An energy-saving air conditioner and illumination controller is applied to an interior space to regulate the air conditioner fan and the illumination device in the space according to the detected interior temperature, brightness, and status of users in the space. Therefore, a manual operation for regulate temperature and brightness is avoided. Automatically powering off the air conditioner fan and the illumination device is also achieved while no one is in the interior space so that a prevention of energy waste is ensured. A simple installation of the energy-saving air conditioner and illumination controller can be applied to existing air conditioner and illumination equipment without complicated assembly and configuration.
AC 220V Power Source

Air Conditioner Fan

Fan Regulator

Water Temperature Controller

Communication Bus

Light Regulator

Multi-Function Sensor

Illumination Device

Controller

Fig. 1
Fig. 2
Fig. 3
Fig. 5

- Key pad
- Microprocessor
- Receive circuit
- Display unit
- Low power detection circuit
- Multi-function sensor

Connections: 4, 41, 42, 43, 44, 3
Fig. 6
Fig. 8
ENERGY-SAVING AIR CONDITIONER AND ILLUMINATION CONTROLLER

FIELD OF THE INVENTION

[0001] The present invention relates to design for energy-saving equipment, and particular to an energy-saving air conditioner and illumination controller for regulating operations of air conditioner and illumination device in an interior by detecting the temperature, brightness, and status of users in the space so as to save energy.

DESCRIPTION OF THE PRIOR ART

[0002] For a better quality of life and work efficiency, a comfort for the interior is well concerned nowadays. However, it is mostly related to the temperature and the brightness of the interior.

[0003] The prior air conditioner and illumination have their own operation unit for being operated by users. Such devices are equipped overhead and it is inconvenient and time-consuming to access.

[0004] For solving the access problem, sensors for detecting interior temperature and brightness are arranged to the devices to regulate the operation of the air conditioner and illumination. While changes of parameters are needed, users still need to access the devices for the purpose.

[0005] Each air conditioner and illumination has its own sensor so that too many sensors will be installed as well as their remote controller.

[0006] Moreover, prior air conditioner and illumination need to be turned on or off manually. A waste of energy always happened while the user forgot to turn off the devices.

[0007] Therefore, a lot of usage problems need to be solved for the prior air conditioner and illumination.

SUMMARY OF THE PRESENT INVENTION

[0008] Accordingly, the primary object of the present invention is to provide an energy-saving air conditioner and illumination controller for automatically regulating air conditioner fan and illumination device according to the detected interior temperature, brightness, and status of users.

[0009] A secondary object of the present invention is to provide a multi-function sensor combining sensors of air conditioner and illumination device for reducing number of sensor.

[0010] A yet object of the present invention is to provide a two-way communication between the multi-function sensor and a controller of the energy-saving air conditioner and illumination controller so that parameters of a fan regulator and light regulator thereof can be either modified or checked by the controller.

[0011] To achieve above object, the present invention provides a fan regulator, light regulator, multi-function sensor, and a controller. The fan regulator is electrically connected to an air conditioner fan for regulating the operation of the air conditioner fan. The light regulator is electrically connected to an illumination device for regulating the operation of the illumination device. The multi-function sensor is electrically connected to the fan regulator and the light regulator for detecting an interior temperature, brightness, and status of users so as to regulate the fan regulator and the light regulator. The controller serves to communicate to the multi-function sensor by optically transmitting parameters for the fan regulator and the light regulator under the user's operation so as to regulate the interior temperature and brightness.

[0012] The fan regulator and the multi-function sensor can be combined as a fan control device, or the light regulator and the multi-function sensor can be combined as a light control device. Moreover, the fan regulator, light regulator, and the multi-function sensor can be combined as an equipment control device.

[0013] According to the present invention, the sensors of the air conditioner and illumination device are combined as a multi-function sensor so as to reduce the numbers of sensor needed. The present invention is also easy to be applied to existing air conditioner and illumination device.

[0014] Also, inconvenience of manual operation for air conditioner and illumination device can be avoided due to the automatically regulation by active detection of interior temperature and brightness of the present invention. Time and work for accessing the equipment can be also saved.

[0015] Furthermore, the present invention will automatically turn on or off the air conditioner and illumination by detecting absence of human in the interior space so that a waste of energy can be prevented.

[0016] Moreover, the communication between the multi-function sensor and the controller is through optical transmission. A changing of the interior temperature or brightness can be done by transmitting parameters from the controller to the fan regulator or the light regulator via the multi-function sensor. The present parameters set to the fan regulator and the light regulator can be also checked by the controller through the opposite transmission path described above.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] FIG. 1 is an electric diagram of the first embodiment of the present invention.

[0018] FIG. 2 is an electric diagram showing a fan regulator of the present invention.

[0019] FIG. 3 is an electric diagram showing a light regulator of the present invention.

[0020] FIG. 4 is an electric diagram showing a multi-function sensor of the present invention.

[0021] FIG. 5 is an electric diagram showing a controller of the present invention.

[0022] FIG. 6 is an electric diagram of the second embodiment of the present invention.

[0023] FIG. 7 is an electric diagram of the third embodiment of the present invention.

[0024] FIG. 8 is an electric diagram of the fourth embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0025] In order that those skilled in the art can further understand the present invention, a description will be provided in the following in details. However, these descriptions and the appended drawings are only used to cause those skilled in the art to understand the objects, features, and characteristics of the present invention, but not to be used to confine the scope and spirit of the present invention defined in the appended claims.

[0026] Referring to FIG. 1, an electric diagram of the first embodiment according to the present invention is illustrated. An energy-saving air conditioner and illumination controller includes a fan regulator 1, light regulator 2, multi-function sensor 3, and a controller 4.

[0027] The fan regulator 1 powered by an AC power source P is electrically connected to an air conditioner fan 5 so as to regulate the operation of the air conditioner fan 5. The light regulator 2 is electrically connected to an illumination device 6 so as to regulate the operation of the illumination device 6. The multi-function sensor 3 serving to detect an interior temperature, brightness, and user status will communicate with the fan regulator 1 and the light regulator 2. The multi-func-
tion sensor 3 will produce and transmit a fan control signal S1 to the fan regulator 1 through a communication bus B so as to regulate the operation of the air conditioner fan 5 based on the control signal S1. The multi-function sensor 3 will also produce and transmit a light control signal S2 to the light regulator 2 through the communication bus B so as to regulate the operation of the illumination device 6 based on the control signal S2.

[0028] The controller 4 communicated with the multi-function sensor 3 will send a control signal S3 to the multi-function sensor 3 through optical transmission under user's operation. The multi-function sensor 3 will produce the fan control signal S1 and the light control signal S2 based on the control signal S3.

[0029] The controller 4 can be defined as an administrative controller which is capable of configuring the parameters of the fan regulator 1 and the light regulator 2 by transmitting parameters set to the controller. The parameters will be optically transmitted to the fan regulator 1 and the light regulator 2 via the multi-function sensor 3.

[0030] On the other hand, the controller 4 is capable of reading the parameters being set to the fan regulator 1 and the light regulator 2 by the administrator. The parameters of the fan regulator 1 and the light regulator 2 will be transmitted to the controller 4 via the multi-function sensor 3 by optical transmission.

[0031] The controller 4 can also be defined as a user controller which is capable of changing the parameters of the fan regulator 1 and the light regulator 2 within the ranges configured by the administrative controller through optical transmission. The user controller can only adjust the parameters of the fan regulator 1 and the light regulator 2 within the ranges configured by the administrative controller, the fan regulator 1 and the light regulator 2 will regulate the temperature or luminance of the air conditioner fan 5 and illumination device 6 within the range even if the user setting is out of the range.

[0032] The fan regulator 1, air conditioner fan 5, and light regulator 2 are electrically connected to and powered by the AC power source P.

[0033] Referring to FIG. 2, the fan regulator 1 includes an AC to DC converter 2G circuit 11, voltage regulator 12, microprocessor 13, signal transmitting and receiving circuit 14, relay control circuit 15, and a LED indicator 16.

[0034] The AC to DC inverter circuit 11 is electrically connected to the AC power source P so that the AC power provided by the power source P will be converted to DC power. The voltage regulator 12 is electrically connected between the AC to DC inverter circuit 11 and the microprocessor 13 so as to provide proper voltage to the microprocessor 13. The signal transmitting and receiving circuit 14 is electrically connected to the microprocessor 13 so as to transmit the received fan control signal S1 from the multi-function sensor 3 via communication bus B to the microprocessor 13.

[0035] The microprocessor 13 will drive the relay control circuit 15 based on the received fan control signal S1 to operate the air conditioner fan 5 so as to control the interior temperature. The LED indicator 16 showing the status of the fan regulator 1 is also electrically connected to the microprocessor 13.

[0036] Referring to FIG. 3, the light regulator 2 includes a voltage regulator 21, microprocessor 22, signal transmitting and receiving circuit 23, relay control circuit 24, and a LED indicator 25. The voltage regulator 21 is electrically connected between the communication bus B and the microprocessor 22 so as to regulate DC voltage from the communication bus B for the microprocessor 22. The signal transmitting and receiving circuit 23 is electrically connected between the communication bus B and the microprocessor 22 so as to transmit the received light control signal S2 from the multi-function sensor 3 via communication bus B to the microprocessor 22.

[0037] The microprocessor 22 will drive the relay control circuit 24 based on the received light control signal S2 to control the power supplied by an AC power source P so as to control the operation of the illumination device 6. The LED indicator 25 showing the status of the light regulator 2 is also electrically connected to the microprocessor 22.

[0038] Referring to FIG. 4, the multi-function sensor 3 includes a voltage regulator 31, microprocessor 32, thermal detection circuit 33, light detection circuit 34, human body detection circuit 35, amplify circuit 36, optical signal transmitting and receiving circuit 37, signal transmitting and receiving circuit 38, and a LED indicator 39.

[0039] The voltage regulator 31 is electrically connected between the communication bus B and the microprocessor 32 so as to regulate DC voltage from the communication bus B for the microprocessor 32.

[0040] The thermal detection circuit 33 detecting interior temperature is electrically connected to the microprocessor 32 so as to produce a temperature signal S41 to the microprocessor 32. The light detection circuit 34 serving to detect interior brightness is electrically connected to the microprocessor 32 so as to produce a temperature signal S42 to the microprocessor 32. The human body detection circuit 35 communicating to the microprocessor 32 through the amplify circuit 36 serves to detect status of user so as to produce a user signal S43 to the microprocessor 32 through the amplify circuit 36. The optical signal transmitting and receiving circuit 37 is electrically connected to the microprocessor 32 to receive and transmit the control signal S3 from the controller 4 to the microprocessor 32.

[0041] The microprocessor 32 will process the temperature signal S41, brightness signal S42, user signal S43, and the control signal S3 so as to generate the fan control signal S1 and the light control signal S2 to the fan regulator 1 and the light regulator 2 through the communication bus B respectively.

[0042] The LED indicator 39 is electrically connected to the microprocessor 32 to show the status of the multi-function sensor 3.

[0043] Referring to FIG. 5, the controller includes a key pad 41, microprocessor 42, optical signal transmit and receive circuit 43, low power detection circuit 44, and a display unit 45.

[0044] The key pad 41 is electrically connected to the microprocessor 42 to produce a control signal S3 to the microprocessor 42. The control signal S3 will be transmitted to the multi-function sensor 3 by the optical signal transmitting and receiving circuit 43. The low power detection circuit 44 is electrically connected to the microprocessor 42 to detect the power of the controller 4.

[0045] The parameters set by administrator can be transmitted from the fan regulator 1 and the light regulator 2 via the multi-function sensor 3 to the controller 4 in optical transmission. The microprocessor 42 of the controller 4 will receive the parameters and show the parameters on the display unit 45.

[0046] Referring to FIG. 6, an electric diagram of the second embodiment according to the present invention is illustrated. An energy-saving air conditioner and illumination controller 200 includes a controller 4 and a fan control device 7. The fan control device 7 includes a fan regulator 1 and a multi-function sensor 3. The principles of the fan regulator 1, multi-function sensor 3, and the controller 4 are the same as those in the embodiment 1.
The fan control device 7 is electrically connected to an air conditioner fan 5 for detecting the interior temperature and status of users so as to regulate the operation of the air conditioner fan 5.

The controller 4 serves to communicate to the fan control device 7 by transmitting an optical control signal S3 to the fan control device 7 under user's operation.

The control signal S3 of the controller 4 issued by the users will be optically transmitted to the corresponding fan control device 7 so that the air conditioner fan 5 connected to the fan control device 7 will be operated based on the control signal S3.

Referring to FIG. 7, an electric diagram of the third embodiment according to the present invention is illustrated. An energy-saving air conditioner and illumination controller 300 includes a controller 4 and a light control device 8. The light control device 8 includes a light regulator 2 and a multifunction sensor 3. The principles of the light regulator 2, multi-function sensor 3, and the controller 4 are the same as those in the embodiment 1.

The light control device 8 is electrically connected to an illumination device 6 for detecting luminance of the illumination device 6 so as to regulate the operation of the illumination device 6.

The controller 4 serves to communicate to the light control device 8 by transmitting an optical control signal S3 to the light control device 8 under user's operation.

The control signal S3 of the controller 4 issued by the users will be optically transmitted to the corresponding light control device 8 so that the illumination device 6 connected to the light control device 8 will be operated based on the control signal S3.

Referring to FIG. 8, an electrical diagram of the fourth embodiment according to the present invention is illustrated. An energy-saving air conditioner and illumination controller 400 includes an electric equipment control device 9 and a controller 4. The equipment control device 9 is connected to an air conditioner fan 5 and an illumination device 6 for detecting the interior temperature, brightness and status of users so as to regulate the air conditioner fan 5 and the illumination device 6. The equipment control device 9 includes a fan regulator 1, light regulator 2, and a multi-function sensor. The principles of the fan regulator 1, light regulator 2, multi-function sensor 3, and the controller 4 are the same as those in the embodiment 1 of the present invention.

A control signal S3 of the controller 4 issued by the users will be optically transmitted to the equipment control device 9 so that the air conditioner fan 5 or the illumination device 6 connected to the equipment control device 9 will be operated based on the control signal S3.

The present invention is thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the present invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

An energy-saving air conditioner and illumination controller comprising:

an equipment control device electrically connected to an air conditioner fan and an illumination device for detecting the interior temperature, brightness, and status of users so as to regulate the operations of the air conditioner fan and an illumination device;

a controller serving to communicate to the equipment control device by optically transmitting parameters for the equipment control device under user's operation.

2. The energy-saving air conditioner and illumination controller as claimed in claim 1, wherein the communication between the controller and the equipment control device is a type of one-way or two-way communication.

3. The energy-saving air conditioner and illumination controller as claimed in claim 1, wherein the controller is defined as one of an administrative controller or a user controller.

4. The energy-saving air conditioner and illumination controller as claimed in claim 1, wherein the equipment control device includes a fan regulator, light regulator, and a multi-function sensor.

5. An energy-saving air conditioner and illumination controller comprising:

a fan control device electrically connected to an air conditioner fan for detecting an interior temperature and status of users so as to regulate the operation of the air conditioner fan;

a controller serving to communicate to the fan control device by optically transmitting parameter for the fan control device under the user's operation.

6. The energy-saving air conditioner and illumination controller as claimed in claim 5, wherein the communication between the controller and the equipment control device is a type of one-way or two-way communication.

7. The energy-saving air conditioner and illumination controller as claimed in claim 5, wherein the controller is defined as one of an administrative controller or a user controller.

8. The energy-saving air conditioner and illumination controller as claimed in claim 5, wherein the equipment control device includes a fan regulator and a multi-function sensor.

9. An energy-saving air conditioner and illumination controller comprising:

a light control device electrically connected to an illumination device for detecting an interior brightness and status of users so as to regulate the operation of the illumination device;

a controller serving to communicate to the light control device by optically transmitting parameter for the light control device under the user's operation.

10. The energy-saving air conditioner and illumination controller as claimed in claim 9, wherein the communication between the controller and the equipment control device is a type of one-way or two-way communication.

11. The energy-saving air conditioner and illumination controller as claimed in claim 9, wherein the controller is defined as one of an administrative controller or a user controller.

12. The energy-saving air conditioner and illumination controller as claimed in claim 9, wherein the light control device includes a light regulator and a multi-function sensor.

13. (canceled)

14-15. (canceled)