiation is provided proximate to individuals in the area.

20. (Original) The automated irradiating device of claim 19 intended to provide a desired heating to one or more individuals in an area, further comprising: at least two directional heat radiation sources pointing in different directions; the detector being a camera with capability for sensing at least one of (i) a presence of one or more individuals in the heated area, (ii) the identity of the individuals, and (iii) a body temperature of individuals present in the heated area; the controller further having processing capability for determining the heating requirements of the individuals in the area from at least one of (i) algorithms to calculate radiation parameters, (ii) stored data of heating practices, (iii) image recognition algorithms for identifying the individual based on the camera information, and (iv) an identified individual's personal preferences.

21. (Original) The automated irradiating device of claim19, further comprising: one or more directional radiation sources capable of being moved so as to direct radiation in a defined direction; the at least one detector capable of providing information on the present location of individuals in the area; the controller programmed to process the detector information and move the radiating sources so as to follow the one or more individuals, whereby the desired radiation is provided in a sub-area substantially proximate to the individuals.

22. (Original) The irradiation device of claim 20, further comprising; the detector being a camera capable of providing images of different parts of the body of individuals to the controller for image processing; the radiation sources being able to direct radiation to different parts of the body; and the controller further programmed to run the image recognition algorithms to identify different parts of the body, to compute the desired radiation level to the different parts of the body and to adjust the radiation from sources directed at the different parts of the body.

23. (Original) The irradiation device of claim 20, further comprising the controller programmed to control the irradiation in time and intensity on the individual to maintain comfortable heating based on at least one of (i) best practices, (ii) feedback from the heat detector configured to detect body temperature of different parts of a body, (iii) personal preferences input to the controller and stored in memory and (iv) commands input from an input device.

24. (Original) The irradiation device of claim 20 where the irradiation instead of for heat is for therapeutic purposes and the radiation may be any of (i) UV radiation, (ii) red light therapy in the 620-660 nm range, and (iii) light therapy for SAD and other disorders selected from the group consisting of seasonal affective disorder, sleep disorders, circadian rhythm disorders, delayed sleep phase syndrome, vitamin D deficiency and skin disorders, where the controller aims the radiation sources to the location where the individual is located and controls the time and intensity of the radiation.

25. (Original) The automated irradiating device of claim 19 further comprising where one or more of the irradiating sources is radiating visible light and one or more of the irradiating sources is designed to substantially radiate heat whereby the device is capable of providing both a desired light and heat radiation to the individuals.

REMARKS

Favorable reconsideration of this application, in light of the remarks and following amendments, is respectfully requested.

In reply to point 1 Claim Objections:

1) *Claim 19 is objected to because of the following informalities: In line 6, "a where said controller for adjusting adjusts" should be changed to -wherein said controller for adjusting- Appropriate correction is required*

The examiner requested corrections have been made in the new listing of claims set forth above per 37 CFR 1.121.

→ Claim 1 has been currently amended by replacing "where" with "wherein" as well as adding a comma after the word adjusting and marked-up in the full list of claims.

In reply to point 2 Drawings:

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "power and control device elements" recited in line 8 of claim 6 must be shown or the feature(s) canceled

It is not clear to the applicant as to if is a specific drawing that is being objected to or in general. Claim 6 describes a lighting fixture with a camera used as a sensor to control light sources *"said camera in communication with power and control device elements"*. There are a number of embodiments including Fig.s 12, 18, 20A and 31 which are constructed with this arrangement is shown and numbered and where block diagram Fig. 22 indicates connectivity between the sensors, logical controller processor and power control gear driving the light-source. The applicant respectfully submits that the item description in the specification and claim 6 is shown in Fig. 12 as item 195. Per paragraph [0183], *The adaptive or intelligent DLF 190 shown in*

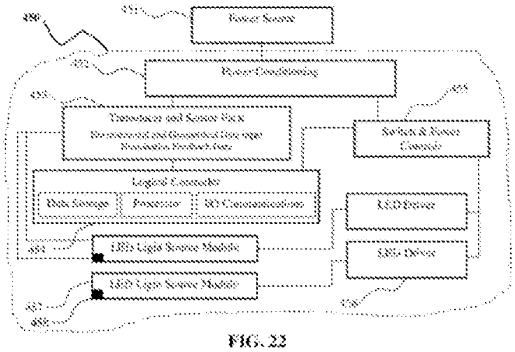


FIG. 22

FIG. 12 has multiple light sources 191.... The ADLF is equipped with an electronic power supply, computer control and communications unit 195.

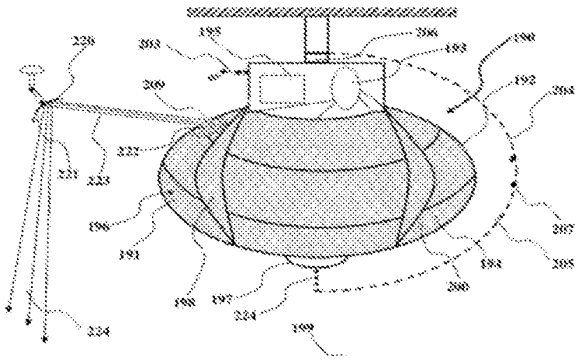


Figure 12

Again in Fig. 31 the power and control items are listed this time separately as logical controller 541 and power equipment 542. Thus per paragraph [0308] of the specification: *FIG. 31 is a perspective view of a multiple light source adjustable luminaire with added irradiation functionality.* device. *A fully featured FAML embodiment would be comprised of: a logical controller 541 having means for processing algorithms, data storage, communications and control capability for the task of influencing sleep cycles; power conditioning means 542."*

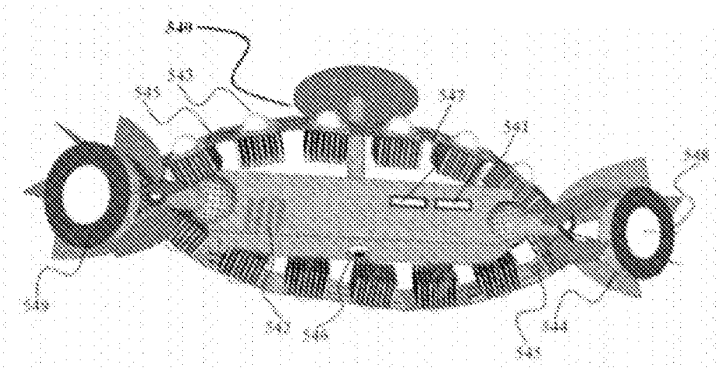


FIG. 31

If a shown in these examples the objection that drawings are not sufficiently showing the feature of the invention, the applicant would be willing to correct any drawing per the specification as instructed by the examiner.

In reply to point 3 Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis...A person shall be entitled to a patent unless - (e) the invention was described in (1) an application for patent,

Claims 19 and 25 are rejected under pre-AIA 35 U.S.C. 102(e) as being anticipated by Mueller et al. (US 2004/0052076).

The allowance of claims 1-18 is appreciated and the applicant believes that the technical issues claim 6 and 7 are in order as explained above or if not can be made in order by knowing which drawing is in question.

However, the applicant respectfully requests reconsideration of allowing claim 19 as presently written or corrected in some form as suggested by the examiner to the pro-se applicant after I present the arguments as to why the cited prior art is not relevant in the following paragraphs.

The applicant is familiar with the authors of the patent application cited US 2004/0052076 and the technology avaible to Mueller. Lys et al at the time of the disclosure does not enable their multiple light source devices to perform as can the real-time user coordinates based device present invention.

With respect to claim 19, Mueller discloses in figures 9 and 39 an automated irradiating device for providing radiation to individuals within an area (3804, e.g., a counter or workspace described in paragraph 0268), intended to provide a desired radiation in a sub-area (figure 39 shows each of light fixtures 100 provides a desired... ., the sensor is a motion sensor for sensing the environment conditions)

The applicant has reviewed the paragraphs in question and most of the rest of Mueller's patent and claim 19 (basically in the specification the device of Fig. 31) does not read on the prior art. Their disclosure is for methods and systems for providing controlled lighting, including optical facilities for modifying light from a lighting unit. The present device of claim 19 has apparatus for providing radiation to a sub-area of a room based on 1) a sensor detection of not only of the presence of a person in a room (such as from the motion detector of Mueller) but the coordinates of the room occupant in a specific sub-area of that room and 2) the device must have control-logic to determine how the focused radiation source is to be driven in order to irradiate in a substantially limited fashion the sub-area proximate to the occupant. So whereas the flexible "optical facility" to change configuration under the control of a processor is a desirable feature in theory in moving radiation within an area there is no disclosure of how to dynamically determine where the radiation is needed on a real time basis and apparatus to specifically coordinate the delivery proximate thereto. Nowhere in Mueller's disclosure is the apparatus or method for the necessary location or coordinate information described or hinted at. Combined apparatus for obtaining the coordinates and bringing a radiation source specifically to the individual is neither trivial nor obvious.

The applicant therefore submits that based on the Mueller disclosure, even one practiced in the art would not have been capable of developing the present invention and therefore could not qualify under 35 USC § 102 as prior art. The applicant requests that the claim 19 and its dependent claims be allowed.

Should the examiner not find these arguments convincing and cannot suggest minor corrective terminology to maintain the independent claim 19 the applicant would be willing to accept the examiners allowance suggestion in the Office Action of January 1, 2017: *Claims 20-24 are objected to as being dependent upon a rejected base claim, but would be*

allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
If I understand correctly I would need to merge claim 19 into claim 20 and then base the subsequent claims on that claim or would each claim need to be an independent claim? If they are independents then I would pay the extra fee. Please advise.

In reply to point 4

With respect to claim 25, Mueller discloses that further comprising where one or more of the irradiating sources is radiating visible light and one or more of the irradiating sources is designed to substantially radiate heat whereby the device is capable of providing both a desired light and heat radiation to the individuals (see paragraph 0224).

The applicant has read paragraph 0224 and if I am not mistaken Mueller is referring to heat in terms of sensing or sending information as a diganl but not the radiation of heat from a device specially constructed to substantially radiate heat vs. light spectrum.

> [0224] Many types of signal source 124 can be used, for sensing any condition or sending any kind of signal, such as temperature, force, electricity, heat flux, voltage, current, magnetic field, pitch, roll, yaw, acceleration, rotational forces, wind, turbulence, flow, pressure, volume, fluid level, optical properties, luminosity, electromagnetic radiation, radio frequency radiation, sound, acoustic levels, decibels, particulate density, smoke, pollutant density, positron emissions, light levels, color, color temperature, color saturation, infrared radiation, x-ray radiation, ultraviolet radiation, visible spectrum radiation, states, logical states, bits, bytes, words, data, symbols, and many others described herein, described in the documents incorporated by reference herein, and known to those of ordinary skill in the arts.

The present disclosure describes how apparatus can be built for the combined, real-time occupant location-based irradiation of light and heat where one or more of the irradiating sources is radiating visible light and one or more of the irradiating sources is designed to substantially radiate heat.
These capabilities are unique to the novel invention and are not taught by Mueller's disclosure. The applicant therefore requests that the claim 25 be allowed.

Conclusion

The applicant has revised the objected claim and requests that the above claims now be amended as in the new list of claims. The applicant submits that the claims are now in proper form to place the case in condition for allowance which action he respectfully solicits.

Conditional Request for Constructive Assistance

Should the examiner still prefer to have these or any or any other claims amended to more clearly highlight the uniqueness of the present invention, the pro se applicant requests under M.P.E.P. § 2173.02 and §707.07(j) that the examiner should draft one or more claims for the applicant and indicate in his or her action that such claims would be allowed if incorporated in the application by amendment. This request is in order that the undersigned can place this application in allowable condition as soon as possible and without the need for further proceedings.

Very respectfully,

/ Yechezkal Evan Spero/
Yechezkal Evan Spero
20 Rashi St
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Israel
Tel: +972-54-440-7280
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yspero@netvision.net.il

Tuesday, August 1, 2017

Electronic Acknowledgement Receipt

EFS ID:	29954610
Application Number:	13357549
International Application Number:	
Confirmation Number:	1905
Title of Invention:	Detector Controlled Illuminating System
First Named Inventor/Applicant Name:	Yechezkal Evan Spero
Customer Number:	37268
Filer:	Yechezkal Evan Spero
Filer Authorized By:	
Attorney Docket Number:	
Receipt Date:	01-AUG-2017
Filing Date:	24-JAN-2012
Time Stamp:	19:45:42
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Applicant Arguments/Remarks Made in an Amendment	Reply_Non_F_May-1-17.pdf	565792 0731dbaa952a953f5fac56a01af28b795cc485ff	no	13

Warnings:

Information:	
Total Files Size (in bytes):	565792

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.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/357,549	Filing Date 01/24/2012	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	08/01/2017	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 25	Minus	** 26	= 0	X $40 =	0
	Independent (37 CFR 1.16(h))	* 4	Minus	***4	= 0	X $210 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
LASHAWN MORGAN

This collection of information is required by 37 CFR 1.16. 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 12 minutes 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. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/357,549	01/24/2012	Yechezkal Evan Spero		1905

37268 7590 08/11/2017

YECHEZKAL EVAN SPERO
74 MOSHAV TIFRACH
M. P. HANEGEV, 85102
ISRAEL

EXAMINER	
LE, TUNG X	

ART UNIT	PAPER NUMBER
2844	

MAIL DATE	DELIVERY MODE
08/11/2017	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 13/357,549	Applicant(s) SPERO, YECHEZKAL EVAN	
	Examiner TUNG X. LE	Art Unit 2844	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08/01/2017*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-25* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☒ Claim(s) *1-18* is/are allowed.

7)☒ Claim(s) *19 and 25* is/are rejected.

8)☒ Claim(s) *20-24* is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

This Office Action is in response to the Applicant's amendment submitted on August 01, 2017. In virtue of this amendment, claims 1-25 are pending in the instant application.

Claim Objections

1. Claim 19 is objected to because of the following informalities:

In line 6, "a" should be deleted

Appropriate correction is required.

Note: "a" in line 6 of claim 19 stands by itself to make the claim not clear what is "a" Applicant intended to be?

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 19 and 25 are rejected under pre-AIA 35 U.S.C. 102(e) as being anticipated by Mueller et al. (US 2004/0052076 of record).

With respect to claim 19, Mueller discloses in figures 9 and 39 an automated irradiating device for providing radiation to individuals within an area (3804, e.g., a counter or workspace described in paragraph 0268), intended to provide a desired radiation in a sub-area (figure 39 shows each of light fixtures 100 provides a desired radiation in a sub-area itself) proximate to the individuals, comprising: an irradiation fixture (100, e.g., a lighting unit) including one or more directional radiation sources (LED01-LED05) where the radiation is in a defined direction (D); at least one detector (124) for sensing a location of individuals in the area (paragraph 0185, e.g., the sensor is a motion sensor for sensing the environment conditions) and feeding transferring that information to a controller (102, e.g., a processor for receiving the sensing information from the sensor 124); a where said controller for adjusting adjusts at least one of (i) a radiation intensity (paragraph 0300, e.g., “a closed loop system can read spectral properties and adjust color rendering index, color temperature, color, intensity, or other lighting characteristics"), and (ii) a direction of the irradiation based on sensed location, whereby the desired radiation is provided proximate to individuals in the area (see paragraph 0178).

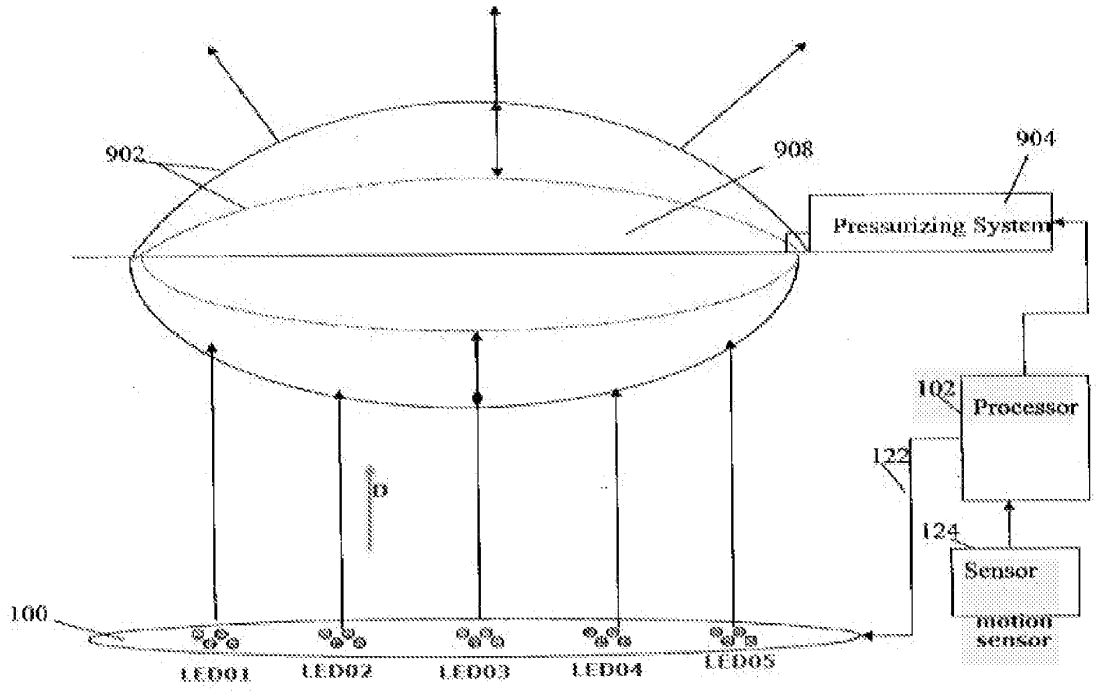


Fig. 9

With respect to claim 25, Mueller discloses that further comprising where one or more of the irradiating sources is radiating visible light and one or more of the irradiating sources is designed to substantially radiate heat whereby the device is capable of providing both a desired light and heat radiation to the individuals (see paragraph 0224).

Allowable Subject Matter

4. Claims 1-18 are allowed.

5. Claims 20-24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

6. The following is a statement of reasons for the indication of allowable subject matter:

- Reasons for indicating the allowable subject matter of claims 1-18 were provided in the previous office action.

Response to Arguments

7. Applicant's arguments filed 08/01/2017 have been fully considered but they are not persuasive.

Applicant argued that the Mueller disclosure, even one practiced in the art would not have not been capable of developing the present invention and therefore could not qualify under USC 102 as prior art.

Examiner respectfully disagrees as following reasons:

- Figures 9 and 39 of Mueller shows every limitation in claims 19 and 25 as addressed out in the office action above.
- Applicant did not point out what limitations, in the claims, have not been taught by the reference of Mueller.
- There is differences between the figures 12, 22 and 31 of the instant application and the figures of 9 and 39 of Mueller, but the different features are not described in the claim 19.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to TUNG X. LE whose telephone number is (571)272-6010. The examiner can normally be reached on 8:30 AM - 5:30 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Douglas Owens can be reached on 571-272-1662. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TUNG X. LE/
Primary Examiner, Art Unit 2844
August 9, 2017

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13357549	SPERO, YECHEZKAL EVAN
	Examiner	Art Unit
	TUNG X. LE	2844

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	08/12/2014	01/15/2015	09/25/2015	08/12/2016	04/26/2017	08/09/2017			
	1	✓	✓	✓	✓	=	=			
	2	✓	✓	✓	✓	=	=			
	3	✓	✓	✓	O	=	=			
	4	✓	✓	✓	O	=	=			
	5	✓	✓	✓	✓	=	=			
	6	✓	✓	✓	✓	=	=			
	7	✓	✓	✓	✓	=	=			
	8	✓	✓	✓	=	=	=			
	9	✓	✓	✓	=	=	=			
	10	✓	✓	✓	=	=	=			
	11	✓	✓	✓	=	=	=			
	12	✓	✓	✓	=	=	=			
	13	✓	✓	✓	=	=	=			
	14	✓	✓	✓	=	=	=			
	15	✓	✓	✓	=	=	=			
	16	✓	✓	✓	=	=	=			
	17	✓	✓	✓	=	=	=			
	18	✓	✓	✓	=	=	=			
	19	✓	✓	✓	✓	✓	✓			
	20	✓	✓	✓	O	O	O			
	21	✓	✓	✓	✓	O	O			
	22	✓	✓	✓	O	O	O			
	23	✓	✓	✓	O	O	O			
	24	✓	✓	✓	O	O	O			
	25	✓	✓	✓	✓	✓	✓			

UNITED STATES PATENT AND TRADEMARK OFFICE

USPTO Automated Interview Request (AIR)

Nov 9 2017

This paper requesting to schedule and/or conduct an interview is appropriate because:

This submission is requested to be accepted as an authorization for this interview to communicate via the internet. Recognizing that Internet communications are not secure, I hereby authorize the USPTO to communicate with the undersigned concerning scheduling of the interview via video conference, instant messaging, or electronic mail, and to conduct the interview in accordance with office practice including video conferencing.

Name(s):
Yechezkal Evan Spero

S-signature:
/Yechezkal Evan Spero/

Registration Number:
37268

U.S. Application Number:
13357549

Confirmation Number:
1905

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Proposed Time of Interview:
11-17-2017 8:30 AM ET

Prefered Interview Type:
Telephonic

I am the applicant or applicant's representative for this application.

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PALM-SILVER

In the United States Patent and Trademark Office

Application/CN: 13/357,549 November 13, 2017
Application Filed: 24 January 2012
Applicant: Spero, Yechezkal Evan
Title: Detector Controlled Illuminating System
Examiner: Le Tung X
Art Unit: 2844

Reply to Non-Final Office Action dated Aug 13, 17

Mailstop: Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

The application is being prosecuted by the Applicant pro se.

Certificate of Transmission Under 37 C.F.R. § 1.8

I hereby certify that this correspondence is being deposited electronically with the U.S. Patent and Trademark Office using the United States Patent and Trademark Office's EFS-Web system on Nov. 13, 2017

Signature
/Yechezkal Evan Spero/

Yechezkal Evan Spero

AMENDMENT UNDER 37 C.F.R. §1.111

In response to the Office Action mailed Aug. 11, 17, the following amendments and remarks are respectfully submitted in connection with the above-identified application.

Amendments to the Claims begin on page 2 of this Amendment.

Amendments to the Specification begin on page 9 of this Amendment.

Remarks begin on page 10 of this Amendment.

Record the substance of the Examiner interview begins on page 11 of this Amendment.

	Claims remaining after Amendment		**Highest number previously paid for**		**Present extra**
Total	25	-	25	=	0
Independent	4	-	4	=	0

AMENDMENTS TO THE CLAIMS

The following is a complete, marked-up listing of revised claims with a status identifier in parenthesis, underlined text indicating insertions, and strike through indicating deletions.

Full list of claims per 37 CFR 1.121

1. (Original) A light fixture for illuminating an area to be lit capable of automatically meeting specific illumination requirements of different sub-areas within the area to be lit, comprising:
    a. a multiplicity of independently controllable light sources, including at least two light sources of directional light output, such that each said source substantially illuminates a different sub-area within the area to be lit, the light sources having at least one of controllable light intensity and spectral light distribution;
    b. a controller for adjusting at least one of a light intensity and light spectrum of the light sources;
    c. one or more detectors for sensing at least one of objects, surfaces and beings within the area to be lit including the specific sub-area location information and of passing the sensed information to the controller and;
    d. a processor for processing the sensed information and determining illumination requirements of the at least one of objects, surfaces and beings using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables and for directing the controller to adjust the light source for that sub-area to meet the specific illumination requirement.

2. (Original) The illuminating device of claim 1 where the detector is comprising at least one of (i) a camera being a photo sensor array coupled with an optical lens, (ii) a photo sensor, (iii) an ultrasound transducer and sensor, (iv) microwave transducer and sensor, and (v) pyroelectric detectors.

3. (Original) The illumination device of claim 1, wherein the illuminated area is

indoors and further comprising a detector for detecting variable illumination from daylight and/or sunlight entering indoors, wherein the controller taking into consideration the intensity variations over the area now illuminated by the daylight and/or sunlight adjusts the light intensity of the directional light sources to meet the varied illumination requirement.

4. (Original) The illuminating device of claim 1, wherein the one or more detectors detects information regarding one or more individuals within the illuminated area, said information is at least one of (i) age, (ii) sex, and (iii) recognition of an individual for matching with stored data about that individual's needs and wherein the controller adjusts the light intensity and/or spectrum of the illumination provided to the one or more individuals based on illumination requirements from at least one of (i) best practices looked up and calculated from stored data, (ii) age and/or sex of the individual, (iii) personal preferences input to the controller and stored in memory, and (iv) commands received by the controller from an input device.

5. (Original) The illuminating device of claim 1 for optimally displaying food, wherein the one or more detectors detect an identity of one or more foods in a sub-area and wherein the controller adjusts the light intensity and/or spectrum of the illumination on the one or more foods based on illumination requirements from the processor.

6. (Original) An illuminating device having automatic control of the light provided to an illuminated area comprising: a structure for incorporating illuminating device elements; one or more light sources incorporated in the structure and in communication with a power source; electronic circuitry apparatus for the controlled powering of the light source and other illuminating device elements; one or more cameras placed on the structure for detecting coordinate-specific information about the illuminated area, said camera in communication with power and control device elements; a controller integrated

with the structure, in communication with the light source controlling power circuitry, said controller arranged to processes the information communicated from the camera and automatically control the light provided to the illuminated area.

7. (Original) The illumination device of claim 6, where one or more light sources are directional wherein the one or more detectors are configured to sense a presence of glare on a person's eyes in the illuminated area, and wherein the controller is programmed to adjust an intensity of the directional light sources to reduce the glare.

8. (Original) An illuminating device which provides light to meet an illumination requirement of an illuminated area in which visual activities are performed, where different sub-areas of the illuminated area need to be illuminated at a different intensity and/or at a different spectrum than another sub-area of the illuminated area, comprising: a light fixture including a multiplicity of directional light sources including at least two directional light sources pointing in different directions thereby illuminating different sub-areas of the illuminated area, the light fixture having movable structure for aiming the directional light sources mounted thereon in a defined direction; a camera for obtaining images of the illuminated area functioning as a detector for at least one of (i) a light detector (ii) a spectrum detector, (iii) a motion detector, (iv) a measuring detector for sensing a geometry of the illuminated area, and (v) a detector for sensing at least one of work surfaces and road objects and at least one of vehicles and people; a controller for adjusting a light intensity and a direction of each of the directional light sources; a processor with stored algorithms and data for identifying at least one of (i) tasks being carried out by people, (ii) location of people, (iii) frequency of area usage by people, (iv) traffic density in the illuminated area from the sensed geometry, (v) work surfaces, (vi) road objects, people and/or vehicles, and (vii) roadway surface luminance any of which is used by said processor for determining illumination within the illuminated area using at least one of artificial intelligence, pattern recognition, video analytics, and look-up tables wherein said

processer, upon calculating the required illumination parameters according to best practice standards, directs the controller to adjust the directional light sources that illuminates the specific sub-areas to meet the illumination requirements of the visual activities.

9. (Original) The illuminating device of claim 8, adjustable by an installer based on room geometry and/or usage further comprising the light fixture having adjustable arms on which directional light sources are mounted for aiming the directional light sources within the illuminated area, where said detector and processor combination provides feedback to the installer so as to aim the light sources such that the illumination requirements can be met by the re-adjusted light source aimings.

10. (Original) The illumination device of claim 8, wherein the controller receives real time information from the camera and wherein the processor, using image recognition capability, directs the controller to adjust at least one of (i) the intensity, (ii) the spectral light distribution and, (iii) the direction of the light sources based on at least one of (i) where people requiring illumination are located, (ii) what object the person is viewing and (iii) what visual task the person needs to perform.

11. (Original) The illumination device of claim 8, further comprising at least one of the directional light sources mounted on the movable structure where the movement of the light source direction is automatically controlled by the controller.

12. (Original) The illumination device of claim 11, providing a different illumination to a sub-area based on usage wherein the controller interpreting images from the camera adjusts the moveable light sources such that they provide the required illumination in a sub-area proximate to the individuals as they move around in the illuminated area.

13. (Original) The illumination device of claim 8, wherein the illuminated area is a road and the objects include road signs.

14. (Original) The illumination device of claim 8, further comprising at least one of the directional light sources on an automatic swivel joint and providing spot lights of limited beam angle for task lighting while other light source provide general illumination to the illuminated area.

15. (Original) The illumination device of claim 8, further comprising a controller with communication capability to other devices, where the camera in one location obtains information and the controller process the information and communicates the camera obtained information to a second device.

16. (Original) The illumination device of claim 15, where the illuminated area is a road and the second device to where the camera obtained information is communicated to is a lighting fixture.

17. (Original) The illumination device of claim 16, where the processor uses information obtained from the cameras and exchanged between fixtures for identifying traffic requirements in the illuminated area and from the vehicles locations and geometry determining the illumination requirements of the illumination area thereby directing the controller to adjust the directional light sources to meet the illumination requirements.

18. (Original) The illumination device of claim 17, wherein the controller is programmed to adjust at least one of (i) increase illumination with an approach of a vehicle, and (ii) change beam cut-off levels as the vehicle advances toward the lighting fixture to eliminate glare.

19. (Currently Amended) An automated irradiating device for providing a desired radiation to individuals within an area, ~~intended to provide a desired radiation in a sub-area proximate to the individuals,~~ comprising: ~~an irradiation fixture including one or more directional radiation sources~~ at least two substantially directional heat radiation sources ~~where the radiation is in a defined direction~~pointing in different directions;~~;~~ at

least one detector for sensing a location of individuals in the area and ~~feeding~~ transferring that information to a controller; ~~a~~ wherein said controller for adjusting, adjusts at least one of ~~(i)~~ a radiation intensity ~~,~~ and ~~(ii)~~ a direction of the irradiation based on sensed location; the automated irradiating device further comprising one detector being a camera with a capability for transferring data to the processor arranged with image recognition algorithms for sensing any of the information selected from the list comprised of: a presence, an identity, a location, a position, an activity, and a body temperature of an individual; the controller having processing capability for using the information and determining the heating requirements of the individuals from at least one of (i) algorithms to calculate radiation parameters, (ii) stored data of heating practices, and (iii) the identified individual's stored personal preferences; whereby the desired radiation is provided proximate to individuals in the area.

20. (Cancelled)

21. (Original) The automated irradiating device of claim19, further comprising: one or more directional radiation sources capable of being moved so as to direct radiation in a defined direction; the at least one detector capable of providing information on the present location of individuals in the area; the controller programmed to process the detector information and move the radiating sources so as to follow the one or more individuals, whereby the desired radiation is provided in a sub-area substantially proximate to the individuals.

22. (Currently Amended) The irradiation device of claim ~~20~~21, further comprising; the detector being a camera capable of providing images of different parts of the body of individuals to the controller for image processing; the radiation sources being able to direct radiation to different parts of the body; and the controller further programmed to run the image recognition algorithms to identify different parts of the body, to compute the desired radiation level to the different parts of the body and to adjust the radiation from sources directed at the different parts of the body.

23. (Currently Amended) The irradiation device of claim ~~20~~21, further comprising the controller programmed to control the irradiation in time and intensity on the individual to maintain comfortable heating based on at least one of (i) best practices, (ii) feedback from the heat detector configured to detect body temperature of different parts of a body, (iii) personal preferences input to the controller and stored in memory and (iv) commands input from an input device.

24. (Currently Amended) The irradiation device of claim ~~20~~ 21 where the irradiation instead of for heat is for therapeutic purposes and the radiation may be any of (i) UV radiation, (ii) red light therapy in the 620-660 nm range, and (iii) light therapy for SAD and other disorders selected from the group consisting of seasonal affective disorder, sleep disorders, circadian rhythm disorders, delayed sleep phase syndrome, vitamin D deficiency and skin disorders, where the controller aims the radiation sources to the location where the individual is located and controls the time and intensity of the radiation.

25. (Cancelled)

Amendments to the Specification:

Please replace paragraph [0052] with the following amended paragraph:

[0052] The overall objective of these exemplary embodiments is the disclosure of an exigency based lighting fixture that provides correct or user preferred illuminance in terms of chromaticity, ~~homogenenaity~~homogeneity, aesthetic considerations over a general area and/or task lighting provided in a small area for the visual tasks at hand. Providing illumination only where, how and when it is needed to efficiently carry out visual tasks minimizes wasted light thus minimizing energy use for lighting. To achieve this efficiency goal there is a need for a lighting fixture having provision for 1) the differentiation over space and time of its light intensity and color 2) that can be set-up in the field and/or 3) adjusted in real-time to changing lighting requirements.

[0274] An irradiation device embodiment of this FAML invention can use the computer vision and aim-ability function to provide infrared heating to individuals in indoor and outdoor settings. The heat radiation sources can be infrared filament lamps or infrared LEDs in addition to other wavelengths. The irradiating devices 472 mounted on the irradiation fixture can provide general area heating or spot heating 482 to people or objects. Computer recognition of individuals is used to irradiate them as they move about the living space. Using face recognition algorithms and stored personal preferences from the data storage, the logical controller 454 will aim the heating rays specifically where on their body they prefer to be heated as well as in what amount and at what times. The camera 475 has sensors sensitive to infra-red wavelengths around 12 .mu.m (micrometers) radiated from people. The controller obtaining the information from the body temperature sensor will run algorithms to calculate radiation parameters and will control the irradiation in time and intensity on the individual to maintain comfortable heating per best practice standards, drawing on stored data of heating practices, or personally input preferences. People may be sensitive to radiation heating on certain parts of the body. For example heating on the head area causes some people discomfort, The camera and controller processor system can use image recognition to identify parts of the body and the controller can provide a different radiation level to the head vs. the rest of the body. Other people feel the cold in the legs etc. In addition the controller can obtain information on other environmental parameters such as the temperature, humidity etc which affect the heating regimen. Thus the camera sensor 475 is an energy saving sensor replacing the room heating thermostat used to maintain the entire room at a high ambient temperature with a more accurate and localized actual measure of the individual's temperature. The radiating fixture 470 will them provide localized heating on an as needed basis to maintain ~~comport~~comfort. The FAML logical controller 454 runs the algorithms and provides spot heating only when necessary and in the right amount. Just as moveable head stage lighting follows the performer about the stage the camera/controller vision system follows the person around the room or outdoors and keeps them warm with an infra-red lamp 482. It is to be understood that the irradiating source can be supplying UV radiation, visible light, or any other radiation for therapeutic, pleasure or manufacturing purposes such as UV, EB or heat curing adhesives etc.

REMARKS

Favorable reconsideration of this application, in light of the remarks and following amendments, is respectfully requested.

In reply to point 1 Claim Objections:

1) *Claim 19 is objected to because of the following informalities: In line 6, "a" should be deleted. Appropriate correction is required.*

→ Claim 19 has been currently amended by deleting "a" and marked-up in the full list of claims. The examiner requested corrections have been made in the new listing of claims set forth above per 37 CFR 1.121.

In reply to point 2 & 3 Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis...
1. Claims 19 and 25 are rejected under pre-AIA 35 U.S.C. 102(e) as being anticipated by Mueller et al. (US 2004/0052076 of record). With respect to claim 19, Mueller discloses in figures 9 and 39 an automated irradiating device for providing radiation to individuals within an area

The applicant has now currently amended claim 19 by merging claim 20 into claim 19 and deleted claim 20. The applicant then made claim 21 dependent on 19 and claims 22,23,24 dependent on claim 21. Claim 20 has been cancelled

In reply to point 4

With respect to claim 25, Mueller discloses ....
Without further arguing the novelty, the applicant has temporarily cancelled Claim 25 from the claim set.

In reply to point 5

Allowable Subject Matter

Claims 1-18 are allowed. Claims 20-24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
The applicant has cancelled claim 20 and amended claims 21-24

Conclusion

The applicant has revised the objected claim and requests that the above claims now be amended as in the new list of claims. The applicant submits that the claims are now in proper form to place the case in condition for allowance which action he respectfully solicits.

Record of the substance of the interview Per 37 CFR 1.133

The applicant asked and was granted an interview with the examiner on the 12th of November 2017. The substance of the interview related to an allowance offered by the examiner and the applicant had some questions. "*5. Claims 20-24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten .....* A list of questions and background material with claim versions to illustrate the possible alternatives was emailed to the examiner prior to the interview.

The applicant had the questions reading the language of examiners request; for example: if there was any reason for each claim, other than the revised broad claim 19 which was to be limited by including claim 20 within, to be an independent claim.

"Actually Claim 21 is dependent on new claim 19 "further comprising" as shown in version 1. Or should it be made an Independent Claim and an extra fee paid for additional independent claims? Same for Claims 22, 23 and 24 – Should I make very long independent claims each time or put them in as sub-claim.

The examiner said that once the claim 19 was amended to include the restrictions of claim 20 the claims 21-24 could in theory be dependent claims but would only actually approve them once the reply to the final action was received.

The applicant also asked the examiner:

I also noticed a spelling error in the specification paragraph: [0274] *An irradiation device embodiment ... The radiating fixture 470 will them provide localized heating on an as needed basis to maintain comport*. The last word should be comfort. At what next stage will I be able to make such corrections?

The examiner said that spelling corrections to were best made in the present amendment.

Conditional Request for Constructive Assistance

Should the examiner still prefer to have these or any or any other claims amended to more clearly highlight the uniqueness of the present invention, the pro se applicant requests under M.P.E.P. § 2173.02 and §707.07(j) that the examiner should draft one or more claims for the applicant and indicate in his or her action that such claims would be allowed if incorporated in the application by amendment. This request is in order that the undersigned can place this application in allowable condition as soon as possible and without the need for further proceedings.

Very respectfully,
/ Yechezkal Evan Spero/
Yechezkal Evan Spero
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yspero@netvision.net.il

Monday, Nov 13, 2017

Electronic Acknowledgement Receipt

EFS ID:	30938349
Application Number:	13357549
International Application Number:	
Confirmation Number:	1905
Title of Invention:	Detector Controlled Illuminating System
First Named Inventor/Applicant Name:	Yechezkal Evan Spero
Customer Number:	37268
Filer:	Yechezkal Evan Spero
Filer Authorized By:	
Attorney Docket Number:	
Receipt Date:	13-NOV-2017
Filing Date:	24-JAN-2012
Time Stamp:	21:16:36
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Applicant Arguments/Remarks Made in an Amendment	Reply_to_Final_OA_Aug-11-17.pdf	150736 397079c5552041f384b1b97efcee64a9b2226e7e	no	12

Warnings:

Information:	
Total Files Size (in bytes):	150736

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.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/357,549	01/24/2012	Yechezkal Evan Spero		1905

37268 7590 11/16/2017

YECHEZKAL EVAN SPERO
74 MOSHAV TIFRACH
M. P. HANEGEV, 85102
ISRAEL

EXAMINER	
LE, TUNG X	

ART UNIT	PAPER NUMBER
2844	

MAIL DATE	DELIVERY MODE
11/16/2017	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Applicant-Initiated Interview Summary	Application No.	Applicant(s)	
	13/357,549	SPERO, YECHEZKAL EVAN	
	Examiner	Art Unit	
	TUNG X. LE	2844	

All participants (applicant, applicant's representative, PTO personnel):

(1) *TUNG X. LE (Examiner)*. (3)_____.

(2) *Evan Spero (Applicant)*. (4)_____.

Date of Interview: *13 November 2017*.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☒ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☒ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☒102 ☐103 ☐Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *19*.

Identification of prior art discussed: *Mueller et al. - US 2004/0052076*.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

The proposed amendment to claim 19 would overcome the prior art of Mueller et al. (US 2004/0052076)..

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

/TUNG X. LE/ Primary Examiner, Art Unit 2844 November 13, 2017	

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews
Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

———

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:
1) A brief description of the nature of any exhibit shown or any demonstration conducted,
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
   (The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

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PTOL-413A (07-15)
Approved for use through 08/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Applicant Initiated Interview Request Form

Application No.: 13357549 First Named Applicant: Evan Spero
Examiner: Le Tung X Art Unit: 2844 Status of Application: Final OA with claims 1-25 pending

Tentative Participants:
(1) Examiner Le Tung X (2) Applicant Evan Spero
(3) _____ (4) _____

Proposed Date of Interview: All day Sept 11 or Sept 13 or Sept 12 ET 0:00 **Proposed Time:** 8:30 - 5:30 (☉AM☉PM)

Type of Interview Requested:
(1) ☑ Telephonic (2) ☐ Personal (3) ☐ Video Conference

Exhibit To Be Shown or Demonstrated: ☑ YES ☐ NO
If yes, provide brief description: Revised claims 1-25 9. Claims 20-24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in indep

Issues To Be Discussed

Issues (Rej., Obj., etc)	Claims/ Fig. #s	Prior Art	Discussed	Agreed	Not Agreed
(1) Amendments	20-25		☐	☐	☐
(2)			☐	☐	☐
(3)			☐	☐	☐
(4)			☐	☐	☐

☐ Continuation Sheet Attached ☑ Proposed Amendment or Arguments Attached

Brief Description of Arguments to be Presented: Per Examiners recommendation I Amended the Claims 20-24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form

An interview was conducted on the above-identified application on _____

NOTE: This form should be completed and filed by applicant in advance of the interview (see MPEP § 713.01). If this form is signed by a registered practitioner not of record, the Office will accept this as an indication that he or she is authorized to conduct an interview on behalf of the principal (37 CFR 1.32(a)(3)) pursuant to 37 CFR 1.34. This is not a power of attorney to any above named practitioner. See the Instruction Sheet for this form, which is incorporated by reference. By signing this form, applicant or practitioner is certifying that he or she has read the Instruction Sheet. After the interview is conducted, applicant is advised to file a statement of the substance of this interview (37 CFR 1.133(b)) as soon as possible. This application will not be delayed from issue because of applicant's failure to submit a written record of this interview.

/Yechezkal Evan Spero/ Yechezkal Evan Spero
Applicant/Applicant's Representative Signature

_____
Examiner/SPE Signature

Yechezkel Evan Spero
Typed/Printed Name of Applicant or Representative

_____
Applicant's/Applicant's Representative's Telephone Number

37268 Tel +972 54- 440-7280
Registration Number, if applicable

This collection of information is required by 37 CFR 1.133. 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 24 minutes 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.
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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NOV 09 2017

PTO/SB/97 (07-09)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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.

Interview Request

Certificate of Transmission under 37 CFR 1.8

Art Unit 2844 - Examiner Tung X. LE

I hereby certify that this correspondence is being facsimile transmitted to the United States Patent and Trademark Office

on 11/09/2017
Date

/Yechezkal Evan Spero/ Yechezkal Evan Spero
Signature

Yechezkal Evan Spero
Typed or printed name of person signing Certificate

37268
Registration Number, if applicable

+972-54-440-7280
Telephone Number

Faxed to: 571 273-8300

Note: Each paper must have its own certificate of transmission, or this certificate must identify each submitted paper.

This collection of information is required by 37 CFR 1.8. 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 1.8 minutes 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. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/SB/06 (09-11)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/357,549	Filing Date 01/24/2012	☐ To be Mailed

ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT

11/13/2017	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 23	Minus	** 26	= 0	X $40 =	0
Independent (37 CFR 1.16(h))	* 4	Minus	***4	= 0	X $210 =	0
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	0

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
CAROL BARNES

This collection of information is required by 37 CFR 1.16. 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 12 minutes 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. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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
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NOTICE OF ALLOWANCE AND FEE(S) DUE

37268 7590 12/19/2017

YECHEZKAL EVAN SPERO
74 MOSHAV TIFRACH
M. P. HANEGEV, 85102
ISRAEL

EXAMINER
LE, TUNG X

ART UNIT	PAPER NUMBER
2844	

DATE MAILED: 12/19/2017

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/357,549	01/24/2012	Yechezkal Evan Spero		1905

TITLE OF INVENTION: Detector Controlled Illuminating System

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$0	$480	03/19/2018

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

37268 7590 12/19/2017
YECHEZKAL EVAN SPERO
74 MOSHAV TIFRACH
M. P. HANEGEV, 85102
ISRAEL

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/357,549	01/24/2012	Yechezkal Evan Spero		1905

TITLE OF INVENTION: Detector Controlled Illuminating System

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$0	$480	03/19/2018

EXAMINER	ART UNIT	CLASS-SUBCLASS
LE, TUNG X	2844	315-307000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
- ❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:
- ❑ Issue Fee
- ❑ Publication Fee (No small entity discount permitted)
- ❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): (**Please first reapply any previously paid issue fee shown above**)
- ❑ A check is enclosed.
- ❑ Payment by credit card. Form PTO-2038 is attached.
- ❑ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ❑ Applicant certifying micro entity status. See 37 CFR 1.29 — NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- ❑ Applicant asserting small entity status. See 37 CFR 1.27 — NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
- ❑ Applicant changing to regular undiscounted fee status. — NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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 NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/357,549	01/24/2012	Yechezkal Evan Spero		1905

37268 7590 12/19/2017

YECHEZKAL EVAN SPERO
74 MOSHAV TIFRACH
M. P. HANEGEV, 85102
ISRAEL

EXAMINER	
LE, TUNG X	

ART UNIT	PAPER NUMBER
2844	

DATE MAILED: 12/19/2017

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. 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 12 minutes 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, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. 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.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 13/357,549	Applicant(s) SPERO, YECHEZKAL EVAN	
	Examiner TUNG X. LE	Art Unit 2844	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *11/13/2017*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1-19 and 21-24*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:
   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/TUNG X. LE/
Primary Examiner, Art Unit 2844
December 7, 2017

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

This Office Action is in response to the Applicant's amendment submitted on November 13, 2017. In virtue of this amendment:

- Claims 20 and 25 are cancelled; and thus,
- Claims 1-19 and 21-24 are now pending in the instant application.

Allowable Subject Matter

1. Claims 1-19 and 21-24 are allowed.

2. The following is an examiner's statement of reasons for allowance:

Prior art of record fails to disclose or fairly suggest the following limitations:

- An automated irradiating device for providing a desired radiation to individuals within an area, comprising … "*the automated irradiating device further comprising one detector being a camera with a capability for transferring data to the processor arranged with image recognition algorithms for sensing any of the information selected from the list comprised of; a presence, an identity, a location, a position, an activity, and a body temperature of an individual; the controller having processing capability for using the information and determining the heating requirements of the individuals from at least one of (i) algorithms to calculate radiation parameters, (ii) stored data of heating practices, and (iii) the identified individual's stored personal preferences*" …, in combination with the

remaining claimed limitations as claimed in independent claim 19 (claims 21-24 are allowed as being dependent on claim 19).

- Reasons for indicating the allowable subject matter of claims 1-18 were provided in the previous office action.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

3. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Prior art Champagne et al. – US 2012/0262575

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to TUNG X. LE whose telephone number is (571)272-6010. The examiner can normally be reached on 8:30 AM - 5:30 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Douglas Owens can be reached on 571-272-1662. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TUNG X. LE/
Primary Examiner, Art Unit 2844
December 7, 2017

Notice of References Cited	Application/Control No. 13/357,549	Applicant(s)/Patent Under Reexamination SPERO, YECHEZKAL EVAN	
	Examiner TUNG X. LE	Art Unit 2844	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2012/0262575 A1	10-2012	Champagne; Jean-Philippe	G08B13/19613	348/143
	B	US-				
	C	US-				
	D	US-				
	E	US-				
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13357549	SPERO, YECHEZKAL EVAN
	Examiner	Art Unit
	TUNG X. LE	2844

CPC- SEARCHED		
Symbol	Date	Examiner
H05B: 33/08, 37/02	08/12/2016	TXL
B60Q1/04	08/12/2016	TXL
updated above	12/07/2017	TXL

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
315	77, 152, 307, 312	08/12/2016	TXL
updated	above	12/07/2017	TXL

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

SEARCH NOTES		
Search Notes	Date	Examiner
EAST (see search history printout)	08/12/2016	TXL
CPC and USPC Searches	08/12/2016	TXL
EAST (see search history printout)	04/25/2017	TXL
EAST (see search histor printout)	12/07/2017	TXL
Inventor and Assignee Searches	12/07/2017	TXL

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
H05B	37/0227	12/07/2017	TXL

/DAVID LOTTER/ Examiner.Art Unit 2844	

INTERFERENCE SEARCH			
US Class/ CPC Symbol	**US Subclass / CPC Group**	**Date**	**Examiner**
315	307	12/07/2017	TXL

/DAVID LOTTER/ Examiner.Art Unit 2844	

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13357549	SPERO, YECHEZKAL EVAN
	Examiner	**Art Unit**
	TUNG X LE	2844

CPC						
Symbol					**Type**	**Version**
H05B		37	/	0227	F	2013-01-01
B60Q		1	/	04	I	2013-01-01
B60Q		1	/	085	I	2013-01-01
B60Q		1	/	1423	I	2013-01-01
B60Q		2300	/	054	A	2013-01-01
B60Q		2300	/	112	A	2013-01-01
B60Q		2300	/	116	A	2013-01-01
B60Q		2300	/	122	A	2013-01-01
B60Q		2300	/	134	A	2013-01-01
B60Q		2300	/	142	A	2013-01-01
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F21V		19	/	02	I	2013-01-01
F21V		21	/	02	A	2013-01-01
F21V		21	/	30	A	2013-01-01
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F21W		2131	/	40	A	2013-01-01
F21Y		2113	/	00	A	2013-01-01
H05B		33	/	0812	I	2013-01-01
H05B		33	/	0857	I	2013-01-01

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 23	
/TUNG X LE/ Primary Examiner.Art Unit 2844 (Primary Examiner)	12/07/2017 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13357549	SPERO, YECHEZKAL EVAN
	Examiner	**Art Unit**
	TUNG X LE	2844

H05B	33	/	0863	I	2013-01-01
H05B	37	/	02	I	2013-01-01
F21V	23	/	0464	I	2013-01-01
F21V	23	/	0478	I	2013-01-01
Y02B	20	/	383	A	2013-01-01
Y02B	20	/	343	A	2013-01-01
F21V	29	/	74	A	2015-01-15
H05B	3	/	008	I	2013-01-01
H05B	37	/	0218	I	2013-01-01
F21S	48	/	1154	I	2013-01-01
F21S	48	/	1159	I	2013-01-01
F21S	48	/	1736	I	2013-01-01
F21S	4	/	28	I	2016-01-01
F21K	9	/	23	I	2016-08-01
F21K	9	/	232	I	2016-08-01
F21Y	2115	/	10	A	2016-08-01
Y02B	20	/	46	A	2013-01-01

CPC Combination Sets					
Symbol			**Type**	**Set**	**Ranking**	**Version**
	/					
	/					

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 23	
/TUNG X LE/ Primary Examiner.Art Unit 2844 (Primary Examiner)	12/07/2017 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

U.S. Patent and Trademark Office

Part of Paper No. 20171207

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13357549	SPERO, YECHEZKAL EVAN
	Examiner	**Art Unit**
	TUNG X LE	2844

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION										
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED					
315	307	H	0	5	B	37 / 02 (2006.01.01)						
CROSS REFERENCE(S)												
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)											

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 23	
/TUNG X LE/ Primary Examiner.Art Unit 2844 (Primary Examiner)	12/07/2017 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13357549	SPERO, YECHEZKAL EVAN
	Examiner	**Art Unit**
	TUNG X LE	2844

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	17	17												
2	2	18	18												
3	3	19	19												
4	4	-	20												
5	5	20	21												
6	6	21	22												
7	7	22	23												
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9	9	-	25												
10	10														
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12	12														
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14	14														
15	15														
16	16														

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 23	
/TUNG X LE/ Primary Examiner.Art Unit 2844 (Primary Examiner)	12/07/2017 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

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BIB DATA SHEET

CONFIRMATION NO. 1905

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
13/357,549	01/24/2012	315	2844	

APPLICANTS

INVENTORS

Yechezkal Evan Spero, Moshav Tifrach, ISRAEL;

**** CONTINUING DATA ***************************

This application is a CIP of 10/604,360 07/14/2003 PAT 8100552
and claims benefit of 61/535,981 09/17/2011

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED **** ** SMALL ENTITY **
02/03/2012

Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☑ No Verified and Acknowledged /TUNG X LE/ Examiner's Signature	☐ Met after Allowance TXL Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		ISRAEL	24	23	4

ADDRESS

YECHEZKAL EVAN SPERO
74 MOSHAV TIFRACH
M. P. HANEGEV, 85102
ISRAEL

TXL 12/07/2017

TITLE

Detector Controlled Illuminating System

FILING FEE RECEIVED		
1055	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S46	107916	(H05B37/02$2 or H05B33/08$2 or B60Q1/04).CPC.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/07 11:32
S47	14171	315/77,152,307,312.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/07 11:32
S48	1024	(light$3 near2 (system or network or fixture)) and ((motion near2 sensor) with (object or people or user)) and (area or location or environment) and ($5processor or $5controller) and (adjust$3 with (intensity or brightness or spectral or spectrum))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/07 11:33
S49	14	(yechezkal near2 evan near2 spero).in.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/07 11:34
S50	115677	S46 or S47 or S48	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/07 11:37
S52	3297	S50 and ((sens$3 or detect$3) with (motion or object or people or person) with (area or (sub adj1 area) or zone or location))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/07 11:38
S53	756	S52 and (adjust$4 near2 (intensity or spectr$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/07 11:39
S54	2	(fixture and (light near2 source) and	US-PGPUB;	OR	ON	2017/12/07

		controller and (adjust$4 with (intensity and spectrum)) and (detector with object with surface with area) and processor).clm.	USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB			11:45
S55	2425	(light$3 near2 fixture) and ($5processor or $5controller) and (adjust$3 near2 (intensity or brightness or spectral or spectrum))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/07 11:52
S56	1654	S55 and (adjust$4 near2 (intensity or spectr$3))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/07 11:52
S57	346	S56 and ((sens$3 or detect$3) with (motion or object or people or person) with (area or (sub adj1 area) or zone or location))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/12/07 11:52
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S59	13	("20090237011" | "20120139417" | "20120206050" | "20120262575" | "5031082" | "6542270" | "7439847" | "8100552" | "8139113" | "8143811" | "8339274" | "8571411" | "8791649").PN. OR ("9060393").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2017/12/07 12:21

12/7/2017 5:55:58 PM
C:\Users\tle16\Documents\EAST\Workspaces\13357549.wsp

OK TO ENTER: /T.X.L/ 12/07/2017

In the United States Patent and Trademark Office

Application/CN: 13/357,549 November 13, 2017
Application Filed: 24 January 2012
Applicant: Spero, Yechezkal Evan
Title: Detector Controlled Illuminating System
Examiner: Le Tung X
Art Unit: 2844

Reply to Non-Final Office Action dated Aug 13, 17

Mailstop: Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

The application is being prosecuted by the Applicant pro se.

Certificate of Transmission Under 37 C.F.R. § 1.8

I hereby certify that this correspondence is being deposited electronically with the U.S. Patent and Trademark Office using the United States Patent and Trademark Office's EFS-Web system on Nov. 13, 2017

Signature
/Yechezkal Evan Spero/

Yechezkal Evan Spero

AMENDMENT UNDER 37 C.F.R. §1.111

In response to the Office Action mailed Aug. 11, 17, the following amendments and remarks are respectfully submitted in connection with the above-identified application.

Amendments to the Claims begin on page 2 of this Amendment.

Amendments to the Specification begin on page 9 of this Amendment.

Remarks begin on page 10 of this Amendment.

Record the substance of the Examiner interview begins on page 11 of this Amendment.

	Claims remaining after Amendment		**Highest number previously paid for**		**Present extra**
Total	25	-	25	=	0
Independent	4	-	4	=	0

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
13/357,549	01/24/2012	2844	1055		26	4

CONFIRMATION NO. 1905

CORRECTED FILING RECEIPT

37268
YECHEZKAL EVAN SPERO
74 MOSHAV TIFRACH
M. P. HANEGEV, 85102
ISRAEL



Date Mailed: 12/22/2017

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. 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**

Inventor(s)

Yechezkal Evan Spero, Moshav Tifrach, ISRAEL;

Applicant(s)

Yechezkal Evan Spero, Moshav Tifrach, ISRAEL;

Assignment For Published Patent Application

Yechezkal Evan Spero, Moshav Tifrach, ISRAEL

Power of Attorney: None

Domestic Priority data as claimed by applicant

This appln claims benefit of 61/535,981 09/17/2011
and is a CIP of 10/604,360 07/14/2003 PAT 8100552
which claims benefit of 60/395,308 07/12/2002

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: No

Permission to Access Search Results: No

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 02/03/2012

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/357,549**

Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****
Title

Detector Controlled Illuminating System

Preliminary Class

315

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications:

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.

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37268 7590 12/19/2017
YECHEZKAL EVAN SPERO
74 MOSHAV TIFRACH
M. P. HANEGEV, 85102
ISRAEL

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Yechezkal Evan Spero	(Depositor's name)
/Yechezkal Evan Spero/	(Signature)
March 18, 2018	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/357,549	01/24/2012	Yechezkal Evan Spero		1905

TITLE OF INVENTION: Detector Controlled Illuminating System

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0	$0	$480	03/19/2018

EXAMINER	ART UNIT	CLASS-SUBCLASS
LE, TUNG X	2844	315-307000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE
Yechezkal Evan Spero

(B) RESIDENCE: (CITY and STATE OR COUNTRY)
2 0 R a s h i S t .
Tifrach, 85102 Israel

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:
☒ Issue Fee
☐ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
☐ A check is enclosed.
☒ Payment by credit card. Form PTO-2038 is attached.
☐ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
☐ Applicant certifying micro entity status. See 37 CFR 1.29
NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
☐ Applicant asserting small entity status. See 37 CFR 1.27
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
☐ Applicant changing to regular undiscounted fee status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Yechezkal Evan Spero/ Date March 18, 2018
Typed or printed name Yechezkal Evan Spero Registration No. 37268

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Electronic Patent Application Fee Transmittal

Application Number:	13357549
Filing Date:	24-Jan-2012
Title of Invention:	Detector Controlled Illuminating System
First Named Inventor/Applicant Name:	Yechezkal Evan Spero
Filer:	Yechezkal Evan Spero
Attorney Docket Number:	

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	2501	1	480	480

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**480**

Electronic Acknowledgement Receipt

EFS ID:	32083961
Application Number:	13357549
International Application Number:	
Confirmation Number:	1905
Title of Invention:	Detector Controlled Illuminating System
First Named Inventor/Applicant Name:	Yechezkal Evan Spero
Customer Number:	37268
Filer:	Yechezkal Evan Spero
Filer Authorized By:	
Attorney Docket Number:	
Receipt Date:	18-MAR-2018
Filing Date:	24-JAN-2012
Time Stamp:	19:12:07
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$480
RAM confirmation Number	031918INTEFSW19183300
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	Part-B_Issue_Fees_CIP.pdf	280946 654b2aa14cce0420c1ed423b9bbec833016bbd5e	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	29991 f5e65f93d6e40988662e64048529eecbd32b3f35	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	310937		

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 NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/357,549	04/24/2018	9955551		1905

37268 7590 04/04/2018

YECHEZKAL EVAN SPERO
74 MOSHAV TIFRACH
M. P. HANEGEV, 85102
ISRAEL

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 911 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Yechezkal Evan Spero, Moshav Tifrach, ISRAEL;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

PTO/SB/123 (04-15)
Approved for use through 03/31/2021. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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CHANGE OF CORRESPONDENCE ADDRESS
Patent

Address to:
Mail Stop Post Issue
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Patent Number	9,955,551
Issue Date	2018-04-24
Application Number	13/357,549
Filing Date	2012-01-24
First Named Inventor	Yechezkal Evan Spero
Attorney Docket Number	TRCH0102RX

Please change the Correspondence Address for the above-identified patent to:

☒ The address associated with Customer Number: 22045

OR

☐ **Firm *or* Individual Name**

Address

City	**State**	**ZIP**

Country

Telephone	**Email**

This form cannot be used to change the data associated with a Customer Number. To change the data associated with an existing Customer Number use "Request for Customer Number Data Change" (PTO/SB/124).

This form will not affect any "fee address" provided for the above-identified patent. To change a "fee address" use the "Fee Address Indication Form" (PTO/SB/47).

I am the:

☒ Patentee.

☐ Assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96).

☐ Attorney or agent of record. Registration Number _____.

Signature	/Yechezkal Evan Spero/
Typed or Printed Name	Yechezkal Evan Spero
Date	July 20, 2021
Telephone	+972544407280

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.

☑ *Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.33. 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 3 minutes 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. **SEND TO: Mail Stop Post Issue, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	43330699
Application Number:	13357549
International Application Number:	
Confirmation Number:	1905
Title of Invention:	Detector Controlled Illuminating System
First Named Inventor/Applicant Name:	Yechezkal Evan Spero
Customer Number:	37268
Filer:	Sangeeta G Shah/Fiona Archer
Filer Authorized By:	Sangeeta G Shah
Attorney Docket Number:	
Receipt Date:	23-JUL-2021
Filing Date:	24-JAN-2012
Time Stamp:	14:11:16
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Change of Address	TRCH0102RX_Change_of_correspondence.pdf	68502 94fd7d9047a9d3b42c26edbd19f1d3a368ab4dda	no	2

Warnings:

Information:	
Total Files Size (in bytes):	68502

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New Applications Under 35 U.S.C. 111

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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

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Alexandria, Virginia 22313-1450
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY.DOCKET NO./TITLE	REQUEST ID
13/357,549	01/24/2012	Yechezkal Evan Spero		150510

Acknowledgement of Loss of Entitlement to Entity Status Discount

The entity status change request below filed through Private PAIR on 10/20/2021 has been accepted.

CERTIFICATIONS:

Change of Entity Status:

X Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be notification of loss of entitlement to small or micro entity status, as applicable.

This portion must be completed by the signatory or signatories making the entity status change in accordance with 37 CFR 1.4(d)(4).

Signature:	/John E. Nemazi/
Name:	John Nemazi
Registration Number:	30876

AO 120 (Rev. 08/10)

TO:	Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court for the District of Delaware on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
	6/7/2022	for the District of Delaware

PLAINTIFF	DEFENDANT
Torchlight Technologies LLC	Daimler AG, et al

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	9,955,551	4/24/2018	Yechezkal Evan Spero
2	10,894,503	1/19/2021	Yechezkal Evan Spero
3	11,208,029	12/28/2021	Yechezkal Evan Spero
4			
5			

In the above---entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above---entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1---Upon initiation of action, mail this copy to Director Copy 3---Upon termination of action, mail this copy to Director
Copy 2---Upon filing document adding patent(s), mail this copy to Director Copy 4---Case file copy

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court for the District of Delaware on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT for the District of Delaware
PLAINTIFF Torchlight Technologies LLC		DEFENDANT General Motors LLC, General Motors Holdings LLC, and General Motors Company

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	9,955,551	4/24/2018	Yechezkal Evan Spero
2	10,894,503	1/19/2021	Yechezkal Evan Spero
3	11,208,029	12/28/2021	Yechezkal Evan Spero
4			
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy