US 20070184775A1

(19) United States
(12) Patent Application Publication
(10) Pub. No.: US 2007/0184775 A1
(43) Pub. Date: Aug. 9, 2007
Perkins et al.

(54) REMOTE CONTROL VENTILATOR SYSTEM AND METHOD

(76) Inventors: **Bernard L. Perkins**, Orange, CA (US); **Quang Minh Truong**, Ontario, CA (US); **Nikhil Jitendra Gandhi**, Anaheim, CA (US); **Humberto V. Meza**, Tustin, CA (US)

Correspondence Address:
MICHAEL BEST & FRIEDRICH, LLP
100 E WISCONSIN AVENUE
Suite 3300
MILWAUKEE, WI 53202 (US)

(21) Appl. No.: **11/350,264**

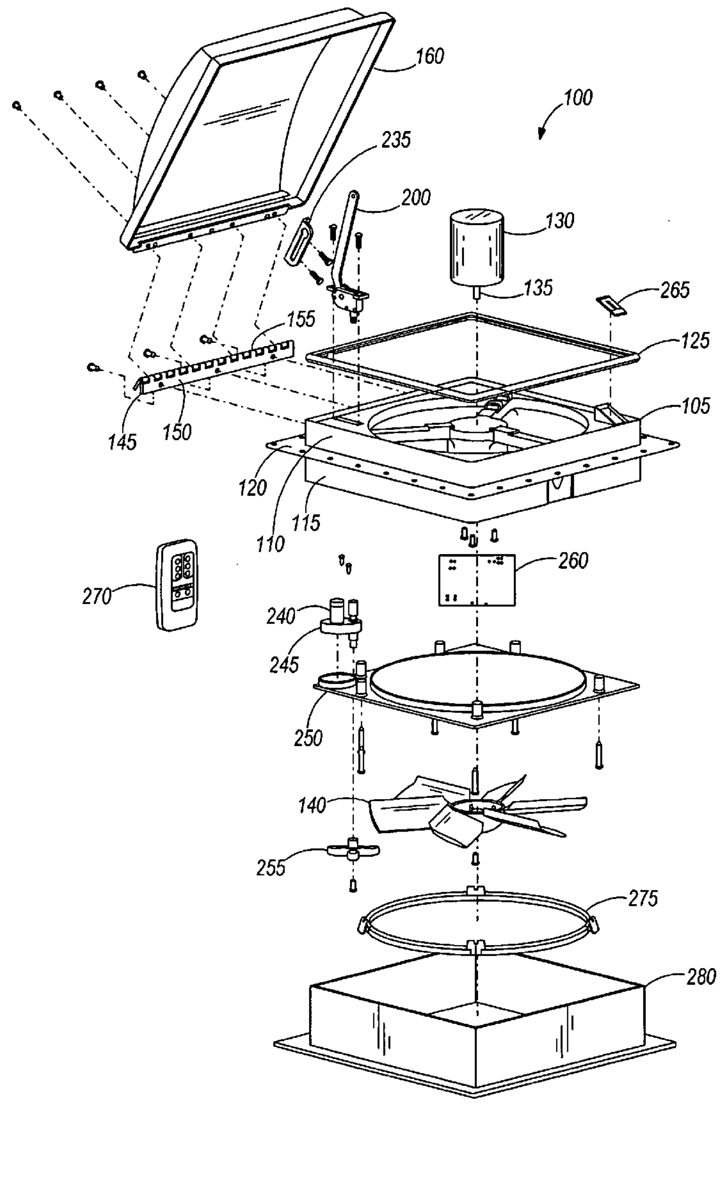
(22) Filed: **Feb. 8, 2006**

Publication Classification

(51) Int. Cl.
F24F 7/00 (2006.01)
(52) U.S. Cl. **454/273**

(57) ABSTRACT

A remote-controlled ventilating system and method. The method can include remotely controlling a ventilation system in a recreational vehicle having a wall and a ceiling. The method can include coupling a fan and a dome to at least one of the wall and the ceiling of the recreational vehicle. The fan and the dome can be connected to a controller. The method can also include transmitting a signal from a remote control to the controller in order to operate the fan and the dome.



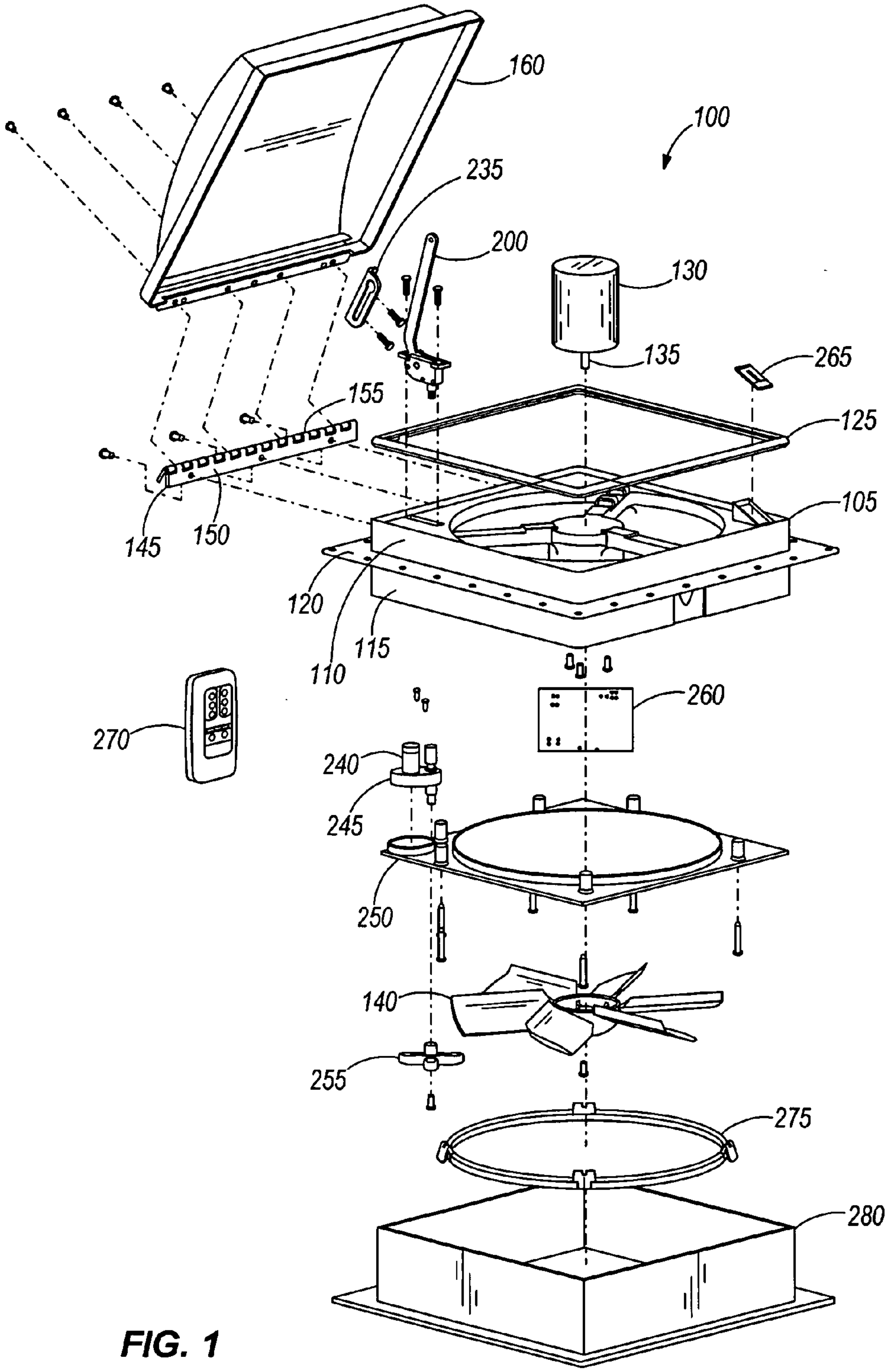

160
100
235
200
130
135
265
155
125
105
145
150
120
110
115
270
260
240
245
250
140
255
275
280

FIG. 1

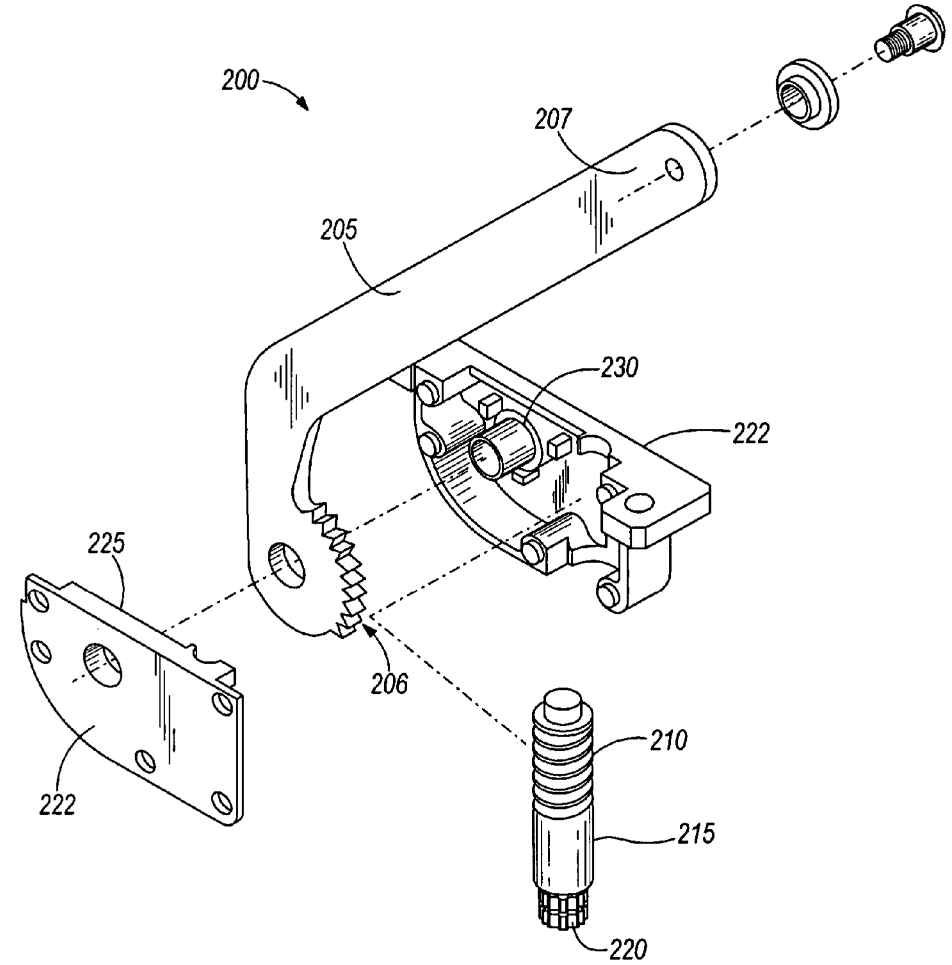


FIG. 2

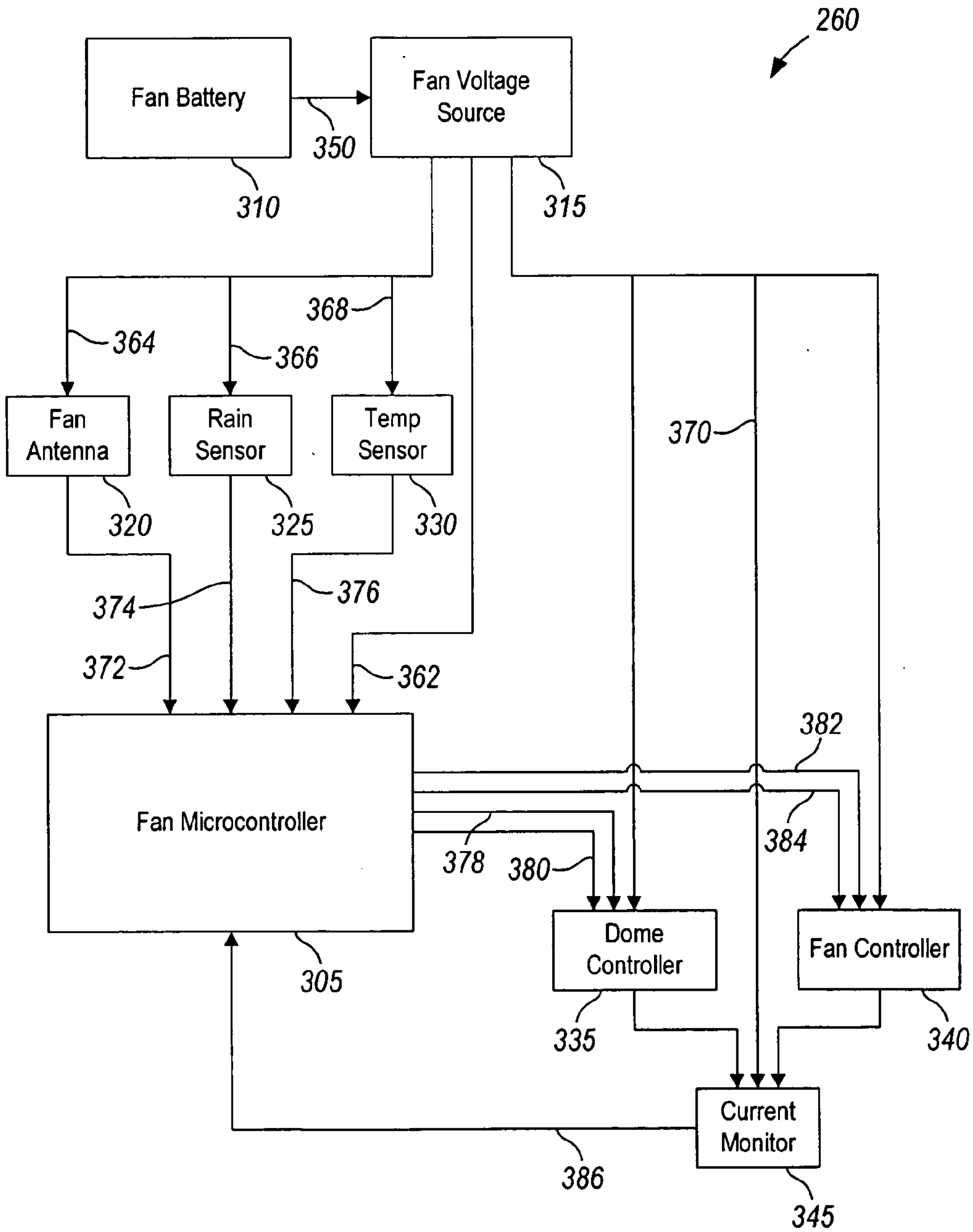

260
Fan Battery
Fan Voltage Source
350
310
315
368
364
366
Fan Antenna
Rain Sensor
Temp Sensor
370
320
325
330
374
376
372
362
382
Fan Microcontroller
384
378
380
Dome Controller
Fan Controller
305
335
340
Current Monitor
386
345

FIG. 3

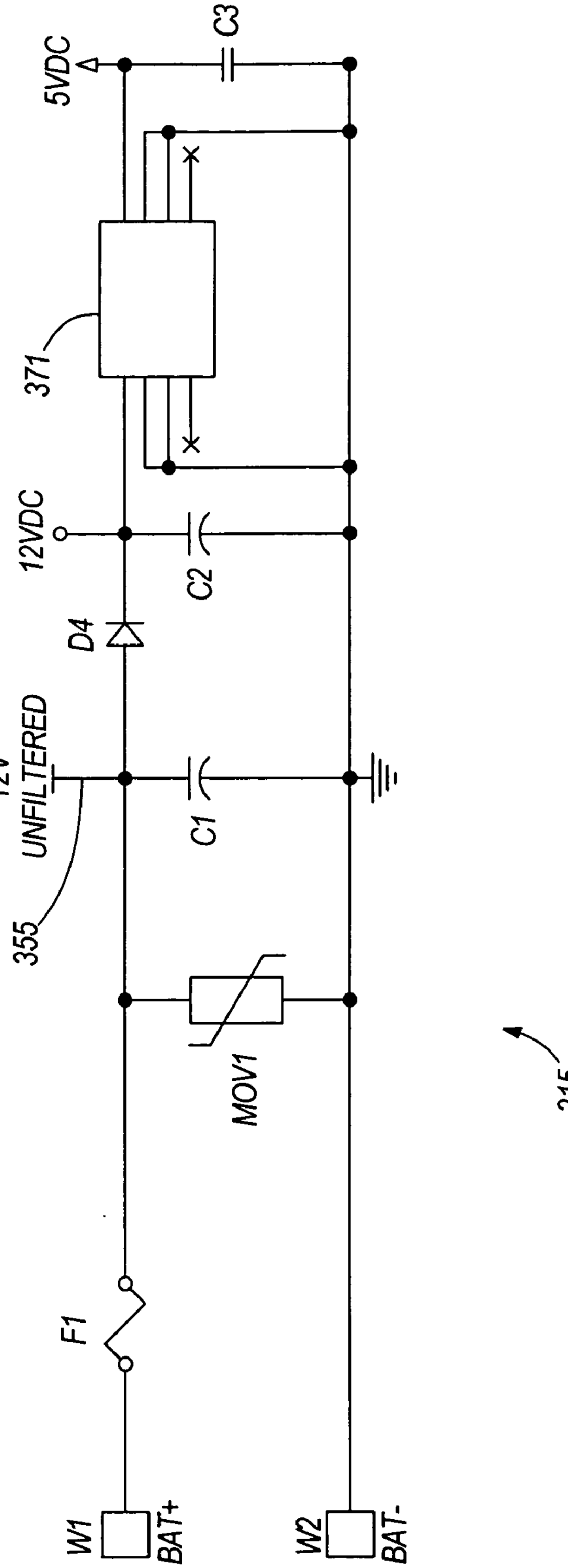

5VDC
C3
371
12VDC
C2
D4
12V
UNFILTERED
C1
355
MOV1
315
F1
W1
BAT+
W2
BAT-

FIG. 4

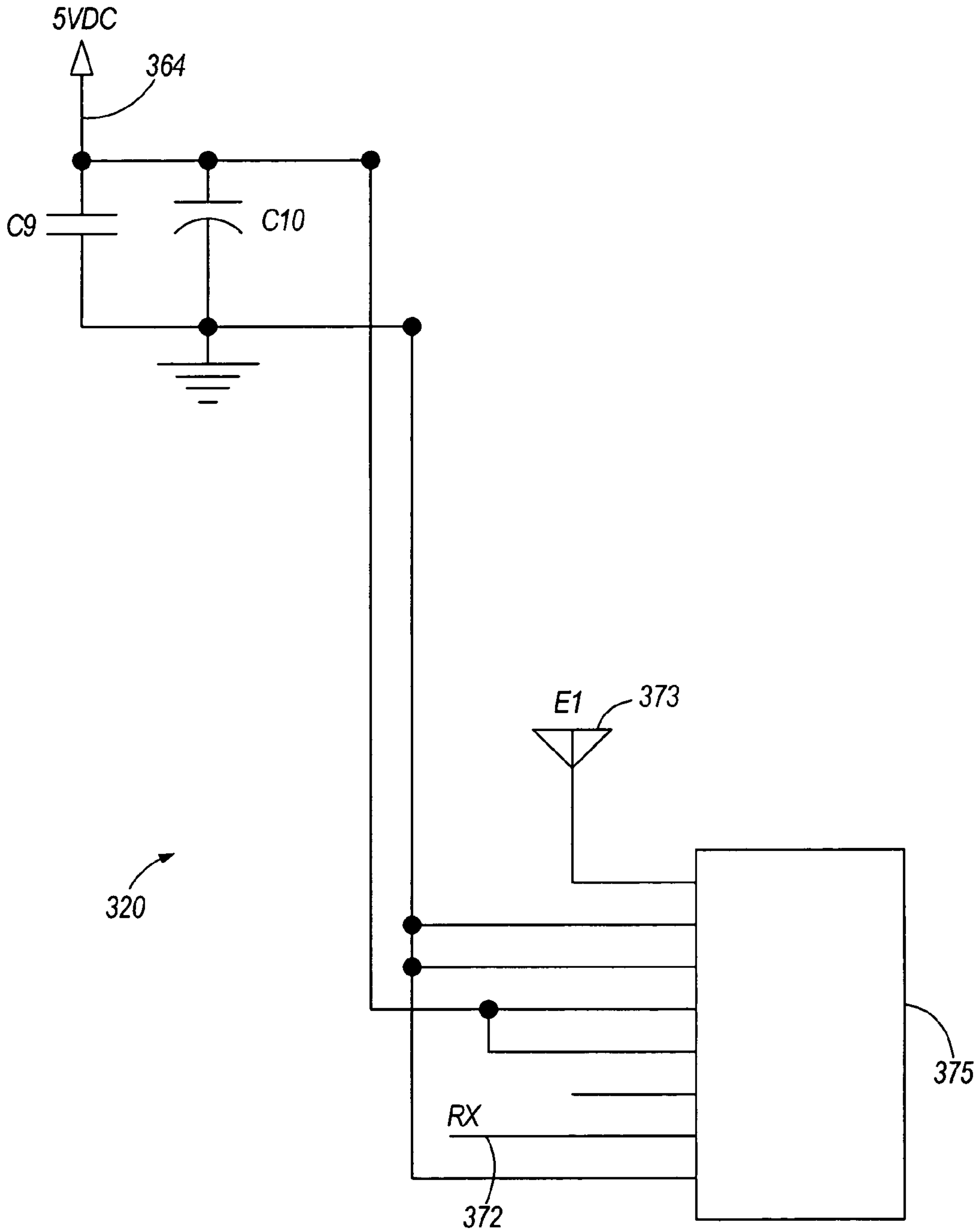


FIG. 5

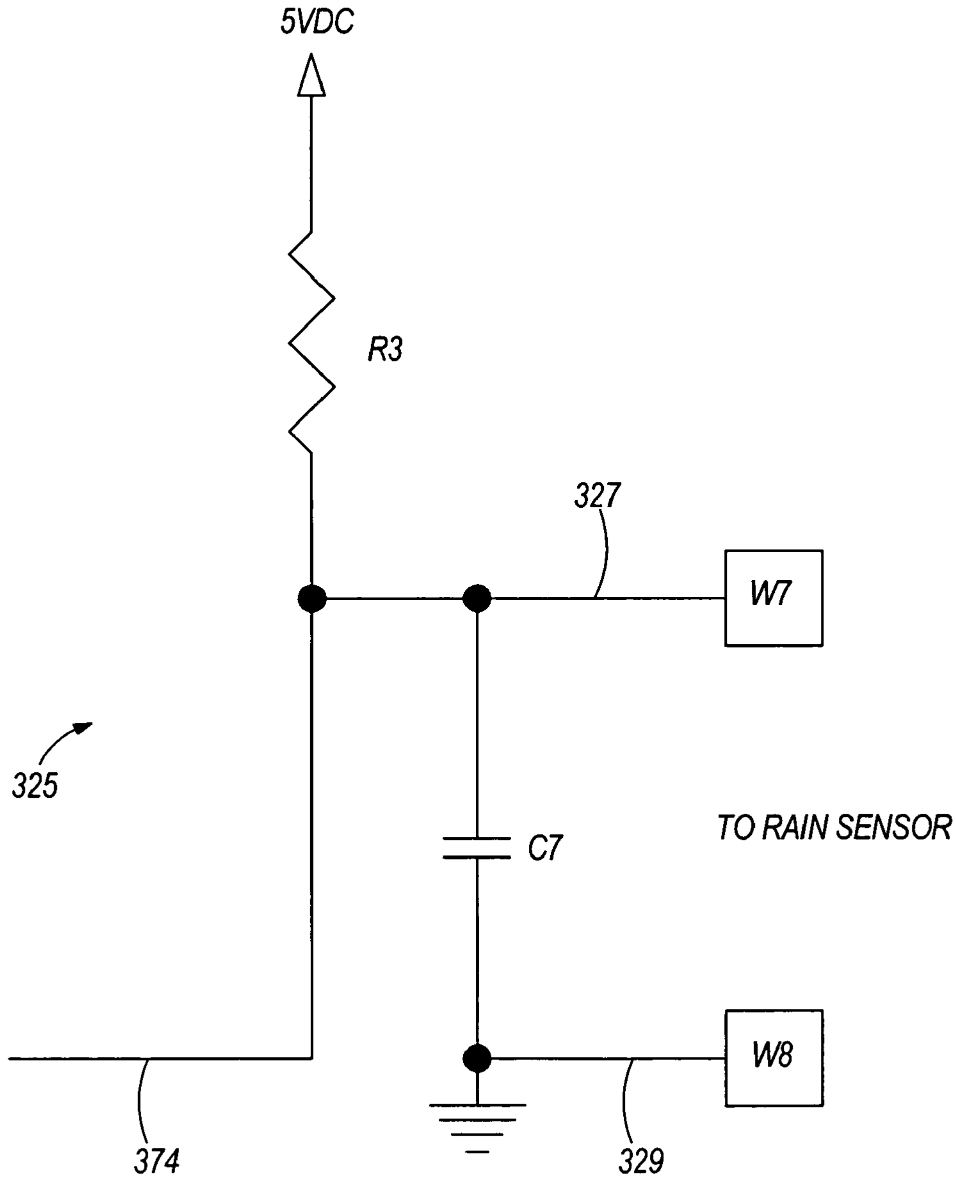
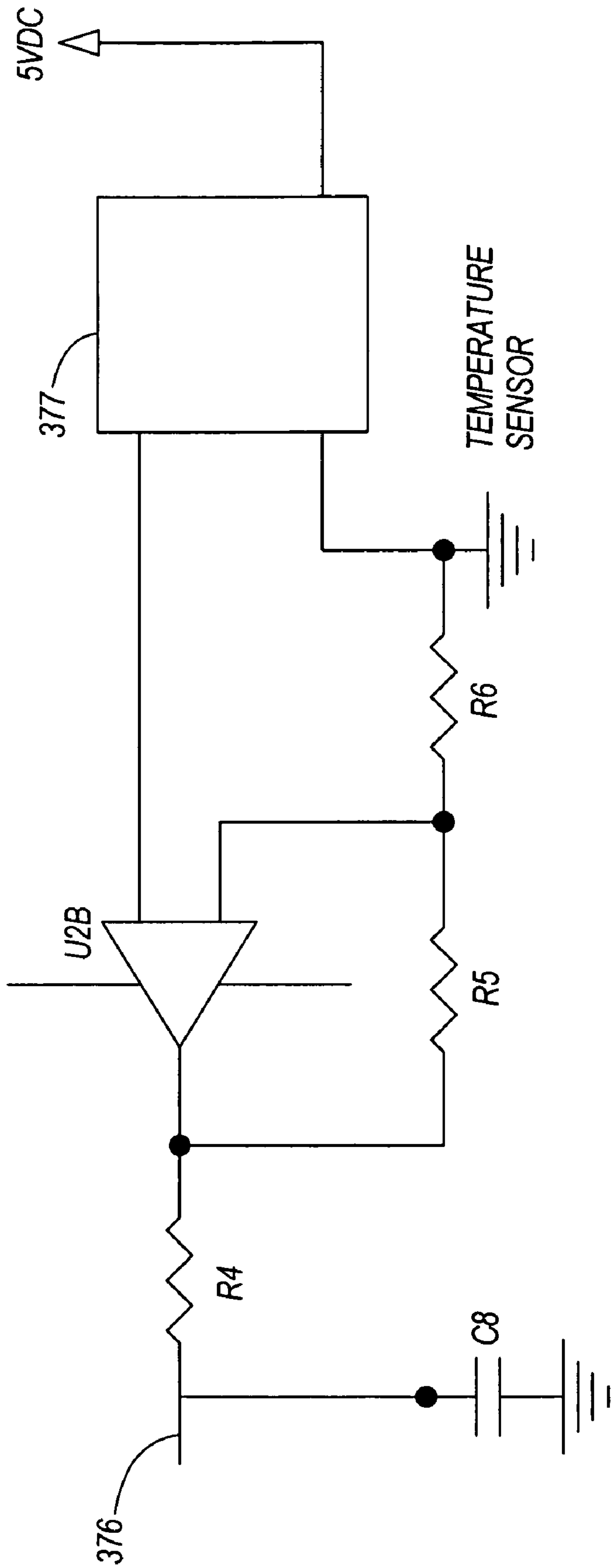


FIG. 6



330

FIG. 7

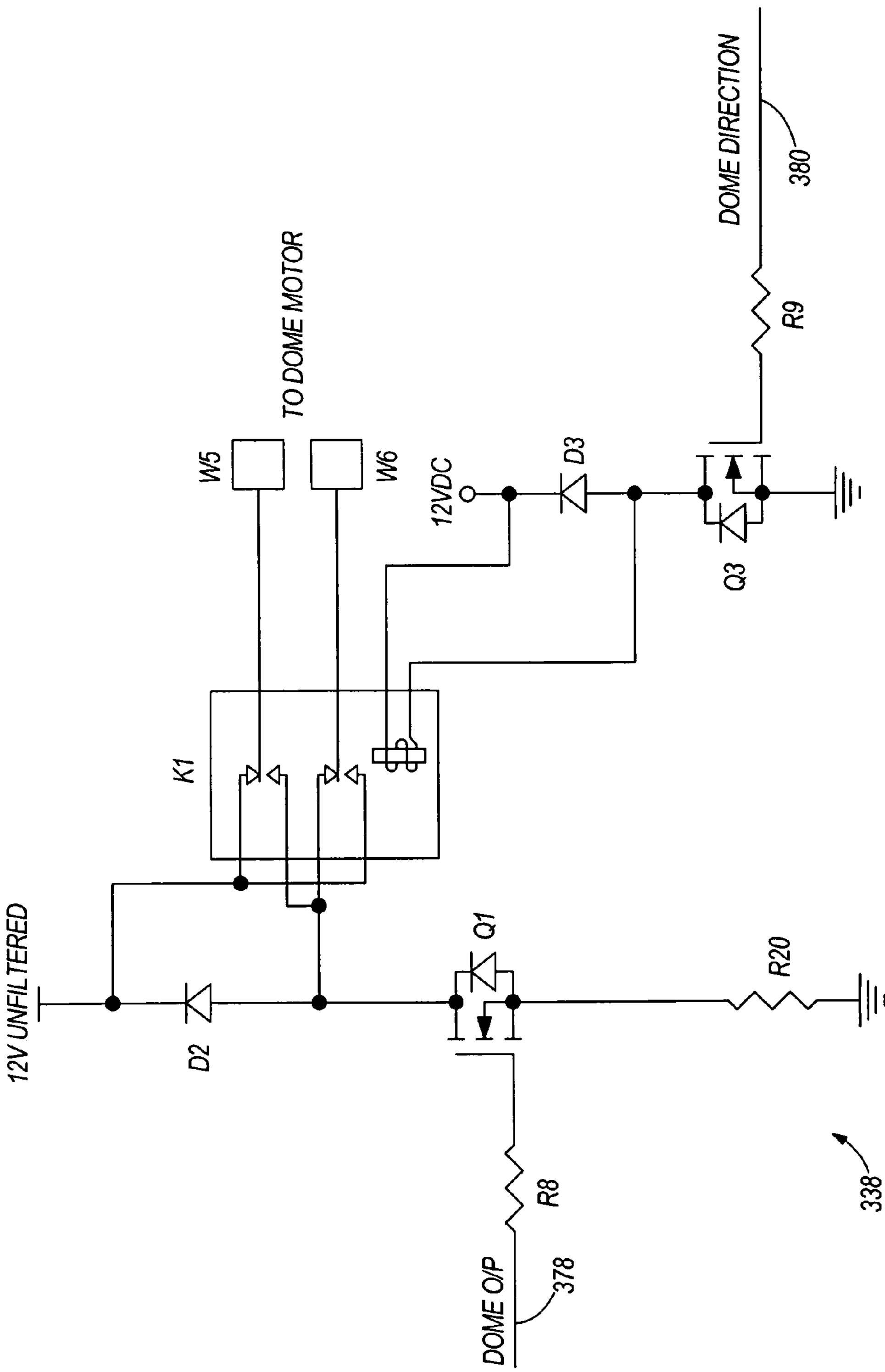

DOME DIRECTION
380
R9
TO DOME MOTOR
W5
W6
12VDC
D3
Q3
K1
12V UNFILTERED
D2
Q1
R20
R8
DOME O/P
378
338

FIG. 8

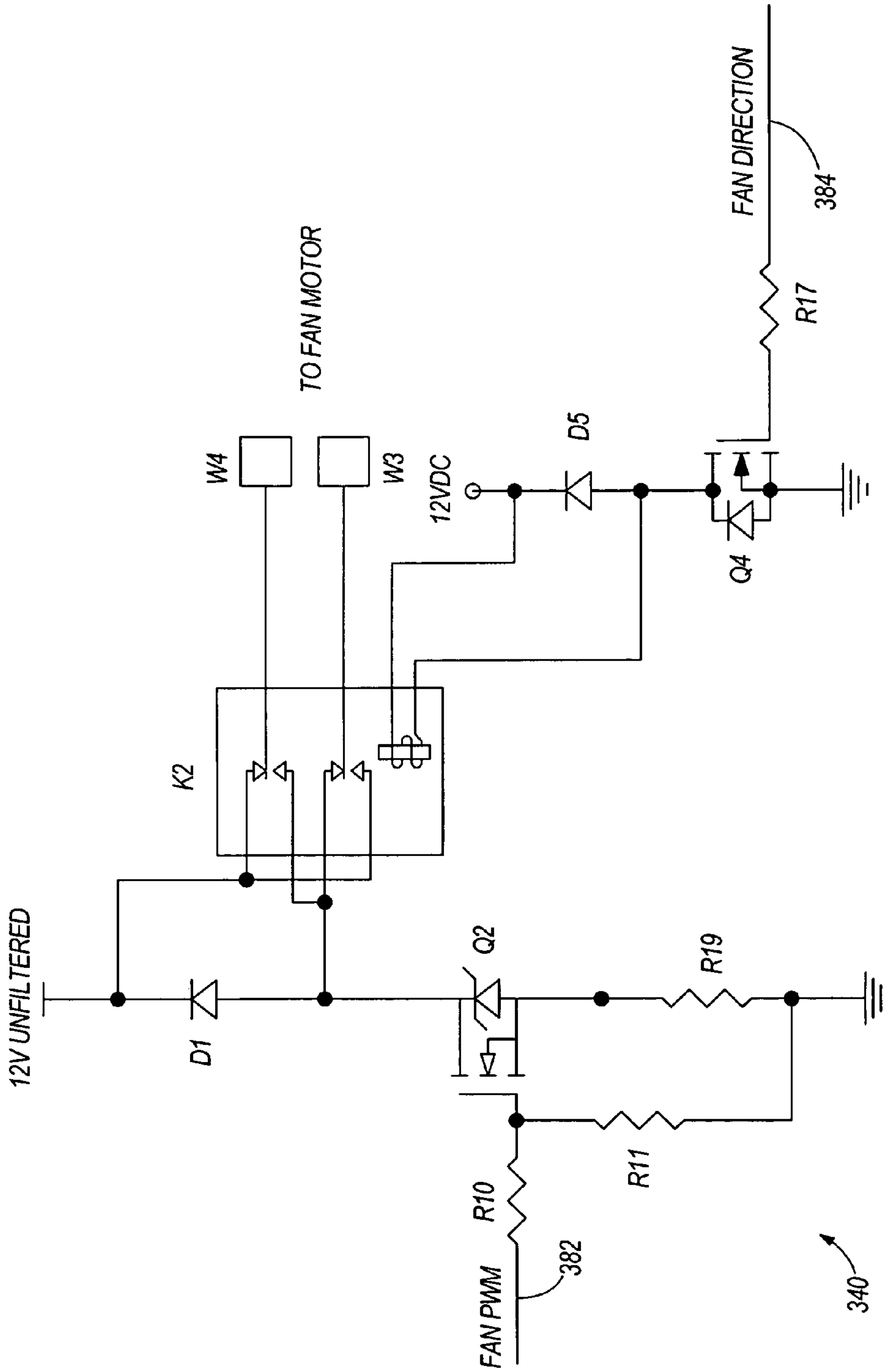

TO FAN MOTOR
W4
W3
12VDC
D5
FAN DIRECTION
384
R17
Q4
K2
12V UNFILTERED
D1
Q2
R19
R10
R11
FAN PWM
382
340

FIG. 9

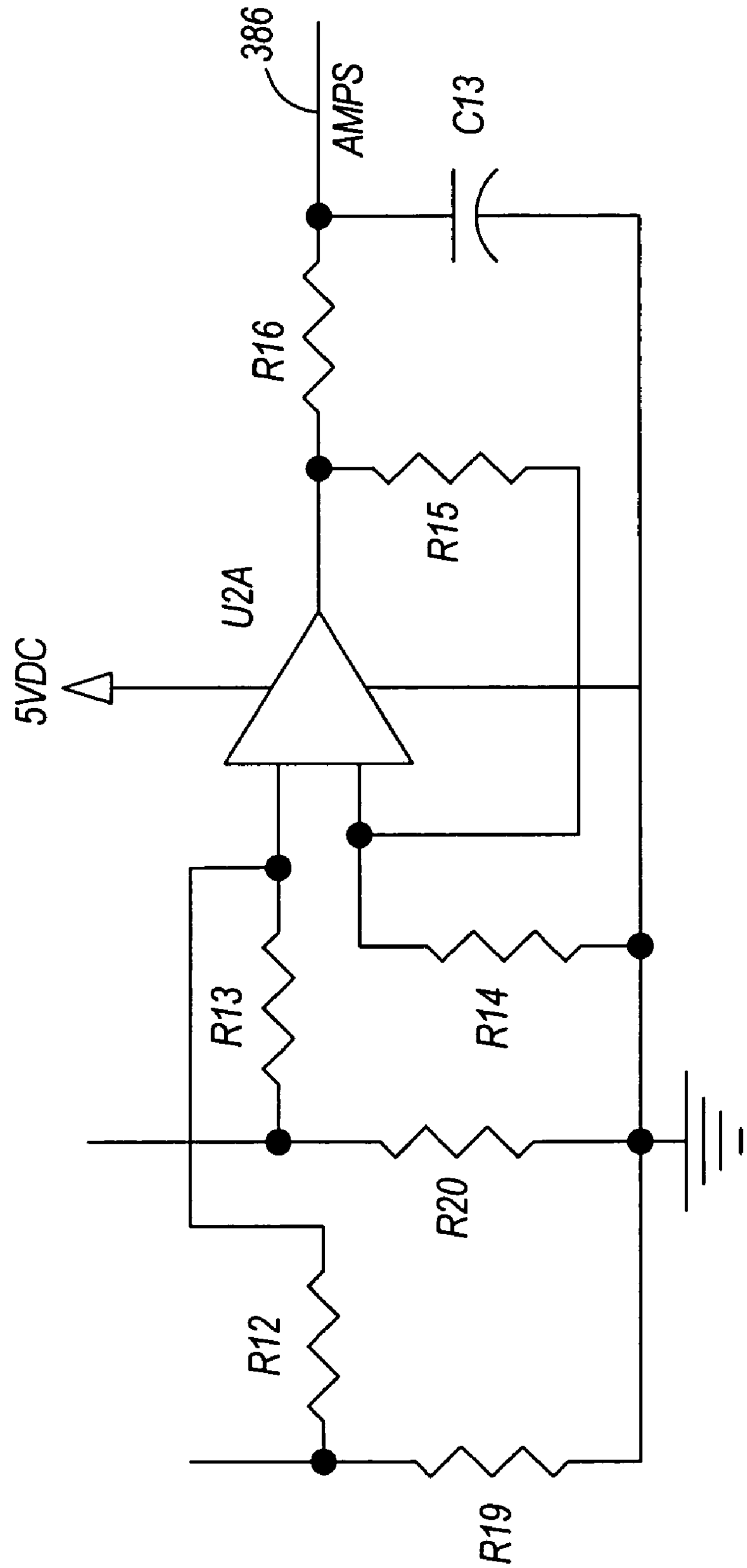


FIG. 10

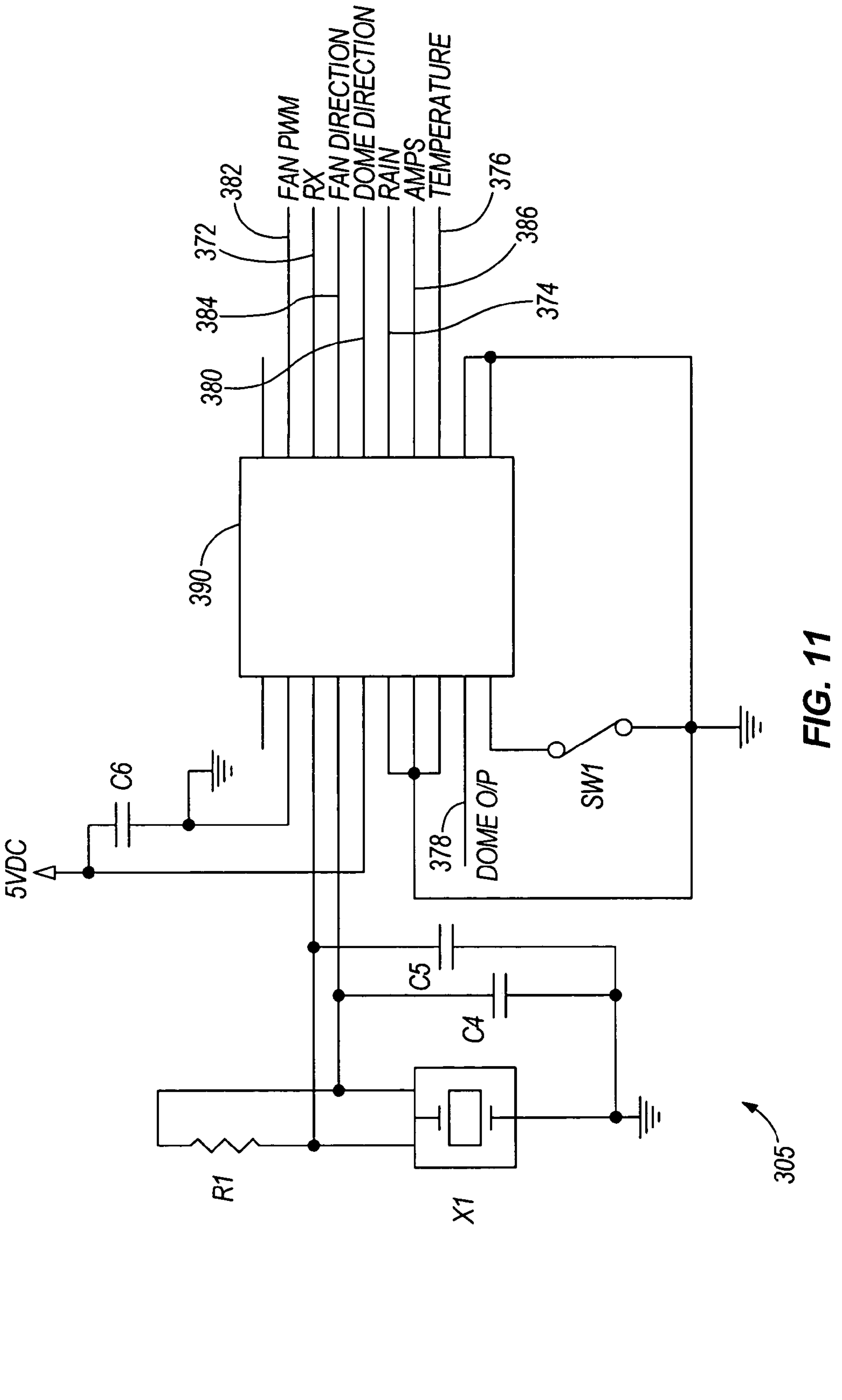

FAN PWM
RX
FAN DIRECTION
DOME DIRECTION
RAIN
AMPS
TEMPERATURE
382
372
384
380
374
386
376
390
5VDC
C6
378
DOME O/P
SW1
C5
C4
R1
X1
305

FIG. 11

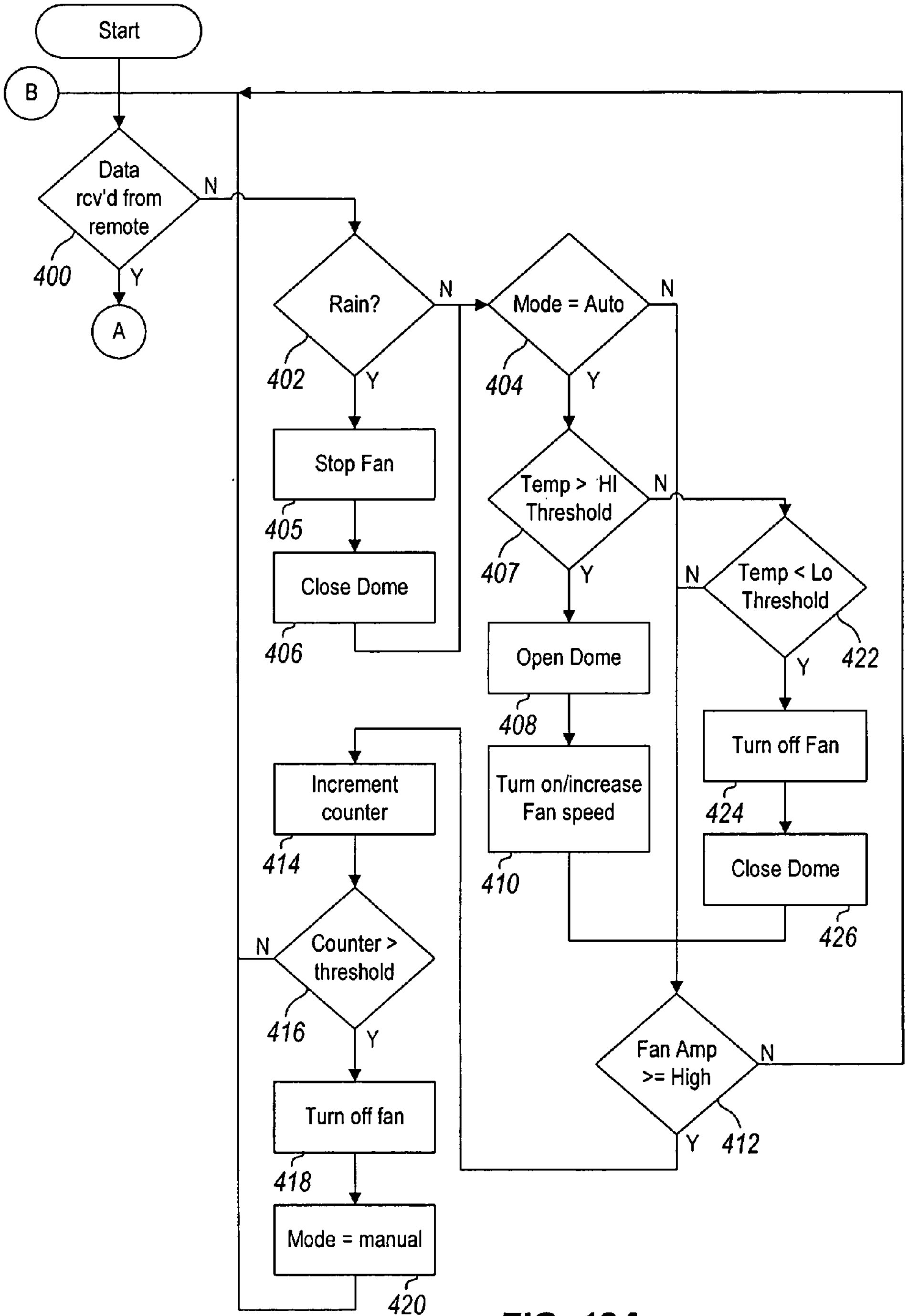

Start
B
Data rcv'd from remote
400
N
Y
A
Rain?
402
Y
N
Stop Fan
405
Close Dome
406
Mode = Auto
404
Y
N
Temp > HI Threshold
407
Y
N
Open Dome
408
Turn on/increase Fan speed
410
Temp < Lo Threshold
422
N
Y
Turn off Fan
424
Close Dome
426
Increment counter
414
Counter > threshold
416
N
Y
Turn off fan
418
Mode = manual
420
Fan Amp >= High
412
N
Y

FIG. 12A

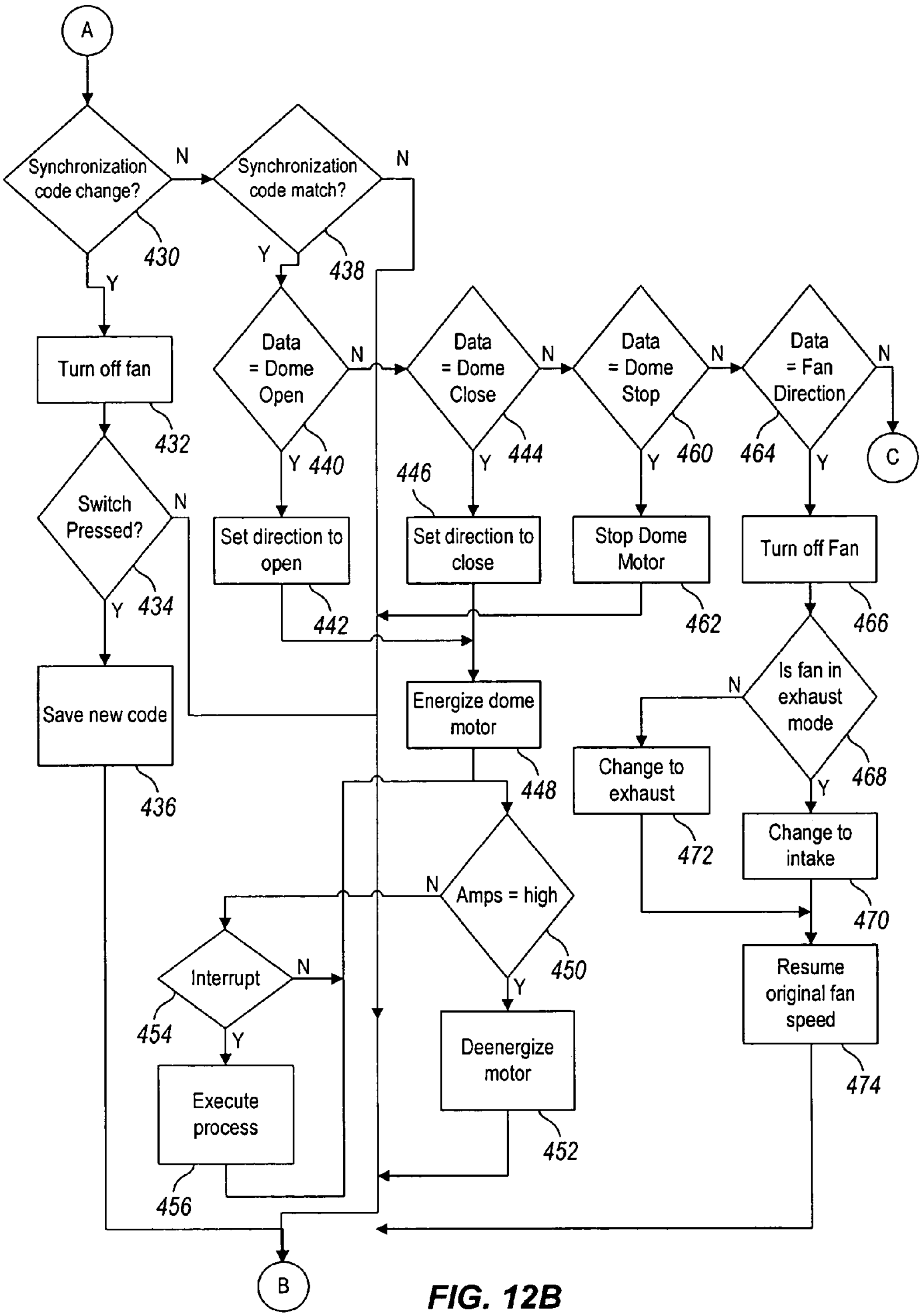

A
Synchronization code change?
N
430
Y
Turn off fan
432
Switch Pressed?
N
434
Y
Save new code
436
Synchronization code match?
N
438
Y
Data = Dome Open
N
440
Y
Set direction to open
442
Data = Dome Close
N
444
Y
446
Set direction to close
Data = Dome Stop
N
460
Y
Stop Dome Motor
462
Data = Fan Direction
N
464
Y
C
Turn off Fan
466
Is fan in exhaust mode
N
468
Y
Change to exhaust
472
Change to intake
470
Resume original fan speed
474
Energize dome motor
448
Amps = high
N
450
Y
Deenergize motor
452
Interrupt
N
454
Y
Execute process
456
B

FIG. 12B

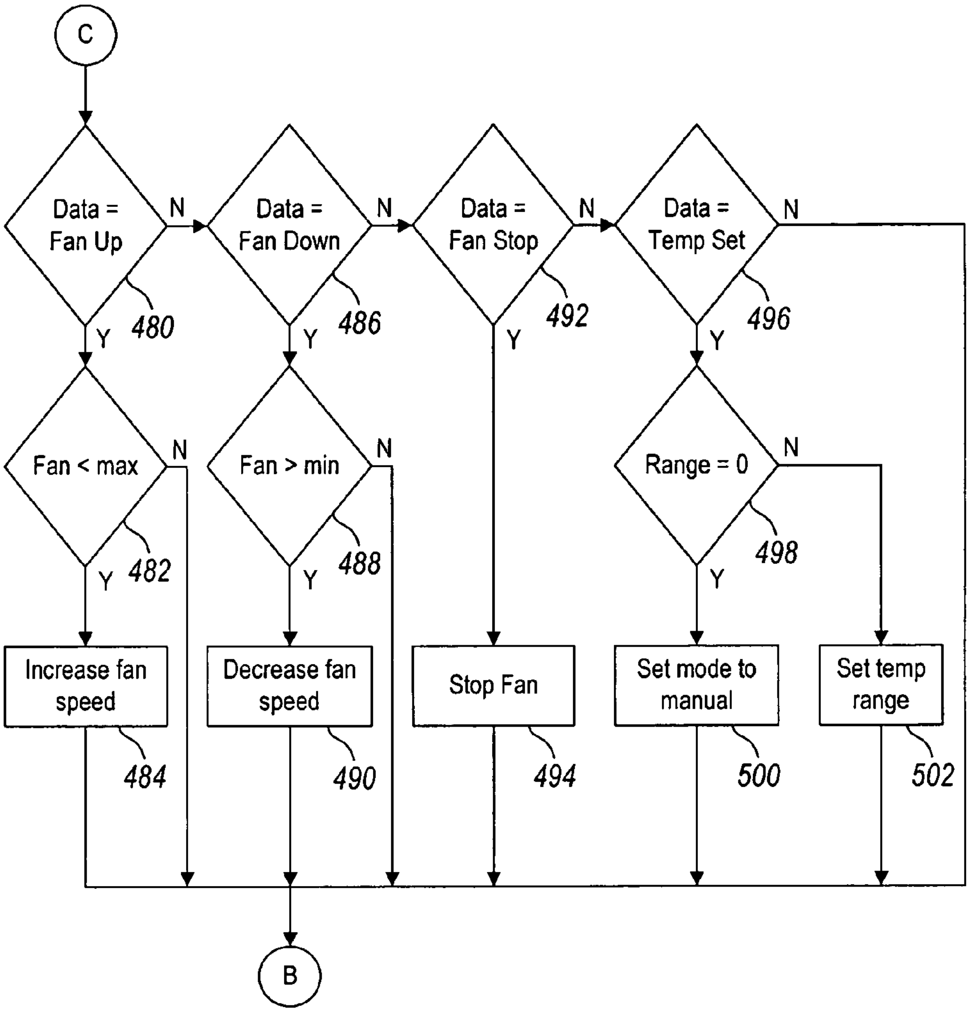

C
Data = Fan Up
N
Y
480
Data = Fan Down
N
Y
486
Data = Fan Stop
N
Y
492
Data = Temp Set
N
Y
496
Fan < max
N
Y
482
Fan > min
N
Y
488
Range = 0
N
Y
498
Increase fan speed
484
Decrease fan speed
490
Stop Fan
494
Set mode to manual
500
Set temp range
502
B

FIG. 12C

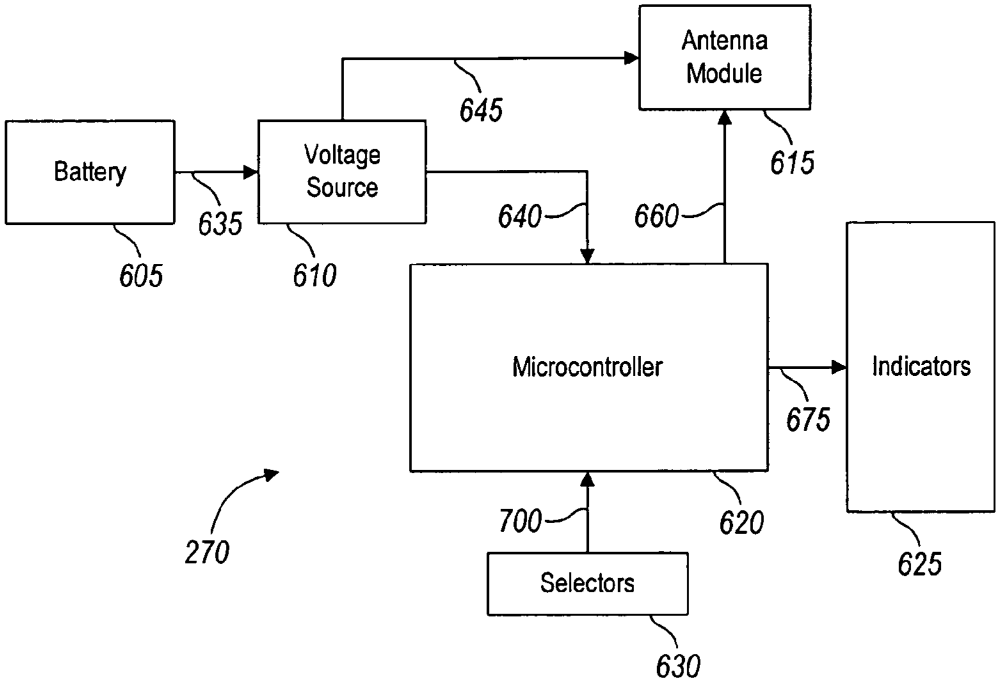

Antenna
Module
645
615
Battery
635
Voltage
Source
640
660
605
610
Microcontroller
Indicators
675
270
700
620
625
Selectors
630

FIG. 13

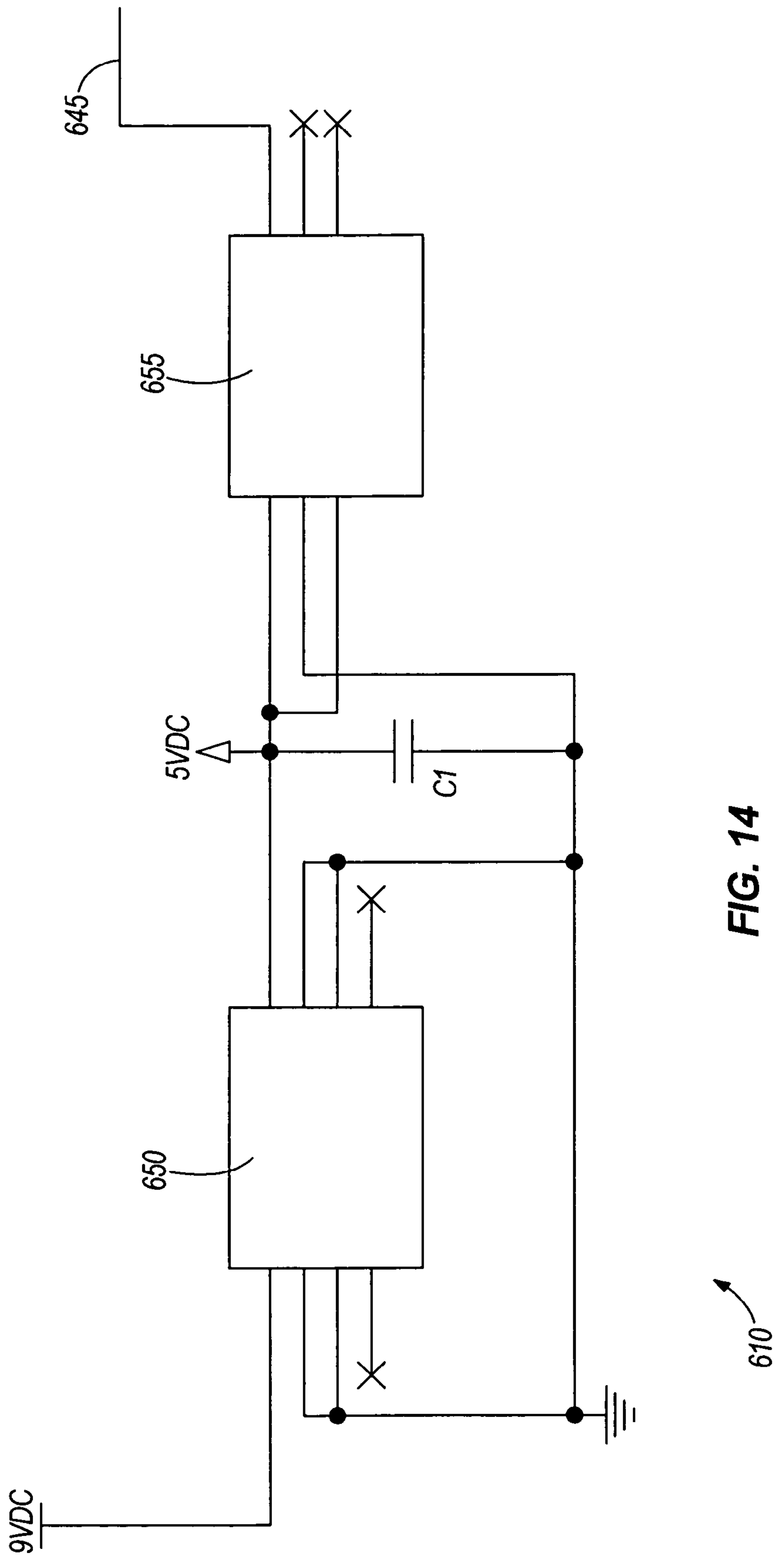


FIG. 14

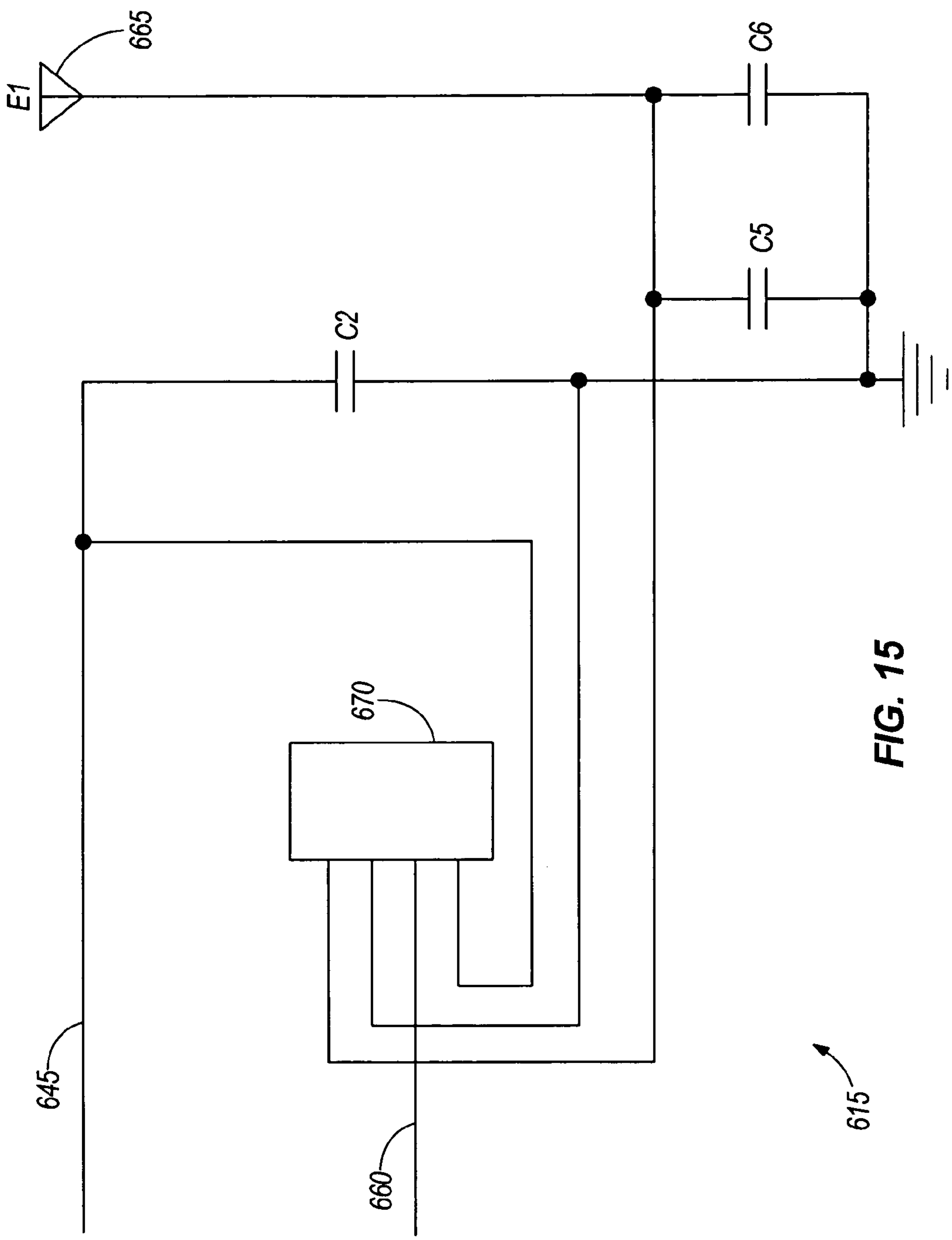


FIG. 15

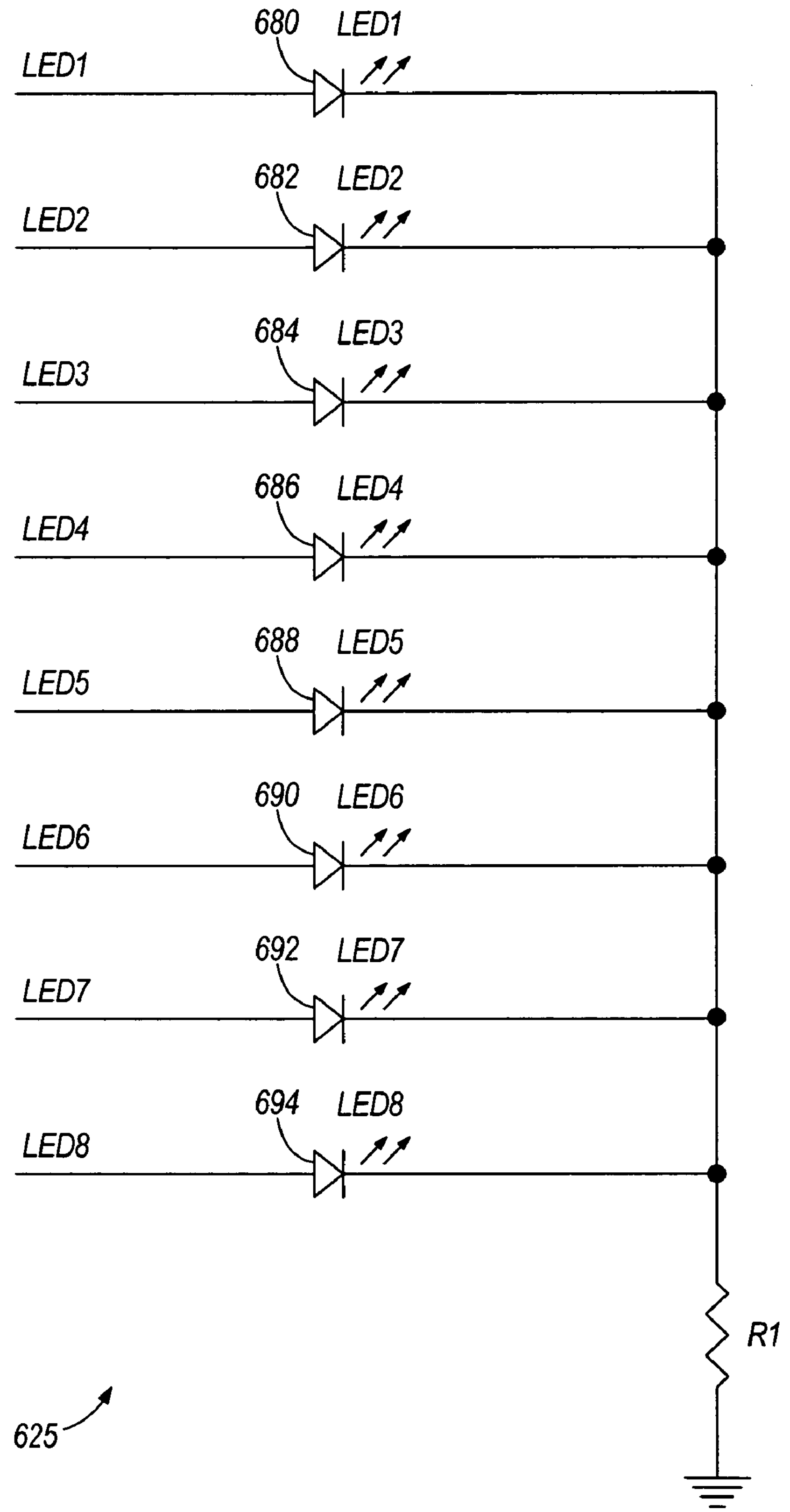

680
LED1
LED1
682
LED2
LED2
684
LED3
LED3
686
LED4
LED4
688
LED5
LED5
690
LED6
LED6
692
LED7
LED7
694
LED8
LED8
R1
625

FIG. 16

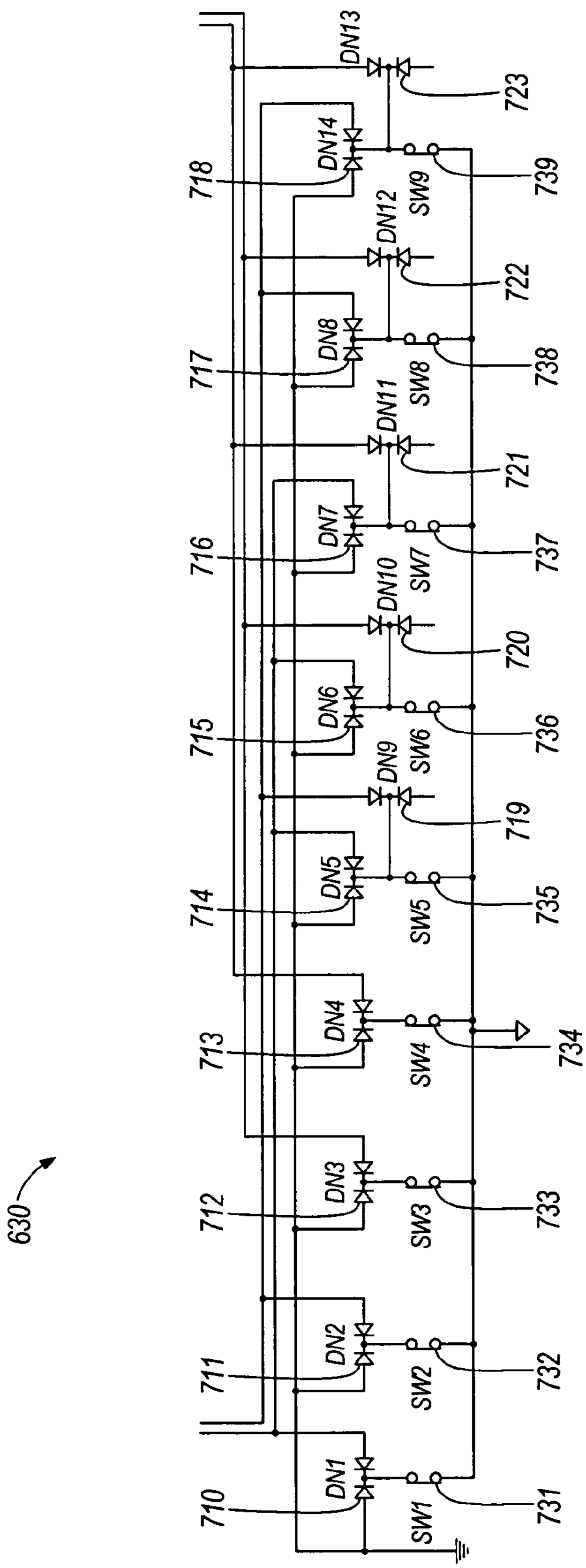

630
DN1
DN2
DN3
DN4
DN5
DN6
DN7
DN8
DN9
DN10
DN11
DN12
DN13
DN14
SW1
SW2
SW3
SW4
SW5
SW6
SW7
SW8
SW9
710
711
712
713
714
715
716
717
718
719
720
721
722
723
731
732
733
734
735
736
737
738
739

FIG. 17

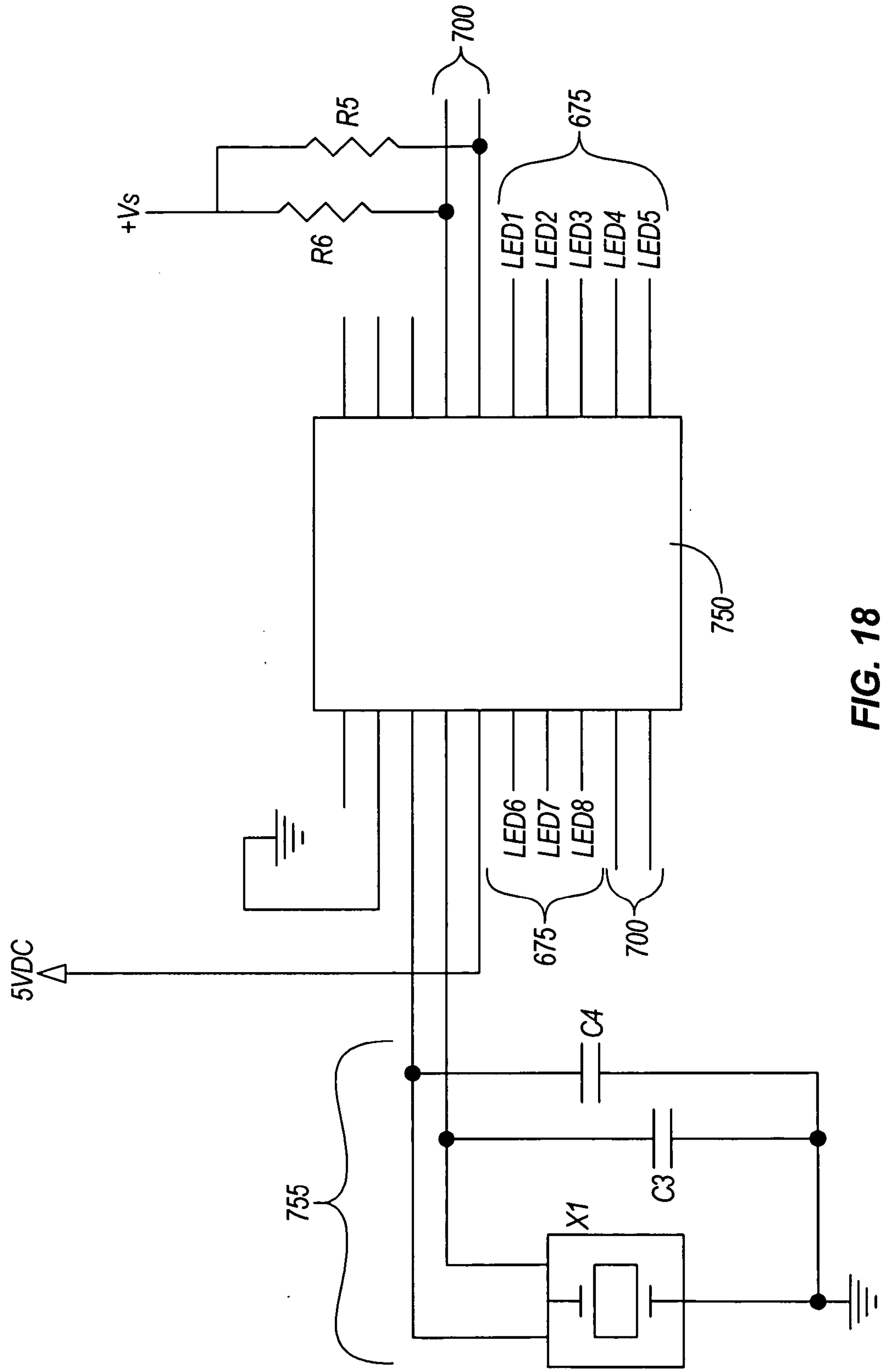

700
R5
675
+Vs
R6
LED1
LED2
LED3
LED4
LED5
750
LED6
LED7
LED8
675
700
5VDC
C4
C3
X1
755

FIG. 18

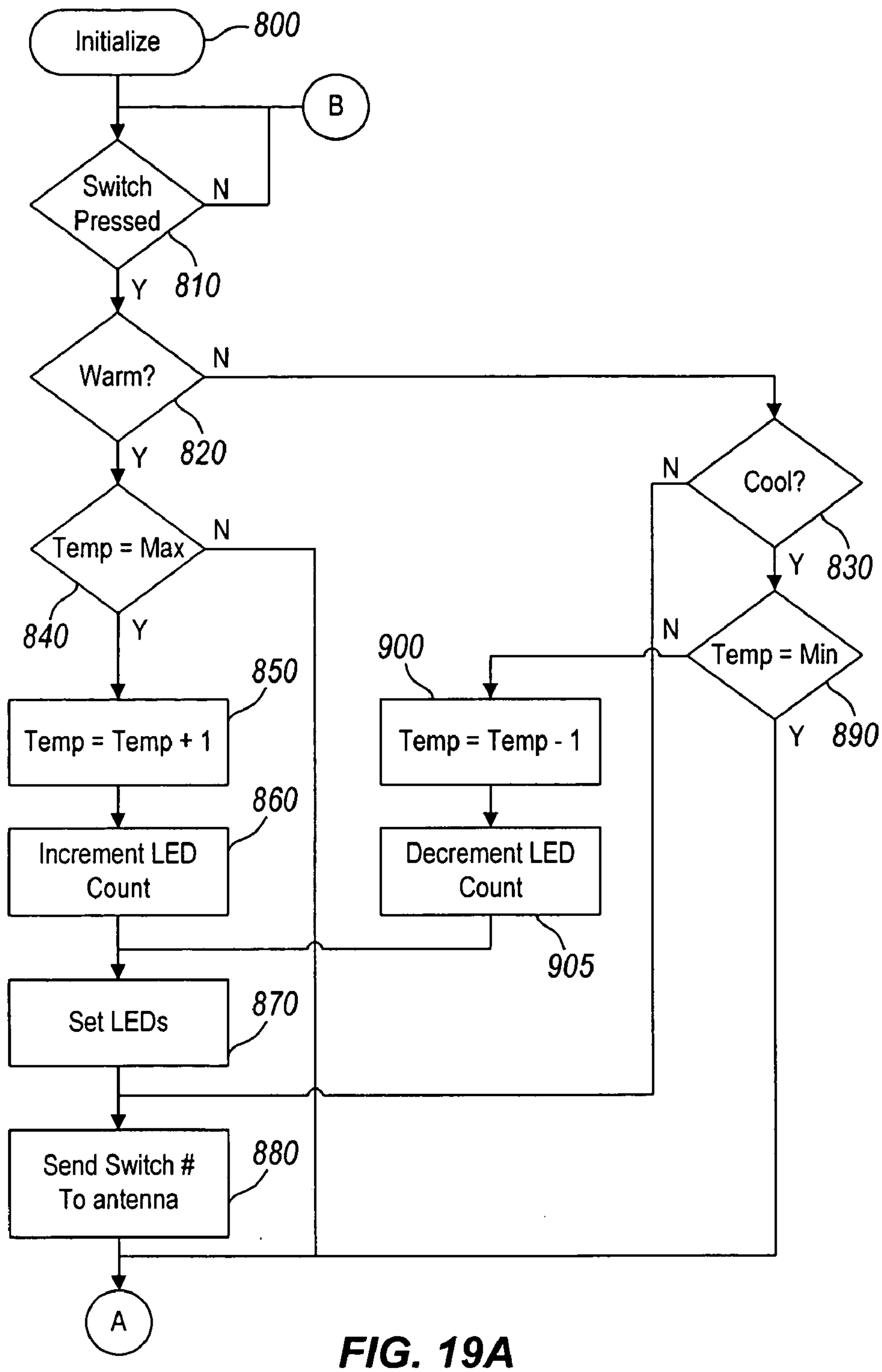

Initialize
800
B
Switch Pressed
N
Y
810
Warm?
N
Y
820
Cool?
N
Y
830
Temp = Max
N
Y
840
900
Temp = Min
N
Y
890
850
Temp = Temp + 1
Temp = Temp - 1
860
Increment LED Count
Decrement LED Count
905
870
Set LEDs
880
Send Switch # To antenna
A

FIG. 19A

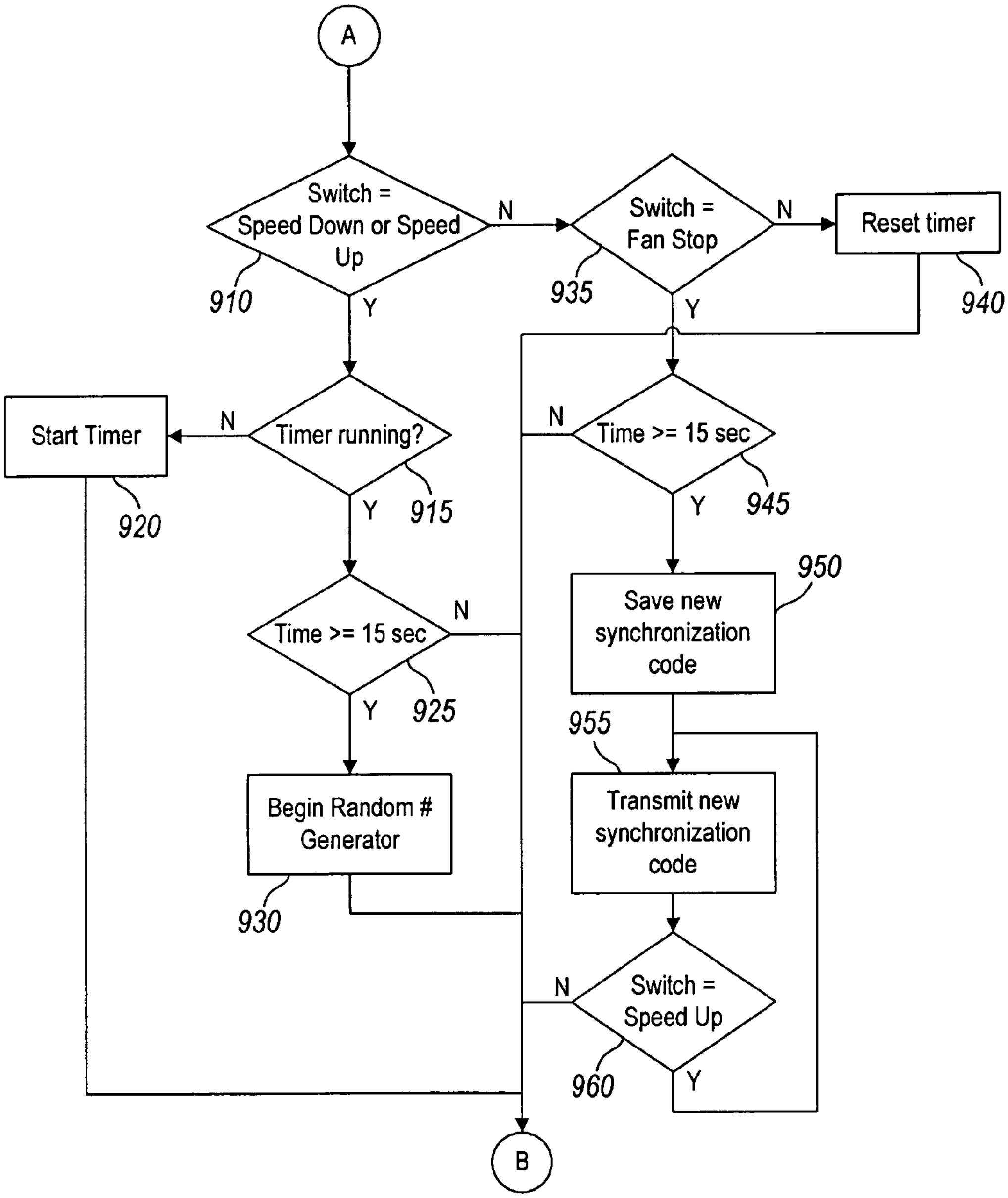

A
Switch = Speed Down or Speed Up
910
N
Y
Switch = Fan Stop
935
N
Y
Reset timer
940
Start Timer
920
N
Timer running?
915
Y
Time >= 15 sec
925
N
Y
Begin Random # Generator
930
N
Time >= 15 sec
945
Y
Save new synchronization code
950
955
Transmit new synchronization code
N
Switch = Speed Up
960
Y
B

FIG. 19B

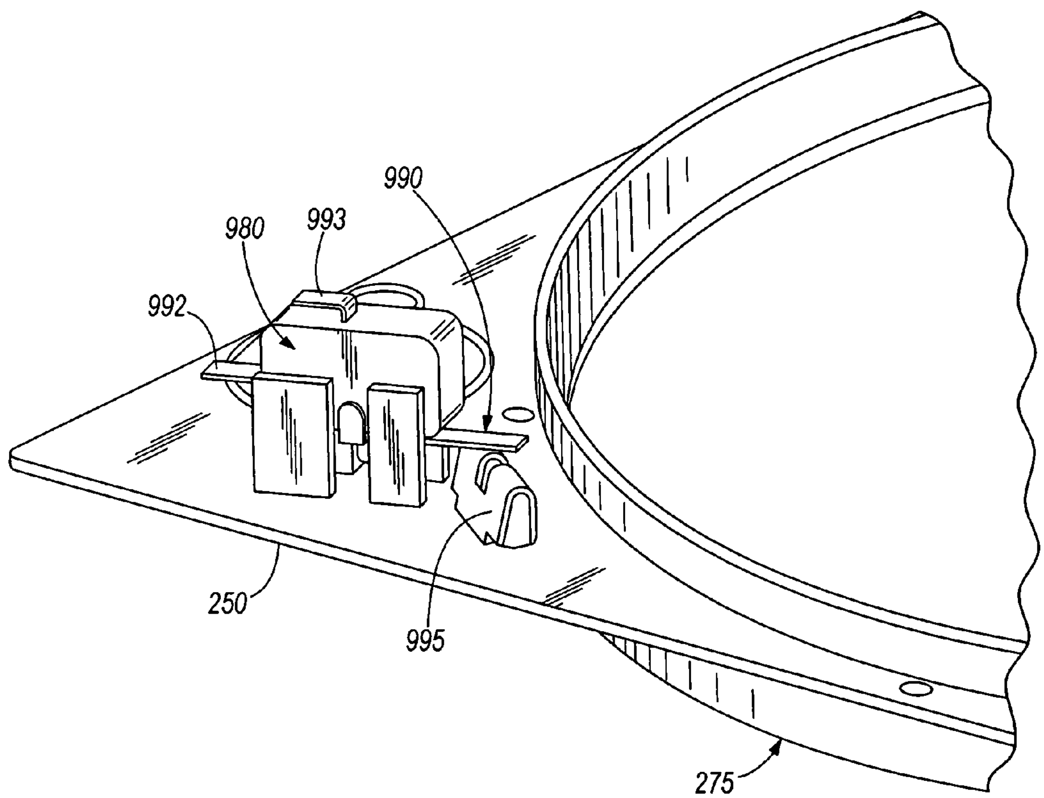


FIG. 20

REMOTE CONTROL VENTILATOR SYSTEM AND METHOD

BACKGROUND OF THE INVENTION

[0001] Recreational vehicles (RVs) generally include some type of ventilation system. While some RVs have full air-conditioning systems, many use a ventilation system including only a fan and a vent. Conventional fan and vent systems require the occupant to manually operate the fan. Several manual adjustments of the fan may be required until the desired cooling or ventilation effect is achieved.

SUMMARY OF THE INVENTION

[0002] Some embodiments of the invention provide a remotely-controlled ventilation system for use in a recreational vehicle having a ceiling and a wall. The system can include a chassis mounted to at least one of the ceiling and the wall of the recreational vehicle, a fan coupled to the chassis, and a dome coupled to the chassis. The system can also include a remote control configured to operate the fan and the dome.

[0003] In some embodiments, the invention provides a method of remotely controlling a ventilation system for use in a recreational vehicle having a wall and a ceiling. The method can include coupling a fan and a dome to at least one of the wall and the ceiling of the recreational vehicle. The fan and the dome can be connected to a controller. The method can also include transmitting a signal from a remote control to the controller in order to operate the fan and the dome.

[0004] Other aspects of the invention will become apparent by consideration of the detailed description and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] FIG. **1** is an exploded perspective view of a remote-controlled ventilation system according to one embodiment of the invention.

[0006] FIG. **2** is an exploded perspective view of a lift arm assembly for use with the remote-controlled ventilation system of FIG. **1**.

[0007] FIG. **3** is a schematic illustration of a control system for use with the remote controlled ventilation system of FIG. **1**.

[0008] FIG. **4** is a schematic illustration of a voltage source for use with the control system of FIG. **3**.

[0009] FIG. **5** is a schematic illustration of an antenna module for use with the control system of FIG. **3**.

[0010] FIG. **6** is a schematic illustration of a rain sensor module for use with the control system of FIG. **3**.

[0011] FIG. **7** is a schematic illustration of a temperature sensor module for use with the control system of FIG. **3**.

[0012] FIG. **8** is a schematic illustration of a dome control module for use with the control system of FIG. **3**.

[0013] FIG. **9** is a schematic illustration of a fan control module for use with the control system of FIG. **3**.

[0014] FIG. **10** is a schematic illustration of a current monitoring module for use with the control system of FIG. **3**.

[0015] FIG. **11** is a schematic illustration of a fan microcontroller for use with the control system of FIG. **3**.

[0016] FIGS. **12**A, **12**B, and **12**C are a flow chart illustrating one embodiment of the operation of the system of FIG. **1**.

[0017] FIG. **13** is a schematic illustration of a remote control for use with the remote-controlled ventilation system of FIG. **1**.

[0018] FIG. **14** is a schematic illustration of a voltage source for use with the remote-control of FIG. **13**.

[0019] FIG. **15** is a schematic illustration of an antenna module for use with the remote-control of FIG. **13**.

[0020] FIG. **16** is a schematic illustration of an indicator module for use with the remote-control of FIG. **13**.

[0021] FIG. **17** is a schematic illustration of a selector module for use with the remote-control of FIG. **13**.

[0022] FIG. **18** is a schematic illustration of a microcontroller for use with the remote-control of FIG. **13**.

[0023] FIGS. **19**A and **19**B are a flow chart illustrating one embodiment of the operation of the remote-control of FIG. **13**.

[0024] FIG. **20** is an exemplary perspective view of a snap-in screen, a panel, and a microswitch of a remote-controlled ventilation system according to one embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0025] Before any embodiments of the invention are explained in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangement of components set forth in the following description or illustrated in the following drawings. The invention is capable of other embodiments and of being practiced or of being carried out in various ways. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting. The use of "including,""comprising," or "having" and variations thereof herein is meant to encompass the items listed thereafter and equivalents thereof as well as additional items. Unless specified or limited otherwise, the terms "mounted,""connected,""supported," and "coupled" and variations thereof are used broadly and encompass both direct and indirect mountings, connections, supports, and couplings. Further, "connected" and "coupled" are not restricted to physical or mechanical connections or couplings.

[0026] In addition, embodiments of the invention include both hardware and electronic components or modules that, for purposes of discussion, may be illustrated and described as if the majority of the components were implemented solely in hardware. However, one of ordinary skill in the art, and based on a reading of this detailed description, would recognize that, in at least one embodiment, the electronic based aspects of the invention may be implemented in software. As such, it should be noted that a plurality of hardware and software based devices, as well as a plurality of different structural components may be utilized to implement the invention. Furthermore, and as described in subsequent paragraphs, the specific mechanical configurations illustrated in the drawings are intended to exemplify embodiments of the invention and that other alternative mechanical configurations are possible.

[0027] FIG. **1** illustrates a remote-controlled ventilation system **100** according to one embodiment of the invention. The remote-controlled ventilation system **100** can be coupled to the ceiling (and/or roof) or a wall of a RV. The remote-controlled ventilation system **100** is also suitable for other installations where ventilation would be desired, such as houses, boats, sheds, garages, etc.

[0028] The remote-controlled ventilation system **100** can include a chassis **105** configured to mount in an aperture (not shown). The chassis **105** is illustrated as being square in shape but can be other suitable shapes. The chassis **105** can have an outer edge **110**, an inner edge **115**, and a flange **120**. The flange **120** can be positioned circumferentially around a center portion of the chassis **105**. The outer edge **110** can be inserted through the aperture until the flange **120** contacts the edges of the aperture. The flange **120** can be fastened to the aperture by screws or other suitable fasteners, such as rivets, bolts, glue, and double-sided tape. A gasket **125** can fit over the outer edge **110** and mount to the outside of the aperture opposite the flange **120**. A water-tight seal can be formed between the gasket **125** and the chassis **105** and between the gasket **125** and the outside surface of the aperture. A fan motor **130** having an armature **135** can mount to the chassis **105**. The armature **135** can extend through the chassis **105** and can be coupled to a fan **140**.

[0029] A hinge **145** can be coupled to one side of the outer edge **110** of the chassis **105** that extends beyond the aperture. In one embodiment, screws can be used to fasten a first end **150** of the hinge **145** to the chassis **105**. A second end **155** of the hinge **145** can attach to a dome or lid **160**, which can have a generally curved, convex shape, a flat shape, or other suitable shapes. The outer dimensions of the dome **160** can be approximately equal to the outer dimensions of the chassis **105**. The dome **160** can swivel on the hinge **145** to open and/or close access to the aperture. When fully closed, the dome **160** can form a water-tight seal with the gasket **125**, preventing any water from entering the RV through the aperture.

[0030] FIG. **2** illustrates an embodiment of a lift arm assembly **200**. A lift arm **205** having a geared end **206** and a lifting end **207** can be coupled to a worm gear **210** which can be coupled to a worm gear shaft **215**. The end of the worm gear shaft **215** opposite the worm gear **210** can include a gear **220**. The gear end **206** of the lift arm **205** and the worm gear **210** of the worm gear shaft **215** can mount in a housing **222** having a first side **225** and a second side **230**.

[0031] Turning the worm gear shaft **210** in one direction can raise the lifting end **207** of the lift arm **205**, and turning the worm gear shaft **210** in the opposite direction can lower the lifting end **207** of the liftarm **205**. The housing **222** can be mounted to the chassis **105**. The end of the lift arm **205** can be coupled to a bracket **235**, which can be mounted on the dome **160**. As a result, turning the worm gear shaft **215** can raise or lower the dome **160**.

[0032] As shown in FIG. **1**, a dome motor **240**, with an attached gear head assembly **245**, can be coupled to a panel **250**, which can be coupled to the chassis **105**. When assembled, the gear of the gear head assembly **245** can engage with the gear end **220** of worm gear shaft **215**. The dome motor **240** can open and close the dome **160**. A hand crank **255** can be coupled to the gear head assembly **245** and can have a gear that can allow manual operation of the dome **160**.

[0033] A master controller **260** can be coupled to the chassis **105**. The master controller **260** can be electrically connected to the fan motor **130** and can control the speed and direction of the fan **140**. The master controller **260** can also be electrically connected to the dome motor **240** and can control its speed and direction as well. The master controller **260** can be further coupled to a rain sensor **265** (e.g., model 12-117-01 manufactured by Yantat). A temperature sensor and an antenna can be mounted on or connected to the master controller **260**. The antenna can enable the master controller **260** to receive data from a remote control **270** via a radio frequency ("RF") signal. Alternative communication methods can be used by the master controller **260** and the remote control **270**, such as infrared ("IR") or other suitable types of communication.

[0034] As shown in FIGS. **1** and **20**, a screen assembly **275** can snap into place with the panel **250**. An external flange **280** can be coupled to the chassis **105**.

[0035] In some embodiments, a microswitch **980** having a lever **990**, a first contact **992**, and a second contact **993** can be mounted on the panel **250**. The lever **990** can have a first position in which there can be an electrical open between the first contact **992** and the second contact **993**. The lever **990** can have a second position in which there can be an electrical coupling between the first contact **992** and the second contact **993**. The screen assembly **275** can have a plurality mounting clips **995** which can pass through openings in the panel **250** and can hold the screen assembly **275** in place. An opening in the panel **250** can be positioned such that when the screen assembly **275** is mounted to the panel **250**, a mounting clip **995** can engage the lever **990** and cen move the lever **990** from the first position to the second position and can electrically couple the first contact **992** to the second contact **993**.

[0036] FIG. **3** is a schematic illustration of the master controller **260** according to one embodiment of the invention. The master controller **260** can include a fan microcontroller **305**, a fan battery **310**, a fan voltage source **315**, a fan antenna module **320**, a rain sensor module **325**, a temperature sensor module **330**, a dome controller module **335**, a fan controller module **340**, and a current monitor module **345**.

[0037] In one embodiment, the fan battery **310** can be a standard 12-Volt automotive battery. The fan battery **310** can be connected to the voltage source **315** via a connection **350**. In some embodiments, the +12-Volt contact of the fan battery **310** can connect to the first contact **992** of the microswitch **980**. The second contact **993** of the microswitch **980** can connect to an overcurrent protector F**1**. When the screen assembly **275** is properly mounted, the lever **990** can be forced into its second position and the +12-Volt contact of the fan battery **310** can be electrically coupled to the overcurrent protector F**1**. When the screen assembly **275** is not mounted, or is not properly mounted, to the panel **250**, the lever **990** can be in its first position and the fan battery **310** can be electrically isolated from the overcurrent protector F**1**. Therefore, in potentially unsafe circumstances, where the screen assembly **275** is not mounted correctly, the master controller **260** can be disconnected from the battery **310** and the remote controlled ventilation system **100** can be inoperable.

[**0038**] FIG. **4** illustrates an embodiment of the fan voltage source **315**. In some embodiments, the +12-Volt contact of the fan battery **310** can connect to the overcurrent protector F**1**. In one embodiment, F**1** can be resettable and can have a trip current of 10 Amps (e.g., part number MF-R500-ND manufactured by Bourns). A transient/surge absorber MOV**1** can be coupled to both the positive and negative leads of the fan battery **310**. The transient/surge absorber MOV**1** can protect the circuits of the master controller **260** should a large current surge (e.g., lightning) occur on the fan battery **310** leads. A filter circuit including two capacitors and a diode, C**1**, C**2**, and D**4**, can filter the 12-Volt signal for the fan battery **310**. An unfiltered +12-Volt signal can be used to drive the fan motor **130** via a connection **355** and the dome motor **240** via a connection **360**. C**1** and C**2**, in some embodiments, have a capacitance of 47 uF and a maximum working voltage of 25 Vdc. Diode D**4**, in some embodiments, has a maximum working voltage of 50 Vdc.

[**0039**] As shown in FIGS. **3** and **4**, the fan voltage source **315** can convert the voltage from the fan battery **310** (i.e., +Vb) to a suitable voltage +Vs (e.g., +5 volts) for use by the fan microcontroller **305** via a connection **362**, the antenna module **320** via a connection **364**, the rain sensor module **325** via a connection **366**, the temperature sensor module **330** via a connection **368**, and the current monitor module **345** via a connection **370**. The fan voltage source **315** can include an integrated circuit (e.g., model UA **78** LO **5** CD manufactured by Texas Instruments, among others) for converting the fan battery **310** voltage to $+V_s$.

[**0040**] As shown in FIGS. **3** and **5**, the fan antenna module **320** can be coupled to the fan voltage source **315** via a connection **364**, to the fan microcontroller **305** via a connection **372**, and to a fan antenna **373**. In some embodiments, the fan antenna **373** can be implemented as a trace on a printed circuit board. In some embodiments, the fan antenna **373** can be positioned inside the chassis **105**. The antenna **373** can be any antenna capable of receiving the type of signal transmitted by the remote control **270**. The fan antenna module **320** can convert RF signals received by the fan antenna **373** into digital data signals and can supply them to the fan microcontroller **305** via a connection **372**. The fan antenna module **320** can include an integrated circuit **375** (e.g., model RCR-433-RP manufactured by Radiotronix, among others). The fan antenna module **320** can include filtering capacitors C**9** and C**10** (e.g., having a capacitance of 0.1uF and 4.7 uF, respectively) for the +5-Volt from the fan voltage source **315**.

[**0041**] FIG. **6** illustrates an embodiment of a rain sensor module **325**. The rain sensor module **325** can include the rain sensor **265** (as shown in FIG. **1**) mounted remotely from the master controller **260**. As shown in FIG. **6**, a pull-up resistor R**3** (e.g., 51.0 k Ω) can be connected to one lead **327** of the rain sensor **265**. The other lead **329** of the rain sensor **265** can be connected to ground. A capacitor C**7** (e.g., 0.1 uF, 25 V) can be connected between both leads **327**, **329** of the rain sensor **265** to filter the signal. The rain sensor **265** and R**3** form a voltage divider. In the absence of rain on the rain sensor **265**, the impedance of the rain sensor can be high, which can result in a low voltage across the rain sensor **265**. In the presence of water on the rain sensor **265**, the impedance of the rain sensor **265** can be low, which can result in a high voltage. The rain sensor signal can be provided to the microcontroller **305** via a connection **374**.

[**0042**] FIG. **7** illustrates one embodiment of the temperature sensor circuit **330**. A temperature sensor **377** (e.g., part number LM35DZ manufactured by National Semiconductor) can produce an output equal to 10 mV per degree Celcius (i.e., 0.2V at 20° C.). The output of the temperature sensor **377** can be amplified by an amplifier circuit including an op-amp U2B (e.g., part number LM258D manufactured by Texas Instruments, among others), resistors R**4** (e.g., 1.0 kΩ), R**5** (e.g., 10.0 kΩ), and R**6** (e.g., 1.0 kΩ), and capacitor C**8** (e.g., 0.1 uF, maximum working voltage of 25Vdc). The amplified signal corresponding to the temperature detected by the temperature sensor **377** can be provided to the microcontroller **305** via a connection **376**.

[**0043**] FIG. **8** is a schematic illustration of the dome control module **335** according to one embodiment. The dome control module **335** can perform two functions: driving the dome motor **240**, and determining the direction of operation of the dome motor **240**, and therefore, the dome **160**. Driving the dome motor **240** can be accomplished by providing the +12-Volt unfiltered signal to either terminal W**5** or terminal W**6** and providing a ground potential to the other terminal. A double pole double throw ("DPDT") relay K**1** (e.g., part number RTE24012F manufactured by Tyco among others) can be configured to control the direction the dome motor **240**.

[**0044**] The +12-Volt unfiltered signal can be provided to pins **8** and **11** of relay K**1**. A mosfet Q**1** (e.g., part number RFD3055LESM manufactured by Fairchild, among others) can be driven, through resistor R**8** (e.g., 1.0 kΩ), by the microcontroller **305** via a connection **378**. When the microcontroller **305** provides a low signal via the connection **378** to mosfet Q**1**, mosfet Q**1** can maintain an open circuit condition and the +12-Volt unfiltered signal can be provided to pins **6** and **9** of relay K**1** through a diode D**2** (e.g., part number 1N4001 manufactured by Microcomercial, among others). The +12-Volt unfiltered signal can be applied to the four input pins **6**, **8**, **9**, and **11** of relay K**1** and to output pins **4** and **13** of relay K**1**. This can apply the +12-Volt unfiltered signal to both terminals W**5** and W**6** of the dome motor **240** to turn the dome motor **240** off.

[**0045**] To power the dome motor **240**, the fan microcontroller **305** can provide a high signal to the mosfet Q**1**. The mosfet Q**1** can close its circuit to provide a near ground potential (to pins **6** and **9** of relay K**1**), after the voltage drop of a resistor R**20** (0.47 Ω). Depending on the state of a dome direction signal **380** on the connection from the microcontroller **305**, the ground potential can be passed to the terminal W**5** or W**6** of the dome motor **240** and the +12-Volt unfiltered signal can be passed to the other terminal, resulting in the dome motor **240** being turned on. Diode D**2** can prevent the +12-Volt unfiltered from being shorted to ground in this state.

[**0046**] The direction of the dome motor **240** can be controlled by the fan microcontroller **305** via a connection

380. The fan microcontroller **305** can provide a signal to a mosfet Q**3** (e.g., part number 2N7002 manufactured by Fairchild, among others) through resistor R**9** (1.0 kΩ). When the signal is low, the mosfet Q**3** can maintain an open circuit condition. In this state, the +12V signal can be provided to both the inputs **1** and **16** of relay K**1**. The coil in relay K**1** can be deenergized, resulting in input pin **11** being connected to output pin **13** and input pin **6** being connected to output pin **4**. When the dome motor **240** is turned on by the fan microcontroller **305**, the dome motor **240** can run in its forward direction and raise the dome **160**. When the signal provided by the microcontroller **305** via the connection **380** to the mosfet Q**3** is high, the mosfet Q**3** can close its circuit and provide a ground potential to pin **1** of relay K**1**. This can cause the coil to energize and pull the contacts of relay K**1**, such that input pin **9** can be connected to output pin **13** and input pin **8** can be connected to output pin **4**. This can result in reverse operation (lowering) of the dome motor **240** when the dome motor **240** is turned on by the fan microcontroller **305**.

[0047] FIG. **9** is a schematic illustration of an embodiment of the fan control module **340**. The fan control module **340** can perform two functions: driving the fan motor **130**, and determining the direction of operation of the fan motor **130**, and therefore, the fan. Driving the fan motor **130** can be accomplished by providing the +12-Volt unfiltered signal to either terminal W**4** or terminal W**3** and providing a ground potential to the other terminal. A double pole double throw ("DPDT") relay K**2** (e.g., part number RTE24012F manufactured by Tyco, among others) can control which direction the fan motor **130** will operate.

[0048] As shown in FIG. **9**, the +12-Volt unfiltered signal can be provided to pins **8** and **11** of relay K**2**. A mosfet Q**2** (e.g., part number HRFZ44N manufactured by Fairchild, among others) can be driven, through resistor R**10** (22 Ω), by the fan microcontroller **305** via a connection **382**. When the fan microcontroller **305** provides a low signal to the mosfet Q**2**, the mosfet Q**2** can maintain an open circuit condition and the +12-Volt unfiltered signal can be provided to pins **6** and **9** of relay K**2** through a diode D**1** (e.g., part number 1N4001 manufactured by Microcomercial, among others). The +12-Volt unfiltered signal can be applied to the four input pins **6**, **8**, **9**, and **11** of relay K**2**, and to the output pins **4** and **13** of relay K**2**. This can apply the +12-Volt unfiltered signal to both terminals W**4** and W**3** of the fan motor **130** to turn the fan motor **130** off.

[0049] To power the fan motor **130**, the fan microcontroller **305** can provide a high signal to mosfet Q**2**. The mosfet Q**2** can close its circuit to provide a near ground potential (to pins **6** and **9** of relay K**2**), after the voltage drop of a resistor R**19** (0.01 Ω). Depending on the state of a fan direction signal **334** from the fan microcontroller **305**, the ground potential can be passed to terminal W**4** or W**3** of the fan motor **130** and the +12-Volt unfiltered signal can be passed to the other terminal, resulting in the fan motor **130** being turned on. Diode D**1** can prevent the +12-Volt unfiltered signal from being shorted to ground in this state. The speed of the fan motor **130** can be controlled by pulse width modulation ("PWM") of the signal provided to the mosfet Q**2**. In some embodiments, a duty cycle of the signal provided to the mosfet Q**2** can range from 0% (off) to 100% (full speed) in about eight substantially equal increments. In one embodiment, a 50% duty cycle can be equal to 50% fan motor speed.

[0050] The fan motor **130** direction can be controlled by the fan microcontroller **305** via a connection **384**. The fan microcontroller **305** can provide a signal to a mosfet Q**4** (e.g., part number 2N7002 manufactured by Fairchild, among others) through resistor R**17** (0.01 kΩ). When the signal is low, the mosfet Q**4** can maintain an open circuit condition. In this state, the +12-Volt signal can be provided to both inputs **1** and **16** of relay K**2**. The coil in relay K**2** can be deenergized, which can result in input pin **11** being connected to output pin **13** and input pin **6** being connected to output pin **4**. When the fan motor **130** is turned on by the fan microcontroller **305**, the fan motor **130** can run in its forward (intake) direction. When the signal provided by the fan microcontroller **305** via the connection **384** to the mosfet Q**4** is high, the mosfet Q**4** can close its circuit and can provide a ground potential to pin **1** of relay K**2**. This can cause the coil to energize and pull the contacts of relay K**2**, such that input pin **9** can be connected to output pin **13** and input pin **8** can be connected to output pin **4**. This can result in reverse (exhaust) operation of the fan motor **130** when the fan motor **130** is turned on by the fan microcontroller **305**.

[0051] Some embodiments of the current monitor module **345** (as shown in FIG. **10**), can monitor current flow in the dome motor **240** windings. An increase in dome motor **240** current can indicate that the dome **160** has reached its fully-open or fully-closed position. When the dome motor **240** is running, current can flow through resistor R**20**. An op-amp U2A (e.g., part number LM258D manufactured by Texas Instruments, among others) can amplify the voltage drop across R**20** and provide the signal to the fan microcontroller **305** via a connection **386**. Resistors R**12** (1.0 k Ω), R**13** (1.0 k Ω), R**14** (1.0 k Ω), R**15** (51.0 k Ω) and R**16** (10 k Ω) along with capacitor C**13** (1.0 uF, 25V) can combine with op-amp U2A to amplify the voltage drop detected across R**20**.

[0052] Some embodiments of the current monitor module **345** (as shown in FIG. **10**), can monitor current flow in the fan motor **130** windings. An increase in fan motor **130** current can indicate that the fan **140** is blocked and cannot turn. When the fan motor **130** is running, current can flow through resistor R**19**. The op-amp U2A can amplify the voltage drop across R**19** and provide the signal to the fan microcontroller **305** via a connection **382**. Resistors R**12** (1.0 k Ω), R**13** (1.0 k Ω), R**14** (1.0 k Ω), R**15** (51.0 k Ω) and R**16** (10 k Ω) along with uF, 25V) can combine with op-amp U2A to amplify the voltage drop detected across R**19**.

[0053] As shown in FIG. **11**, the fan microcontroller **305** can include a microprocessor integrated circuit **390**, which can be programmed to perform various functions. As used herein and in the appended claims, the term "controller" is not limited to just those integrated circuits referred to in the art as microcontrollers, but broadly refers to one or more microcomputers, processors, application-specific integrated circuits, or any other suitable programmable circuit or combination of circuits. In some embodiments, the microprocessor **390** can be a model number MC68HC908JK1CDW manufactured by Freescale Semiconductor, Inc. In some embodiments, the fan microcontroller **305** can be positioned inside the chassis **105**. The microprocessor **390** can include a clocking signal generator including a crystal or oscillator X**1**, resistor R**1** (1.0 mΩ), and loading capacitors C**4** and C**5**. In some embodiments, the crystal X**1** can operate at 8 MHz and the loading capacitors C**4** and C**5** can each have a capacitance value of 12 pF. The clocking signal generator can provide a clock signal input to the microprocessor **390** and can be coupled to pin **3** and to pin **4**.

[**0054**] The microprocessor **390** (at pin **18**) can be connected to the fan antenna module **320** via the connection **372**. The microprocessor **390** (at pin **15**) can be connected to the rain sensor module **325** via the connection **374**. The microprocessor **390** (at pin **13**) can be connected to the temperature sensor **330** via the connection **376**. The microprocessor **390** (at pins **9** and **16**) can be connected to the dome control module **335** via the connections **378** and **380**. The microprocessor **390** (at pins **17** and **19**) can be connected to the fan control module **340** via the connections **382** and **384**. The microprocessor **390** (at pin **14**) can be connected to the current sensing module **345** via the connection **386**. The microprocessor **390** (at pin **10**) can be connected to a switch SW**1**, which can be connected to ground.

[**0055**] FIGS. **12**A, **12**B, and **12**C illustrate a process the master controller **260** can follow for operation of the remote-controlled ventilator **100**. At step **400**, the microprocessor **390** can determine if a command has been received from the remote control **270** via the fan antenna module **320**. If a new command has not been received, the master controller **260** can check the voltage across the rain sensor **265** (at step **402**). If the voltage across the rain sensor **265** is greater than a threshold, the rain sensor **265** has not detected any rain and processing continues (at step **404**). If the voltage across the rain sensor **265** is less than a threshold, the rain sensor **265** has detected rain. The master controller **260** can stop the fan and/or close the dome (at steps **405** and **406**) to prevent water from entering the RV through the ventilation system **100**. Processing can then continue (at step **404**).

[**0056**] If rain was not detected (at step **402**), the master controller **260** can determine if the system is in automatic mode (step **404**). If the mode is set to automatic, the microprocessor **390** can read the voltage provided by the temperature sensor module **330**. If the temperature detected is above a first threshold (at step **407**), the ventilation system can attempt to cool the RV. The microprocessor **390** can output a low signal on pin **16** (connection **380**) to set the dome direction to open and can output a high signal on pin **9** (connection **378**) to energize the dome motor **240** opening the dome **160** (step **408**). When the dome **160** reaches its fully-open position, the dome **160** can stop moving. However, the dome motor **240** can continue running, but because its armature cannot turn, the current the dome motor **240** draws can increase. A signal representative of this increasing current can be sent by the current monitor module **345** via the connection **386** to pin **14** of the microprocessor **390**. Once this signal reaches a threshold, the microprocessor **390** can remove the signal from pin **9**, which can de-energize the dome motor **240**. Processing can continue (at step **410**), where the fan can be turned on or sped up by incrementing its duty cycle.

[**0057**] At step **412**, the microprocessor **390** can poll the signal on pin **14** received from the current monitor module **345**. If this signal exceeds a threshold, a high-amps counter can be incremented (step **414**). If the high-amps counter is less than a threshold, processing can continue (at step **400**.) If the high-amps counter is greater than or equal to the threshold total, a fault condition (e.g., the fan **140** is blocked) can be determined to exist and the fan can be turned off (step **418**) and the mode can be set to manual (step **420**).

[**0058**] If the temperature is below the first threshold (at step **407**), the temperature can be compared to a second threshold (step **422**). If the temperature is above the second threshold, processing can continue (at step **412**) with determining the fan amps. If the temperature is below the second threshold, the master controller **260** can attempt to warm up the RV by turning off the fan (step **424**) and closing the dome (step **426**). Processing can continue at step **412** with determining the fan amps. If the mode was set to manual (at step **404**), processing can continue (at step **412**) with determining the fan amps.

[**0059**] In one embodiment, the remote control **270** can have eight functions and a key sequence for changing the synchronization code. For example, the eight functions can include: dome open, dome close, dome stop, toggle exhaust/intake, increase fan speed, decrease fan speed, stop fan, and set temperature range.

[**0060**] If the remote control **270** transmits a synchronization code change (step **430**), the master controller **260** can turn off the fan (at step **432**) and determine if switch SW**1** (FIG. **11**) has been pressed (step **434**). If switch SW**1** is pressed, the connection from common to pin **10** on the microprocessor **390** can open, causing pin **10** to go high. The microprocessor **390** can then save the new synchronization code in its flash memory (step **436**) and processing can continue (at step **400**). If switch SW**1** is not pressed, the new synchronization code can be ignored and processing can continue (at step **400**). If the command received from the remote control **270** is different than changing the synchronization code, the synchronization code sent can be compared to the synchronization code saved in the microprocessor's **390** flash memory (step **438**). If the codes do not match, the master controller **260** can ignore the command and continue processing (at step **400**).

[**0061**] If the synchronization codes match, processing can continue by determining which command is being sent by the remote control **270**. If the command received is to open the dome **160** (step **440**), the microprocessor **390** can output a low signal on pin **16** to set the correct direction for the dome motor **240** (step **442**). If the command received is to close the dome **160** (step **444**), the microprocessor **390** can output a high signal on pin **16** to set the correct direction for the dome motor **240** (step **446**). Next the microprocessor **390** can output a high signal on pin **9** to energize the dome motor **240** (step **448**). At step **450**, the microprocessor **390** can determine the signal on pin **14** received from the current monitor module **345**. If the level of the current signal is above a threshold, the dome has reached the end of its travel path and the microprocessor **390** can turn off the dome motor **240** by removing the signal from pin **9** (step **452**). Processing then continues (at step **400**). If the level of the current signal is below a threshold, the microprocessor **390** can determine if an interrupt has occurred (step **454**). An interrupt can occur when a new command is received by the master controller **260**, while the microprocessor **390** is waiting for the dome **160** to fully open or fully close. When an interrupt occurs, the microprocessor **390** can perform the requested command (step **456**). Once processing of the command is complete, the microprocessor **390** can return to step **450** to wait for a high current condition.

[**0062**] If the command received is to stop the dome (step **460**), the microprocessor **390** can remove power from pin **9**, de-energizing the dome motor **240** (step **462**). Processing can continue (at step **400**).

[**0063**] If the command received is to toggle the fan direction (step **464**), the microprocessor **390** can turn off the fan at step **466**. The master controller **260** can then determine (at step **468**), whether the fan is in exhaust mode. If the fan is in exhaust mode, the microprocessor **390** can change the signal on pin **17** from high to low, changing the fan to intake mode (step **470**). If the fan is in intake mode, the microprocessor **390** can change the signal on pin **17** from low to high, changing the mode to exhaust (step **472**). At step **474**, the master controller **260** can then set the fan speed to the same level as before it was turned off. Processing can then continue (at step **400**).

[**0064**] If the command received is to speed the fan up (step **480**), the master controller **260** can determine the present speed of the fan **140** (step **482**). If the speed is less than a maximum, the master controller **260** can increment a PWM duty cycle register, which can increase the duty cycle, and thus the speed of the fan, for example, ⅛th of full speed (step **484**). The duty cycle can be increased, and thus the fan **140** can run, regardless of the position of the dome **160**, including when the dome **160** is fully closed. If the speed of the fan **140** is at a maximum, processing can continue (at step **400**).

[**0065**] If the command received is to slow the fan down (step **486**), the master controller **260** can determine the present speed of the fan **140** (step **488**). If the fan **140** is not off, the master controller **260** can decrement the PWM duty cycle register, which can lower the duty cycle, and thus the speed of the fan, for example,⅛th of full speed (step **490**). If the fan is off, processing can continue (at step **400**). If the command received is to stop the fan (step **492**), the master controller **260** can turn the fan **140** off (step **494**). Processing can then continue (at step **400**).

[**0066**] If the command received is to set the temperature range (step **496**), the master controller **260** can determine if the range is set to zero (step **498**). If the range is set to zero, the mode can be manual and the temperature control can be disabled (step **500**). If the range is not set to zero, the range can be saved and control can be set to automatic (step **502**). Processing can then continue (at step **400**).

[**0067**] FIG. **13** is a schematic illustration of an embodiment of a remote control **270**. The remote control **270** can include a battery **605**, a voltage source **610**, an antenna **615**, a microcontroller **620**, an indicator group **625**, and a selector group **630**. The components of the remote control **270** can be constructed with one or more integrated circuits mounted on a circuit board (not shown) that can be mounted in a housing.

[**0068**] In one embodiment, the battery **605** can be a standard 9-Volt battery. However, a direct current ("DC") voltage source providing between about 7-Volts and about 20-Volts can be used. The battery **605** can be connected to the voltage source **610** via a connection **635**. As shown in FIG. **14**, the voltage source **610** can convert the voltage from the battery (i.e., $+V_b$) to a suitable voltage $+V_s$, (e.g., +5 Volts) for use by the microcontroller **620** via a connection **640** and $+V_a$ (e.g., +3 Volts) for use by the antenna **615** via a connection **645**. The voltage source **610** can include an integrated circuit **650** (e.g., model UA78L05CD manufactured by Texas Instruments, among others) for converting the battery voltage to $+V_s$. The integrated circuit **650** can be coupled to a capacitor C**1**. The capacitance of C**1** can be designed to provide a constant, suitable voltage output for use with the microcontroller **620**. In some embodiments, the capacitance value can be 0.10 uF for C**1**. In addition, the maximum working-voltage rating of capacitor C**1** can be 25 Vdc. In addition, the voltage source **610** can include an integrated circuit **655** (e.g., model REG101NA-3/250 manufactured by Texas Instruments, among others) for converting $+V_s$ voltage to $+V_a$. The integrated circuit **655** can be coupled to a capacitor C**2**. The capacitance of C**2** can be designed to provide a constant, suitable voltage output for use with the antenna module **615**. In some embodiments, the capacitance value can be 0.10 uF for C**2**. In addition, the maximum working-voltage rating of capacitor C**2** can be 25 Vdc.

[**0069**] As shown in FIG. **15**, the antenna module **615** can be coupled to the voltage source **610** via a connection **645**, to the microcontroller **620** via a connection **660**, and to the antenna **665**. The antenna module **615** can convert data signals, received from the microcontroller **620** via connection **660**, into RF signals and transmit the signals to the antenna **665**. The antenna **665** then can transmit the RF waves. The antenna module **615** can include an integrated circuit **670** (e.g., model RCT-433-AS manufactured by Radiotronix, among others). The antenna module **615** can include filtering capacitors C**5** and C**6** (e.g., capacitance values of 6.0 pF), which can connect the output (at pin **1**) of the integrated circuit **670** to the antenna **665**. In some embodiments, the antenna **665** can be implemented as a trace on a printed circuit board.

[**0070**] As shown in FIG. **16**, the indicators **625** can be coupled to the microcontroller **620** via a connection **675**. The indicators **625** can include green light emitting diodes ("LED") **680-684** (e.g., MV5474C manufactured by Fairchild, among others), yellow LEDs **686-688** (e.g., MV5374C manufactured by Fairchild, among others), and red LEDs **690-694** (e.g., MV5075C manufactured by Fairchild, among others). The indicators **625** can include a current-sinking resistor R1 (e.g., 1.0 kΩ).

[**0071**] As shown in FIG. **17**, the selectors **630** can be coupled to the microcontroller **620** via a connection **700**. The selectors **630** can include diode arrays **710-723** (e.g., BAV170E6327 manufactured by Infineon, among others). The selectors **630** can include switches **731-739** (e.g., B3F-1000 manufactured by Omron, among others). In one embodiment, the functions shown in Table 1 can be applied to the switches **731-739**.

TABLE 1

Switch Functions

Switch	Function
731	Speed Up/Synchronization
732	Speed Down/Synchronization

TABLE 1-continued

Switch Functions	
Switch	Function
733	Fan Stop/Implement Synchronization Code Change
734	Dome Open
735	Dome Close
736	Dome Stop
737	Cool
738	Warm
739	Exhaust/Intake

[0072] As shown in FIG. **18**, the microcontroller **620** can include a microprocessor integrated circuit **750**, which can an be programmed to perform various functions. In some embodiments, the microprocessor **750** can be a model number MC68HC908JK1CDW manufactured by Freescale Semiconductor, Inc. The microcontroller **620** can include pull-up resistors R**5** (e.g., 10 kΩ) and R**6** (e.g,10 kΩ) The microprocessor **750** can include a clocking signal generator **755** including a crystal or oscillator X**1** and loading capacitors C**3** and C**4**. In some embodiments, the crystal X**1** can operate at 8 MHz and the loading capacitors C**3** and C**4** can each have a capacitance value of 12 pF. The clocking signal generator **755** can provide a clock signal input to the microprocessor **750** and can be coupled to pin **3** and pin **4**. The microprocessor **750** (at pins **6-8** and **11-15**) can be connected to the indicators **625** via a connection **675**. The microprocessor **750** (at pins **9**, **10**, **16**, and **17**) can be connected to the selectors **630** via a connection **700**.

[0073] The microprocessor **750** can be programmed to operate the remote control **270** as shown in FIGS. **19**A and **19**B. As shown in FIG. **19**A, the microprocessor can be initialized (at step **800**) by setting various registers, inputs/outputs, and variables. The microprocessor **750** can wait until a switch has been engaged (at step **810**). When a switch **731-739** in the selector **630** is engaged, the microprocessor **750** can determine which switch **731-739** in the selector **630** was engaged. The microprocessor **750** can determine this by monitoring the states of its pins (**9**, **10**, **16**, and **17**). The combination of states for each pin (**9**, **10**, **16**, and **17**) can signify which switch **731-739** is engaged. One embodiment of state combinations is shown in Table 2.

TABLE 2

Switch State Combinations				
	State of			
Switch engaged	Pin 9	Pin 10	Pin 16	Pin 17
731	Off	On	On	On
732	On	Off	On	On
733	On	On	Off	On
734	On	On	On	Off
735	Off	Off	On	On
736	Off	On	Off	On
737	Off	On	On	Off
738	On	Off	Off	On
739	On	Off	On	Off

[0074] Once the microprocessor **750** determines which switch **731-739** has been engaged, the microprocessor **750** can determine if the engaged switch is the warm switch **738** or the cool switch **737** (at steps **820** and **830**). If the engaged switch is the warm switch **738**, the microprocessor **750** can determine whether the temperature setting is at a maximum (at step **840**). If the temperature is not at the maximum, the microprocessor **750** can increment a temperature register (at step **850**) and an LED count (at step **860**). The microprocessor **750** can apply power to the proper number of LEDs **680-694** in the indicator **625** (at step **870**).

[0075] At step **880**, the microprocessor **750** can send a digital signal to the antenna module **615** representative of the temperature setting. The antenna module **615** can convert this digital signal into an RF signal and transmit the RF signal via the antenna **665**.

[0076] If the engaged switch is the cool switch **737**, the microprocessor **750** can determine whether the temperature setting is at a minimum (at step **890**). If the temperature is not at the minimum, the microprocessor **750** can decrement the temperature register (at step **900**) and the LED count (at step **905**). The microprocessor **750** can then apply power to the proper number of LEDs **680-694** in the indicator **625** (at step **870**).

[0077] At step **880**, the microprocessor **750** can send a digital signal to the antenna module **615** representative of the temperature setting. The antenna module **615** can convert this digital signal into an RF signal and transmit the RF signal via the antenna **665**.

[0078] If the engaged switch is not the warm switch **738** or the cool switch **737**, the microprocessor **750** can send a digital signal to the antenna module **615** representative of the switch pressed (at step **880**). The antenna module **615** can convert this digital signal into an RF signal and transmit the RF signal via the antenna **665**.

[0079] If the temperature setting was at the maximum setting (at step **840**), or the temperature setting was at the minimum setting (at step **890**), or following transmission of the digital signal to the antenna module **615** (at step **880**), processing can continue (at step **910**) with sequences for modifying the synchronization code (as shown in FIG. **19**B). The microprocessor **750** can determine if the switch pressed is the speed down switch **731** or the speed up switch **732**. If the switch pressed is the speed down switch **731** or the speed up switch **732**, the microprocessor **750** can determine if a timer is running (step **915**). If the timer is not running, the microprocessor **750** can start the timer (at step **920**) and processing can continue (at step **810**).

[0080] If the timer is running (at step **915**), the microprocessor **750** can determine if the timer has been running for a predetermined time (e.g., fifteen seconds) (at step **925**). If the timer has been running for the predetermined time, a random number generator can be started (at step **930**) and processing can continue (at step **810**). If the predetermined time has not been reached (at step **925**), processing can continue (at step **810**).

[0081] If the switch selected is not the speed down switch **731** or the speed up switch **732** (at step **910**), the microprocessor **750** can determine if the switch selected is the fan stop switch **733** (step **935**). If the fan stop switch **733** is not selected, the timer can be stopped and reset (at step **940**) and processing can continue (at step **810**). If the switch selected is the fan stop switch **733**, the microprocessor **750** can determine if the timer has been running for a predetermined time (e.g., fifteen seconds) (step **945**). If the timer has been running for less than the predetermined time, processing can continue (at step **810**). If the timer has been running for the predetermined time, the random number from the random number generator can be saved by the microprocessor **750** in its flash memory (at step **950**). The microprocessor **750** can then transmit this code via the antenna module **615** (at step **955**). The microprocessor **750** can then determine if the speed up switch **732** is still selected (at step **960**). If the fan stop switch **733** is still selected, processing can continue (at step **955**) with retransmission of the code. If the fan stop switch **733** is not selected any longer, processing can continue (at step **810**).

[**0082**] The resistance, capacitance, and voltage values used herein are used as examples only. Various features and advantages of the invention are set forth in the following claims.

1. A remotely-controlled ventilation system for use in a recreational vehicle having a ceiling and a wall, the system comprising:

a chassis mounted to at least one of the ceiling and the wall of the recreational vehicle;

a fan coupled to the chassis;

a dome coupled to the chassis; and

a remote control configured to operate the fan and the dome.

2. The system of claim 1 and further comprising at least one motor coupled to at least one of the fan and the dome.

3. The system of claim 1 wherein the remote control is configured to open and close the dome.

4. The system of claim 1 wherein the remote control is configured to turn the fan on and off.

5. The system of claim 1 wherein the remote control is configured to change a direction of the fan in order to intake air and exhaust air.

6. The system of claim 1 wherein the remote control is configured to change a speed of the fan.

7. The system of claim 1 and further comprising a controller and a temperature sensor connected to the controller, the controller connected to the fan and the dome.

8. The system of claim 7 wherein the controller receives a sensed temperature and automatically controls the fan and the dome based on the sensed temperature.

9. The system of claim 7 wherein the remote control is configured to set a temperature threshold for automatic temperature control.

10. The system of claim 9 wherein the remote control stores the temperature threshold.

11. The system of claim 9 wherein a direction of the fan is based on the temperature threshold and the sensed temperature.

12. The system of claim 9 wherein a speed of the fan is based on the temperature threshold and the sensed temperature.

13. The system of claim 9 wherein a position of the dome is based on the temperature threshold and the sensed temperature.

14. The system of claim 1 and further comprising a hand crank coupled to the chassis to manually open and close the dome.

15. The system of claim 1 wherein the remote control communicates wirelessly using one of radio frequency communication and infrared communication.

16. The system of claim 1 and further comprising a removable, snap-in screen coupled to the chassis.

17. The system of claim 16 wherein removal of the screen deactivates the fan.

18. The system of claim 1 and further comprising a rain sensor that provides a signal to a controller, and wherein the controller at least one of closes the dome and turns off the fan when rain is detected.

19. The system of claim 1 and further comprising a controller connected to the fan and the dome, and wherein the controller and the remote control share a synchronization code.

20. The system of claim 18 wherein the synchronization code is set by substantially simultaneously pressing one or more buttons.

21. The system of claim 1 wherein the fan is stopped when a fault occurs.

22. The system of claim 1 wherein at least one position of the dome is determined by an amount of current drawn by a motor coupled to the dome.

23. The system of claim 1 wherein the dome is moved to any position between a fully closed position and a fully open position.

24. The system of claim 1 and further comprising a controller and an antenna, at least one of the controller and antenna located within the chassis.

25. The system of claim 1 wherein a pulse width modulated signal controls a speed of the fan.

26. The system of claim 1 wherein the fan is operable when the dome is in a fully closed position.

27. A remotely-controlled ventilation system for use in a recreational vehicle, the system comprising:

a fan and a dome coupled to the recreational vehicle;

a controller connected to the fan and the dome, the controller including a first button; and

a remote control configured to operate the fan and the dome, the remote control including a second button;

the controller and the remote control configured to set a synchronization code when the first button and the second button are pressed substantially simultaneously.

28. The system of claim 27 wherein the synchronization code is stored in a transmitter of the remote control and a receiver of the controller.

29. The system of claim 28 wherein the transmitter randomly selects the synchronization code and the controller stores the synchronization code selected by the transmitter.

30. The system of claim 27 and further comprising at least one motor coupled to at least one of the fan and the dome.

31. The system of claim 27 and further comprising a remote control that is configured to open and close the dome and control the fan.

32. The system of claim 31 wherein the remote control is configured to turn the fan on and off.

33. The system of claim 31 wherein the remote control is configured to change a direction of the fan in order to intake air and exhaust air.

34. The system of claim 31 wherein the remote control is configured to change a speed of the fan.

35. The system of claim 27 and further comprising a temperature sensor connected to the controller.

36. The system of claim 35 wherein the controller receives a sensed temperature and automatically controls the fan and the dome based on the sensed temperature.

37. The system of claim 35 wherein a remote control is configured to set a temperature threshold for automatic temperature control.

38. The system of claim 37 wherein the remote control stores the temperature threshold.

39. The system of claim 37 wherein a direction of the fan is based on the temperature threshold and the sensed temperature.

40. The system of claim 37 wherein a speed of the fan is based on the temperature threshold and the sensed temperature.

41. The system of claim 37 wherein a position of the dome is based on the temperature threshold and the sensed temperature.

42. The system of claim 27 and further comprising a hand crank coupled to the chassis to manually open and close the dome.

43. The system of claim 31 wherein the remote control communicates wirelessly using one of radio frequency communication and infrared communication.

44. The system of claim 27 and further comprising a chassis coupled to the fan and the dome, and a removable, snap-in screen coupled to the chassis.

45. The system of claim 44 wherein removal of the screen deactivates the fan.

46. The system of claim 27 and further comprising a rain sensor that provides a signal to a controller, and wherein the controller at least one of closes the dome and turns off the fan when rain is detected.

47. The system of claim 27 wherein the fan is stopped when a fault occurs.

48. The system of claim 27 wherein at least one position of the dome is determined by an amount of current drawn by a motor coupled to the dome.

49. The system of claim 27 wherein the dome is moved to any position between a fully closed position and a fully open position.

50. The system of claim 27 and further comprising a controller and an antenna, at least one of the controller and antenna located within the chassis.

51. The system of claim 27 wherein a pulse width modulated signal controls a speed of the fan.

52. The system of claim 27 wherein the fan is operable when the dome is in a fully closed position.

53. A remotely-controlled ventilation system for use in a recreational vehicle, the system comprising:

a fan and a dome coupled to the recreational vehicle;

a controller connected to the fan and the dome; and

a rain sensor connected to the controller, the rain sensor providing a signal to the controller indicating the presence of rain;

the controller at least one of automatically closing the dome and automatically turning off the fan when the signal indicates the presence of rain.

54. The system of claim 53 and further comprising at least one motor coupled to at least one of the fan and the dome.

55. The system of claim 53 and further comprising a remote control is configured to open and close the dome and control the fan.

56. The system of claim 55 wherein the remote control is configured to turn the fan on and off.

57. The system of claim 55 wherein the remote control is configured to change a direction of the fan in order to intake air and exhaust air.

58. The system of claim 55 wherein the remote control is configured to change a speed of the fan.

59. The system of claim 53 and further comprising a temperature sensor connected to the controller.

60. The system of claim 59 wherein the controller receives a sensed temperature and automatically controls the fan and the dome based on the sensed temperature.

61. The system of claim 59 wherein a remote control is configured to set a temperature threshold for automatic temperature control.

62. The system of claim 61 wherein the remote control saves the temperature threshold.

63. The system of claim 61 wherein a direction of the fan is based on the temperature threshold and the sensed temperature.

64. The system of claim 61 wherein a speed of the fan is based on the temperature threshold and the sensed temperature.

65. The system of claim 61 wherein a position of the dome is based on the temperature threshold and the sensed temperature.

66. The system of claim 53 and further comprising a hand crank coupled to the chassis to manually open and close the dome.

67. The system of claim 55 wherein the remote control communicates wirelessly using one of radio frequency communication and infrared communication.

68. The system of claim 53 and further comprising a chassis coupled to the fan and the dome, and a removable, snap-in screen coupled to the chassis.

69. The system of claim 68 wherein removal of the screen deactivates the fan.

70. The system of claim 55 and further comprising a controller connected to the fan and the dome, and wherein the controller and the remote control share a synchronization code.

71. The system of claim 70 wherein the synchronization code is set by substantially simultaneously pressing one or more buttons.

72. The system of claim 53 wherein the fan is stopped when a fault occurs.

73. The system of claim 53 wherein at least one position of the dome is determined by an amount of current drawn by a motor coupled to the dome.

74. The system of claim 53 wherein the dome is moved to any position between a fully closed position and a fully open position.

75. The system of claim 53 and further comprising a controller and an antenna, at least one of the controller and antenna located within the chassis.

76. The system of claim 53 wherein a pulse width modulated signal controls a speed of the fan.

77. The system of claim 53 wherein the fan is operable when the dome is in a fully closed position.

78. A method of remotely controlling a ventilation system for use in a recreational vehicle having a wall and a ceiling, the method comprising:

coupling a fan and a dome to at least one of the wall and the ceiling of the recreational vehicle, the fan and the dome connected to a controller; and

transmitting a signal from a remote control to the controller in order to operate the fan and the dome.

79. The method of claim 78 and further comprising controlling at least one motor coupled to at least one of the fan and the dome.

80. The method of claim 78 and further comprising opening and closing the dome and controlling the fan with the remote control.

81. The method of claim 78 and further comprising turning the fan on and off with the remote control.

82. The method of claim 78 and further comprising changing a direction of the fan with the remote control in order to intake air and exhaust air.

83. The method of claim 78 and further comprising changing a speed of the fan with the remote control.

84. The method of claim 78 and further comprising sensing a temperature.

85. The method of claim 84 and further comprising automatically controlling the fan and the dome based on the sensed temperature.

86. The method of claim 84 and further comprising automatically controlling at least one of the fan and the dome to maintain a temperature threshold.

87. The method of claim 86 and further comprising storing the temperature threshold in the remote control.

88. The method of claim 86 and further comprising changing a direction of the fan based on the temperature threshold and the sensed temperature.

89. The method of claim 86 and further comprising changing a speed of the fan based on the temperature threshold and the sensed temperature.

90. The method of claim 86 and further comprising changing a position of the dome based on the temperature threshold and the sensed temperature.

91. The method of claim 78 and further comprising manually opening and closing the dome.

92. The method of claim 78 and further comprising transmitting one of a radio frequency signal and an infrared signal from the remote control to the controller.

93. The method of claim 78 and further comprising coupling a chassis to the fan and the dome, and coupling a removable, snap-in screen to the chassis.

94. The method of claim 93 and further comprising deactivating the fan when the screen is removed.

95. The method of claim 78 and further comprising storing a common synchronization code in the controller and the remote control.

96. The method of claim 95 and further comprising setting the synchronization code by substantially simultaneously pressing one or more buttons.

97. The method of claim 78 and further comprising stopping the fan when a fault occurs.

98. The method of claim 78 and further comprising determining at least one position of the dome by an amount of current drawn by a motor coupled to the dome.

99. The method of claim 78 and further comprising moving the dome to any position between a fully closed position and a fully open position.

100. The method of claim 78 and further comprising locating a controller and an antenna within the chassis.

101. The method of claim 78 and further comprising controlling a speed of the fan with a pulse width modulated signal.

102. The method of claim 78 and further comprising operating the fan when the dome is in a fully closed position.

* * * * *