(12) UK Patent (19) GB (11) 2540862 (13) B

(45) Date of B Publication 03.11.2021

(54) Title of the Invention: Vehicle with advertising screen

(51) INT CL: ***G09F 21/04*** (2006.01) ***G09F 9/302*** (2006.01) ***G09F 9/33*** (2006.01)

(21) Application No: **1610216.2**

(22) Date of Filing: **13.06.2016**

(30) Priority Data:
(31) **1510302.1** (32) **12.06.2015** (33) **GB**

(43) Date of A Publication **01.02.2017**

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(58) Field of Search:
As for published application 2540862 A viz:
INT CL **G09F, G09G**
Other: **Online: EPODOC, WPI.**
updated as appropriate

Additional Fields
Other: **None**

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GB 2540862 B

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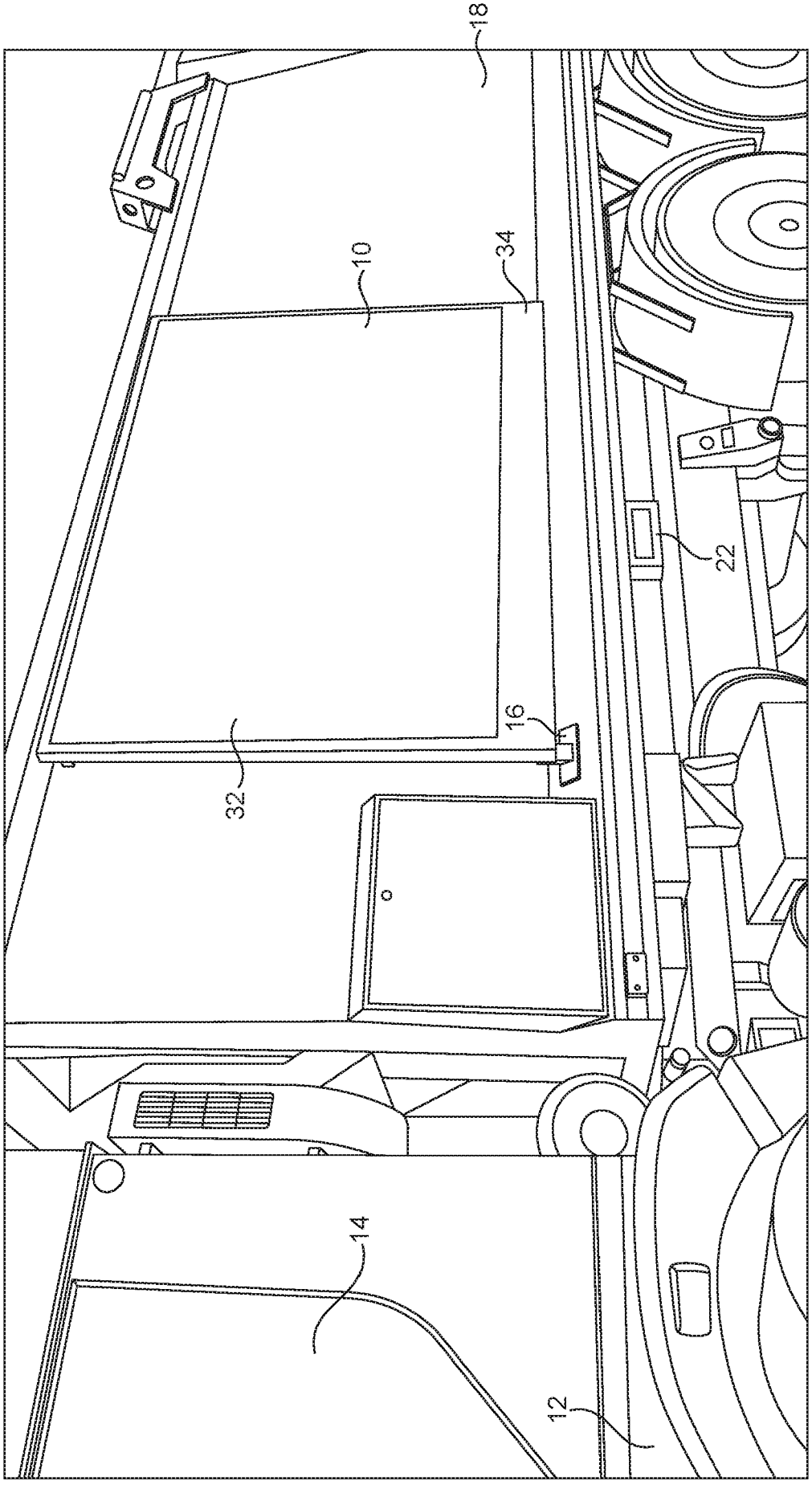

FIG. 1

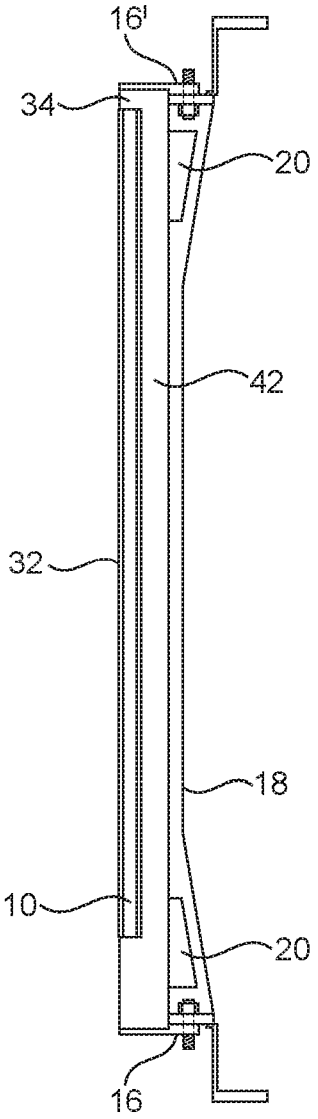

FIG. 2

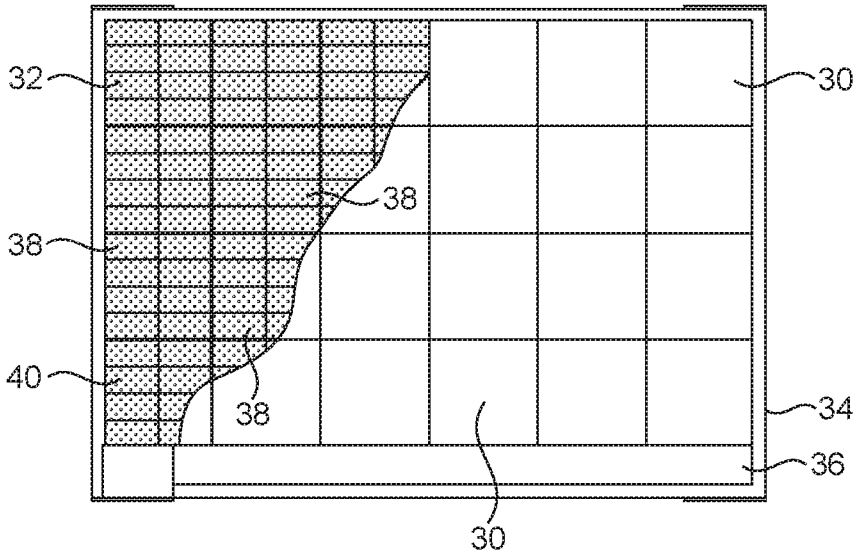

FIG. 3

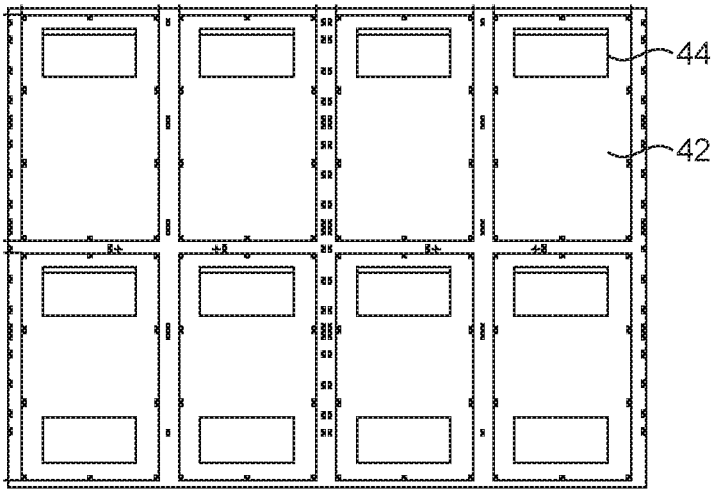

FIG. 4

FIG. 5

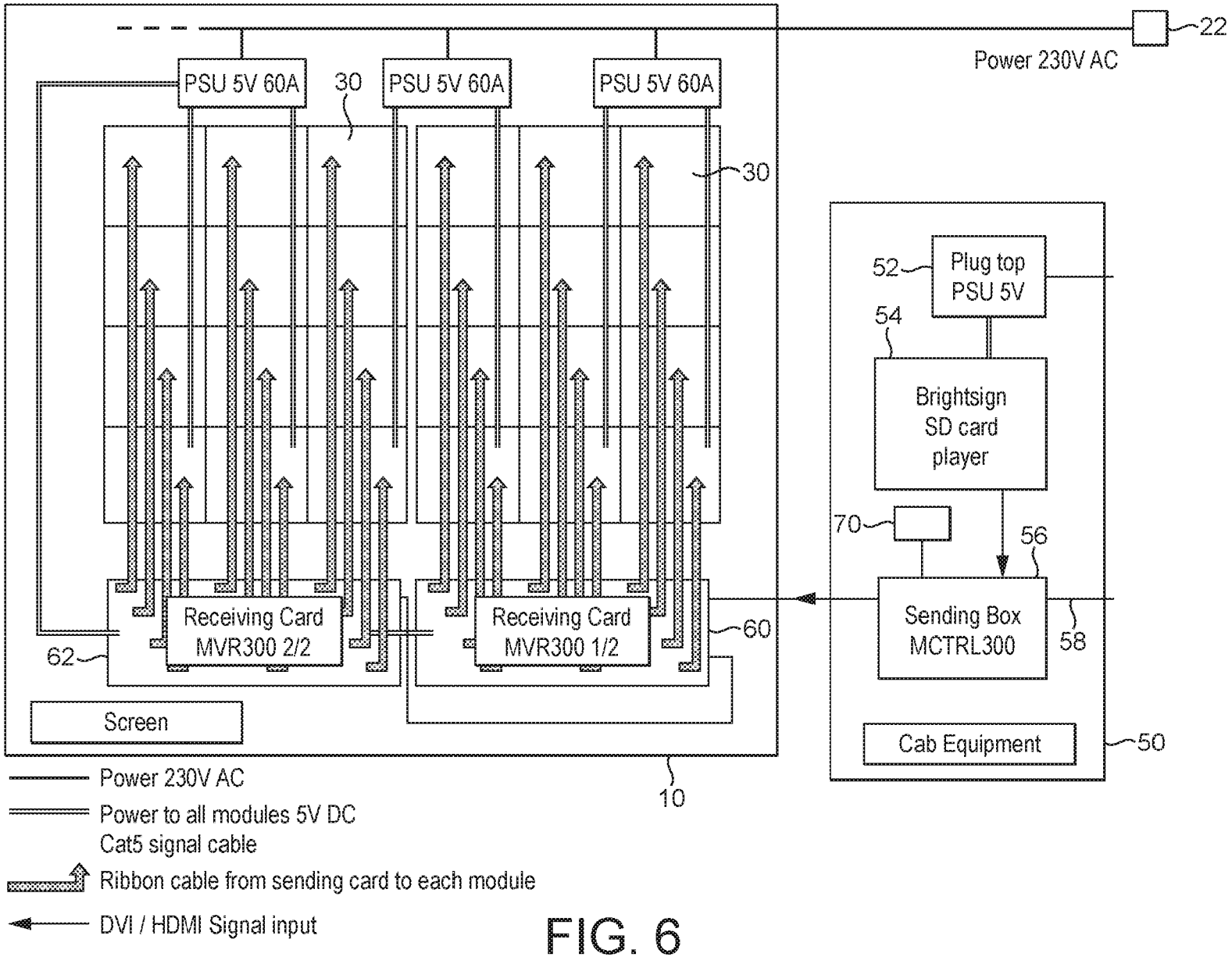
22
Power 230V AC
PSU 5V 60A
30
PSU 5V 60A
PSU 5V 60A
30
52
Plug top
PSU 5V
54
Brightsign
SD card
player
70
56
Receiving Card
MVR300 2/2
Receiving Card
MVR300 1/2
60
62
Sending Box
MCTRL300
58
Screen
Cab Equipment
50
10
Power 230V AC
Power to all modules 5V DC
Cat5 signal cable
Ribbon cable from sending card to each module
DVI / HDMI Signal input

FIG. 6

Title: Vehicle with Advertising Screen

Field of the invention

This invention relates to a vehicle with an externally mounted advertising screen, and in particular a screen for use on large commercial or municipal vehicles.

Background to the invention

Vehicles have been used for advertising in a variety of different ways. Adverts can be permanent painted displays on the outside of the vehicle. Small electronic displays mounted within vehicles to be visible either internally or externally are also known. Small electronic display units can be mounted onto vehicle roofs to provide a small advertising screen. However, all of these displays have either a limited visual impact due to size, or are static images and present limited opportunities for advertising.

Summary of the invention

According to the present invention, there is provided a vehicle comprising an externally mounted digital display screen attached to a substantially vertical surface of the vehicle, the screen comprising a plurality of electrically interconnected screen elements to create a display surface, wherein a perforated grid extends over the display surface, the perforated grid comprising a plurality of first apertured grid elements and multiple first apertured grid elements are positioned over each screen element. For large commercial or municipal vehicles such as refuse collection vehicles, lorries, heavy goods vehicles and buses, the display screen is able to cover an extensive area and be visually imposing. Commercial or municipal vehicles often have large areas uninterrupted by windows on which the display screen can be situated and the display screen can thus be large, typically the height of a vehicle body.

To ensure a vehicle with such a screen does not breach permitted vehicle widths, the screen preferably has a maximum depth of 0.15m, and more preferably 0.06m, so as to limit the amount by which the screen protrudes from the side of the vehicle. Preferably the vehicle has a maximum total width of 2.55m.

The screen elements are desirably coated with transparent plastics material. By using a plasticised coating, the screen element is more robust and less likely to suffer damage, particularly due to flexing, and electronic components forming part of the screen element are also protected from water ingress.

Preferably, the grid has a solid area of no more than 40 to 70% of the total screen area so as to have a total perforated or apertured area of at least 30 to 60% to ensure the display surface is visible through the grid.

The perforated grid preferably comprises a plurality of apertures regularly spaced in an orthogonal array.

The first apertured grid elements may comprise a plurality of intersecting elongate members defining a plurality of apertures or openings. Typically the apertures will each have a surface area of between 0.09 to 0.40mm^2 so that objects are prevented from passing through the apertures and damaging the image display surface.

Each first apertured grid element is preferably engageable with and detachable from each screen element to allow for ease of replacement of individual grid elements.

Preferably the screen is mounted to the vertical surface or vehicle side using shock absorbent fixings so as to dampen vibrations and impact which might cause damage.

At least one cushion member may be disposed between the screen and the vertical surface so as to reduce flexing of the screen, particularly against a curved body. Typically at least four cushions will be provided proximal to each corner of the screen.

With such a screen, graphics will only be displayed on a single side of the screen, the screen having an image display face facing outwardly from the vehicle side.

The screen may further comprise a backing grid to protect the rear of the screen, the backing grid comprising a plurality of second grid elements integrally formed with

ventilation apertures to avoid overheating. Typically the second grid elements will be larger than the first apertured grid elements and allow access to two or more screen elements at a time.

The backing grid may be perforated with a plurality of apertures to increase ventilation and to reduce the overall weight of the screen.

The screen may further comprise a light detection means adapted to automatically adjust brightness of the display screen.

By having a modular screen made from a plurality of screen elements, the dimensions of the screen can readily be configured to match the dimensions of any given vehicle area to which the screen is to be applied. The screen preferably extends over a substantial portion of a vehicle side, and typically over 20% to 60% of a vehicle side.

The screen is preferably powered by battery units independent of the vehicle power supply. This prevents operation of the screen draining the vehicle battery.

The screen may be controlled from a control unit within the vehicle, typically situated in the driver's cab. Static and/or moving image content is supplied from the control unit to the screen and image content may be updated by remote communication with the control unit.

The control unit may be adapted to respond to a location detector.

The invention will now be described by way of example, and with reference to the accompanying drawings in which:

Figure 1 is a perspective view of a vehicle with a display screen;

Figure 2 is a partial side view of the vehicle;

Figure 3 is a cut-away plan view of the display screen;

Figure 4 is a view from beneath the screen;

Figure 5 is a side view of the screen; and

Figure 6 is a schematic electrical diagram relating to the screen.

Description

Figure 1 shows an embodiment of an advertising screen 10 in accordance with the invention as mounted to a substantially vertical sidewall of a refuse vehicle 12. A control unit [not shown] is located within a driver's cab 14 and is in electrical communication with screen 10 by CAT5 cabling or equivalent situated within a PVC-coated metal flexible conduit which is located with the vehicle wiring cavity. The control station incorporates a digital media player, with an input for either DVI or HDMI source, and generates images for display upon the screen. The control station

is controllable remotely to enable updated information to be uploaded simultaneously across a plurality of control stations in different vehicles.

Screen 10 is mounted on vehicle 12 using four vibration dampening universal isolation mounts 16, 16' located proximal the corners of screen 10. Mounts 16, 16' comprise an elastomeric ring and an elastomeric bushing bonded to a central metal spacer and are held in place using a bolt and snubbing washer to attachment points welded onto the side 18 of vehicle 12 at positions where the vehicle body is substantially rigid. Universal mounts 16, 16' are capable of withstanding loads in all axes to ensure that they can flex as the vehicle body distorts so allowing a degree of movement of screen 10.

Between the rear of screen 10 and the vehicle side, see Figure 2, are disposed protective cushions 20, typically proximal each corner of screen 10 which support screen 10 and limit the amount of screen flexing, particularly where the vehicle side is curved. Typically there will be a small gap between the rear of screen 10 and the vehicle side wall to ensure that screen 10 does not directly contact the vehicle side at any point. Screen 10 has the minimum thickness possible so as to ensure the vehicle does not breach permitted vehicle widths when screen 10 is fixed in place. Typically screen 10 has a depth of no more than 15cm and desirably 6cm or less. The weight of screen 10 should be kept as light as possible and preferably no more than 125kg.

Screen 10 is powered using a dedicated battery unit 22 with an inverter so as to supply power directly to the screen independently of the vehicle engine. Typically the screen will have a maximum power consumption of 2.5kW.

The structure of screen 10 will now be discussed in detail with reference to Figures 3 to 6.

As shown in Figure 3, screen 10 comprises a plurality of electrically interconnected individual screen tiles 30 located within an aluminium frame 34 having an enlarged lower border 36 to provide space for cabling within the frame. If desired, a plurality of inverters for converting DC battery power to AC power can be located within

frame 34 as an alternative to a single inverter associated with battery 22. Screen tiles 30 create a composite single large screen for displaying images. The screen shown is based on a 6 x 4 array of 24 screen tiles with dimensions of 0.32m x 0.32m x 0.02m but the screen size and number of tiles within the array can be altered depending on the upright vehicle surface area available for placement of the screen.

Figure 3 shows a cutaway view of the front of screen 10 to illustrate how protective perforated plastics grid 32 overlies screen tiles 30. Plastics grid 32 is disposed over the entirety of the screen surface to protect the screen surface from impact whilst allowing images on screen to be visible through the perforations of grid 32. Plastics grid 32 sits proud of display surface 30 although the gap between the plastics grid and the display surface is minimal.

Each screen tile 30 comprises a plurality of individual Surface-Mount-Device (SMD) LED spots soldered to a circuit board with the entirety of the screen tile plasticised to IP66 rate waterproofing, such that a plastics mask is overlaid to fill spaces between the LED components, the mask protruding around 1mm beyond the face of the LED components. By using plastics material, the tile is waterproofed and more resistant to damage through light abrasion, impact or excessive vibration. The area of each LED SMD is typically 3.5mm x 3.5mm = 12.25mm^2. The area of each complete pixel is 6.7mm x 6.7mm = 44.49mm^2. This provides a screen surface with 27.5% made up from LED components and 72.5% comprised of protective plastic mask. The plastic mask does not obstruct any of the light emitting surface of the LED and so causes no obstruction or degradation in the image quality viewed from within a 140 degree horizontal or vertical viewing angle.

Reinforced apertured plastics grid 32 comprises a plurality of apertured grid elements individually securable to and detachable from screen tiles 30. Typically each screen tile 30 has eight grid elements disposed over it. By having a number of small elements forming grid 32, individual grid elements can be replaced as and when required should damage occur to a small region.

Grid 32 is required to protect screen tiles 30 from damage whilst still allowing images displaced on the screen surface to be viewed. Each grid element 38 comprises a plurality of intersecting elongate members which define an orthogonal array of apertures 40. Apertures 40 in combination provide sufficient visible screen tile area that a viewer can see the screen images through grid 32, with the solid portion of grid 32 representing no more than 40 to 70% of the total screen area. Typically the area of each aperture 40 is around 0.09 to 0.40mm^2 so as to prevent damage to the underlying screen from branches and the like, and in combination apertures 40 represent an opening of 60 to 30% of the total screen area. For a square aperture, a width of around 0.4mm is preferred.

The rear of display screen 10 is protected by eight larger access tiles 42 each incorporating a ventilation vent 44, see Figures 4 and 5, with the ventilation vents protruding away from the rear of the display surface. Fans with filters can be associated with vents 44 so far as to further improve cooling. Access tiles 42 protect the rear of screen 10 and allow access to individual screen tiles 30 for repair. Access tiles 42 will typically be perforated with a plurality of apertures to provide extra ventilation and reduce weight.

Typically removal of individual screen tiles will be performed by disconnecting screen 10 from uppermost mounts 16', pivoting screen 10 to a horizontal position whilst screen 10 is secured to lowermost mounts 16, and then removing access tiles 42 as required to replace or repair individual screen tiles 30. When repair is complete, screen 10 can be returned to its upright position and reconnected to uppermost mounts 16.

An exemplary wiring schematic is shown in Figure 6. Screen 10 is powered by battery and invertor combination 22 and receives digital information from control box 50 located within the vehicle cab 14. Control unit 50 comprises a power supply unit 52 providing a DC voltage of 5V to an SD card player 54 which provides images to a digital controller 56 which can supply images from card player 54 or receive external images from input 58. Controller 56 supplies images to receiving cards 60, 62

associated with screen 10 to supply a digital signal to each individual screen tile 30 such that the combination of tiles will display one or a plurality of images to a viewer.

Vehicle position locator 70, such as a GPS or mobile location device using 3G or 4G, can be provided to communicate with controller 56, with the images supplied to screen 10 being altered by controller 56 dependent on the location identified by GPS 70. This allows the screen to display live feed media updates and location-dependent advertisements.

The screen typically further comprises an integral light detector to adjust screen brightness depending on external light conditions. This ensures adequate picture quality under all external lighting conditions and also ensures the emitted light complies with the Road Vehicle Lighting Regulations (1989).

By providing a digital advertising screen mountable on the side or body of a large commercial municipal vehicle, such as refuse collection vehicles, lorries and buses, large mobile display screens can be provided enabling vehicle operators to sell advertising space as well as providing an alternative source for local information services and location-specific marketing. The screen is able to display video action adverts as well as static digital display, with multiple images present if required.

Claims

1. A vehicle comprising an externally mounted digital display screen attached to a substantially vertical surface of the vehicle, the screen comprising a plurality of electrically interconnected screen elements to create a display surface, wherein a perforated grid extends over the display surface, the perforated grid comprising a plurality of first apertured grid elements and multiple first apertured grid elements are positioned over each screen element.

2. A vehicle according to claim 1, wherein the screen has a maximum depth of 0.15m.

3. A vehicle according to any of the preceding claims, wherein the screen elements are coated with transparent plastics material.

4. A vehicle according to any of the preceding claims, wherein a solid area of the perforated grid is no more than 40 to 70% of the total screen area.

5. A vehicle according to any of the preceding claims, wherein the perforated grid comprises a plurality of apertures regularly spaced in an orthogonal array.

6. A vehicle according to any of the preceding claims, wherein each first apertured grid element comprises a plurality of intersecting elongate members defining a plurality of apertures.

7. A vehicle according to any of the preceding claims, wherein each first apertured grid element is engageable with and detachable from each screen element.

8. A vehicle according to any of the preceding claims, wherein the screen is mounted to the substantially vertical surface using shock absorbent fixings.

9. A vehicle according to any of the preceding claims, wherein at least one cushion member is disposed between the screen and the substantially vertical surface.

10. A vehicle according to any of the preceding claims, wherein the screen further comprises a backing grid.

11. A vehicle according to any of the preceding claims, wherein the backing grid comprises a plurality of second grid elements integrally formed with ventilation apertures.

12. A vehicle according to any of the preceding claims, wherein the screen further comprises a light detection means adapted to automatically adjust brightness of the display screen.

13. A vehicle according to any of the preceding claims, wherein the screen extends over 20% to 70% of a vehicle side.

14. A vehicle according to any of the preceding claims, wherein the screen is powered by battery units independent of a vehicle power supply.

15. A vehicle according to any of the preceding claims, wherein the screen is controlled from a control unit operable by a driver.

16. A vehicle according to any of the preceding claims, wherein the control unit is adapted to respond to a location detector.