[0033] It is therefore desirable to provide improved LED lamps and associated connector systems which overcome some, if not all of the proceeding problems and disadvantages.

Summary of Invention

[0033a] According to an aspect of the present invention, there is provided a linear LED lamp for use in a networked LED lighting system, the linear LED lamp comprising:

an elongate body with a length between spaced first and second ends;

an elongate heat sink formed of a heat dissipating material and comprising a mounting portion;

at least one LED emitter panel secured to the heat sink mounting portion, the LED emitter panel comprising a circuit board containing LED emitters connected in a circuit for emitting and distributing light outwardly from the emitter panel in a light distribution pattern;

a first end connector at the first end of the body configured to engage a leading end portion of a first support connector mounted on a support of a lighting fixture;

the first end connector having a wall defining a first opening bounded by an edge and sized to receive the leading end portion of the first support connector;

the first end connector and leading end portion of the first support connector respectively having first and second surfaces,

the first end connector configured so that the first and second surfaces are placed in confronting relationship to prevent separation of the first end connector and the first support connector as an incident of the first end connector moving relative to the first support connector from a position fully separated from the first support connector part in a substantially straight path that is transverse to the length of the body into an engaged position with the leading end portion of the first support connector extending through the first opening to maintain the first end of the body in an operative state on the support;

a communications jack at the first end of the linear LED lamp, the jack including a housing defining an internal port for receiving a network communications plug through an access opening of the port and providing an interface operable to transmit power and data signals, the jack positioned so that the access opening of the port faces the first opening of the first end connector.

Brief Description of the Drawings

[0034] FIG. 1A is a side perspective view showing a standard male connector plug at an end of an Ethernet cable;

[0035] FIG. 1B is an end view of the connector plug of FIG. 1A and showing exposed electrical pins of the plug;

[0036] FIG. 1C is a top view of the connector plug of FIG. 1A;

[0037] FIG. 2A is an end perspective view showing a standard female jack including an opening for receiving the male connector plug of FIGs. 1A – 1C and contacts for engaging the electrical pins of the plug;

[0038] FIG. 2B shows a perspective view of the jack of FIG. 2A;

[0039] FIG. 3A is a perspective view of PoE snap-fit connector assembly mounted to a lighting fixture and configured to receive a male Ethernet connector plug at a proximal base end thereof, to secure the cylindrical end cap of a linear LED lamp to the lighting fixture using a snap-fit connection, and to provide Ethernet power and data connectivity to the lamp;

[0040] FIG. 3B is a view as in FIG. 3A with the Ethernet connector plug, PoE snap-fit connector assembly, lamp end cap and cylindrical tubular lamp body joined in an assembled configuration;

[0041] FIG. 4A is side perspective view of the PoE snap-fit connector assembly of FIGs. 3A and 3B, and showing a proximal base end for mounting to a lighting fixture, a mid-portion including a snap-fit actuator assembly and extending to a distal tip portion configured as integral Ethernet plug;

[0042] FIG. 4B is right side view of the PoE snap-fit connector assembly of FIG. 4A;

[0043] FIG. 4C is an end view of the PoE snap-fit connector assembly, and showing an integral standard Ethernet jack accessible through an end-wall of the base end of the connector;

CLAIMS

What is claimed is:

1. A linear LED lamp for use in a networked LED lighting system, the linear LED lamp comprising:

an elongate body with a length between spaced first and second ends;

an elongate heat sink formed of a heat dissipating material and comprising a mounting portion;

at least one LED emitter panel secured to the heat sink mounting portion, the LED emitter panel comprising a circuit board containing LED emitters connected in a circuit for emitting and distributing light outwardly from the emitter panel in a light distribution pattern;

a first end connector at the first end of the body configured to engage a leading end portion of a first support connector mounted on a support of a lighting fixture;

the first end connector having a wall defining a first opening bounded by an edge and sized to receive the leading end portion of the first support connector;

the first end connector and leading end portion of the first support connector respectively having first and second surfaces,

the first end connector configured so that the first and second surfaces are placed in confronting relationship to prevent separation of the first end connector and the first support connector as an incident of the first end connector moving relative to the first support connector from a position fully separated from the first support connector part in a substantially straight path that is transverse to the length of the body into an engaged position with the leading end portion of the first support connector extending through the first opening to maintain the first end of the body in an operative state on the support;

a communications jack at the first end of the linear LED lamp, the jack including a housing defining an internal port for receiving a network communications plug through an access opening of the port and providing an interface operable to transmit power and data signals, the jack positioned so that the access opening of the port faces the first opening of the first end connector.

2. The linear LED lamp according to claim 1, further comprising a control module mounted within the linear LED lamp and electrically connected to the communications jack, the control module including a processor configured to execute

instructions defined by control signals received via the jack and associated with or more operational functions of the linear LED lamp.

3. The linear LED lamp according to claim 2, further comprising a connector end board at the first end of the body, the jack electrically connected to the control module via connector end board.

4. The linear LED lamp according to claim 3, wherein the jack is an Ethernet jack.

5. The linear LED lamp according to claim 3, wherein the jack is a Universal Serial Bus jack.

6. The linear LED lamp according to claim 1, further comprising a second end connector at the second end of the body, the second end connector configured to engage a second support connector mounted on the support to maintain the second end of body in an operative state on said support, wherein the second end connector and second support connector have surfaces that are respectively structurally substantially the same as the first and second surfaces of the first end connector and first support connector and interact with each other at the second end of the body in the same way that the first and second surfaces of the first end connector and first support connector interact with each other at the first end of the body.

7. The linear LED lamp of claim 3, wherein the first end connector is part of a first end cap assembly that is at the first end of the body, the first end cap assembly comprising a first cup-shaped component into which the first end of the body extends.

8. The linear LED lamp of claim 7, wherein the connector end board is at least partially positioned within the first end cap assembly.

9. The linear LED lamp of claim 6, wherein the second end connector is part of a second end cap assembly that is at the second end of the body, the second end cap assembly comprising a second cup-shaped component into which the second end of the body extends.

10. The linear LED lamp according to claim 1, wherein the leading end portion of the first support connector comprises an integral network communications plug, and the jack is mounted at a position such that the plug is received through the access opening and into the internal port of the jack to electrically connect the plug and the jack as an incident of the first end connector moving from the fully separated position into the engaged position.

11. The linear LED lamp according to claim 1, wherein the first support connector includes an internal raceway configured to allow a network cable terminated with a

communications plug to translate along the raceway, and the jack is mounted at a position such that the plug can be translated through an opening in the leading end portion of the first support connector and into the internal port of the jack to electrically connect the plug and the jack.

12. The linear LED lamp according to claim 2, wherein control module further comprises a driver circuit for driving the LED emitters with a controlled level of electric current.

13. The linear LED lamp according to claim 12, wherein the control module is operative to receive control signals containing instructions executable by the processor in response to which the control module turns on or off the LED emitters of, or changes the brightness of light emitted by, the LED emitter panel.

14. The linear LED lamp according to claim 12, wherein the control module is operative to receive signals from a sensor that generates signals corresponding to a sensed environmental input, and wherein the control module is operable to change a characteristic of the light emitted by the LED emitter panel based on the sensor signal.

15. The linear LED lamp according to claim 14, wherein the signals received from the sensor correspond to a sensed condition associated with motion, occupancy, light level, an air characteristic, or sound.

16. The linear LED lamp according to claim 12, wherein the LED emitter panel comprises first and second groups of LED emitters, the first group of LED emitters connected in parallel to the second group of LED emitters and the LED emitters of each group connected in series to the other LED emitters of the same group, the driver circuit comprises multiple parallel driver subcircuits for independently driving each group of LED emitters at a controlled current level.

17. The linear LED lamp according to claim 16, wherein the driver subcircuits control the current level provided to the first and the second group of LED emitters below a maximum current capacity thereof for providing more efficient conversion of electrical power to light output.

18. The linear LED lamp according to claim 16, wherein the LED emitters of the first group are operable to emit light characterized by a first color correlated temperature and the LED emitters of the second group are operable to emit light characterized by a second color correlated temperature different from the first color temperature.

19. The linear LED lamp according to claim 18, wherein control module is operative to receive control signals containing instructions executable by the processor in response to which the driver subcircuits adjust the relative current level provided to the first and the second group of LED emitters to electrically tune the color correlated temperature of the composite light emitted by the LED emitter panel.

20. The linear LED lamp according to claim 1, wherein the LED emitter panel comprises a plurality of LED emitter subpanels connected end to end.

21. The linear LED lamp according to claim 1 wherein the heat sink is a multi-sided heat sink comprising first and second sidewalls comprising generally planar mounting surfaces lying in intersecting planes and a third sidewall having an outer surface forming outer surface of the linear LED lamp, the linear LED lamp comprising first and second LED emitter panels, the first LED emitter panel secured to the first sidewall and the second LED emitter panel secured to the second sidewall.

22. The linear LED lamp according to claim 21, further comprising a control module mounted internal to the sidewalls of the multiple sided heat sink and electrically connected to the communications jack, the control module including a processor configured to execute instructions defined by control signals received via the jack and associated with or more operational functions of the linear LED lamp.

23. The linear LED lamp according to claim 22, wherein the control module further comprises a driver circuit having a plurality of driver subcircuits and the control module is operable to independently drive the first LED emitter panel at a first controlled current level and the second LED emitter panel at a second controlled current level.

24. The linear LED lamp according to claim 21, further comprising a battery power supply circuit mounted internal to the sidewalls of the multiple sided heat sink, and wherein the battery power supply circuit comprises at least one battery, a charging circuit for providing a charging current to the at least one battery in a first mode of operation, and a control sub-circuit for switching the load to the at least one battery in a second mode of operation.

25. The linear LED lamp according to claim 22, wherein the multiple sided heat sink further comprising a fourth, generally planar sidewall extending between the first and second sidewalls, and a third LED emitter panel secured to the fourth sidewall.

26. The linear LED lamp according to claim 25, wherein the control module is operable to drive the third LED emitter panel independent of the other LED emitter panels at a current level based on instructions received by the control module.

27. The linear LED lamp according to claim 1, wherein the linear LED lamp has a length of about 24 inches or about 48 inches.

28. The linear LED lamp according to claim 6, a second communications jack at the second end of the body, the second jack including a housing defining an internal port for receiving a second network communications plug through an access opening of the internal port and providing an interface operable to transmit power and data signals, an outer wall of the second end connector defining an opening, the jack positioned such that the access opening is generally aligned with the opening of the outer wall such that the second plug can be moved through the outer wall opening and received in the internal port of the second jack to electrically connect the second plug and the second jack.

29. The linear LED lamp according to claim 1, further comprising an elongate light diffuser cover providing a light transmissive lens positioned about and covering the LED emitters for reflecting, diffusing and/or focusing light emitted from the LED emitters.

30. The linear LED lamp according to claim 2, wherein the control module is operable to receive data signals associated with one or more operational functions of the linear LED lamp and to communicate corresponding data signals to the communications jack, and the jack is operable to communicate corresponding data signals to a local area network associated with an automated lighting control system.