



Enabled LED Licensing Program for LED Luminaires and Retrofit Bulbs

Signify Intellectual Property (for information purposes only)

September 2022

Agenda

Introduction

Program outline

Contact info

Core Technology Examples

This presentation is for information purposes only. It is not intended to be a contract and shall not be legally binding in any respect on any party. There shall be no contract until a final written contract is signed by authorized representatives of both companies.



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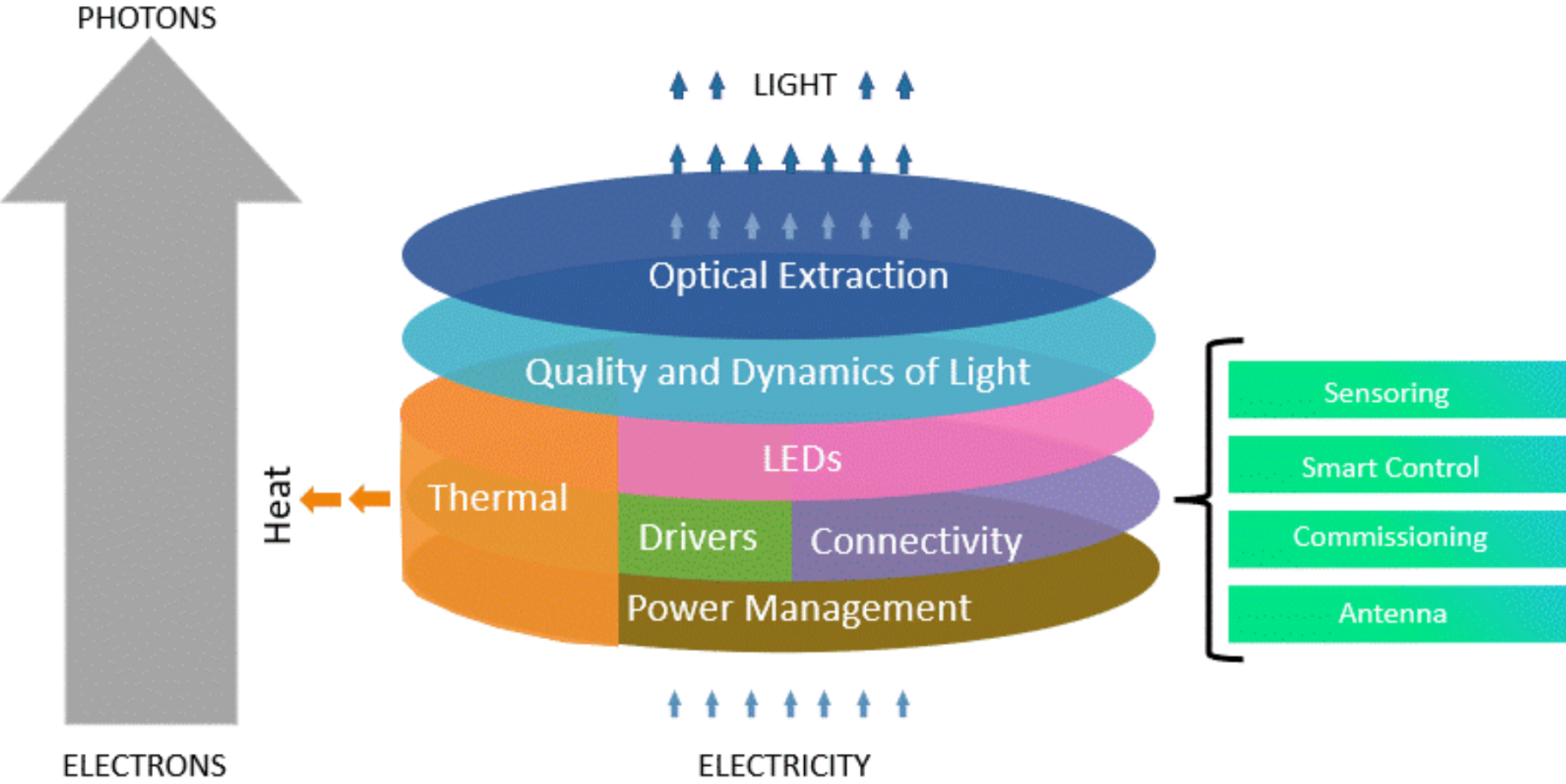
What are the benefits?



- **The business drivers for the Licensee**
 - Preferred and more economic solutions
 - More flexibility in component sourcing
 - More freedom for optimal solution
- **The business drivers for the Licensee and Signify**
 - Accelerate growth of LED luminaires and retrofit bulb markets
 - Enable more functionalities and features in connected systems



LED Lighting Systems - What's Involved?



What does the program cover?



- **The product scope:**
 - Finished, branded, LED Luminaires and Retrofits
- **The field of use**
 - General Illumination (Professional and Residential)
 - Architectural, Theatrical and Entertainment fields
- **The scope of the licensed patents:**
 - Basic LED control and system-level technologies
 - Optics, thermal, mechanics and safety related
 - Sensoring, connectivity, commissioning, spectral tuning, atmosphere creation
 - Includes patents (and patent applications) with priority date prior to 2020
 - Covers patents from Signify Lighting technology investments and from acquisitions (e.g. Color Kinetics, Cooper, Fluence)



What is the licensed Patent Portfolio?



- More than 600 inventions
- More than 4700 granted patents
- More than 200 pending patent applications

- Worldwide
 - (e.g. US, Europe, Turkey, China, Japan, Korea, Canada, Australia, Taiwan, Hong Kong, India, Mexico)





What are the key steps to an agreement?

1. You meet with Signify IP Licensing representative

Signify licensing specialists operate globally and are ready to respond to your questions. They will work with you on every step, so you can quickly start using our patent-protected technology

2. Portfolio Analysis

We work with you to determine which of your products are relevant and require a license.

3. Determine the historical use of the inventions and agree the past-use to be paid.

4. Choose between two royalty payment methods to conclude the agreement

1. In the **standard approach**, we list all relevant products, the corresponding royalty rate, and the countries where a royalty payment is triggered
2. In the **flat rate approach**, we use the portfolio analysis and your turnover of branded luminaires or retrofits in a reference period to determine a single percentage flat rate which will apply on a quarterly basis.



In order to protect **your and Signify's** confidential information that are exchanged between the parties prior to concluding the license agreement, a mutual, two-sided Non-Disclosure Agreement (NDA) will be signed.



What are the Royalties for LED Luminaires?

- **The royalties are based on Net Revenues**
 - 3% for Single Color Luminaires
(fixed color temperature white or color)
 - 4% for Tunable White Luminaires
(color temperature controllable)
 - 5% for Color Changing Luminaires

(Charged only for manufacturing or sales in countries where Signify has at least one issued patent covering a feature of the licensed product)

- **Net Revenue** is the price actually charged to a customer to purchase a licensed product, excluding freight, insurances, and taxes





What are the Royalties for LED Retrofit Bulbs?

- **The royalties are based on Net Revenues:**

- 5%

- Minimum 0.25 Euro per unit*

(Charged only for manufacturing or sales in countries where Signify has at least one issued patent covering a feature of the licensed product)

- **“LED-based Retrofit Bulb” means:**

- a LED-based light bulb designed and intended to be installed in an existing luminaire that previously utilized a conventional (non-LED) light bulb

*For Licensees who are in full compliance with their royalty payment obligations under the Agreement, Signify will waive the minimum royalty of EUR 0.25 applicable to sales of Retrofit Bulbs after 1 January 2015.



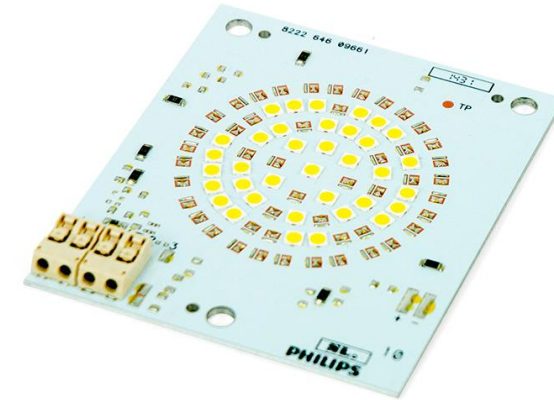


How to use qualified components?

No royalties will be due on luminaires only using Qualified Components provided that the following are **all** from a Qualified Supplier:

- **all LED light-engine modules** (LEDs placed on one or more common circuit board(s)); and
- **all LED drivers**; and
- **all components**, if any, **for controlling** the light output of the LEDs used in the luminaire

The trademark of the respective Qualified Supplier(s) is **identifiable** on each of the above components assembled in the luminaire.



What are the Qualified Suppliers?



- **Our Qualified Suppliers are;**
 - Signify
 - Lumileds (only for light engine modules)
 - Osram GmbH
 - Zumtobel AG
- You still need to enter into a license agreement with Signify
 - even if all luminaires only include components from Qualified Suppliers





How to use the EnabLED member logo?

The personalized EnabLED member logo

- An official logo which you can use
 - to make your customers aware of being a member of the EnabLED Program.
 - It can be used on your website, catalogue and brochure.
- The logo also incorporates a unique QR code linking to our webpage with your details, which protects your identity as one of our valued licensee members.



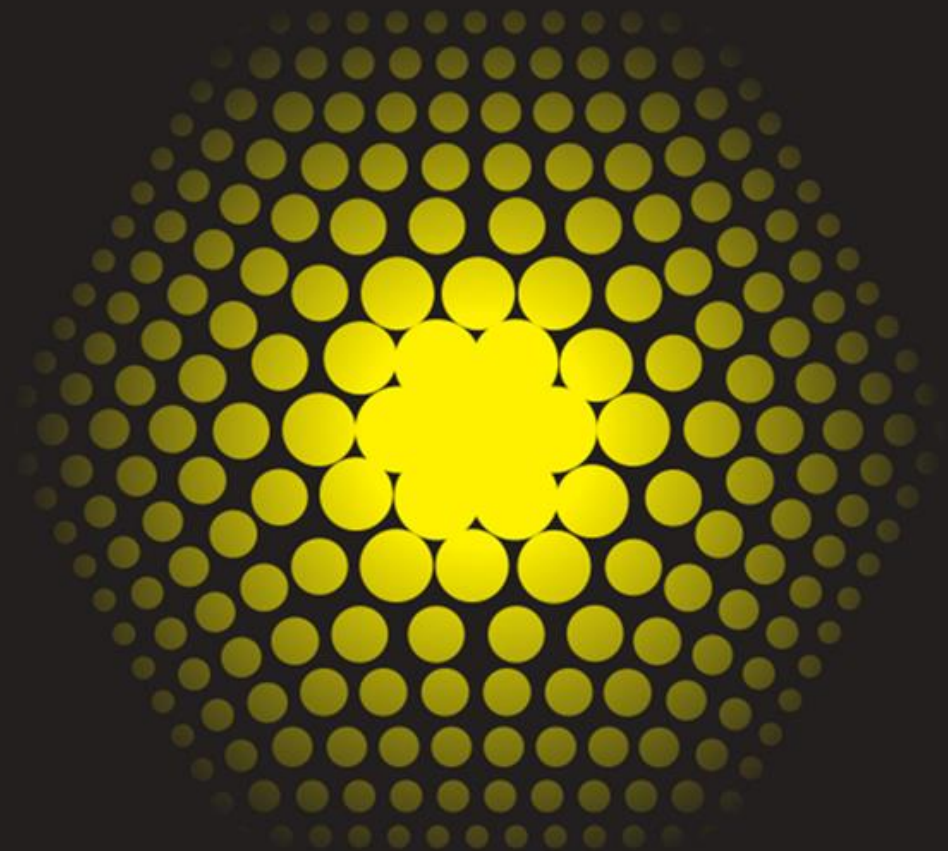
Contact

Mail:

info.SSLicensing@signify.com

Web:

signify.com/enabled

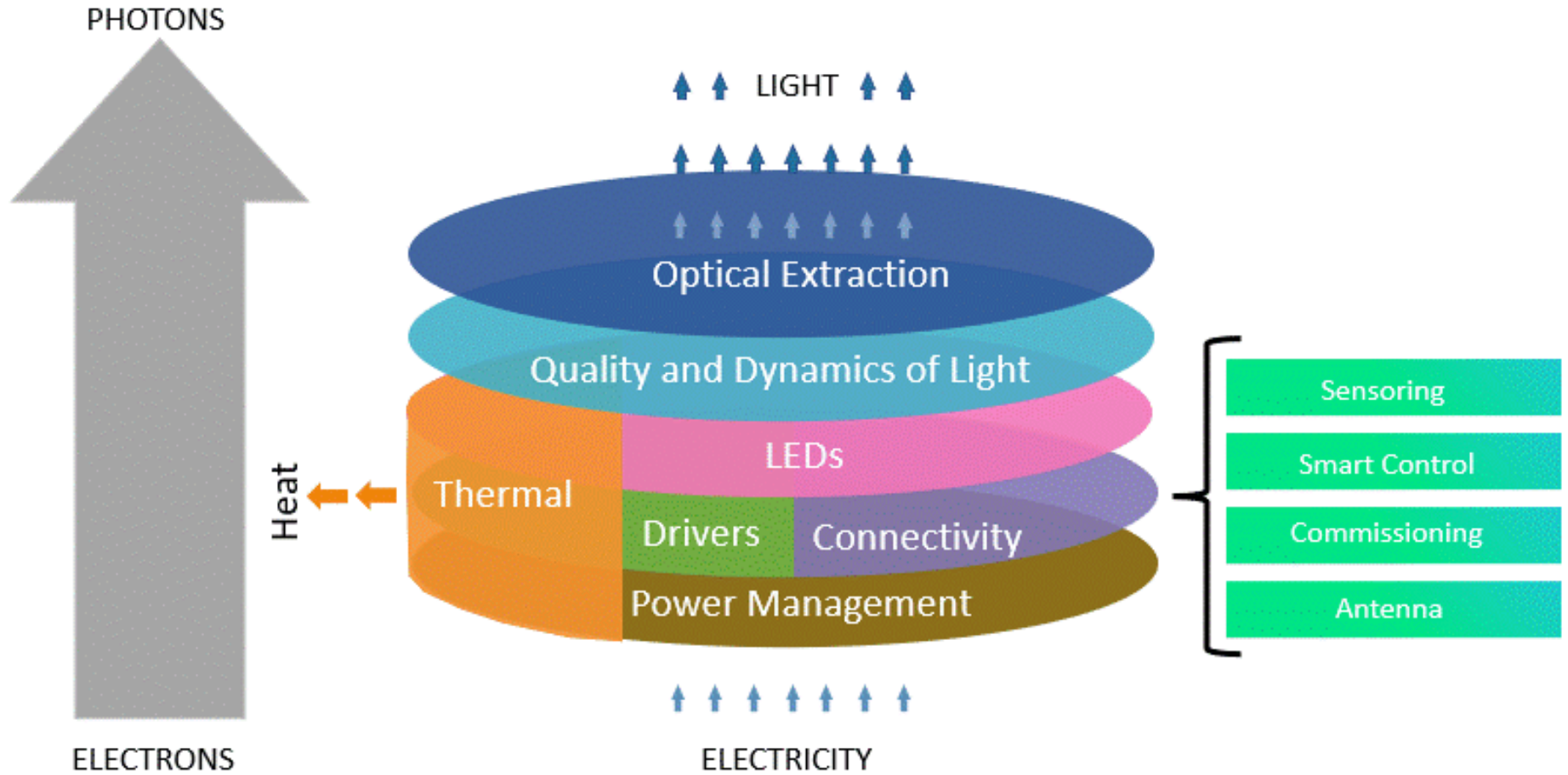


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LED Lighting Systems – Examples of what could be involved

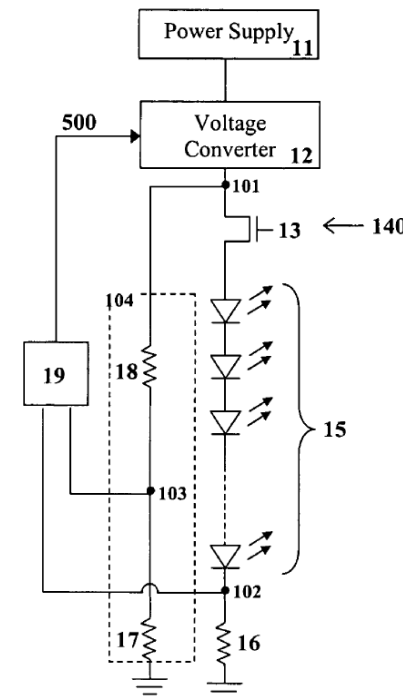
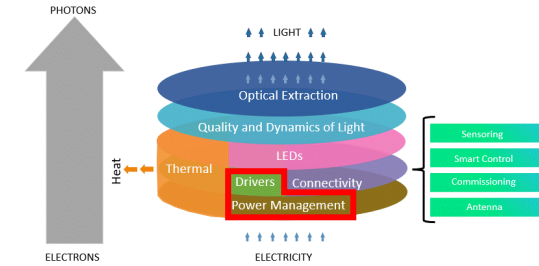


Core Technologies for LED Lighting Systems

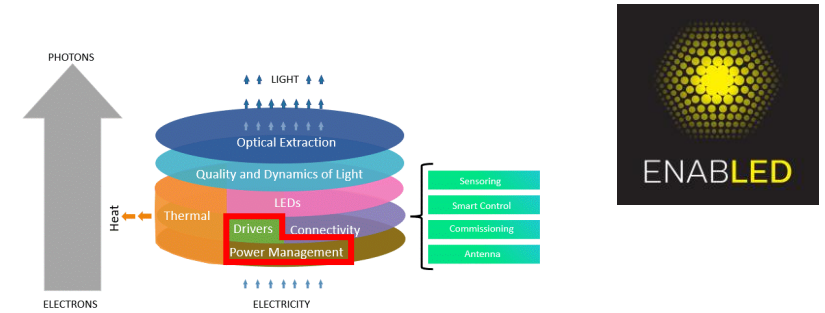
Driving LEDs



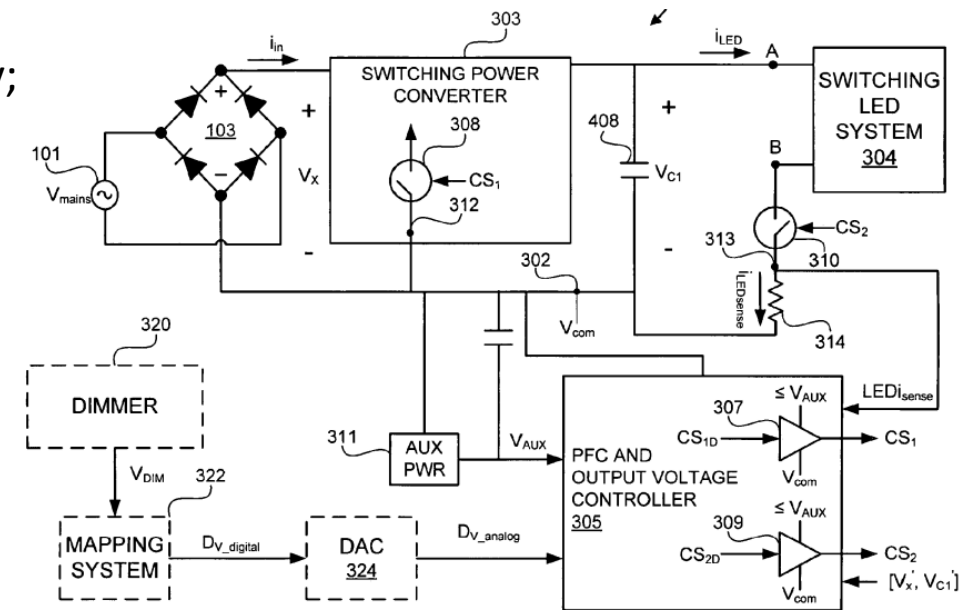
- Application: Efficient and safe LED light source driving and control
- Advantage: Allows accurate control and protection of driver circuitry in case of changes in the LEDs at the output, such as overvoltage, short circuits or malfunctioning of an individual LED in a string; inrush current; Anti glow/ghosting
- Example Patents:
 - North America: CA2572335; US7030572, 7202608, 7262559, 7358681, 7420335, 7542257, 7635957, 9655176, 9900939, 9967935
 - Europe: DE10356608; EP1579735, 1665893, 1776628, 2823691, 2964000, 3036974, 3102003
 - Asia: CN100539780, 100558203, 101010649, 104145529, 104704918, 107710872; IN327182, 356112; JP4588994, 4782785, 5426807, 6072982, 6087960, 6353992; KR100982167



Dimming



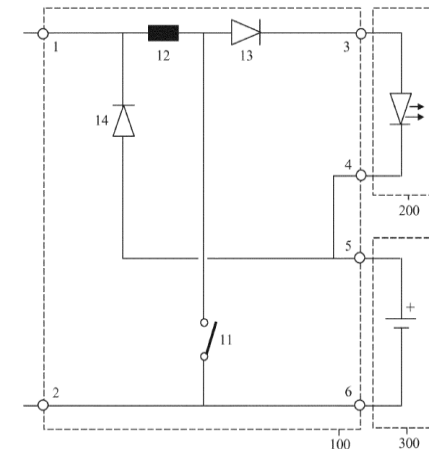
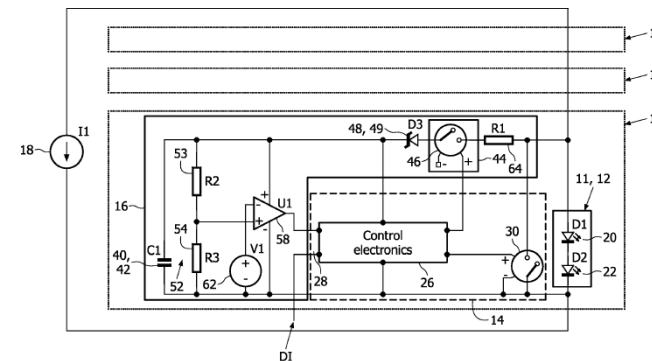
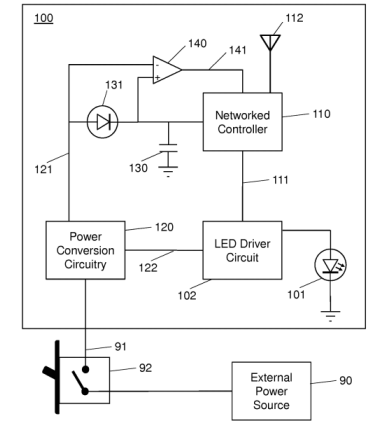
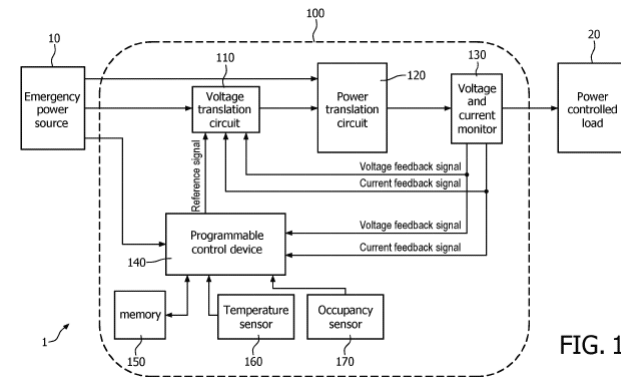
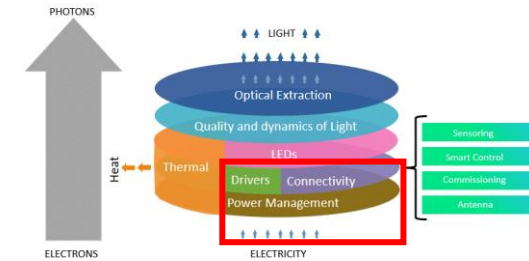
- Application: Power control with dimming
- Advantage: Re-use existing dimmers (e.g., phase-cut, 1-10V); Deep dimming; Mimic existing incandescent look; Improve dimmer compatibility; High power factor and power efficiency in dimmable drivers
- Example Patents:
 - North America: US7288902, 7511437, 7804256, 7852017, 8174204, 8232736, 8482220, 8487546, 8547034, 8587211, 8742684, 8829812, 8952625, 8963449, 9155138, 9155163, 9485833, 9572208, 10356857
 - Europe: EP1984667, 2130407, 2135487, 2550843, 2681969; GB2421367, 2474994
 - Asia: CN101637064, 101653042, 101707874, 102282912, 102648664, 102804919, 102812781, 103209526, 103329617, 104936355, 104955235, 106304474; IN360445; JP5698738, 5837036, 6541606; KR101300007, 101806535



Emergency Lighting



- Application: Emergency lighting with charging and/or reporting functionality; Capacitor backup power
- Advantage: Reduces additional wiring of conventional systems; Provides status reporting, including power failure
- Example Patents:
 - North America: US7204622, 8115397, 8183783, 8242710, 8456090, 8937557, 9999108, 10468910; CA2751111
 - Europe: EP1535495, 1698036, 2165576, 2392192, 2636286, 3281270
 - Asia: CN100576687, 101690397, 102301824, 106465498, 107439055; IN337767; JP4547387, 4625697, 5337153, 5662347, 6526236, 6695811, 6949892; KR101644480, TWI459853



Feedback Control

- Application: Color quality and lifetime improvement using temperature feedback and control
- Advantage: Produce and maintain high quality light output with less dependency on temperature of light source(s) and ambient temperature
- Example Patents:
 - North America: US7635957, 7802902, 7804260, 8405947, 8675332
 - Europe: EP1665893, 1932394, 1943880
 - Asia: CN100539780, 101297604, 101554087; IN272161, 365765; JP5311639, 5341517, 6305966; KR101300565

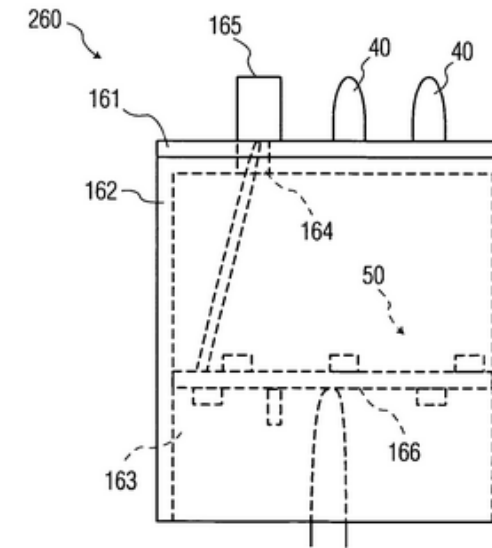
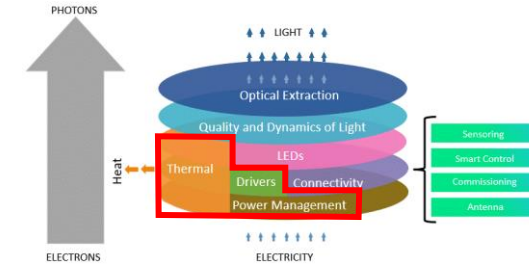
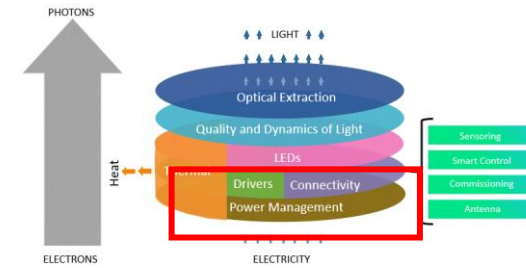


FIG. 12

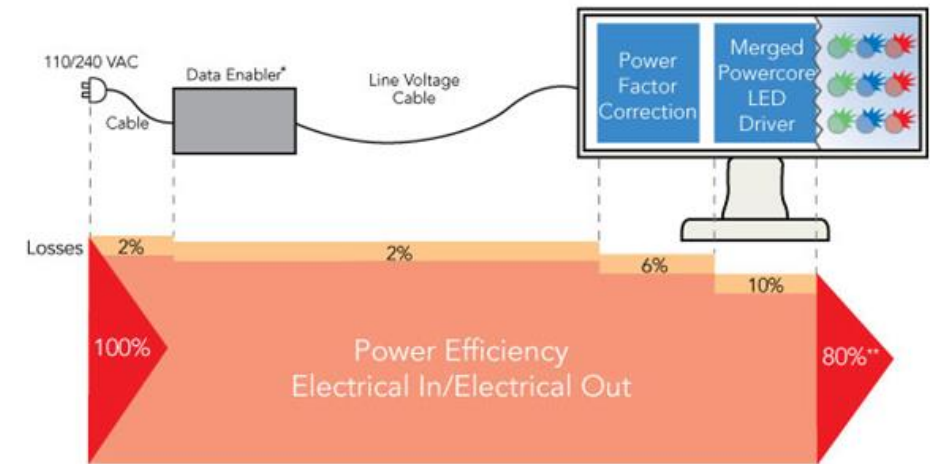
Powercore Feed Forward Control

- Application: Power control (for single color or white, tunable white and color-changing)
- Advantage: Increase power efficiencies; Easier system installations and lower system costs by eliminating stand-alone power supplies
- Example Patents:
 - North America: US7233115, 7256554, 7358706, 7459864, 7557521, 7659673, 7737643; CA2559718, 2730210
 - Europe: EP1731004
 - Asia: JP5198057, 5419918, 5735073; KR10-1182674
 - AU2005222987

Powercore® is a patented breakthrough in digital power processing technology that surpasses traditional power supply technology by streamlining multiple conversion and regulation stages into a single, flexible, microprocessor-controlled power stage that rapidly, efficiently and accurately controls power output to LED-based systems directly from line voltage, eliminating the need for an external power supply.



Powercore® System

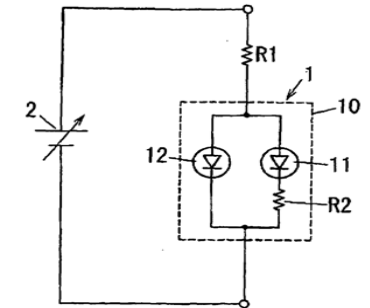
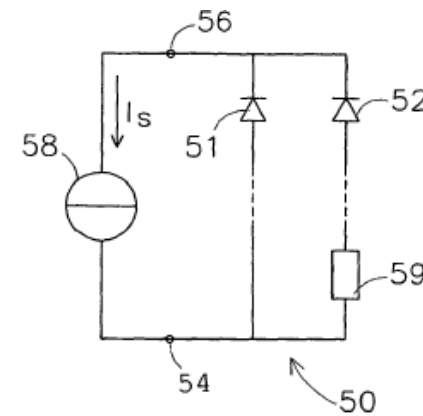
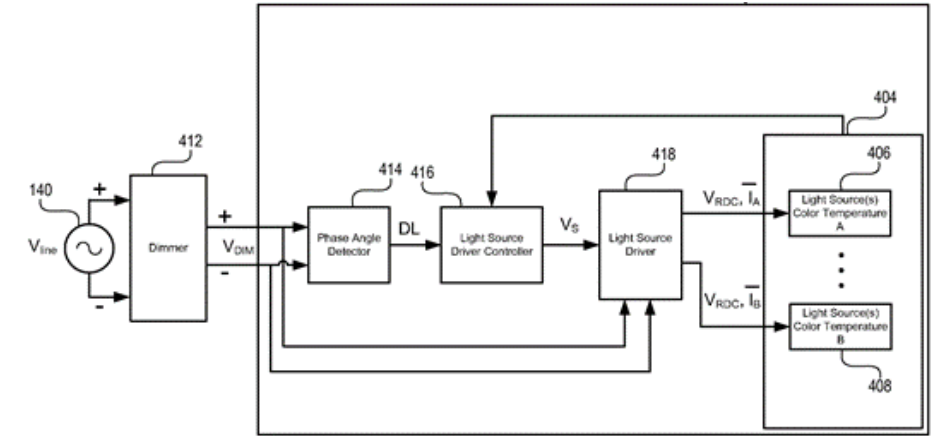
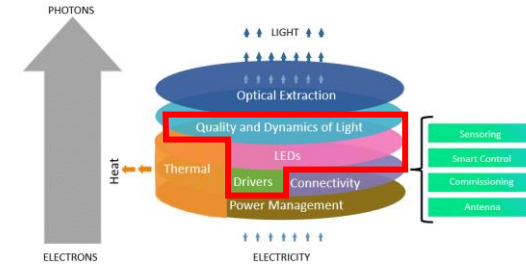


*Minimum communications electronics fixed overhead not included.

Warm Dimming Incandescent Emulation

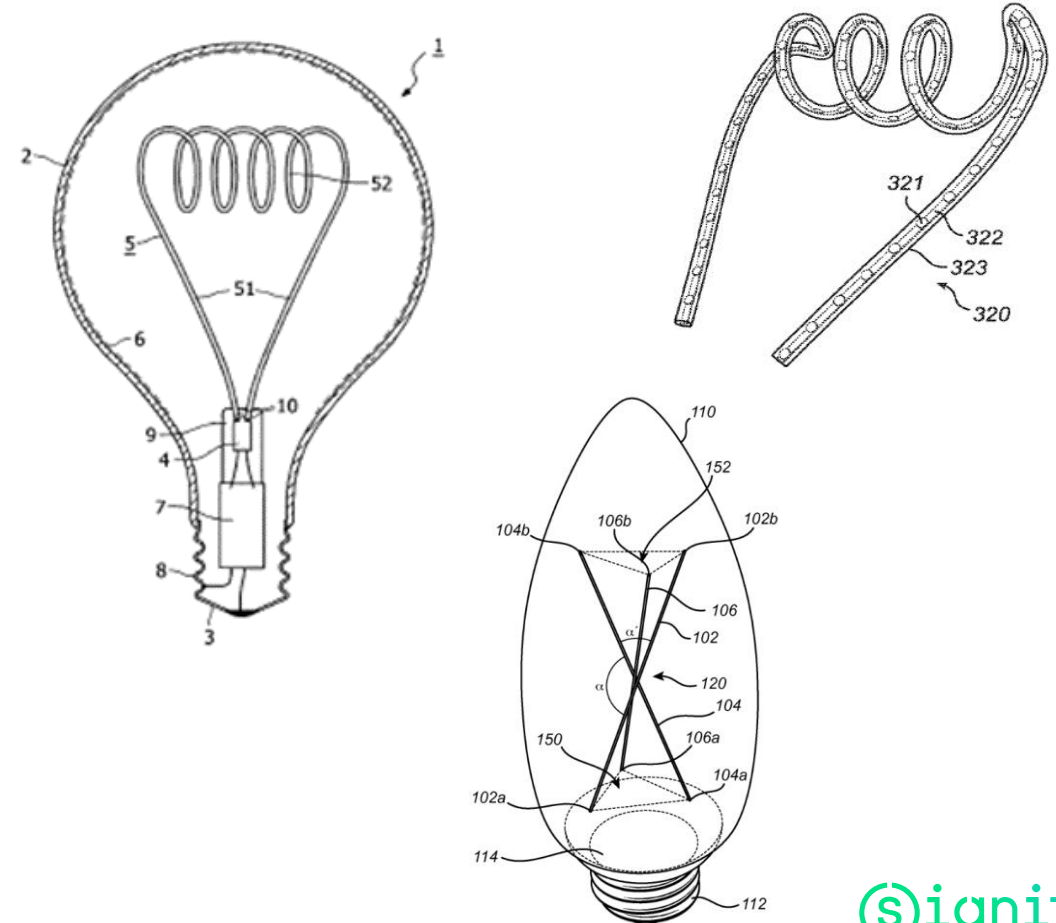
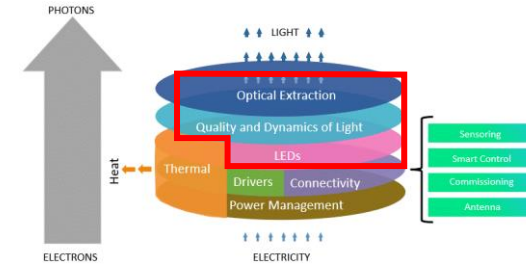


- Application: Using LEDs to emulate warm dimming features of incandescent bulbs
- Advantage: Create white light with natural warm dimming effects
- Example Patents:
 - North America: US7288902, 7719209, 7791289, 8120279, 8203284, 8277078, 8587205, 9253849, 9730291, 10334678, 10624170
 - Europe: EP1842399, 2143303, 2375861; GB2421367;
 - Asia: CN101107885, 101653042, 101663919, 102223745, 102349353, 106304474; HK1111856; IN270149, 285915, 388444; JP5128279, 5285912, 5485868, 5763555, 5807195; KR101814193, 101888416



Filament Based LED Products

- Application: Using LEDs and filament forms to generate light
- Advantage: Mimic conventional carbon filaments bulbs; Improve homogeneity and luminous efficacy of filament LED bulbs; Reduce filament shadowing effects
- Example Patents:
 - North America: US7543956, 7810974, 8240900, 10330297, 10670194, 11175000
 - Europe: EP1805452, 2789894, 3139086, 3351851, 3428506, 3500792, 3671010, 3722665
 - Asia: CN100520152, 105864664; IN370282; JP4931819, 6878599, 7071572; KR10-1147342; TW1347421



LED-based Lamp for Replacing TL Fluorescent Lamp With Safety Features



- Application: General illumination and specialty applications
- Advantage: Energy-efficient, long-life and mercury-free alternative to fluorescent tubes with safe installation features, including improved safety and compatibility with high-frequency ballasts
- Example Patents:
 - North America: US6762562, 6853151, 7067992, 7490957, 7507001, 8664892, 8847475, 8917020, 9301354, 9485828, 9622317, 9743466, 10458639, 10816184
 - Europe: EP2274956, 2567149, 2689182, 2692208, 2989864, 3005834, 3028541, 3028543, 3164638, 3167225; GB2465966
 - Asia CN102017796, 103003629, 103477710, 103502728, 105325058, 105432145, 105432146, 105782930, 107079545; IN323926, 328703, 345741, 391827, 392115; JP5480250, 5952892, 5985090, 6058828, 6133500, 6391690, 6636497

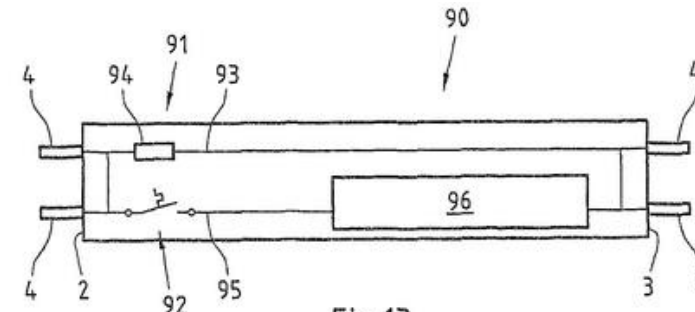
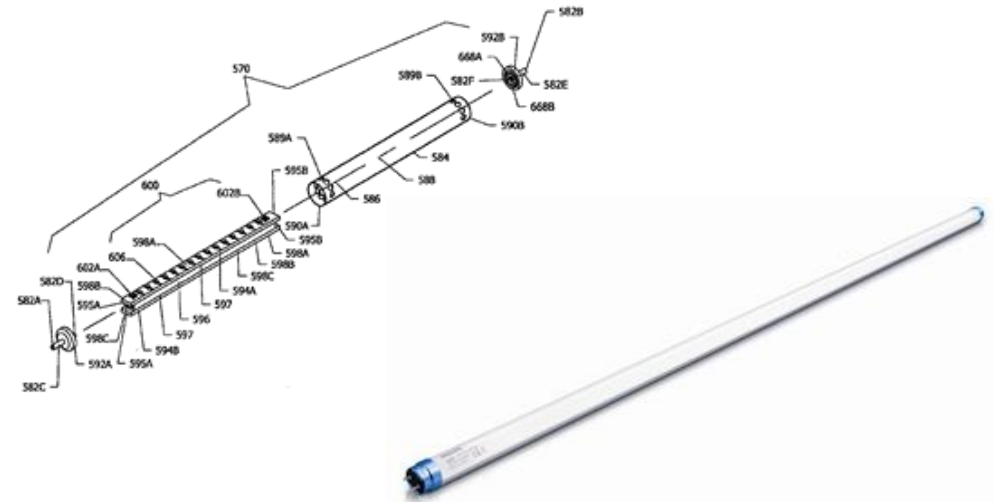
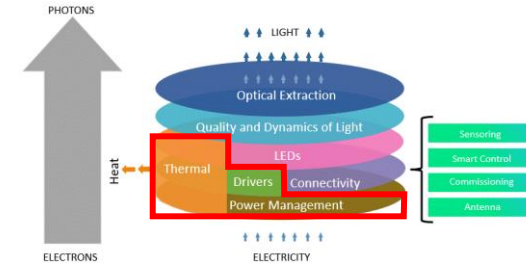
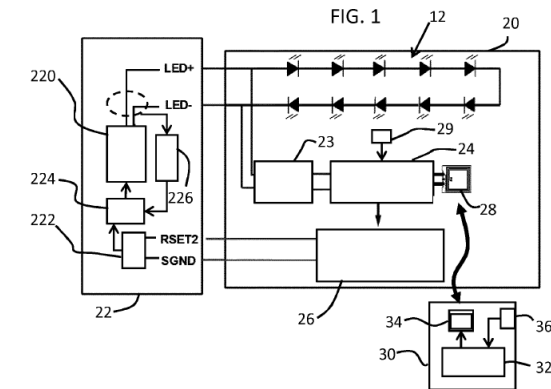
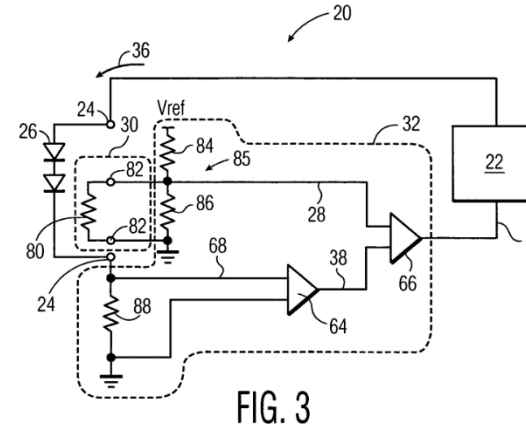
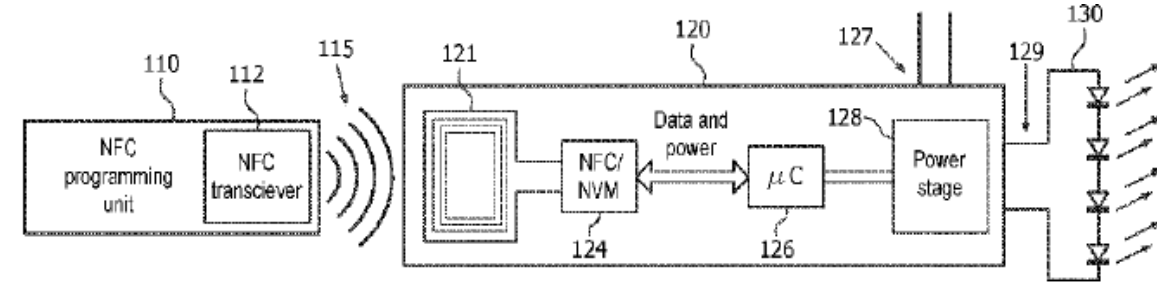
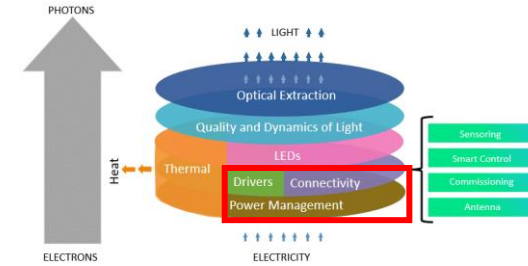


Fig.13

Driver Configuration



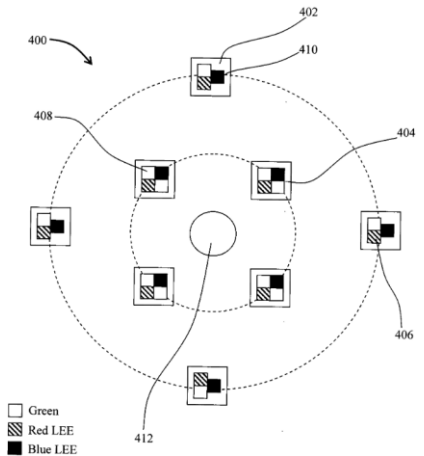
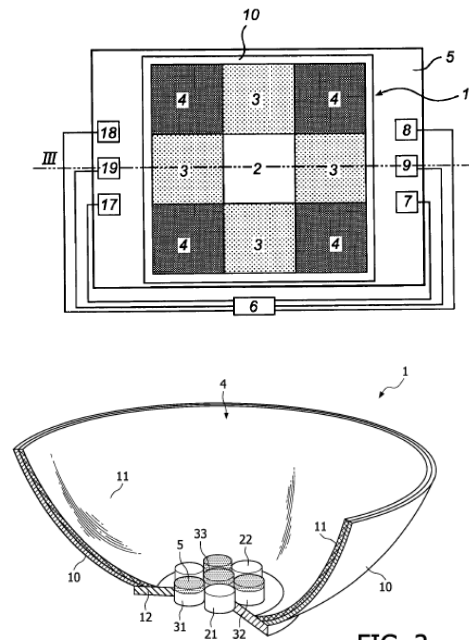
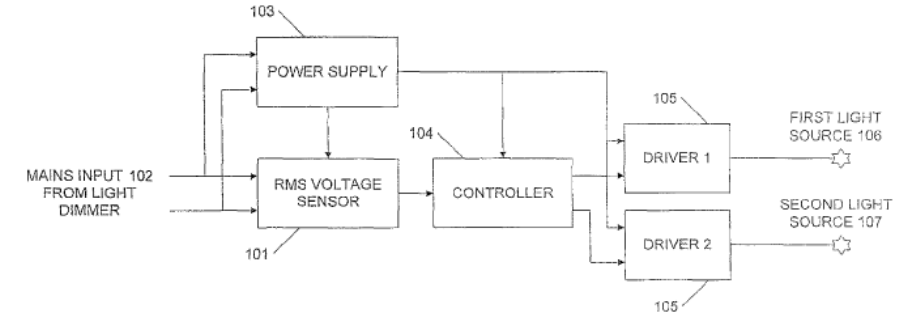
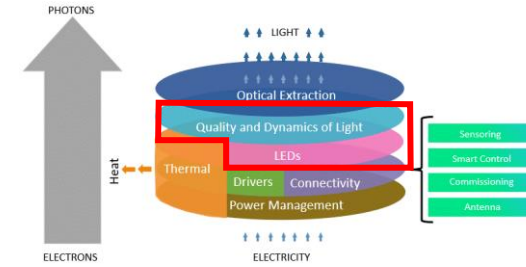
- **Application:** Custom configuration of lighting and LED drivers using NFC, RFID, configuration resistors
- **Advantage:** Lighting manufacturers can offer broad luminaire product portfolios with reduced driver diversity; Provides custom LED string light output luminous flux; NFC driver programming provides efficient luminaire manufacturing
- **Example Patents:**
 - North America: US8143803, 8339247, 8994296, 9301347, 9565744, 9832830, 9854651
 - Europe: EP1889519, 2030483, 2064925, 2752089, 2999314, 3013124, 3036976, 3259959, 3554198
 - Asia: CN100551182, 101513127, 103947289, 105659703, 107624267; HK1111856; IN266914, 360585; JP5317694, 5629092, 6096231, 6339300, 6430254, 6682434; KR10-1243692; MY-145509-A; TW-I479466



Multi Spectrum High Quality White Light



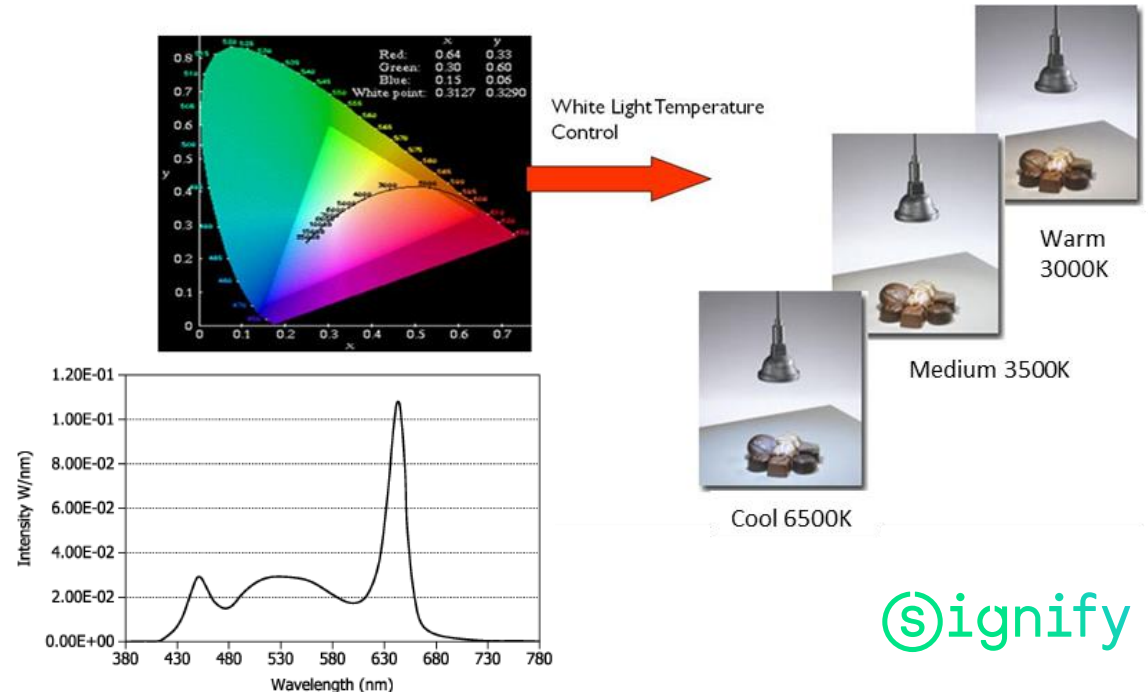
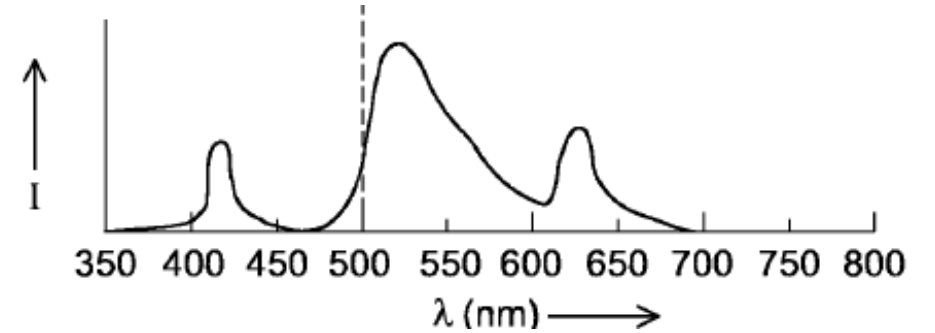
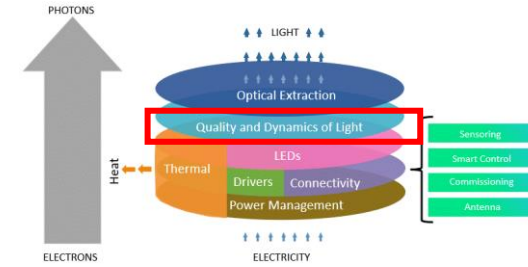
- Application: Using two or more different LEDs to generate light (for single color or white, tunable white and color-changing)
- Advantage: Achieve desired color of light or color temperature of white light, for both static and dynamic (e.g., color-changing) applications
- Example Patents:
 - North America: US7719209, 7731389, 8026532, 8203284, 8414138, 10054272
 - Europe: EP1825515, 1842399, 2087772, 2143303, 2347172, 2829159, 3637185; GB2421367
 - Asia: CN100585269, 101107885, 101536606, 101663919, 102203505, 104206011; IN270149, 288532, 285915; JP5285912, 5350251, 5485868, 5490812, 5616000, 6581500; KR101199260, 101507755



Spectral Tuning



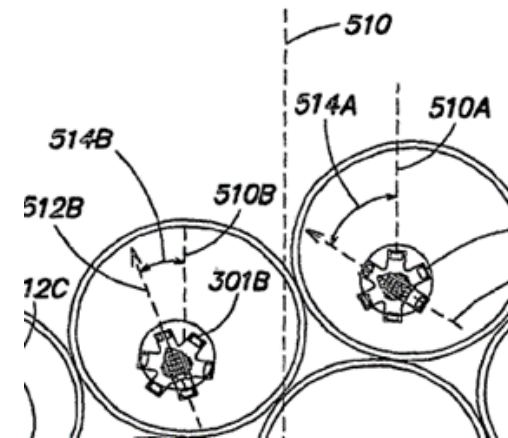
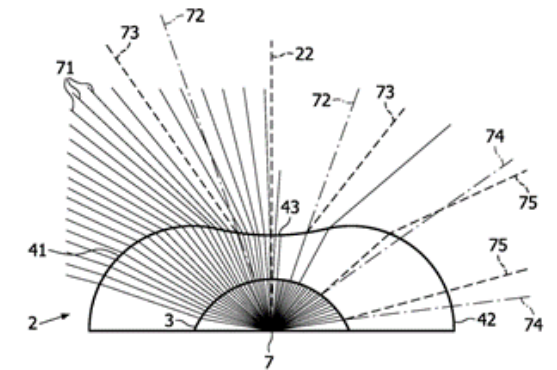
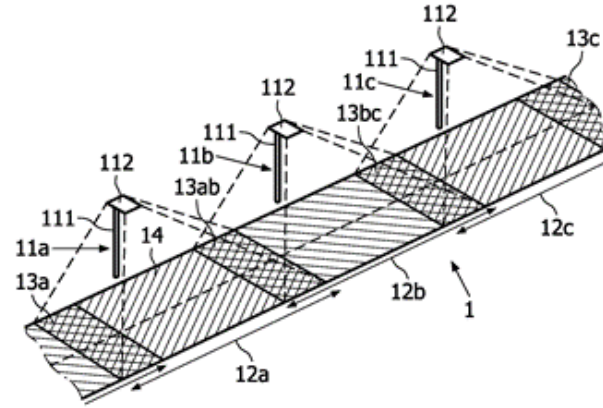
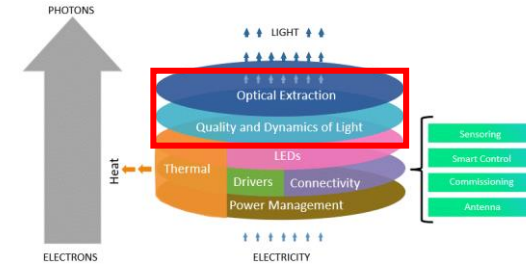
- Application: White color generation
- Advantage: Blue peak reduction; Produce high quality white light with reduced melatonin production; Provide high CRI; Natural, crisp white light; Circadian rhythm tuned light; Product specific light spectra
- Example Patents:
 - North America: US7731389, 8226263, 8414138, 8491154, 10090442, 10334686, 10946211
 - Europe: EP2087772, 2117648, 2140502, 2347172, 2834842, 3055022, 3061320, 3382755, 3637185
 - Asia: CN101536606, 101663769, 102203505, 104303298, 105830216; IN288532, 294852, 321607, 381904; JP5350251, 5490812, 6321192, 6363061, 6479781; KR101507755



Efficient Light Control



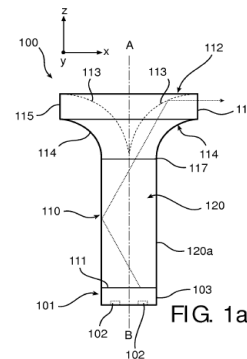
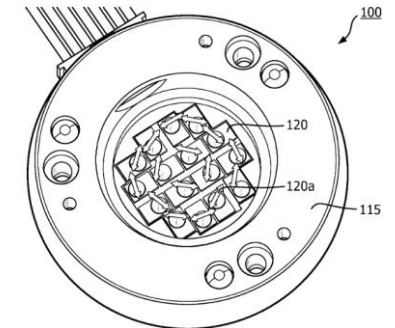
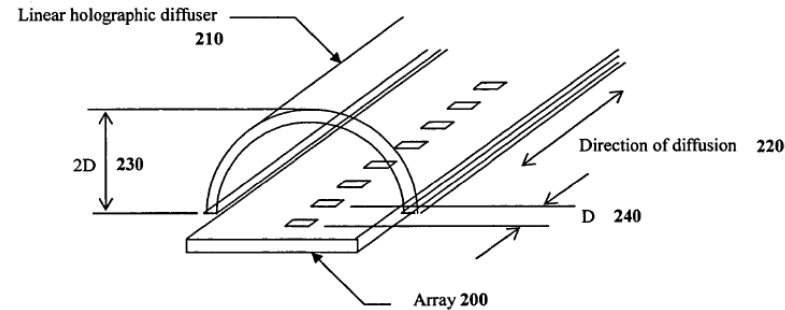
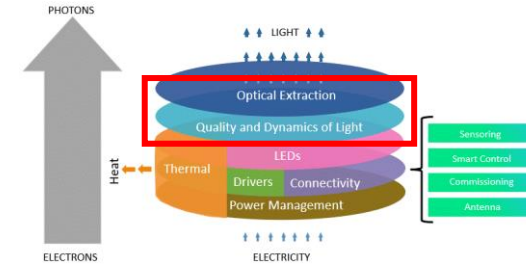
- Application: Efficient light projection in lens and/or reflector-based lighting systems
- Advantage: Homogeneous illumination of an area without dazzling the user; Efficient lens based light output in narrow-beam applications;
- Example Patents:
 - North America: US7806558, 8220958
 - Europe: EP2089656, 2135005
 - Asia: CN101627253, 101657678, 103822172; JP5349453, 5396278, 5805718, 5974242; KR10-1523993



Light Source Mixing and Distribution



- Application: Light output control
- Advantage: Effective and efficient blending and directing of LED light output
- Example Patents:
 - North America: US7255458, 8556456, 9151469, 9541240; CA2533195
 - Europe: EP2414876, 2556294, 2721656
 - Asia: CN102378928, 102812290, 103636011; IN309228, 367981; JP5732127, 5823948, 6096180; KR101810235



exemplary mappings only

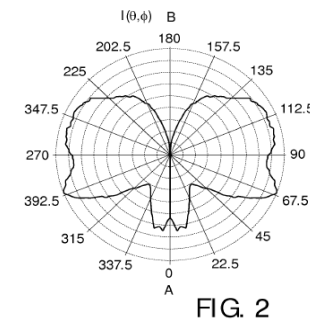
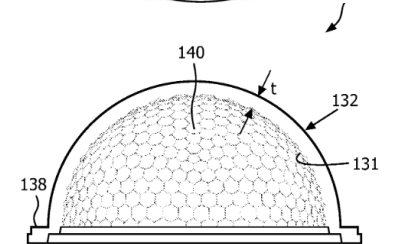
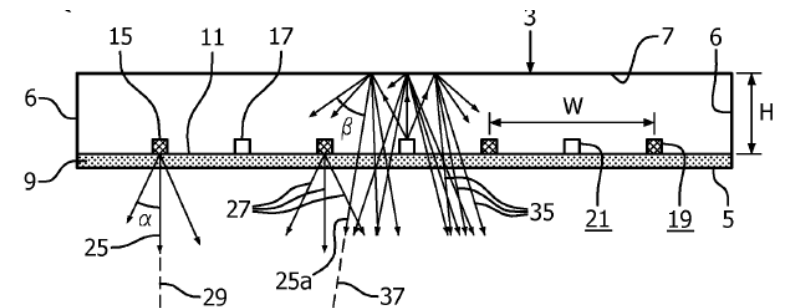
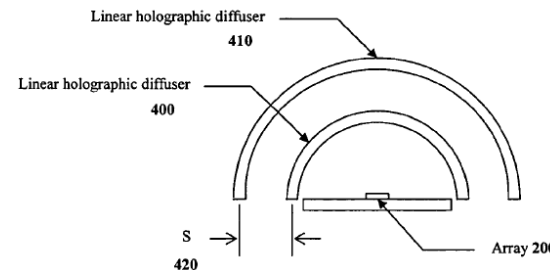
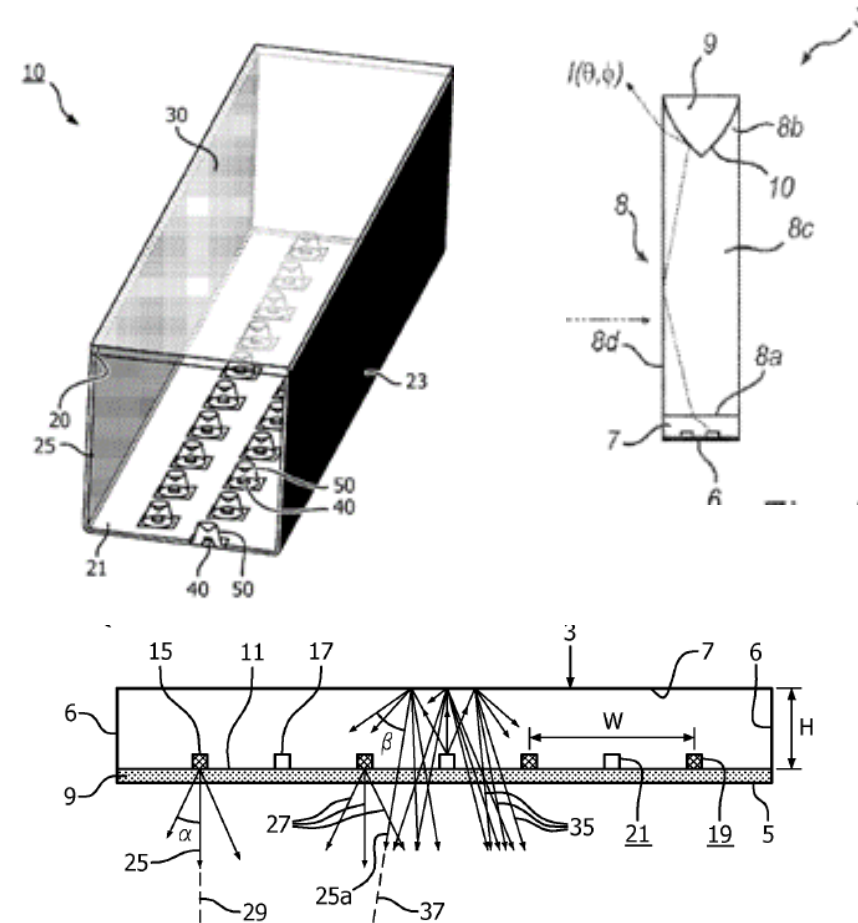
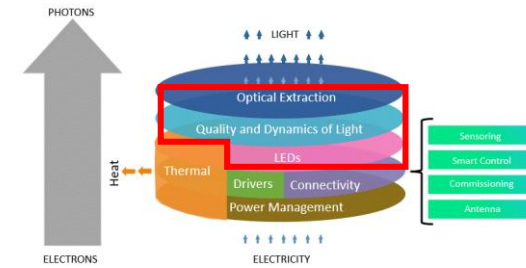


FIG. 2



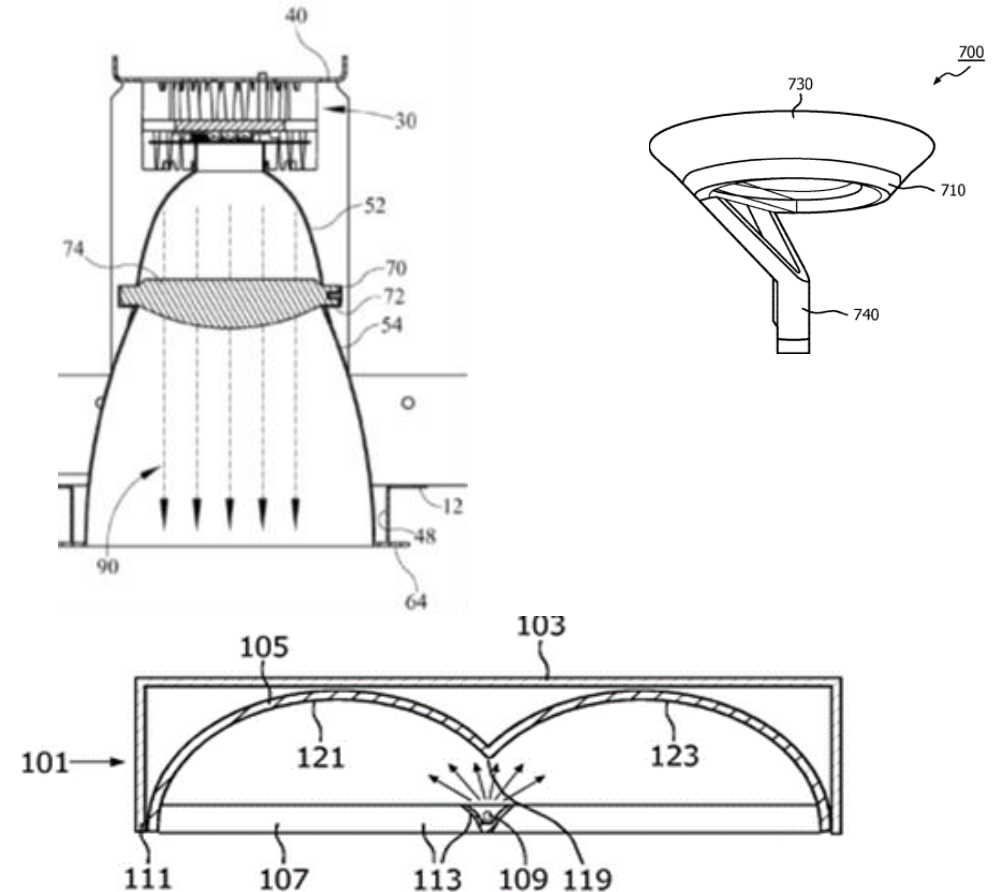
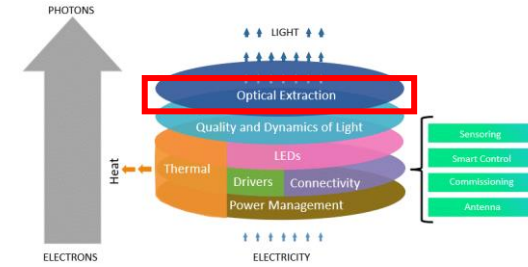
Uniform Mixed LED Color Output

- Application: Multi color or tunable white LED
- Advantage: Provides good color/tunable white mixing; Eliminates unequal phosphor effects in phosphor converted LEDs
- Example Patents:
 - North America: US7255458, 7866845, 7988327, 8628220, 9279547, 9689555, 10364959; CA2533195, 2643105
 - Europe: EP1996857, 2386045, 2802805, 2912367, 2935980
 - Asia: CN101405538, 102272515, 104040242, 107084318, 104755831; IN350548, 350614; JP5551714, 6133329, 6045725, 6250687; KR101839417



LED Glare Reduction

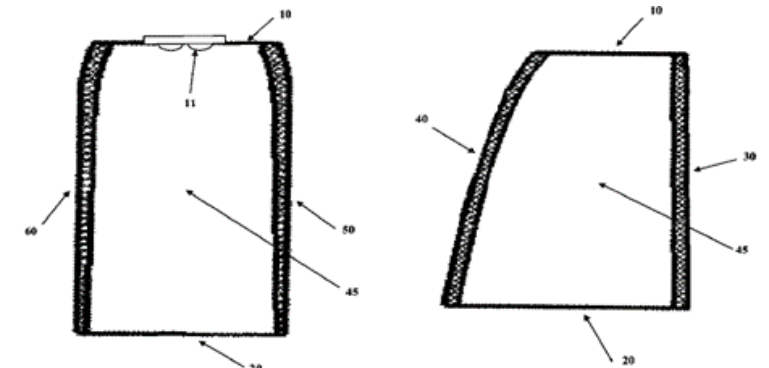
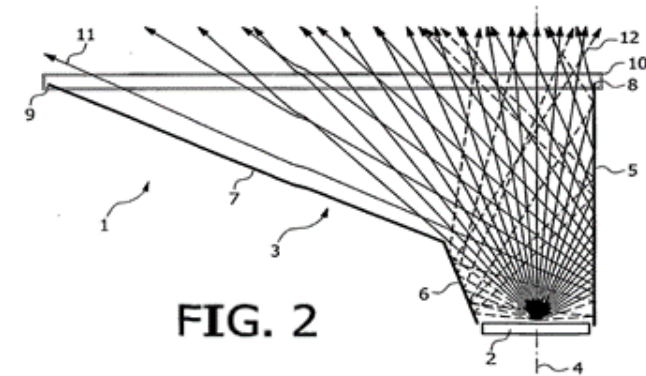
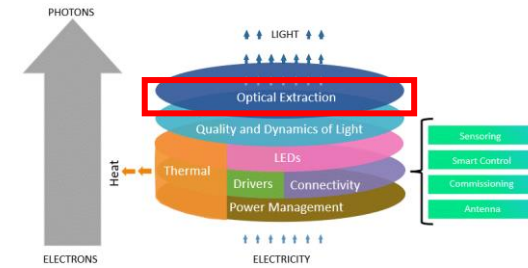
- Application: Where comfortable LED light output is required
- Advantage: Reduces LED glare effects and provides uniform light output
- Example Patents:
 - North America: US7520636, 8425101, 8579473, 8070328, 8979319, 9810380
 - Europe: EP1948995, 2150851, 2326869, 2748517
 - Asia: CN101305242, 101681059, 102149966, 103998855; IN336655; JP5198278, 5290279, 5438766, 6436779; KR1207324



Asymmetric LED Light Output



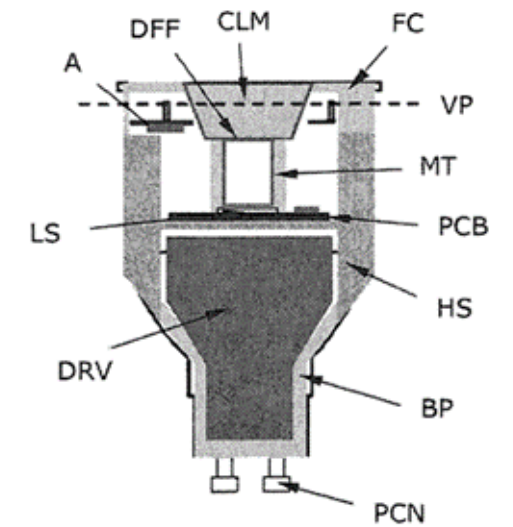
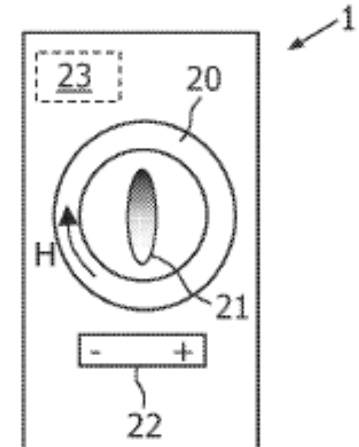
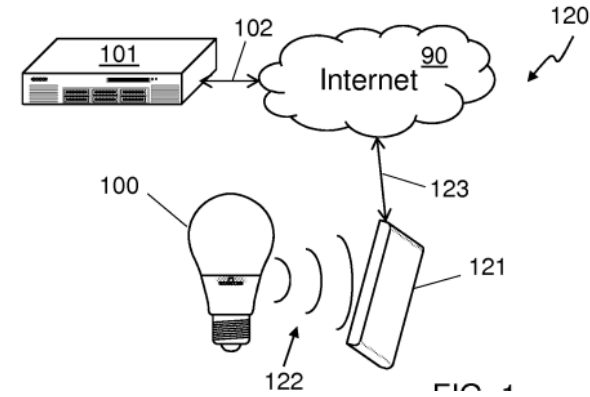
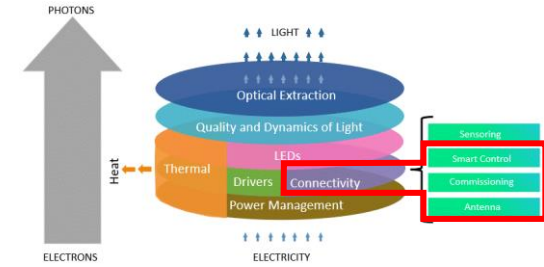
- Application: Asymmetrical, directed LED light applications
- Advantage: Provides LED light output only to directions and areas that need to be illuminated
- Example Patents:
 - North America: US7182480, 7670038, 7566155, 7652300, 7658506, 7866845; CA2452348, 2557447, 2643105
 - Europe: EP1776718, 1794491, 1996857
 - Asia: CN1993826, 100585269, 101405538; JP4933434, 5026969; KR10-1209696, 10-1228848



Smart Retrofit Lamps



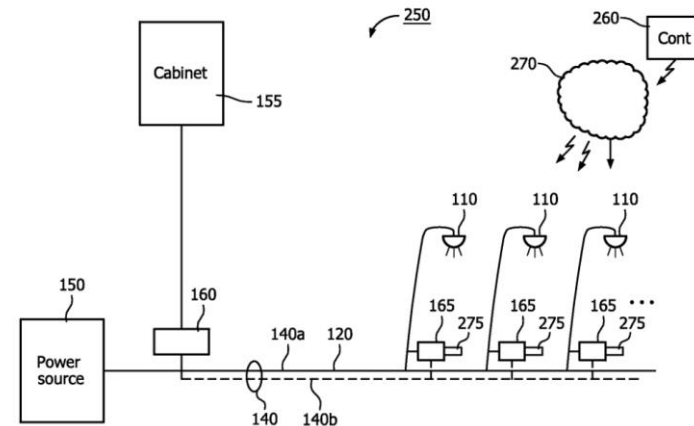
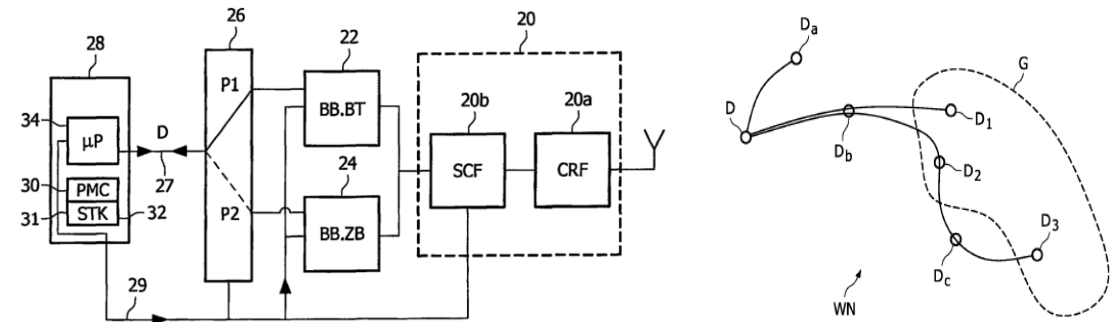
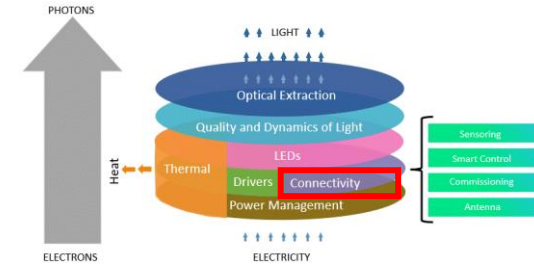
- Application: Smart lamps
- Advantage: Antennas to improve communication; Simplified commissioning; Intuitive control
- Example Patents:
 - North America: US7358961, 7417556, 7980726, 8013545, 8421376, 8531137, 8893968, 8896414, 9184497, 9345105, 9881275, 10075558, 10142443, 10842006, 11175000
 - Europe: EP1537764, 1623602, 1997352, 2311299, 2377371, 2438647, 2491767, 2533615, 2745350, 3139086, 3351851, 3590149
 - Asia: CN1679376, 1784932, 102119581, 102246600, 102668710, 102804493, 103797641, 108027111; IN308776, 341006, 370282; JP5539354, 5544372, 6258854, 6738973; KR101679056



Wireless Communication



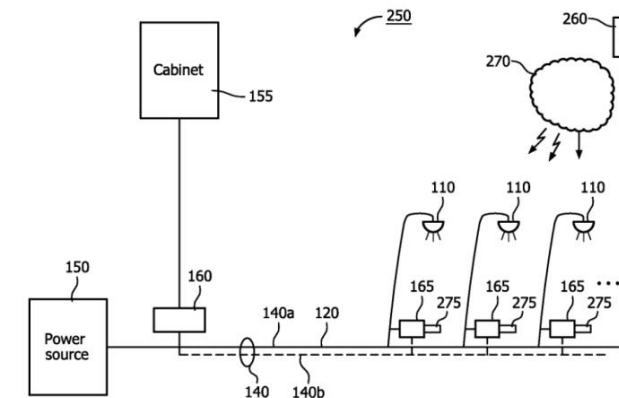
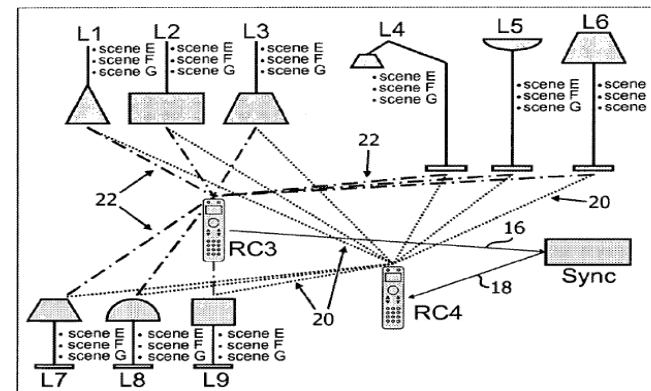
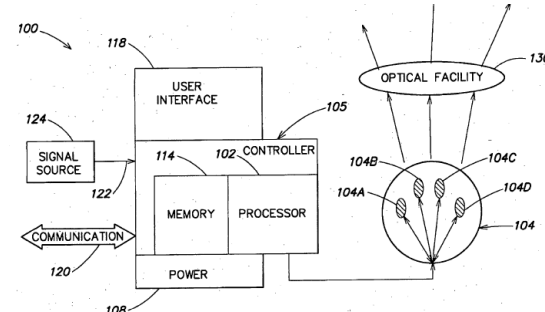
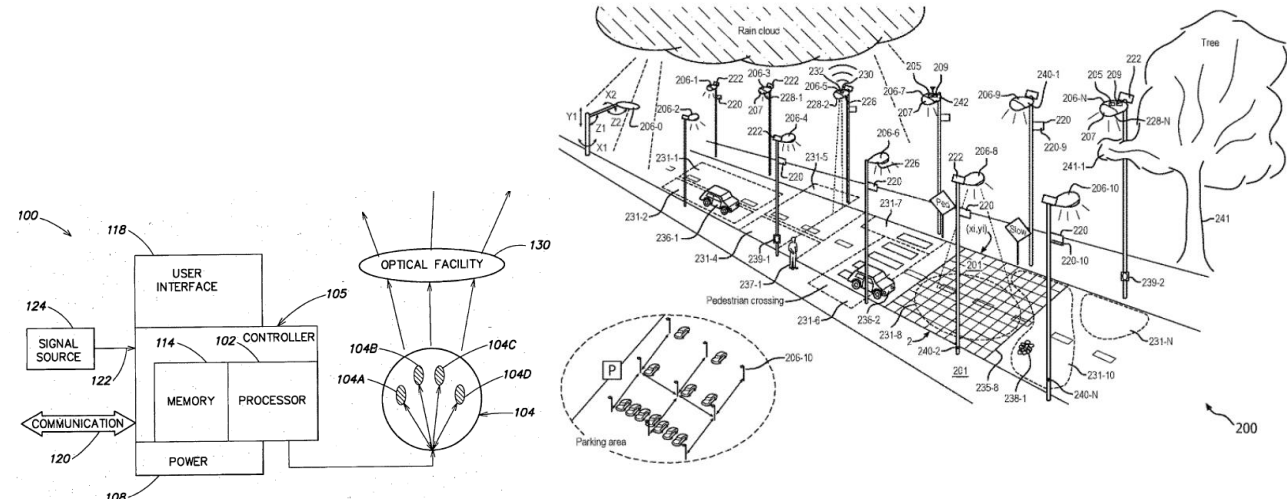
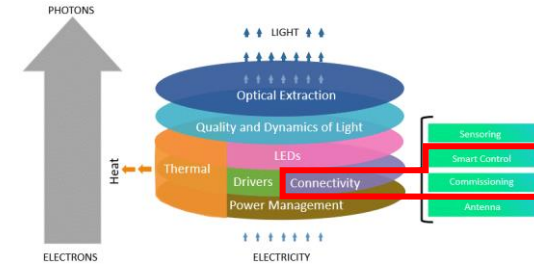
- Application: Wireless connectivity including point to point, mesh networking and master slave networking
- Advantage: Provides, for example, 2-way, bi-directional communication, dual mode Zigbee-Bluetooth
- Example Patents:
 - North America: US7417556, 8359051, 8923324, 9253707, 9320080, 9398668, 9578722, 9907147, 10582593
 - Europe: EP1537764, 1665659, 2289266, 2374334, 2873302
 - Asia: CN1679376, 1843004, 102057722, 102239747, 104412715, 105191505; IN349160; JP4570621, 5503643, 6263176, 6416198; KR101163080; TWI408921



Connectivity



- Application: Wired and wireless connectivity including point to point and mesh networking
- Advantage: Provides, for example, 2-way, bi-directional communication, master and slave communication, DALI improvements, multi-protocol communication
- Example Patents:
 - North America: US7204622, 7961113, 8359051, 8896414, 9313861, 9320080, 9398668, 9775220, 9907147, 10582593
 - Europe: EP1535495, 1537764, 2087776, 2311299, 2873302, 2875701
 - Asia: CN1679376, 102119581, 104412715, 104488361, 105191505, 101589650; IN285046, 323303, 341006; JP4625697, 5539354, 6263176, 6416087, 6416198; KR101679056; TWI471709



Lighting Systems



- Application: Network control

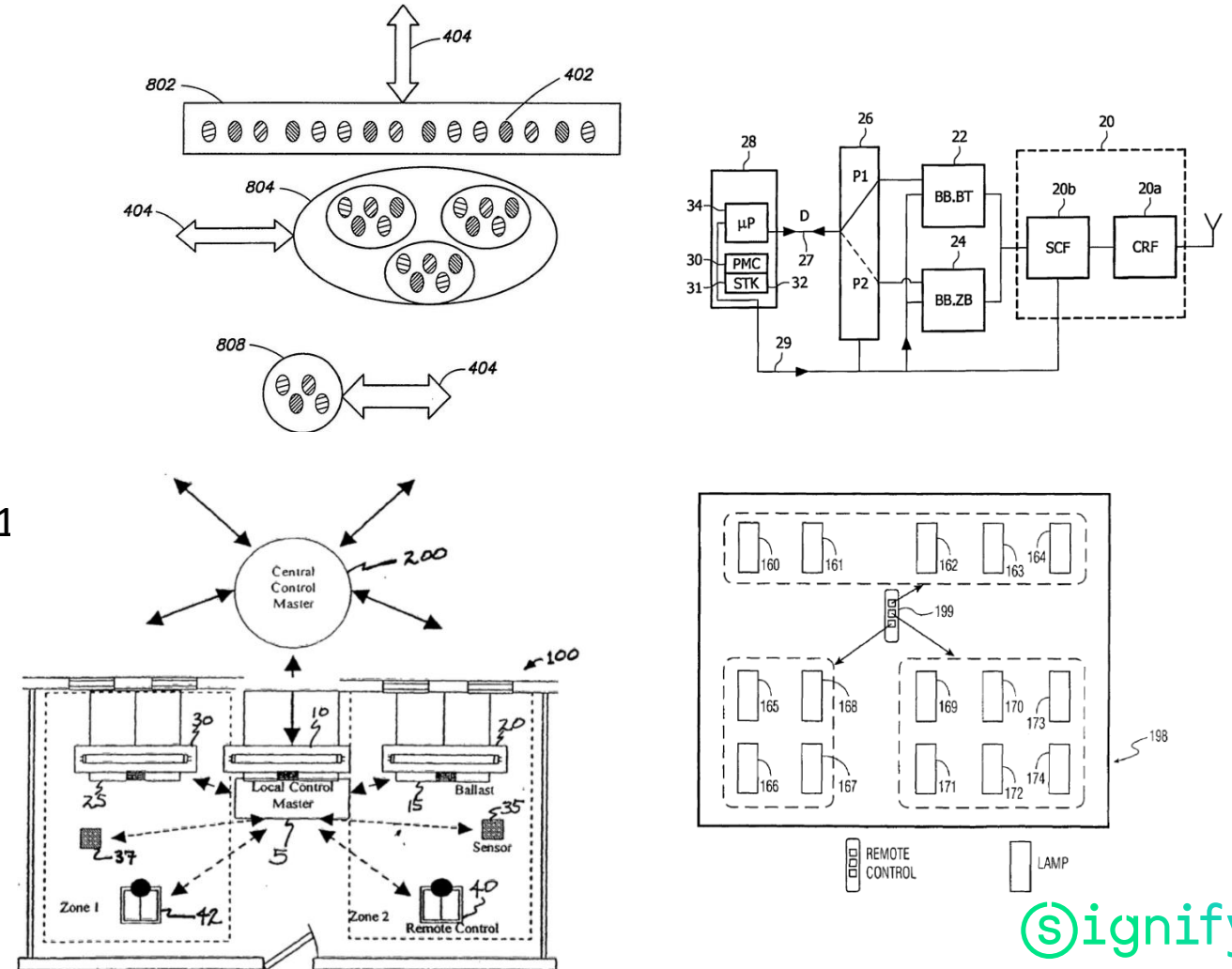
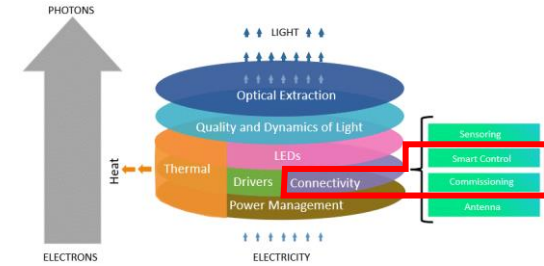
- Advantage: Effective and efficient operation, communication and/or interaction by or between multiple devices

- Example Patents:

- North America: US7204622, 7417556, 8218547, 8923324, 8981672

- Europe: EP1537764, 1535495, 1938666, 3445021

- Asia: CN1679376, 1843004, 101652978; JP4570621 4625697, 5059008, 5389778; KR101163080B1



Commissioning



- Application: Automatically assigning lighting nodes to switching control nodes
- Advantage: Reduces commissioning time in lighting installations
- Example Patents:
 - North America: US8665762, 9253040, 9374268, 9578722, 9615434, 10075558, 10117314, 10142443, 10159138
 - Europe: EP1665552, 1862036, 1897332, 2374334, 2377371, 3099972, 3201697
 - Asia: CN100358309, 101138279, 102239747, 102246600, 105490898, 106165544, 106716270; IN308776, 349160, 372811, 397140; JP4981784, 5311557, 5544372, 5676611, 6165351, 6667512; KR101298188, 101025177, 10-1537522

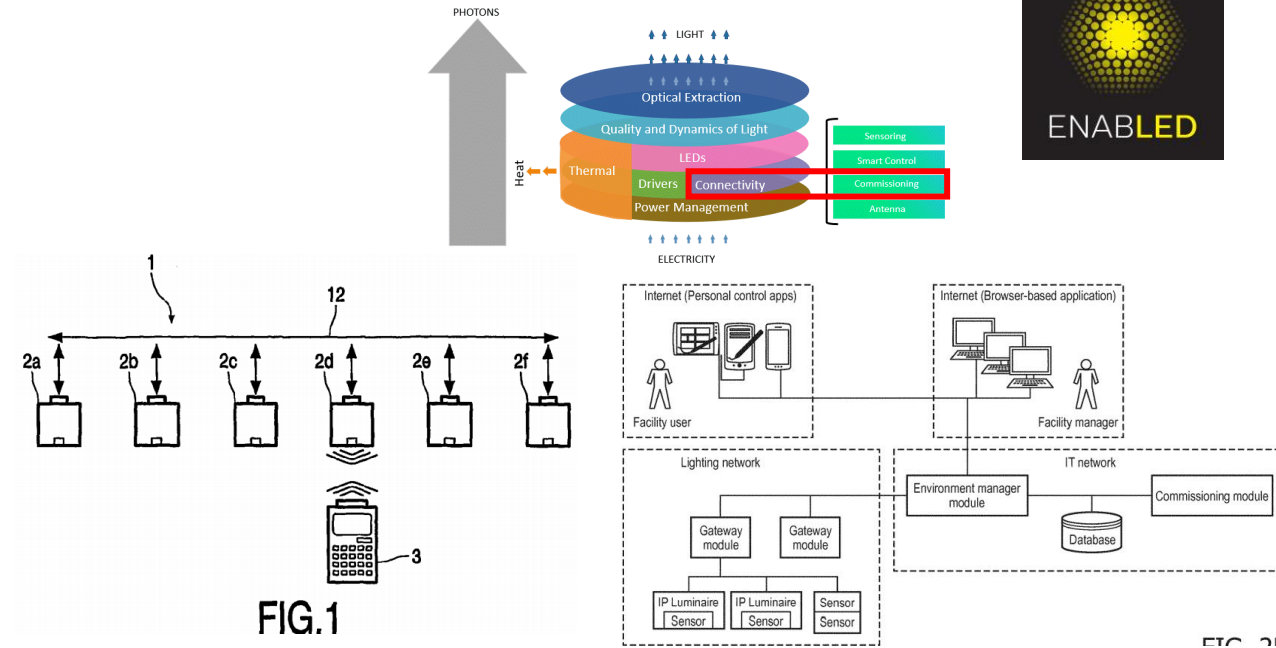


FIG. 1

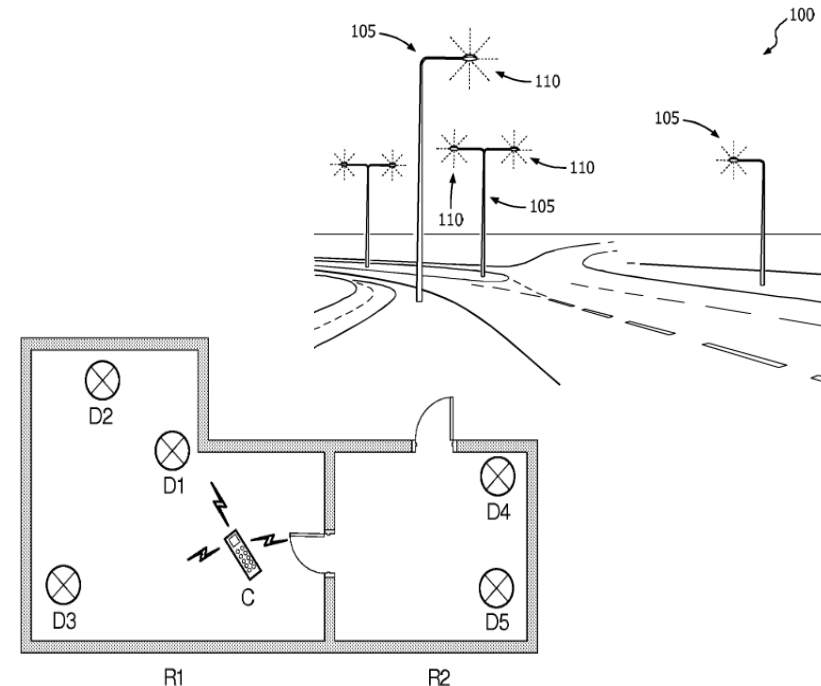
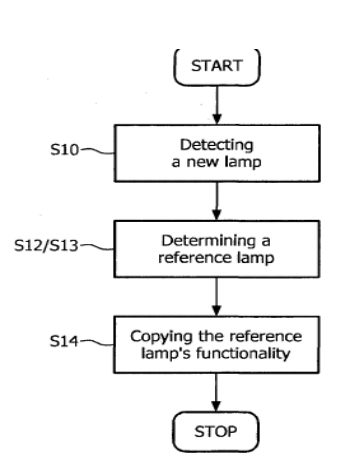


FIG. 1



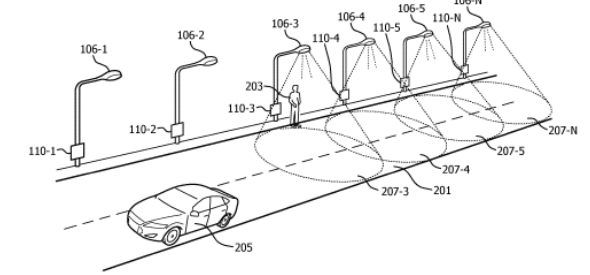
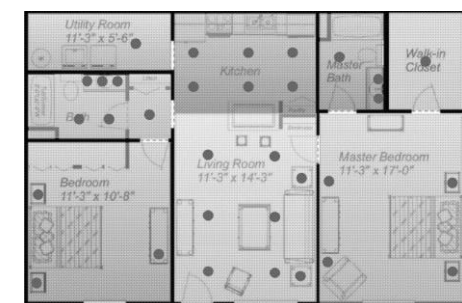
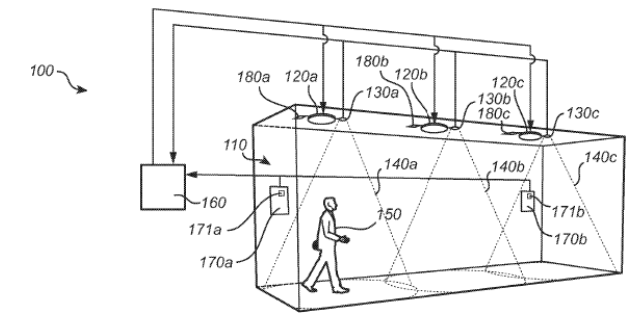
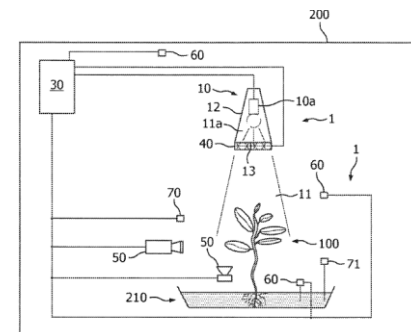
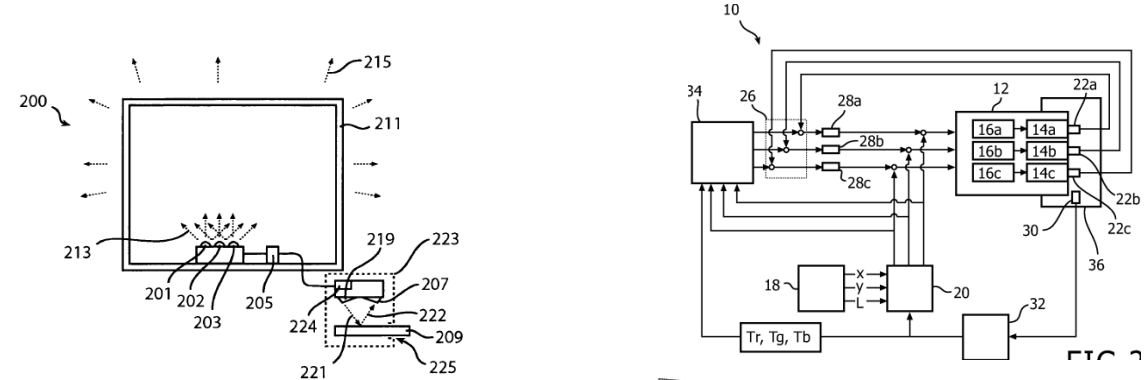
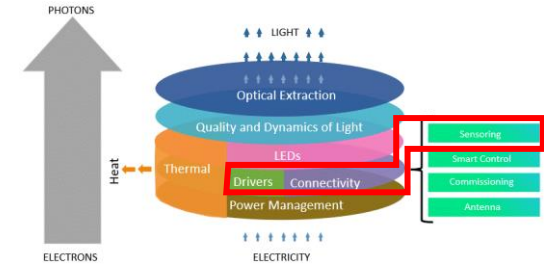
Sensing



- Application: Sensing light, sound, color, temperature and/or people in the environment to improve lighting and/or people in the environment to improve lighting
- Advantage: Allows lighting to react to, and learn from, environmental changes, in an intelligent and controlled manner and/or complement ambient light

• Example Patents:

- North America: US7804260, 8422889, 8604700, 8786198, 9087514, 9491834, 9655207, 10512138; CA2754195
- Europe: EP1878319, 1943880, 2323472, 2404485, 2944161
- Asia: CN100544532, 101297604, 102088840, 102342184, 104885572, 105794324; IN272161, 345080; JP5160411, 5311639, 5486022, 6495180, 6629205; KR101300565, 101303359; TWI416988

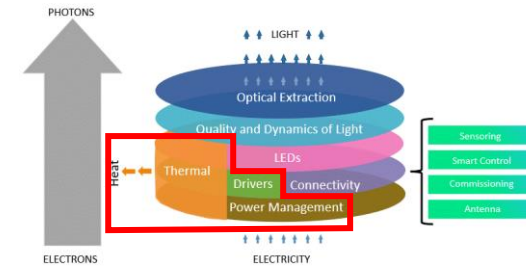


\$10M L Prize Winning Technology

- Application: Efficient LED lamps with omnidirectional high-quality light and award-winning reliability
- Advantage: Energy efficient omnidirectional high-quality light output whilst maintaining cooling efficiency
- Example Patents:
 - North America: US8314537, 8624513, 8760043, 9345079; CA2771848
 - Europe: EP2359052, 2471344
 - Asia: CN102216669, 102484916, 103939768; JP5508532, 5519701, 5767304, 6143810; KR 10-1659505, 101928769 , TWI515390, I538553

U.S. Department of Energy: [L Prize® Competition Impact Summary](#)

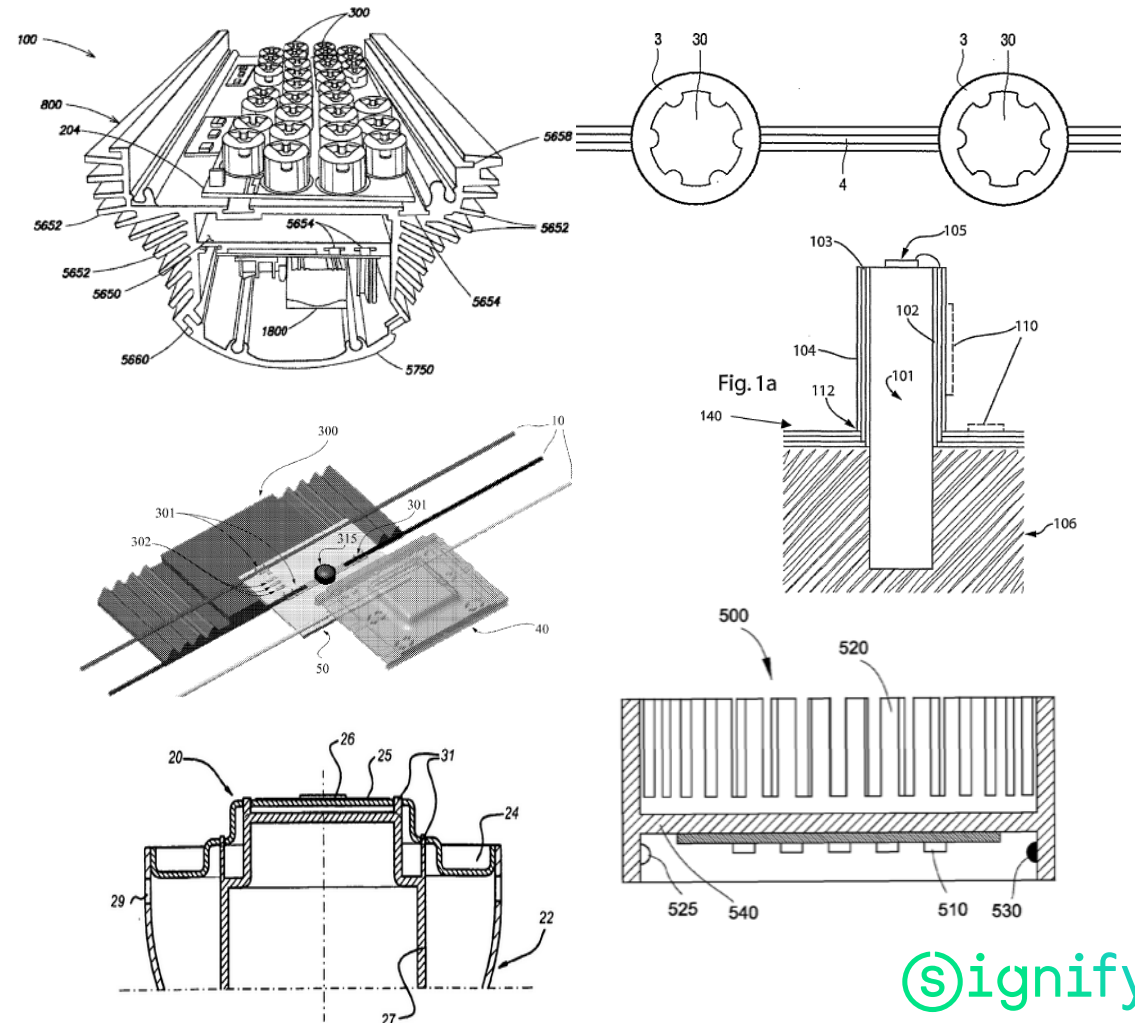
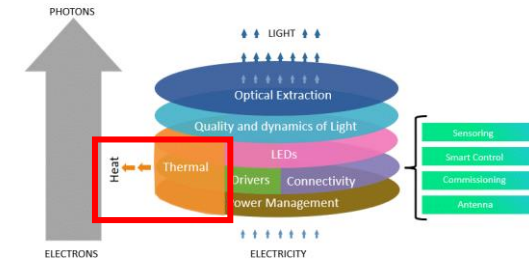
Signify's "entry helped catalyze market competition and pushed industry toward a clear target. As a result, prices dropped and performance improved to the point where there are now many competitive LED 60W replacement bulbs on the market."



Thermal Management

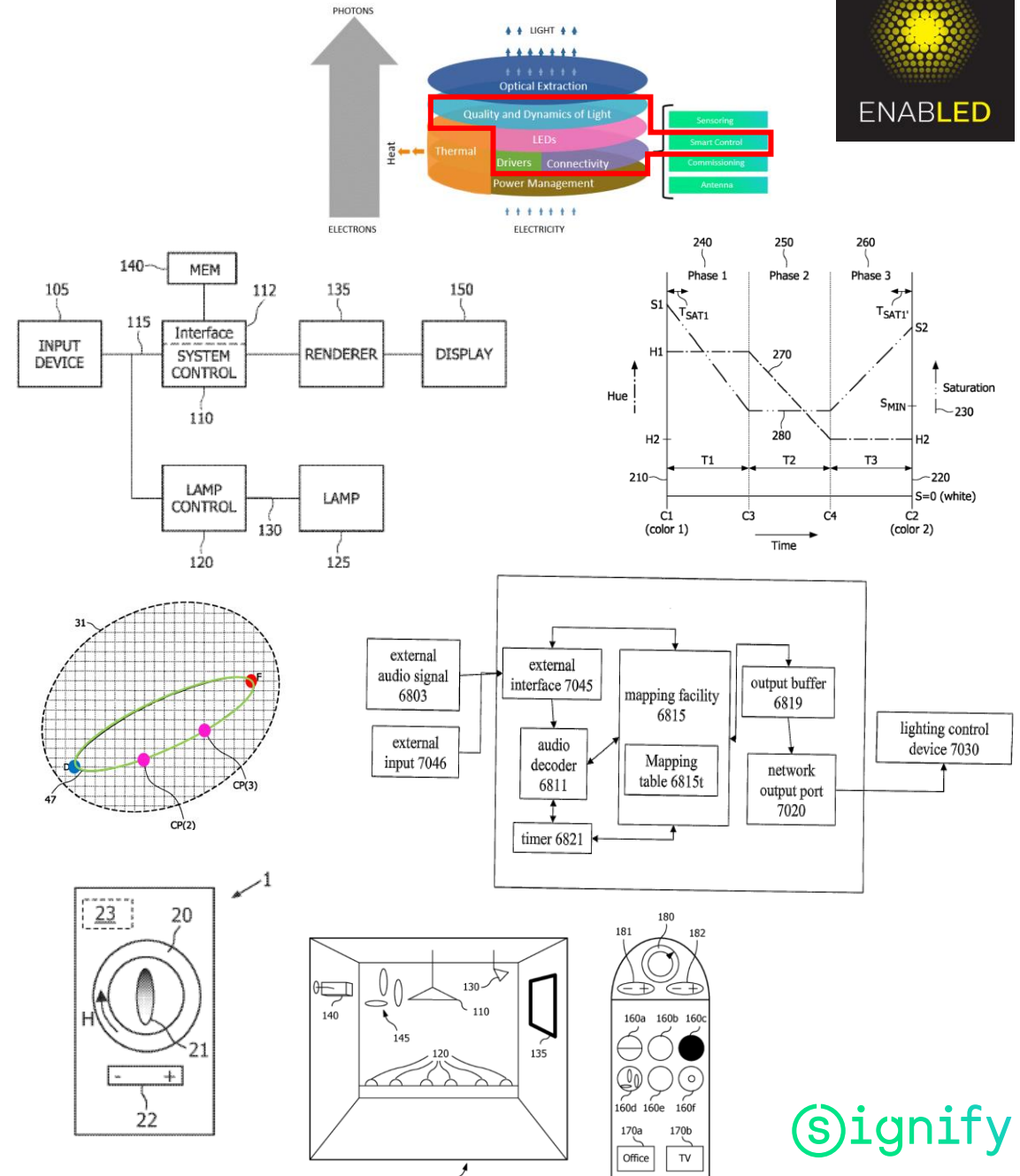


- Application: Provide well managed heat removal from LED lights source and/or driver
- Advantage: Enables extended product reliability and lifetime
- Example Patents:
 - North America: US7178941, 7348604, 7911118, 8207821, 8330387, 8729781, 9111822, 9383081, 9791141; CA2606687, 2616007
 - Europe: EP1537354, 1846949, 1869365, 1891671, 2542826, 2863104, 2994696, 3416460
 - Asia: CN101228393, 105143763, 105423169; IN289132, 326951; JP4865227, 5441886, 6125233, 6298006; KR101799504, 101203073, 102071338



User Interface and Atmosphere Creation

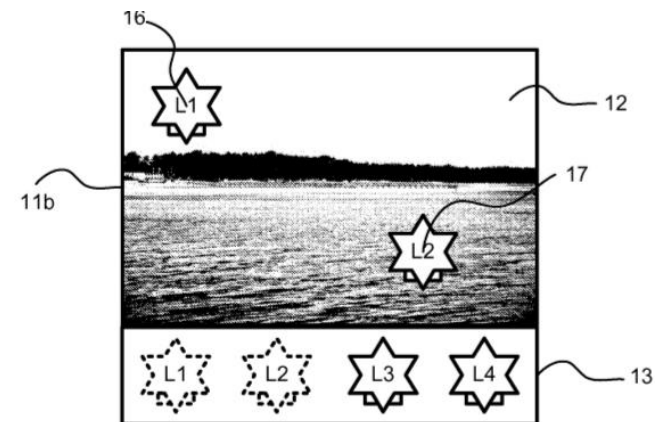
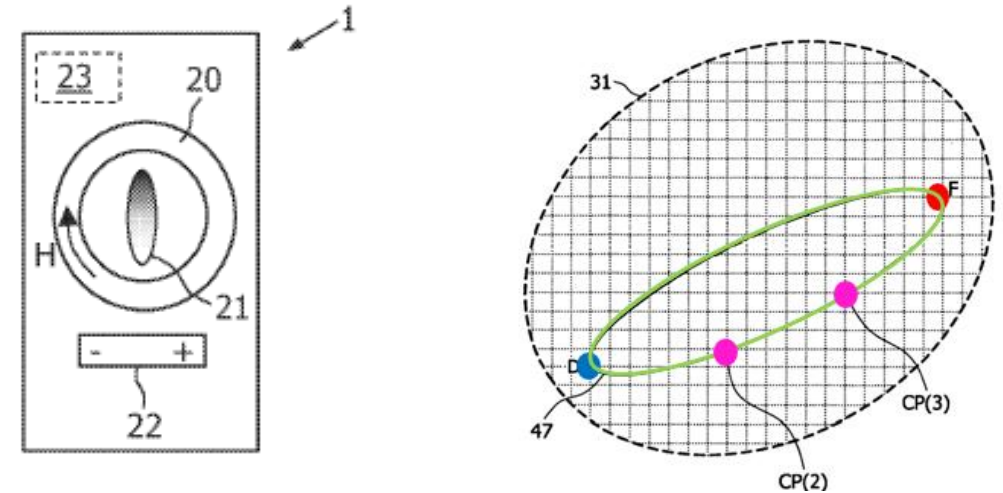
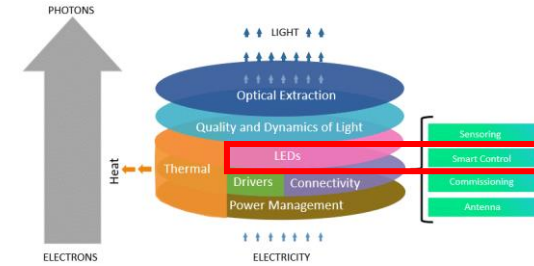
- Application: Create static and dynamic atmospheres using lighting with simple and intuitive user interfaces
- Advantage: Simplification and Enhancement of User Interfaces
- Example Patents:
 - North America: US7358961, 7980726, 8356904, 8427721, 8456100, 8807765; 8922134, 9226370; CA2764352
 - Europe: EP1623602, 1729615, 1964451, 1997352, 2036407, 2181565, 2229228, 2438799
 - Asia: CN1784932, 101331802, 101480106, 101785362, 101918094, 102461336; IN305191, 309313, 339895; JP5280356, 5485913, 5490694, 5593381; KR10-1468901, 101687942; TWI349376, I442817



Intelligent Color Illumination



- Application: Intelligent RGB color control
- Advantage: Allows creation of simple to sophisticated illumination effects; Smooth and dynamic color changing; Intuitive user interaction, including “*Color Picker*” color selection from photographs, images and videos
- Example Patents:
 - North America: US7358961, 7980726, 8456100, 8922134, 8933903, 9480130
 - Europe: EP1623602, 1997352, 2036407, 2614687, 2815633, 3182807
 - Asia: CN1784932, 101480106, 103081573, 103249214; IN309313, 325906; JP5280356, 5850938, 6199903



Signify