(57) Abstract: An information display for a public transport vehicle comprises a display device (9) to be arranged behind a window (3) of said vehicle and comprising a plurality of display elements forming an information display surface visible from the outside when arranged behind said window. A casing (1) contains said display device. Means are arranged for securing the casing to the inside of the window with the display elements close to the window. The display device is a LED-display device having light emitting diodes (10) as said display elements.
For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
An information display and a method for mounting a display device of an information display

TECHNICAL FIELD OF THE INVENTION AND PRIOR ART

The present invention relates to an information display for a public transport vehicle, such as a bus or a train, having a display device comprising a plurality of display elements forming an information display surface visible from the outside of the vehicle and adapted to mostly indicate the destination and/or line number of the vehicle. Such information displays are normally arranged in the forward part, on both sides and in the rear part of the vehicle.

Such information displays according to a known type are arranged directly on frame members of the vehicle and in the roof area of the vehicle. Due to the size of the display device of the information display a comparatively large amount of space is required in the roof area, so that less space will be available for the passenger compartment. Would display devices of such known information displays be suspended directly in the passenger compartment with the aid of their securing means, they would constitute a source of danger for the passengers.

For solving these problems information displays of another type has been proposed. In this type of information displays the display device is arranged behind a window of said vehicle and the information display comprises a casing containing the display device and means for securing this casing of the information
display to the inside of said window with the display elements close to the window.

Such an information display is known through for instance US 6 282 824 and EP 1 019 890.

Such an information display has several advantages. By using the window of the vehicle for securing the casing containing the display device of the information display said securing means has not to be adapted for securing said casing to a frame member of the vehicle and may by that be made lighter. Furthermore, by arranging the display elements close to the window, the casing will project substantially less far into the passenger compartment than casings of information displays of the other type mentioned above. Thus, the risks of injuries of passengers are remarkably reduced with respect to the latter information displays.

The present invention also relates to a method for mounting a display device of an information display behind a window of a public transport vehicle.

SUMMARY OF THE INVENTION

Although the known information displays of the second type mentioned above have several advantages, the object of the present invention is to provide an information display involving further improvements of an information display of that type.

This object is according to the invention obtained by providing such an information display with a display device being a LED-display device having light emitting diodes as said display elements.
This means that the casing containing the display device may with its content be made lighter and thinner requiring less space, so that more space of the passenger compartment will be available for other purposes and risks of injuries of passengers will be further reduced. One reason for the possibility to obtain this is that light emitting diodes may be arranged very close to the inner surface of the window, since no distance is required between such a display element and the window surface for any movement in connection with a change of information state of the display element, in the case of a light emitting diode when turning it on or off, such as is the case when the display elements are part of a dot-matrix display device and have to be tilted for changing the information state. Furthermore, in the case of using light emitting diodes as display elements no further light sources are required for illuminating any display elements, since these are themselves emitting light, which means increased possibilities to a more compact construction of the display device. Moreover, a LED-display device is in itself light and compact increasing these features of the casing with content.

Accordingly, the totally new approach of using light emitting diodes as display elements in exactly an information display of this type results in great advantages.

According a preferred embodiment of the invention the information display comprises a circuit board, to the circuits of which said light emitting diodes are connected, and the circuits of said circuit board are arranged on the opposite side of the circuit board with respect to the arrangement of the light emitting diodes. It is normal to have light emitting diodes of a LED-display arranged on the same side of the circuit board as the circuits, but by moving the circuits to the so-called rear side to be facing away from the window when the display device is arranged behind said window the light emitting diodes may be arranged
closer to the circuit board and by that the circuit board closer to the window and the casing may be made thinner.

According to another preferred embodiment of the invention the information display also comprises a device delivering a voltage suitable for supplying electricity to said light emitting diodes, and said voltage delivering device is arranged outside and remote from the casing containing the display device. By taking the voltage delivering device, which often is a DC/DC-converter, out of the casing containing the display device this may be made even more compact increasing the advantages of the information display according to the invention further. This device may then be arranged in a separate casing secured to the vehicle at any place where it will not cause any disturbances.

According to another preferred embodiment of the invention the information display further comprises a drive circuit adapted to receive serial data from a terminal arranged in the vicinity of the driver's seat in the vehicle for controlling the state of the display elements, and said drive circuit is arranged outside and remote from the casing containing the display device. By removing such a drive circuit from the casing containing the display device this may together with its content be made even lighter and thinner resulting in the advantages discussed above.

It is preferred to arrange the voltage delivering device and the drive circuit in the same separate casing.

According to another preferred embodiment of the invention the information display comprises at least one elongated safety member, such as a safety wire, secured to the casing containing the display device and adapted to be attached to a frame of the vehicle, such as the ceiling thereof. Such a safety member results in an extra safety would the fastening of the casing containing the display device for any reason break, for example if the window breaks as a consequence of any traffic accident or
the like, since the casing will then not fall down and cause any injuries of passengers.

A method for mounting a display device of an information display behind a window of a public transport vehicle according to the invention is defined in the appended independent method claim. The advantage of securing a casing containing a display device in the form of a LED-display device having light emitting diodes as said display elements to the inside of said window is that an information display having the advantages discussed above is obtained and that the securing step will be easy to carry out, since such a casing with its content will be light and compact and by that easy to handle.

Further advantages as well as preferred features of the invention will appear from the following description and the other dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

With reference to the appended drawings below follows a specific description of preferred embodiments of the invention cited as examples.

In the drawings:

Fig 1 is an exploded perspective view schematically illustrating how a casing containing a display device of an information display according to the present invention may be secured to the inside of a vehicle window,

Fig 2 is a vertical cross-section through the casing of the information display shown in fig 1 when secured to said window,
Fig 3 is a schematical view of the display device of the information display according to fig 1 and 2 from the outside of said window, and

Fig 4 is a view corresponding to fig 2 of an information display according to another preferred embodiment of the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

An information display according to a preferred embodiment of the invention will now be explained while making reference simultaneously to fig 1-3. The information display comprises a casing 1, for example of plastic, containing a display device to be described further below and adapted to be secured to the inside 2 of a window 3 of a public transport vehicle, such as a bus, a train, a tram or the like. This window may be a side, front or rear window of the vehicle.

For obtaining the securing of the casing to the window the information display has a securing means including an adhesive through which two elongated plate-like elements 4, here of aluminium, are secured to the window by glueing. The two elements are secured so that they extend substantially in parallel with each other and at a distance appropriate for the later securing of the casing 1 to these elements. Each element 4 has a plurality of sleeves 5 projecting away from the window and provided with an inner thread arranged therein. The casing 1 has corresponding holes 6, through which securing members in the form of screws 7 may be introduced for engagement through their threaded portions with the thread of the sleeves and being tightened for securing the casing to the elements 4 and by that to the window 3. This construction makes maintenance and repair of components inside the casing easy by only loosening the screws and lifting away the casing with its content.
Safety members in the form of safety wires 8 are secured to the casing 1 and adapted to be attached to a frame of the vehicle, such as the ceiling thereof, for suspending the casing 1, so that it will not fall down even if the window will break or the securing of the casing to the window will for any reason fail.

The interior and the content of the casing 1 will now be explained while making reference in particular to fig 2.

The casing contains a display device 9 being a so-called LED-display device having a plurality of display elements in the form of light emitting diodes 10 forming an information display surface visible from the outside of the window as shown in fig 3 for displaying information by forming signs with adjacent such light emitting diodes when emitting light as illustrated in fig 3. These light emitting diodes are through their legs 24 connected to circuits of a circuit board 11 for enabling control thereof and providing them with electricity. A front plate 12, for example of aluminium, is arranged close to the window and is provided with longitudinal horizontal ribs 13 for protecting the light emitting diodes against the sun and increasing the contrasts of the display surface.

A voltage delivering device in the form of a DC/DC-converter 14 is arranged in the casing and through a cable 15 connected to the voltage source of the vehicle, normally a 24 Volts battery or the power supply of the vehicle in the form of a generator. This converter converts the voltage from said voltage source into a voltage of a level suited for the supply of electricity to the light emitting diodes. In the present case this means a conversion of the voltage from 24 V to 3,3 V. This voltage is through a connector 16 supplied to the circuits of the circuit board for the supply of electricity in the form of direct currents to the light emitting diodes. However, any other levels of these voltages are
conceivable, e.g. 2 V for light emitting diodes manufactured for that voltage level.

The casing also contains a drive circuit 17 adapted to receive serial data from a terminal arranged in the vicinity of the drivers' seat in the vehicle for controlling the state of the light emitting diodes. 18 indicates a cable including a conductor for such a supply of serial data as well as a conductor connected to the voltage source of the vehicle for supplying a 24 Volt direct voltage to the drive circuit 17. The drive circuit 17 is through a contact member 19 in contact with the circuits of the circuit board for enabling the drive circuit to control the state of the different light emitting diodes by turning them on or off and by that producing information on the display surface of the display device.

The casing also contains an inner metal box or casing 20 containing the circuit board 11, the converter 14 and the drive circuit 17 for shielding them against outer disturbances.

When using a LED-display device as display device the distance between the window and the display elements, the light emitting diodes, may be made very short, such as only one or a few millimetres, mostly without any problem under 5 millimetres. In fact, a zero distance would be possible if vibrations of the window are taken care of.

An information display according to another preferred embodiment of the invention is illustrated in fig 4 and the parts thereof corresponding to parts of the embodiment shown in fig 2 has been provided with the same reference numeral added with an ' and will now only be described as far as they differs from those in the embodiment according to fig 2.

The casing 1 in this embodiment is made even thinner and the content thereof even lighter thanks to a number of features. The
circuits of the circuit board 11' have been arranged on the opposite side of the circuit board with respect to the light emitting diodes 10', so that the circuit board may be arranged closer to the front panel 12'.

The DC/DC-converter has been removed from the casing and arranged in a separate casing 21, which may be arranged anywhere in the vehicle, for instance on the frame thereof, and it supplies electricity to the circuit board through a cable 22. Also the drive circuit has been moved out of the casing 1' and is arranged in the casing 21 and control signals therefrom are sent to the circuit board through the contact member 19', which has been made thinner, through a cable 23. All these measures contribute to a more compact design being lighter and thinner.

The invention is of course not in any way restricted to the preferred embodiments described above, but many possibilities to modifications thereof would be apparent to a person with ordinary skill in the art without departing from the basic idea of the invention as defined in the appended claims.

The securing of the casing to the window may be achieved through other means. The elongated elements may for instance be arranged with another orientation, or they may be replaced by a number of smaller elements, for instance arranged in each corner of the casing. It would also be possible to secure such elements by other means than by glueing to the window, for instance by drilling holes through the window and using nuts and screws therefor.

It is also possible to integrate the DC/DC-converter into the circuit board by suitable circuits for reducing the thickness and weight of the display device.

Furthermore, the front plate is not always necessary and may be omitted.
Although not shown in the figures the invention is of course also applicable to windows being more or less curved.

It is also conceivable to use any other type of device than a DC/DC-converter for delivering a voltage suitable for supplying the light emitting diodes with electricity. In some type of vehicles there may even be an alternating voltage source and said device may then be an AC/DC-converter.
Claims

1. An information display for a public transport vehicle comprising

   - a display device (9) to be arranged behind a window (3) of said vehicle and comprising a plurality of display elements (10, 10') forming an information display surface visible from the outside when arranged behind said window,
   - a casing (1, 1') containing said display device, and
   - means for securing said casing of the information display to the inside of said window with the display elements close to the window,

   characterized in that said display device is a LED-display device having light emitting diodes (10, 10') as said display elements.

2. An information display according to claim 1, characterized in that it comprises a circuit board (11), to the circuits of which said light emitting diodes (10, 10') are connected, and that the circuits of said circuit board are arranged on the opposite side of the circuit board with respect to the arrangement of the light emitting diodes.

3. An information display according to claim 1 or 2, characterized in that it also comprises a device delivering a voltage suitable for supplying electricity to said light emitting diodes (10, 10'), and that said voltage delivering device is integrated directly into a circuit board, to the circuits of which said light emitting diodes are connected.

4. An information display according to claim 1 or 2, characterized in that it also comprises a device delivering a voltage suitable for supplying electricity to said light emitting
diodes (10, 10'), and that said voltage delivering device is arranged outside and remote from the casing (1, 1) containing the display device.

5. An information display according to claim 4, characterized in that said voltage delivering device (14) is arranged in a separate casing (21) secured to the vehicle.

6. An information display according to any of claims 3-5, characterized in that said voltage delivering device is a DC/DC-converter (14) adapted to convert the voltage from the voltage source of the vehicle into a voltage suitable for supplying electricity to said light emitting diodes (10, 10').

7. An information display according to any of the preceding claims, characterized in that it further comprises a drive circuit (17) adapted to receive serial data from a terminal arranged in the vicinity of the drivers seat in the vehicle for controlling the state of the display elements (10, 10'), and that said drive circuit is arranged outside and remote from the casing containing the display device.

8. An information display according to claim 7, characterized in that said drive circuit (17) is arranged in a separate casing (21) secured to the vehicle.

9. An information display according to claim 5 and 8, characterized in that said voltage delivering device (14) and drive circuit (17) are arranged in the same casing (21).

10. An information display according to any of the preceding claims, characterized in that it comprises at least one elongated safety member (8), such as a safety wire, secured to the casing (1, 1') containing the display device and adapted to be attached to a frame of the vehicle, such as the ceiling thereof.
11. An information display according to any of the preceding claims, characterized in that said securing means includes elements (4) to be secured to the inside of said window (3) and members (7) for securing said casing (1, 1') containing the display device to the window by securing them to said elements.

12. An information display according to claim 11, characterized in that said securing means further includes an adhesive for securing said elements (4) to the inside of said window (3) by glueing.

13. An information display according to claim 11 or 12, characterized in that said elements (4) comprises elongated plates to be secured to the inside of said window and having means (5) for establishing a mechanical connection to said securing members (7) for securing said casing (1, 1') thereto.

14. An information display according to any of the claims 11-13, characterized in that said securing means includes threaded members (5) arranged on said elements (4), and that said securing members (7) have threaded portions adapted to engage said threaded members (1, 1') for securing said casing to the window.

15. An information display according to claim 14, characterized in that said threaded members arranged on said elements (4) are sleeves (5) having an inner thread and the securing members are screws (7).

16. A method for mounting a display device (9) of an information display behind a window (3) of a public transport vehicle, said display device comprising a plurality of display elements (10, 10') forming an information display surface
visible from the outside when arranged behind said window, which comprises a step of securing a casing (1, 1') containing said display device to the inside of a said window with the display elements close to the window, characterized in that in the securing step a casing containing a display device in the form of a LED-display device having light emitting diodes (10, 10') as said display elements is secured to the inside of said window.

17. A method according to claim 16, characterized in that in the securing step elongated plates (4) are secured to the inside of said window (3) and said casing (1, 1') containing the display device is secured to the window by establishing a mechanical connection between securing members (7) and said elongated plates (4).

18. A method according to claim 17, characterized in that said mechanical connection is established by making threaded members (5) of said elongated plates (4) to engage securing members (7) having threaded portions.

19. A method according to any of claims 16-18, characterized in that it is a display device of an information display according to any of claims 1-15 that is mounted behind a window of a public transport vehicle.
# INTERNATIONAL SEARCH REPORT

## A. CLASSIFICATION OF SUBJECT MATTER

**IPC7: G09F 9/33, G09F 13/00**  
According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

**IPC7: B60Q, G09F**  
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## EPO-INTERNAL, WPI DATA

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category*</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
</table>
| X         | GB 2227590 A (TIMOTHY CHARLES DODD), 1 August 1990  
(01.08.1990), page 1, line 1 - page 2, line 19,  
figures 1-3, claims 1,2,6,8 | 1-15 |
| X         | GB 2022899 A (FLORIN LTD), 19 December 1979  
(19.12.1979), page 1, line 16 - line 73, claims  
1-6 | 1-15 |
column 1, line 20 - line 58, figures 1-5, claim 1 | 1-15 |

[X] Further documents are listed in the continuation of Box C.  
[X] See patent family annex.

* Special categories of cited documents:
  * "A" document defining the general state of the art which is not considered to be of particular relevance
  * "E" earlier application or patent but published on or after the international filing date
  * "L" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
  * "Y" document published prior to the international filing date but later than the priority date claimed
  * "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
  * "O" document referring to an oral disclosure, use, exhibition or other means
  * "V" document member of the same patent family

**Date of the actual completion of the international search:** 7 June 2004  
**Date of mailing of the international search report:** 16-06-2004

---

Name and mailing address of the ISA/
Swedish Patent Office
Box 5055, S-102 42 STOCKHOLM
Facsimile No. +46 8 666 02 86  
Authorized officer
Igor Gazdik/EK
Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (January 2004)
<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>US 5724161 A (SMITH ET AL), 3 March 1998 (03.03.1998), column 1, line 35 - column 2, line 15, figure 1, claims 8-13,15</td>
<td>1,4-9,12</td>
</tr>
<tr>
<td>Country</td>
<td>Number</td>
<td>Date</td>
</tr>
<tr>
<td>---------</td>
<td>----------</td>
<td>-----------</td>
</tr>
<tr>
<td>GB</td>
<td>2227590</td>
<td>01/08/1990</td>
</tr>
<tr>
<td>GB</td>
<td>2022899</td>
<td>19/12/1979</td>
</tr>
<tr>
<td>US</td>
<td>4868542</td>
<td>19/09/1989</td>
</tr>
<tr>
<td>US</td>
<td>5724161</td>
<td>03/03/1998</td>
</tr>
</tbody>
</table>