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(54) **High power cold cathode straight fluorescent lamp**

(57) A high power tubular CCFL device (11) comprises at least one CCFL (2); and a light transmission tube (3) having two ends, where the at least one CCFL is at a fixed location inside the light transmission tube. At least two fixtures (4) are used, one fixture at each of the two ends of the light transmission tube. At least two connectors (5) are used, one connector at each of the two ends of the light transmission tube for connection to input electric power. Preferably a portion of a driver (12; which preferably includes at least one high voltage transformer) is employed in the fixture. The fixture connects the light transmission tube, the CCFL(s) and the connector. To design a CCFL device that generates multi-color lighting for various purposes such as entertainment, two or more

CCFLs may be used. A driver circuit converts input electric power to an AC output in the range of about 5 -400 volts and at a frequency in the range of about 1 kHz-800kHz. At least one high voltage transformer responds to said AC output to cause suitable voltage(s) to be supplied to each of the CCFLs to cause the CCFLs to supply light. In one embodiment, a plurality of CCFL lamp units are used, each equipped with its own driver control circuit that supplies a suitable voltage to the CCFL of such unit. Hence, the driver circuits applying AC outputs to the two or more CCFL lamp units may apply AC outputs that are different from one another, so that the two or more CCFL units are individually controlled to emit light of the same or different intensities.

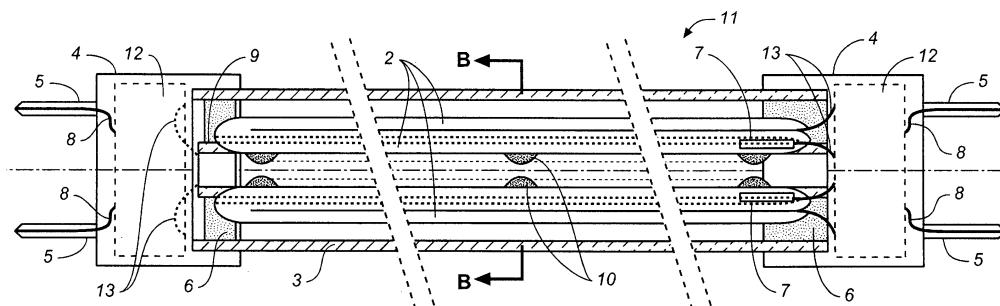


FIG. 3



EUROPEAN SEARCH REPORT

Application Number
EP 06 25 2923

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2005/104501 A1 (CRANDALL EARL F [US] ET AL) 19 May 2005 (2005-05-19)	1-4,7,18,21	INV.
Y	* abstract *	3	H01J61/32
	* paragraphs [0011] - [0021]; figure 3 *		H01J61/56
	-----		H01J61/72
A	US 5 615 093 A (NALBANT MEHMET K [US]) 25 March 1997 (1997-03-25)	1-3	H05B41/24
	* abstract *		H05B41/36
	* column 4, line 45 - column 5, line 40; figure 5 *		

Y	EP 0 379 729 A2 (TACCONI RENATO [IT]; TACCONI FULVIO [IT]) 1 August 1990 (1990-08-01)	3	
	* abstract *		
	* column 1, line 35 - column 4, line 28; figure 1 *		

Y	US 5 270 910 A (KILE EDWIN N [US]) 14 December 1993 (1993-12-14)	3	
	* abstract *		
	* column 6, lines 22-64; figure 5 *		

The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		1 September 2011	Lang, Thomas
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.02 (P04C01)



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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-4, 21(completely); 7, 18(partially)

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



**LACK OF UNITY OF INVENTION
SHEET B**

Application Number

EP 06 25 2923

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-4, 21(completely); 7, 18(partially)

A high power tubular CCFL device, comprising at least one CCFL; a larger diameter light transmission tube having two ends, said at least one CCFL at a fixed location inside the light transmission tube; at least two fixtures, each of the two fixtures at one of the two ends of the light transmission tube; at least two connectors, each of the two connectors at one of the two ends of the light transmission tube for connection to input electric power; a driver having a portion in one of said fixtures, said fixtures connecting said light transmission tube, the CCFL(s) and the connectors, wherein when input electric power is supplied to the connectors, the portion of the driver will cause suitable voltage to be supplied to cause the CCFL to supply light (claim 1); the portion of the driver comprising at least one high voltage transformer (claim 2); the portion of the driver further comprising an electric circuit which comprises a fuse (claim 3, second alternative).

2. claims: 5, 6, 24-28

The CCFL device of claim 1, the portion of the driver further comprising an electric circuit that converts input electric power from said connector to an AC output supplied to the at least one high voltage transformer at a voltage in the range of about 5-400 volts and at a frequency in the range of about 1 kc-800kc (claim 5); or a high power tubular CCFL device, comprising two or more CCFLs; a driver circuit converting input electric power to an AC output in the range of about 5-400 volts and at a frequency in the range of about 1kc-800kc; and at least one high voltage transformer responsive to said AC output to cause suitable voltage(s) to be supplied to the CCFLs to cause the CCFLs to supply light (claim 24)

3. claims: 8, 22(completely); 7, 18(partially)

The CCFL device of claim 1, wherein said at least one shaped CCFL tube is the shape of a "U", multi-"U" shape, "(n+1/2)U", shape "H" shape, multi-"H" shape or "(n+1/2)H" shape CCFL tube, where n is an integer number of 1 (claim 7, second to sixth alternatives); or comprising at least one serpentine or H-shaped CCFL or two U-shaped CCFLs with the bent ends of the two CCFLs placed adjacent each other at a center location in the light transmission tube with the ends of the two CCFLs located near the ends of the light transmission tube (claim 8); or the CCFL device of claim 1



**LACK OF UNITY OF INVENTION
SHEET B**

Application Number

EP 06 25 2923

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

wherein said light transmission tube has a semi-circular, elliptical, square or rectangular cross-section, or a cross-section that is a straight line on one side combined with a U-shape (claim 18, second to sixth alternatives); or wherein said at least one CCFL emits light for illumination along directions, and at least one CCFL comprises one end that is bent into a substantially U-shaped or H-shaped portion along a direction that does not block light emitted by the at least one CCFL (claim 22).

4. claims: 9-12

The CCFL device of claim 1, said device comprising at least two CCFLs emitting light of the same light color or different light color.

5. claims: 13-17, 23

The CCFL device of claim 1, further comprising a support supporting said at least one CCFL, and a soft adhesive attaching the at least one CCFL to the support, said transparent support having a circular, elliptical, square or rectangular cross-section, or a conical shape (claim 13); or said support having a length commensurate with length of the light transmission tube (claim 14); or said support comprising a plurality of sections separated from one another (claim 15); or said support being transparent and comprising a glass, metallic or plastic material, said support comprising a solid or hollow body (claim 16); or the CCFL device of claim 1 wherein said at least one shaped CCFL tube is attached to an internal surface of said light transmission tube (claim 17); or the CCFL device of claim 1, said device comprising a plurality of CCFLs, said device further comprising a support supporting said CCFLs, so that the CCFLs are attached together to form a unitary mechanical structure for increased mechanical strength (claim 23).

6. claims: 19, 20

The CCFL device of claim 1, further comprising a light reflective layer on said light transmission tube, said reflective layer comprising a mirrored or diffusive reflective surface.

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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01-09-2011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2005104501 A1	19-05-2005	NONE	
US 5615093 A	25-03-1997	TW 400685 B US 5615093 A	01-08-2000 25-03-1997
EP 0379729 A2	01-08-1990	EP 0379729 A2 IT 1228394 B	01-08-1990 14-06-1991
US 5270910 A	14-12-1993	NONE	