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(54) **Displays using electro-luminescent material**

(57) Electro-luminescent sheet material has a layer of a phosphor which is sandwiched between a pair of electrodes of which at least one is translucent. Such material is used as a source of illumination for a window

display. The material may be in the form of a sandwich having a ply which is self-adherent to glass and which is covered with a peelable protective covering. It is suitably in the form of a string of interconnected linguistic characters or in the form of a single linguistic character.

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Description

[0001] This invention relates to the use of electro-luminescent material.

[0002] Electro-luminescent material with which the present invention is concerned has essentially a layer of a phosphor which is sandwiched between a pair of electrodes of which at least one is translucent. When an electrical potential is applied across the two electrodes, the phosphor layer becomes excited and light is emitted. Given a uniform layer, the flux density of the emitted light is uniform over the full extent of the layer. The electrodes and phosphor layer (the "working layers") are sandwiched between outer layers which serve to support and protect the working layers and any other layers which may be present.

[0003] Electro-luminescent sandwich material can be made in thin sheet form, for example about 0.5 mm thick, and it has been available in that form for many years, but its uses to date have been surprisingly limited having regard to its potential advantages in many fields of use.

[0004] The present invention is based on an appreciation of these advantages and an insight into ways in which these advantages may be exploited.

[0005] According to one of its aspects, the present invention resides in the use of electro-luminescent sheet material as a source of illumination for a window display.

[0006] Such an illumination can be uniform over an area which can be as large or as small as required, and it is economical, and does not require the whole of the enclosure behind the window to be illuminated.

[0007] In its simplest form such electro-luminescent sheet material can be used for back-lighting advertising or other material (which is preferably translucent) applied in known manner to a window such as a display window of retail sales premises, or a windscreen of a motor vehicle. That the electro-luminescent sheet material may be illuminated using a battery power source is particularly advantageous in the latter case.

[0008] Preferably, however, the electro-luminescent sandwich itself incorporates the required display material. The advantages of this are great, since in particular, the actual advertising material itself may be caused to emit light, rather than being merely back-lit. This affords the designer of the advertising material a much greater freedom to exercise his or her talents in order to attract the attention of potential customers.

[0009] It is also preferred that the electro-luminescent sandwich itself is directly applied to the window for forming the display, and the invention includes electro-luminescent sheet material in the form of a sandwich having a ply which is self-adherent to glass and which is covered with a peelable protective covering.

[0010] Particular importance is attached to the use of self-illuminating lettering in window displays, and the invention also includes electro-luminescent sandwich material which is in the form of a string of interconnected linguistic characters and it includes electro-luminescent

sandwich material which is in the form of a linguistic character.

[0011] The phosphor layer of electro-luminescent material for use in the invention may be excited by an applied potential of less than 150v, and such potential may be as low as for example 5v which is advantageous from the point of view of safety and convenience if it is desired to power the display using batteries. The power may be AC or DC, and it may be supplied from the mains (for example via a transformer) or from batteries. The use of a pulsed supply to cause flashing of the phosphor will have particularly advantageous attention-seeking properties.

[0012] A preferred embodiment of the invention will now be described with reference to the accompanying diagrammatic drawings in which:

Fig. 1 is an exploded view of a sandwich of electro-luminescent sheet material suitable for use in accordance with the invention;

Fig. 2 is a plan view of electro-luminescent material which is in the form of two strings of interconnected linguistic characters, and

Fig. 3 is a plan view of electro-luminescent material which is in the form of a single linguistic character.

[0013] In Fig. 1, electro-luminescent sheet material comprises a backing sheet 1 which acts as a support. Supported by the backing sheet 1 is an optional reflective layer 2 on top of which is a back electrode 3 arranged to be fed by a bus strip 4. In such an arrangement, the back electrode 3 would be translucent, or there would be no purpose to the reflective layer 2. In an alternative arrangement, a reflective layer of a metal may itself constitute the back electrode. The back electrode supports a phosphor layer 5 which is designed to emit light when energised by the back electrode 3 and a transparent front electrode 6 which is itself fed with current by means of a bus strip 7. The front electrode 6 is covered by a front ply 8, and a peelable protective covering 9.

[0014] The bus strips 4 and 7 are suitably formed of copper, which provides a good compromise between cost and conductivity, and translucent electrodes are suitably formed as a coating layer of doped tin oxide or indium tin oxide. Such layers are conveniently formed by a vacuum deposition technique.

[0015] In the embodiment shown, the backing sheet 1 is of a reasonably durable material, as is the protective covering, so that they can resist the rigours of day-to-day handling prior to use in a display, and, in the case of the backing layer, during such display. The backing sheet 1 may for example be formed of a polyamide. For display, the protective covering 9 is peeled away, and the front ply 8 is presented to the interior of a window in which the display is to be made. The front ply 8 is formed

of a highly plasticised translucent material which is self-adherent to a glass sheet. It may for example be formed from a polymeric material such as polyvinyl chloride.

[0016] The front ply 8 may be clear and transparent, it may incorporate pigments and/or dyes, or it may incorporate fillers which impart some opalescent or other special effect on its optical properties. It may be printed on one or both faces with price information, brand names, manufacturers' logos or other material.

[0017] As an alternative, the various layers of the material just described are re-arranged to form a sheet material assembly which is designed for application to the exterior surface of a window, for example within a retail store premises.

[0018] Figure 2 shows electro-luminescent material formed as two strings of linguistic characters 10 which are interconnected by connections 11 which enable actuating current to be supplied to the character strings in order to illuminate them. The connections 11 thus include conductors which interconnect bus strips (not shown) which are included within each character in a manner analogous to that shown in Fig. 1. Such strings are primarily intended for window display use in which they would be self-adhered to a window, but they could be used for other purposes where the self-adhesive property was not necessary.

[0019] Character strings such as those shown in Fig. 2 may be made each as an integral strip in which the connections are fixed, or they may be made up from individual characters which are connected together *in situ*.

[0020] In an integral strip in which the connections are fixed and the desired visible profile of the string substantially follows that of each individual character, such connections would be designed to be visually unobtrusive, and thus they would be narrow and might be fragile. In such an integral strip type of character string, it is therefore preferable for the whole string to be carried between continuous, for example rectangular, protective sheets during the period between manufacture and use. A front protective sheet such as that shown at 9 in Fig. 1 could then be stripped away prior to positioning for display. It might be aesthetically acceptable to have a continuous backing sheet (such as shown at 1 in Fig. 1) for the whole character string which would remain visible in the display, or it might be preferred for that backing sheet to be substantially confined to areas occupied by characters of the string and their interconnections. In the latter case, it would be preferable to provide a second continuous protective cover sheet at the rear surface of the material which could be peeled off after positioning of the display so that the profile of each character of the string would be visible.

[0021] It is to be noted that the expression "linguistic character" is used herein in such a way as to denote not only letters and numerals, but also all the various symbols which are used in writing a language in order to convey meaning, and it thus includes currency symbols -- £ is shown -- and punctuation marks -- a full stop or

period is shown. The writing is of course not confined to characters of the Roman alphabet, but includes characters in other alphabets, such as the Greek and Cyrillic alphabets. The expression "linguistic character" includes other characters such as ideograms or Japanese hiragana or katakana.

[0022] Fig. 3 shows electro-luminescent material in the form of a single linguistic character, the letter "I", which incorporates an electro-luminescent phosphor layer 5 which is excitable by a pair of electrodes (not shown) which are in turn fed by bus strips 4 and 7 (compare Fig. 1). The bus strip 7 is extended along the base of the character as indicated by reference numeral 19, and the end of the bus strip 4 and the bus strip extension 19 are provided with terminal pins 20, 21 respectively for connection of the two bus strips 4, 7 into an electric circuit for the supply of current.

20 Claims

1. Use of electro-luminescent sheet material as a source of illumination for a window display.
2. Electro-luminescent sheet material in the form of a sandwich having a ply which is self-adherent to glass and which is covered with a peelable protective covering.
3. Electro-luminescent material which is in the form of a string of interconnected linguistic characters.
4. Electro-luminescent material which is in the form of a linguistic character.

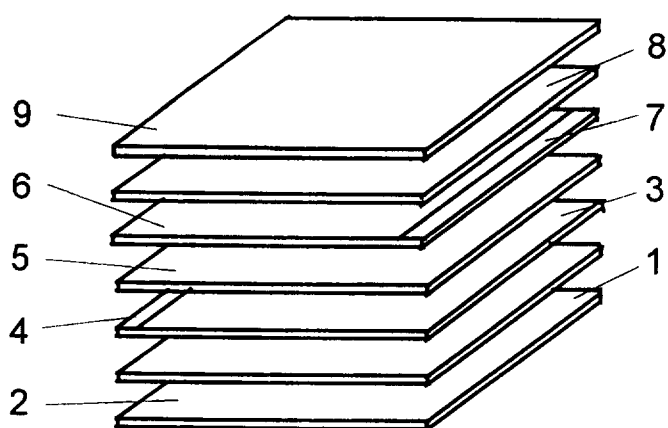


Fig. 1



Fig. 2

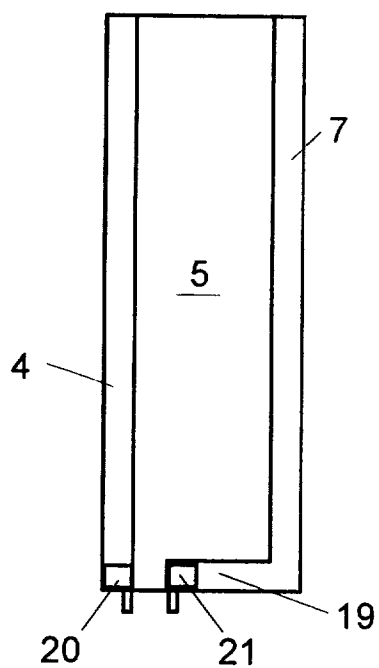


Fig. 3



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EUROPEAN SEARCH REPORT

Application Number
EP 98 30 7763

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	GB 2 306 746 A (SEIKO PRECISION) 7 May 1997	1-3	G09F13/22
Y	* the whole document *	4	
Y	US 4 327 511 A (P.RODRIGUEZ) 4 May 1982 * abstract; figures *	4	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			G09F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 16 December 1998	Examiner Gallo, G
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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**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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16-12-1998

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82