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(12) **EX PARTE REEXAMINATION CERTIFICATE** (9143rd)
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Timmermans et al.

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- (54) **LED LIGHTING DEVICE FOR REPLACING FLUORESCENT TUBES**
- (75) Inventors: **Jos Timmermans**, Ortonville, MI (US);
Jean C. Raymond, Nominique, CA (US); **John Ivey**, Farmington Hills, MI (US)
- (73) Assignee: **Altair Engineering, Inc.**, Troy, MI (US)

- (51) **Int. Cl.**
F21S 4/00 (2006.01)
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- (52) **U.S. Cl.** **362/225**; 362/221; 362/249.01;
362/659
- (58) **Field of Classification Search** None
See application file for complete search history.

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Reexamination Certificate C2 7,510,299 issued May 24, 2011
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Related U.S. Application Data

- (63) Continuation of application No. 11/085,744, filed on Mar. 21, 2005, which is a continuation of application No. 09/782,375, filed on Feb. 12, 2001, now Pat. No. 7,049,761.
- (60) Provisional application No. 60/181,744, filed on Feb. 11, 2000.

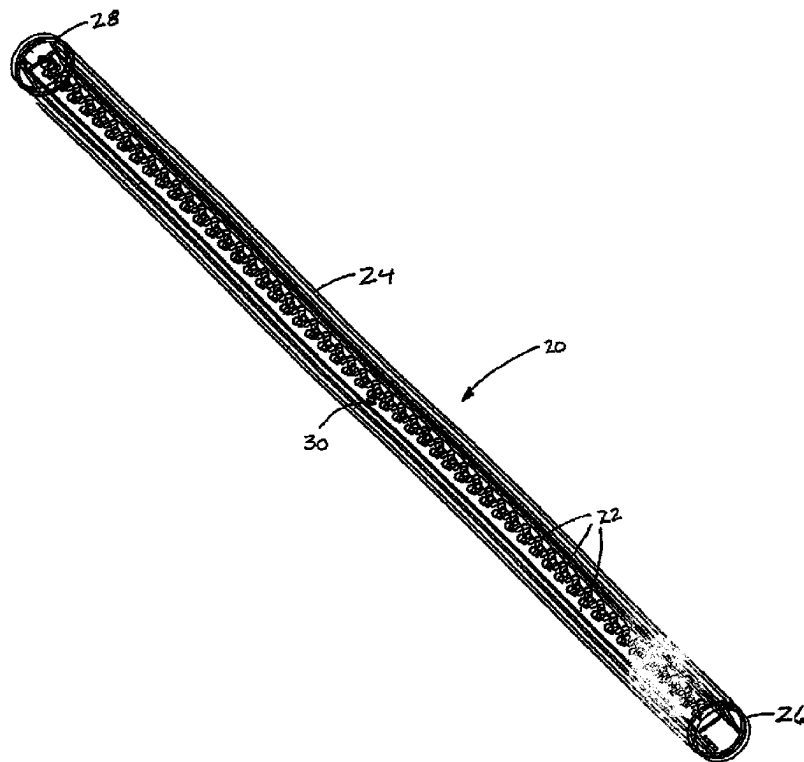
(56) **References Cited**

To view the complete listing of prior art documents cited during the proceeding for Reexamination Control Number 90/011,762, please refer to the USPTO's public Patent Application Information Retrieval (PAIR) system under the Display References tab.

Primary Examiner—Simon Ke

(57) **ABSTRACT**

A light tube for replacing fluorescent tubes including a bulb portion and a pair of end caps disposed at opposite ends of the bulb portion, and configured for illumination by a power supply circuit. A plurality of light emitting diodes are disposed inside the bulb portion and in electrical communication with a pair of end caps for illuminating in response to electrical current to be received from the power supply circuit.



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**EX PARTE
REEXAMINATION CERTIFICATE
ISSUED UNDER 35 U.S.C. 307**

THE PATENT IS HEREBY AMENDED AS
INDICATED BELOW.

Matter enclosed in heavy brackets [] appeared in the patent, but has been deleted and is no longer a part of the patent; matter printed in italics indicates additions made to the patent.

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

Claims 1 and 3 are cancelled.

Claims 2 and 4-8 are determined to be patentable as amended.

Claim 9, dependent on an amended claim, is determined to be patentable.

2. An elongate generally tubular lighting device for replacing a conventional fluorescent light tube comprising:

an elongate support structure providing a substantially continuous LED mounting surface extending substantially the length of said device;

a plurality of LEDs arranged along the length of said surface;

a light transmissive bulb portion overlying said surface and said LEDs to transmit light from said LEDs away from said surface;

a pair of end caps mounted on opposite ends of said device and providing male bi-pin connectors at said opposite ends for installing said device in a fluorescent light tube fixture; and

said support structure providing on opposite sides of said surface opaque side [Walls] walls extending above said surface in the light emitting direction to confine the entirety of light emitted from said device said unit in an included angle of less than about 180°.

4. A lighting device as defined in claim [3] 2 wherein said bulb portion is of a structural character so as to diffuse light from said LEDs.

5. [A lighting device as defined in claim 3] *An elongate tubular lighting device of given length for replacing a conventional fluorescent tube light of the type having male bi-pin connectors at each end for installation in a fixture for such lights comprising:*

a support structure defining a substantially continuous, elongate LED mounting surface approximating said given length;

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a plurality of LEDs arranged along the length of said surface so as to emit light from said device;

a light transmissive bulb portion overlying said surface and said LEDs to allow transmission of light from said LEDs away from said surface; and

a pair of end caps mounted to opposite ends of said device, each end cap having a set of male bi-pin connectors suitable for operative engagement with said fixture, said LEDs being electrically connected to and between said bi-pin connectors to be illuminated by power received from said fixture;

the combination of said support structure and said bulb portion being such that substantially the entire light output of said device is emitted away from said surface and confined to an included angle of less than about 180° said lighting device; and further including:

means for modulating/dimming illumination from said LEDs.

6. A lighting device as defined in claim [3] 2 wherein the LEDs are arranged in clusters or groups of closely spaced individual light producing elements.

7. A lighting unit as defined in claim [3] 2 wherein said opaque sidewalls extend above a mounting surface of said plurality of LEDs on opposing sides of said plurality of LEDs such that the included angle is less than 180°.

8. [A lighting device as defined in claim 1] *An LED lighting unit for replacing a conventional fluorescent tube between the opposed electrical receptacles of a conventional fluorescent lighting fixture comprising:*

a rigid, substantially cylindrical structure having a first end and a second end opposite said first end;

a first end cap disposed upon said first end of said structure and a second end cap disposed upon said second end of said structure;

a pair of parallel, fluorescent light fixture receptacle connectors extending from each said end cap and configured for installing within the opposed electrical receptacles of a lighting fixture; and

a plurality of LEDs disposed along said structure in electrical contact with one another and with said pair of connectors extending from said end caps, whereby light is divergently emitted along the length of said unit in an included angle of less than about 180°;

wherein the combination of said support structure and said bulb portion is such that substantially the entire light output of said device is emitted away from said surface and is confined to the included angle by sidewalls extending to a height above said surface on opposing sides of said plurality of LEDs between the first end and the second end; and wherein the included angle is less than 180°.

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