US012392483B1

(12) **United States Patent**
Owen et al.

(10) **Patent No.: US 12,392,483 B1**
(45) **Date of Patent: Aug. 19, 2025**

(54) **MULTISTATE ENVIRONMENTAL CONTROL SYSTEM AND METHOD**

(71) Applicant: **SnapRays, LLC**, Vineyard, UT (US)

(72) Inventors: **D. Scott Owen**, Bluffdale, UT (US); **Blake M. Hale**, West Jordan, UT (US)

(73) Assignee: **SnapRays, LLC**, Vineyard, UT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **18/584,786**

(22) Filed: **Feb. 22, 2024**

Related U.S. Application Data

(63) Continuation-in-part of application No. 18/410,650, filed on Jan. 11, 2024, now abandoned, and a continuation-in-part of application No. 17/740,070, filed on May 9, 2022, now Pat. No. 11,913,627, said application No. 18/410,650 is a continuation of application No. 17/740,070, filed on May 9, 2022, now Pat. No. 11,913,627, which is a continuation of (Continued)

(51) **Int. Cl.**

F21V 23/04	(2006.01)
F21L 4/00	(2006.01)
F21V 23/00	(2015.01)
H05B 47/10	(2020.01)
F21Y 115/10	(2016.01)

(52) **U.S. Cl.**
CPC ***F21V 23/04*** (2013.01); ***F21L 4/00*** (2013.01); ***F21V 23/003*** (2013.01); ***H05B 47/10*** (2020.01); *F21Y 2115/10* (2016.08)

(58) **Field of Classification Search**
CPC F21V 23/04; F21V 23/003; H05B 39/02; H05B 39/04; H05B 41/04; H05B 47/10; H05B 47/105; H05B 47/155; H05B 47/165; H05B 47/185; F21L 4/00
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

707,516 A	8/1902	Klein
3,601,757 A	8/1971	Gober

(Continued)

OTHER PUBLICATIONS

Best Mount for Google Home Mini & Amazon Echo Dot, https://www.youtube.com/watch?v=D9i_HzOi7kc, published Jun. 28, 2018, pp. 1-5, Dock Socket.

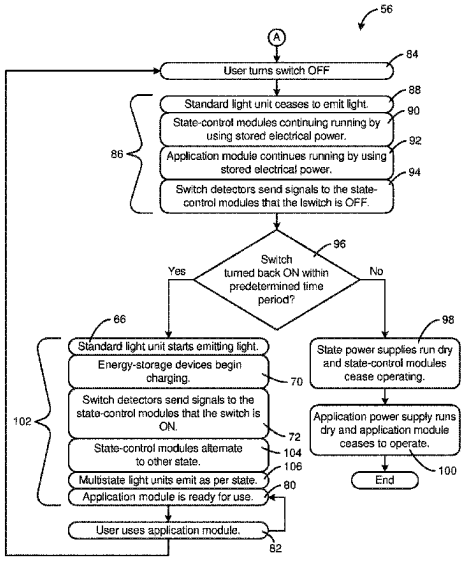
(Continued)

Primary Examiner — Evan P Dzierzynski
Assistant Examiner — Nathaniel J Lee
(74) *Attorney, Agent, or Firm* — Young Basile Hanlon & MacFarlane, P.C.

(57) **ABSTRACT**

Systems and methods for using light switches to control lighting and other functions are disclosed. Each switch may be a manual switch that is mounted to a wall. A biasing device may be positioned proximate each switch. When a user moves the switch out of a first position and into a second position or toward a second position, the delivery of household power to one or more light units may be interrupted. However, when the user releases the switch, the biasing device may provide an immediate automatic return of the manual switch to the first position. The resulting short interruption in household power may be used as a signal for controlling operation of the one or more light units and/or other electronic devices installed at one or more lighting sites corresponding to the switch.

7 Claims, 24 Drawing Sheets



Related U.S. Application Data

application No. 16/893,376, filed on Jun. 4, 2020, now Pat. No. 11,353,202.

(60) Provisional application No. 63/447,893, filed on Feb. 24, 2023, provisional application No. 62/856,739, filed on Jun. 4, 2019.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,657,334	A	4/1987	Simmons	
5,306,957	A	4/1994	Ellingham et al.	
5,813,873	A	9/1998	McBain et al.	
6,794,575	B1	9/2004	McBain et al.	
11,353,202	B1 *	6/2022	Owen	F21L 4/00
11,913,627	B1 *	2/2024	Owen	F21V 23/04
2010/0078189	A1	4/2010	Leopold et al.	
2010/0081303	A1	4/2010	Roth et al.	
2017/0214229	A1	7/2017	Smith et al.	
2018/0046144	A1	2/2018	Blakeman	
2018/0217003	A1	8/2018	Fadell et al.	
2019/0067990	A1 *	2/2019	Hermans	H05B 47/172
2019/0261493	A1 *	8/2019	Dolan	H05B 45/10

OTHER PUBLICATIONS

Commercial Electric 6 in. White Integrated LED Recessed Downlight with Nightlight Trim, https://www.amazon.com/Commercial-Electric-Integrated-Downlight-Nightlight/dp/B07R27YHGP, published at least as early as May 29, 2019 (see date of question on p. 5), accessed Jun. 30, 2020, pp. 1-8.

Dock Socket: Light Socket Mount for Google Home Mini, https://www.amazon.com/Dock-Socket-Light-Mount-Google/dp/B07C687FP9, accessed Jun. 22, 2020, pp. 1-5.

How to Install and Pair LED Bluetooth Downlight Speakers, https://www.youtube.com/watch?v=h1NcVpOPC1o, published Mar. 28, 2018, pp. 1-17, 1000Bulbs.com.

Lithonia Lighting 3000K 6SL RD 07LM 4000K 90CRI MW 6-inch Dimmable LED Module with Integrated Wireless Speaker, 730 Lumens, 120 Volts, 13 Watts, Wet Listed, Matte White, https://www.amazon.com/Lithonia-Lighting-6SL-07LM-90CRI/dp/B075F4KBJ5/ref=sr_1_3?crid=1C2DZN0U5E4H5&dchild=1&keywords=speaker-downlight&qid=, accessed Jun. 22, 2020, pp. 1-12.

* cited by examiner

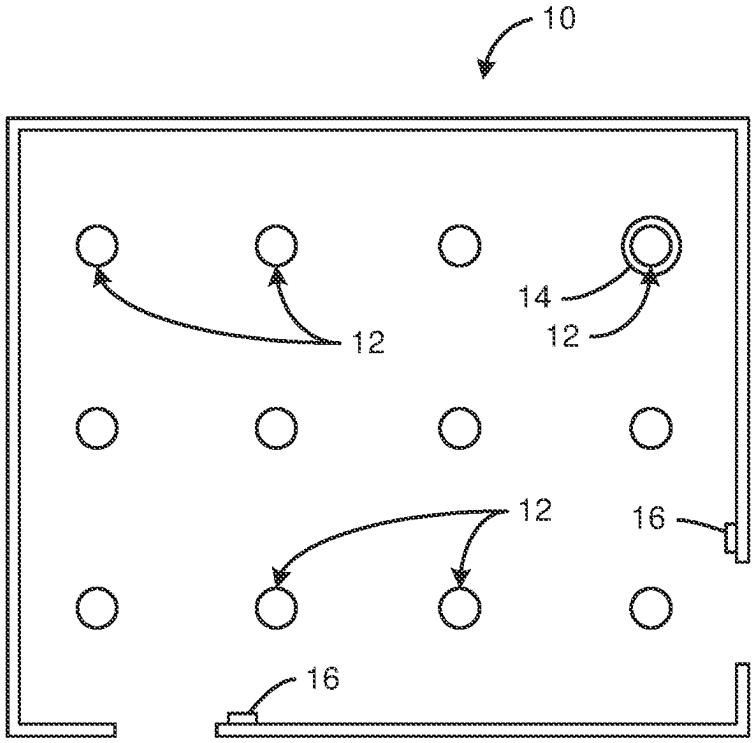


FIG. 1

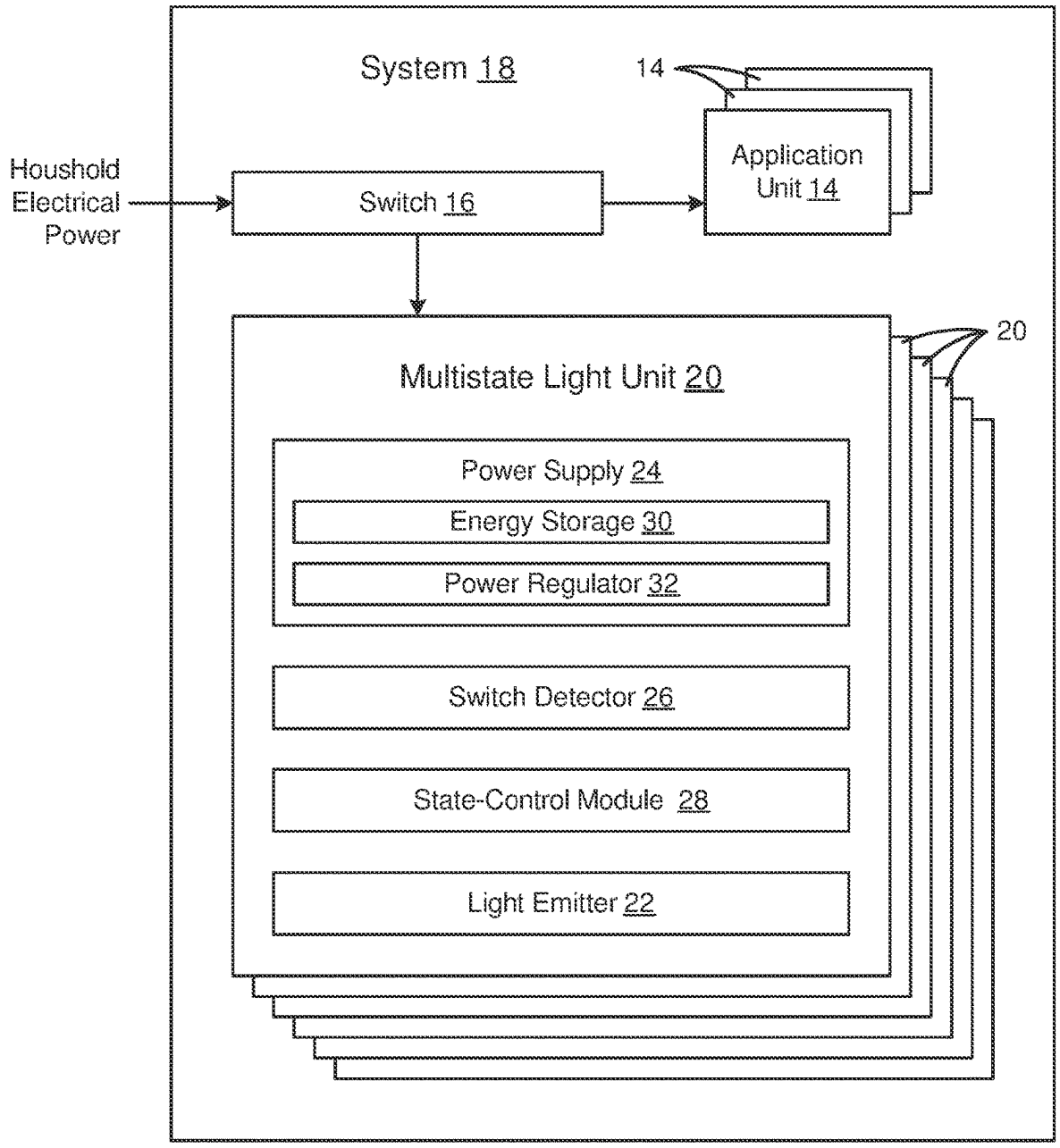

System 18
14
Application Unit 14
Houshold Electrical Power
Switch 16
20
Multistate Light Unit 20
Power Supply 24
Energy Storage 30
Power Regulator 32
Switch Detector 26
State-Control Module 28
Light Emitter 22

FIG. 2

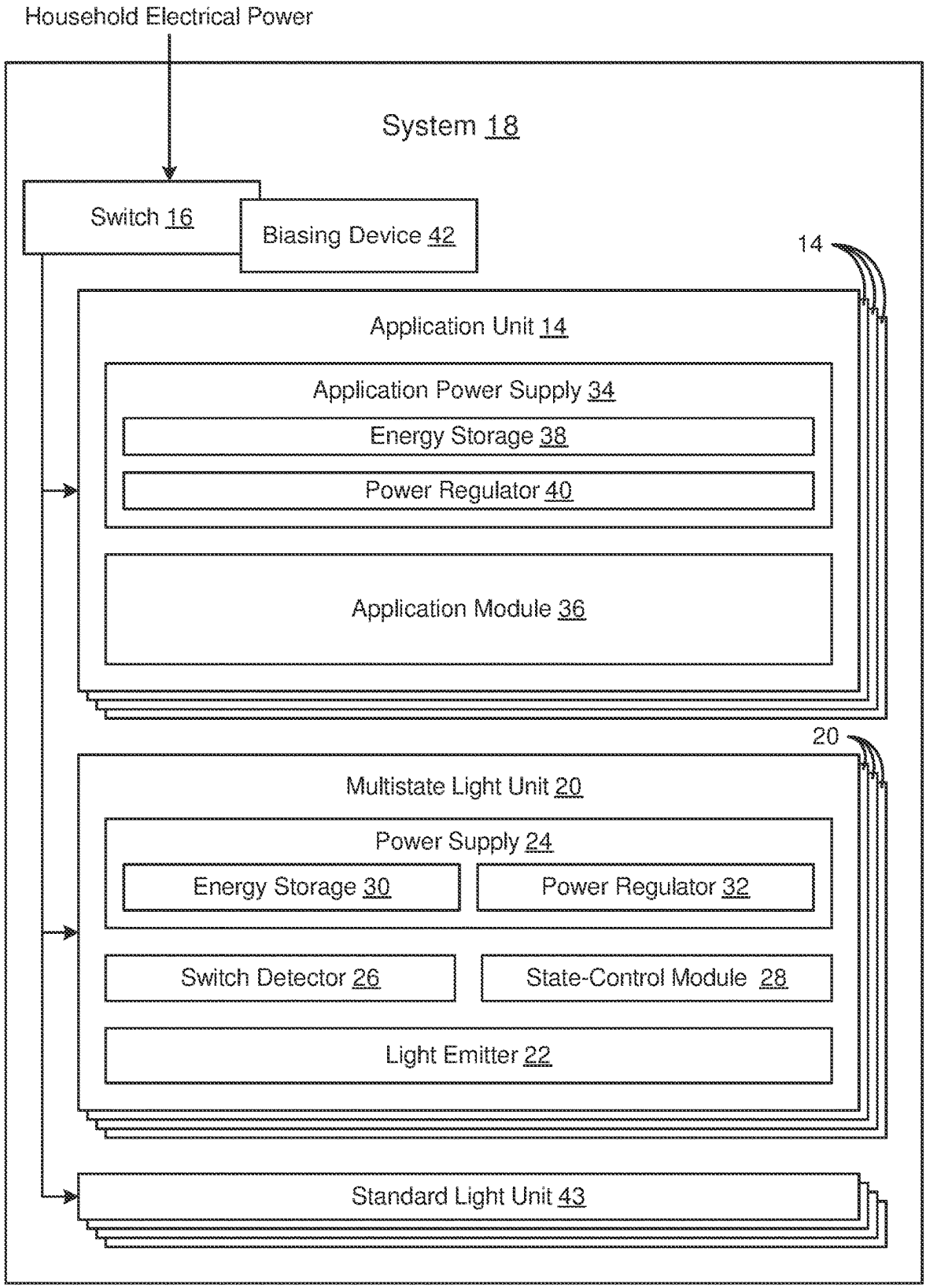

Household Electrical Power
System 18
Switch 16
Biasing Device 42
14
Application Unit 14
Application Power Supply 34
Energy Storage 38
Power Regulator 40
Application Module 36
20
Multistate Light Unit 20
Power Supply 24
Energy Storage 30
Power Regulator 32
Switch Detector 26
State-Control Module 28
Light Emitter 22
Standard Light Unit 43

FIG. 3

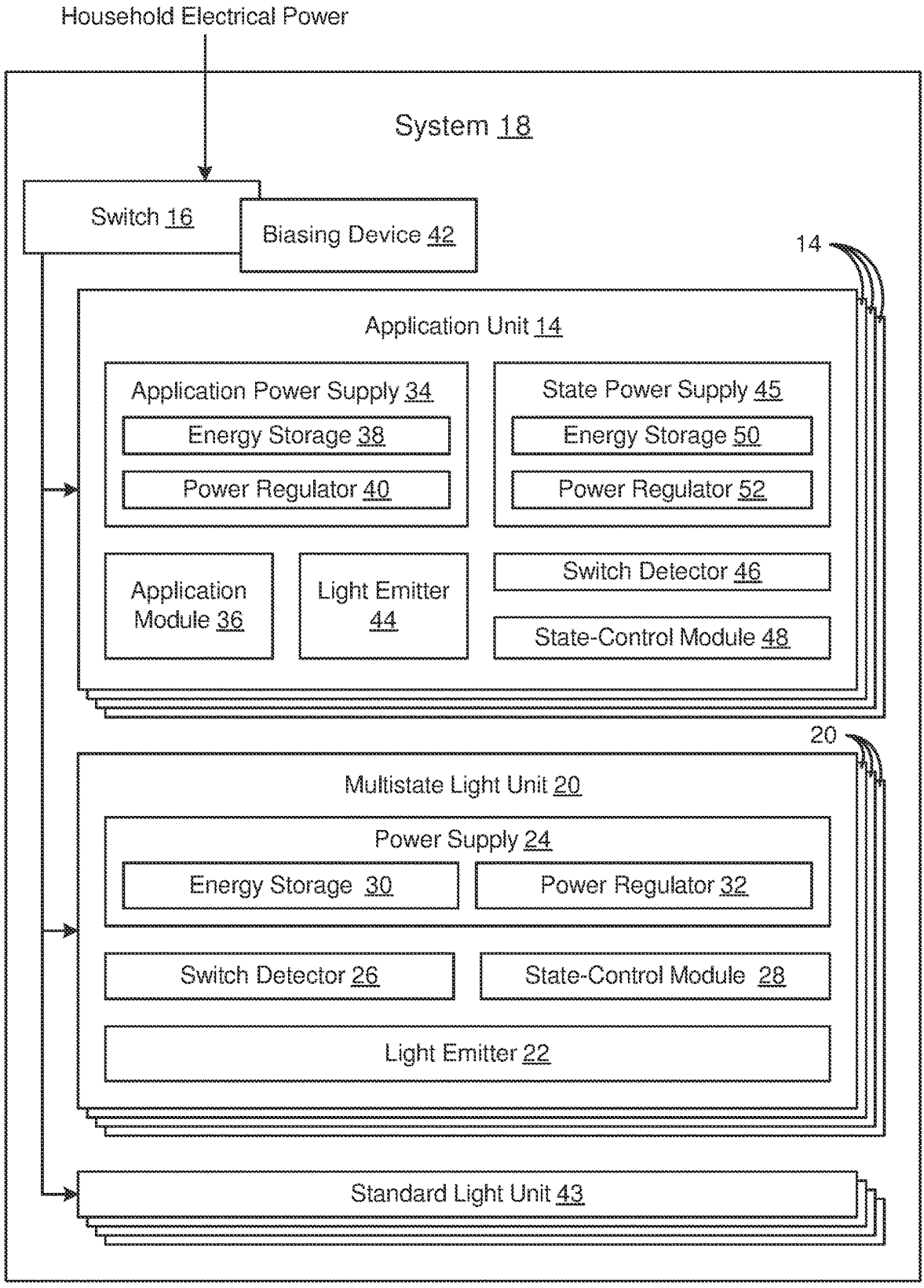

Household Electrical Power
System 18
Switch 16
Biasing Device 42
14
Application Unit 14
Application Power Supply 34
Energy Storage 38
Power Regulator 40
State Power Supply 45
Energy Storage 50
Power Regulator 52
Application Module 36
Light Emitter 44
Switch Detector 46
State-Control Module 48
20
Multistate Light Unit 20
Power Supply 24
Energy Storage 30
Power Regulator 32
Switch Detector 26
State-Control Module 28
Light Emitter 22
Standard Light Unit 43

FIG. 4

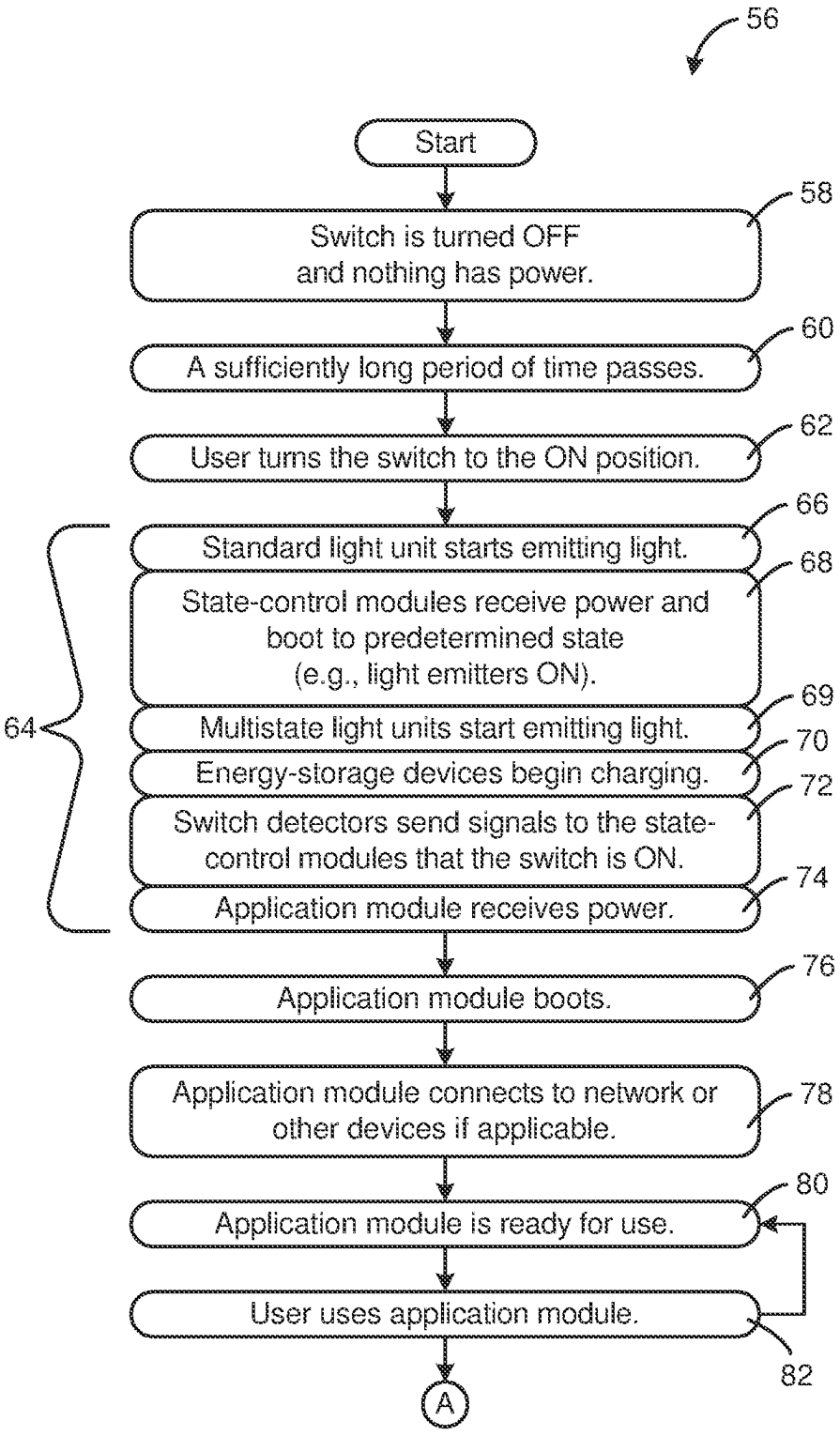

56
Start
Switch is turned OFF and nothing has power.
58
A sufficiently long period of time passes.
60
User turns the switch to the ON position.
62
64
Standard light unit starts emitting light.
66
State-control modules receive power and boot to predetermined state (e.g., light emitters ON).
68
Multistate light units start emitting light.
69
Energy-storage devices begin charging.
70
Switch detectors send signals to the state-control modules that the switch is ON.
72
Application module receives power.
74
Application module boots.
76
Application module connects to network or other devices if applicable.
78
Application module is ready for use.
80
User uses application module.
82
A

FIG. 5

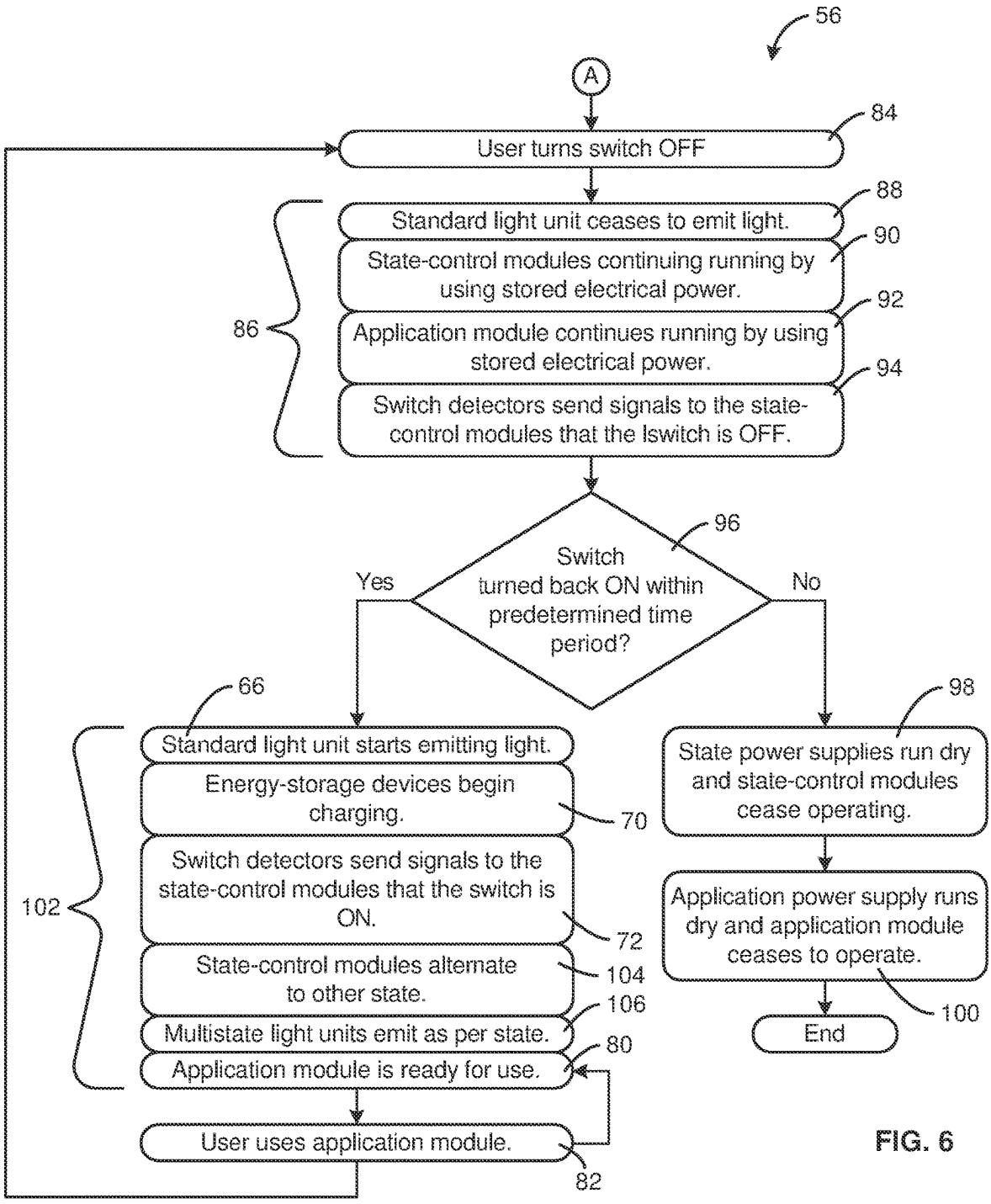

56
A
84
User turns switch OFF
88
Standard light unit ceases to emit light.
90
State-control modules continuing running by using stored electrical power.
92
Application module continues running by using stored electrical power.
94
Switch detectors send signals to the state-control modules that the lswitch is OFF.
86
96
Switch turned back ON within predetermined time period?
Yes
No
66
Standard light unit starts emitting light.
Energy-storage devices begin charging.
70
Switch detectors send signals to the state-control modules that the switch is ON.
72
State-control modules alternate to other state.
104
Multistate light units emit as per state.
106
Application module is ready for use.
80
User uses application module.
82
102
98
State power supplies run dry and state-control modules cease operating.
Application power supply runs dry and application module ceases to operate.
100
End

FIG. 6

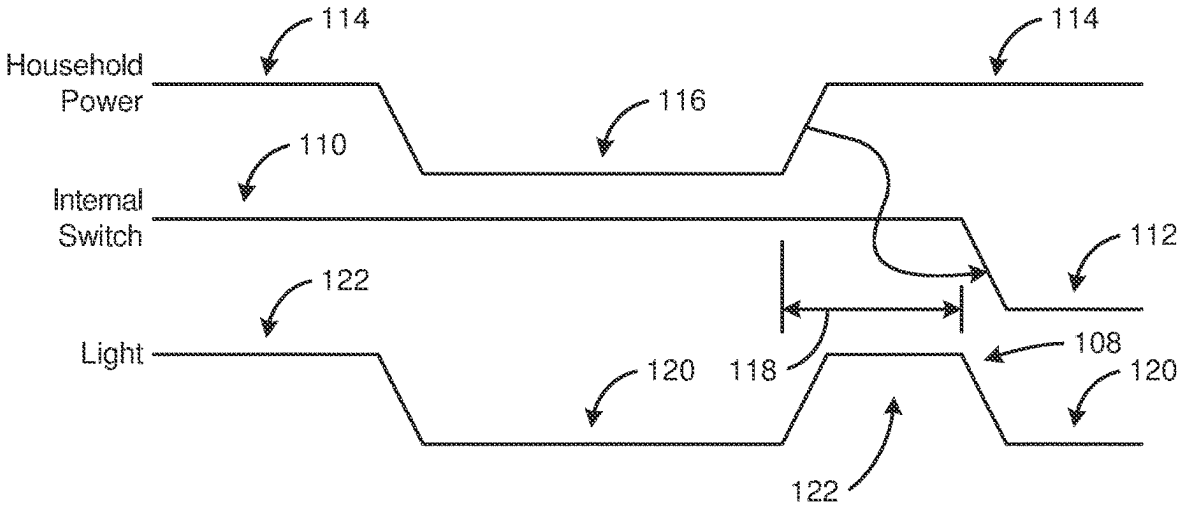

114
114
Household Power
116
110
Internal Switch
112
122
Light
108
120
118
120
122

FIG. 7

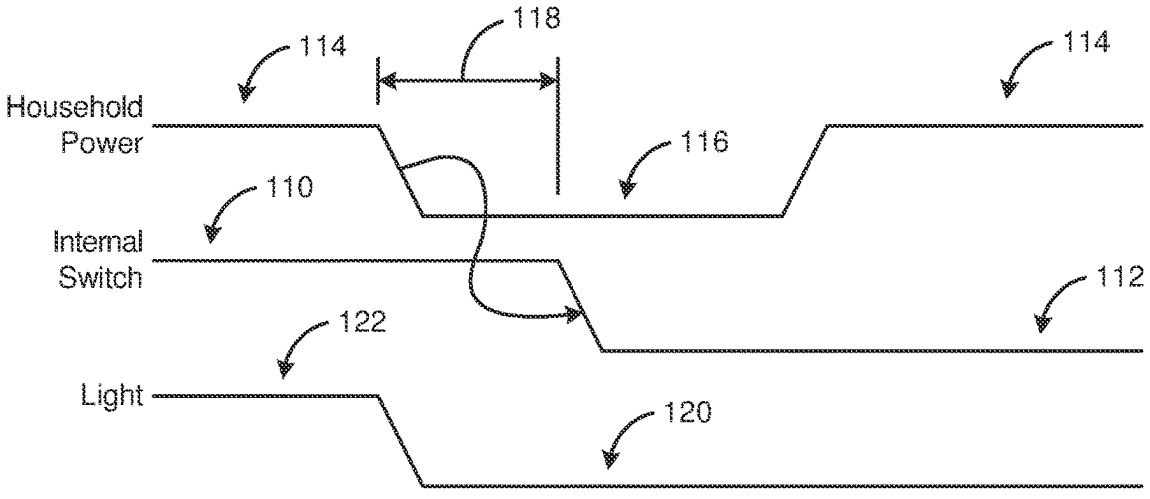

118
114
114
Household Power
116
110
Internal Switch
112
122
Light
120

FIG. 8

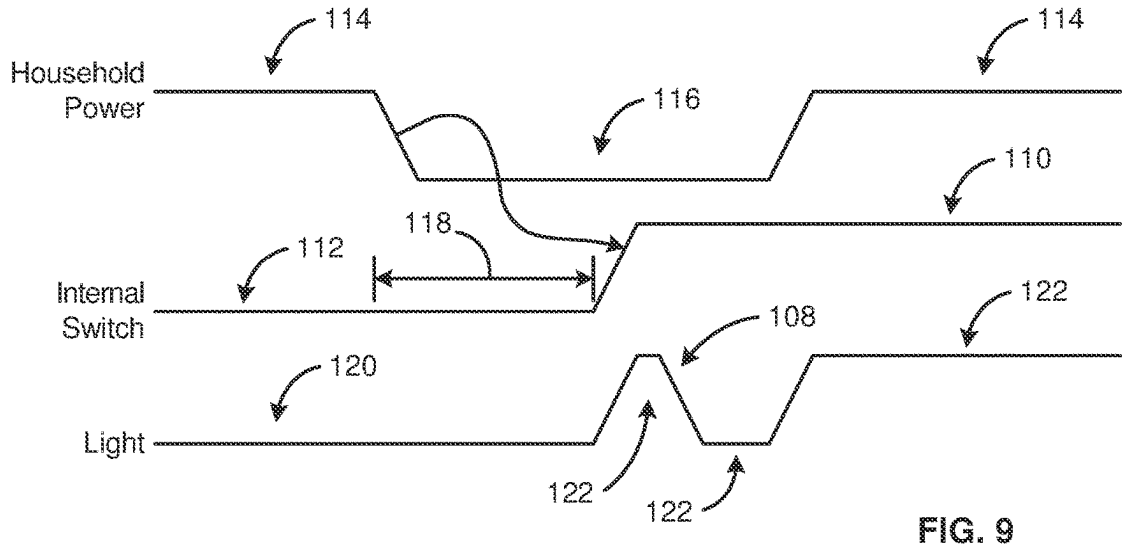

114
114
Household Power
116
110
118
112
Internal Switch
122
108
120
Light
122
122

FIG. 9

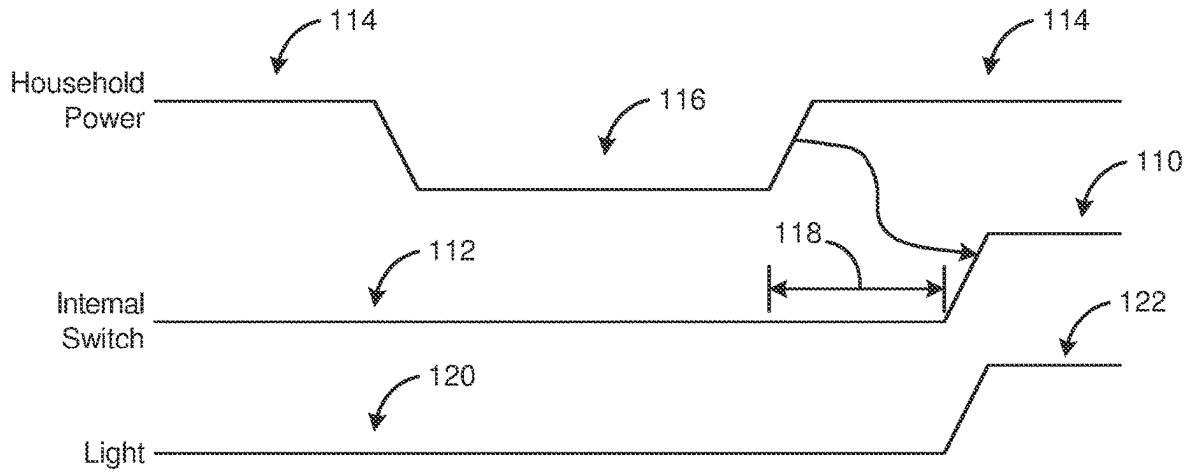

114
114
Household Power
116
110
118
112
Internal Switch
122
120
Light

FIG. 10

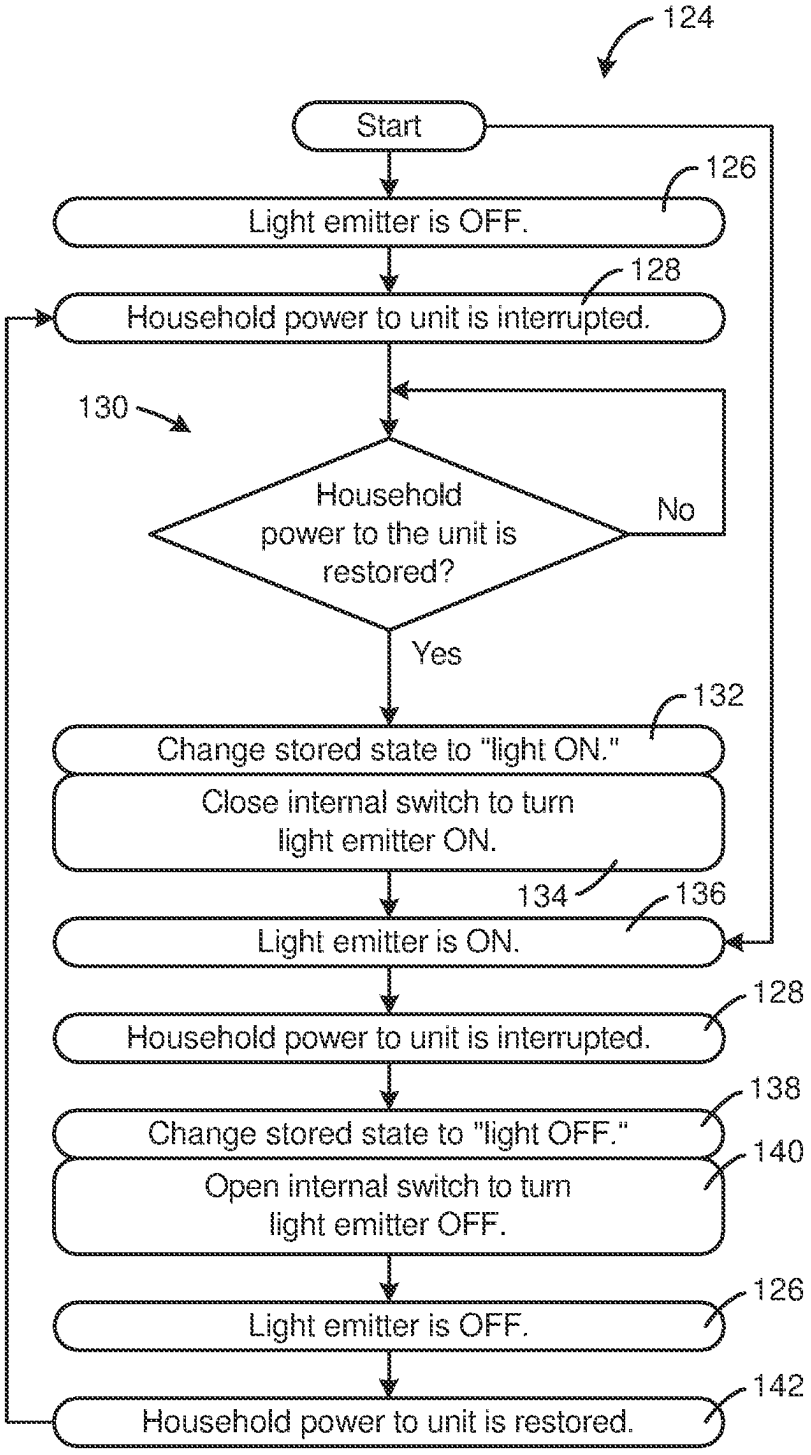

124
Start
126
Light emitter is OFF.
128
Household power to unit is interrupted.
130
Household power to the unit is restored?
No
Yes
132
Change stored state to "light ON."
Close internal switch to turn light emitter ON.
134
136
Light emitter is ON.
128
Household power to unit is interrupted.
138
Change stored state to "light OFF."
140
Open internal switch to turn light emitter OFF.
126
Light emitter is OFF.
142
Household power to unit is restored.

FIG. 11

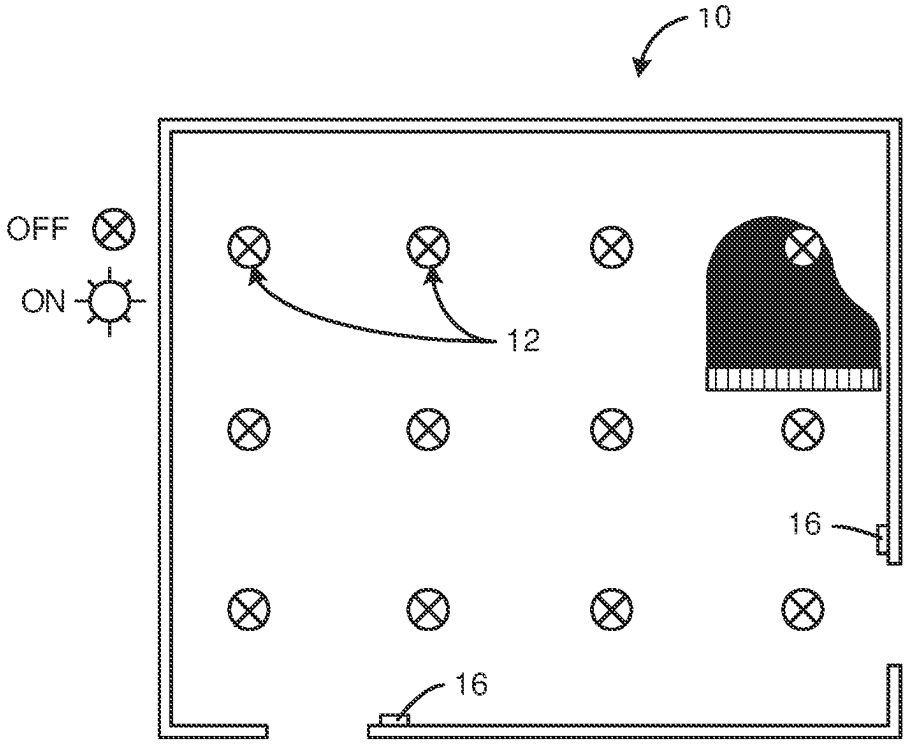


FIG. 12

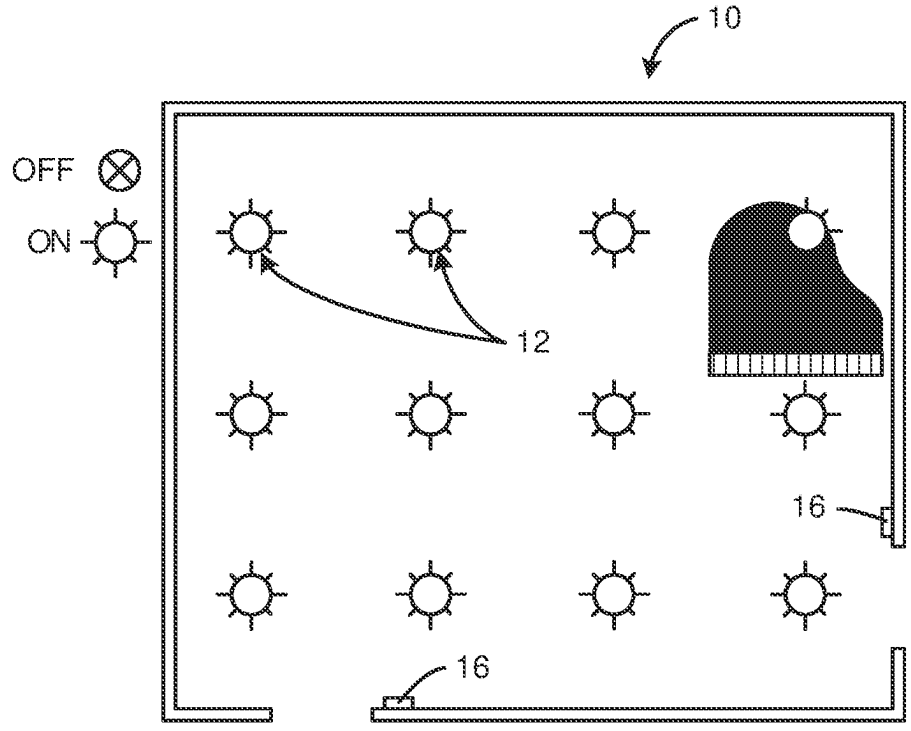


FIG. 13

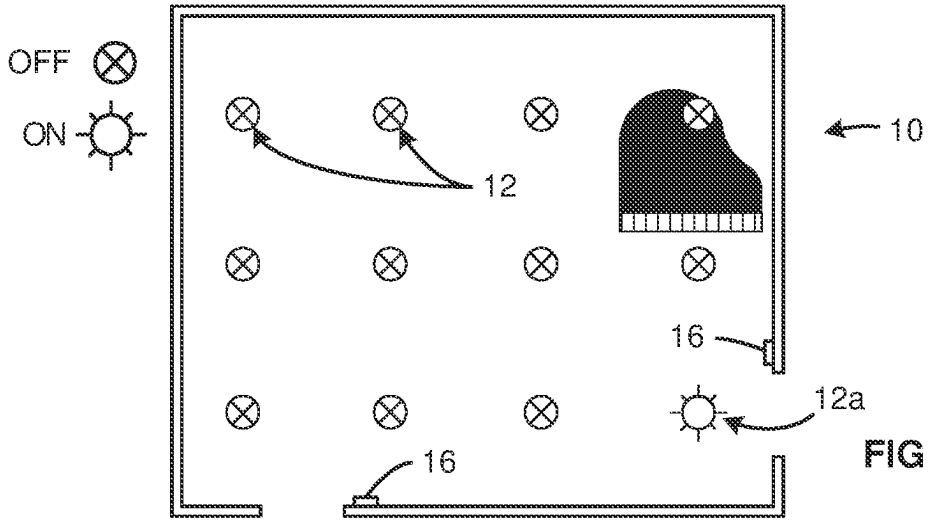


FIG. 14

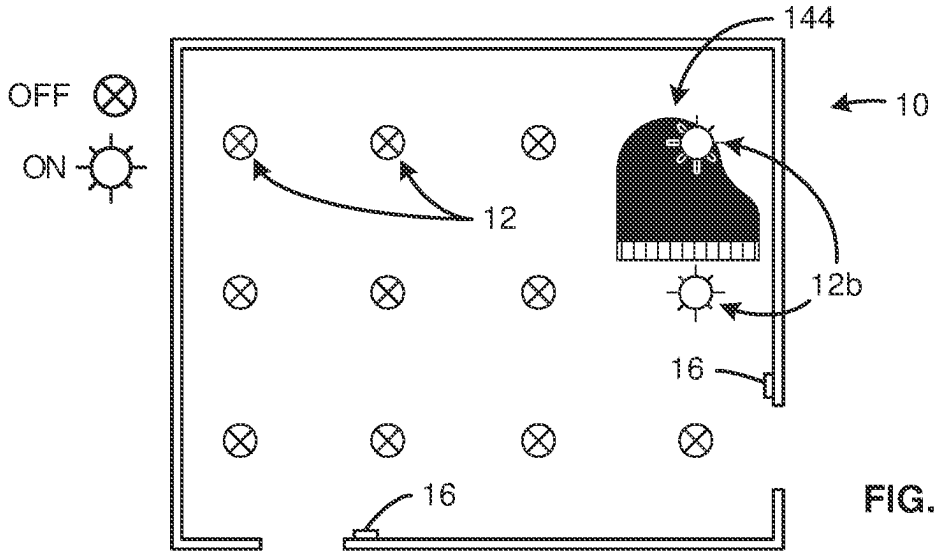


FIG. 15

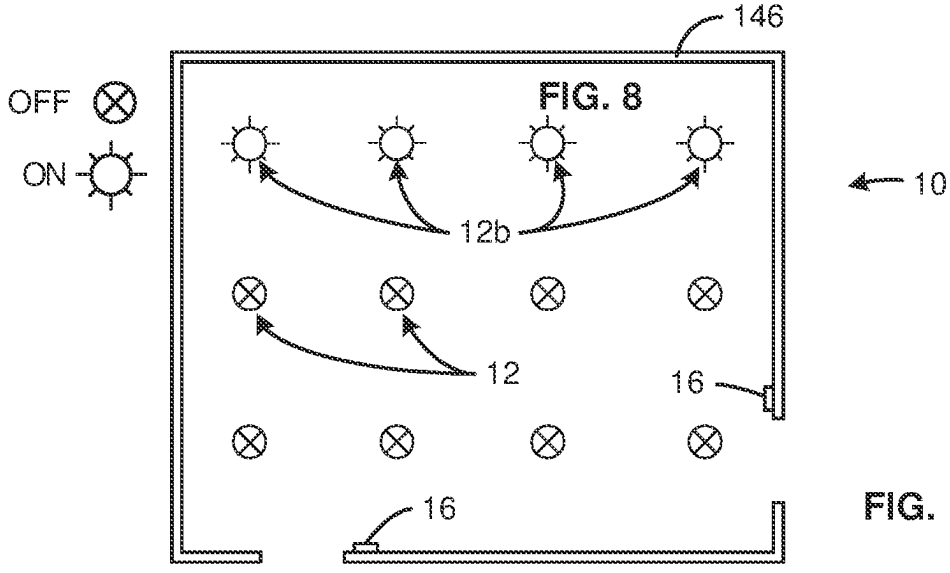


FIG. 16

FIG. 8

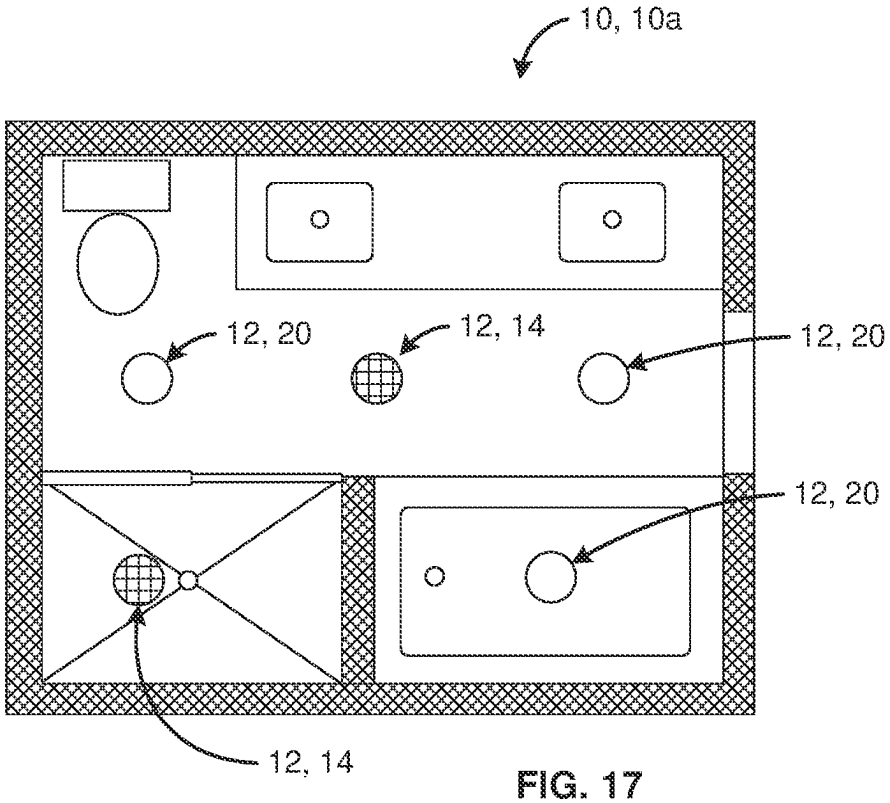


FIG. 17

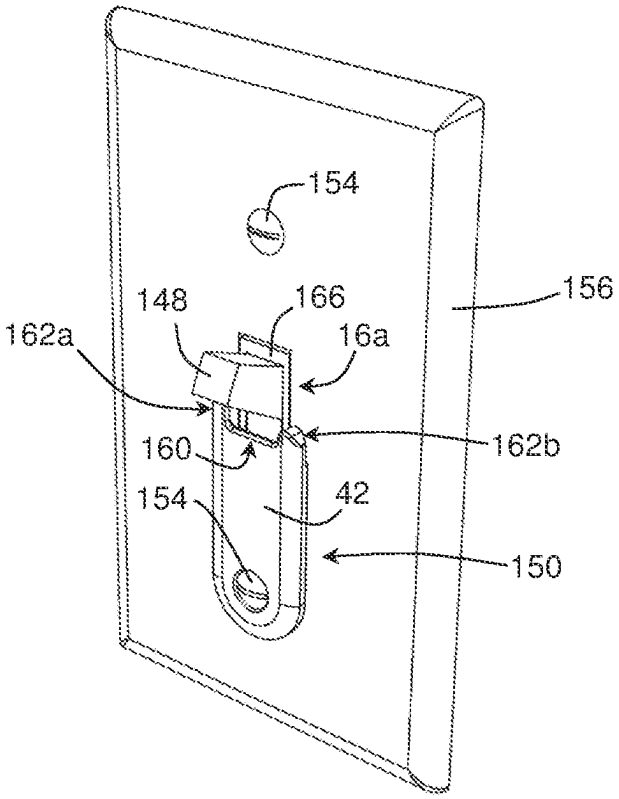

154
156
148
166
16a
162a
162b
160
154
42
150

FIG. 18

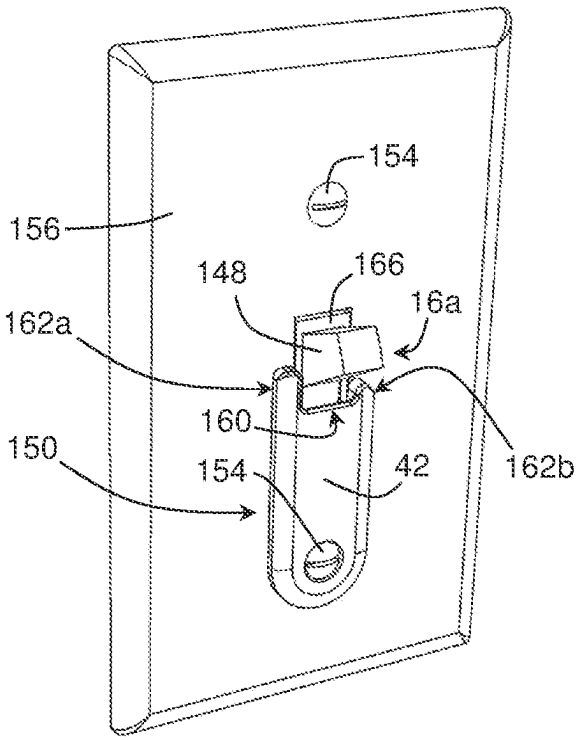

154
156
148
166
16a
162a
160
150
154
42
162b

FIG. 19

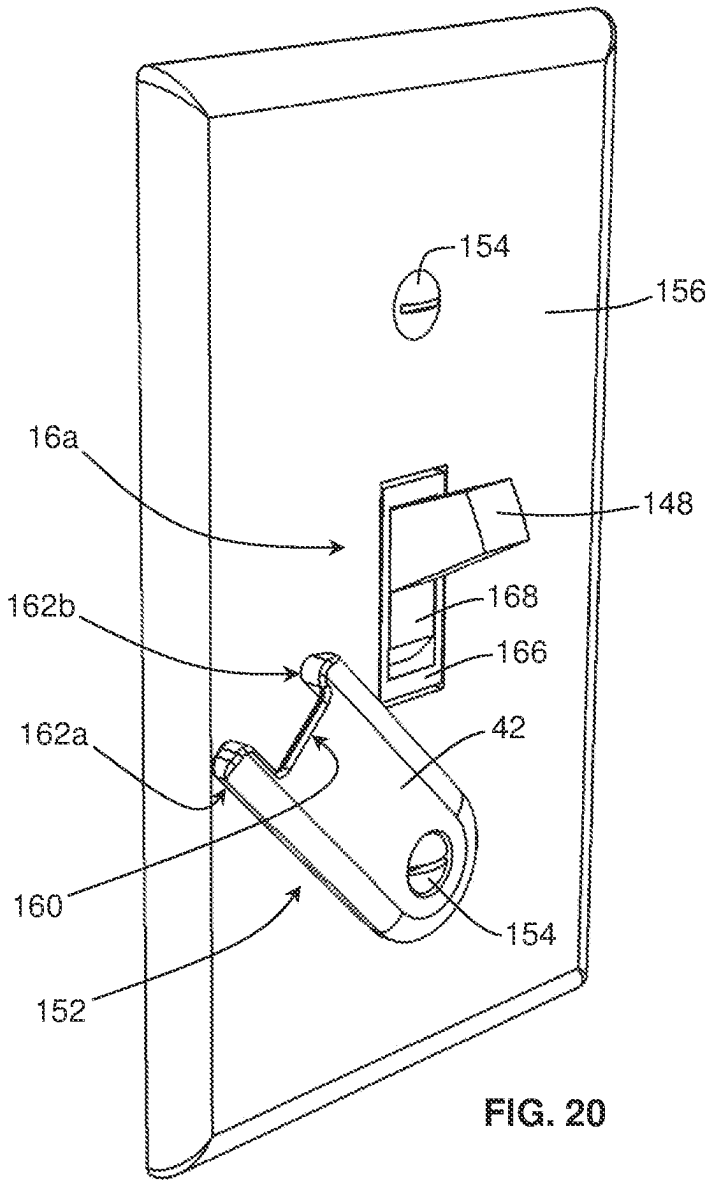


FIG. 20

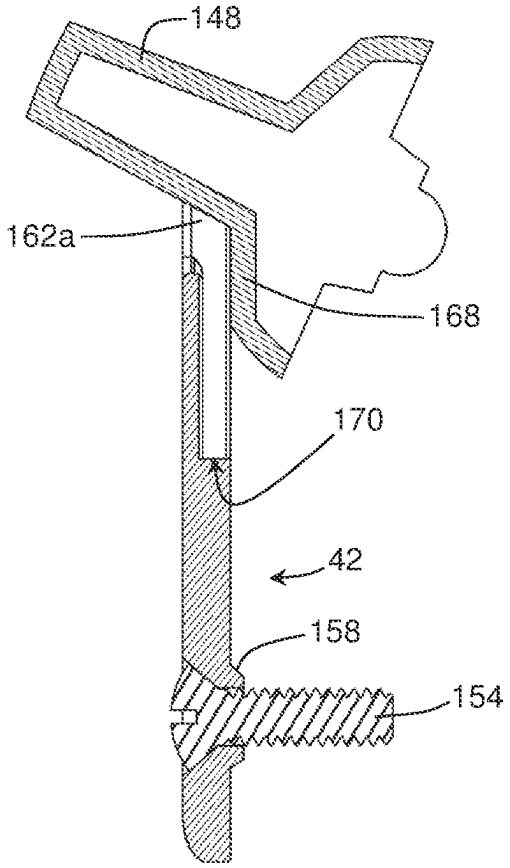


FIG. 21

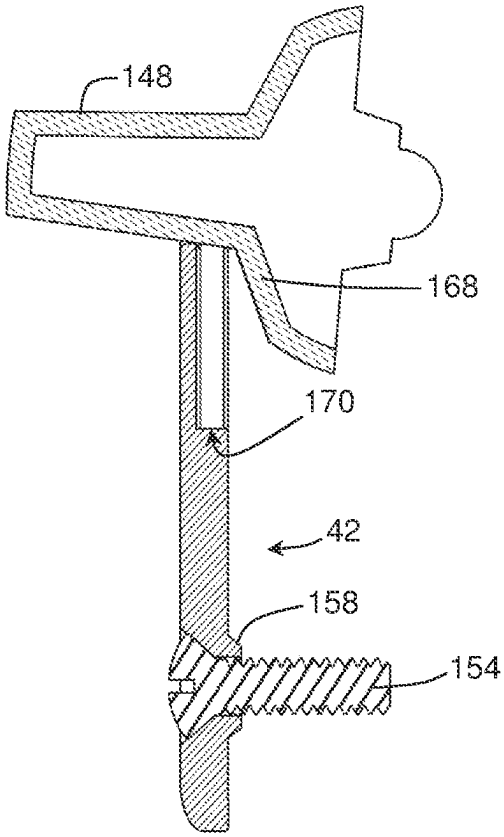


FIG. 22

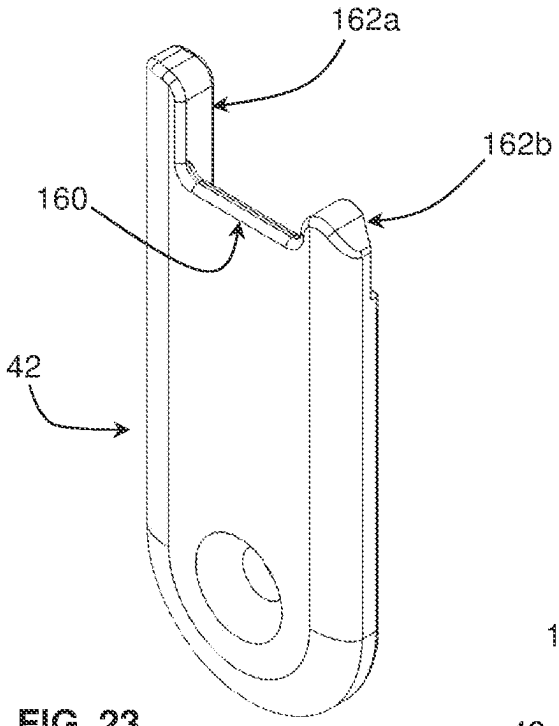


FIG. 23

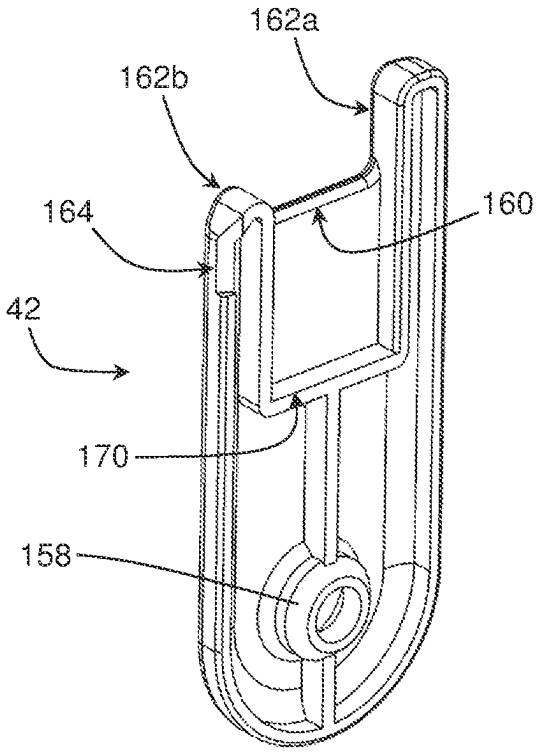


FIG. 24

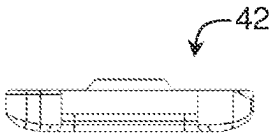


FIG. 25

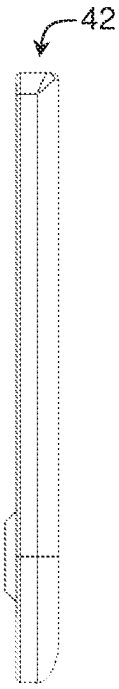


FIG. 26

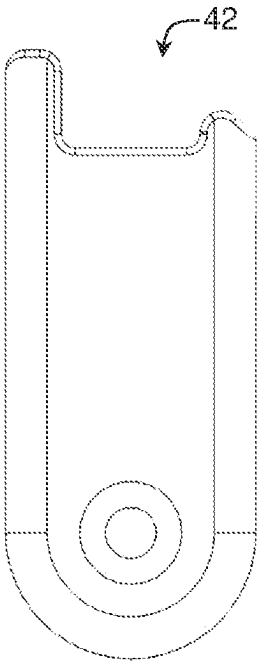


FIG. 27

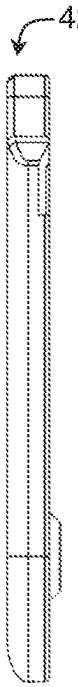


FIG. 28

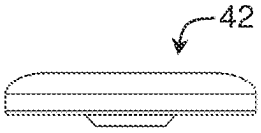


FIG. 29

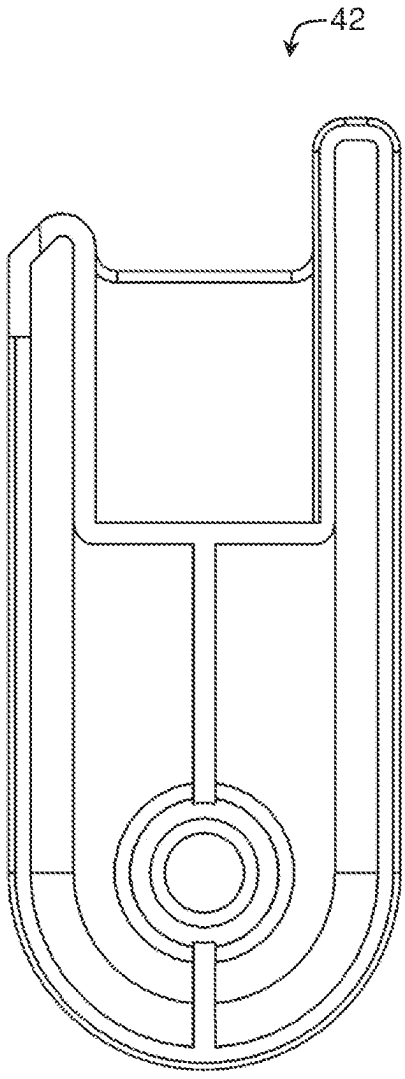


FIG. 30

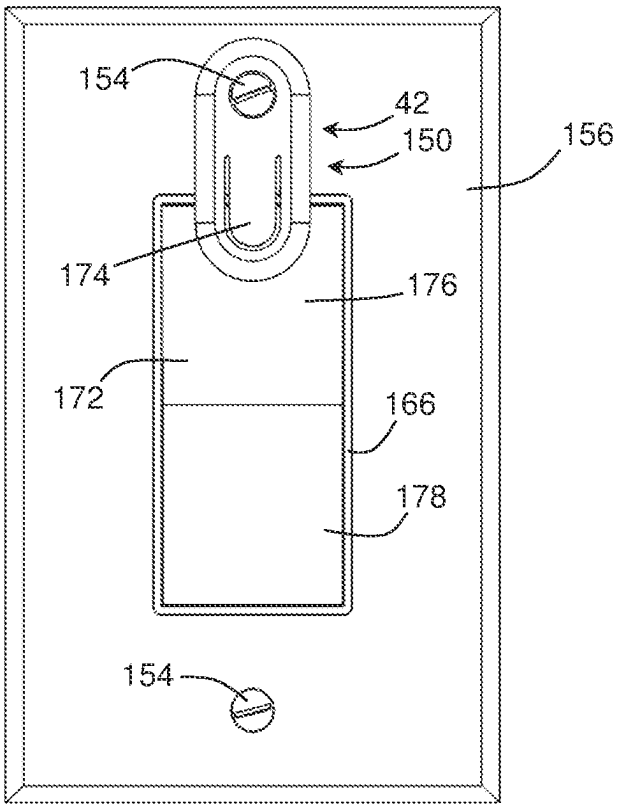

154
42
150
156
174
176
172
166
178
154

FIG. 31

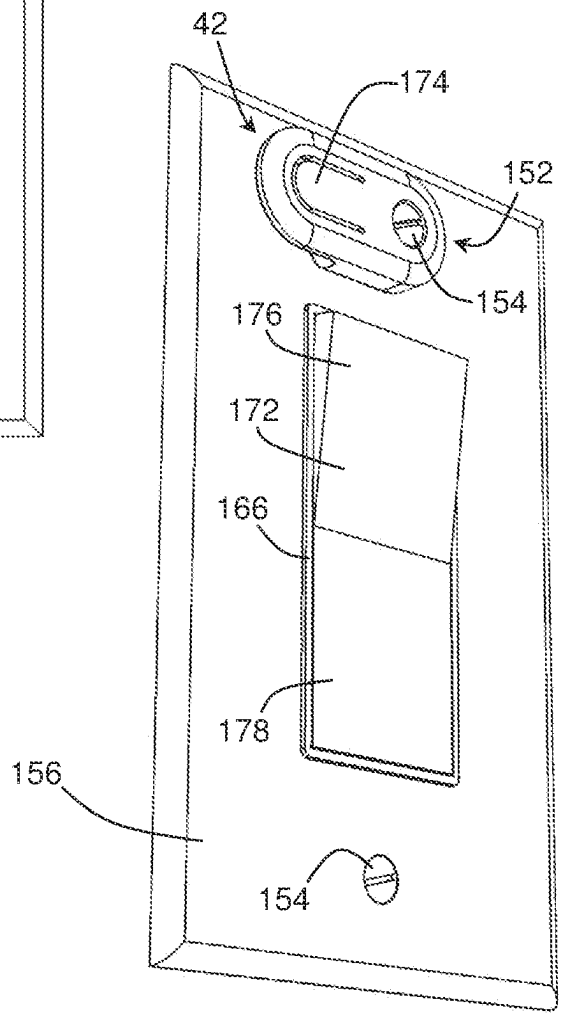

42
174
152
154
176
172
166
178
156
154

FIG. 32

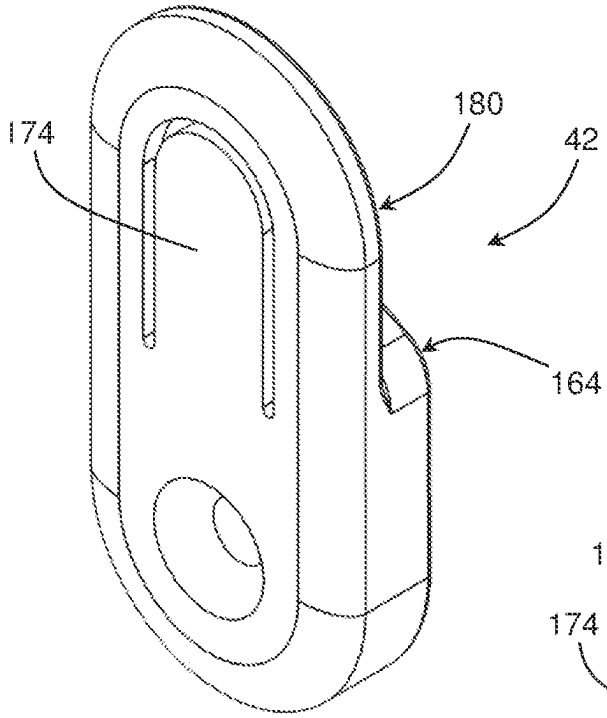


FIG. 33

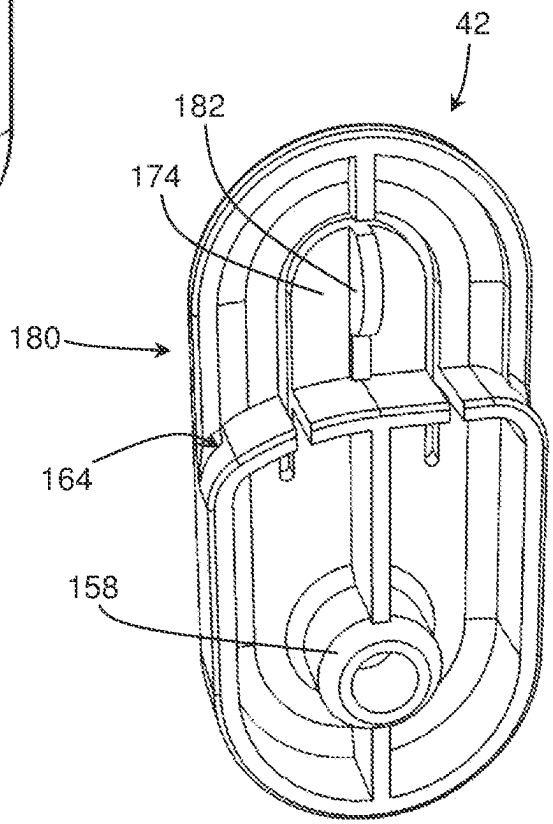


FIG. 34

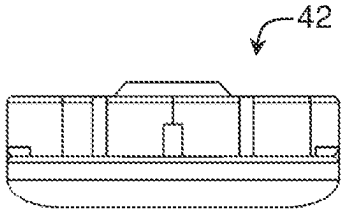


FIG. 35

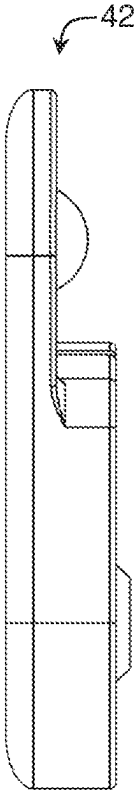


FIG. 36

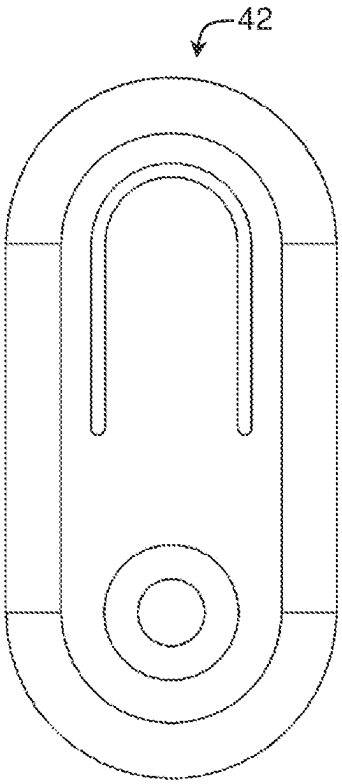


FIG. 37

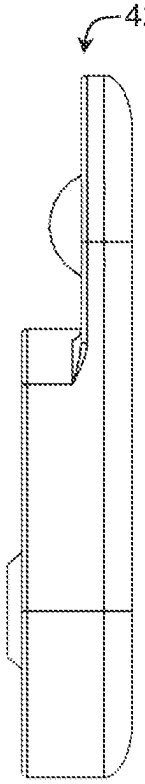


FIG. 38

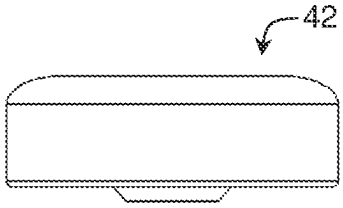


FIG. 39

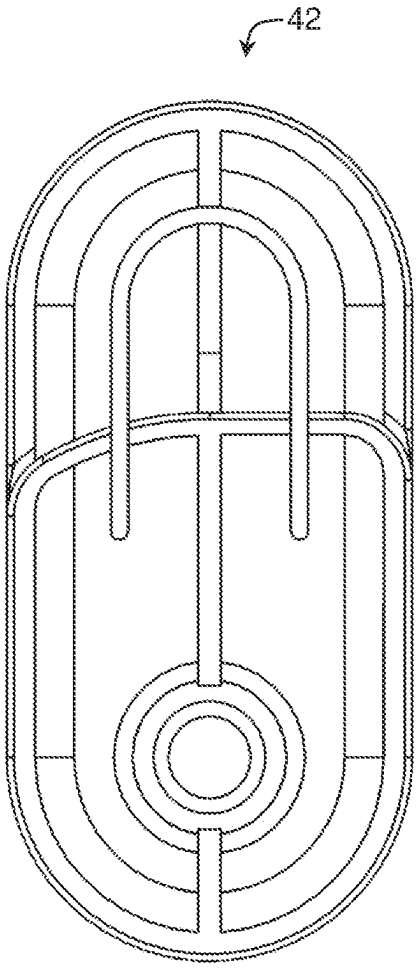


FIG. 40

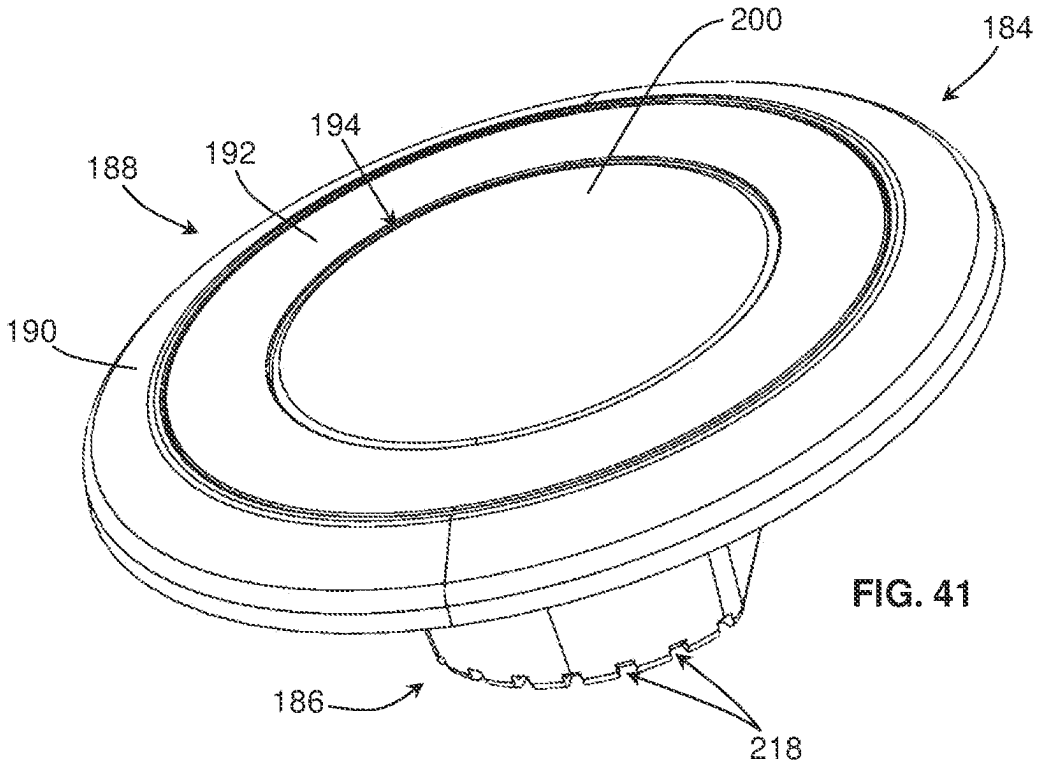


FIG. 41

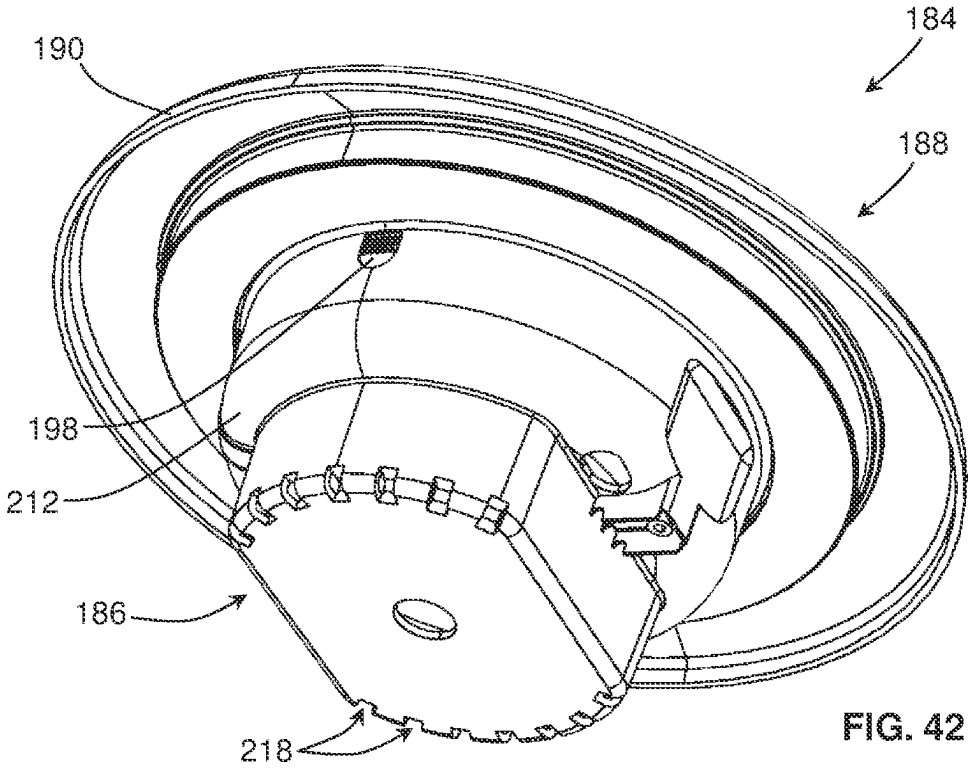


FIG. 42

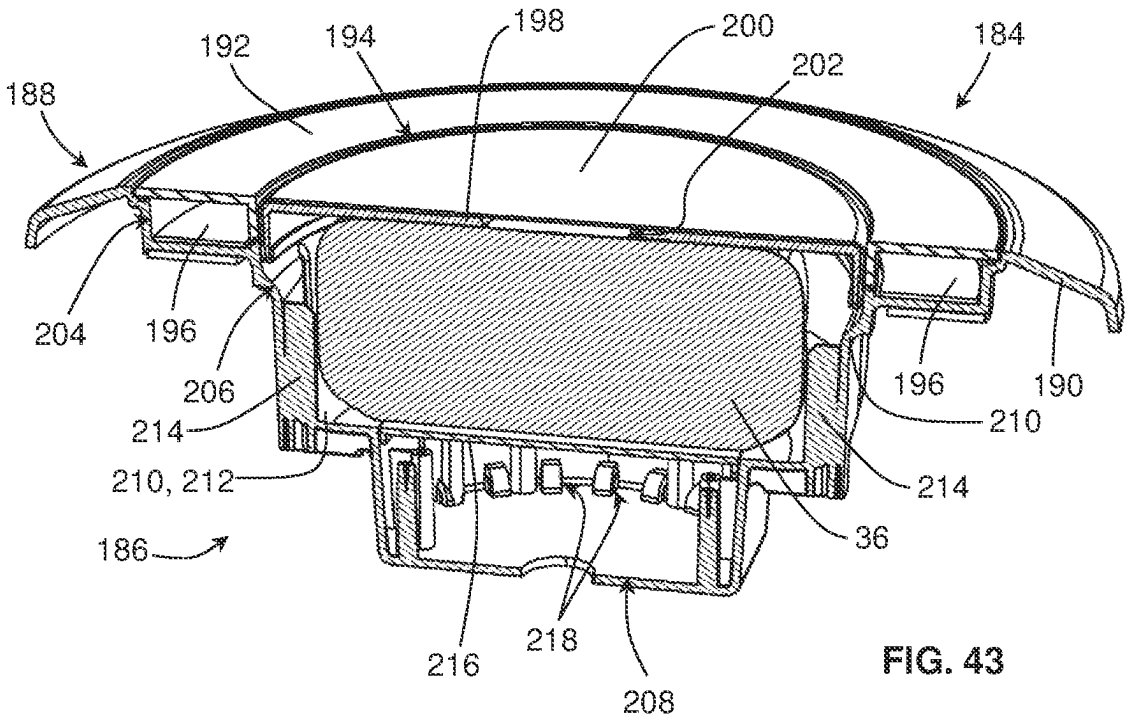

188
192
194
198
200
202
184
204
196
206
214
210, 212
186
216
218
208
196
190
210
214
36

FIG. 43

MULTISTATE ENVIRONMENTAL CONTROL SYSTEM AND METHOD

RELATED APPLICATIONS

This application: (1) claims the benefit of U.S. Provisional Patent Application Ser. No. 63/447,893 filed Feb. 24, 2023; (2) is a continuation-in-part of U.S. patent application Ser. No. 18/410,650 filed Jan. 11, 2024, which is a continuation of U.S. patent application Ser. No. 17/740,070 filed May 9, 2022, which is a continuation of U.S. patent application Ser. No. 16/893,376 filed Jun. 4, 2020 (now U.S. Pat. No. 11,353,202), which claims the benefit of U.S. Provisional Patent Application Ser. No. 62/856,739 filed Jun. 4, 2019; and (3) is a continuation-in-part of U.S. patent application Ser. No. 17/740,070 filed May 9, 2022, which is a continuation of U.S. patent application Ser. No. 16/893,376 filed Jun. 4, 2020 (now U.S. Pat. No. 11,353,202), which claims the benefit of U.S. Provisional Patent Application Ser. No. 62/856,739 filed Jun. 4, 2019.

U.S. Provisional Patent Application Ser. No. 63/447,893, U.S. patent application Ser. No. 18/410,650, U.S. patent application Ser. No. 17/740,070, U.S. patent application Ser. No. 16/893,376 (now U.S. Pat. No. 11,353,202), and U.S. Provisional Patent Application Ser. No. 62/856,739 are each hereby incorporated by reference in their entireties.

BACKGROUND

Field of the Invention

This invention relates to electrical systems installed in homes and other buildings and, more particularly, to novel systems and methods for using light switches to control lighting and other functions.

Background Art

Most built-in electronics (e.g., in-ceiling electronic devices) need to be installed by a professional. The installation may be expensive and difficult to change when technology improves or a built-in device breaks. Moreover, in-ceiling electronics typically cannot be taken with an occupant when he or she moves to a new location.

One example of a typical in-ceiling electronic device is a recessed or "can" light. Other in-ceiling devices may include speakers, smoke detectors, and components of security systems. The installation and wiring of such devices is typically best accomplished during construction and not after a location is already built out. Even during construction, however, installation may be difficult due to various structures being in the way of wiring or a mounting structure.

For example, pipes or other structures may interfere with the wiring. Alternatively, or in addition thereto, studs, rafters, joists, or other structures to which electronic devices may be mounted may not be present in the desired locations. This may particularly troublesome for applications where the function of the electronic device depends on the location. For example, the quality of the sound produced by one or more speakers may depend on location and current solutions are difficult to test and move. Accordingly, what is needed are systems and methods that provide greater flexibility in the placement of electronic devices within a building or home, particularly after the building or home has been built out.

BRIEF DESCRIPTION OF THE DRAWINGS

The features of the present invention will become more fully apparent from the following description and appended claims, taken in conjunction with the accompanying drawings. Understanding that these drawings depict only typical embodiments of the invention and are, therefore, not to be considered limiting of its scope, the invention will be described with additional specificity and detail through use of the accompanying drawings in which:

FIG. **1** is a schematic plan view of a room having lighting sites therewithin suitable for receiving multistate light units and/or application units in accordance with the present invention;

FIG. **2** is a schematic block diagram of one embodiment of a system in accordance with the present invention;

FIG. **3** is a schematic block diagram of an alternative embodiment of a system in accordance with the present invention;

FIG. **4** is a schematic block diagram of another alternative embodiment of a system in accordance with the present invention;

FIG. **5** is a schematic block diagram of a first portion of one embodiment of a method in accordance with the present invention;

FIG. **6** is a schematic block diagram of a second portion of the method of FIG. **5**;

FIG. **7** is a schematic diagram illustrating a light-flash problem that may occur in certain circumstances;

FIG. **8** is a schematic diagram illustrating one embodiment of a solution to the light-flash problem of FIG. **7**;

FIG. **9** is a schematic diagram illustrating another light-flash problem that may occur in certain circumstances;

FIG. **10** is a schematic diagram illustrating one embodiment of a solution to the light-flash problem of FIG. **9**;

FIG. **11** is a schematic block diagram of one embodiment of a method for implementing the solutions of FIGS. **8** and **10**;

FIG. **12** is a schematic plan view of a room having all lighting sites thereof fitted with either a multistate light unit or an application unit in accordance with the present invention, wherein the light emitters corresponding to those units are all turned OFF;

FIG. **13** is a schematic plan view of the room of FIG. **12** with all the light emitters corresponding to the units turned ON;

FIG. **14** is a schematic plan view of the room of FIG. **12** set up with an alternative embodiment of a system in accordance with the present invention;

FIG. **15** is a schematic plan view of the room of FIG. **12** set up with another alternative embodiment of a system in accordance with the present invention;

FIG. **16** is a schematic plan view of the room of FIG. **12** with the piano removed and the room set up with another alternative embodiment of a system in accordance with the present invention;

FIG. **17** is a schematic plan view of a bathroom set up with another alternative embodiment of a system in accordance with the present invention;

FIG. **18** is a perspective view of one embodiment of a biasing device in accordance with the present invention installed on a conventional toggle switch and in a biasing position;

FIG. **19** is another perspective view of the biasing device of FIG. **18** installed on a conventional toggle switch and in a biasing position;

FIG. **20** is a perspective view of the biasing device of FIG. **18** installed on a conventional toggle switch and in a non-biasing position;

FIG. **21** is a partial side cross-sectional view of the toggle and biasing device of FIG. **18** with the toggle in a first position and the biasing device in a biasing position;

FIG. **22** is another partial side cross-sectional view of the toggle and biasing device of FIG. **18**, wherein the toggle has pivot into contact with the biasing device and the biasing device is blocking any further pivoting in that direction;

FIG. **23** is a perspective view of the biasing device of FIG. **18**;

FIG. **24** is another perspective view of the biasing device of FIG. **18**;

FIG. **25** is a top view of the biasing device of FIG. **18**;

FIG. **26** is a first side view of the biasing device of FIG. **18**;

FIG. **27** is a front view of the biasing device of FIG. **18**;

FIG. **28** is a second, opposite side view of the biasing device of FIG. **18**;

FIG. **29** is a bottom view of the biasing device of FIG. **18**;

FIG. **30** is a rear view of the biasing device of FIG. **18**;

FIG. **31** is a perspective view of an alternative embodiment of a biasing device in accordance with the present invention installed on conventional decora switch and in a biasing position;

FIG. **32** is a perspective view of the biasing device of FIG. **31** installed on a conventional decora switch and in a non-biasing position;

FIG. **33** is a perspective view of the biasing device of FIG. **31**;

FIG. **34** is another perspective view of the biasing device of FIG. **31**;

FIG. **35** is a top view of the biasing device of FIG. **31**;

FIG. **36** is a first side view of the biasing device of FIG. **31**;

FIG. **37** is a front view of the biasing device of FIG. **31**;

FIG. **38** is a second, opposite side view of the biasing device of FIG. **31**;

FIG. **39** is a bottom view of the biasing device of FIG. **31**;

FIG. **40** is a rear view of the biasing device of FIG. **31**;

FIG. **41** is a perspective view of one embodiment of a housing for an application unit in accordance with the present invention configured for installation within a recessed light housing or "can";

FIG. **42** is another perspective view of the housing of FIG. **41**; and

FIG. **43** is a cross-sectional view of the housing of FIG. **41** with an application module and a board for a light emitter positioned therewithin.

DETAILED DESCRIPTION OF SELECTED EMBODIMENTS

It will be readily understood that the components of the present invention, as generally described and illustrated in the drawings herein, could be arranged and designed in a wide variety of different configurations. Thus, the following detailed description of selected embodiments of the system and method of the present invention, as represented in the drawings, is not intended to limit the scope of the invention as claimed, but is merely representative of various embodiments of the invention. The illustrated embodiments of the invention will be best understood by reference to the drawings, wherein like parts are designated by like numerals throughout.

Referring to FIG. **1**, a room **10** (e.g., a bedroom, living room, kitchen, bathroom, garage, closet, hallway, office, conference room, showroom, patio, deck, outdoor living space, or other space within or associated with a home or other building) may have multiple lighting sites **12** installed therewithin during a construction process. A lighting site **12** may be a structure (e.g., a connection box, wall box, ceiling box, recessed lighting housing or "can," switched power outlet, or the like) that has been wired to receive "household" power (e.g., grid power or other primary electrical power for a home or other building). Accordingly, a lighting site **12** may have the mechanical structure and/or electrical power needed to support a light.

In a typical or initial build out, a light fixture may be installed at every lighting site **12** within a room **10**. For example, if a room **10** were to include a two-dimensional array of twelve lighting sites **12**, twelve light fixtures would typically or initially be installed with one lighting fixture at each lighting site **12**. However, in selected embodiments in accordance with the present invention, one or more application units **14** may respectively be installed at one or more lighting sites **12**. Installation of an application unit **14** may be a retrofit. Accordingly, installation of an application unit **14** may comprise removing a lighting fixture from a lighting site **12** and installing the application unit **14** in its place.

An application unit **14** in accordance with the present invention may be an electrical device having functionality other than or that extends beyond emitting light. For example, an application unit **14** may be or include a speaker and/or microphone (e.g., at least one of a speaker or a microphone). Accordingly, an application unit **14** may be or include a virtual assistant. Alternatively, or in addition thereto, an application unit **14** may be or include a wireless protocol repeater, video projector, smoke detector, heat detector, motion detector, security camera, baby monitor, oil diffuser, wireless charging transmitter, or other electronic device.

Due to the number and distribution of lighting sites **12** within a room **10**, an occupant or user of the room **10** may have a variety of options when choosing where to install an application unit **14**. Moreover, each lighting site **12** may already have household power delivered thereto. Accordingly, the effort and/or skill required to install an application unit **14** at a selected lighting site **12** may be sufficiently low that a user or occupant of a room **10** may accomplish the task without professional assistance.

An application unit **14** may be modular and configured to interface with electrical and/or mechanical structures typically found at a lighting site **12**. For example, an application unit **14** may be sized and shaped to fit within and/or engage a five or six inch recessed lighting housing and/or include an electrical connector for extending and engaging an Edison screw connector (e.g., an E26 receptacle). A modular design may enable simple upgrades (e.g., a simple replacement of a light fixture with an application unit **14**) without requiring replacement, modification, or rewiring of a lighting site **12**.

The delivery of household power to one or more lighting sites **12** may be controlled by one or more switches **16**. Such switches **16** may enable an occupant or user of a room **10** to turn the lights (e.g., one or more light emitters corresponding to one or more light fixtures installed at one or more lighting sites **12**) within the room **10** ON and OFF as desired. For example, in a typical room **10**, a switch **16** may be connected to household power. In the United States, household power is typically 120V and on a 15 or 20 amp circuit. When the switch **16** is in the OFF position, the light fixtures and one or more application units **14** installed at one or more lighting

sites **12** do not have access to household power. When the switch **16** is in the ON position, household power passes through the switch **16** and is available to the light fixtures and to the one or more application units **14**.

Referring to FIG. **2**, for the light fixtures within a room **10**, an interruption of household power caused by actuation of a switch **16** may be exactly what is desired by the occupant or user. However, an interruption of power may not be desired for the one or more application units **14** installed within the room **10**. That is, an application unit **14** may require continuous power to perform as desired. Systems **18** in accordance with the present invention may overcome this challenge in a variety of ways.

For example, in selected embodiments, a system **18** may include one or more switches **16** that control delivery of household power to one or more application units **14** and one or more multistate light units **20** corresponding to a room **10** or other space within a home or building. The one or more multistate light units **20** may be installed within one or more light fixtures within the room **10**. In operation, a multistate light unit **20** may interpret a user toggling a switch **16** OFF and then back ON in some predetermined pattern as an instruction to take some predetermined action. In one example, a user may toggle a switch **16** OFF then ON and, by doing so, signal to a multistate light unit **20** that a load such as a light emitter **22** corresponding thereto should be turned OFF. Accordingly, the multistate light unit **20** may turn the light emitter **22** OFF and keep it that way, even when household power is available at the multistate light unit **20**. This may enable the light emitter **22** to be turned OFF while minimizing the amount of time one or more corresponding application units **14** (e.g., one or more application units **14** corresponding to the same switch **16** or switches **16**) are disconnected from household power.

In selected embodiments, a multistate light unit **20** may include a power supply **24**, switch detector **26**, state-control module **28**, light emitter **22**, or the like or a combination or sub-combination thereof. A power supply **24** may supply properly conditioned electrical power to one or more other components of a multistate light unit **20**. For example, in certain embodiments, a power supply **24** may supply properly conditioned electrical power to a state-control module **28**.

In selected embodiments, a power supply **24** may include one or more energy-storage devices **30**, a power regulator **32**, or the like or a combination thereof. An energy-storage device **30** may comprise one or more capacitors, super capacitors, ultra-capacitors, batteries, or the like and enable one or more components of a multistate light unit **20** to continue to function as desired during a period of time when the multistate light unit **20** does not have access to household power.

In certain embodiments, an energy-storage device **30** may enable a state-control module **28** to function continuously as a user toggles a switch **16** OFF and ON in some predetermined pattern. Accordingly, with uninterrupted power, a state-control module **28** may monitor and/or interpret that pattern and respond appropriately. An energy-storage device **30** may recharge as needed whenever household power is available.

In selected embodiments, an energy-storage device **30** may be sized to support a reset function. For example, an energy-storage device **30** may be sized to power a state-control module **28** through a first interruption (e.g., a five second interruption) in household power, but not a second, longer interruption (e.g., a ten second interruption) in household power. Accordingly, a state-control module **28** may have sufficient power to monitor and/or interpret normal ON/OFF patterns and respond appropriately. However, in the event of a longer interruption (e.g., an interruption in household power that extends longer than ten seconds), a state-control module **28** may consume all stored electrical power available to it and then cease to operate. When household power is again available, a state-control module **28** may startup in a predetermined initial or home state. Accordingly, running dry on stored power may function as a reset for a state-control module **28**.

A power regulator **32** may convert household power (e.g., alternating current at 120V) to low voltage direct current suitable for powering a state-control module **28** or the like. Alternatively, or in addition thereto, a power regulator **32** may condition electrical power supplied thereto by an energy-storage device **30** so that it is suitable for powering a state-control module **28** or the like. For example, in selected embodiments, a power regulator **32** may reduce a voltage of electrical power supplied thereto by an energy-storage device **30** comprising one or more capacitors so that it is suitable for powering a state-control module **28**.

A switch detector **26** may send one or more signals to a state-control module **28** indicating whether a switch **16** is ON or OFF (i.e., whether a corresponding multistate light unit **20** has access to household power). For example, a switch detector **26** may send a first signal to a state-control module **28** (e.g., set a flag at a first or "true" value) when household power is available at the multistate light unit **20** and send a second signal to a state-control module **28** (e.g., set the flag to a second or "false" value) when household power is not available at the multistate light unit **20**.

A state-control module **28** may be configured in any of a number of ways to retain a state of a corresponding multistate light unit **20**. A state-control module **28** may receive an input that influences the state of a multistate light unit **20** and change (or signal a change) in that state. In certain embodiments, a state-control module **28** may retain a state of a multistate light unit **20** as long as the state-control module **28** has properly conditioned electrical power supplied thereto.

Memory of a state-control module **28** may be digital or analog. In certain embodiments, a state-control module **28** may have memory in the form of a flip flop. In other embodiments, a state-control module **28** may retain a state in nonvolatile or volatile memory, a latching relay, a latching circuit (SRlatch), toggle flip flops, JK flip flops, a shift register, or any other memory that holds state.

In selected embodiments, a state-control module **28** may comprise a microprocessor. For example, a state-control module **28** may comprise a microprocessor that retains a current state, alternates to another state when appropriate, and the like. In selected embodiments, a state-control module **28** may comprise a microprocessor operating in conjunction with a relay, MOSFET, bipolar junction transistor (BJT), or the like to control or switch an electrical connection between a light emitter **22** and household power.

Referring to FIG. **3**, in certain embodiments, an application unit **14** may include an application power supply **34** and an application module **36**. An application power supply **34** may supply properly conditioned electrical power to an application module **36**.

In selected embodiments, an application power supply **34** may include one or more energy-storage devices **38**, a power regulator **40**, or the like or a combination thereof. An energy-storage device **38** may comprise one or more capacitors, super capacitors, ultra-capacitors, batteries, or the like and enable an application module **36** to continue to function as desired during a period of time when the application unit

14 does not have access to household power. In certain embodiments, an energy-storage device **38** may enable an application module **36** to function continuously for a relatively short period of time as a user toggles a switch **16** OFF and ON in some predetermined pattern. In other embodiments, one or more energy-storage devices **38** may provide electrical power to one or more components of an application unit **14** for a much longer period of time. In either case, one or more energy-storage devices **38** may recharge whenever household power is available.

In selected embodiments, an energy-storage device **38** may be sized to support a reset function. For example, an energy-storage device **38** may be sized to power an application module **36** through a first interruption (e.g., a five second interruption) in household power, but not a second, longer interruption (e.g., a ten second interruption) in household power. Accordingly, an application module **36** may have sufficient power to function as desired across normal ON/OFF patterns. However, in the event of a longer interruption (e.g., an interruption in household power that extends longer than ten seconds), an application module **36** may consume all stored electrical power available to it and then cease to operate. When household power is again available, an application module **36** may startup in a predetermined initial or home state. Accordingly, running dry on stored power may function as a reset for an application module **36**.

A power regulator **40** may convert household power (e.g., alternating current at 120V) to low voltage direct current suitable for powering an application module **36**. Alternatively, or in addition thereto, a power regulator **40** may condition electrical power supplied thereto by an energy-storage device **38** so that it is suitable for powering an application module **36**. For example, in selected embodiments, a power regulator **40** may reduce a voltage of electrical power supplied thereto by an energy-storage device **38** comprising one or more capacitors so that it is suitable for powering an application module **36**.

An application module **36** may provide the primary or a core functionality of an application unit **14**. That is, an application module **36** may provide the functionality driving an occupant's or user's decision to install an application unit **14**. In certain embodiments, an application module **36** may include hardware and/or software that provides functionality that is different from emitting light. For example, an application module **36** may be or include a speaker and/or microphone. Accordingly, an application module **36** may be or include a virtual assistant. Alternatively, or in addition thereto, an application module **36** may be or include a wireless protocol repeater, video projector, smoke detector, heat detector, motion detector, security camera, baby monitor, oil diffuser, wireless charging transmitter, or the like. In other embodiments, an application module **36** may be some other kind of electrical device or provide some other kind of functionality. Accordingly, the functionality incorporated within an application module **36** in accordance with the present invention may be extensive and/or varied from embodiment to embodiment.

A system **18** may include one or more biasing devices **42**. In certain embodiments, a system **18** may include one biasing device **42** for each switch **16** within the system **18**. A biasing device **42** may be or include a structure that biases a corresponding switch **16** to a particular position. For example, a biasing device **42** may be positioned to bias a switch **16** (e.g., a toggle switch, decora switch, or the like) toward an ON position. Accordingly, in operation, a human user may be free to move a switch **16** out of an ON position and into an OFF position or toward an OFF position. However, when the user releases the switch **16**, the biasing device **42** may effect, provide, or enable a rapid (e.g., immediate) automatic return of the switch **16** to the ON position. As a result, a biasing device **42** may ensure that household power is promptly restored to one or more application units **14** corresponding to the switch **16**.

In selected embodiments, a system **18** in accordance with the present invention may include one or more standard light units **43** (e.g., standard light bulbs, Light emitting diodes with standard connection interfaces, or the like). Such units **43** may emit light when they are connected to household power and stop emitting light when they are not connected to household power. In certain embodiments, one or more standard light units **43** may provide security lighting, safety lighting, scene lighting, or the like.

Referring to FIG. **4**, in selected embodiments, an application unit **14** may interpret a user toggling a switch **16** OFF and then back ON in some predetermined pattern as an instruction to take some predetermined action. For example, an application unit **14** may include a light emitter **44**. Thus, in addition to having the functionality associated with an application module **36**, an application unit **14** may provide lighting. To control the operation of a light emitter **44**, an application unit **14** may be configured like a multistate light unit **20**. Accordingly, like a multistate light unit **20**, an application unit **14** may interpret a user toggling a switch **16** OFF and then back ON as an instruction to turn a light emitter **44** OFF or ON, depending on its initial or previous state. Thus, in certain embodiments, an application unit **14** may be configured or viewed as a multistate light unit **20** with an application power supply **34** and an application module **36** added thereto.

Alternatively, or in addition thereto, an application unit **14** may interpret a user toggling a switch **16** OFF and then back ON in some predetermined pattern as an instruction to take some predetermined action with respect to the functionality of an application module **36**. For example, a user may toggle a switch **16** OFF then ON in a selected number of cycles (e.g., two cycles) to signal to an application module **36** comprising a security camera to start (or end) a motion-activated recording mode (e.g., an "away" mode). In another example, a user may toggle a switch **16** OFF then ON in a selected number of cycles to signal to an application module **36** comprising an oil diffuser to start (or end) an diffusion process (e.g., to turn the diffuser ON or to turn the diffuse OFF). In another example, a user may toggle a switch **16** OFF then ON in a selected number of cycles to turn an application module **36** comprising a virtual assistant OFF (or ON) and, thereby, control when the virtual assistant is monitoring voice activity. In certain embodiments, a cycle may comprise (1) a user moving a switch **16** out of an ON position and into an OFF position or toward an OFF position, (2) the user releasing the switch **16**, and (3) a biasing device **42** providing an immediate automatic return of the switch **16** to the ON position. Accordingly, a cycle may be accomplished quickly and easily and resemble, from the perspective of a user, a push of a button.

When controlling a lighting functionality associated therewith (e.g., controlling a light emitter **44**), an application unit **14** may look for and/or respond to the same cycle pattern as a multistate light unit **20**. However, when controlling other functionality (e.g., functionality associated with an application module **36**), an application unit **14** may look for and/or respond to a different cycle pattern.

For example, in selected embodiments, a multistate light unit **20** may look for and/or respond to a standalone cycle.

A standalone cycle may be a single cycle that is separated by a predetermined period of time (e.g., two or more seconds) from any preceding or subsequent cycle. Accordingly, if a multistate light unit **20** detects a standalone cycle, it may turn a corresponding light emitter **22** OFF or ON, depending on its initial or previous state. In contrast, when controlling non-lighting functionality, an application unit **14** may look for and/or respond to a double cycle. A double cycle may occur when two cycles are detected within a predetermined period of time (e.g., within two seconds of each other). Accordingly, in certain embodiments, one or more multistate lights **20** within a system **18** may respond to standalone along cycles and ignore double cycles, while one or more application units **14** within the system **18** may respond to standalone cycles (e.g., use standalone cycles to control the lighting functionality provided by an application unit **14**) and respond to double cycles (e.g., use double cycles to control some other functionality provided by an application unit **14**). In this manner, lighting functionality associate with one or more light emitters **22**, **44** may be controlled independently of functionality associated with an application module **36**.

In selected embodiments, an application unit **14** may include a state power supply **45**, switch detector **46**, state-control module **48**, or the like or a combination or sub-combination thereof. A state power supply **45** may supply properly conditioned electrical power to a state-control module **48** corresponding to an application unit **14**. In certain embodiments, a state power supply **45** and an application power supply **34** may be the same device or they may share certain components, hardware, or the like. Alternatively, a state power supply **45** may be totally independent from an application power supply **34**.

In selected embodiments, a state power supply **45** may include one or more energy-storage devices **50**, a power regulator **52**, or the like or a combination thereof. An energy-storage device **50** may comprise one or more capacitors, super capacitors, ultra-capacitors, batteries, or the like and enable a state-control module **48** of an application unit **14** to function as desired during a period of time when the application unit **12** does not have access to household power.

In certain embodiments, an energy-storage device **50** may enable a state-control module **48** of an application unit **14** to function continuously as a user toggles a switch **16** OFF and ON in some predetermined pattern. Accordingly, with uninterrupted power, a state-control module **48** may monitor and/or interpret that pattern and respond appropriately. An energy-storage device **50** may recharge as needed whenever household power is available. As disclosed hereinabove with respect to other energy-storage devices **30**, **38**, an energy-storage device **50** corresponding to a state power supply **45** may be sized to support a reset function.

A power regulator **52** may convert household power (e.g., alternating current at 120V) to low voltage direct current suitable for powering a state-control module **48** of an application unit **14**. Alternatively, or in addition thereto, a power regulator **52** may condition electrical power supplied thereto by an energy-storage device **50** so that it is suitable for powering a state-control module **48** or the like. For example, in selected embodiments, a power regulator **52** may reduce a voltage of electrical power supplied thereto by an energy-storage device **50** comprising one or more capacitors so that it is suitable for powering a state-control module **48** of an application unit **14**.

A switch detector **46** of an application unit **14** may function like a switch detector **26** corresponding to a multistate light unit **20**. Accordingly, a switch detector **46** of an application unit **14** may send one or more signals to a state-control module **28** indicating whether a switch **16** is ON or OFF (i.e., whether a corresponding application unit **14** has access to household power). A state-control module **48** of an application unit **14** may be configured (e.g., comprise similar or identical components) and/or function like a state-control module **28** corresponding to a multistate light unit **20**. Accordingly, a state-control module **48** of an application unit **14** may receive an input that influences the state of an application module **36**, the state of a light emitter **44**, or the like and change (or signal a change) in that state. In certain embodiments, a state-control module **48** of an application unit **14** may differ from a state-control module **28** of a multistate light unit **20** only by looking for and/or responding to a different cycle pattern or to more cycle patterns.

Referring to FIGS. **5** and **6**, in certain embodiments, a method **56** in accordance with the present invention may prolong, preserve, or maximize the time over which household power is delivered to an application unit **14** installed at a lighting site **12**, while still enabling a user to turn OFF certain light emitters **22**, **44** using a switch **16** (e.g., a conventional wall-mounted switch). For purposes of discussion, such a method **56** will be discussed hereinbelow as pertaining to a system **18** like the one illustrated in FIG. **3** and comprising one switch **16**, one standard light unit **43**, one application unit **14** with an application module **36** forming a virtual assistant, and multiple multistate light units **20**. However, a method **56** may be used on or adapted to other systems **18** in accordance with the present invention as desired or necessary.

As a method **56** begins, a system **18** may be in an unpowered condition. For example, a switch **16** may be turned **58** OFF (i.e., be in an OFF position) so that nothing (e.g., no standard light unit **43**, multistate light unit **20**, or application unit **14**) is connected to household power. Additionally, a sufficiently long time may pass **60** with the switch **16** in the OFF position to ensure that all electrical energy stored in the system **18** may be completely consumed and all components (e.g., state-control modules **28**, application modules **36**) may be unpowered. In selected embodiments, a sufficiently long period of time may comprise about 30 seconds.

At some point thereafter, a user may turn **62** the switch **16** to an ON position. This may result in multiple steps **64** being performed in rapid succession, simultaneously, or some combination thereof. Accordingly, the order of the steps **64** shown in FIG. **5** is merely illustrative. The steps **64** may include: (1) the standard light unit **43** starting **66** to emit light; (2) the state-control modules **28** of the various multistate light units **20** receiving **68** power and loading, booting, or initializing to predetermined states (e.g., a state corresponding to light emitters **22** being connected to household power and emitting light); (3) the multistate light units **20** (e.g., the light emitters **22** of the multistate light units **20**) starting **69** to emit light; (4) the energy-storage devices **30**, **38** beginning **70** to charge; (5) switch detectors **26** of the various multistate light units **20** sending **72** signals to corresponding state-control modules **28** indicating that the switch **16** is ON (i.e., that household power is available); and (6) an application module **36** of the application unit **14** receiving **74** electrical power.

After receiving **74** electrical power, the application module **36** may boot **76**, turn ON, or begin some other startup process. Accordingly, the application module **36** may connect **78** to a network (e.g., connect to a wireless computer network) and/or otherwise ready **80** itself for use. Thereafter,

a user may use **82** the application module **36**. For example, a user may issue a voice command requesting the application module **36** to play a particular song, playlist, or the like.

At some point thereafter, a user may turn **84** the switch OFF. This may result in multiple steps **86** being performed in rapid succession, simultaneously, or some combination thereof. Accordingly, the order of the steps **86** shown in FIG. **6** is merely illustrative. The steps **86** may include: (1) the standard light unit **43** ceasing **88** to emit light; (2) the state-control modules **28** of the various multistate light units **20** continuing **90** to run by using stored electrical power (e.g., electrical power stored within a corresponding power supply **24**); (3) the application module **36** continuing **92** to run by using stored electrical power (e.g., electrical power stored within a corresponding power supply **34**); and (4) switch detectors **26** of the various multistate light units **20** sending **94** signals to corresponding state-control modules **28** indicating that the switch **16** is OFF (i.e., that household power is not available).

An intent of the user in turning **84** the switch **16** OFF may be to shut everything down, reset one or more components of a system **18**, or the like. Alternatively, the intent may be to turn OFF the various light emitters **22**. In selected embodiments, the intent of the user may be inferred based on a determination **96** of whether the user turns the switch **16** back ON in a timely manner (e.g., within a few seconds before all stored energy is consumed). If the switch is not turned back on in a timely manner, the state power supplies **24** of the multistate light units **20** may run **98** "dry" (i.e., run out of stored power) and the corresponding state-control modules **28** may cease operating. The application power supply **34** may also run **100** dry and the application module **36** may cease operating. Accordingly, if the switch **16** is not turned back on in a timely manner, as system **18** may return to an unpowered condition.

On the other hand, if the switch **16** is turned back on in a timely manner, multiple steps **102** may be performed in rapid succession, simultaneously, or some combination thereof. Accordingly, the order of the steps **102** shown in FIG. **6** is merely illustrative. The steps **102** may include: (1) the standard light unit **43** starting **66** to emit light; (2) the energy-storage devices **30**, **38** beginning **70** to charge; (3) switch detectors **26** of the various multistate light units **20** sending **72** signals to corresponding state-control modules **28** indicating that the switch **16** is ON (i.e., that household power is available); (4) the state-control modules **28** of the various multistate light units **20** alternating **104** to the other state; (5) the multistate light units **20** (e.g., the light emitters **22** of the multistate light units **20**) emitting **106** in accordance with the state stored within the state-control modules **28**; and (6) an application module **36** of the application unit **14** continuing **80** to be ready for use.

In selected embodiments, alternating **104** to the other state may be a switch to the other of two alternative states. For example, if a current state stored within a state-control module corresponds to "light emitters OFF," then alternating **104** to the other state may change the stored state to "light emitters ON." In such situations, emitting **106** in accordance with the state would result in the multistate light units **20** emitting light. Conversely, if a current state stored within a state-control module corresponds to "light emitters ON," then alternating **104** to the other state may change the stored state to "light emitters OFF." In such situations, emitting **106** in accordance with the state would result in the multistate light units **20** ceasing to emitting light. Accordingly, repeatedly looping within the method **56** back to turning **84** the switch OFF and then turning the switch **16** back on in a timely manner may alternate the multistate light units **20** between emitting light and not emitting light.

The foregoing method **56** may be adapted to a system **18** like the one illustrated in FIG. **4**. For example, in selected embodiments, the state power supply **45**, switch detector **46**, state-control module **48**, and light emitter **44** of an application unit **14** may respectively function just like the power supply **24**, switch detector **26**, state-control module **28**, and light emitter **22** of a multistate light unit **20**. Accordingly, the light emitter **44** associated with an application unit **14** may turn ON and OFF in unison with the light emitters **22** of the various multistate light units **20** of the system **18**. In certain such embodiments, no control of an application module **36** may be exerted by a user via a switch **16** other than a total denial of household power that would eventually produce a shutdown of the application module **36** when one or more energy-storage devices **38** associated therewith run dry. In selected embodiments, such running dry may occur within a few seconds (e.g., a time within the range from about 3 seconds to about 30 seconds).

Referring to FIGS. **7** and **8**, the various electrical connections of one or more light emitters **22**, **44** to household power may be controlled by one or more corresponding state-control modules **28**, **48**. In selected embodiments, each state-control module **28**, **48** within a system **18** may be an "internal switch" comprising a microprocessor operating in conjunction with a relay, MOSFET, bipolar junction transistor (BJT), or the like. Accordingly, the internal switch provided by one or more state-control modules **28**, **48** may selectively connect/disconnect one or more corresponding light emitters **22**, **44** to/from household power.

In selected embodiments, to avoid an unwanted flash **108** of light, one or more state-control modules **28**, **48** may act in certain circumstances to disconnect their respective internal switches (i.e., transition from a connected condition **110** to a disconnected condition **112**) based on a falling edge of household power (i.e., based on household power transition from an ON condition **114** to an OFF condition **116**) rather than a rising edge of household power (i.e., based on household power transition from an OFF condition **116** to an ON condition **114**).

The internal switching performed by one or more state-control modules **28**, **48** may not be instantaneous. It may require some time **118** (e.g., some fraction of a second) for the one or more state-control modules **28**, **48** to see that household power has been restored and then react and disconnect their respective internal switches. In certain circumstances (i.e., the circumstances illustrated in FIG. **7**), this delay **118** may result in one or more light emitters **22**, **44** emitting a flash **108** of light (i.e., transitioning rapidly from an OFF condition **120** to an ON condition **122** and then back to an OFF condition **120**).

For example, initially, household power may be in an ON condition **114**, one or more internal switches may be in a connected condition **110**, and one or more light emitters **22**, **44**, may be in an ON condition **122**. A user may then turn **84** a switch **16** OFF and transition household power to an OFF condition **116**. The one or more light emitters **22**, **44** may react to this cut in power by transitioning from an ON condition **122** to an OFF condition **120**. If the one or more state-control modules **28**, **38** were disconnecting their respective internal switches based on a rising edge of household power, they would be doing nothing at this point because there has been no rising edge. Accordingly, their internal switches would remain in a connected condition **110**. As a result, when the household power is restored (i.e., transitioned from an OFF condition **116** to an ON condition

114), the one or more light emitters **22**, **44** are still connected and can rapidly begin to emit light. Accordingly, the one or more light emitters **22**, **44** may begin emitting light before the one or more state-control modules **28**, **48** can see that household power has been restored and react by disconnecting their respective internal switches. The one or more light emitters **22**, **44** may emit light for a short period of time until they are disconnected by the one or more state-control modules **28**, **38**.

In the same circumstances, disconnecting respective internal switches based on a falling edge of household power as shown in FIG. **8** may avoid the possibility of a flash **108**. For example, initially, household power may be in an ON condition **114**, one or more internal switches may be in a connected condition **110**, and one or more light emitters **22**, **44**, may be in an ON condition **122**. A user may then turn **84** a switch **16** OFF and transition household power to an OFF condition **116**. The one or more light emitters **22**, **44** may react to this cut in power by transitioning from an ON condition **122** to an OFF condition **120**. The one or more state-control modules **28**, **38** may see that household power has been cut off and react by disconnecting their respective internal switches. Accordingly, regardless of whether the user chooses to rapidly restore household power, the one or more light emitters **22**, **44** will already have been disconnected from household power. That is, the reaction time **118** of the one or more state-control modules **28**, **38** may be significantly faster than those of a user operating a switch **16**, even when that switch **16** is coupled with a biasing device **42**. Given the initial conditions (i.e., light emitters were ON) and the action **84** of the user (i.e., the user turned **84** the switch **16** OFF), this disconnection is a desired and not a logically unreasonable result.

Referring to FIGS. **9** and **10**, in selected embodiments, to avoid an unwanted flash **108** of light, one or more state-control modules **28**, **48** may act in certain circumstances to connect their respective internal switches (i.e., transition from a disconnected condition **112** to a connected condition **110**) based on a rising edge of household power (i.e., based on household power transition from an OFF condition **116** to an ON condition **114**) rather than a falling edge of household power (i.e., based on household power transition from an ON condition **114** to an OFF condition **116**).

In certain circumstances (i.e., the circumstances illustrated in FIG. **9**), capacitance corresponding to certain light emitters **22**, **44** (e.g., capacitance built in to an high voltage LED system to provide "flickerless" or "flicker free" operation) may result in those emitters **22**, **44** emitting a flash **108** of light (i.e., transitioning rapidly from an OFF condition **120** to an ON condition **122** and then back to an OFF condition **120**). For example, initially, household power may be in an ON condition **114**, one or more internal switches may be in a disconnected condition **112**, and one or more light emitters **22**, **44**, may be in an OFF condition **120**. A user may then turn **84** a switch **16** OFF and transition household power to an OFF condition **116**. If the one or more state-control modules **28**, **38** were connecting their respective internal switches based on a rising edge of household power, they would start, and within a short period of time **118** complete, the process of connecting those internal switches. Accordingly, if a transition from a disconnected condition **112** to a connected condition **110** results in one or more light emitters **22**, **44** being connected with certain capacitance associated therewith, those one or more light emitters **22**, **44** may emit light. However, since the capacitance may be relatively small, the stored energy may be consumed quickly and the light emitters **22**, **44** may cease emitting light before the household power is restored (i.e., transitioned from an OFF condition **116** to an ON condition **114**). The end result may be a noticeable and undesirable flash **108**.

In the same circumstances, connecting respective internal switches based on a rising edge of household power as shown in FIG. **10** may avoid the possibility of a flash **108**. For example, initially, household power may be in an ON condition **114**, one or more internal switches may be in a disconnected condition **112**, and one or more light emitters **22**, **44**, may be in an OFF condition **120**. A user may then turn **84** a switch **16** OFF and transition household power to an OFF condition **116**. Since the one or more state-control modules **28**, **38** are disconnecting their respective internal switches based on a rising edge of household power, they would be doing nothing at this point because there has been no rising edge. Accordingly, only after the user restores household power, will the internal switches be connected. At that point, the one or more light emitters **22**, **44** may have full access to household power and may operate as designed without any flash **108** and, due the capacitance, without any flickering.

Referring to FIG. **11**, a method **124** in accordance with the present invention may enable one or more systems **18** in accordance with the present invention to avoid unwanted flashes **108** of light by implementing the solutions illustrated in FIGS. **8** and **10**. For purposes of discussion, such a method **124** will be applied hereinbelow to a single multistate light unit **20** or to a single application unit **14**. However, the method **124** may be simultaneously employed by all multistate light units **20** and/or application units **14** within a system **18**.

In certain situations, as a method **124** begins, household power may be available (i.e., in an ON condition **114**), but a light emitter **22**, **44** may be 126 OFF. Accordingly, as the method **124** begins, an internal switch corresponding to the unit **14**, **20** may be in a disconnected condition **112**. At some point thereafter, a user may turn **84** a switch **16** to an OFF position. This may interrupt **128** the flow of household power to the unit **14**, **20**. As a result, the unit **14**, **20** (e.g., a state-control module **28**, **38** of a unit **20**, **14**) may monitor **130** the situation to determine when household hold power is restored.

The presumption may be that the household power will be shortly restored. If that presumption is incorrect in a given situation, a unit **14**, **20** may persist in monitoring **130** for as long as it has stored power to do so. When the stored power is exhausted, the unit **14**, **20** may cease **98** operating and reset as disclosed hereinabove when power is eventually restored in the future.

If the presumption is correct and the monitoring **130** indicates that household power has been restored, then a state-control module **28**, **38** corresponding to the unit **20**, **14** may change **132** the stored state to a "light ON" state and close an internal switch to turn the light emitter **22**, **44** ON. Accordingly, in short order, a light emitter **22**, **44** may be 136 ON.

At some point thereafter, a user may again turn **84** a switch **16** to an OFF position. This may again interrupt **128** the flow of household power to the unit **14**, **20**. However, rather than monitoring **130**, the unit **14**, **20** (e.g., a state-control module **28**, **38** of a unit **20**, **14**) may immediately change **138** the stored state to a "light OFF" state and open the internal switch to turn the light emitter **22**, 44 OFF. Accordingly, in short order, a light emitter **22**, **44** may be 126 OFF.

Again the presumption may be that the household power will be shortly restored. If that presumption is incorrect in a

given situation, a unit **14**, **20** may persist in functioning (e.g., storing a state) for as long as it has stored power to do so. When the stored power is exhausted, the unit **14**, **20** may cease **98** operating and reset as disclosed hereinabove when power is eventually restored in the future. If the presumption is correct and the household power is restored **142** in a timely manner, then the state-control module **28**, **38** of the corresponding unit **20**, **14** may leave the state and internal switch unchanged until a user again interrupts **128** the flow of household power. In this manner, a system **18** may repeatedly loop through the method **125** as often as desired by the user.

In certain other situations, as a method **124** begins, household power may be available (i.e., in an ON condition **114**) and a light emitter **22**, **44** may be 136 ON. Accordingly, as the method **124** begins, an internal switch corresponding to the unit **14**, **20** may be in a connected condition **110**. Thus, depending on the initial conditions, the method **124** may begin at different locations within the repeating loop.

Referring to FIGS. **12** and **13**, many different lighting arrangements may be obtained using systems **18** in accordance with the present invention. Moreover, a user may have a great deal of freedom in customizing a lighting arrangement and the arrangement of application units **18** to meet his or her specific wishes or requirements. For example, in selected embodiments, a room **10** may have multiple lighting sites **12** connected to household power by one or more switches **16** (e.g., two three-way switches). Each of the lighting sites **12** may have either a multistate light unit **20** or an application unit **14** having lighting functionality installed therein. Accordingly, cycling a switch **16** one time may simultaneously turn light emitters **22**, **44** corresponding to each of the lighting sites **12** ON and cycling a switch **16** one time may simultaneously turn light emitters **22**, **44** corresponding to each of the lighting sites **12** OFF. In such embodiments, a system **18** may be viewed as having one lighting functionality (i.e., full power lighting) that alternates between an ON state and an OFF state.

In other embodiments, a system **18** may support more than one lighting functionality. For example, a system **18** may support three lighting functionalities that each alternate between an ON state and an OFF state. A first state may correspond to full power lighting and may be accessed and/or controlled by a standalone cycle. A second state may correspond to half power lighting and may be accessed and/or controlled by a double cycle. A third state may correspond to a quarter power lighting and may be accessed and/or controlled by a triple cycle (i.e., three cycles completed within a predetermined period of time).

In such a system **18**, a standalone cycle my turn all the light emitters **22**, **44** ON at full power. A following standalone cycle may turn all the light emitters **22**, **44** OFF. A double cycle my turn all the light emitters **22**, **44** ON at half power. A following double cycle may turn all the light emitters **22**, **44** OFF. A triple cycle my turn all the light emitters **22**, **44** ON at quarter power. A following triple cycle may turn all the light emitters **22**, **44** OFF. When all the light emitters **22**, **44** are ON, but not at full power, a standalone cycle may turn all the light emitters **22**, **44** to full power. When all the light emitters **22**, **44** are ON, but not at half power, a double cycle may turn all the light emitters **22**, **44** to half power. When all the light emitters **22**, **44** are ON, but not at quarter power, a triple cycle may turn all the light emitters **22**, **44** to quarter power.

In selected embodiments, functionality corresponding to one or more application units **14** may also be controlled by a number of cycles. To enable lighting functionality to be controlled independently from functionality of an application module **36**, different numbers of cycles may be assigned to the different functionality. Accordingly, a wide variety of functionality may be controlled by counting cycles.

Referring to FIG. **14**, in selected embodiments, a room **10** may have multiple lighting sites **12** connected to household power by one or more switches **16** (e.g., two three-way switches). Most of the lighting sites **12** may have either a multistate light unit **20** or an application unit **14** having lighting functionality installed therein. The remaining few lighting sites **12***a* may have a standard light unit **43** installed thereat. Accordingly, cycling a switch **16** one time may simultaneously turn light emitters **22**, **44** corresponding to most of the lighting sites **12** ON and cycling a switch **16** one time may simultaneously turn light emitters **22**, **44** corresponding to most of the lighting sites **12** OFF. The few standard light units **43** may be ON whenever the switches **16** are ON, which may be all of the time except for brief instances when a switch **16** is being cycled. Accordingly, the standard light units **43** may be well suited for use as security lighting, safety lighting, scene lighting, or the like.

Referring to FIGS. **15** and **16**, in selected embodiments, a room **10** may have multiple lighting sites **12** connected to household power by one or more switches **16** (e.g., two three-way switches). All of the lighting sites **12** may have either a multistate light unit **20** or an application unit **14** having lighting functionality installed therein. However, a few of the lighting sites **12***b* may be fitted with multistate light units **20** or application units **14** that are programmed differently than the others **20**, **14**.

For example, the majority of the multistate light units **20** or application units **14** may be programmed to respond only to a standalone cycle. Accordingly, the light emitters **22**, **44** corresponding thereto may turn ON to full power with a standalone cycle and turn OFF with a standalone cycle. Other cycle counts may be ignored. The few lighting sites **12***b* may be fitted with multistate light units **20** or application units **14** that are programmed to respond to cycle counts other than standalone cycles.

For example, the few lighting sites **12***b* may be fitted with multistate light units **20** or application units **14** that support three lighting functionalities that each alternate between an ON state and an OFF state. A first state may correspond to full power lighting and may be accessed and/or controlled by a double cycle. A second state may correspond to half power lighting and may be accessed and/or controlled by a triple cycle. A third state may correspond to a quarter power lighting and may be accessed and/or controlled by a quadruple cycle (i.e., four cycles completed within a predetermined period of time). As a result, a user may control the lighting associated with the few lighting sites **12***b* independently from the rest of the lighting. A user may choose to locate the few lighting sites **12***b* in strategic places such as over a piano **144**, along a wall **146** with display art, or the like.

Referring to FIG. **17**, one embodiment of system **18** for use in a bathroom **10***a* is illustrated. The bathroom **10***a* includes five lighting sites **12**. Two of the lighting sites **12** each have an application unit **14** installed therein. The other three lighting sites **12** each have a multistate light unit **20** installed therein. The two application units **14** each comprise an application module **36** providing the functionality of a virtual assistant. The two application modules **36** may be wirelessly paired so as to act as a single virtual assistant. Accordingly, a user may issue voice commands hands free as desired while showering, taking a bath, etc.

Referring to FIGS. **18-30**, in selected embodiments, a switch **16** may be a standard toggle-style light switch **16***a* (hereinafter "toggle switch **16***a*"). A toggle switch **16***a* may control the delivery of household power by selectively moving between a first position (e.g., an ON position) and a second position (e.g., an OFF position). A toggle **148** of a toggle switch **16***a* may be internally biased toward the first and second positions (i.e., toward the opposing extremes of its range of motion) and out of any intermediate position therebetween.

That is, when a toggle **148** is in a first position, the internals of the toggle switch **16***a* may resist the toggle **148** moving out of that position. This resistance or biasing effect may continue until the toggle **148** reaches a midpoint of its range of motion. Accordingly, if a user were to release a toggle **148** before reaching the midpoint, the toggle **148** would automatically return to the first position. On the other hand, if a user moves the toggle **148** past the midpoint, the internals of the toggle switch **16***a* may start exert a biasing force urging the toggle on to the second position. Accordingly, if a user were to release a toggle **148** after passing the midpoint, the toggle **148** would automatically advance fully into the second position.

In selected embodiments, a biasing device **42** may take advantage of the internal biasing effect of a toggle switch **16***a* in order provide an automatic return of the toggle **148** to the first position when the user releases it. For example, a biasing device **42** may block a toggle **148** from reaching a midpoint of its range of motion. The toggle **148** may have clearance to move out of the first position sufficiently to open the switch **16***a*. A user may continue moving the toggle **148** until further motion is blocked by the biasing device **42**. At that point, the user may release the toggle **148**. Since the toggle **148** did not pass or even reach the midpoint, the internal biasing effect of the toggle switch **16***a* may cause the toggle **148** to automatically return to the first position (and, thereby, close the switch **16***a*).

In selected embodiments, a biasing device **42** may selectively pivot or otherwise move between a biasing position **150** and a non-biasing position **152**. In a biasing position **150**, a biasing device **42** may block a toggle **148** from reaching a midpoint as set forth hereinabove. In a non-biasing position **152**, a biasing device **42** may be pivoted or moved out of the way so a corresponding toggle switch **16***a* may be free to act in a conventional manner (i.e., toggle between the first and second positions as desired by a user).

In certain embodiments, a biasing device **42** may pivot about a face-plate screw **154**. That is, a face plate **156** may be applied to a toggle switch **16***a*. Conventionally, a face plate **14** may secure to a toggle switch **16***a* with two screws **154**. In selected embodiments, one of those two screws **152** may be removed, a biasing member **42** may be held in alignment with the vacated screw hole, and then the face-plate screw **154** (or a slightly longer face-plate screw **154**) may be reinserted and used to hold the biasing device **42** against the face plate **156**. Thereafter, a biasing device **42** may pivot about the face-plate screw **154** into and out of a biasing position **150** as desired.

As noted above, a face plate **156** may be held in place with two face-plate screws **154**. Either screw **154** may be used to secure a biasing device **42**. The choice of which screw **154** to use may depend on which position the toggle **148** will be biased toward. For example, if a toggle **148** is to be biased toward an upper position, then a user may use the lower screw **154** to secure the biasing device **42**. Conversely, if a toggle is to be biased toward a lower position, then a user may use the upper screw **154** to secure the biasing device **42**.

In general, a toggle **148** in an upper position may be in the ON position. However, for switches **16** set up in three-way wiring, the ON position may be the upper position or the lower position and may change each time a different switch **16** within the system **18** is flipped. In such situations, a switch **16** may be flipped to turn one or more lights ON. Thereafter, without moving any of the switches **16**, each may be set up with a biasing device **42** positioned to bias the switch **16** to that particular position, without regard to whether it is an upper or lower position.

In selected embodiments, screw apertures in a face plate **156** (i.e., apertures formed in a face plate **156** to receive face-plate screws **154**) may have a countersink formed therein. This countersink may allow the heads of the face-plate screws **154** to sit flush with a face of the face plate **156**. In certain embodiments, a biasing device **42** may include a cone **158** shaped to extend into (e.g., nest within) a countersink of a face plate **156**. This nesting effect may facilitate a proper alignment of a biasing device **42** with respect to the face plate **156**. It may also enable or support a smooth pivoting motion of the biasing device **42** with respect to a face plate **156**.

In certain embodiments, a biasing device **42** may have a slot **160** formed therein. The slot **160** may be positioned to receive a toggle **148** as it moves toward the biasing device **42**. The slot **160** may tend to center a biasing device **42** with respect to a toggle **148**. The slot **160** may also reduce the chance that moving a toggle **148** into contact with a biasing device **42** will cause the biasing device **42** to pivot out of a proper biasing position **150**.

In selected embodiments, a slot **160** may be defined by two extensions **162***a*, **162***b* that extend away from a distal end of a biasing device **42**. One of the two extensions **162***a* may be long enough to abut a side of a toggle **148** as a biasing device **42** pivots with respect to the toggle **148**. This structural interference may prevent the biasing device **42** from rotating past a proper biasing position **150**. Accordingly, to reach a proper biasing position **150**, a user may simply pivot a biasing device **42** (e.g., in a clockwise direction) with respect to a toggle switch **16***a* until the one extension **162***a* abuts the appropriate side of the toggle **148**.

A biasing device **42** may include various features that improve its functionality or ease of use. For example, in certain embodiments, a biasing device **42** may include a chamfer **164** or ramp **164** that will enable the biasing device **42** to smoothly pivot into a biasing position **150** without catching or snagging on a bezel **166** surrounding a toggle **148**, a shoulder **168** of a toggle **148**, or the like. In selected embodiments, a back side of a biasing device **42** may include a cavity **170** sized and positioned to accommodate the motion of a shoulder **168** of a toggle **148** as it moves within its range of motion.

Referring to FIG. **31-40**, in selected embodiments, a switch **16** may be a standard decora-style light switch **16***b* (hereinafter "decora switch **16***b*"). A decora switch **16***b* may control the delivery of household power by selectively moving between a first position (e.g., an ON position) and a second position (e.g., an OFF position). Like a toggle **148** of a toggle switch **16***a*, a paddle **172** of a decora switch **16***b* may be internally biased toward the first and second positions (i.e., toward the opposing extremes of its range of motion) and out of any intermediate position therebetween.

A biasing device **42** configured to bias a decora switch **16***b* may include a cantilever **174**. When the biasing device **42** is installed, a cantilever **174** thereof may be positioned to extend over a first end **176** of a paddle **172**. With the first end **176** flush with the surrounding bezel **166**, the paddle **172**

may be in a first position. As the raised second end **178** of the paddle **172** is pressed in by a user, the first end **176** may move outward and deflect the cantilever **174**. The cantilever **174** may be sufficiently flexible to permit the paddle **172** to pivot sufficiently to open the switch **16***b*. For example, the cantilever **174** may be sufficiently flexible to permit the paddle **172** to pivot completely into the second position. However, when a user releases the paddle **172**, the resiliency of the cantilever **174** may be sufficient to cause it to return to its neural position and take the first end **176** of the paddle **172** with it. Accordingly, the resiliency of the cantilever **174** may return the paddle **172** to the first position.

As noted above, a face plate **156** may be held in place with two face-plate screws **154**. Either screw **154** may be used to secure a biasing device **42** configured for use with a decora switch **16***b*. The choice of which screw **154** to use may depend on which position the paddle **172** will be biased toward. For example, if a paddle **172** is to be biased toward a position where the first (upper) end **176** thereof is flush with the surrounding bezel **166**, then a user may use the upper screw **154** to secure the biasing device **42**. Conversely, if a paddle **172** is to be biased toward a position where the second (lower) end **178** thereof is flush with the surrounding bezel **166**, then a user may use the lower screw **154** to secure the biasing device **42**.

In selected embodiment, a portion **180** of a biasing device **42** that extends over an end **176**, **178** of a paddle **172** may have an undercut that provides clearance for the paddle **172** to move (e.g., pivot outward) as desired. However, a cantilever **174** may include a projection **182** that extends into the undercut. Accordingly, as a paddle **172** pivots into the undercut, it may only contact (and, therefore, only deflect) the cantilever **174**.

Referring to FIG. **41-43**, in certain embodiments, an application unit **14** may be configured to be mounted within a standard recessed lighting housing or "can." In such embodiments, an application unit **14** may include its own housing **184**. A housing **184** of an application unit **14** may include an interior portion **186** shaped and sized to extend into a standard recessed lighting housing. A housing **184** may also include an exterior portion **188** that may be visible after the application unit **14** is installed in a standard recessed lighting housing.

In selected embodiments, an exterior portion **188** of a housing **184** may include a bezel **190**, light diffusing lens **192**, cover **194**, or the like or a combination or sub-combination thereof. A bezel **190** may form an outer extreme of an exterior portion **188** and may circumferentially encircle all the other components **192**, **194** thereof. A bezel **190** may provide an aesthetically pleasing interface between an application unit **14** and a surrounding ceiling surface.

A light diffusing lens **192** may be positioned interior to (i.e., inboard of) a bezel **190** and exterior to (i.e., outboard of) a cover **194**. In selected embodiments, a light diffusing lens **192** may have an annular shape. A light diffusing lens **192** may diffuse light generated by a light emitter **44** as it passes therethrough. In certain embodiments, a light emitter **44** may comprise an arrangement of LEDs (e.g., a ring of LEDs) mounted to an annular circuit board **196** that is positioned just below or axially interior to a light diffusing lens **192**.

In selected embodiments, a cover **194** may form a center (e.g., a circular center) of an exterior portion **188** of a housing **184** of an application unit **14**. A cover **194** may assist in securing an application module **36** in place. For example, in certain embodiments, an application module **36** may comprise a commercially available virtual assistant such as an AMAZON ECHO DOT. In such embodiments, a cover **194** may assist in securing the virtual assistant within an interior portion **186** of a housing **184**. A cover **194** may also protect the virtual assistant from water, dust, or the like that may be found in a corresponding room **10**.

In certain embodiments, a cover **194** may comprise a structural element **198** and a protective barrier **200**. A structural element **198** may hold an application module **36** in place. In selected embodiments, a structural element **198** may have one or more apertures **202** extending therethrough (e.g., extending axially therethrough). Such apertures **202** may enable sound to more easily pass to and from an application module **36**. A protective barrier **200** may extend over a structural element **198** and prevent unwanted material from passing through one or more apertures **202** in a structural element **198**. For example, a protective barrier **200** may be a cloth or thin plastic layer or membrane that is readily permeable to sound, but substantially impermeable to water droplets, water vapor, dust, or the like or a combination or sub-combination thereof.

An interior portion **186** of a housing **184** may define one or more compartments or spaces therewithin for housing and/or mounting various parts of an application unit **14**. For example, a housing **184** may define a space **204** for securing a light emitter **44**, a space **206** for receiving an application module **36**, and a space **208** for various other components of an application unit **14**. In selected embodiments, a space **206** for receiving an application module **36** may be shaped and have sufficient clearance to direct sound emanating from an application module **36** out into a room **10**. For example, the wall **210** of the housing **184** that defines a space **206** for an application module **36** (e.g., the wall that encircles an application module **36**) may be or form a sound reflector with a round bottom corner **212** that guides the sound energy produced by the application module **36** out through a cover **194** and into a corresponding room **10**. Various fins **214** may extend into a gap between an application module and a wall **210** in order to center an application module **36** within the space **206**.

In selected embodiments, a space **208** for various other components of an application unit **14** may be positioned axially below a space **206** for an application module **36**. A cover **216** may divide the two spaces **206**, **208** and protect one or more electronic components housed within the lower space **208**. In certain embodiments, one or more printed circuit boards may be mounted within the lower space **208**. The printed circuit boards and the corresponding electrical connections and hardware thereof may form various components of an application unit **14** including an application power supply **34**, state power supply **45**, switch detector **46**, state-control module **48**, or the like or a combination or sub-combination thereof. In certain embodiments, a housing **184** may have a plurality of vents **218** formed therein to facilitate air circulation and cooling of electronic components with the lower space **208**.

An application unit **14** may include various interface devices that assist in connecting the application unit **14** within a recessed light housing. For example, an application unit **14** may include (or be sold with) cabling and/or one or more wiring harnesses that interconnect a power source within a recessed light housing (e.g., an E26 socket), an application module **36**, a light emitter **44**, a printed circuit board (e.g., a board supporting or forming an application power supply **34**, state power supply **45**, switch detector **46**, state-control module **48**, or the like), or the like or a combination or sub-combination thereof. In selected embodiments, when an application module **36** is an inde-

pendent commercially available product like a virtual assistant, a wiring harness may be used in place of a power supply provided with the product.

In selected embodiments, a multistate light unit **20** may resemble an application unit **14** as disclosed and illustrated in FIG. **41-43** above. A primary difference may be that a multistate light unit **20** may not include an application module **36** and the components **34**, **194**, specifically associated therewith. Accordingly, an exterior portion **188** of a multistate light unit **20** may simply include a bezel **190** and a central light diffusing lens **192** (e.g., a circular rather than annular light diffusing lens **92**). A space **206** for an application module **36** may become a space **206** for a light emitter **22**.

The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative, and not restrictive. The scope of the invention is, therefore, indicated by the appended claims, rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

What is claimed and desired to be secured by United States Letters Patent is:

The invention claimed is:

1. A system comprising:

a state-control module comprising an internal switch;

a first power supply comprising an energy-storage device configured to deliver electrical power to the state-control module;

a load; and

the state-control module being configured to, when the internal switch is closed,

respond to a first interruption in delivery of household power to the system by opening the internal switch and, thereby, disconnecting the load from the household power, and

respond to the delivery of the household power to the system being restored immediately after the first interruption by leaving the internal switch open and the load disconnected from the household power.

2. The system of claim **1**, wherein the load is a light emitter.

3. The system of claim **2**, further comprising an application unit comprising:

at least one of a speaker or a microphone; and

an energy-storage device configured to deliver electrical power to the at least one of the speaker or the microphone.

4. The system of claim **1**, wherein the state-control module is further configured to, when the internal switch is open,

respond to a second interruption in the delivery of the household power to the system by leaving the internal switch open and the load disconnected from the household power, and

respond to the delivery of the household power to the system being restored immediately after the second interruption by closing the internal switch and, thereby, connecting the load to the household power.

5. A system comprising:

a state-control module comprising an internal switch;

an energy-storage device configured to deliver electrical power to the state-control module;

a light emitter;

the state-control module being configured to, when the internal switch is closed,

respond to a first interruption in delivery of household power to the system by opening the internal switch and, thereby, disconnecting the light emitter from the household power, and

respond to the delivery of the household power to the system being restored immediately after the first interruption by leaving the internal switch open and the light emitter disconnected from the household power; and

an application unit comprising an application power supply and an application module, the application power supply configured to deliver electrical power to the application module between the first interruption and when the delivery of the household power to the system is restored immediately after the first interruption.

6. The system of claim **5**, wherein the application module comprises at least one of a speaker, microphone, or camera.

7. The system of claim **5**, wherein the state-control module is further configured to, when the internal switch is open,

respond to a second interruption in the delivery of the household power to the system by leaving the internal switch open and the light emitter disconnected from the household power, and

respond to the delivery of the household power to the system being restored immediately after the second interruption by closing the internal switch and, thereby, connecting the light emitter to the household power.

* * * * *