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Belliveau

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(54) **MANUAL AND AUTOMATIC LOCKING SYSTEM FOR A MULTIPARAMETER LIGHTING FIXTURE**

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(52) **U.S. Cl.** **362/272**; 362/85; 362/269; 315/316
(58) **Field of Search** 362/269, 271, 362/272, 85; 340/825.22; 315/312, 316

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(57) **ABSTRACT**

A multiparameter lighting fixture, which includes a locking system for pan and/or tilt, either of which may include a manual input device and an actuator. The locking systems for pan and tilt can be manually locked or unlocked by a technician using their respective manual input devices and automatically locked or unlocked by their respective actuators. A yoke of the multiparameter lighting fixture can be locked in more than one rotational position in relation to the base housing. In addition, the lamp housing of the multiparameter lighting fixture can be locked in more that one rotational position in relation to the yoke. The locking systems for pan or tilt can be automatically locked by an appropriate actuator in response to an electronic control system.

51 Claims, 6 Drawing Sheets

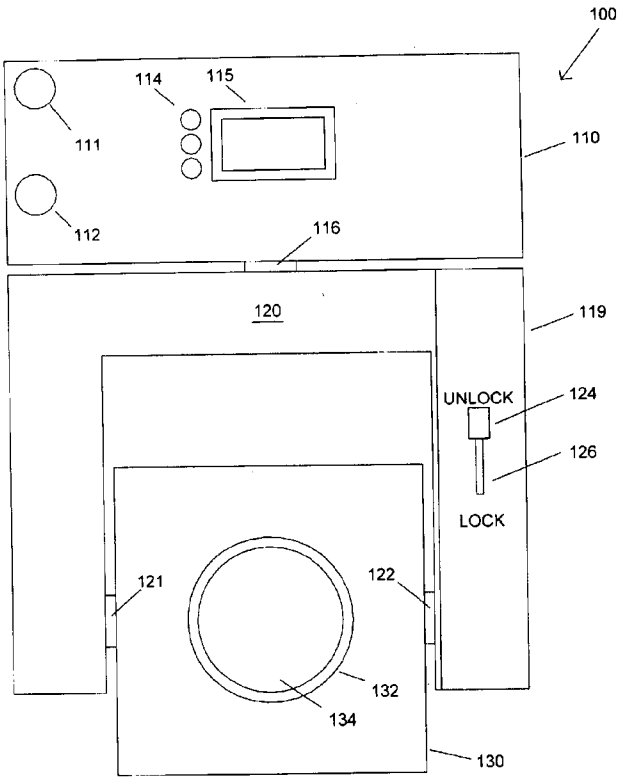
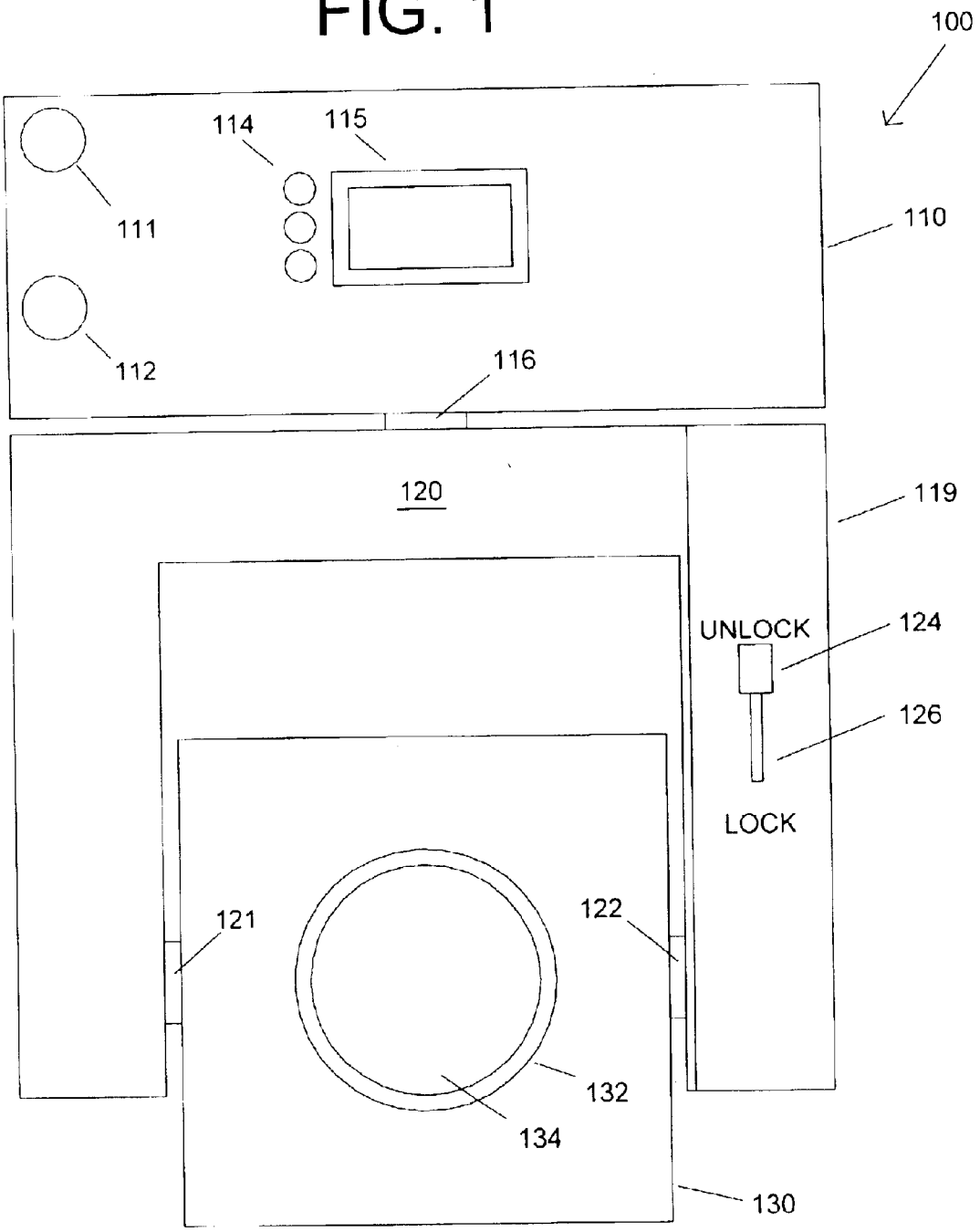


FIG. 1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111
110
112
116
120
119
UNLOCK
124
126
LOCK
121
122
132
134
130

FIG. 2

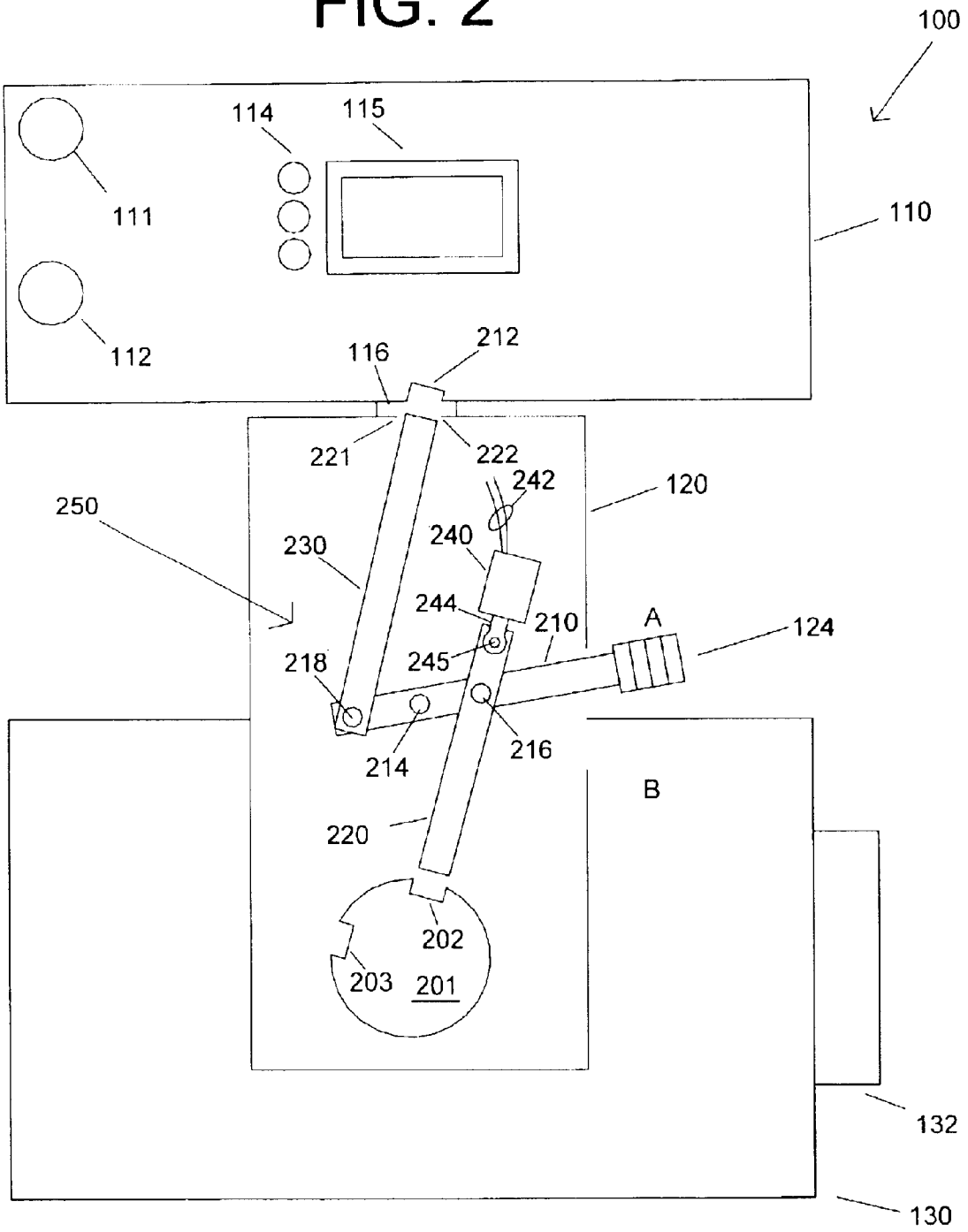
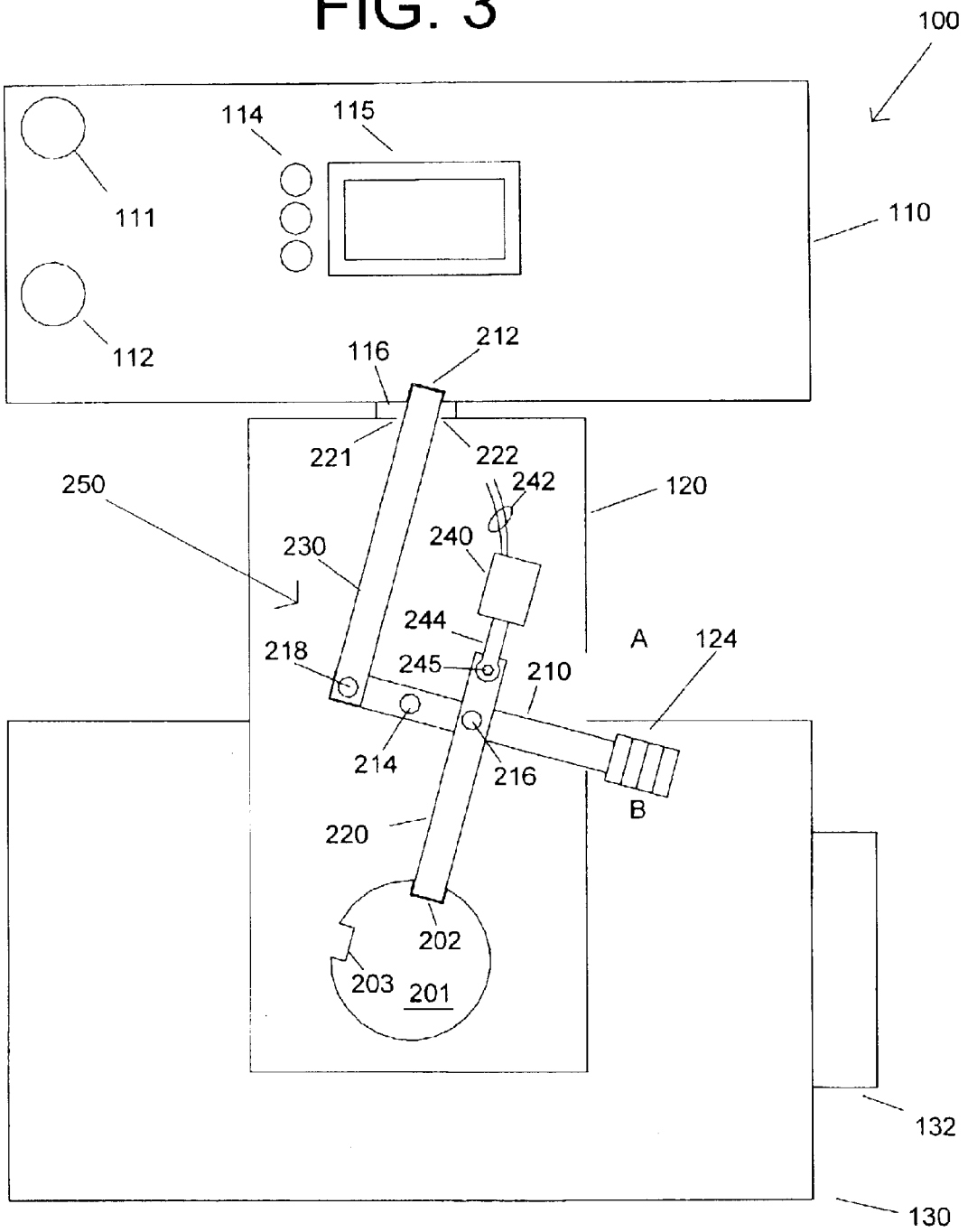

100
114
115
111
110
112
116
212
221
222
242
120
250
240
230
244
210
A
124
218
245
214
216
B
220
202
203
201
132
130

FIG. 3


100
114
115
111
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116
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222
242
250
120
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244
A
124
218
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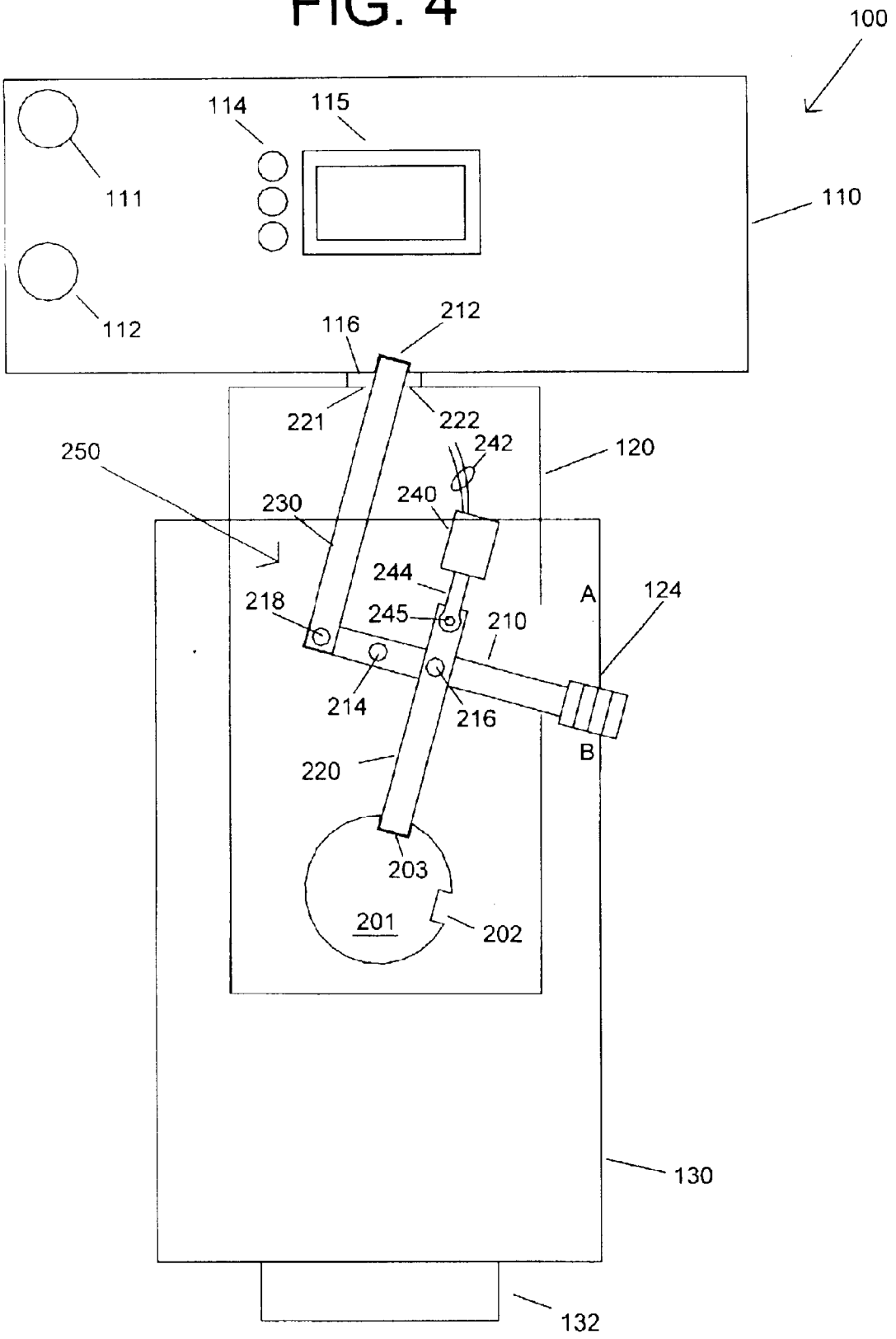
216
B
220
202
203
201
132
130

FIG. 4


100
114
115
111
110
112
116
212
221
222
242
120
250
240
230
244
218
245
210
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124
214
216
B
220
203
201
202
130
132

FIG. 5

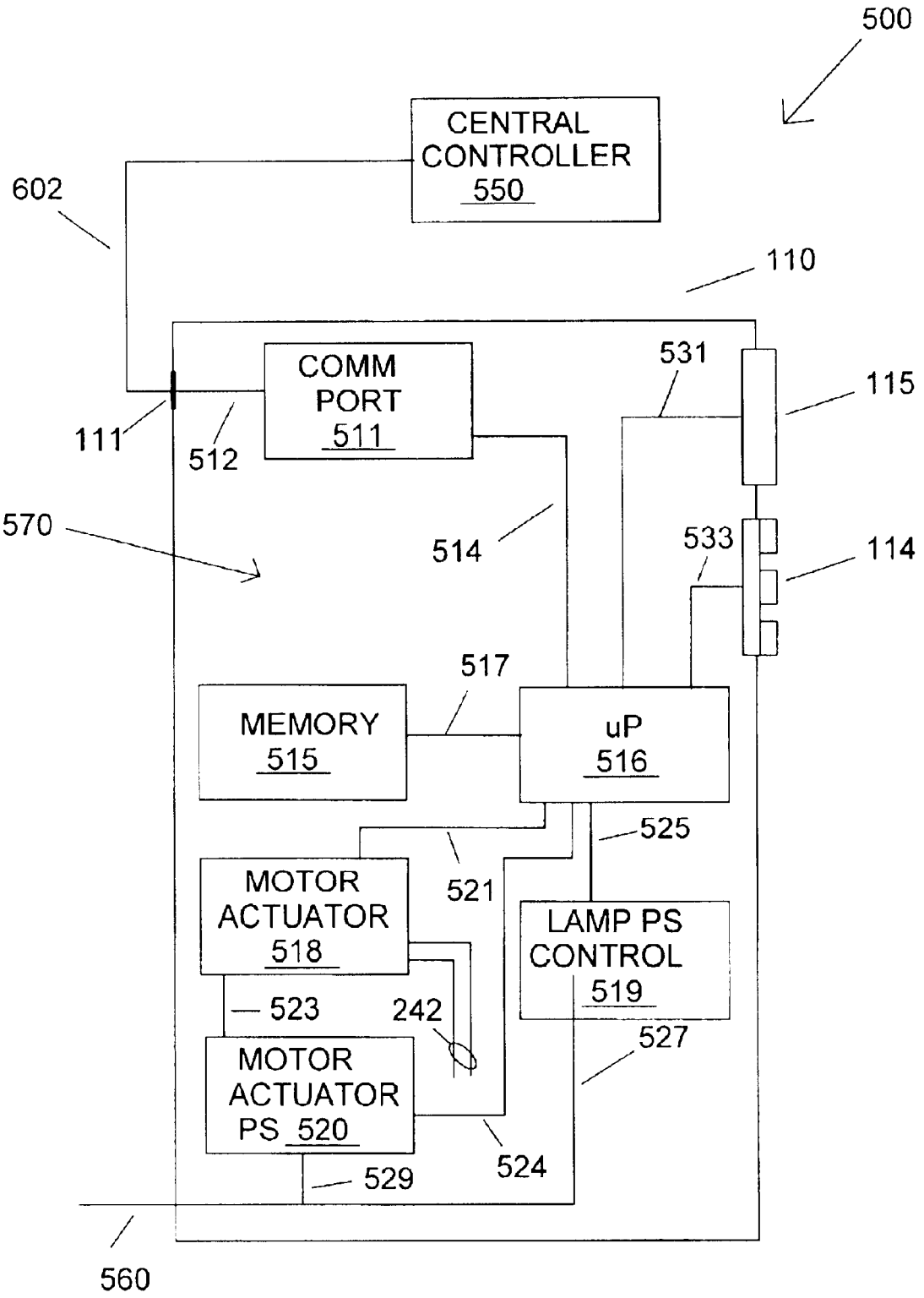
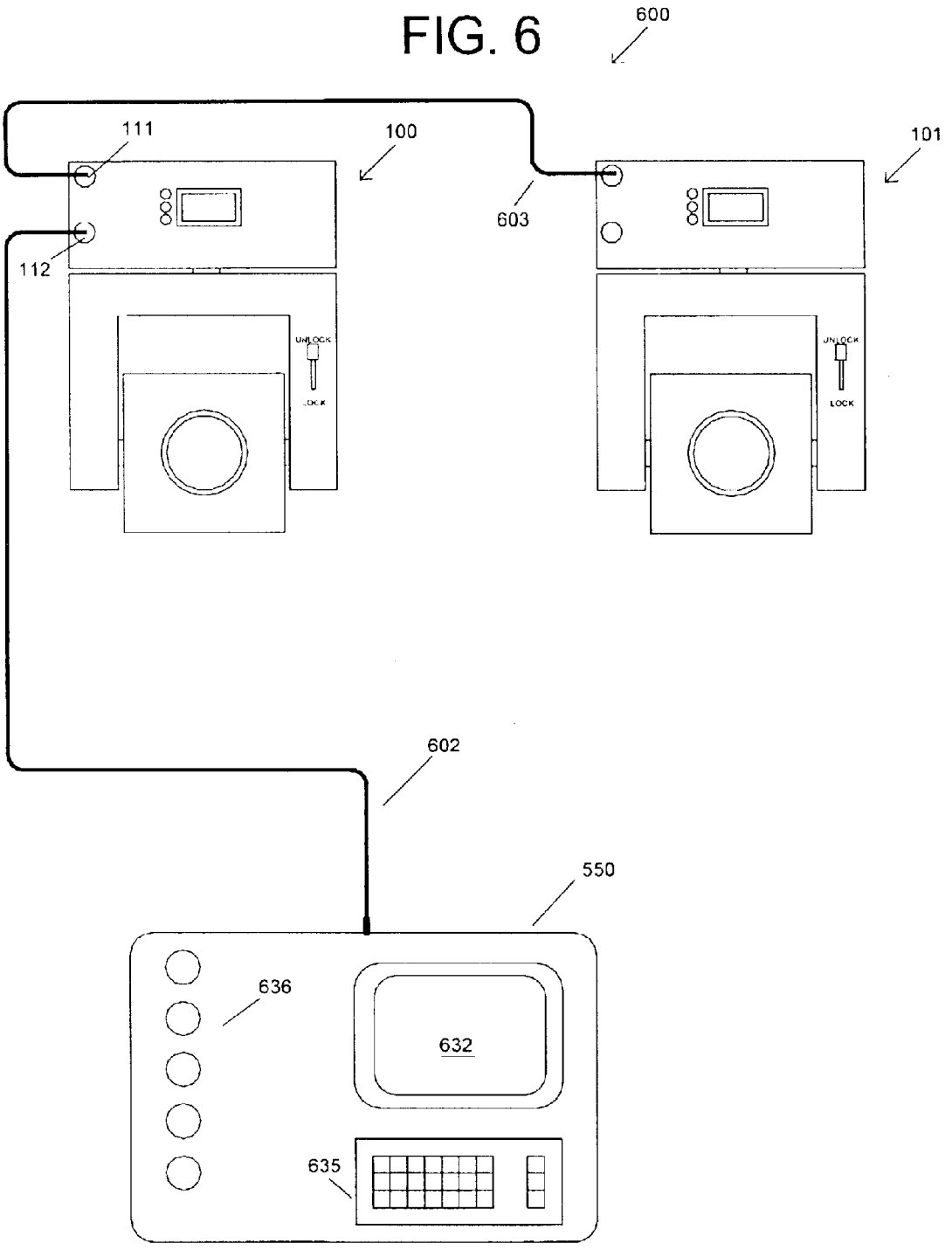

500
CENTRAL CONTROLLER 550
602
110
COMM PORT 511
531
115
111
512
570
514
533
114
517
MEMORY 515
uP 516
525
521
MOTOR ACTUATOR 518
LAMP PS CONTROL 519
523
242
527
MOTOR ACTUATOR PS 520
524
529
560

FIG. 6



MANUAL AND AUTOMATIC LOCKING SYSTEM FOR A MULTIPARAMETER LIGHTING FIXTURE

FIELD OF THE INVENTION

This invention relates to multiparameter lighting fixtures and the locking systems for pan and tilt.

BACKGROUND OF THE INVENTION

Multiparameter lighting fixtures are lighting fixtures, which illustratively have two or more individually remotely adjustable parameters such as focus, color, image, position, or other light characteristics. Multiparameter lighting fixtures are widely used in the lighting industry because they facilitate significant reductions in overall lighting system size and permit dynamic changes to the final lighting effect. Applications and events in which multiparameter lighting fixtures are used to great advantage include showrooms, television lighting, stage lighting, architectural lighting, live concerts, and theme parks. Illustrative multi-parameter lighting fixtures are described in the product brochure entitled "The High End Systems Product Line 2001" and are available from High End Systems, Inc. of Austin, Tex.

Multiparameter lighting fixtures are commonly constructed with a lamp housing that may pan and tilt in relation to a base housing so that light projected from the lamp housing can be remotely positioned to project on the stage surface. Commonly a plurality of multiparameter lights are controlled by an operator from a central controller. The central controller is connected to communicate with the plurality of multiparameter lights via a communication system. U.S. Pat. No. 4,392,187 titled "Computer controlled lighting system having automatically variable position, color, intensity and beam divergence" to Bomhorst and incorporated herein by reference disclosed a plurality of multiparameter lights and a central controller.

The lamp housing of the multiparameter light contains the optical components and the lamp. The lamp housing is rotatably mounted to a yoke that provides for a tilting action of the lamp housing in relation to the yoke. The lamp housing is titled in relation to the yoke by a motor actuator system that provides remote control of the tilting action. by the central controller. The yoke is rotatably connected to the base housing that provides for a panning action of the yoke in relation to the base housing. The yoke is panned in relation to the base housing by a motor actuator system that provides remote control of the panning action by the central controller.

Often times the multiparameter lighting fixtures travel by truck from one performance location (such as a concert hall) to another and require frequent loading and unloading of the multiparameter lighting fixtures by technicians. The loading and unloading process often requires frequent mounting and unmounting of the multiparameter lighting fixture by a technician onto structural support frames that are suspended above the stage set. The handling of a multiparameter lighting fixture by the technician can become cumbersome if the lamp housing can freely rotate in relation to the base while it is being carried by the technician. The prior art multiparameter lights often include a manual locking system that fixes the lamp housing in relation to the yoke and the yoke in relation to the base in a predetermined position. This keeps the lamp housing, yoke and base fixed in the predetermined position during the loading and unloading process. As a multiparameter lighting fixture is being carried by the technician, the technician insures the multiparameter lighting fixture is in the predetermined locked position, making it easier for the technician to carry and handle the fixture. After the multiparameter light is mounted to the structural support frame the technician must manually unlock the multiparameter lighting fixture so that the lamp housing can rotate freely in relation to the yoke and the yoke can rotate freely in relation to the base housing. If the technician should forget to manually unlock the multiparameter light pan and tilt locking system after mounting to the structural support frame, the multiparameter light will fail to operate properly as the lamp housing cannot be driven to rotate in relation to the yoke by the titling motor actuator and the yoke cannot be driven to rotate in relation to the base housing by the panning motor actuator.

Multiple technicians may be required to mount to the structural support frame as many as 50 to 100 multiparameter lighting fixtures during one show. The time for loading and unloading the show by the technicians at many of the show facilities may be limited as the schedule for the shows may require frequent travel between different facility locations on a day to day basis. Frequently a technician in the haste to load a show may accidentally forget to unlock the pan and tilt locking system of the multiparameter lighting fixture often requiring the technician to climb the structural support frame that may be elevated 20 to 40 feet above the stage surface. Obviously if the time is limited for loading the show the accidental mistake of forgetting to unlock the pan and tilt system of a multiparameter light can have a negative effect on the other time related aspects of loading and preparing the show.

SUMMARY OF THE INVENTION

A multiparameter lighting fixture is disclosed that may incorporate manual and remotely controllable automatic locking or unlocking systems for the pan and/or tilt of a multiparameter lighting fixture. If a technician should forget to unlock the pan and/or tilt locking or locking systems after the fixture is mounted to a structural support frame, the operator of a central controller or control system may unlock the multiparameter light pan or tilt locking systems by sending an unlock command over a communications system from the central controller to the multiparameter lighting fixture. The multiparameter lighting fixture of the invention still retains the manual locking and unlocking that can be important for the technicians so that service can be performed at any time without having to apply a source of power to the multiparameter light.

The present invention in one or more embodiments discloses a multiparameter lighting fixture comprising a base housing, a yoke, and a lamp housing. The multiparameter lighting fixture includes a locking system for pan and/or a locking system for tilt, either of which may include a manual input device and an actuator. The locking systems for pan and tilt can be manually locked by a technician using their respective manual input devices and automatically locked by their respective actuators. The locking systems for pan and tilt, similarly, can be unlocked by a technician using their respective manual input devices and automatically locked by their respective actuators.

In at least one embodiment of the present invention, the yoke can be locked in more than one rotational position in relation to the base housing. In addition, the lamp housing can be locked in more that one rotational position in relation to the yoke.

The locking systems for pan or tilt can be automatically locked by an appropriate actuator in response to an elec-

tronic control system. The electronic control system may receive a command at a communications port that causes the appropriate actuator to lock the locking system for pan or tilt: The electronic control system may receive an input command from an input keypad to automatically lock the locking system for pan or tilt by using the appropriate actuator.

The present invention includes a method for operating a multiparameter lighting fixture comprised of a base housing, a yoke, and a lamp housing comprising the steps of: manually locking a locking system for pan or tilt with a manual input device, and automatically locking the locking system for pan or tilt with an actuator.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows a multiparameter lighting fixture of the invention incorporating a system for manual and automatic locking;

FIG. **2** shows the multiparameter lighting fixture of FIG. **1** but with a yoke of the fixture rotated ninety degrees with respect to a base housing of the fixture and a yoke housing cover removed so that the system for manual and automatic locking can be seen in the unlocked position;

FIG. **3** shows the multiparameter lighting fixture of FIG. **2** but with the system for manual and automatic locking in the locked position;

FIG. **4** shows the same multiparameter lighting fixture of FIG. **3** but with the lamp housing rotated ninety degrees in relation to the yoke and with the system for manual and automatic locking shown in the locked position;

FIG. **5** shows a block layout of an electronic system in the base housing of the multiparameter lighting fixture of FIG. **1** that controls the multiparameter lighting fixture of FIG. **1**; and

FIG. **6** shows a lighting system incorporating two multiparameter lights of one or more embodiments of the present invention and a central controller.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. **1** shows a multiparameter lighting fixture **100** in accordance with an embodiment of the present invention. The multiparameter lighting fixture **100** includes a base housing **110**, a bearing **116**, a yoke **120**, and a lamp housing **130**.

The base housing **110** is rotatably connected to the yoke **120** by a bearing **116**, i.e. the yoke **120** rotates or swivels with respect to the base housing **110**. The yoke **120** is driven to rotate in relation to the base housing **110** by a motor actuator (not shown for simplification). The lamp housing **130** may contain various optical components including a lamp (not shown). The lamp housing **130** is rotatably connected by bearings **121** and **122** to the yoke **120**. The lamp housing **130** is driven to rotate in relation to the yoke **120** by a tilt motor actuator (not shown for simplification). In some designs of multiparameter lighting fixtures the base housing **130** may be only a support bracket for mounting to the structural support and the control system **570** of FIG. **5** may be located within the yoke **120**.

The lamp housing **130** has an output lens frame **132** containing a lens or aperture **134**. The yoke **120** has a removable housing cover **119** that a manual input device called a lever knob **124** protrudes out of. A slot **126** for guiding the positioning of the lever knob **124** in the housing cover **119** is shown. The base housing **110** has two communications connectors **111** and **112** for connecting external communications cables **603**, and **602**, respectively, of FIG. **6** to the multiparameter lighting fixture **100**. The communications connectors **111** and **112** may be electrically connected to provide an input and an output respectively.

A group of input keys forming a keypad **114** are shown available to the outside of the base housing **110**. The keypad **114** can be used in combination with a display device **115** to act as a stand alone control system for providing input commands to the multiparameter lighting fixture **100** by an operator of the keypad **114** and the display device **115**.

FIG. **2** shows the multiparameter lighting fixture **100** with the yoke **120** rotated 90 degrees. The yoke housing cover **119** has been removed in FIG. **2**, to expose the internal mechanism for manual and automatic locking of pan and tilt. The base housing **110**, communications connectors **111** and **112**, keypad **114**, display device **115**, and bearing **116** are the same components as in FIG. **1**. The lamp housing **130** and output lens frame **132** is the same as in FIG. **1**. A hub **201** with sockets **202** and **203** rotates with the lamp housing **130** in relation to the yoke **120**. The lever knob **124**, as shown in FIG. **2**, is fixed to lever bar **210** in any suitable manner. The lever bar **210** is pivotally mounted to pivot point **214**. The pivot point **214** is fixed to the yoke **120**. A hub engaging bar **220** is pivotally mounted to a pivot point **216**. The pivot point **216** is fixed to the lever bar **210**. The hub engaging bar **220** is fixed to a shaft **244** of a push pull actuator **240** by a connecting pin **245**. Driving wires **242** for the push pull actuator **240** are shown as **242**. The driving wires **242** are run though the yoke **120**, and through the bearing **116** to the base housing **110** where the driving wires **242** are electrically connected to the motor actuator interface **518** shown in FIG. **5**. The motor actuator interface **518** provides driving signals to the push pull actuator **240** to linearly move the shaft **244**. The view of the push pull actuator **240** and the shaft **244** are shown with the shaft **244** withdrawn into the actuator **240** or in the "pull position". A base housing engaging bar **230** is shown pivotally connected to pivot point **218** which is fixed in any suitable manner to the lever bar **210**. A hole in the yoke **120** is shown by boundary points **221** and **222** that allow the base housing engaging bar **230** to pass freely though the yoke **120**. The base housing engaging bar **230** passes through the yoke **120** and engages into a base housing socket **212** that is located in the base housing **110** when the base housing engaging bar **230** is placed into a locking position by the lever bar **210**. In FIG. **2**, the multiparameter lighting fixture **100** is shown with the locking system **250** not locked as to allow the yoke **120** to rotate in relation to the base housing **110** and the lamp housing **130** to rotate in relation to the yoke **110**.

FIG. **3** shows the same multiparameter lighting fixture **100** with the base housing **110**, the yoke **120** and the lamp housing **130** in the same position in relation to each other. Referring to FIGS. **2** and **3**, the lever knob **124** has been moved from position A in FIG. **2** to position B in FIG. **3** to cause the lever bar **210** to move and in turn position the hub engaging bar **220** to move into the hub socket **202**. The lever knob **124** being moved to position B also causes the base housing engaging bar **230** to engage into the base housing socket **212**. The shaft **244** of the push pull actuator **240** is now shown extended farther outwards into a push position in FIG. **3** as compared to the less extended position in FIG. **2**.

The rotational movement of the lever bar **210** from the position A in FIG. **2** to the position B in FIG. **3** causes the locking system **250** to lock and not allow the yoke **120** to rotate in relation to the base housing **110** and to not allow the lamp housing **130** to rotate in relation to the yoke **110**. The

locking in FIG. **3** can be accomplished by a technician positioning the lever knob **124** from position A in FIG. **2** to position B in FIG. **3**. The locking can also be accomplished sending driving signals from the motor actuator interface **518** of FIG. **5** over wires **242** causing the push pull actuator **240** to push the shaft **244** into the push position as shown in FIG. **3**. The shaft **244** of the actuator **240** can be placed into the push position by driving signals over wires **242** from the motor actuator interface **518** shown in FIG. **5**. When this occurs the shaft **244** pushes the lever bar **210** to place the lever bar **210** and the lever knob **124** into the locking position B causing the hub engaging bar **220** to engage into hub socket **202** locking the lamp housing **130** to the yoke **120** and the base housing engaging bar **230** to engage into the base housing socket **212** and lock the yoke **120** to the base housing **110**.

FIG. **4** shows the multiparameter lighting fixture **100** where the lamp housing **130** has been rotated ninety degrees with respect to the yoke **120** from the position shown in FIG. **3**. FIG. **4** shows that more than one rotational locking position is provided so the lamp housing **130** may be locked in at least two rotational positions in relation to the yoke **120** as determined by the hub sockets **202** and **203**. More than one base housing socket like base housing socket **212** may also be provided in the base housing **110** so that the yoke **120** can be locked to the base housing **110** in several different rotational positions. More than one base housing socket **212** is not shown for simplification.

Referring to FIGS. **2** and **4**, the lever knob **124** has been removed from position A in FIG. **2** to position B in FIG. **4**, to cause the lever bar **210** to move and in turn position the hub engaging bar **220** into the hub socket **203**. The lever knob **124** being moved to position B also causes the base housing engaging bar **230** to engage into the base housing socket **212**. The shaft **244** of the push pull actuator **240** is shown extended into the push position in FIG. **4**.

The movement of the lever bar **210** to position B on pivot point **214** fixed to yoke **120** causes the locking system **250** to lock and not allow the yoke **120** to rotate in relation to the base housing **110** and the lamp housing **130** not to rotate in relation to the yoke **110**. The locking in FIG. **4** can be accomplished by a technician moving the lever knob **124** from position A in FIG. **2** to position B in FIG. **4**. The locking can also be accomplished by sending driving signals from the motor actuator interface **518** of FIG. **5** over wires **242** causing the push pull actuator **240** to push the shaft **244** into the push position as shown in FIG. **4**. The shaft **244** of the actuator **240** can be placed into the push position by driving signals over wires **242** from the motor actuator interface **518** shown in FIG. **5**. This causes the shaft **244** to push against the lever bar **210** to place the lever bar **210** and the lever knob **124** into the locking position B and causes the hub engaging bar **220** to engage into the hub socket **203** locking the lamp housing **130** to the yoke **120** and causes the base housing engaging bar **230** to engage into the base housing socket **212** and lock the yoke **120** to the base housing **110**.

The multiparameter lighting fixture **100** of FIG. **4** may be manually locked by the lever knob **124** by moving the lever knob **124** into the B position when the lamp housing **130** is rotated by the technician in relation to the yoke **120** as to align the hub engaging bar **220** with one of the hub sockets **202** or **203** and the yoke **120** is manually rotated to align the base housing engaging bar **230** with the base housing socket **212** or other base housing sockets (not shown for simplification). For example, a technician working with the multiparameter light fixture **100** of FIG. **1** may manually rotate the lamp housing **130** in relation to the yoke **120** and the yoke **120** in relation to the base housing **110** to lock the lamp housing **130** in relation to the yoke **120** and the yoke **120** in relation to the base housing **110** in several selectable positions as determined by the number of hub sockets and base housing sockets.

FIG. **5** shows a block layout of a central controller **550** connected over a communications system cable **602** to the electronic control system **570** located in the base housing **110**. The electronic control system **570** may be comprised of a processor **516**, a memory **515**, a communications port **511**, a motor actuator interface **518** and a motor actuator power supply **520**. The central controller **550** may send address and command signals over a communications system on cable **602** to the communications connector **111** that is connected by wire **512** to the communications port **511** located within the base housing **110**. Address and command signals sent from the central controller **550** are received by the communications port **511** and then passed to the processor **516** where the address and command signals are operated upon in accordance with the operational code stored in the memory **515**. The communications port **511** may be a part of the processor **516**, the communications port **511** can be any device capable of receiving a communication sent over the communications system comprised of communications cable **602**. An operator of the central controller **550** may use an input keyboard **635** shown in FIG. **6** to input an address of a desired multiparameter lighting fixture, such as fixture **100**, to control from a plurality of multiparameter lighting fixtures, such as **100** and **101** shown in FIG. **6**. If for example the operator should elect for the multiparameter lighting fixture **100** of FIG. **6** to respond to command signals the operator must first enter the address of multiparameter lighting fixture **100** into the keyboard **635** of the central controller **550** of FIG. **6**. The desired address is then transmitted over the communications system via cables **602** and **603** to the multiparameter lighting fixtures **100** and **101** of FIG. **6** and received by the communications port **511** of FIG. **5**. Multiparameter lighting fixture **101** can be of the same type and may have the same type of components as multiparameter lighting fixture **100** and the multiparameter lighting fixture **101** can also receive address and communication signals sent over the communication system at the communications port for **101**, not shown for simplification. The communication cable **602** is connected into the base housing communications connector **111** shown in FIG. **5**. The desired address as sent by the central controller **550** is carried over the communications cable **602** to the base housing communications connector **111** and then routed over wiring **512** to the communications port **511** where the address signal is sent via wiring **514** to the processor **516** shown in FIG. **5**. The received address signal is then compared by the processor **516** to the operating address stored in the memory **515** to see if the received address matches the operating address stored in the memory **515**. If the address received over the communications system matches the operating address stored in the memory **515** then the multiparameter lighting fixture **100** is next ready to respond to commands sent from the central controller **550** over the communications system.

For FIG. **6**, two multiparameter lighting fixtures **100** and **101** are shown. A lighting system may contain fifty or more multiparameter lighting fixtures that may all have separate operating addresses so as to respond to commands sent from the central controller **550** individually. After the desired address sent from the central controller **550** is matched to the operating address of the multiparameter lighting fixture **100**,

the multiparameter lighting fixture **100** may then respond to commands. The commands may be operated upon by the multiparameter lighting fixture **100** to vary the color, intensity, projected pattern, focus or position of the lamp housing **130** in relation to the base housing **110**.

FIG. **5** shows the processor **516** which may be a plurality of processors or a set of discrete components that are able to process data. The processor **516** is connected to the memory **515** via wiring **517**. The wiring **517** may be circuit board traces or other conductors. The memory **515** may be a component of the processor **516**. The memory **515** contains the operational code for the multiparameter lighting fixture **100** along with the operating address. The processor **516** is connected to the display device **115**, shown in FIG. **1**, over wiring **531**. The display device **115** may be any type of display device that is capable of displaying characters or data to a technician. The processor **516** provides the driving signals to the display device **115** so that characters and text can be read by a technician working with the multiparameter lighting fixture **100**. The technician may also input control commands via the keypad **114** mounted to the base housing **110** over wiring **533** to the processor **516**. The commands are then operated on by the multiparameter lighting fixture **100** in accordance with the operating software stored in the memory **515**. The keypad **114** can be formed of any input devices such as buttons, switches or knobs that provide electronic signals.

The processor **516** is connected via wiring **521** to the motor actuator interface **518**. The processor **516** may receive commands sent from the central controller **550** as received by the communications port **511**. The commands may be processed in accordance with the operational code in the memory **515** to cause control signals to be sent to the motor actuator interface **518**. The control signals sent to the motor actuator interface may in turn send the driving signals to the motor actuators (not shown) that control rotation of the lamp housing **130** in relation to the yoke **120** and rotation of the yoke in relation to the base housing **110**. Also the motor actuator interface **518** may control the various motor actuators in the lamp housing **130** that produce the optical parameters as known in the art. The motor actuator **518** interface is also connected via wiring **242** to the push pull actuator **240** shown in FIGS. **2**, **3** and **4**. Locking and unlocking command signals received over the communication port **511** from the central controller **550** are sent to the processor **516** where they are operated upon in accordance with the operating code stored in the memory **515** and control signals are sent to the motor actuator interface **518** that drives the push pull actuator **240** to place the lever knob **124** of FIGS. **2**, **3** and **4** into the A (unlocked) or B (locked) position. In this way an operator of the central controller **550** may first send the desired appropriate address to the desired multiparameter lighting fixture to be controlled from a plurality of multiparameter lighting fixtures and next the operator may send a lock or unlock command to the desired multiparameter lighting fixture, such as **100** or **101**, to lock or unlock the pan and tilt locking system **250**. The locking and unlocking of the pan and tilt locking system **250** by the push pull actuator **240** also simultaneously changes the position of the lever knob **124** from the A (unlocked) to the B (locked) position.

The processor **516** may also control the lamp power supply control system **519** over wiring **525** to switch on or off the lamp. The base housing **110** is connected to a source of power through wiring **560** that directs the source of power though wiring **529** to the motor actuator power supply **520**. Wiring **560** also connects with wiring **527** to supply power to the lamp power supply control system **519**. The processor **516** and associated electronics may receive their power from the motor actuator power supply **520** over wiring **524**. Any of the wiring shown in the base housing **110** may of course be circuit board traces.

FIG. **6** shows a lighting system **600** using two multiparameter lighting fixtures **100** and **101** of one or more embodiments of the present invention **100**. The lighting system **600** is comprised of the lighting fixtures **100**, **101**, and the central controller **550**.

The central controller **550** has an input keyboard **635**, a display device **632** which may be a video monitor, and several input devices such as rotary potentiometers **636**. The central controller **550** has an internal communication port (not shown for simplification) that is connected to communications cable **602**. Communications cable **602** is connected to one of the communications connectors, **111** or **112**, of multiparameter lighting fixture **100**. Communications cable **603** is connected to the other communications connector, i.e. **111** or **112**, of multiparameter lighting fixture **100** and to one of the communications connectors of multiparameter lighting fixtures **101**.

When the multiparameter lighting fixture **100** is not powered up and with the pan and tilt lever knob **124** in the A (unlocked) position as shown in FIG. **2**, the technician can manually rotate the lamp housing **130** in relation to the yoke **120** and manually rotate the yoke **120** in relation to the base housing **110**. The lamp housing **130** and the yoke **120** can be manually rotated to positions such as that shown in FIGS. **3** and **4** and then the lever knob **124** can be placed in locked position B. When the multiparameter lighting fixture **100** is connected to a source of power and connected to communicate with the central controller **550**, lock and unlock commands received by the communications port **511** shown in FIG. **5** can cause the push pull actuator **240** to automatically lock or unlock the pan and tilt locking system **250** which also causes the lever knob **124** of FIG. **2** to move simultaneously to the unlocked A position or the locked B position.

There can be several locking positions for the lamp housing **130** in relation to the yoke **120** as determined by the number of hub sockets. There can also be several locking positions of the yoke **120** in relation to the base housing **110** as determined by the number of base housing sockets. It is possible for the multiparameter lighting fixture **100** to automatically lock the pan and tilt locking system **250** in any position that the hub sockets and base sockets allow. The multiparameter light **100** can contain operational code in the memory **515** that can allow multiple locking positions to be selected as a preference by an operator of the central controller **550** or by a technician using the stand alone control system formed by input keypads **114** and visual display **115**. Different locking positions can be stored in the operational memory **515**. When pan and tilt locking commands are sent by an operator of the central controller **550** by entering the desired locking command into the keyboard **635** or with input devices **636** the locking command is received by the desired multiparameter lighting fixture, such as **100**, at the communications port **511**. The command signals are sent to the processor **516** from the communications port **511** where they are acted upon by the operational code stored in the memory **515**. For example if a command to lock the pan and tilt in a first position is received by the processor **516** the operational code allows the processor **516** to rotationally position the lamp housing **130** in relation to the yoke **120** a certain number of predetermined degrees so that the hub engaging bar **220** is aligned with the desired hub

socket for the first position. Also the same command to lock in the first position, positions the yoke **120** to be positioned a certain number of predetermined degrees in reference to the base housing **110** so that the base engaging bar **230** is aligned with the desired base housing socket, such as socket **212**. Next the push pull actuator **240** is engaged by the processor **516** to be in the push position to automatically lock the pan and tilt locking system **250** with the lever knob **124** simultaneously moved to position B (the locked position) as seen in FIG. **3**. The locking of the lamp housing **130** in relation to the yoke **120** and the yoke **120** in relation to the base for the first position can be seen in FIG. **3** while a different locking or second position can be seen in FIG. **4**.

The multiparameter lighting fixture **100** may be set to automatically unlock the pan and tilt locking system **250** when the multiparameter lighting fixture **100** is powered up so that when the source of power is applied to the multiparameter lighting fixture **100** at wiring **560** shown in FIG. **5**, the push pull actuator **240** of FIG. **4** is driven to the pull position and the lever knob **124** is simultaneously moved to position A (the unlocked position). The preference setting to unlock the multiparameter lighting fixture **100** when the correct power is applied to wiring **560** of FIG. **5** may be done by a technician through the stand alone control system formed by the input keypad **114** and the display device **115** or the setting could occur from commands sent by the central controller **550** that are received at the communications port **511**.

The technician may also use the stand alone control system to predetermine what rotational position the lamp housing **130** will be in relation to the yoke **120** and what position the yoke **120** will be in relation to the base housing **110** when a lock command is received. The lock command may be sent from the central controller **550** to the communication port **511** of the multiparameter lighting fixture **100**. For example the technician may enter into the keypad **114** that the technician would like the multiparameter lighting fixture **100** to respond to a lock command received by the communications port **511** and to lock in a first or second position. The lock command could lock the pan and tilt locking system **250** for multiparameter lighting fixture **100** into a first position which may be called a default locking position or a second position. The multiparameter lighting fixture **100** may respond upon receipt of the locking command by positioning the lamp housing **130** in relation to the yoke **120** and the yoke **120** in relation to the base **110** as predetermined by the default first position setting. Thereafter the push pull actuator **240** may move to the push position to lock the pan and tilt locking system **250**. In this way a locking command as commanded by the operator of the central control system **550** can be received by the communications port **511** or a plurality of multiparameter lighting fixtures and all the multiparameter lighting fixtures or selected multiparameter lighting fixtures will respond to the locking command by correctly positioning the lamp housing **130** in relation to the yoke **120** and the yoke **120** in relation to the base housing **110**. Next all of the push pull actuators, similar to **240**, in all of the multiparameter lighting fixtures such as **100** and **101**, will automatically move to the locking position (B) of FIG. **3**. All of the plurality of multiparameter lighting fixtures, such as **100** and **101** will then be in the same locking position such as the default first position as shown in FIG. **3**. This allows the technician to unload the multiparameter lighting fixtures from a structural support frame without having to manually position and lock each multiparameter lighting fixture manually. If for any reason any particular multiparameter lighting fixture should need to be unlocked, to untangle a wire or cable for example, the technician need only manually move the lever knob **124** to the unlock position (A) as shown in FIG. **2**.

The technician may also find it an advantage to lock and unlock the pan and tilt locking system **250** of the multiparameter lighting fixture **100** by not using the manual input device called the lever knob **124** of FIG. **2**. Rather, the technician may lock and unlock the multiparameter lighting fixture **100** by inputting a command through input keypad **114**. The command may send either a lock or unlock command to the processor **516** of FIG. **5** to automatically lock or unlock the pan and tilt locking system **250** using the actuator **240** of FIG. **2**. Of course this will only work for the technician when the multiparameter lighting fixture, such as **100**, has power applied.

In addition, an unlocking command may be sent from the central controller **550** to the plurality of multiparameter lighting fixtures, such as fixtures **100** and **101** of FIG. **6** to be received by a communications port, such as **511** shown in FIG. **5**. When the plurality of multiparameter lighting fixtures receive the unlock command at their communications port, similar to **511** of FIG. **5**, they should respond by unlocking their respective pan and tilt locking systems for the plurality of multiparameter lights. The unlock command is useful for when a technician accidentally forgets to manually unlock one of the plurality of multiparameter lighting fixtures such as **100** or **101** of FIG. **6** during the time the multiparameter lighting fixture was loaded on to a structural support. This prevents the technician from having to manually unlock the multiparameter lighting fixture **100** if it is difficult to approach on the structural support.

The pan and tilt locking system **250** shown in FIGS. **2**, **3**, and **4** is by way of example. There are other ways to design a pan and tilt locking system that is manual such as by using cams or gears. The manual locking system is comprised of a manual input device for providing a means for the technician to manually lock and unlock the pan and tilt **250**. The manual input device shown in FIGS. **1**, **2**, **3** and **4** is a lever knob **124**. The manual input device that is a part of the multiparameter lighting fixture could also be a push button, or a rotary knob that effects the locking and unlocking of pan and tilt or pan or tilt locking mechanisms. The pan and tilt locking system **250** as shown in FIGS. **2**, **3**, and **4** may be separated into a tilt locking system with a manual input device and an actuator and a pan locking system with manual input device and an actuator. It is preferred that only one actuator be used with one manual input device to lock both pan and tilt.

The push pull actuator **240** can be any actuator that can lock or unlock the pan and tilt locking system **250** without requiring the technician to manually provide an input to the manual input device that locks or unlocks the pan and tilt or pan or tilt locking device. The push pull actuator **240** may be a push pull electrical relay, a rotary solenoid or a motor for example.

Although the invention has been described by reference to particular illustrative embodiments thereof, many changes and modifications of the invention may become apparent to those skilled in the art without departing from the spirit and scope of the invention. It is therefore intended to include within this patent all such changes and modifications as may reasonably and properly be included within the scope of the present invention's contribution to the art.

I claim:

1. A multiparameter fighting fixture comprising

a base housing;

a yoke;

a lamp housing; and

an unlocking system including a manual input device and an unlocking actuator;

wherein the manual input device is mechanically coupled to the unlocking actuator and can respond mechanically to a movement produced by the unlocking actuator;

wherein the unlocking system can be used to place the multiparameter lighting fixture in a locked state or an unlocked state;

wherein when the multiparameter lighting fixture is in the unlocked state the yoke can be rotated with respect to the base housing by a first motor actuator;

wherein when the multiparameter lighting fixture is in the locked state the yoke can not be rotated with respect to the base housing by the first motor actuator;

wherein the unlocking system is distinct from the first motor actuator; and

wherein the manual input device can be used by a technician to place the multiparameter lighting fixture in an unlocked state.

2. The multiparameter lighting fixture of claim **1** wherein

the unlocking actuator automatically places the multiparameter lighting fixture in the unlocked state and in response the manual input device moves to an unlocked position.

3. The multiparameter lighting fixture of claim **1** further comprising

an electronic control system;

wherein the electronic control system can cause the multiparameter lighting fixture to be placed in the unlocked state.

4. The multiparameter lighting fixture of claim **3** further comprising

a communications port; and

wherein the electronic control system receives a command at the communications port that causes the unlocking actuator to place the multiparameter lighting fixture in the unlocked state.

5. The multiparameter lighting fixture of claim **3** further comprising

an input keypad, and

wherein the electronic control system receives an input command from the input keypad to automatically place the multiparameter lighting fixture in the unlocked state.

6. A multiparameter lighting fixture comprising

a base housing;

a yoke;

a lamp housing; and

a locking system including a manual input device and a locking actuator;

wherein the manual input device is mechanically coupled to the locking actuator and can respond mechanically to a movement produced by the locking actuator;

wherein the locking system can be used to place the multiparameter lighting fixture in a locked state or an unlocked state;

wherein when the multiparameter lighting fixture is in the unlocked state the yoke can be rotated with respect to the base housing by a first motor actuator;

wherein when the multiparameter lighting fixture is in the locked state the yoke can not be rotated with respect to the base housing by the first motor actuator;

where in the locking system is distinct from the first motor actuator;

wherein a technician can use the manual input device to manually place the multiparameter lighting fixture in the locked state;

and wherein the multiparameter lighting fixture can be automatically placed in the locked state by the locking actuator.

7. The multiparameter lighting fixture of claim **6** wherein

the locking actuator automatically places the multiparameter lighting fixture in the locked state; and in response the manual input device moves to a locked position.

8. The multiparameter lighting fixture of claim **6** further comprising

an electronic control system;

wherein the electronic control system causes the locking actuator to place the multiparameter lighting fixture in the locked state.

9. The multiparameter lighting fixture of claim **8** further comprising

a communications port; and

wherein the electronic control system receives a command at the communications port that causes the locking actuator to place the multiparameter lighting fixture in the locked state.

10. The multiparameter lighting fixture of claim **8** further comprising

an input keypad; and

wherein the electronic control system receives an input command from the input keypad that causes the locking actuator to automatically place the multiparameter lighting fixture in the locked state.

11. The multiparameter lighting fixture of claim **6** wherein

the locking system can place the multiparameter lighting fixture in the locked state when the base housing is at a first rotational position with respect to the yoke;

and the locking system can place the multiparameter lighting fixture in the locked state when the base housing is at a second rotational position with respect to the yoke;

wherein the first and second rotational positions are different.

12. A multiparameter fighting fixture comprising

a yoke;

a lamp housing;

an unlocking system including a manual input device and an unlocking actuator;

wherein the manual input device is mechanically coupled to the unlocking actuator and can respond mechanically to a movement produced by the unlocking actuator;

wherein the unlocking system can be used to place the multiparameter lighting fixture in a locked state or an unlocked state;

wherein when the multiparameter lighting fixture is in the unlocked state the lamp housing can be rotated with respect to the yoke by a first motor actuator;

wherein when the multiparameter lighting fixture is in the locked state the lamp housing can not be rotated with respect to he yoke by the first motor actuator;

wherein the unlocking system is distinct from the first motor actuator;

wherein the manual input device can be used by a technician to place the multiparameter lighting fixture in an unlocked state; and

wherein the unlocking actuator can automatically place the multiparameter lighting fixture in an unlocked state.

13. The multiparameter lighting fixture of claim **12** wherein

the actuator automatically places the multiparameter lighting fixture in an unlocked state and in response the manual input device moves to an unlocked position.

14. The multiparameter lighting fixture of claim **12** further comprising

an electronic control system;

and wherein the electronic control system causes the unlocking system to automatically place the multiparameter lighting fixture in an unlocked state.

15. The multiparameter lighting fixture of claim **14** further comprising

a communications port; and

wherein the electronic control system receives a command at the communications port that causes the unlocking actuator to place the multiparameter lighting fixture in an unlocked state.

16. The multiparameter lighting fixture of claim **14** further comprising

an input keypad; and

wherein the electronic control system receives an input command from the input keypad to automatically cause the unlocking actuator to place the multiparameter lighting fixture in an unlocked state.

17. A multiparameter lighting fixture comprising

a base housing;

a yoke;

a lamp housing;

a locking system including a manual input device and a locking actuator;

wherein the manual input device is mechanically coupled to the locking actuator and can respond mechanically to a movement produced by the locking actuator;

wherein the locking system can be used to place the multiparameter lighting fixture in a locked state or an unlocked state;

wherein when the multiparameter lighting fixture is in the unlocked state the lamp housing can be rotated with respect to the yoke by a first motor actuator;

wherein when the multiparameter lighting fixture is in the locked state the lamp housing can not be rotated with respect to the yoke by a first motor actuator;

wherein the locking system is distinct from the first motor actuator; and

wherein a technician can use the manual input device to manually place the multiparameter lighting fixture in the locked state and the locking actuator can be used to automatically place the multiparameter lighting fixture in the locked state.

18. The multiparameter lighting fixture of claim **17** wherein

the locking actuator automatically places the multiparameter lighting fixture in the locked state and in response the manual input device moves to a locked position.

19. The multiparameter lighting fixture of claim **17** further comprising

an electronic control system;

wherein the locking actuator automatically places the multiparameter lighting fixture in the locked state in response to the electronic control system.

20. The multiparameter lighting fixture of claim **19** further comprising

a communications port; and

wherein the electronic control system receives a command at the communications port that causes the locking actuator to place the multiparameter lighting fixture in the locked state.

21. The multiparameter lighting fixture of claim **19** further comprising

an input keypad; and

wherein the electronic control system receives an input command from the input keypad to automatically place the multiparameter lighting fixture in the locked state.

22. The multiparameter lighting fixture of claim **17** wherein

the locking system can place the multiparameter lighting fixture in the locked state when the lamp housing is at a first rotational position with respect to the yoke;

and the locking system can place the multiparameter lighting fixture in the locked state when the lamp housing is at a second rotational position with respect to the yoke;

wherein the first and second rotational positions are different.

23. A method for operating a multiparameter lighting fixture comprising of a base housing, a yoke, and a lamp housing comprising the steps of:

using a manual input device to manually change the multiparameter lighting fixture from a locked state to an unlocked state;

wherein the manual input device is mechanically coupled to a locking actuator and can respond mechanically to a movement produced by the locking actuator;

wherein when the multiparameter lighting fixture is in the unlocked state the yoke can be rotated with respect to the base housing by a first motor actuator;

wherein when the multiparameter lighting fixture is in the locked state the yoke can not be rotated with respect to the base housing by a first motor actuator; and

further comprising automatically changing the multiparameter lighting fixture from the locked state to the unlocked state; and

wherein the manual input device and the locking actuator are distinct from the first motor actuator.

24. The method of claim **23** wherein

the manual input device moves to an unlocked position in response to the step of automatically changing the multiparameter lighting fixture from the locked state to the unlocked state.

25. The method of claim **23** wherein

an electronic control system causes the step of automatically changing the multiparameter lighting fixture from the locked state to the unlocked state.

26. The method of claim **25** further comprising

receiving a command at a communications port that causes the step of automatically changing the multiparameter lighting fixture from the locked state to the unlocked state.

27. The method of claim **25** further comprising

receiving an input command from an input keypad to cause the step of automatically changing the multiparameter lighting fixture from the locked state to the unlocked state.

28. A method for operating a multiparameter lighting fixture comprised of a base housing, a yoke, and a lamp housing comprising the steps of:

using a manual input device to manually change the multiparameter lighting fixture from a locked state to an unlocked state;

wherein the manual input device is mechanically coupled to an unlocking actuator and can respond mechanically to a movement produced by the unlocking actuator;

wherein when the multiparameter lighting fixture is in the unlocked state the yoke can be rotated with respect to the base housing by a first motor actuator;

wherein when the multiparameter lighting fixture is in the locked state the yoke can not be rotated with respect to the base housing by a first motor actuator; and

using the unlocking actuator to automatically change the multiparameter lighting fixture from the locked state to the unlocked state; and

wherein the manual input device and the unlocking actuator are distinct from the first motor actuator.

29. The method of claim **28** wherein

the manual input device moves to an unlocked position in response to the step of automatically changing the multiparameter lighting fixture from the locked state to the unlocked state.

30. The method of claim **28** wherein

an electronic control system causes the step of using the unlocking actuator to automatically change the multiparameter lighting fixture from the locked state to the unlocked state.

31. The method of claim **30** further comprising

receiving a command at a communications port that causes the step of automatically changing the multiparameter lighting fixture from the locked state to the unlocked state.

32. The method of claim **30** for comprising

receiving an input command from an input keypad to cause the step of automatically changing the multiparameter lighting fixture from the locked state to the unlocked state.

33. The method of claim **28** wherein

the locking system can place the multiparameter lighting fixture in the locked state when the yoke is at a first rotational position with respect to the base housing;

and the locking system can place the multiparameter lighting fixture in the locked state when the yoke is at a second rotational position with respect to the base housing;

wherein the first and second rotational positions are different.

34. A method for operating a multiparameter lighting fixture comprised of a base housing, a yoke, and a lamp housing comprising the steps of:

using a manual input device to manually change a multiparameter lighting fixture from a locked state to an unlocked state;

wherein the manual input device is mechanically coupled to an unlocking actuator and can respond mechanically to a movement produced by the unlocking actuator;

wherein when the multiparameter lighting fixture is in the unlocked state the lamp housing can be rotated with respect to the yoke by a first motor actuator;

wherein when the multiparameter lighting fixture is in the locked state the lamp housing can not be rotated with respect to the yoke by a first motor actuator; and

using the unlocking actuator to automatically change the multiparameter lighting fixture from the locked state to the unlocked state; and

wherein the manual input device and the unlocking actuator are distinct from the first motor actuator.

35. The method of claim **34** wherein

the manual input device moves to an unlocked position in response to the step of the using the unlocking actuator to automatically change the multiparameter lighting fixture from the locked state to the unlocked state.

36. The method of claim **34** wherein

an electronic control system causes the step of using the unlocking actuator to automatically change the multiparameter lighting fixture from the locked state to the unlocked state.

37. The method of claim **36** further comprising

receiving a command at a communications port that causes the step of the using the unlocking actuator to automatically change the multiparameter lighting fixture from the locked state to the unlocked state.

38. The method of claim **36** further comprising receiving an input command from an input keypad to cause the step of automatically changing the multiparameter lighting fixture from the locked state to the unlocked state.

39. A method for operating a multiparameter lighting fixture comprised of a base housing, a yoke, and a lamp housing comprising the steps of:

using a manual input device to change a multiparameter lighting fixture from an unlocked state to a locked state;

wherein the manual input device is mechanically coupled to a locking actuator and can respond mechanically to a movement produced by the locking actuator;

wherein when the multiparameter lighting fixture is in the unlocked state the lamp housing can be rotated with respect to the yoke by a first motor actuator;

wherein when the multiparameter lighting fixture is in the locked state the lamp housing can not be rotated with respect to the yoke by a first motor actuator; and

using the locking actuator to automatically change the multiparameter lighting fixture from the unlocked state to the locked state; and

wherein the manual input device and the locking actuator are distinct from the first motor actuator.

40. The method of claim **39** wherein

the manual input device moves to a locked position in response to the step of using the locking actuator to automatically change the multiparameter lighting from the unlocked state to the locked state.

41. The method of claim **39** wherein

an electronic control system causes the step of using the locking actuator to automatically change the multiparameter lighting fixture from the unlocked state to the locked state.

42. The method of claim **41** further comprising

receiving a command at a communications port that causes the step of using the locking actuator to automatically change the multiparameter lighting fixture from the unlocked state to the locked state.

43. The method of claim **41** further comprising

receiving an input command from an input keypad to cause the step of using the locking actuator to automatically change the multiparameter lighting fixture from the unlocked state to the locked state.

44. The method of claim **39** wherein

the locking system can place the multiparameter lighting fixture in the locked state when the lamp housing is at a first rotational position with respect to the yoke;

and the locking system can place the multiparameter lighting fixture in the locked state when the lamp

housing is at a second rotational position with respect to the yoke; and

wherein the first and second rotational positions are different.

45. A multiparameter lighting fixture comprising

a yoke;

a lamp housing;

a locking system for pan including a manual input device;

a locking system for tilt including a manual input device and an unlocking actuator;

wherein the manual input device is mechanically coupled to the unlocking actuator and can respond mechanically to a movement produced by the unlocking actuator;

wherein the locking system for pan can place the multiparameter lighting fixture in a locked pan state or an unlocked pan state;

wherein when the multiparameter lighting fixture is in the unlocked pan state the yoke can be rotated with respect to the base housing by a first motor actuator;

wherein when the multiparameter lighting fixture is in the locked pan state the yoke can not be rotated with respect to the base housing by the first motor actuator;

wherein the locking system for tilt can place the multiparameter lighting fixture in a locked tilt state or an unlocked tilt state;

wherein when the multiparameter lighting fixture is in the unlocked tilt state the lamp housing can be rotated with respect to he yoke by a second motor actuator;

wherein when the multiparameter lighting fixture is in the locked tilt state the lamp housing can not be rotated with respect to the yoke by the second motor actuator;

wherein a technician can use the manual input device of the locking system for pan to place the multiparameter lighting fixture in a unlocked pan state;

wherein the technician can use the manual input device of the locking system for tilt to place the multiparameter lighting fixture in an unlocked tilt state;

and wherein the unlocking actuator can automatically place the multiparameter lighting fixture in an unlocked tilt state; and

wherein the locking system for tilt and the locking system for pan are distinct from the first motor actuator and the second motor actuator.

46. The multiparameter lighting fixture of claim **45** wherein

the manual input device of the locking system for tilt moves to an unlocked position in response the unlocking actuator of the locking system for tilt automatically placing the multiparameter lighting fixture in an unlocked tilt state.

47. The multiparameter lighting fixture of claim **45** further comprising

an electronic control system;

wherein the electronic control system can cause an unlocking actuator of the locking system for pan to automatically to place the multiparameter lighting fixture in an unlocked pan state;

and wherein the electronic control system can cause the unlocking actuator of the locking system for tilt to automatically place the multiparameter lighting fixture in an unlocked tilt state.

48. The multiparameter lighting fixture of claim **47** further comprising

a communications port; and

wherein the electronic control system receives a command at the communications port that causes the unlocking actuator of the locking system for pan to place the multiparameter lighting fixture in an unlocked pan state; and causes the unlocking actuator of the locking system for tilt to place the multiparameter lighting fixture in an unlocked tilt state.

49. The multiparameter lighting fixture of claim **47** further comprising

an input keypad; and

wherein the electronic control system receives an input command from the input keypad

which causes the unlocking actuator of the locking system for pan to automatically place the multiparameter lighting fixture in an unlocked pan state; and causes the unlocking actuator of the locking system for tilt to automatically place the multiparameter lighting fixture in an unlocked tilt state.

50. The multiparameter lighting fixture of claim **45** wherein

the locking system for tilt can place the multiparameter lighting fixture in the locked tilt state when the lamp housing is at a first rotational position with respect to the yoke;

and the locking system for tilt can place the multiparameter lighting fixture in the locked tilt state when the lamp housing is at a second rotational position with respect to the yoke; and

wherein the first and second rotational positions are different.

51. The multiparameter lighting fixture of claim **50** further comprising

a keypad; and

a communications port;

wherein the keypad can be used by a technician to cause a command to select whether the lamp housing will be set at the first rotational position with respect to the yoke or at the second rotational position with respect to the yoke when the multiparameter lighting fixture is in the locked tilt state.

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