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Power source pole and illumination device using same, and multifunctional device

Abstract

A power source pole of the present application includes a pole main body, a solar cell module, a storage battery, and a power source side connector. The solar cell module and the power source side connector are located outside the pole main body. The storage battery is charged with electric power generated by the solar cell module. The electric power of the storage battery is output to the outside through the power source side connector. An illumination apparatus of the present application includes the power source pole of the present application and a light emission unit. A multifunctional apparatus of the present application includes the power source pole of the present application and an outside unit.

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Background/Summary

TECHNICAL FIELD

(1) The present application relates to a power source pole, and an illumination apparatus and a multifunctional apparatus including the power source pole.

BACKGROUND ART

(2) A conventional pole having solar cells includes solar cell modules attached approximately vertically on a peripheral wall of a pole main body, and has the function of generating electric energy utilizing solar radiation afforded by at least scattered sunlight selected from scattered sunlight or direct sunlight (Patent Document 1).

(3) Such a pole having solar cells occupies a small area and thus can be installed at any location. Further, an external apparatus, such as illumination equipment such as an outdoor lamp, a guide sign, an electric clock, or communication equipment, can be attached to the pole. That is, the pole is excellent since it can be used for the plurality of purposes according to use conditions.

PRIOR ART DOCUMENT

Patent Document

(4) Patent Document 1: JP-A-H10-233236

DISCLOSURE OF INVENTION

Problem to be Solved by the Invention

(5) The above-described pole having solar cells is configured to include only one of the external apparatuses. It is thus difficult to install a plurality of detachable external apparatuses on the pole to allow the pole to function as a multifunctional apparatus in harmony with an increase in the efficiency of the solar cell modules.

(6) The present application solves this problem. As the efficiency of the solar cell modules increases, it is becoming necessary to provide the pole having solar cells with greater versatility and functionality. For this purpose, the present application provides a power source pole to and from which a plurality of external apparatuses are flexibly attachable and detachable, and a multifunctional apparatus that includes the power source pole.

Means for Solving Problem

(7) A power source pole of the present application includes a pole main body, a solar cell module, a storage battery, and a power source side connector. The solar cell module and the power source side connector are located outside the pole main body. The storage battery is charged with electric power generated by the solar cell module. The electric power of the storage battery is output to the outside through the power source side connector.

(8) An illumination apparatus of the present application includes the power source pole of the present application, and a light emission unit. The light emission unit includes a power receiving side connector. The power source side connector of the power source pole is connected with the power receiving side connector of the light emission unit.

(9) A multifunctional apparatus of the present application includes the power source pole of the present application, and an outside unit. The outside unit includes a power receiving side connector. The power source side connector of the power source pole is connected with the power receiving side connector of the outside unit.

Effects of the Invention

(10) The present application can provide a power source pole to and from which a plurality of external apparatuses are flexibly attachable and detachable, and a multifunctional apparatus that includes the power source pole.

Description

BRIEF DESCRIPTION OF DRAWINGS

(1) FIG. 1 is a schematic side view illustrating an exemplary power source pole of an embodiment.

(2) FIG. 2 is a schematic partial side view illustrating another exemplary power source pole of the embodiment.

(3) FIG. 3 is a schematic partial side view illustrating an exemplary illumination apparatus of an

embodiment.

(4) FIG. 4 is a schematic cross-sectional view illustrating a power source side connector and a power receiving side connector of the embodiment.

(5) FIG. 5 is a schematic partial side view illustrating an exemplary multifunctional apparatus of an embodiment.

(6) FIG. 6 is a schematic partial side view illustrating another exemplary multifunctional apparatus of the embodiment.

(7) FIG. 7 is a schematic partial side view illustrating another exemplary multifunctional apparatus of the embodiment.

DESCRIPTION OF THE INVENTION

(8) (Power Source Pole)

(9) A power source pole of the present application includes a pole main body, a solar cell module, a storage battery, and a power source side connector. The solar cell module and the power source side connector are located outside the pole main body. The storage battery is charged with electric power generated by the solar cell module. The electric power of the storage battery is output to the outside through the power source side connector.

(10) The power source pole of the present application, which includes the solar cell module and thus can function as an off-the-grid power source that is independent from an electrical grid, can be effectively used as a power source in a region that is isolated from an electrical grid and a region to which it is difficult to supply electric power from an electrical grid due to a natural disaster such as an earthquake.

(11) If unseasonable weather continues for an extended time, it may be difficult to supply electric power by only the solar power generation. In preparation for such a case, the power source pole of the present application can also use commercial power sources.

(12) Adjusting the number, location, and the like of the power source side connector of the power source pole of the present application allows, for example, outside units, such as a light emission unit, a camera unit, a sensor unit, and a communication unit, to be flexibly attached to and detached from the power source pole, and also allows them to be flexibly located. This makes it easy to provide the power source pole including the solar cell with greater versatility and functionality.

(13) The power source side connector preferably includes a receptacle socket. This makes it easy to connect and disconnect the outside unit to and from the power source pole.

(14) Preferably, the power source side connector is attached to the pole main body via an attachment unit that is removable. If a plurality of the attachment units having different shapes is prepared, the attachment units having various shapes can be exchangeably used according to the intended use, which allows the power source pole to be more flexibly used.

(15) The power source side connector may also include a communication line in addition to an electric current line.

(16) Preferably, the attachment unit has a cap-like shape and is installed at the distal end of the pole main body. This allows the outside unit to be installed at a certain height. Thus, when, e.g., a light emission unit, a camera unit, a sensor unit, or a communication unit is used as the outside unit, they are effective over wider areas.

(17) Preferably, the attachment unit is rotatable on the central axis of the pole main body. This allows the direction of the connected outside unit to be flexibly changed according to conditions such as the installation location of the power source pole.

(18) Preferably, the solar cell module includes a flexible solar power generation sheet wound around an exterior surface of the pole main body. This allows sunlight to be always incident on the solar power generation sheet irrespective of the position of the sun.

(19) Hereinafter, an embodiment of the power source pole of the present application will be described with reference to the drawings.

(20) FIG. 1 is a schematic side view illustrating an exemplary power source pole of the present

embodiment. In FIG. 1, a power source pole **10** includes a pole main body **11**, a solar power generation sheet **12**, a connector attachment unit **13**, and a power source side connector **14**. The power source pole **10** functions as a pole-type solar power generation apparatus (off-the-grid power source) that includes the solar power generation sheet **12** as the solar cell module, and can perform solar power generation using the solar power generation sheet **12** when the power source pole **10** stands substantially vertically. The solar power generation sheet **12** is installed by winding the solar power generation sheet **12** around the exterior surface of the pole main body **11**. The connector attachment unit **13** has a cap-like shape and is installed at the distal end of the pole main body **11**. The connector attachment unit **13** includes the power source side connector **14** in the side face of the connector attachment unit **13**. The pole main body **11** contains a storage battery (not shown). The storage battery is electrically connected with the power source side connector **14**. The storage battery is charged with electric power generated by the solar power generation sheet **12**. The electric power of the storage battery can be output to the outside through the power source side connector **14**.

(21) The power source pole **10** is a pole type that has a solar power generation function. The pole type includes, e.g., a cylindrical pole that stands substantially vertically as illustrated. The pole type also includes a wide range of poles: a polygonal pole such as a quadrangular pole; an elliptical pole; a pole formed by connecting two or more poles; a pole having a standing angle that is slightly adjusted depending on the landform and intended use; and poles that are at least partially erected, such as a foldable pole, an extendable pole, and a pole that can be housed underground.

(22) The solar cell module refers to all things that convert light energy of, e.g., sunlight into electrical energy, and is not limited to the flexible solar power generation sheet **12**, which is illustrated as one example. The solar cell module may be a plate panel formed into a cylindrical shape, or may have other configurations.

(23) The solar power generation sheet **12** includes a transparent resin sheet that is made of a flexible material, and a solar cell device that is sealed in the resin sheet by, e.g., lamination. The solar cell device is, e.g., a flexible solar cell device such as an amorphous silicon-based thin-film solar cell. In addition to the amorphous silicon-based solar cell, various solar cells such as a compound semiconductor-based solar cell, an organic semiconductor-based solar cell, and a dye-sensitized solar cell can be used. The solar cell sheet does not include a glass substrate that is included in a crystalline silicon-based solar cell panel, and does not need a base plate for maintaining the strength of the panel, and thus has a light weight.

(24) The solar power generation sheet **12** may be directly wound around an exterior surface of the pole main body **11**. Alternatively, the solar power generation sheet **12** may be wound around an exterior surface of an elongated cylindrical tube. Then, the pole main body **11** may be inserted into the tube, and the tube may be fixed to the pole main body **11**.

(25) The pole main body **11** has a housing portion (not shown) inside the pole main body **11**. The housing portion houses the storage battery (not shown) that is charged with electric power generated by the solar power generation sheet **12**. The housing portion may house other built-in equipment in addition to the storage battery. The pole main body **11** may have a ground portion (not shown) in the lower portion of the pole main body **11**. The ground portion grounds and supports the entire pole. The pole main body **11** may be constituted as an integral member or a plurality of components. The pole main body **11** may be extendable or transformable.

(26) Examples of the storage battery include a nickel-hydrogen battery and a lithium-ion battery. The nickel-hydrogen battery is suitable since it has a light weight and a large electric capacity. Examples of the built-in equipment other than the storage battery include an electric power regulator of the storage battery, and a controller that controls the outside unit that is connected with the power source pole **10**. The outside unit to be connected with the power source pole **10** may be, e.g., a light emission unit, a camera unit, a sensor unit, or a communication unit, as will be described in detail later.

(27) The connector attachment unit **13** is attached to the distal end of the pole main body **11**. The power source side connector **14** is installed in the side face of the connector attachment unit **13**. The connector attachment unit **13** may be fixed to or removable from the pole main body **11**. The connector attachment unit **13** may be rotatable on the central axis of the pole main body **11**. If the connector attachment unit **13** is rotatable around the pole main body **11**, it is easy to change the direction of the power source side connector **14**.

(28) The power source side connector **14** is not limited to a particular form, but is preferably in the form of a receptacle socket. The receptacle socket makes it easy to attach and detach a power receiving side connector to and from the power source side connector **14**. The power source side connector **14**, which includes an electric current line, preferably includes a communication line in addition to the electric current line. This allows information data to be exchanged with the outside unit that is connected with the power source pole **10**. For example, if the housing portion of the pole main body **11** houses a communication apparatus as the built-in equipment, and a camera unit as the outside unit is connected with the power source pole **10** through the power source side connector **14**, image data can be transferred to the communication apparatus from the camera unit through the communication line, and then transmitted to the outside from the communication apparatus.

(29) FIG. 2 is a schematic partial side view illustrating another exemplary power source pole of the present embodiment. In FIG. 2, a power source pole **20** includes a solar power generation sheet **12** that is attached to a pole main body, a connector attachment unit **13**, and power source side connectors **14a**, **14b**, and **14c**. As illustrated in FIG. 2, providing the plurality of power source side connectors **14a**, **14b**, and **14c** in the top face and side face of the connector attachment unit **13** allows the power source side connectors to be more flexibly oriented. If the connector attachment unit **13** is rotatable on the central axis of the pole main body, the power source side connectors are even more flexibly oriented. Preferably, the power source side connectors **14a**, **14b**, and **14c** each include a communication line in addition to an electric current line.

(30) (Illumination Apparatus)

(31) An illumination apparatus of the present application includes the above-described power source pole of the present application, and a light emission unit. The light emission unit includes a power receiving side connector. The power source side connector of the power source pole is connected with the power receiving side connector of the light emission unit.

(32) The illumination apparatus of the present application includes the power source pole that can function as an off-the-grid power source that is independent from an electrical grid, and the light emission unit that is supplied with electric power from the power source pole. Thus, the illumination apparatus of the present application can be effectively used in a region that is isolated from an electrical grid and a region to which it is difficult to supply electric power from an electrical grid due to a natural disaster such as an earthquake.

(33) In the illumination apparatus of the present application, since the power source side connector of the power source pole is connected with the power receiving side connector of the light emission unit, the light emission unit can be flexibly removed from the power source pole. This facilitates the replacement and maintenance of the light emission unit. Adjusting the number, location, and the like of the power source side connector of the power source pole makes it easy to change the direction of the light emission unit.

(34) The power receiving side connector preferably includes a plug pin. This makes it easy to connect and disconnect the light emission unit to and from the power source pole.

(35) Hereinafter, an embodiment of the illumination apparatus of the present application will be described with reference to the drawings. However, the explanation for the power source pole of the present application will not be repeated.

(36) FIG. 3 is a schematic partial side view illustrating an exemplary illumination apparatus of the present embodiment. In FIG. 3, an illumination apparatus **30** includes the power source pole **10** as

illustrated in FIG. 1, and a light emission unit **31**. The power source side connector **14** is provided in the side face of the connector attachment unit **13** of the power source pole **10**. The light emission unit **31** includes a power receiving side connector **32** with a power cord **33** therebetween. The power source pole **10** is electrically connected with the light emission unit **31** through the power source side connector **14** and the power receiving side connector **32**.

(37) The light emission unit **31** includes the power cord **33** and thus is more flexibly located. Extending the power cord **33** allows the light emission unit **31** to be installed at a location apart from the power source pole **10**.

(38) Although in FIG. 3, one power source side connector **14** is located in the side face of the connector attachment unit **13** of the power source pole **10**, a plurality of the power source side connectors **14** may be located as illustrated in FIG. 2. The power receiving side connector **32** may be directly attached to the light emission unit **31** so that the power cord **33** is eliminated. In this case, if the connector attachment unit **13** is rotatable on the central axis of the pole main body, it is easy to change the direction of the light emission unit **31**.

(39) FIG. 4 is a schematic cross-sectional view illustrating the power source side connector and the power receiving side connector of the present embodiment. In FIG. 4, the power source side connector **14** includes a receptacle socket, and the power receiving side connector **32** includes a plug pin. The power receiving side connector **32** includes the plug pin with one pin in FIG. 4, but may include a plug pin with, e.g., two or three pins. In this case, the number of pin-receiving holes of the power source side connector **14** is equal to the number of the pins of the power receiving side connector **32**.

(40) The power source side connector **14**, the power receiving side connector **32**, and the power cord **33**, which each include an electric current line, may each include a communication line in addition to the electric current line.

(41) (Multifunctional Apparatus)

(42) A multifunctional apparatus of the present application includes the above-described power source pole of the present application, and an outside unit. The outside unit includes a power receiving side connector. The power source side connector of the power source pole is connected with the power receiving side connector of the outside unit.

(43) The multifunctional apparatus of the present application includes the power source pole that can function as an off-the-grid power source that is independent from an electrical grid, and the outside unit that is supplied with electric power from the power source pole. Selecting the type of the outside unit allows the multifunctional apparatus of the present application to be effectively used as a multifunctional apparatus that can deal with various intended uses in a region that is isolated from an electrical grid and a region to which it is difficult to supply electric power from an electrical grid due to a natural disaster such as an earthquake.

(44) In the multifunctional apparatus of the present application, since the power source side connector of the power source pole is connected with the power receiving side connector of the outside unit, the outside unit can be flexibly removed from the power source pole. This allows various types of the outside units to be attached to the power source pole depending on necessity, and thus allows the power source pole to act as the multifunctional apparatus that can be used for various intended uses. Adjusting the number, location, and the like of the power source side connector of the power source pole makes it easy to change the direction of the outside unit according to the function of the outside unit. In particular, if a plurality of the outside units is installed, it is easy to appropriately orient each outside unit.

(45) The power receiving side connector preferably includes a plug pin. This makes it easy to connect and disconnect the outside unit to and from the power source pole.

(46) Any type of the outside unit can be used. For example, a light emission unit, a camera unit, a sensor unit, and a communication unit can be used. One type or a plurality of types of the outside units may be used.

(47) Hereinafter, an embodiment of the multifunctional apparatus of the present application will be described with reference to the drawings. However, the explanation for the power source pole of the present application will not be repeated.

(48) FIG. 5 is a schematic partial side view illustrating an exemplary multifunctional apparatus of the present embodiment. In FIG. 5, a multifunctional apparatus **40** includes the power source pole **10** as illustrated in FIG. 1, a light emission unit **31**, and a camera unit **41**. The power source side connector **14** is provided in the side face of the connector attachment unit **13** of the power source pole **10**.

(49) The camera unit **41** includes a power receiving side connector **42** with a power cord **44** therebetween. The power source pole **10** is electrically connected with the camera unit **41** through the power source side connector **14** and the power receiving side connector **42**. The camera unit **41** also includes an intermediate power source side connector **43**.

(50) The light emission unit **31** includes a power receiving side connector **32** with a power cord **33** therebetween. The camera unit **41** is electrically connected with the light emission unit **31** through the intermediate power source side connector **43** and the power receiving side connector **32**.

(51) As illustrated in FIG. 5, since the power source pole **10**, the light emission unit **31**, and the camera unit **41** are connected with each other through the connectors, it is easy to directly or indirectly attach and detach the light emission unit **31** and the camera unit **41** to and from the power source pole **10**.

(52) The camera unit **41** and the light emission unit **31** include the power cord **44** and the power cord **33**, respectively, and thus are more flexibly located. Extending the power cord **44** and the power cord **33** allows the camera unit **41** and the light emission unit **31** to be installed at locations apart from the power source pole **10**.

(53) Although in FIG. 5, one power source side connector **14** is located in the side face of the connector attachment unit **13** of the power source pole **10**, a plurality of the power source side connectors **14** may be located as illustrated in FIG. 2. The power receiving side connector **42** may be directly attached to the camera unit **41** so that the power cord **44** is eliminated. In this case, if the connector attachment unit **13** is rotatable on the central axis of the pole main body, it is easy to change the direction of the camera unit **41**. The power receiving side connector **32** may be directly attached to the light emission unit **31** so that the power cord **33** is eliminated.

(54) The power source side connector **14** and the intermediate power source side connector **43** may each include a receptacle socket. The power receiving side connectors **32** and **42** may each include a plug pin with, e.g., one, two, or three pins. In this case, the number of pin-receiving holes of the power source side connector **14** is equal to the number of the pins of the power receiving side connector **42**. The number of pin-receiving holes of the intermediate power source side connector **43** is equal to the number of the pins of the power receiving side connector **32**.

(55) The power source side connector **14**, the intermediate power source side connector **43**, the power receiving side connectors **32** and **42**, and the power cords **33** and **44**, which each include an electric current line, preferably each include a communication line in addition to the electric current line. This enables information data exchange between the power source pole **10**, the camera unit **41**, and the light emission unit **31**. For example, if the housing portion of the power source pole **10** houses a communication apparatus as the built-in equipment, image data can be transferred to the communication apparatus from the camera unit **41** through the communication lines, and then transmitted to the outside from the communication apparatus.

(56) FIG. 6 is a schematic partial side view illustrating another exemplary multifunctional apparatus of the present embodiment. In FIG. 6, a multifunctional apparatus **50** includes the power source pole **10** as illustrated in FIG. 1, a light emission unit **31**, a camera unit **41**, and a communication unit **51**. The power source side connector **14** is provided in the side face of the connector attachment unit **13** of the power source pole **10**.

(57) The communication unit **51** includes a power receiving side connector **52** with a power cord

54 therebetween. The power source pole **10** is electrically connected with the communication unit **51** through the power source side connector **14** and the power receiving side connector **52**. The communication unit **51** also includes an intermediate power source side connector **53**.

(58) The camera unit **41** includes a power receiving side connector **42** with a power cord **44** therebetween. The communication unit **51** is electrically connected with the camera unit **41** through the intermediate power source side connector **53** and the power receiving side connector **42**. The camera unit **41** also includes an intermediate power source side connector **43**.

(59) The light emission unit **31** includes a power receiving side connector **32** with a power cord **33** therebetween. The camera unit **41** is electrically connected with the light emission unit **31** through the intermediate power source side connector **43** and the power receiving side connector **32**.

(60) As illustrated in FIG. 6, since the power source pole **10**, the light emission unit **31**, the camera unit **41**, and the communication unit **51** are connected with each other through the connectors, it is easy to directly or indirectly attach and detach the light emission unit **31**, the camera unit **41**, and the communication unit **51** to and from the power source pole **10**.

(61) The communication unit **51**, the camera unit **41**, and the light emission unit **31** include the power cord **54**, the power cord **44**, and the power cord **33**, respectively, and thus are more flexibly located. Extending the power cord **54**, the power cord **44**, and the power cord **33** allows the communication unit **51**, the camera unit **41**, and the light emission unit **31** to be installed at locations apart from the power source pole **10**.

(62) Although in FIG. 6, one power source side connector **14** is located in the side face of the connector attachment unit **13** of the power source pole **10**, a plurality of the power source side connectors **14** may be located as illustrated in FIG. 2. The power receiving side connector **52** may be directly attached to the communication unit **51** so that the power cord **54** is eliminated. In this case, if the connector attachment unit **13** is rotatable on the central axis of the pole main body, it is easy to change the direction of the communication unit **51**. The power receiving side connector **42** may be directly attached to the camera unit **41** so that the power cord **44** is eliminated. The power receiving side connector **32** may be directly attached to the light emission unit **31** so that the power cord **33** is eliminated.

(63) The power source side connector **14** and the intermediate power source side connectors **43** and **53** may each include a receptacle socket. The power receiving side connectors **32**, **42**, and **52** may each include a plug pin with, e.g., one, two, or three pins. In this case, the number of pin-receiving holes of the power source side connector **14** is equal to the number of the pins of the power receiving side connector **52**. The number of pin-receiving holes of the intermediate power source side connector **43** is equal to the number of the pins of the power receiving side connector **32**. The number of pin-receiving holes of the intermediate power source side connector **53** is equal to the number of the pins of the power receiving side connector **42**.

(64) The power source side connector **14**, the intermediate power source side connectors **43** and **53**, the power receiving side connectors **32**, **42**, and **52**, and the power cords **33**, **44**, and **54**, which each include an electric current line, preferably each include a communication line in addition to the electric current line. This enables information data exchange between the communication unit **51**, the camera unit **41**, and the light emission unit **31**. For example, image data can be transferred to the communication unit **51** from the camera unit **41** through the communication lines, and then transmitted to the outside from the communication unit **51**.

(65) FIG. 7 is a schematic partial side view illustrating another exemplary multifunctional apparatus of the present embodiment. In FIG. 7, a multifunctional apparatus **60** includes the power source pole **20** as illustrated in FIG. 2, a light emission unit **31**, a camera unit **41**, a communication unit **51**, and a sensor unit **61**. The power source side connectors **14a**, **14b**, and **14c** are provided for the connector attachment unit **13** of the power source pole **20**.

(66) The light emission unit **31** directly includes a power receiving side connector **32**. The power source pole **20** is electrically connected with the light emission unit **31** through the power source

side connector **14a** and the power receiving side connector **32**.

(67) The camera unit **41** directly includes a power receiving side connector **42**. The power source pole **20** is electrically connected with the camera unit **41** through the power source side connector **14b** and the power receiving side connector **42**. The camera unit **41** also includes an intermediate power source side connector **43**.

(68) The communication unit **51** directly includes a power receiving side connector **52**. The camera unit **41** is electrically connected with the communication unit **51** through the intermediate power source side connector **43** and the power receiving side connector **52**.

(69) The sensor unit **61** directly includes a power receiving side connector **62**. The power source pole **20** is electrically connected with the sensor unit **61** through the power source side connector **14c** and the power receiving side connector **62**.

(70) As illustrated in FIG. 7, since the power source pole **20**, the light emission unit **31**, the camera unit **41**, the communication unit **51**, and the sensor unit **61** are connected with each other through the connectors, it is easy to directly or indirectly attach and detach the light emission unit **31**, the camera unit **41**, the communication unit **51**, and the sensor unit **61** to and from the power source pole **20**.

(71) In FIG. 7, the power source side connectors **14a**, **14b**, and **14c** are located in the side face and top face of the connector attachment unit **13** of the power source pole **20**. In this case, if the connector attachment unit **13** is rotatable on the central axis of the pole main body, the directions of the outside units (the light emission unit **31**, the camera unit **41**, the communication unit **51**, and the sensor unit **61**) can be changed.

(72) The power source side connectors **14a**, **14b**, and **14c** and the intermediate power source side connector **43** may each include a receptacle socket. The power receiving side connectors **32**, **42**, **52**, and **62** may each include a plug pin with, e.g., one, two, or three pins. In this case, the number of pin-receiving holes of the power source side connector **14a** is equal to the number of the pins of the power receiving side connector **32**. The number of pin-receiving holes of the power source side connector **14b** is equal to the number of the pins of the power receiving side connector **42**. The number of pin-receiving holes of the power source side connector **14c** is equal to the number of the pins of the power receiving side connector **62**. The number of pin-receiving holes of the intermediate power source side connector **43** is equal to the number of the pins of the power receiving side connector **52**.

(73) The power source side connectors **14a**, **14b**, and **14c**, the intermediate power source side connector **43**, and the power receiving side connectors **32**, **42**, **52**, and **62**, which each include an electric current line, preferably each include a communication line in addition to the electric current line. This enables information data exchange between the communication unit **51**, the light emission unit **31**, the camera unit **41**, and the sensor unit **61**. For example, image data can be transferred to the communication unit **51** from the camera unit **41** through the communication lines, and then transmitted to the outside from the communication unit **51**. Further, observed data can be transferred to the communication unit **51** from the sensor unit **61** through the communication lines, and then transmitted to the outside from the communication unit **51**.

(74) As described above, the power source side connector, the intermediate power source side connector, and the power receiving side connector each function as a hardware interface for connecting the power source pole with the outside unit. Locating a plurality of the multifunctional apparatuses each including the communication unit and any of the other outside units in a specific region can form an information communication network system.

(75) Using the information communication network system allows an atmosphere (e.g., temperature, humidity, atmospheric pressure, solar radiation, and rainfall) observation system, and a ground environment (e.g., landslide, inclination, debris flow, and water level) observation system (e.g., a ground observation system, a river observation system, and a crime prevention system) to be operated, for example.

(76) The present application may be embodied in other forms. The embodiments disclosed in this application are to be considered in all respects as illustrative and not limitative. The scope of the invention is indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are intended to be embraced therein.

DESCRIPTION OF REFERENCE NUMERALS

(77) **10, 20** power source pole **11** pole main body **12** solar power generation sheet **13** connector attachment unit **14** power source side connector **14a, 14b, 14c** power source side connector **30** illumination apparatus **31** light emission unit **32, 42, 52, 62** power receiving side connector **33, 44, 54** power cord **40, 50, 60** multifunctional apparatus **41** camera unit **43, 53** intermediate power source side connector **51** communication unit **61** sensor unit

Claims

1. A multifunctional apparatus comprising: a power source pole; and an outside unit, wherein the power source pole includes a pole main body, a solar cell module, a storage battery, and a power source side connector, the solar cell module and the power source side connector are located outside the pole main body, the storage battery is charged with electric power generated by the solar cell module, the electric power of the storage battery is output to the outside through the power source side connector, the outside unit includes a power receiving side connector and an intermediate power source side connector, the outside unit includes at least one selected from the group consisting of a light emission unit, a camera unit, a sensor unit, and a communication unit, and the power source side connector of the power source pole is directly connected with the power receiving side connector of the outside unit, or indirectly connected with the power receiving side connector of the outside unit through the intermediate power source side connector.
 2. The multifunctional apparatus according to claim 1, wherein the power source side connector and the intermediate power source side connector each include a receptacle socket.
 3. The multifunctional apparatus according to claim 1 or 2, wherein the power source side connector is attached to the pole main body via an attachment unit that is removable.
 4. The multifunctional apparatus according to claim 3, wherein the attachment unit has a cap-like shape and is installed at a distal end of the pole main body.
 5. The multifunctional apparatus according to claim 3, wherein the attachment unit is rotatable on a central axis of the pole main body.
 6. The multifunctional apparatus according to claim 1, wherein the solar cell module includes a flexible solar power generation sheet wound around an exterior surface of the pole main body.
 7. The multifunctional apparatus according to claim 1, wherein the power source side connector, the power receiving side connector, and the intermediate power source side connector each include an electric current line and a communication line.
 8. The multifunctional apparatus according to claim 1, wherein the power receiving side connector includes a plug pin.
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