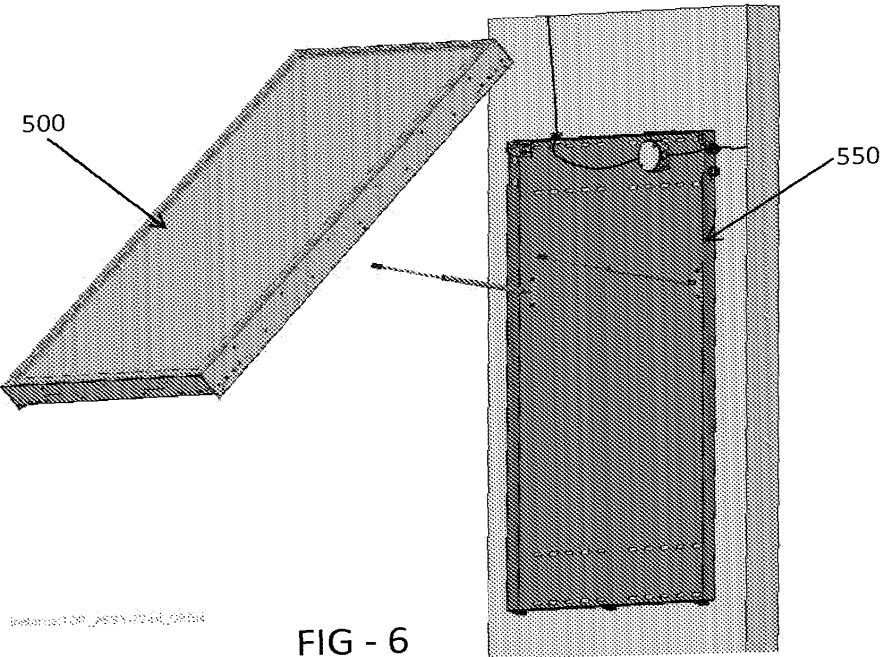
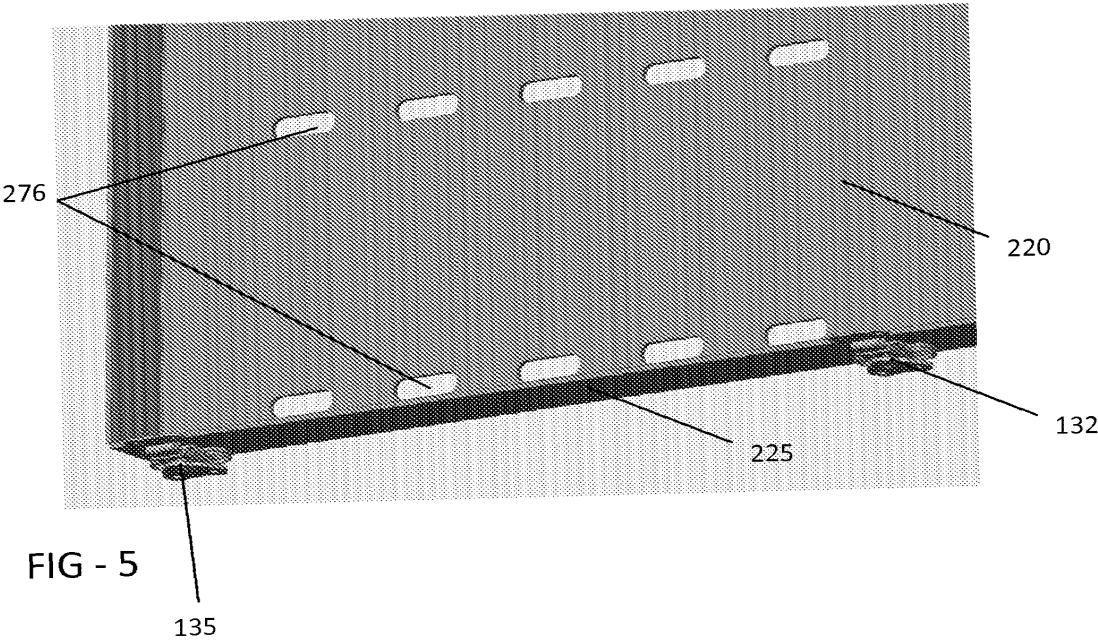




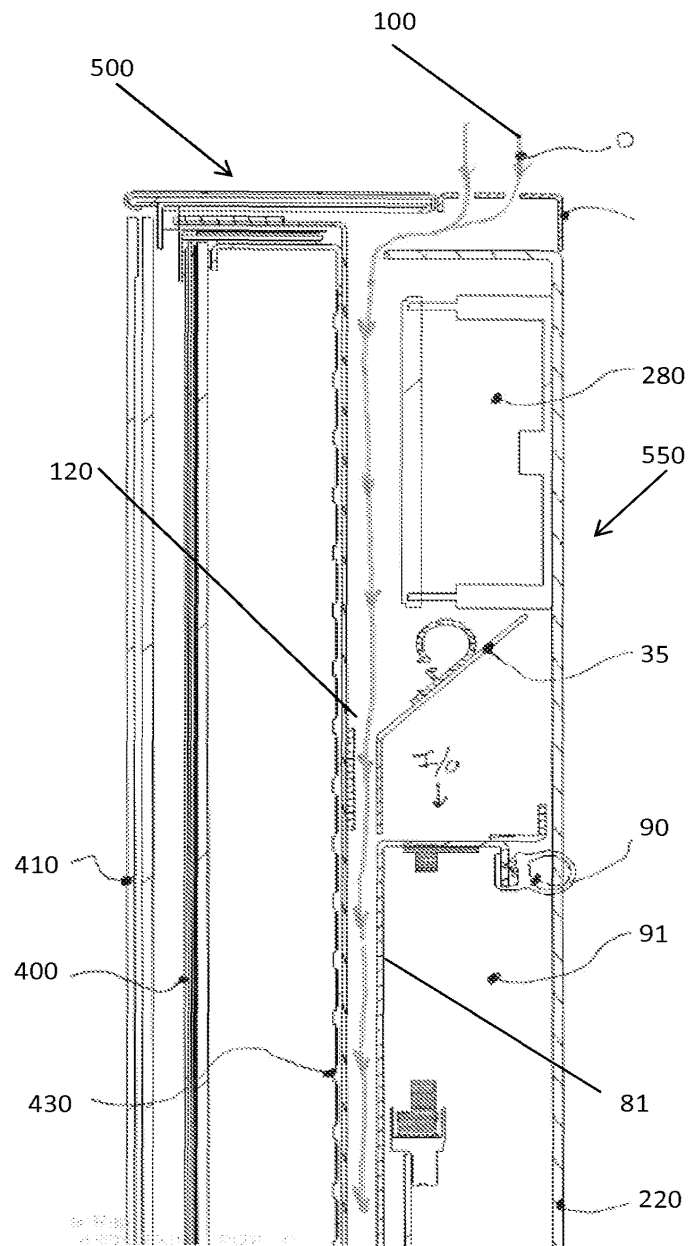
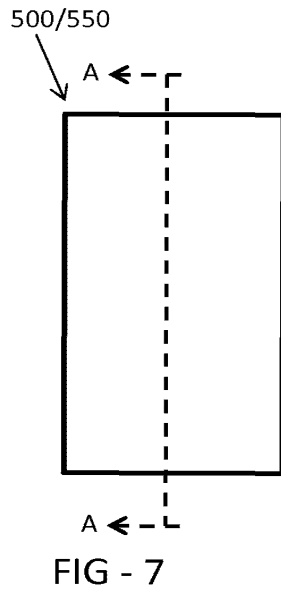
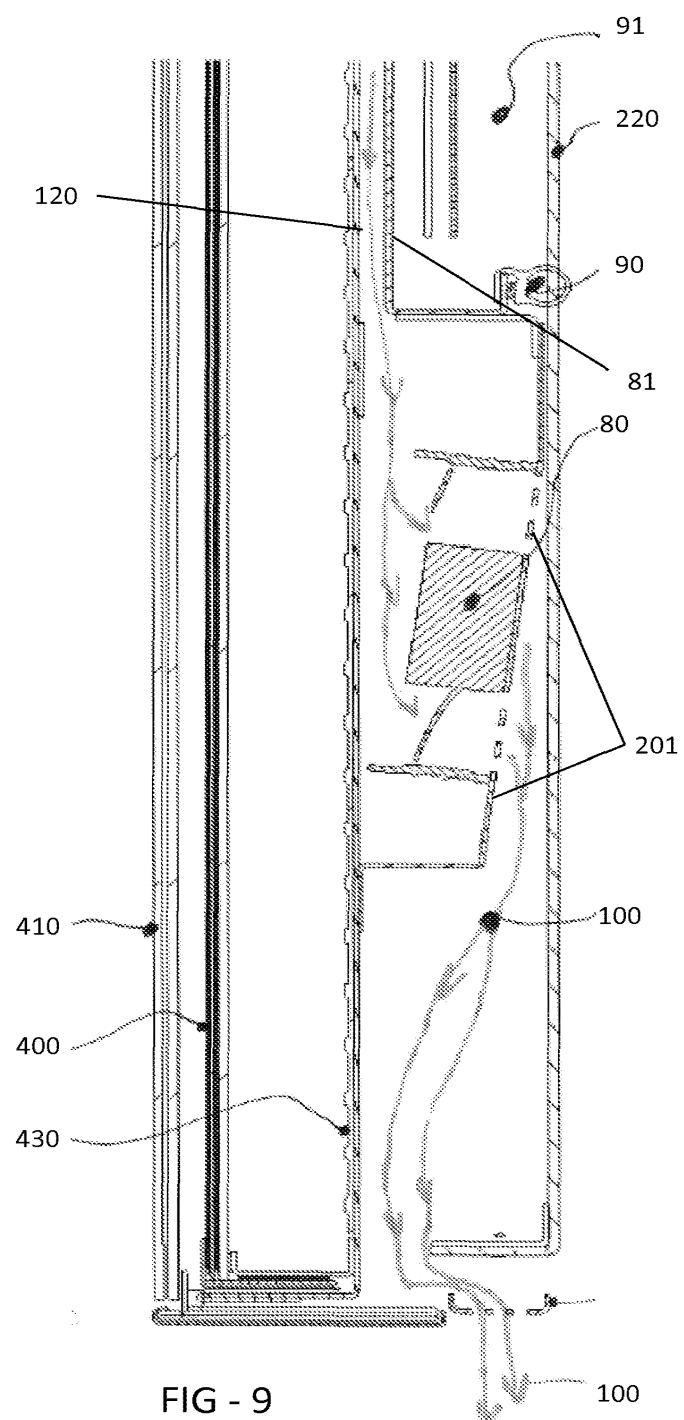


FIG - 8





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(54) **BACK PAN COOLING ASSEMBLY FOR ELECTRONIC DISPLAY**

RÜCKSEITENKÜHLANORDNUNG FÜR EINE ELEKTRONISCHE ANZEIGE

ENSEMBLE DE REFROIDISSEMENT DE PANNEAU DE PLAQUE ARRIÈRE D'UN AFFICHAGE
ÉLECTRONIQUE

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(73) Proprietor: **Manufacturing Resources
International, INC.
Alpharetta, GA 30005 (US)**

(72) Inventors:
• **DUNN, William
Alpharetta, GA 30005 (US)**

• **BROWN, Mike
Alpharetta, GA 30005 (US)**
• **HUBBARD, Tim
Alpharetta, GA 30005 (US)**

(74) Representative: **FRKelly
27 Clyde Road
Dublin D04 F838 (IE)**

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**JP-A- H11 296 094 JP-A- H11 296 094
US-A1- 2012 020 114 US-A1- 2012 020 114
US-A1- 2012 044 217 US-A1- 2012 044 217**

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EP 2 909 829 B1

SEC et al. v. MRI
SEC Exhibit 1022.1004
IPR2023-00221

Description

Technical Field

[0001] Embodiments generally relate to a cooling assembly for the back pan of an electronic display.

Background of the Art

[0002] Electronic displays are now being used for a variety of applications, in addition to the traditional in-home viewing applications. It is now desirable for electronic displays to be used as restaurant menu boards, advertising, and general informational purposes. Each application may require a different set of electronic assemblies, in order to drive the electronic display and provide any ancillary services related to the electronic display and its purpose. Electronic displays are typically manufactured in standard sizes, shapes, and with standard electronic components. JP H11 296094, US 2012/020114 and US 2012/044217 disclose known electronic displays having cooling assemblies.

Summary of the Exemplary Embodiments

[0003] According to the present invention there is provided a back pan cooling assembly for an electronic display as claimed in claim 1. One exemplary embodiment provides a cooling back pan that is positioned behind the rear pan of an electronic display, where the space between the cooling back pan and the rear pan defines a gap. A fan is preferably positioned so as to cause a flow of ambient air through the gap, cooling the rear pan and the cooling back pan. Electronic components for operating the electronic display can be mounted to the cooling back pan and preferably are placed in conductive thermal communication with the cooling back pan.

[0004] The foregoing and other features and advantages of the present invention will be apparent from the following more detailed description of the particular embodiments, as illustrated in the accompanying drawings.

Brief Description of the Drawings

[0005] A better understanding of an exemplary embodiment will be obtained from a reading of the following detailed description and the accompanying drawings wherein identical reference characters refer to identical parts and in which:

FIGURE 1 is a rear perspective view of an exemplary back pan cooling assembly.

FIGURE 2 is a sectional view of the embodiment shown in Figure 1.

Detailed Description

[0006] The invention is described more fully hereinafter

with reference to the accompanying drawings, in which exemplary embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the exemplary embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. In the drawings, the size and relative sizes of layers and regions may be exaggerated for clarity.

[0007] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0008] Embodiments of the invention are described herein with reference to illustrations that are schematic illustrations of idealized embodiments (and intermediate structures) of the invention. As such, variations from the shapes of the illustrations as a result, for example, of manufacturing techniques and/or tolerances, are to be expected. Thus, embodiments of the invention should not be construed as limited to the particular shapes of regions illustrated herein but are to include deviations in shapes that result, for example, from manufacturing.

[0009] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

[0010] **FIGURE 1** is a rear perspective view of an exemplary back pan cooling assembly where the rear cover 100 has been removed. An electronic display 15 is provided on the bottom with an exemplary cooling back pan 45 positioned on the top. The electronic display 15 contains a rear pan 22 on the rear surface of the electronic display 15 (i.e. on the side opposing an intended observer). The rear pan 22 is often a component in mass-manufactured electronic displays and typically provides mounts for electronic subassemblies or housings to go with the electronic display. In some embodiments, the rear pan 22 is metallic. As used herein, the term 'rear pan' does not require that the pan is actually the one that came with the originally mass-manufactured display, as this component may be upgraded from its originally mass-manufactured form by downstream manufactur-

ers.

[0011] Here, electronic components 10 and 11 for driving the electronic display 15 are fastened to the cooling back pan 45. In an exemplary embodiment, the electronic components 10 and 11 may be placed in conductive thermal communication with the cooling back pan 22. The electronic components 10 and 11 may contain any one of the following: timing and control boards (TCON), power supplies, video cards/drivers/players, input/output interfaces, antennas, wireless receivers, modems, local electronic storage, and CPU/microprocessors.

[0012] The space between the rear pan 22 and the exemplary cooling back pan 45 defines an air gap 25. The fan 30 is positioned so as to cause a flow of ambient cooling air through the gap 25, in order to cool both the rear pan 22 and the cooling back pan 45. The fan 30 preferably draws ambient air from around the display housing, without letting the air enter other portions of the display housing, especially the portions of the cooling back pan 45 which contain the electronic components 10 and 11 (i.e. the portions sealed off between the cooling back pan 45 and the rear cover 100). In other words, the fan 30 is preferably placed in sealed gaseous communication with the surrounding ambient air and the gap 25 such that ambient air can pass through the fan 30 and gap 25 without entering the area sealed by the cooling back pan 45 and rear cover 100.

[0013] In at least one embodiment, a port 150 is provided which provides sealed gaseous communication between the ambient air surrounding the display housing and the fan 30. Once forced through the gap 25, the cooling air can exit any portion of the perimeter of the rear pan 22 and cooling back pan 45 assemblies, and eventually is exhausted out of the edges of the display housing. In other words, the gap 25 preferably extends to all four edges of the display housing and allows ambient air to enter/exit the gap 25 along all four edges of the rear pan 22 and cooling back pan 45.

[0014] FIGURE 2 is a sectional view of the embodiment shown in Figure 1.

[0015] As can be observed, the cooling back pan 45 can be used to mount any number of specialized electrical components 10 and 11 which may be required for the end-use of any electronic display. At the same time, the cooling back pan 45 can help remove heat from the electronic components 10 and 11 as well as the rear pan 22, without exposing the sensitive components to ambient air (which may contain dirt, dust, or contaminants).

[0016] It should be noted that although a single fan 30 is shown, this is not required by any embodiment as there can be multiple fans positioned on the cooling back pan 45 in other embodiments. Also, although an exemplary embodiment uses the fan 30 to push the cooling air into the gap 25, alternative embodiments could also be used to draw air from the edges of the display housing, through the gap 25, and exhaust the air through the port 150. It should also be noted that additional fans may be positioned within the cooling back pan 45 in order to circulate

air around the interior of the cooling back pan 45, without mixing with the ambient air.

[0017] It should also be noted that it is preferable to place the fan 30 near the center of the cooling back pan 45, although this is not required. It may be preferable in some instances to place the fan 30 closer to the horizontal top edge of the cooling back pan 45 (as shown in Figure 2), as the heat generated by the display assembly tends to rise where additional flow rates of cooling air would be beneficial in this area. In most cases, if using only one fan 30, it may be preferable to place the fan near the vertically-drawn centerline of the cooling back pan 45.

[0018] As used herein, the term 'electronic display' is any electronic assembly for generating an image to a viewer. The term specifically includes, but is not limited to: liquid crystal displays (all types), OLED, light emitting diode (LED), field emitting display (FED), light emitting polymer (LEP), organic electro luminescence (OEL), plasma displays, and any other type of thin/flat panel display. In an exemplary embodiment, the electronic display 15 comprises an LED edge lit LCD display where the LED backlight is placed in conductive thermal communication with the rear pan 22. In another exemplary embodiment, the electronic display 15 comprises an LED direct backlit LCD display where the rear pan 22 is provided as the rear surface of the direct LED backlight.

[0019] Having shown and described a preferred embodiment of the invention, those skilled in the art will realize that many variations and modifications may be made to affect the described invention and still be within the scope of the claimed invention. It is the intention, therefore, to limit the invention only as indicated by the scope of the claims.

Claims

1. A back pan cooling assembly for an electronic display (15) having a rear pan (22), the assembly comprising:

a cooling back pan (45) positioned behind the rear pan (22);
a gap (25) defined by the space between the cooling back pan (45) and the rear pan (22);
a rear cover (100) positioned on the cooling back pan (45) to define a rear compartment which is sealed to prevent ambient air from entering the rear compartment;
a port (150) in the rear cover (100) which accepts ambient gas;
at least one fan (30), the port (150) being in gaseous communication with the fan (30), the fan (30) being oriented such that the ambient air is drawn through the port (150) and exhausted out of the gap (25);
wherein the fan (30) is positioned to cause a flow of ambient air through the gap (25); and

an electronic component (10, 11) for driving the electronic display (15) placed in the rear compartment and in conductive thermal communication with the cooling back pan (45) wherein: the fan (30) is sealed within the cooling back pan (45) such that ambient air is not permitted to contact the electronic component (10, 11).

2. The cooling assembly of claim 1 further comprising:

an LED backlight within the electronic display (15) and placed in thermal communication with the rear pan (22).

3. The cooling assembly of claim 1 wherein: the rear pan (22) comprises the rear surface of a direct-lit LED backlight.

4. The cooling assembly of claim 1 wherein:

the rear pan (22) has a first pair of vertical edges and a first pair of horizontal edges; the cooling back pan (45) has a second pair of vertical edges and a second pair of horizontal edges; the first pair of horizontal edges are aligned with the second pair of horizontal edges; the first pair of vertical edges are aligned with the second pair of vertical edges; the gap (25) extends to each horizontal edge to define a pair of horizontal edge gaps and to each vertical edge to define a pair of vertical edge gaps; and the fan (30) is positioned to cause the flow of ambient air through the horizontal edge gaps and the vertical edge gaps.

Patentansprüche

1. Rückenschalen-Kühlungsanordnung für eine elektronische Anzeigevorrichtung (15), die eine hintere Schale (22) aufweist, wobei die Anordnung Folgendes umfasst:

eine Kühlrückschale (45), die hinter der hinteren Schale (22) positioniert ist; einen Spalt (25), der von dem Zwischenraum zwischen der Kühlrückschale (45) und der hinteren Schale (22) definiert wird; eine hintere Abdeckung (100), die auf der Kühlrückschale (45) positioniert ist, um einen hinteren Raum zu definieren, der abgedichtet ist, um zu verhindern, dass Umgebungsluft in den hinteren Raum eintritt; eine Öffnung (150) in der hinteren Abdeckung (100), die Umgebungsgas aufnimmt;

mindestens ein Gebläse (30), wobei die Öffnung (150) in Gasverbindung mit dem Gebläse (30) steht, wobei das Gebläse (30) derart orientiert ist, dass die Umgebungsluft durch die Öffnung (150) gesaugt und durch den Spalt (25) ausgeblasen wird; wobei das Gebläse (30) positioniert ist, um einen Strom von Umgebungsluft durch den Spalt (25) zu bewirken; und eine elektronische Komponente (10, 11) zum Treiben der elektronischen Anzeigevorrichtung (15), die in dem hinteren Raum platziert ist und in leitfähiger thermischer Verbindung mit der Kühlrückschale (45) steht, wobei: das Gebläse (30) innerhalb der Kühlrückschale (45) dicht eingeschlossen ist, so dass es Umgebungsluft nicht ermöglicht wird, mit der elektronischen Komponente (10, 11) in Kontakt zu gelangen.

2. Kühlungsanordnung nach Anspruch 1, die weiter Folgendes umfasst:

eine LED-Hintergrundbeleuchtung innerhalb der elektronischen Anzeigevorrichtung (15), die in thermischer Verbindung mit der hinteren Schale (22) platziert ist.

3. Kühlungsanordnung nach Anspruch 1, wobei: die hintere Schale (22) die hintere Oberfläche einer direkt beleuchteten LED-Hintergrundbeleuchtung umfasst.

4. Kühlungsanordnung nach Anspruch 1, wobei:

die hintere Schale (22) ein erstes Paar vertikale Ränder und ein erstes Paar horizontale Ränder aufweist; die Kühlrückschale (45) ein zweites Paar vertikale Ränder und ein zweites Paar horizontale Ränder aufweist; das erste Paar horizontale Ränder auf das zweite Paar horizontale Ränder ausgerichtet ist; das erste Paar vertikale Ränder auf das zweite Paar vertikale Ränder ausgerichtet ist; sich der Spalt (25) zu jedem horizontalen Rand erstreckt, um ein paar horizontale Randspalte zu definieren, und zu jedem vertikalen Rand erstreckt, um ein Paar vertikale Randspalte zu definieren; und das Gebläse (30) positioniert ist, um den Strom von Umgebungsluft durch die horizontalen Randspalte und die vertikalen Randspalte zu bewirken.

Revendications

1. Ensemble de refroidissement de plaque côté arrière

pour un affichage électronique (15) ayant une plaque arrière (22), l'ensemble comportant :

une plaque côté arrière de refroidissement (45) positionnée derrière la plaque arrière (22) ; 5
une brèche (25) définie par l'espace entre la plaque côté arrière de refroidissement (45) et la plaque arrière (22) ;
un couvercle arrière (100) positionné sur la plaque côté arrière de refroidissement (45) pour 10
définir un compartiment arrière qui est scellé pour empêcher l'air ambiant d'entrer dans le compartiment arrière ;
un orifice (150) dans le couvercle arrière (100) qui accepte du gaz ambiant ; 15
au moins un ventilateur (30), l'orifice (150) étant en communication gazeuse avec le ventilateur (30), le ventilateur (30) étant orienté de telle sorte que l'air ambiant est aspiré au travers de l'orifice (150) et évacué par la brèche (25) ; 20
dans lequel le ventilateur (30) est positionné pour amener un écoulement d'air ambiant au travers de la brèche (25) ; et
un composant électronique (10, 11) servant à entraîner l'affichage électronique (15) placé 25
dans le compartiment arrière et en communication thermique conductrice avec la plaque côté arrière de refroidissement (45) dans lequel :
le ventilateur (30) est scellé dans la plaque côté 30
arrière de refroidissement (45) de telle sorte que l'air ambiant n'est pas autorisé à entrer en contact avec le composant électronique (10, 11).

2. Ensemble de refroidissement selon la revendication 1, comportant par ailleurs : 35
un rétroéclairage à DEL à l'intérieur de l'affichage électronique (15) et placé en communication thermique avec la plaque arrière (22).
3. Ensemble de refroidissement selon la revendication 1, dans lequel : 40
la plaque arrière (22) comporte la surface arrière d'un rétroéclairage à DEL à éclairage direct.
4. Ensemble de refroidissement selon la revendication 1, dans lequel : 45

la plaque arrière (22) a une première paire de bords verticaux et une première paire de bords horizontaux ; 50
la plaque côté arrière de refroidissement (45) a une deuxième paire de bords verticaux et une deuxième paire de bords horizontaux ;
les bords de la première paire de bords horizontaux sont alignés sur les bords de la deuxième 55
paire de bords horizontaux ;
les bords de la première paire de bords verticaux sont alignés sur les bords de la deuxième paire

de bords verticaux ;
la brèche (25) s'étend jusqu'à chaque bord horizontal pour définir une paire de brèches de bords horizontaux et jusqu'à chaque bord vertical pour définir une paire de brèches de bords verticaux ; et
le ventilateur (30) est positionné pour entraîner l'écoulement de l'air ambiant au travers des brèches de bords horizontaux et des brèches de bords verticaux.

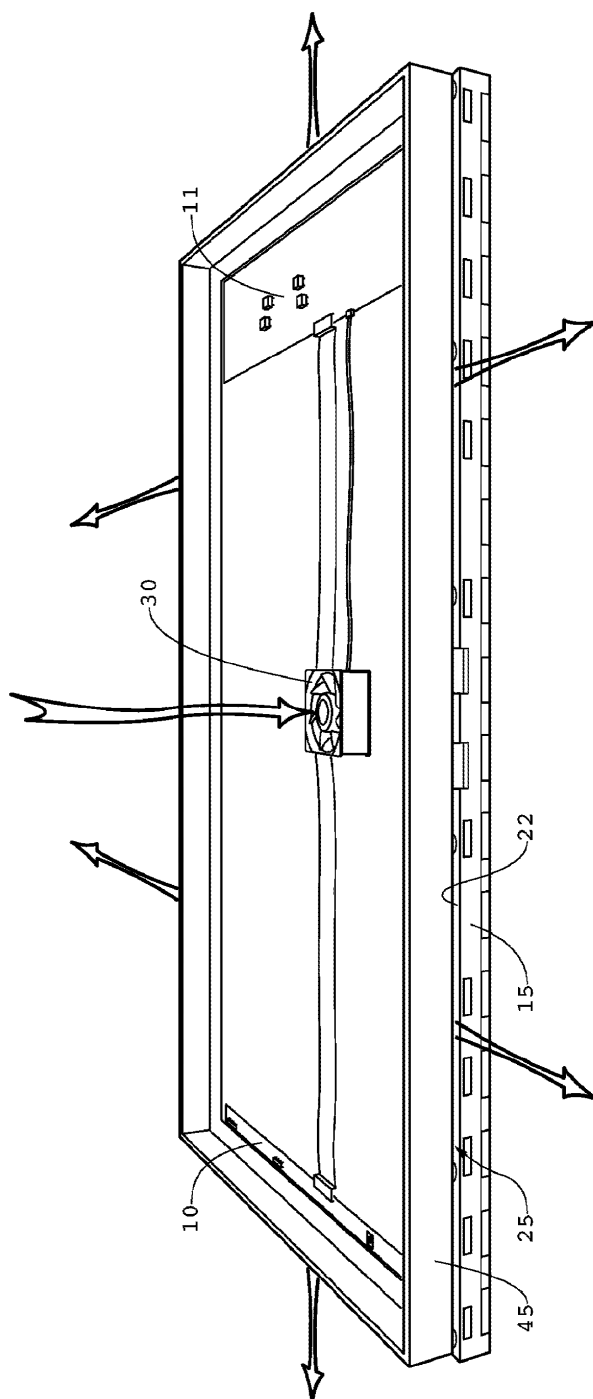


FIG. 1

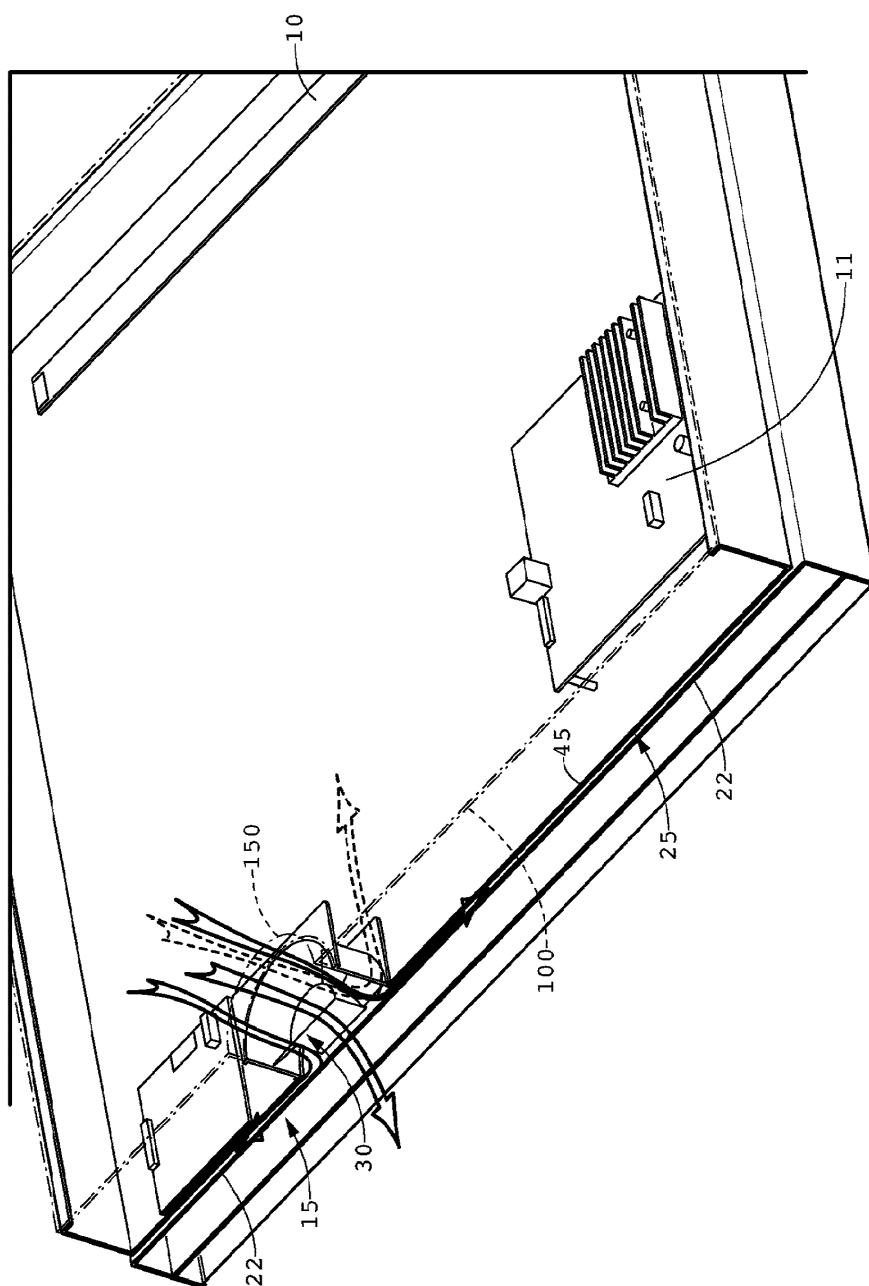


FIG. 2

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

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Espacenet

JP2011014593A LED LIGHT SOURCE, ITS MANUFACTURING METHOD, AND LED-BASED PHOTOLITHOGRAPHY APPARATUS AND METHOD SOURCE

Applicants: HITACHI HIGH-TECHNOLOGIES CORP

Inventors: HATA SHOHEI,ISHIDA SUSUMU

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IPC **G03F7/20; H01L21/027; H01L33/00; H01L33/64;**

CPC **G03F7/2004 (KR); G03F7/7005 (EP,KR); G03F7/70858 (EP,KR); H01L21/0275 (KR); H01L25/13 (KR); H01L33/64 (KR,US); H01L33/641 (KR); H05B3/0038 (EP,KR); H05K1/0204 (EP,KR); H05K1/0206 (KR); H05K3/0061 (EP,KR); H01L2224/48091 (EP); H01L25/13 (EP); H01L33/641 (EP); H05K1/0206 (EP); H05K2201/0209 (EP); H05K2201/09063 (EP); H05K2201/10106 (EP); H05K2201/10977 (EP);**

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LED LIGHT SOURCE, ITS MANUFACTURING METHOD, AND LED-BASED PHOTOLITHOGRAPHY APPARATUS AND METHOD SOURCE

Abstract

PROBLEM TO BE SOLVED: To suppress temperature variations among substrates mounting a plurality of light-emitting elements and also improve the heat dissipation characteristics of the substrates mounting the light-emitting elements, with a simple structure.**SOLUTION:** A light-emitting diode (LED) light source includes: an LED element formed by connecting an LED chip to electrodes formed on a ceramic substrate; an LED element-mounting substrate on which a plurality of the LED elements are mounted; and a heat dissipating element for releasing heat generated in the LED element-mounting substrate. In the LED light source, a thermally conductive resin is interposed between the LED element-mounting substrate and the heat dissipating element, and a portion of the thermally conductive resin protrudes via through holes formed in the LED element-mounting substrate to a side of a surface of the LED element-mounting substrate, on which the LED elements are mounted, so that the part of the thermally conductive resin is joined with the plurality of the LED elements.

【特許請求の範囲】

【請求項 1】

セラミックの基体上に形成した電極に発光ダイオード（ＬＥＤ）チップを接続したＬＥＤ素子体と、該ＬＥＤ素子体を複数搭載したＬＥＤ素子搭載基板と、該ＬＥＤ素子搭載基板で発生した熱を放熱する放熱素子とを有するＬＥＤ光源であって、前記ＬＥＤ素子搭載基板と前記放熱素子との間には熱伝導樹脂が介在し、該熱伝導樹脂の一部は前記ＬＥＤ素子搭載基板に設けられた貫通穴を介して該ＬＥＤ素子搭載基板の前記ＬＥＤ素子体が搭載されている面の側に延在して前記複数のＬＥＤ素子体と接合していることを特徴とするＬＥＤ光源。

【請求項 2】

前記発光ダイオード（ＬＥＤ）チップを、前記セラミック基体に形成した凹部の内部で前記セラミックの基体上に形成した電極にワイヤボンディングにより接続されていることを特徴とする請求項 1 記載のＬＥＤ光源。

【請求項 3】

前記ＬＥＤ素子搭載基板に設けられた貫通穴を介して該ＬＥＤ素子搭載基板の前記ＬＥＤ素子体が搭載されている面の側に延在した前記熱伝導樹脂は前記複数のＬＥＤ素子体間に該ＬＥＤ素子体よりも低い高さで充填されていることを特徴とする請求項 1 記載のＬＥＤ光源。

【請求項 4】

前記ＬＥＤ素子体から発光された光の光分散防止用のレンズ手段が設けられていることを特徴とする請求項 1 記載のＬＥＤ光源。

【請求項 5】

前記熱伝導性樹脂の熱伝導率は、前記ＬＥＤ素子搭載基板の熱伝導率よりも大きいことを特徴とする請求項 1 記載のＬＥＤ光源。

【請求項 6】

露光光源手段と、露光パターンを形成する露光パターン形成部と、基板を載置して少なくとも一方向に移動可能なテーブル手段と、前記露光光源手段と前記露光パターン形成部と前記テーブル手段とを制御する制御手段とを備えた露光装置であって、前記露光光源手段はＬＥＤ光源を備え、該ＬＥＤ光源は、セラミックの基体上に形成した電極に発光ダイオード（ＬＥＤ）チップを接続したＬＥＤ素子体と、該ＬＥＤ素子体を複数搭載したＬＥＤ素子搭載基板と、該ＬＥＤ素子搭載基板と接して前記ＬＥＤ素子体で発生した熱を放熱する放熱素子とを有し、前記ＬＥＤ素子搭載基板と前記放熱素子とは熱伝導樹脂を介して接続されており、該熱伝導樹脂の一部は前記ＬＥＤ素子搭載基板に設けられた貫通穴を介して該ＬＥＤ素子搭載基板の前記ＬＥＤ素子体が搭載されている面の側に延在して前記複数のＬＥＤ素子体と接合していることを特徴とするＬＥＤ光源を備えた露光装置。

【請求項 7】

前記露光パターン形成部は、前記テーブル手段で駆動される基板の位置に応じて該基板を露光するパターンの形状を変えることを特徴とする請求項 6 記載のＬＥＤ光源を備えた露光装置。

【請求項 8】

前記露光光源手段は水冷ジャケットを備え、該水冷ジャケットで前記ＬＥＤ光源を冷却することを特徴とする請求項 6 記載のＬＥＤ光源を備えた露光装置。

【請求項 9】

放熱素子上に熱伝導樹脂を供給し、表面にＬＥＤ素子体を複数搭載したＬＥＤ素子搭載基板の裏面側を前記熱伝導樹脂が供給された放熱素子に所定の間隔になるまで押付けて前記熱伝導樹脂を前記放熱素子と前記ＬＥＤ素子搭載基板との間に広げさせ、前記ＬＥＤ素子搭載基板に設けた貫通穴を介して前記放熱素子と前記ＬＥＤ素子搭載基板との間にある前記熱伝導樹脂の一部を前記ＬＥＤ素子搭載基板の表面に押出して該表面に搭載された複数のＬＥＤ素子体の間に充填し、前記熱伝導樹脂を前記放熱素子と前記ＬＥＤ素子搭載基板との間に広げさせてその一部を前記貫通穴を介して前記放熱素子と前記ＬＥＤ素子搭載基

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板との間に充填させた状態で加熱して硬化させることを特徴とするＬＥＤ光源の製造方法。

【請求項１０】

前記ＬＥＤ素子体は、セラミックの基体上に形成した電極に発光ダイオード（ＬＥＤ）チップをワイヤボンディングにより接続して形成されたことを特徴とする請求項９記載のＬＥＤ光源の製造方法。

【請求項１１】

前記熱伝導性樹脂の熱伝導率は、前記ＬＥＤ素子搭載基板の熱伝導率よりも大きいことを特徴とする請求項９記載のＬＥＤ光源の製造方法。

【請求項１２】

露光光源手段から発射された露光光を露光パターン形成部に照射し、該露光光が照射された露光パターン形成部により形成された光パターンを表面にレジストが塗布された基板上に結像し、該結像させた光パターンにより前記レジストを露光する方法であって、前記露光光は前記露光光源手段のＬＥＤ光源から発射された光であり、該ＬＥＤ光源は水冷ジャケットで冷却されたＬＥＤ素子搭載基板に搭載されて間に熱伝導樹脂が充填された複数のＬＥＤ素子体から発射された光であることを特徴とするＬＥＤ光源を用いた露光方法。

【請求項１３】

前記基板は少なくとも一方向に移動可能なテーブルに載置され、前記露光パターン形成部は、前記テーブルにより一方向に移動する基板の位置に応じて該基板を露光するパターンの形状を変えることを特徴とする請求項１２記載のＬＥＤ光源を用いた露光方法。

【発明の詳細な説明】

【技術分野】

【０００１】

本発明は、各種照明用光源などに使用されるＬＥＤ光源、それを用いたバックライトモジュールなどのバックライト装置に関する。

【背景技術】

【０００２】

一般的な従来のＬＥＤ（発光ダイオード）素子基板における構成例として、特許文献１には図５に示すようなＬＥＤ素子基板が開示されている。

【０００３】

図５において、このＬＥＤ素子基板１０は、セラミック基板１１の表面に凹部１１ａが形成されている。その凹部１１ａ内には配線パターン１２が設けられ、その配線パターン１２に、１個または異なる発光色を有する複数のＬＥＤチップ１３が接着剤（図示せず）などによってダイボンディングされている。このとき、ＬＥＤチップ１３は、発光面と反対側の面をセラミック基板凹部１１ａ側に向けて接着されている。そのＬＥＤチップ１３の電極（発光面側の電極）とセラミック基板凹部１１ａ上の配線パターン１２の所定位置とは、金などからなる接続用ワイヤ１４にてワイヤボンディングされ、凹部１１ａの内部はシリコン樹脂などのモールド樹脂１５により覆われて封止されているか、窒素などの不活性ガスが封入されている。また、セラミック基板１１の一部側面から一部裏面にわたって、このＬＥＤ素子基板１０を外部と電気的に接続するための電極配線用端子１６が設けられている。

【０００４】

さらに特許文献１には、上記図５に示すようなＬＥＤ素子基板１０を用いて照明用光源などのＬＥＤ光源を構成する場合に、複数のＬＥＤ素子基板１０を、図６に示すように、ガラスエポキシ樹脂などからなる接続基板１７に半田１７ａなどによって例えば一列または複数列に並ぶようにそれぞれ取り付け構成が開示されている。このとき、ＬＥＤチップ１３ａ～ｃは、発光面と反対側の面をセラミック基板凹部１１ａ～ｃ側に向けて取り付けられている。

【０００５】

さらに、特許文献 1 には、例えば露光装置や各種照明装置などに LED 光源を用いる場合には、LED 光源が大電流で駆動されるため、十分な放熱が必要となる。このような場合には、図 6 に示すように、複数の LED 素子基板 10 が取り付けられた接続基板 17 の LED 素子基板取付面とは反対側の面（裏面）に、ヒートシンクなどのような放熱素子 18 が取り付けられている。これらの LED 光源は、図 7 に示すように、バックライト装置の導光板 19 の側面（光入射端面）に沿って、導光板 19 内に光が入射されるように設置される。

【0006】

そのほかにも、特許文献 1 には、LED 光源における放熱構造として図 8 に示すような構造が提案されている。発光素子搭載基板 11 として表面に凹部 11a が設けられたセラミック基板 11 上の配線パターンに LED チップ 13 が発光面とは反対側をセラミック基板凹部 11a に向けてダイボンドされており、セラミック基板の発光面とは反対側の面にヒートシンクなどの放熱素子 18 が直接接合されている。接続基板 17 はその下方に配置されている複数のセラミック基板 11 に対応して LED 素子基板 10 から光を通過させるための光透過部としての窓部 21 がそれぞれ設けられている。また、接続基板 17 には LED チップ 13 に電流を供給するための配線パターン（図示せず）とセラミック基板 11 の上面に設けられた配線パターン（図示せず）とがはんだ 20 などにより接続されている構造が提案されている。

【0007】

この特許文献 1 の LED 表示装置によれば、電流が流れることによって LED チップ 13 から発せられた熱は、LED チップ 13 をセラミック基板 11 にダイボンドする接着剤およびセラミック基板 11 のみを経て放熱素子 18 に伝えられるため、LED チップ 13 から放熱を効率よく行うことができる。

【0008】

また、特許文献 2 には、図 9 で示すように図 5 の LED 素子基板 10 の変形例として、LED チップ 13 の発光面とは反対側に、内部に液相気相放熱装置 23 を有する金属ハウジング 22 と接続された放熱構造が開示されている。

【0009】

特許文献 2 での放熱構造においては、LED チップ 13 での発熱は金属ハウジング 22 に伝導し、高熱伝導性を有した液相気相放熱装置 23 を通して速やかに LED チップ 13 から熱を離すことが可能となるため、LED チップの温度上昇を抑制することができる。更に、特許文献 3 には、マスクレス露光装置について記載されている。

【先行技術文献】

【特許文献】

【0010】

【特許文献 1】特開 2004-311791 号公報

【特許文献 2】特開 2008-172177 号公報

【特許文献 3】特開 2006-250982 号公報

【発明の概要】

【発明が解決しようとする課題】

【0011】

しかしながら、上記図 5 に示したような特許文献 1 に開示されている LED 光源では、複数の LED 素子基板 11 が取り付けられた接続基板 17 の LED 素子基板取り付け面とは反対側の面（裏面）に、ヒートシンクなどのような放熱素子 18 が取り付けられている。このため、LED チップ 13 にて発生した熱は、LED 素子基板 10 を構成するセラミック基板 11 と接続基板 17 を経て放熱素子 18 に伝えられる。

【0012】

ここで、図 10 に示すように複数の LED 素子基板 10 が高密度に接続基板 17 上に実装されている場合、LED 素子基板 10b を囲む複数の LED 素子基板 10a 内の LED 素子から発生した熱は、LED 素子基板 10a からはんだ 17a と接続基板 17 とを経由

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して放熱素子 18 に伝導する。放熱素子 18 内では、LED 素子基板 10 a の直下に当る放熱素子 18 の温度を上昇させ、面内周辺方向に行くに従って温度が下がる温度分布を形成する。

【0013】

LED 素子基板 10 b から、はんだ 17 a と接続基板 17 とを経由して放熱素子 18 へ伝達した熱は、すでに温度が上昇している放熱素子 18 内では、前術の LED 素子基板 10 a より発生した熱と同様に拡散することができないため、LED 素子基板 10 b の直下に位置する接続基板周辺領域 17 b と放熱素子の周辺領域 18 b は、局所的に温度が上昇する。それに伴い、LED 素子基板 10 b で発生した熱は、接続基板 17 に十分に伝達することができないため、LED 素子基板 10 b の温度は上昇する。したがって、LED 素子基板 10 b の温度は、LED 素子基板 40 a の温度と異なる状態となる。よって、接続基板 17 上に実装されている LED 素子基板 10 においてばらつきが発生する問題が発生する。

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【0014】

その結果、大電流にて駆動される露光機用光源や照明用光源などのように、消費電流量が多くなって LED チップ 13 からの発熱量が増えると、温度ばらつきは拡大する。さらに、LED 素子基板の実装間隔幅が狭くなることによっても、温度ばらつきは拡大する。高温となった LED 素子基板 10 a では、LED チップ 13 a も高温となる。LED チップは、温度上昇と共に発光効率が悪くなるため、発光出力は小さくなる。さらに高温環境に置かれた LED チップの劣化は早まるために LED の寿命は短くなる。このことから、温度ばらつきの拡大は、光度の低下や光度のばらつき、LED の寿命低下などの問題が生じる。

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【0015】

一方、上記特許文献 1 の LED 表示装置では、発光素子搭載基板と放熱素子までの放熱性は向上しているが、発光素子搭載基板間の温度ばらつきの問題は考慮されておらず、前述したように上記従来の構成による問題と同様の問題が生じる。

【0016】

特許文献 2 についても同様に、上記従来の構成による問題と同様の問題が生じる。特許文献 3 はマスクレス露光装置に関する発明で、光源として半導体レーザ又は水銀ランプやキセノンランプなどの放電ランプを用いることが記載されているが、LED を光源として用いることについては触れられていない。

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【0017】

本発明の目的は、上記した従来の問題を解決して、簡単な構成で、また簡単な製造方法によって、LED 発光素子を高密度に実装した発光素子搭載基板間の温度ばらつきを低減してより均一な照明を実現できる LED 光源、及びこの光源を用いた露光装置を提供することを目的とする。

【課題を解決するための手段】

【0018】

上記した目的を達成するために、本発明では、セラミックの基体上に形成した電極に発光ダイオード (LED) チップを接続した LED 素子体と、LED 素子体を複数搭載した LED 素子搭載基板と、LED 素子搭載基板で発生した熱を放熱する放熱素子とを備えた LED 光源において、LED 素子搭載基板と放熱素子との間に熱伝導樹脂を介在させ、この熱伝導樹脂の一部は LED 素子搭載基板に設けられた貫通穴を介して LED 素子搭載基板の LED 素子体が搭載されている面の側に延在して複数の LED 素子体と接合している構成とした。

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【0019】

また、本発明では、LED 光源の製造方法において、放熱素子上に熱伝導樹脂を供給し、表面に LED 素子体を複数搭載した LED 素子搭載基板の裏面側を熱伝導樹脂が供給された放熱素子に所定の間隔になるまで押付けて熱伝導樹脂を放熱素子と LED 素子搭載基板との間に広げさせ、LED 素子搭載基板に設けた貫通穴を介して放熱素子と LED 素子搭載基板との間にある熱伝導樹脂の一部を LED 素子搭載基板の表面に押出して表面に搭

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載された複数のＬＥＤ素子体の間に充填し、熱伝導樹脂を放熱素子とＬＥＤ素子搭載基板との間に広がらせてその一部を貫通穴を介して放熱素子とＬＥＤ素子搭載基板との間に充填させた状態で加熱して硬化させるようにした。

【００２０】

また、本発明では、露光光源手段と、露光パターンを形成する露光パターン形成部と、基板を載置して少なくとも一方向に移動可能なテーブル手段と、露光光源手段と露光パターン形成部とテーブル手段とを制御する制御手段とを備えた露光装置において、露光光源手段はＬＥＤ光源を備え、ＬＥＤ光源は、セラミックの基体上に形成した電極に発光ダイオード（ＬＥＤ）チップを接続したＬＥＤ素子体と、ＬＥＤ素子体を複数搭載したＬＥＤ素子搭載基板と、ＬＥＤ素子搭載基板と接してＬＥＤ素子体で発生した熱を放熱する放熱素子とを有し、ＬＥＤ素子搭載基板と放熱素子とは熱伝導樹脂を介して接続されており、この熱伝導樹脂の一部はＬＥＤ素子搭載基板に設けられた貫通穴を介してＬＥＤ素子搭載基板のＬＥＤ素子体が搭載されている面の側に延在して複数のＬＥＤ素子体と接合するよう

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【００２１】

更に、本発明では、露光光源手段から発射された露光光を露光パターン形成部に照射し、露光光が照射された露光パターン形成部により成形された光パターンを表面にレジストが塗布された基板上に結像し、結像させた光パターンによりレジストを露光する方法において、露光光は露光光源手段のＬＥＤ光源から発射された光であり、この露光光は水冷ジャケットで冷却されたＬＥＤ素子搭載基板に搭載されて間に熱伝導樹脂が充填された複数の

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【発明の効果】

【００２２】

本発明によれば、基板に搭載した複数の発光素子は熱伝導樹脂によって熱的に接続されているために発光素子（ＬＥＤ）搭載基板間の温度ばらつきは軽減される。これに加えて、熱伝導性樹脂は、発光素子搭載基板と放熱素子との間には熱伝導樹脂を通して接続しているために従来技術と比べると発光素子搭載基板から放熱素子への放熱をより効率良く行うことが可能となる。

【００２３】

さらに発光素子搭載基板として従来の樹脂基板に代えて熱伝導性の良いセラミック基板や金属ベース基板を用いれば、温度ばらつきは一層低減できる。これによって、高温となる発光素子への熱ストレスを低減できて、信頼性を向上させることができる。

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【００２４】

また、上記のＬＥＤ光源構造においては、従来の製造工程と同一工程にて製造できるために、新たな工程を新設する必要もなく、製造装置の導入も必要ない。このため製造コストを抑制することができる。

更に、本発明によるＬＥＤ光源を露光装置に適用することにより、より少ない消費電力でパターンの露光を行うことが可能になる。

【図面の簡単な説明】

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【００２５】

【図１】本発明のＬＥＤ光源の実施形態１における構成例を示す断面図である。

【図２Ａ】実施例１における接続基板と放熱素子の接合工程を示した図で、放熱素子４に熱伝導樹脂５が所定の量供給された状態を示す図である。

【図２Ｂ】実施例１における接続基板と放熱素子の接合工程を示した図で、接続基板３を押下げていって放熱素子４との間に熱伝導樹脂５を挟みこんだ状態を示す図である。

【図２Ｃ】実施例１における接続基板と放熱素子の接合工程を示した図で、接続基板３を所定の位置まで押下げて放熱素子４との間に挟みこんだ熱伝導樹脂５の一部を貫通穴３０と通して接続基板３の上面でＬＥＤ素子基板の隙間に回りこんだ状態を示す図である。

【図３】本発明のＬＥＤ光源の実施形態２における構成例を示す断面図である。

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【図 4】本発明の実施形態 3 を示す露光機用 LED 光源の断面図である。

【図 5】従来の LED 光源素子基板における構成を示す斜視図である。

【図 6】従来の LED 光源の構成を示す断面図である。

【図 7】従来の LED バックライトモジュールの構成を示す断面図である。

【図 8】従来の LED 光源における他の構成を示す断面図である。

【図 9】従来の LED 光源における他の構成を示す断面図である。

【図 10】従来の LED 光源において熱の流れを示す断面図である。

【図 11 A】本発明の実施形態 4 を示す露光機装置の全体構成を示す概略図である。

【図 11 B】本発明の実施形態 4 を示す露光機装置の露光条件を示すグラフである。

【発明を実施するための形態】

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【0026】

以下に、本発明の LED 光源、これを用いたバックライト装置および、これを用いた露光装置の実施形態 1～4 として、LED 光源、これを用いた LED バックライト装置および、これを用いた露光装置に適用した場合について図面を参照しながら説明する。

【実施例 1】

【0027】

図 1 は、本発明の LED 光源の第 1 の実施例における構成例を示す断面図である。

図 1 において、この LED 光源 1 は、接続基板 3 とこの接続基板 3 の上に一列または複数列に所定間隔に配列された複数の発光素子搭載基板としての複数の LED 素子基板 2 と、接続基板 3 の下面に設けられたヒートシンクなどの放熱部材である放熱素子 4 と、LED 素子基板 2 間と接続基板 3 と放熱素子 4 の隙間にはシリコン接着剤などの熱伝導樹脂 5 が備えてある。

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【0028】

LED 素子基板 2 a～c は、図 5 に示した LED 素子基板 10 と同じ構成を有しており、発光素子搭載用基板としての 2 mm～7 mm 角で厚さが 1.5～3 mm のセラミック基板 201 a～c と、セラミック基板 201 に設けられた発光源の発光素子としての 0.2 mm～2 mm 角の発光ダイオードチップである LED チップ 202 と、セラミック基板 201 上の最表面が 0.3 μm 以上の Au、または Ag または Al など反射率の高い金属で覆われた配線パターン（図示せず）の所定位置と LED チップ 202 の電極とを接続するための接続用ワイヤ 203（または配線ワイヤ）とを有している。

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【0029】

セラミック基板 201 はアルミナや窒化アルミにより構成されているために熱伝導性がよく、セラミック基板 201 には、その一方、表面中央部に凹部が設けられている。凹部内には 1 個または、異なる発光色の複数個の LED チップ 202 が、発光面とは反対側の面（裏面）をセラミック基板 201 に向けて配置されて、凹部 201 a 内に設けられた配線パターン（図 5 参照）の所定位置上にダイボンドされている。LED チップ 202 の発光面側の電極は、凹部上に設けられた配線パターン（図示せず）の所定位置と接続用ワイヤ 203 によってワイヤボンドされている。

【0030】

接続基板 3 は、その上面に複数のセラミック基板 201 が配列されている。接続基板 3 は、LED チップ 202 に電流を供給するための配線パターン（図示せず）と、セラミック基板 201 の裏面に設けられた配線パターン（図示せず）とがはんだ 32 や導電性ペーストにより接続されている。

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【0031】

厚さ 0.5 mm から 5 mm の接続基板 3 には、その表裏を貫通するように直径が 0.5 mm から 2 mm の複数の貫通穴 30 が設けられている。貫通穴 30 の設置位置は、セラミック基板 201 を載置する位置の近傍に置かれることにより、熱伝導樹脂 5 を効率よくセラミック基板 201 の側面に供給することができる。

【0032】

アルミまたは、銅製の熱伝導性の優れた金属によって構成された放熱素子 4 は、その上

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面に配置した接続基板 3 と熱伝導樹脂 5 を介して接合されている。

熱伝導樹脂 5 は、シリコン樹脂またはエポキシ系樹脂に熱伝導のためにアルミナ、カーボン、酸化チタン、シリカなどの絶縁体フィラ剤を混ぜ合わせたもので、熱伝導率が $0.5 \sim 1.0 \text{ W/mK}$ であり、熱膨張率 $2 \sim 100 \text{ ppm}$ の粘度 $10 \sim 100 \text{ Pa s}$ とした熱塑性樹脂または光塑性樹脂である。熱伝導樹脂 5 は、複数のセラミック基板 201a～c の裏面または側面に接触しており、さらに、接続基板 3 の貫通穴 30 を埋めるように配置されている。さらに、熱伝導樹脂 5 は、接続基板 3 の裏面と放熱素子 4 とを接合している。

【0033】

図 1 の LED 光源の構成によれば、複数のセラミック基板 201a～c の側面または裏面が熱伝導樹脂 5 に接続しているために高温のセラミック基板 201B の熱は、熱伝導樹脂 5 を通して低温のセラミック基板 201a および 201c に伝導し、セラミック基板 201b とセラミック基板 201a および 201c の温度差は小さくなる。このため、複数のセラミック基板 201a～c での温度のばらつきは減少する。LED1 個当たり 2W の投入電力に対して図 6 に示した従来の構成ではセラミック基板 201b とセラミック基板 201a、c 間の温度差が 7°C であったものが、図 1 の構成において、充填高さ h (熱伝導樹脂 5 が接続基板 3 の表面から上に出た部分の高さ) を 1mm 程度とすると、セラミック基板 201b とセラミック基板 201a の温度差は 3°C 以内となった。

【0034】

さらに、熱伝導樹脂 5 の充填高さ h を高めることで、熱伝導樹脂 5 とセラミック基板 201a～c との接続面積を拡大することができるため、セラミック基板 201a～c から熱伝導樹脂 5 への熱伝導性は向上する。その結果として、セラミック基板 201a とセラミック基板 201b の温度差をより小さくできる。

【0035】

次に、LED 光源の製造工程について説明する。

図 2A から図 2C には、接続基板と放熱素子の接着工程を示した。

図 2A に示した工程では、接続基板 3 にはリフローによるはんだによるセルフアライメントによって位置決めされた複数の LED 素子基板 2a～c が搭載されている。

また、熱伝導樹脂 5 は、たとえば、ディスペンサ (図示せず) を使って塗布量が調節された状態で放熱素子 4 に塗布されている。

【0036】

図 2B に示した工程では、放熱基板 4 と接続基板 3 は、張り合わせ時に位置ズレしないように、たとえば、位置あわせのガイド (図示せず) などを通して位置あわせを行った後に、放熱基板 4 と接続基板 3 の裏面が、熱伝導樹脂 5 によって接合されるように上方から圧力をかける。圧力によって放熱基板 4 と接続基板 3 との間に挟みこまれた熱伝導樹脂 5 は厚さが薄くなりながら、水平面内方向に広がる。放熱基板 4 と接続基板 3 との間隔が所定の値になった時点で加圧をストップする。

接続基板 3 上には、LED 素子 2a～c のセラミック基板 211a～c の近くに貫通穴 30 が設置されているため、圧力印加と共に、熱伝導樹脂 5 が、貫通穴 30 を通して、接続基板 3 の表面に押し出されてくる。

【0037】

図 2C では、さらに圧力を加え接続基板 3 の表面に押し出された熱伝導樹脂 5 が、セラミック基板 211a～c の裏面または、複数のセラミック基板 211a～c 間の隙間に回りこみ、複数のセラミック基板 211a～c 間に熱伝導樹脂 5 で充填された状態となり、セラミック基板 211a～c の側面または、裏面を熱伝導性樹脂 5 によって接合することができる。ここで、接続基板 3 の表面に押し出される熱伝導樹脂 5 の量は、複数のセラミック基板 211a～c 間に充填された熱伝導樹脂 5 の表面の高さがセラミック基板 211a～c の高さよりも高くないような量に設定する。

【0038】

その後、熱伝導性樹脂 5 を、たとえば、 150°C 程度の高温に 1 時間放置する熱処理によって固化する。固化によって熱伝導性樹脂 5 の体積変化はほとんどないため、固化によ

る熱伝導性樹脂 5 のはがれや、亀裂は起こらない。ここでは、熱硬化樹脂について述べたが、固化方法は、熱伝導性樹脂 5 の材料に依存するものであるから、熱伝導性樹脂 5 の材料に応じて熱硬化以外の光硬化や常放置による硬化方法が適用される。ここで述べた製造工程は、従来の工程と同一工程にて製造できるために、新たに接着工程を新設する必要もなく、製造装置の導入も必要ない。このため製造コストを抑制することができる。

【0039】

さらに、上記の製造方法によれば、熱伝導樹脂 5 をセラミック基板 211a～c の裏面から上面(表面)に向けて供給できるために、LED 素子基板 2a～c の発光面を熱伝導性樹脂 5 によって汚すことがなく、熱伝導性樹脂 5 を供給することができる。これにより、光源装置としての光照射量の低減が防止できる。

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【0040】

さらには、複数の LED 素子基板 2a～c が、狭い間隔にて実装された接続基板においても、熱伝導樹脂 5 は液体であるため狭い隙間にも入り込むことができ、セラミック基板の側面に隙間なく接着することができる。このために、接続基板 3 への実装密度を上げてセラミック基板と熱伝導樹脂の接触面積が広がることで熱伝導性が向上し、セラミック基板 211 の温度ばらつきは縮小する。

【実施例 2】

【0041】

図 3 は、本発明の LED 光源の第 2 の実施例における構成例を示す断面図である。第 2 の実施例では、放熱素子 304 の上面に突起 307 が設置されており、接続基板 303 には、前述の突起 307 に合致する位置に位置あわせ穴 308 が設けられている。突起 307 と位置あわせ穴 308 とを合致させることで放熱素子 304 と接続基板 303 の相対位置を決めることができる。

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【0042】

突起 307 の高さは、接続基板 303 の厚さよりも高くすることで、突起の先端 307a は、接続基板においてセラミック基板 301a 及び b が実装された面(表面)から突き出た構造となっている。

【0043】

このような構成においても実施形態 1 で図 2A から図 2C を用いて説明したのと同様な工程を経ることにより、図 3 に示したように放熱素子 304 と接続基板 303 との間に供給された熱伝導樹脂 305 は、接続基板 303 の貫通穴 309 を通って接続基板 303 の表面(LED 素子基板 300a, 300b が搭載されている面)に押し出され、複数の LED 素子基板 300a, 300b のセラミック基板 301 の裏面または側面さらには放熱素子 304 の突起 307a にも回り込んで接触している。

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【0044】

この構造によれば、セラミック基板 301a 及び b と放熱素子 304 との間を熱伝導樹脂 305 を介して接続しているため、LED 素子基板 300a, 300b で発生した熱は実施形態 1 で説明した放熱経路に加えて、セラミック基板 301a 及び b の側面から突起 70 を通して放熱素子 304 に伝導する熱伝導経路を経由することで放熱することができることから LED 光源の放熱性を高めることができる。よって、複数の LED 素子基板 300a, 300b のセラミック基板 301a 及び b の温度ばらつきが減少することに加えてセラミック基板 301a 及び b の温度を低減することが可能となる。

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【実施例 3】

【0045】

図 4 は本発明の第 3 の実施例を示す露光機用 LED 光源の断面図である。図 4 において、この LED 光源 1A は、LED 素子基板 410 のセラミック基板 401 の上面にレンズ基板 402 が設置され、このレンズ基板 402 に窓部 411 が設けられて光分散防止用のレンズ機能素子 412 が嵌め込まれている点で実施形態 1 及び 2 と異なる。レンズ機能素子 412 は LED 素子基板 410 からの発射され放射状に拡散して入射した光を平行な光に変換する。

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【0046】

レンズ機能素子412は、LED素子から発せられた光の波長において透過率50%以上を有しており、石英などの無機ガラス材のほかにも、シリコン樹脂、アクリル、エポキシ樹脂など有機樹脂を用いてレンズ形状に成型したものを用いる。レンズ機能素子412としては、球面レンズ、非球面レンズ、フレネルレンズなどを用いることができる。

【0047】

本実施例においても第1の実施例で図2Aから図2Cを用いて説明したのと同様な工程を経ることにより、図4に示したような構成とすることができる。本実施形態においては、まず予めレンズ機能素子412が嵌め込まれたレンズ基板402と複数のLED素子基板410がリフロー半田付けされた接続基板403とを接合した状態で、熱伝導樹脂405が供給された放熱素子404に接続基板403を図示していないガイドを用いて位置合わせを行った後に押付けて圧力をかける。この圧力をかけ続けることにより、放熱素子404と接続基板403との間に供給された熱伝導樹脂405は接続基板403の貫通穴409を通して接続基板403の表面（複数のLED素子基板410が搭載されている面）に押し出される。この、接続基板403の表面に押し出された熱伝導樹脂405は複数のLED素子基板410セラミック基板401の裏面または側面に回り込む。

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【0048】

このようにして熱伝導樹脂405が複数のLED素子基板410のセラミック基板401の裏面または側面に回り込ませた状態で150℃程度の高温に1時間放置する加熱処理を施すことにより熱伝導樹脂405は固化する。熱伝導樹脂405は固化することによる体積の変化がほとんど無いため、固化により熱伝導樹脂405が放熱素子404や接続基板403、LED素子基板410とはがれや亀裂が発生せず、放熱素子404や接続基板403、LED素子基板410の間の熱伝達を向上させることができる。

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【0049】

なお、上記した工程において、レンズ機能素子412が嵌め込まれたレンズ基板402とLED素子基板410がリフロー半田付けされた接続基板403とを接合することを、LED素子基板410がリフロー半田付けされた接続基板403と放熱素子404との間で熱伝導樹脂405を加熱固化してから行っても良い。

【0050】

この構造によれば、LED素子基板410のセラミック基板401と放熱素子404との間を熱伝導樹脂305を介して接続しているため、LED素子基板410で発生した熱は実施形態1で説明した放熱経路を経由することで放熱することができることからLED光源の放熱性を高めることができる。よって、複数のLED素子基板410セラミック基板401の温度ばらつきが減少することに加えてセラミック基板301の温度を低減することが可能となる。

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【0051】

なお、本実施例3においてこの場合のレンズ機能素子412は、例えばコリメートレンズが窓部411に嵌め込まれていてもよい。また、本実施例3に拠れば、LED素子基板410から発射した光が上方照射面に対して放射状に広がってしまうのを、図4に示すように、接続基板403の窓部411内にレンズ機能素子412を設けることによって、LED素子基板410からの光の方向を変化させて上方照射面に対して広がらずに垂直に照射させることが可能になり、LED光源に対向した光照射平面（図示せず）に対して照射強度ばらつきのない面内均一な照射光を得ることができる。

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【実施例4】

【0052】

図11は本発明によるLED光源をマスクレスの露光機装置に適用した第4の実施例を示す露光装置の概略構成を示す図である。

【0053】

本実施例における露光装置は、光源部500、インテグレータ503、コリメータミラー504、パターン生成部505、パターン生成部505を駆動するパターン生成駆動部

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５０５０、被露光基板であるワーク５０６を載置するワーク用テーブル５０６０、パターン生成駆動部５０５０及びワーク用テーブル５０６０、光源部５００を制御する制御部５１０を備えて構成されている。

【００５４】

露光光を放射する光源部５００は、複数の光源装置５００１，５００２，５００３から構成されており、各光源装置５００１，５００２，５００３は、発熱を効率よく放熱するために水冷ジャケット５０１に取り付けられている。各光源装置５００１，５００２，５００３の接続基板上に設けられた配線はハーネス５０２１，５０２２，５０２３を通して、電力を供給する点灯電源５０２４，５０２５，５０２６に接続されている。

光源装置５００１，５００２，５００３の配置または傾斜角度は、光源装置５００１，５００２，５００３から発せられた光が、効率よくインテグレータ５０３に入射できるように設計されている。光源装置５００１，５００２，５００３及びインテグレータ５０３の各素子は図１１の紙面に垂直な方向に２次元状に配置されている。

【００５５】

本実施例においては、露光用の光源部５００に実施例１乃至３で説明したようなＬＥＤ光源を採用する。このようなＬＥＤ光源を採用することにより、比較的大きな領域を均一に照明することが可能になり、大面積を均一に露光することができる。

【００５６】

また、照明の幅に方向に渡ってほぼ同じ出射光量にすることができ、各ＬＥＤ光源の寿命もほぼ同じにすることができ、光源部５００を長寿命化することができる。

【００５７】

上記した構成において、光源部５００から発射されてインテグレータ５０３を透過した露光光は、コリメータミラー５０４でマスク５０５に形成された露光パターン面に沿って線状に集光（図面に垂直な露光パターン面の長手方向に線状）され、パターン生成部５０５を介してレジスト等の感光剤が塗布されたワーク５０６に照射されることによりパターン生成部５０５に形成されたパターンによる光像がワーク５０６上に塗布された感光剤（レジスト）に結像されて感光剤が露光される（なお、図１１に示した露光装置の構成においては、説明を簡略化するために結像光学系の記載を省略している。）。

ここでパターン生成部５０５はパターン生成駆動部５０５０で駆動されてワーク用テーブル５０６０により一方向に一定の速度で移動するワーク５０６の位置に応じて露光パターンを形成する。マスクレス露光装置の具体的な構成については、たとえば特開２００６－２５０９８２号公報に記載されているような構成を用いればよい。

【００５８】

本実施例においては集光光学系に光透過型のレンズではなくコリメータミラー５０４を用いているために露光光の色収差の問題を発生することが無く、ＬＥＤ光源として多波長光を用いる場合に、より微細なパターン、よりシャープなパターンを露光することが可能になる。

【００５９】

露光時の光源装置への露光条件を図１１（ｂ）に示す。露光機における露光工程には、ワークの搬入、所定位置へのワークの固定、マスクとワークとの位置あわせ、露光、ワークの固定解除、ワークの搬出の工程がある。露光工程は、１０～１２０秒が必要となるが、実際にワークに光が露光される時間は、およそ５～６０秒である。

【００６０】

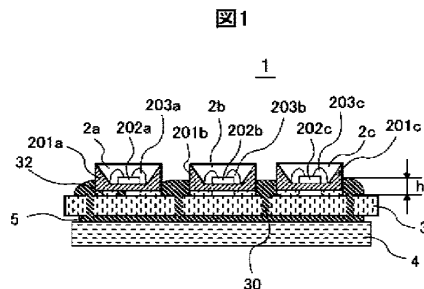
従来の水銀ランプ光源を用いた露光機においては、水銀ランプへの通電直後においては、ランプの温度の変動により出射光度が安定しない。そのために、安定するまで３０分程度待たなければならない。したがって、従来の水銀ランプ光源の露光機を用いる場合、露光工程では出射光度を安定させるために水銀ランプは常に通電して点灯させておく必要がある。しかし、本発明によるＬＥＤ光源を用いれば、通電直後でも数ミリ秒以内に射出光度が安定するために、露光工程においては露光時間にだけＬＥＤ光源に通電すればよいことから、露光機の消費電力の大幅な低減が可能となる。

【符号の説明】

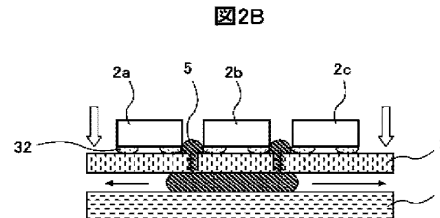
【0061】

1、1A・・・LED光源 2・・・LED素子基板 3・・・発光素子搭載基板
 4・・・放熱素子 5・・・熱伝導性樹脂 10、10a、10b・・・LED素子基板
 11・・・セラミック基板 11a・・・凹部 12・・・基板配線
 13・・・LED素子 14・・・接続用ワイヤ 15・・・モールド樹脂
 16・・・電気配線用端子 17・・・発光素子搭載用基板 17a・・・はんだ
 18・・・放熱素子 19・・・導光板 20・・・窓部 21・・・はんだ
 22・・・金属ハウジング 23・・・液相気相放熱装置 30・・・貫通穴
 32・・・はんだ 201、201A、201B、211・・・セラミック基板 10
 201a・・・凹部 202・・・LEDチップ 301・・・セラミック基板
 303・・・接続基板 304・・・放熱素子 305・・・熱伝導樹脂 3
 07・・・突起 307a・・・突起の先端 308・・・位置あわせ穴
 401・・・セラミック基板 402・・・レンズ基板 403・・・接続基板
 404・・・放熱素子 405・・・熱伝導樹脂 410・・・LED素子基板
 411・・・窓部 412・・・レンズ機能素子 500、501・・・冷却ジャケット
 502・・・点灯電源 503・・・インテグレイタ 504・・・コリメータミラー
 505・・・マスク 506ワーク 507・・・露光時間 50
 8・・・露光していない時間 509・・・露光工程時間。

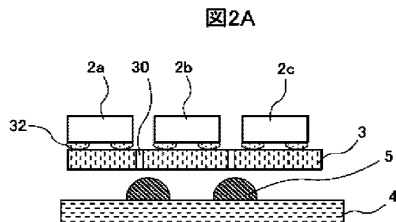
【図1】



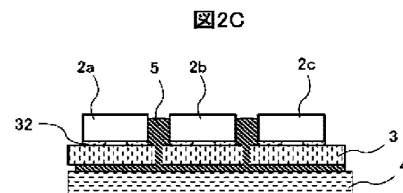
【図2B】



【図2A】

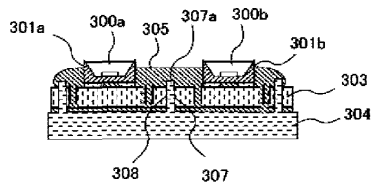


【図2C】



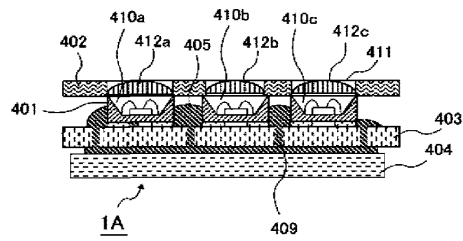
【 図 3 】

図3



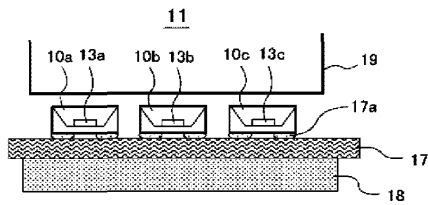
【 図 4 】

図4



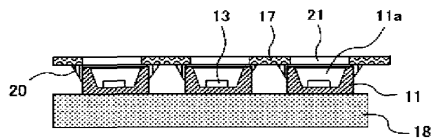
【 図 7 】

図7



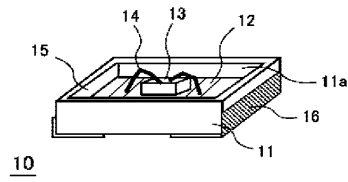
【 図 8 】

図8



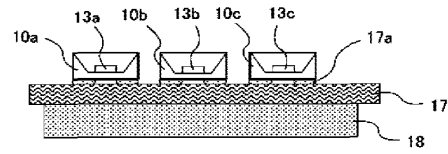
【 図 5 】

図5



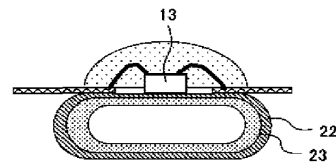
【 図 6 】

図6



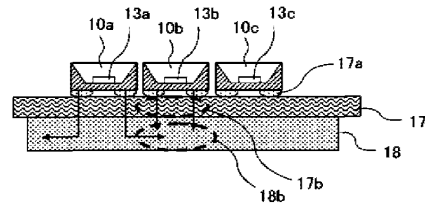
【 図 9 】

図9



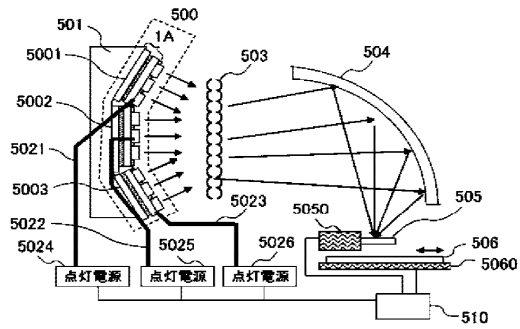
【 図 1 0 】

図10



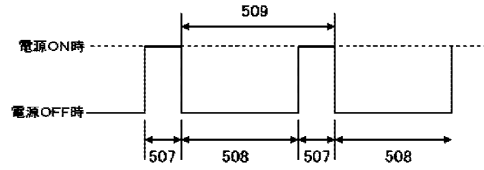
【図 1 1 A】

図11A



【図 1 1 B】

図11B





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(71) Applicant: **Manufacturing Resources**
International, Inc.
Alpharetta, GA 30005 (US)

(72) Inventors:
• **HUBBARD, Tim**
Alpharetta, GA Georgia GA 30005 (US)
• **DUNN, William**
Alpharetta, GA Georgia GA 30005 (US)

(74) Representative: **FRKelly**
27 Clyde Road
Dublin D04 F838 (IE)

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under INID code 62.

(54) **SYSTEM FOR COOLING AN ELECTRONIC IMAGE ASSEMBLY**

(57) A system for cooling an electronic image assembly with ambient gas, the system comprising:
a plurality of channels placed behind the electronic image assembly, each channel having an inlet and exit;
a first manifold in gaseous communication with the inlet of each channel;
a second manifold in gaseous communication with the exit of each channel;
a fan positioned to force ambient gas through the channels;

a front plate placed in front of the electronic image assembly, the space between the front plate and the electronic image assembly defining a front channel;
a circulating fan positioned to force circulating gas through the front channel; and
a cross through plate having a first pathway for circulating gas traveling through the front channel and a second pathway for ambient gas traveling through the plurality of channels behind the electronic image assembly.

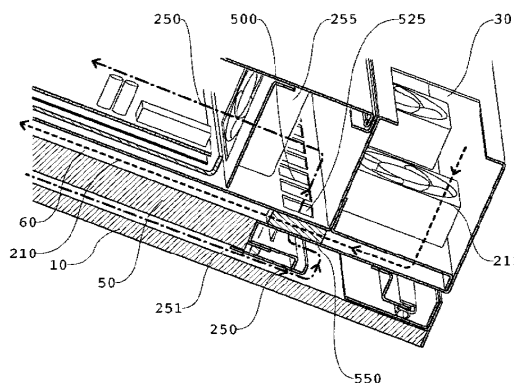


FIG - 5

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Description

Technical Field

[0001] Exemplary embodiments generally relate to cooling systems and in particular to cooling systems for electronic displays.

Background of the Art

[0002] Improvements to electronic displays now allow them to be used in outdoor environments for informational, advertising, or entertainment purposes. While displays of the past were primarily designed for operation near room temperature, it is now desirable to have displays which are capable of withstanding large surrounding environmental temperature variations. For example, some displays are capable of operating at temperatures as low as -22F and as high as 113 F or higher. When surrounding temperatures rise, the cooling of the internal display components can become even more difficult.

[0003] Additionally, modern displays have become extremely bright, with some backlights producing 1,000-2,000 nits or more. Sometimes, these illumination levels are necessary because the display is being used outdoors, or in other relatively bright areas where the display illumination must compete with other ambient light. In order to produce this level of brightness, illumination devices and electronic displays may produce a relatively large amount of heat.

[0004] Still further, in some situations radiative heat transfer from the sun through a front display surface can also become a source of heat. In some locations 800-1400 Watts/m² or more through such a front display surface is common. Furthermore, the market is demanding larger screen sizes for displays. With increased electronic display screen size and corresponding front display surfaces, more heat will be generated and more heat will be transmitted into the displays.

[0005] Exemplary modern displays have found some effective means for cooling the displays including circulating a closed loop of gas around the display and drawing ambient gas through the display so that the closed loop of gas may be cooled (as well as portions of the electronic display). Various thermal communications have been discovered which can transfer heat away from the sensitive electronic components and out of the display. Heat exchangers were found to produce an excellent means for transferring heat between the closed loop of gas and the ambient gas. However, previous designs for moving the gas through the display have been found to generate an undesirable amount of noise emission from the display as well as thermal gradients where portions of the display were cooled but others remained warm.

[0006] When using LCD displays, it was found that backlights were often a source of heat and it was desirable to move gas across the rear surface of the backlight in order to cool it. While desirable, it was thought that the

front surface of the backlight could not be cooled for fear that the backlight cavity would become contaminated with dust, dirt, or other particulate.

Summary of the Exemplary Embodiments

[0007] Exemplary embodiments use a combination of circulating gas and ambient gas in order to adequately cool an electronic display. Circulating gas may be used to remove heat from the front of the image assembly. When using a LCD as the electronic image assembly, circulating gas may also be used to remove heat from the backlight cavity of the LCD. Because the gas is only circulating within the display, it can remain free of particulate and contaminates and will not harm the display.

[0008] Ambient gas may be ingested into the display in order to cool the circulating gas. The ambient gas and the circulating gas may be drawn through a heat exchanger which will allow the heat to transfer from the circulating gas to the ambient gas, preferably without letting the ambient and circulating gases mix with one another. An exemplary embodiment would use a cross-flow heat exchanger. An additional flow of ambient gas can be drawn across the rear surface of the image assembly to remove heat from the rear portion of the image assembly. When using a LCD as the electronic image assembly, this additional flow of ambient gas can be used to remove heat from the rear portion of the backlight for the LCD.

[0009] In order to reduce noise emissions, the fans which drive the ambient and/or circulating gas through the heat exchanger may be placed within the heat exchanger, which can then act as a muffler and reduce the noise emitted by the fans. Further, if using the additional ambient gas pathway behind the image assembly, a manifold may be used to collect the ambient gas along an edge of the display and distribute this into a number of smaller flows. The fans for driving this additional ambient gas pathway can be placed within the manifold in order to reduce the noise emitted by the fans and provide an even distribution of ambient gas across the display.

[0010] It has been found that ingesting ambient gas from the top or bottom edge of the display is preferable as these edges are not typically observable to the viewer. However, when ingesting ambient gas from the top or bottom of a portrait-oriented display, it has been found that as the cool ambient gas travels across the rear portion of the electronic image assembly and accepts heat it increases in temperature. Once the cooling air reaches the opposite edge (either top or bottom), it may have increased in temperature substantially and may no longer provide adequate cooling to the opposing portion of the display. Thus, the manifolds herein allow for cool ambient air to adequately cool the entire electronic image assembly in an even manner and reduce any 'hot spots' within the electronic image assembly.

[0011] The foregoing and other features and advantages will be apparent from the following more detailed description of the particular embodiments of the inven-

tion, as illustrated in the accompanying drawings.

Brief Description of the Drawings

[0012] A better understanding of an exemplary embodiment will be obtained from a reading of the following detailed description and the accompanying drawings wherein identical reference characters refer to identical parts and in which:

FIGURE 1A provides a front perspective view of an exemplary embodiment of the electronic display.

FIGURE 1B provides a rear perspective view of an exemplary embodiment of the electronic display.

FIGURE 2 provides a rear perspective view similar to that shown in Figure 1B where the rear cover has been removed.

FIGURE 3 provides a perspective sectional view along the A-A section line shown in Figure 1B.

FIGURE 4 provides a perspective sectional view along the B-B section line shown in Figure 1B.

FIGURE 5 provides a perspective sectional view of insert C shown in Figure 4.

FIGURE 6 provides a perspective sectional view of one embodiment of the cross through plate.

FIGURE 7 provides an exploded perspective view of one exemplary embodiment of the heat exchanger and fan assembly.

FIGURE 8 provides a perspective sectional view of another embodiment which uses a flow of circulating gas through the backlight cavity of a liquid crystal display (LCD).

FIGURE 9 provides a perspective sectional view of an exemplary embodiment which uses a flow of circulating gas through the backlight cavity in addition to the flow of circulating gas between the LCD and front plate.

Detailed Description

[0013] The invention is described more fully hereinafter with reference to the accompanying drawings, in which exemplary embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the exemplary embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. In the drawings, the size and relative sizes of layers and regions may be exaggerated for clarity.

[0014] It will be understood that when an element or layer is referred to as being "on" another element or layer, the element or layer can be directly on another element or layer or intervening elements or layers. In contrast, when an element is referred to as being "directly on" another element or layer, there are no intervening elements or layers present. Like numbers refer to like elements

throughout. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.

[0015] It will be understood that, although the terms first, second, third, etc., may be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers and/or sections should not be limited by these terms. These terms are only used to distinguish one element, component, region, layer or section from another region, layer or section. Thus, a first element, component, region, layer or section discussed below could be termed a second element, component, region, layer or section without departing from the teachings of the present invention.

[0016] Spatially relative terms, such as "lower", "upper" and the like, may be used herein for ease of description to describe the relationship of one element or feature to another element(s) or feature(s) as illustrated in the figures. It will be understood that the spatially relative terms are intended to encompass different orientations of the device in use or operation, in addition to the orientation depicted in the figures. For example, if the device in the figures is turned over, elements described as "lower" relative to other elements or features would then be oriented "upper" relative to the other elements or features. Thus, the exemplary term "lower" can encompass both an orientation of above and below. The device may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein interpreted accordingly.

[0017] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0018] Embodiments of the invention are described herein with reference to cross-section illustrations that are schematic illustrations of idealized embodiments (and intermediate structures) of the invention. As such, variations from the shapes of the illustrations as a result, for example, of manufacturing techniques and/or tolerances, are to be expected. Thus, embodiments of the invention should not be construed as limited to the particular shapes of regions illustrated herein but are to include deviations in shapes that result, for example, from manufacturing.

[0019] For example, an implanted region illustrated as a rectangle will, typically, have rounded or curved features and/or a gradient of implant concentration at its edges rather than a binary change from implanted to non-implanted region. Likewise, a buried region formed by

implantation may result in some implantation in the region between the buried region and the surface through which the implantation takes place. Thus, the regions illustrated in the figures are schematic in nature and their shapes are not intended to illustrate the actual shape of a region of a device and are not intended to limit the scope of the invention.

[0020] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

[0021] FIGURE 1A provides a front perspective view of an exemplary embodiment of the electronic display 100. A transparent front plate 10 is placed on the front portion of the display to protect the internal components and allow the images produced by the display 100 to be seen. Some embodiments may use glass as the transparent front plate 10. Exemplary embodiments may use two pieces of glass laminated with index-matching optical adhesive. Some front plates 10 may provide other utility such as antireflection or polarizing functions. An inlet aperture 24 and exit aperture 25 may be provided in the housing so that the display 100 can accept ambient gas for cooling the display 100.

[0022] FIGURE 1B provides a rear perspective view of an exemplary embodiment of the electronic display 100. A rear cover 15 may be used to provide access to the internal components of the display 100.

[0023] FIGURE 2 provides a rear perspective view similar to that shown in Figure 1B where the rear cover 15 has been removed. Ambient gas 200 may be ingested into the display through the inlet aperture 24 and pass through a heat exchanger 45 and exit the display through the exit aperture 25. The ambient gas 200 may be drawn into the display and forced through the heat exchanger 45 using heat exchanger fan assembly 46. An exemplary placement for the heat exchanger fan assembly 46 is discussed further below, but in many embodiments the fan assembly 46 can be placed near the inlet aperture 24 and/or exit aperture 25 and may or may not be placed within the heat exchanger 45 (as shown in Figure 2).

[0024] Optionally, ambient gas 210 may also be ingested into the display through inlet aperture 24 (or a separate inlet aperture). Ambient gas 210 may then be directed through a first manifold 30 which travels along the edge of the display. The first manifold 30 accepts the single larger inlet flow of ambient gas 210 and distributes it into a plurality of smaller flows (channels 60) across the display. A second manifold 35 may be placed along the opposite edge of the display as the first manifold 30. The second manifold 35 accepts the plurality of smaller flows (channels 60) and combines them into a single flow and

exhausts it out of the exit aperture 25 (or a separate exit aperture). In this embodiment, a manifold fan assembly 211 is used to draw the ambient gas 210 into the inlet aperture 24 and force the ambient gas 210 across the display. For this particular embodiment, the manifold fan assembly 211 is placed within the first manifold 30 and is used to draw the ambient gas 210 into the display as well as distribute the single flow into a plurality of smaller flows (channels 60). This is not required however, as some embodiments may place the manifold fan assembly 211 in the second manifold 35, or within both the first and second manifolds 30 and 35.

[0025] The first and second manifolds 30 and 35 may be placed along any opposing edges of the display. However, it is preferable that the first and second manifolds 30 and 35 are placed along the vertical edges of the display with the channels 60 travelling horizontally. Other embodiments may place the first and second manifolds 30 and 35 along the horizontal edges of the display with the channels 60 travelling vertically.

[0026] While both flows of ambient gas may be used in an exemplary embodiment, there is no requirement that they are both used. Some embodiments may use only ambient gas 200 or ambient gas 210. Also, if using both flows of ambient gas 200 and ambient gas 210 there is no requirement that they share the same inlet and exit apertures. Thus, there may be separate inlet and exit apertures for the two flows of ambient gas.

[0027] FIGURE 3 provides a perspective sectional view along the A-A section line shown in Figure 1B. Again, ambient gas 200 may be ingested into the display through the inlet aperture 24 and pass through a heat exchanger 45 and exit the display through the exit aperture 25. The ambient gas 200 may be drawn into the display and forced through the heat exchanger 45 using heat exchanger fan assembly 46. Obviously, the inlet aperture 24 may contain a filter or other coverings so that contaminants, insects, garbage, and/or water/fluids cannot easily be ingested into the display. However, an exemplary embodiment would not be damaged if the ambient gas 200 contained contaminants as they would only pass through the heat exchanger 45 which may not be susceptible to damage from particulate or contaminants. Exit aperture 25 may also contain some type of covering to ensure that contaminants and/or insects could not enter the display.

[0028] An electronic image assembly 50 may be placed behind the front plate 10. A plurality of channels 60 may be placed behind the electronic image assembly 50. Ambient gas 210 may be forced through the channels 60 after travelling through the first manifold 30 (not shown here). The flow of ambient gas 210 behind the electronic image assembly 50 may be used to remove any buildup of heat from the rear portion of the electronic image assembly 50. It may be preferable to have a thermally conductive surface/plate on the rear portion of the electronic image assembly 50 so that heat can easily transfer to this surface/plate and be removed by the ambient gas

210.

[0029] The channels 60 can take on any number of forms. Although shown in this embodiment with a square cross-section this is not required. Other embodiments may contain channels 60 with I-beam cross-sections, hollow square cross-sections, hollow rectangular cross-section, solid rectangular or solid square cross-sections, 'T' cross-sections, 'Z' cross-sections, a honeycomb cross-section, or any combination or mixture of these. The channels 60 are preferably thermally conductive and also preferably in thermal communication with the electronic image assembly 50. Thus, in a preferred embodiment, heat which accumulates on the rear portion of the electronic image assembly 50 may be transferred throughout the channels 60 and removed by ambient gas 210. Preferably, the channels 60 are metallic and even more preferably aluminum. Further, in an exemplary embodiment the channels 60 are in conductive thermal communication with the electronic image assembly 50.

[0030] FIGURE 4 provides a perspective sectional view along the B-B section line shown in Figure 1B. In this view, the path of the circulating gas 250 can also be observed. The space between the front plate 10 and the electronic image assembly 50 may define a front channel 251, through which the circulating gas 250 may travel in order to remove any accumulation of heat on the front surface of the electronic image assembly 50. The circulating gas 250 is preferably then directed into the heat exchanger 45 where heat may be transferred from the circulating gas 250 to the ambient gas 200. Upon exiting the heat exchanger 45, the circulating gas 250 may be re-directed into the front channel 251. In this way, the heat exchanger 45 and the front channel 251 are placed in gaseous communication with each other.

[0031] The circulating gas 250 may also be directed over various electronic components 7 so that heat may be transferred from the electronic components 7 to the circulating gas 250. The electronic components 7 could be any one of the following but not limited to: power modules, heat sinks, capacitors, motors, microprocessors, hard drives, AC/DC converters, transformers, or printed circuit boards.

[0032] Also shown in this sectional view is the path of the ambient gas 210 travelling down one of the channels 60 behind the electronic image assembly 50. In this embodiment, the ambient gas 210 is forced out of the first manifold 30, across the channels 60, and into the second manifold 35 by manifold fan assembly 211. In other words, each channel 60 preferably has an inlet which is in gaseous communication with the first manifold 30 as well as an exit which is in gaseous communication with the second manifold 35. As shown in this Figure, the paths of the ambient gas 210 and the circulating gas 250 may cross, but it is preferable to keep the two gases from mixing (as the ambient gas 210 may contain particulate or contaminants while the circulating gas 250 can remain substantially free of particulate and contaminants). It may be preferable to keep the circulating gas 250 from having

particulate or contaminants because it travels in front of the electronic image assembly 50. Thus, to keep the image quality from being impaired, it may be desirable to keep the circulating gas 250 clean and prevent it from mixing with the ambient gas 210.

[0033] FIGURE 5 provides a perspective sectional view of insert C shown in Figure 4. As noted above, if practicing an embodiment which uses ambient gas 210 as well as the circulating gas 250, the pathways of the two gases may need to cross over one another and it may be desirable to prohibit them from mixing to prevent contamination of sensitive portions of the display. Here, cross through plate 500 allows the pathways of the two gases to cross over one another without letting them mix together. The cross through plate 500 in this embodiment contains a series of voids which pass through the plate. A first series of voids 550 passes through the cross through plate 500 and allows ambient gas 210 to travel from the first manifold 30 into the channels 60 which run behind the electronic image assembly 50. A second series of voids 525 pass through the cross through plate 500 in a direction substantially perpendicular to that of the first series of voids 550. The second series of voids 525 allows the circulating gas to exit the front channel 251, cross over the ambient gas 210, and continue towards the heat exchanger 45. In this embodiment, a circulating gas fan assembly 255 is used to draw the circulating gas 250 through the front channel 251 and through the heat exchanger 45. Much like the other fan assemblies shown and described here, the circulating gas fan assembly 255 could be placed anywhere within the display, including but not limited to the entrance/exit of the heat exchanger 45 or the entrance/exit of the front channel 251.

[0034] FIGURE 6 provides a perspective sectional view of one embodiment of the cross through plate 500. In this embodiment, the cross through plate 500 is comprised of a plurality of hollow blocks 503 sandwiched between a top plate 501 and bottom plate 502 with sections of the plates 501 and 502 removed to correspond with the hollow sections of the blocks 503. A portion of the top plate 501 has been removed to show the detail of the hollow blocks 503, first series of voids 550, and second series of voids 525. The cross through plate 500 could take on any number of forms and could be constructed in a number of ways. Some other embodiments may use a solid plate where the first and second series of voids 550 and 525 are cut out of the solid plate. Other embodiments could use two sets of hollow blocks where the hollow sections are perpendicular to each other and the blocks are fastened together. Still other embodiments could use a design similar to those that are taught below for the heat exchanger 45, for example any type of cross-flow heat exchanger design could be used. Thus, an exemplary cross through plate 500 contains two gaseous pathways where the two pathways do not allow the gaseous matter to mix. Here, the first gas pathway would be 525 while the second gas pathway would be 550.

[0035] FIGURE 7 provides an exploded perspective view of one exemplary embodiment of the heat exchanger 45 and fan assembly 46. In this view, the fan assembly 46 is shown removed from its mounted position within the fan housing 51. In this embodiment, the heat exchanger 45 is divided into two portions 47 and 48 where the fan housing 51 is used to provide a gaseous communication between the two portions 47 and 48. Here, the fan assembly 46 is placed between the two portions 47 and 48. While the fan assembly 46 can be placed anywhere so that it draws ambient gas 200 through the heat exchanger 45, it has been found that placing the fan assembly 46 between the two portions of the heat exchanger can provide a number of benefits. First, the volumetric flow rate of the ambient gas 200 through the heat exchanger is high, which results in better cooling capabilities for the heat exchanger 45. Second, the noise produced by the fan assembly 46 can be reduced because the surrounding portions 47 and 48 of the heat exchanger 45 essentially act as a muffler for the fan assembly 46.

[0036] In this embodiment, portion 48 is thinner and longer than portion 47. This was done in order to free up more space within the housing so that additional electronic components could fit within the housing (adjacent to portion 48). As shown, the fan housing 51 may be used to connect two portions of a heat exchanger which may be of different lengths. As shown, portion 48 of the heat exchanger is thinner than the fan housing 51. In an alternative embodiment, both portions 48 and 47 may be thinner than the fan assembly 46 such that a fan housing 51 may be used to provide a sealed gaseous communication between the two portions, even though they are both thinner than the fan assembly 51. This design may be preferable when it is desirable to create the largest possible heat exchanger 45 (for maximum cooling abilities) even though space is limited. This is of course not required, and other embodiments may have portions which are of equal width and length. Also, although this embodiment uses the fan assembly 46 to drive the ambient gas 200, other embodiments could use a fan assembly placed within the heat exchanger to drive the circulating gas 250 instead and drive the ambient gas 200 with another fan assembly (possibly placed within the heat exchanger or located at the entrance/exit of the heat exchanger). Some exemplary embodiments may place fans within the heat exchanger 45 to drive both the ambient gas 200 and circulating gas 250.

[0037] The ambient gas 200 travels through a first pathway (or plurality of pathways) of the heat exchanger 45 while the circulating gas 250 travels through a second pathway (or plurality of pathways) of the heat exchanger 45. Although not required, it is preferable that the circulating gas 250 and ambient gas 200 do not mix. This may prevent any contaminants and/or particulate that is present within the ambient gas 200 from harming the interior of the display. In a preferred embodiment, the heat exchanger 45 would be a cross-flow heat exchanger. However, many types of heat exchangers are known

and can be used with any of the embodiments herein. The heat exchanger 45 may be a cross-flow, parallel flow, or counter-flow heat exchanger. In an exemplary embodiment, the heat exchanger 45 would be comprised of a plurality of stacked layers of thin plates. The plates may have a corrugated, honeycomb, or tubular design, where a plurality of channels/pathways/tubes travel down the plate length-wise. The plates may be stacked such that the directions of the pathways are alternated with each adjacent plate, so that each plate's pathways are substantially perpendicular to the pathways of the adjacent plates. Thus, ambient gas or circulating gas may enter an exemplary heat exchanger only through plates whose channels or pathways travel parallel to the path of the gas. Because the plates are alternated, the circulating gas and ambient gas may travel in plates which are adjacent to one another and heat may be transferred between the two gases without mixing the gases themselves (if the heat exchanger is adequately sealed, which is preferable but not required).

[0038] In an alternative design for a heat exchanger, an open channel may be placed in between a pair of corrugated, honeycomb, or tubular plates. The open channel may travel in a direction which is perpendicular to the pathways of the adjacent plates. This open channel may be created by running two strips of material or tape (esp. very high bond (VHB) tape) between two opposite edges of the plates in a direction that is perpendicular to the direction of the pathways in the adjacent plates. Thus, gas entering the heat exchanger in a first direction may travel through the open channel (parallel to the strips or tape). Gas which is entering in a second direction (substantially perpendicular to the first direction) would travel through the pathways of the adjacent plates).

[0039] Other types of cross-flow heat exchangers could include a plurality of tubes which contain the first gas and travel perpendicular to the path of the second gas. As the second gas flows over the tubes containing the first gas, heat is exchanged between the two gases. Obviously, there are many types of cross-flow heat exchangers and any type would work with the embodiments herein.

[0040] An exemplary heat exchanger may have plates where the sidewalls have a relatively low thermal resistance so that heat can easily be exchanged between the two gases. A number of materials can be used to create the heat exchanger. Preferably, the material used should be corrosion resistant, rot resistant, light weight, and inexpensive. Metals are typically used for heat exchangers because of their high thermal conductivity and would work with these embodiments. However, it has been discovered that plastics and composites can also satisfy the thermal conditions for electronic displays. An exemplary embodiment would utilize polypropylene as the material for constructing the plates for the heat exchanger. It has been found that although polypropylene may seem like a poor thermal conductor, the large amount of surface area relative to a small sidewall thickness, results in an

overall thermal resistance that is low. Thus, an exemplary heat exchanger would be made of plastic and would thus produce a display assembly that is thin and lightweight. Specifically, corrugated plastic may be used for each plate layer where they are stacked together in alternating fashion (i.e. each adjacent plate has channels which travel in a direction perpendicular to the surrounding plates).

[0041] FIGURE 8 provides a perspective sectional view of another embodiment which uses a flow of circulating gas 350 through the backlight cavity of a liquid crystal display (LCD) 300. In this embodiment, a LCD 300 and an associated backlight 320 are used as the electronic image assembly. A backlight wall 330 may enclose the area between the LCD 300 and the backlight 320 in order to create a backlight cavity. Typically, the backlight cavity is closed to prevent contaminants/particulate from entering the backlight cavity and disrupting the optical/electrical functions of the backlight 320. However, as discussed above the exemplary embodiments may use a clean gaseous matter for the circulating gases which could now be used to ventilate the backlight cavity in order to cool the backlight 320 and even the rear portion of the LCD 300. An opening 340 can be placed in the backlight wall 330 to allow circulating gas 350 to flow through the backlight cavity. A fan assembly 360 may be used to draw the circulating gas 350 through the backlight cavity. In an exemplary embodiment there would be an opening on the opposing backlight wall (on the opposite side of the display as shown in this figure) so that circulating gas 350 could easily flow through the backlight cavity. In this way, the backlight cavity is placed in gaseous communication with the heat exchanger 45.

[0042] FIGURE 9 provides a perspective sectional view of an exemplary embodiment which uses a flow of circulating gas 350 through the backlight cavity in addition to the flow of circulating gas 250 through the front channel 251 (the area defined between the LCD 300 and front plate 10). Circulating fan assembly 255 may be placed so that it can draw circulating gas 350 through the backlight cavity as well as circulating gas 250 through the front channel 251. As discussed above, the circulating gases 250 and 350 are preferably forced through the heat exchanger 45 (not shown in this figure) so that they may be cooled by the ambient gas 200 (also not shown in this figure). In this way, both the front channel 251 and the backlight cavity are placed in gaseous communication with the heat exchanger 45.

[0043] Also shown in Figure 9 is the optional additional flow of ambient gas 210 which may travel immediately behind the electronic image assembly (in this embodiment backlight 320). Once travelling through the first manifold 30, the ambient gas 210 may pass through the channels 60 in order to remove heat from the backlight 320 and even the channels 60 themselves (if they are thermally conductive). The manifold fan assembly 211 may be used to draw the ambient gas 210 into the first manifold 30 and through the channels 60. Again, the cross though plate 500 may be used to allow the circ-

ulating gases 350 and 250 to cross paths with the ambient gas 210 without letting the two gases mix.

[0044] In an exemplary embodiment, the backlight 320 would contain a plurality of LEDs mounted on a thermally conductive substrate (preferably a metal core PCB). On the surface of the thermally conductive substrate which faces the channels 60 there may be a thermally conductive plate which may be in thermal communication with the channels 60. In an exemplary embodiment, the thermally conductive plate would be metallic and more preferably aluminum and the thermal communication between the channels 60 and the backlight 320 would be conductive thermal communication.

[0045] As noted above, many electronic image assemblies (especially LEDs, LCDs, and OLEDs) may have performance properties which vary depending on temperature. When 'hot spots' are present within an image assembly, these hot spots can result in irregularities in the resulting image which might be visible to the end user. Thus, with the embodiments described herein, the heat which may be generated by the image assembly (sometimes containing a backlight assembly) can be distributed (somewhat evenly) throughout the channels 60 and thermally-conductive surfaces to remove hot spots and cool the backlight and/or electronic image assembly.

[0046] The circulating gases 250 and 350, ambient gas 200, and optional ambient gas 210 can be any number of gaseous matters. In some embodiments, air may be used as the gas for all. As well known by those of ordinary skill in the art, air typically contains some amount of water vapor. It should be noted that the use of the term 'gas' herein does not designate pure gas and that it is specifically contemplated that any of the gaseous matters described herein may contain some amount of impurities including but not limited to water vapor. Preferably, because the circulating gases 250 and 350 may travel in front of the image assembly and backlight respectively, they should be substantially clear, so that they will not affect the appearance of the image to a viewer. The circulating gases 250 and 350 should also preferably be substantially free of contaminants and/or particulate in order to prevent an adverse effect on the image quality and/or damage to the internal electronic components. It may sometimes be preferable to keep ambient gases 200 and 210 from having contaminants as well. Filters may be used to help reduce the particulate within ambient gases 200 and 210. Filters could be placed near the inlet aperture 24 so that ambient gases 200 and/or 210 could be drawn through the filter. However, in an exemplary embodiment the display may be designed so that contaminants could be present within the ambient gases 200 and 210 but this will not harm the display. In these embodiments, the heat exchanger 45, manifolds 30 and 35, channels 60, and any other pathway for ambient or circulating gas should be properly sealed so that any contaminants in the ambient gas would not enter sensitive portions of the display. Thus, in these exemplary embodiments, ambient air may be ingested for the ambient gas-

es 200 and 210, even if the ambient air contains contaminants or particulate. This can be particularly beneficial when the display is used in outdoor environments or indoor environments where contaminants are present in the ambient air.

[0047] The cooling system may run continuously. However, if desired, temperature sensing devices (not shown) may be incorporated within the electronic display to detect when temperatures have reached a predetermined threshold value. In such a case, the various cooling fans may be selectively engaged when the temperature in the display reaches a predetermined value. Predetermined thresholds may be selected and the system may be configured to advantageously keep the display within an acceptable temperature range. Typical thermostat assemblies can be used to accomplish this task. Thermocouples may be used as the temperature sensing devices.

[0048] It is to be understood that the spirit and scope of the disclosed embodiments provides for the cooling of many types of electronic image assemblies. As used herein, the term 'electronic image assembly' is any electronic assembly for creating an image. At this time this, these are LCD (all types), light emitting diode (LED), organic light emitting diode (OLED), field emitting display (FED), light emitting polymer (LEP), organic electro luminescence (OEL), plasma displays, and any thin/flat panel electronic image assembly. Furthermore, embodiments may be used with displays of other types including those not yet discovered. In particular, it is contemplated that the system may be well suited for use with full color, flat panel OLED displays. Exemplary embodiments may also utilize large (55 inches or more) LED backlit, high definition liquid crystal displays (LCD). While the embodiments described herein are well suited for outdoor environments, they may also be appropriate for indoor applications (e.g., factory/industrial environments, spas, locker rooms) where thermal stability of the display may be a concern.

[0049] As is well known in the art, electronic displays can be oriented in a portrait manner or landscape manner and either can be used with the embodiments herein.

[0050] Having shown and described preferred embodiments, those skilled in the art will realize that many variations and modifications may be made to affect the described embodiments and still be within the scope of the claimed invention. Additionally, many of the elements indicated above may be altered or replaced by different elements which will provide the same result and fall within the spirit of the claimed invention. It is the intention, therefore, to limit the invention only as indicated by the scope of the claims.

Claims

1. A system for cooling an electronic image assembly with ambient gas, the system comprising:

a plurality of channels (60) placed behind the electronic image assembly (50), each channel having an inlet and exit;
a first manifold (30) in gaseous communication with the inlet of each channel (60);
a second manifold (35) in gaseous communication with the exit of each channel (60);
a fan (211) positioned to force ambient gas through the channels (60);
a front plate (10) placed in front of the electronic image assembly (50), the space between the front plate and the electronic image assembly defining a front channel (251);
a circulating fan (255) positioned to force circulating gas through the front channel (251); and
a cross through plate (500) having a first pathway (525) for circulating gas (250) traveling through the front channel (251) and a second pathway (550) for ambient gas (210) traveling through the plurality of channels (60) behind the electronic image assembly (50).

2. The cooling system of claim 1 wherein: the channels (60) are in thermal communication with the electronic image assembly (50).
3. The cooling system of claim 1 or 2 wherein: the first (30) and second (35) manifolds are placed along a pair of vertical edges of the electronic image assembly (50).
4. The cooling system of any one of claims 1-3 wherein: the fan (211) is placed within either the first or second manifold.
5. The cooling system of any one of claims 1-4 wherein: the channels (60) are arranged in horizontal rows.
6. The cooling system of any one of claims 1-5 wherein: the channels (60) are metallic.
7. The cooling system of any one of claims 1-6 wherein: the first (525) and second (550) gas pathways are substantially perpendicular.
8. The cooling system of any one of claims 1-7 wherein: the first (525) and second (550) gas pathways do not allow the ambient gas and circulating gas to mix.
9. The cooling system of any one of claims 1-8 further comprising:

a heat exchanger (45) having first and second gas pathways; and
a fan assembly (46) placed within the heat exchanger (45) to draw ambient gas (200) through the first gas pathway of the heat exchanger (45); wherein the circulating fan (255) is placed to

draw circulating gas (250) through the second gas pathway of the heat exchanger (45).

10. The cooling system of any one of claims 1-8 further comprising: 5
- a heat exchanger (45) in gaseous communication with the front channel (251), the heat exchanger comprising two portions (48) and (47), each portion having first and second gas pathways, where the first gas pathways are in gaseous communication with inlet (24) and exit (25) apertures for ambient gas (200) and the second gas pathways are in gaseous communication with the channel (251); and 10 15
- a fan assembly (46) placed between the two portions (48) and (47) of the heat exchanger (45) to force ambient gas (200) through the first gas pathways; 20
- wherein the circulating fan (255) is positioned to force circulating gas (250) through the second gas pathways. 25
11. The cooling system of any one of claims 9 and 10 wherein: 25
- the heat exchanger (45) is comprised of corrugated layers.
12. The cooling system of any one of claims 9 and 10 wherein: 30
- the heat exchanger (45) is a cross-flow heat exchanger.
13. The cooling system of any one of claims 1-12 wherein: 35
- the front plate 10 is transparent.
14. The cooling system of any one of claims 1-13 wherein: 40
- the circulating fan (255) is positioned to force circulating gas in a closed loop that passes through the front channel (251).
15. The cooling system of any one of claims 1-14 wherein: 45
- the electronic image assembly (50) comprises a backlight; and
- the channels (60) are in thermal communication the backlight. 50

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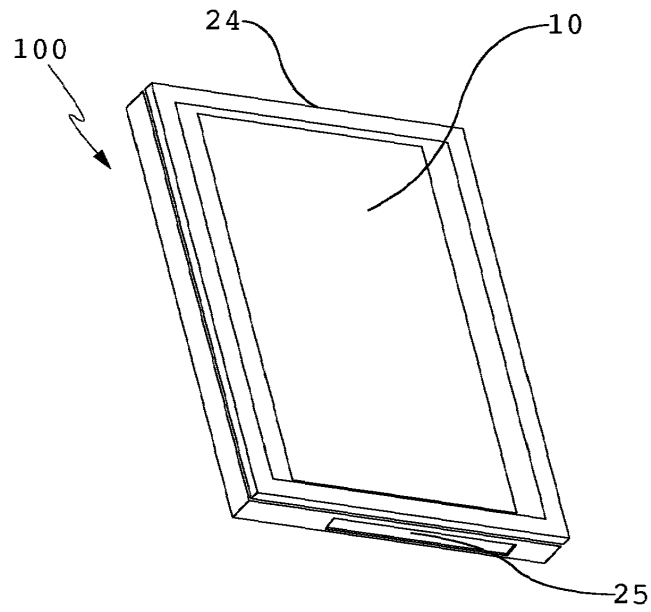


FIG - 1A

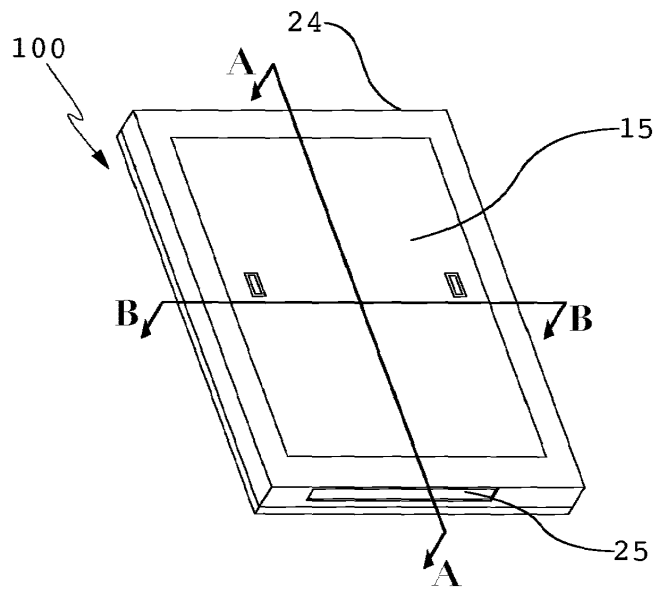


FIG - 1B

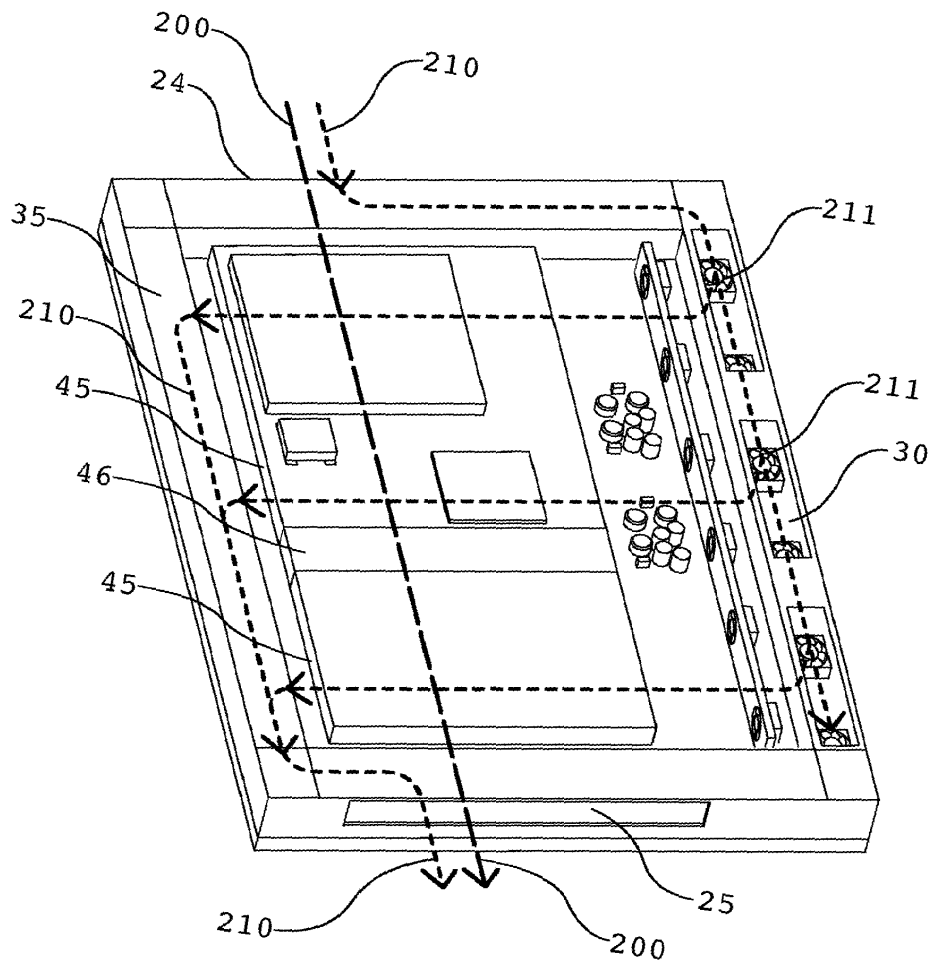


FIG - 2

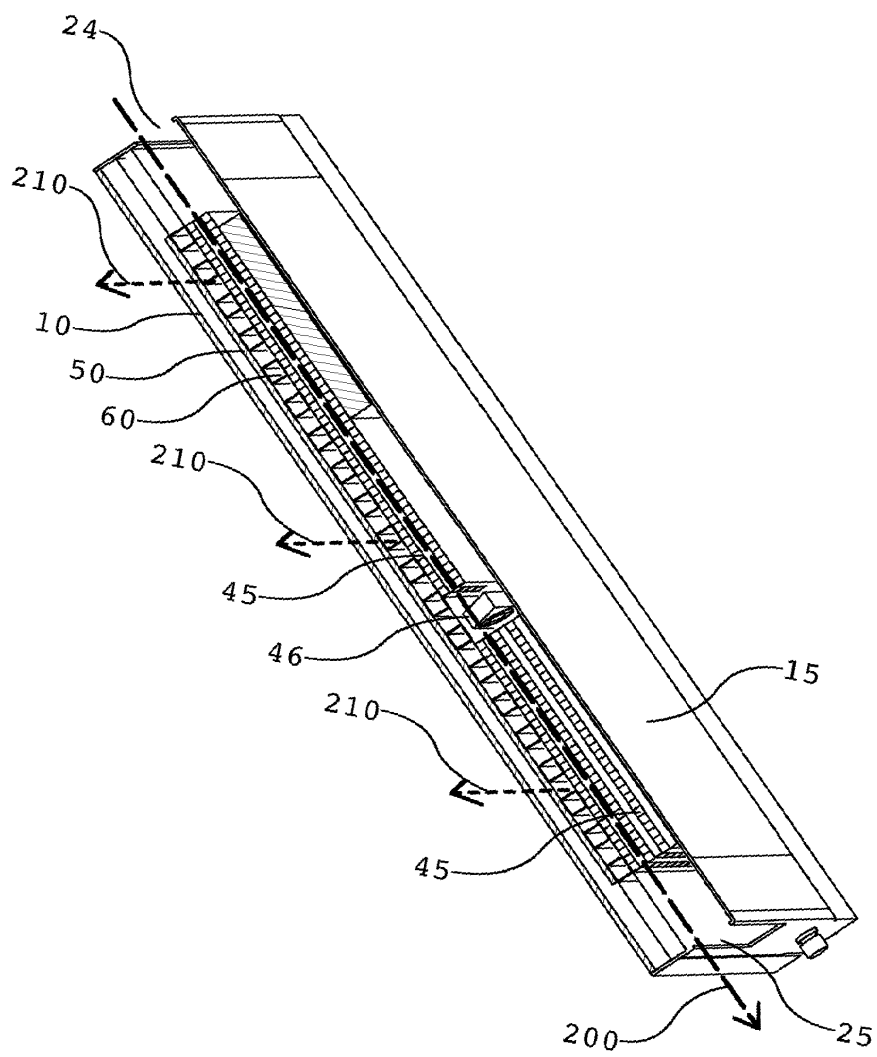


FIG - 3

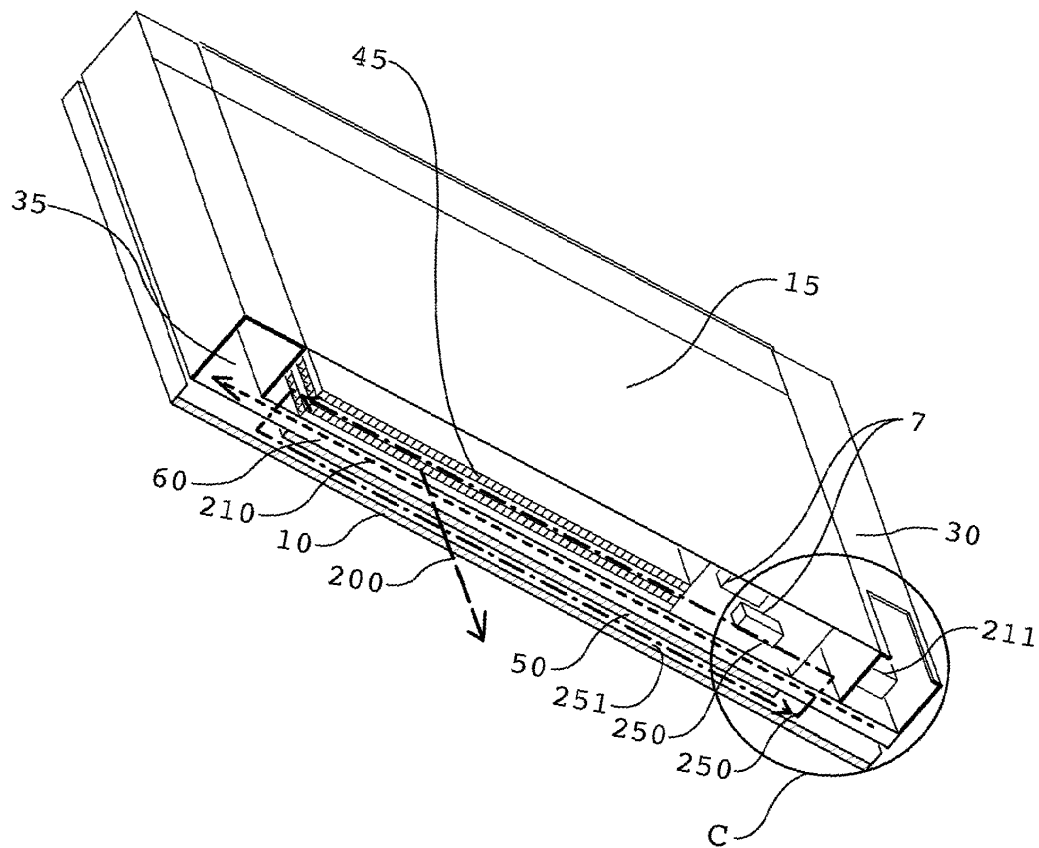


FIG - 4

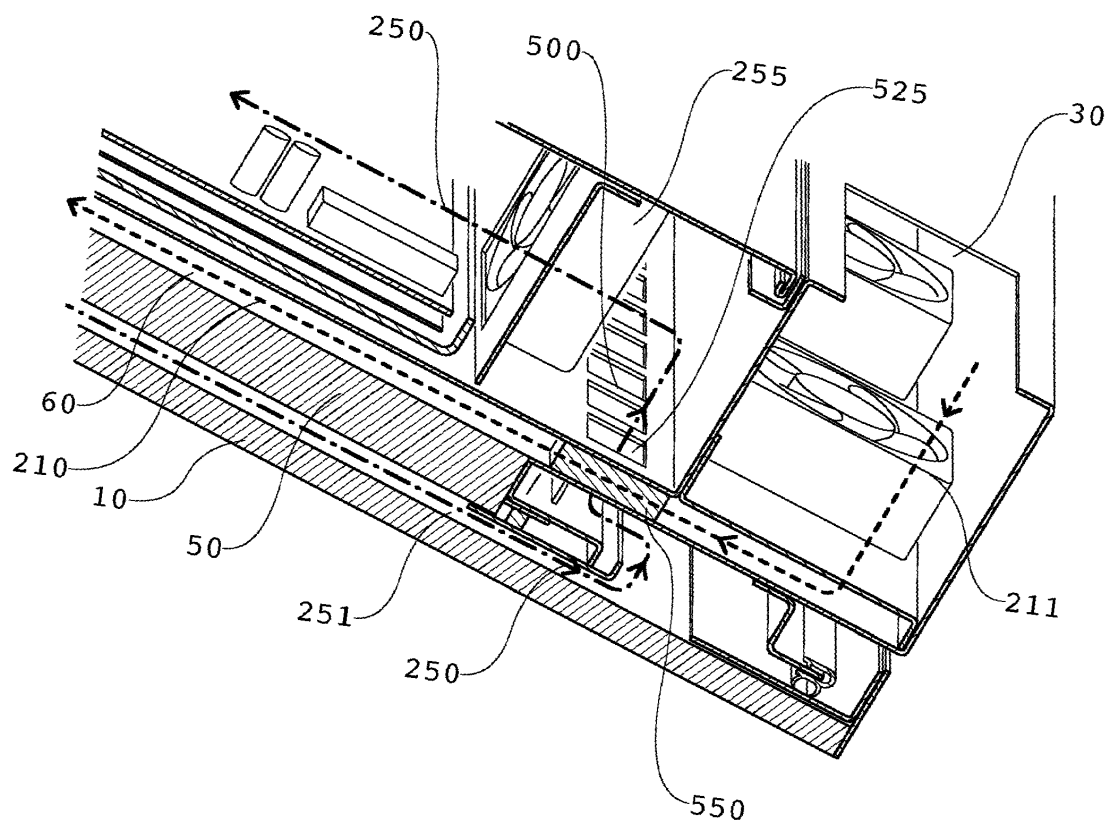


FIG - 5

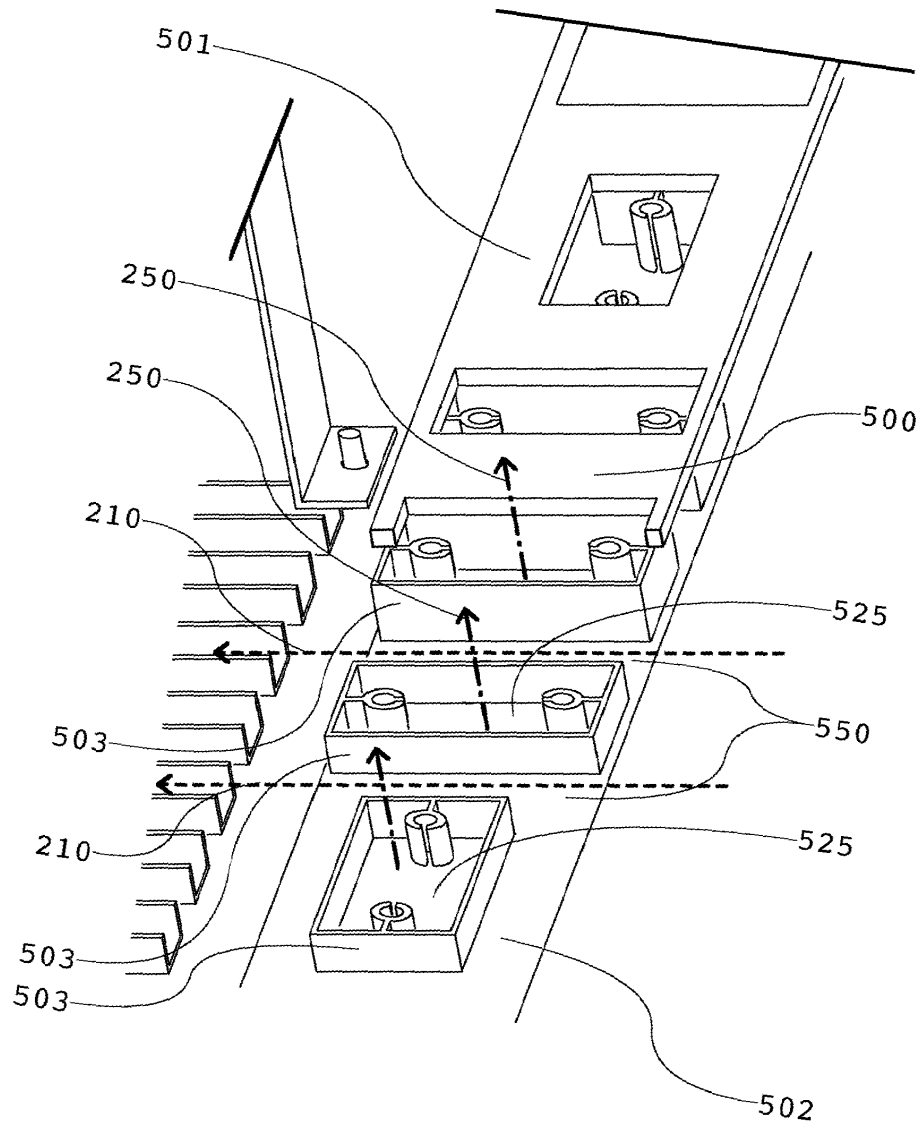


FIG - 6

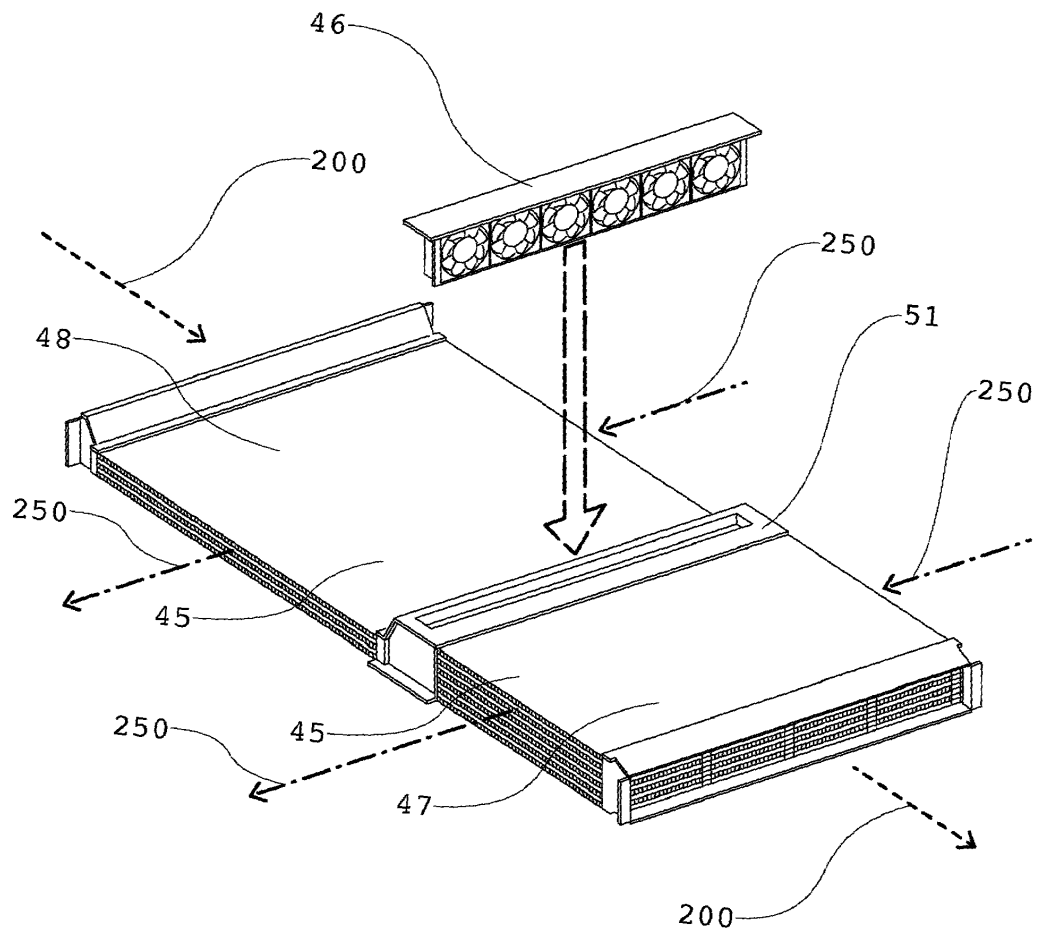


FIG - 7

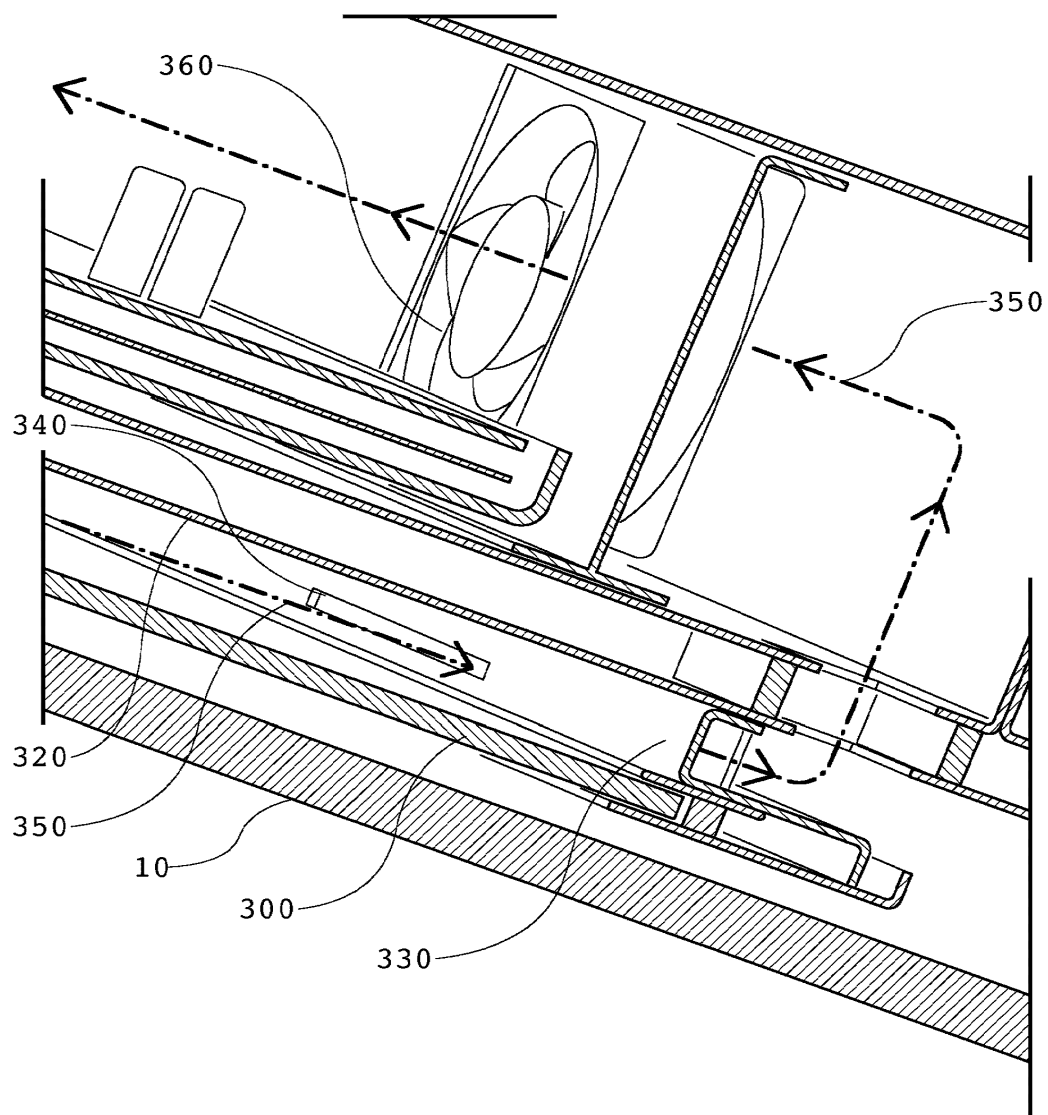


FIG - 8

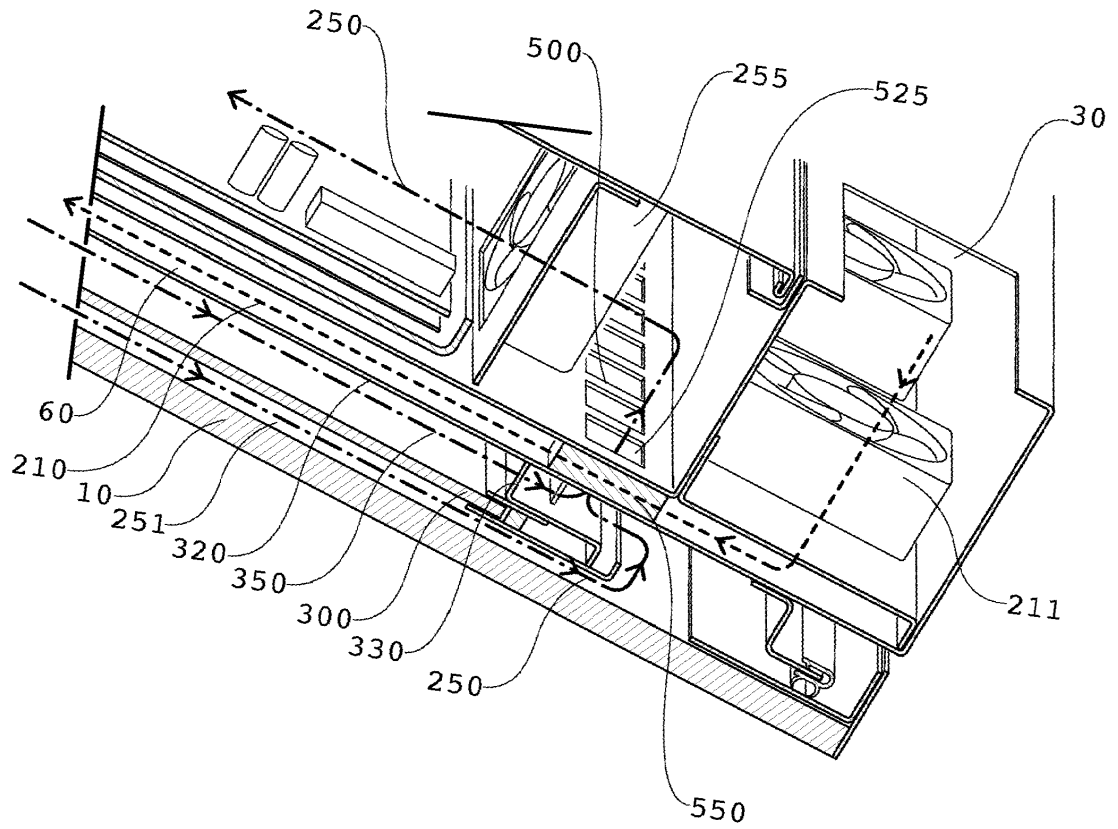


FIG - 9



EUROPEAN SEARCH REPORT

Application Number
EP 19 19 7577

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A	EP 1 647 766 A2 (LG ELECTRONICS INC [KR]) 19 April 2006 (2006-04-19) * abstract; figures 3,5,6,7 * * paragraphs [0027], [0036] * -----	1-15	
A	WO 2009/065125 A2 (MFG RESOURCES INT INC [US]; DUNN WILLIAM R [US]) 22 May 2009 (2009-05-22) * abstract; figures 2,3,4,8,9,10 * * paragraphs [0038], [0039] * -----	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			G02F H05K
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 31 January 2020	Examiner Schweiger, Dietmar
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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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82



Australian Government

IP Australia

CERTIFICATE OF GRANT STANDARD PATENT

Patent number: 2017228430

The Commissioner of Patents has granted the above patent on 5 March 2020, and certifies that the below particulars have been registered in the Register of Patents.

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Manufacturing Resources International, Inc. of 6415 Shiloh Road East Alpharetta Georgia 30005 United States of America

Title of invention:

Cooling system for double sided display assembly

Name of inventor(s):

Diaz, Marcos

Term of Patent:

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Number

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Date

4 March 2016

Filed with

US



Dated this 5th day of March 2020

Commissioner of Patents

PATENTS ACT 1990

The Australian Patents Register is the official record and should be referred to for the full details pertaining to this IP Right.

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(71) Applicant(s)
Manufacturing Resources International, Inc.

(72) Inventor(s)
Diaz, Marcos

(74) Agent / Attorney
Spruson & Ferguson, GPO Box 3898, Sydney, NSW, 2001, AU

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(71) Applicant: **MANUFACTURING RESOURCES INTERNATIONAL, INC.** [US/US]; 6415 Shiloh Road East, Alpharetta, GA 30005 (US).

(72) Inventor: **DIAZ, Marcos**; 6415 Shiloh Road East, Alpharetta, GA 30005 (US).

(74) Agent: **SMITH, Adam, J.**; Standley Law Group LLP, 6300 Riverside Drive, Dublin, OH 43017 (US).

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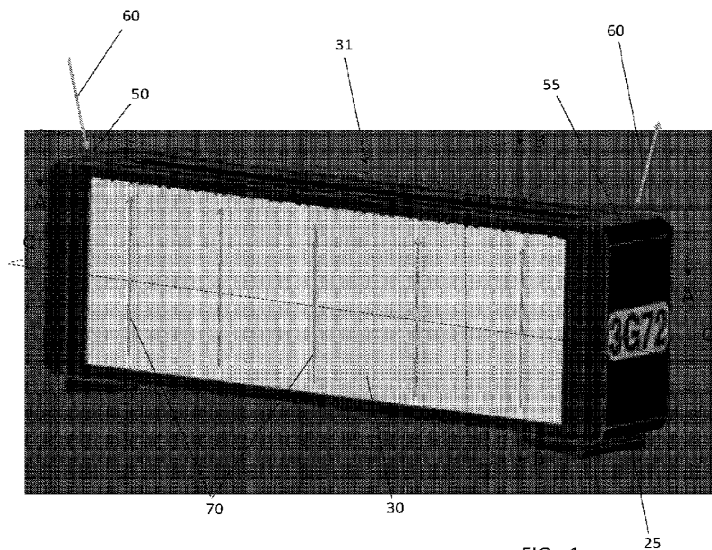
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[Continued on next page]

(54) Title: COOLING SYSTEM FOR DOUBLE SIDED DISPLAY ASSEMBLY



(57) Abstract: A pair of electronic displays (30 and 31) are placed back to back and are configured for mounting to a vehicle. A pair of thermal plates (126 and 127) are located behind the electronic displays and a pair of transparent plates (35 and 36) are located in front of the electronic displays. A closed loop of air travels vertically through the space between the electronic displays and transparent panels and through a closed loop plenum. An open loop of air travels horizontally through the space between thermal plates and the rear surface of the electronic displays.

WO 2017/152166 A1



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- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

COOLING SYSTEM FOR DOUBLE SIDED DISPLAY ASSEMBLY

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] The application claims priority from US Provisional Patent Application No. 62/303,806 filed on March 4, 2016, which is hereby incorporated by reference in its entirety.

TECHNICAL FIELD

[0002] Embodiments of the present invention generally relate to cooling systems for electronic displays.

BACKGROUND

[0003] Electronic displays are sometimes used in outdoor environments or other areas where the surrounding temperatures may be high or there may be other sources of heat such as solar loading causing the temperatures within the display to rise. However, some portions of the display can be difficult to cool as simply ingesting ambient air into some portions of the display can introduce dust and contaminates into sensitive portions of the display, which can lead to premature failures.

SUMMARY OF THE INVENTIVE CONCEPT

[0003a] It is an object of the present invention to substantially overcome, or at least ameliorate, one or more disadvantages of existing arrangements.

[0003b] According to one aspect of the present invention, there is provided a display assembly for mounting to a roof of a vehicle comprising: a housing adapted to be mounted to the roof of the vehicle; a first electronic display and a second electronic display positioned in a back to back arrangement within the housing, wherein each of said first electronic display and said second electronic display has a front surface and a rear surface; a first transparent panel and a second transparent panel, wherein each of said first transparent panel and said second transparent panel is positioned in front of the front surface of one of the first electronic display and the second electronic display; a first thermal plate and a second thermal plate, wherein each of said first thermal plate and said second thermal plate is positioned behind the rear surface of one of the first electronic display and the second electronic display; an open loop pathway comprising:

an inlet aperture in the housing for ingesting ambient air; a first open loop channel and a second open loop channel, wherein each of the first open loop channel and the second open loop channel is located between one of the first thermal plate and the second thermal plate, respectively, and the rear surface of one of the first electronic display and the second electronic display, respectively; a number of entrance apertures located on each of the first thermal plate and the second thermal plate, wherein each of said entrance apertures is configured to permit gaseous communication between the inlet aperture and the first open loop channel and the second open loop channel, respectively; an exhaust aperture in the housing for exhausting ambient air; and a number of exit apertures located on each of the first thermal plate and the second thermal plate, wherein each of said exit apertures is configured to permit gaseous communication between the exhaust aperture and the first open loop channel and the second open loop channel, respectively; wherein the open loop pathway is configured to accept a flow of ambient air, split said flow after entering the inlet apertures such that a portion of said flow travels through each of said first open loop channel and the second open loop channel, by way of each of said entrance apertures, and rejoin said split flow, after exiting each of said exit apertures, prior to exhausting the flow through the exhaust aperture; and a closed loop pathway comprising: a first closed loop channel and a second closed loop channel, wherein each of said first closed loop channel and the second closed loop channel is located between one of the first transparent panel and the second transparent panel, respectively, and one of the first electronic display and the second electronic display, respectively; and a closed loop plenum defined by the first thermal plate and the second thermal plate, wherein the closed loop plenum is configured to permit gaseous communication with each of the first closed loop channel and the second closed loop channel.

[0004] Exemplary embodiments may comprise multiple separate flow paths for a fluid, such as air, through an electronic display housing. At least one path may be a closed loop and several other paths may provide open loops. The closed loop path preferably circulates through a sealed electronics compartment as well as pass between the electronic display(s) and a front transparent panel. A first open loop of ambient air may pass behind the first electronic display while a second path of ambient air may pass behind the second electronic display. In some embodiments the open loop air also removes heat from a thermal plate having electronic components and in some embodiments the open loop air also removes heat from an LED backlight (or LED

display). The fans can be positioned so as to precisely control the amount of fluid travelling through each path.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] In addition to the features mentioned above, other aspects of the present invention will be readily apparent from the following descriptions of the drawings and preferred embodiments, wherein like reference numerals across the several views refer to identical or equivalent features, and wherein:

[0006] **FIGURE 1** is a front perspective view showing an exemplary embodiment of the double sided display assembly, as well as the location for section lines A-A, B-B, and C-C.

[0007] **FIGURE 2** is a side section view of the embodiment shown in Figure 1, taken along the section line A-A.

[0008] **FIGURE 3** is a front section view of the embodiment shown in Figure 1, taken along the section line B-B.

[0009] **FIGURE 4** is a top section view of the embodiment shown in Figure 1, taken along the section line C-C and indicating the location for Detail A.

[0010] **FIGURE 5** is a detailed section view of Detail A.

[0011] **FIGURE 6** is a partial exploded view of the embodiment shown in Figure 1.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENT(S)

[0012] The invention is described more fully hereinafter with reference to the accompanying drawings, in which exemplary embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the exemplary embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and

complete, and will fully convey the scope of the invention to those skilled in the art. In the drawings, the size and relative sizes of layers and regions may be exaggerated for clarity.

[0013] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/ or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0014] Embodiments of the invention are described herein with reference to illustrations that are schematic illustrations of idealized embodiments (and intermediate structures) of the invention. As such, variations from the shapes of the illustrations as a result, for example, of manufacturing techniques and/or tolerances, are to be expected. Thus, embodiments of the invention should not be construed as limited to the particular shapes of regions illustrated herein but are to include deviations in shapes that result, for example, from manufacturing.

[0015] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

[0016] FIGURE 1 is a front perspective view showing an exemplary embodiment of the double sided display assembly, as well as the location for section lines A-A, B-B, and C-C. Generally speaking, an exemplary embodiment includes two displays 30 and 31 positioned back to back and placed within a housing 25. An inlet aperture 50 accepts a flow of ambient air 60 into and through the housing 25. The ambient air 60 is preferably exhausted out of the housing 25 through the exhaust aperture 55. A closed loop flow of circulating gas 70 travels within the housing 25 as well, but preferably does not mix with the flow of ambient air 60 in any substantial manner.

[0017] As used herein, the term ambient air 60 simply refers to common atmospheric air that would provide the surrounding environment for the assembly. This ambient air 60 is known to contain a mixture of different types of gaseous elements, as well as dust, dirt, pollen, water vapor, and other particulate. Also as used herein, the term circulating gas 70 can refer to any gaseous matter, which might be a mixture of different types of gases or could be a pure gaseous matter. Preferably, the circulating gas 70 does not contain substantial amounts of dust, dirt, pollen, or other types of particulate.

[0018] Exemplary embodiments of the present invention may be configured for mounting to a vehicle, preferably to the roof. The housing 25 may be sized and configured for fitting atop a vehicle roof. Further, the housing 25 may be sized and adapted to minimize aerodynamic drag. The housing 25 may comprise a pair of feet 26 for mounting the housing 25 to the vehicle. The feet 26 may be sized and configured to be secured to a vehicle's roof, or to be secured to internal supports placed on or within the vehicle. In such embodiments, the housing 25 is preferably thin and comprises rounded corners and other features to minimize aerodynamic drag. The housing 25 may comprise a variety of stiffening members to provide

structural rigidity and strength to accommodate the forces caused by a moving vehicle. Likewise, the various components of the display assembly may be configured or comprised of a sufficiently rigid material so as to accommodate the forces caused by a moving vehicle. Furthermore, the housing and various components of the display assembly may be configured to withstand the forces, vibrations, and other rigors of being mounted to a vehicle. For example, but not to serve as a limitation, the feet 26 and other components of the display assembly may comprise rubber pads or other vibration and shock absorption devices.

[0019] As indicated in the figure, section line A-A is positioned horizontally down the center of the assembly and cuts through the assembly vertically. Section line B-B is oriented vertically and cuts through the assembly horizontally. Finally, section line C-C is oriented horizontally and cuts through the assembly horizontally as well. The section line arrows in figure 1 indicate the direction of hypothetical cut to obtain the section view.

[0020] FIGURE 2 is a side section view of the embodiment shown in Figure 1, taken along the section line A-A. The ambient air 60 may enter the housing 25 through the inlet aperture 50, where it may then be directed into an entrance plenum, and pass through one of a plurality of entrance apertures 200 which connect with the open loop channels (described further below). The ambient air 60 is preferably pulled by one or more fans 100, but the fans 100 could also be positioned to push the ambient air 60, or several fans could be used for a combination of push/pull. In this particular embodiment, the fan 100 is located near an exit plenum, where the ambient air 60 is collected from the open loop channels by travelling through one of a plurality of exit aperture 201, collected within the exit plenum, and directed out of the housing 25 through the exhaust aperture 55.

[0021] As will be described further below, the entrance apertures 200 and exit apertures 201 are in gaseous communication with a first open loop channel running behind the electronic display 31. There is preferably another set of entrance apertures and exit apertures on the opposite side of the assembly (not shown in this view), which communicate with a second open loop channel running behind the electronic display 30. The apertures 200 and 201 are preferably distributed across the width of the electronic display 30/31 in a substantially equidistant manner from one another. The apertures 200/201 allow the flow of ambient air 60 to pass through the housing 25 and the open loop channels without substantially mixing with the circulating gas 70 or entering the sealed electronics compartment 125.

[0022] A plurality of electronic components 110 are preferably placed within a sealed electronics compartment 125 which forms a part of the closed loop for the circulating gas 70. The electronic components 110 may comprise one or more of the following: power modules, video player, electronic data storage, microprocessor, satellite/wireless receiver/transmitter, and timing and control board. At least some of the electronic components 110 may be in electrical connection with the displays 30 and 31.

[0023] One or more fans 90 may force the closed loop of circulating gas 70 over the electronic components 110. While shown with two fans 90, this is not required. Additionally, while shown pushing the circulating gas 70 over the electronic components 110, this is not required as the fans 90 could also be positioned to pull the circulating gas 70, or several fans 90 could be used in a combination push/pull of the circulating gas 70.

[0024] **FIGURE 3** is a front section view of the embodiment shown in Figure 1, taken along the section line B-B. Here, the closed loop of circulating gas 70 can be clearly

shown. As mentioned above, the circulating gas 70 preferably travels over the electronic components 110 within the sealed electronics compartment 125 and then splits to wrap around each of the displays 30 and 31. Regarding the first display 30, a transparent panel 35 is preferably placed in front of the display 30 to define a closed loop channel between the display 30 and the transparent panel 35 for accepting circulating gas 70. Once the circulating gas 70 has travelled across the display 30, it is directed back in to the sealed electronics compartment 125 to begin the closed loop again.

[0025] Similarly, regarding the second display 31, a transparent panel 36 is preferably placed in front of the display 31 to define a closed loop channel between the display 31 and the transparent panel 36 for accepting circulating gas 70. Once the circulating gas 70 has travelled across the display 31, it is directed back in to the sealed electronics compartment 125 to begin the closed loop again.

[0026] As shown, the flow of ambient air 60 is preferably split into at least two channels, with one open loop channel travelling behind each display. Regarding display 30, a path of ambient air 60 preferably travels between the rear surface of the display 30 and a thermal wall 126 of the sealed electronics compartment 125. Although not required, when using a direct LED backlit LCD as the display 30, the ambient air 60 preferably travels between the rear surface of the LED backlight 40 and the thermal wall 126. As shown above, a plurality of electronic components 110 are preferably attached to (or near) one or both thermal walls 126 and 127. In this way, heat from the electronic components 110 may be transferred (preferably through conduction but some convection and radiation may occur as well) to the walls 126 and 127 and removed by the flow of ambient air 60.

[0027] Similarly regarding display 31, a path of ambient air 60 preferably travels between the rear surface of the display 31 and a thermal wall 127 of the sealed electronics compartment 125. Although not required, when using a direct LED backlit LCD as the display 31, the ambient air 60 preferably travels between the rear surface of the LED backlight 41 and the thermal wall 127. It should be expressly noted that although a direct LED backlit LCD is shown in these embodiments, this type of display and its associated backlight is not necessary for every embodiment. The displays 30 and 31 could be any one of the following: plasma, OLED, LCD (direct lit or edge lit), LED, and any type of electroluminescent polymer display.

[0028] FIGURE 4 is a top section view of the embodiment shown in Figure 1, taken along the section line C-C and indicating the location for Detail A. In this figure, the two channels for ambient air 60 behind each of the displays 30 and 31 can be seen. Again, preferably the two paths of ambient air 60 can remove heat from the electronic displays 30 and 31 as well as the electronics 110 (through the thermal walls 126 and 127).

[0029] FIGURE 5 is a detailed section view of Detail A. Once the ambient air 60 has travelled through each of the open loop channels, it can be gathered by the exit plenum and forced out of the display housing 25 by the fan 100.

[0030] FIGURE 6 is a partial exploded view of the embodiment shown in Figure 1. This shows the stacking of the elements for one side of the assembly, i.e. the components surrounding electronic display 31. The ambient air 60 is preferably directed through the entrance apertures 200 so that it may pass between the thermal plate 127 and the rear of the electronic display 31 (in this embodiment, the rear surface of the LED backlight 41). Once passing through the open loop channel, the ambient air 60 is preferably directed out of an exit aperture 201 so that it can be

collected in the exit plenum and exhausted out of the display housing. The circulating gas 70 generally encircles the open loop channel(s) having the ambient air 60. In other words, the open loop ambient air 60 passes through the center of the closed loop of circulating gas 70.

[0031] As noted above, the circulating gas 70 preferably passes over electronic components 110, exits the sealed electronics compartment 125, travels between the front transparent plate 36 and the front of the electronic display 31, eventually returning to the sealed electronics compartment 125. Again it should be noted that only one half of the embodiment is shown in this partial exploded view. Generally, there would be a second closed loop of circulating gas 70 travelling around the opposing display 30 and a second open loop channel for ambient air 60 passing behind the display 30, as shown and described above.

[0032] It should also be noted that the variety of open and closed cooling loops that are shown in the figures may be shown in a horizontal or vertical arrangement but it is clearly contemplated that this can be reversed or changed depending on the particular embodiment. Thus, the closed loop may run horizontally or vertically and in a clockwise or counter-clockwise direction. Further, the open loop may also be horizontal or vertical and can run left to right, right to left, and top to bottom, or bottom to top.

[0033] Having shown and described a preferred embodiment of the invention, those skilled in the art will realize that many variations and modifications may be made to affect the described invention and still be within the scope of the claimed invention. Additionally, many of the elements indicated above may be altered or replaced by different elements which will provide the same result and fall within the spirit of the

claimed invention. It is the intention, therefore, to limit the invention only as indicated by the scope of the claims.

CLAIMS

1. A display assembly for mounting to a roof of a vehicle comprising:
 - a housing adapted to be mounted to the roof of the vehicle;
 - a first electronic display and a second electronic display positioned in a back to back arrangement within the housing, wherein each of said first electronic display and said second electronic display has a front surface and a rear surface;
 - a first transparent panel and a second transparent panel, wherein each of said first transparent panel and said second transparent panel is positioned in front of the front surface of one of the first electronic display and the second electronic display;
 - a first thermal plate and a second thermal plate, wherein each of said first thermal plate and said second thermal plate is positioned behind the rear surface of one of the first electronic display and the second electronic display;
 - an open loop pathway comprising:
 - an inlet aperture in the housing for ingesting ambient air;
 - a first open loop channel and a second open loop channel, wherein each of the first open loop channel and the second open loop channel is located between one of the first thermal plate and the second thermal plate, respectively, and the rear surface of one of the first electronic display and the second electronic display, respectively;
 - a number of entrance apertures located on each of the first thermal plate and the second thermal plate, wherein each of said entrance apertures is configured to permit gaseous communication between the inlet aperture and the first open loop channel and the second open loop channel, respectively;
 - an exhaust aperture in the housing for exhausting ambient air; and
 - a number of exit apertures located on each of the first thermal plate and the second thermal plate, wherein each of said exit apertures is configured to permit gaseous communication between the exhaust aperture and the first open loop channel and the second open loop channel, respectively;
 - wherein the open loop pathway is configured to accept a flow of ambient air, split said flow after entering the inlet apertures such that a portion of said flow travels through each of said first open loop channel and the second open loop channel, by way of each of said entrance apertures, and rejoin said split flow, after exiting each of said exit apertures, prior to exhausting the flow through the exhaust aperture; and

a closed loop pathway comprising:

a first closed loop channel and a second closed loop channel, wherein each of said first closed loop channel and the second closed loop channel is located between one of the first transparent panel and the second transparent panel, respectively, and one of the first electronic display and the second electronic display, respectively; and

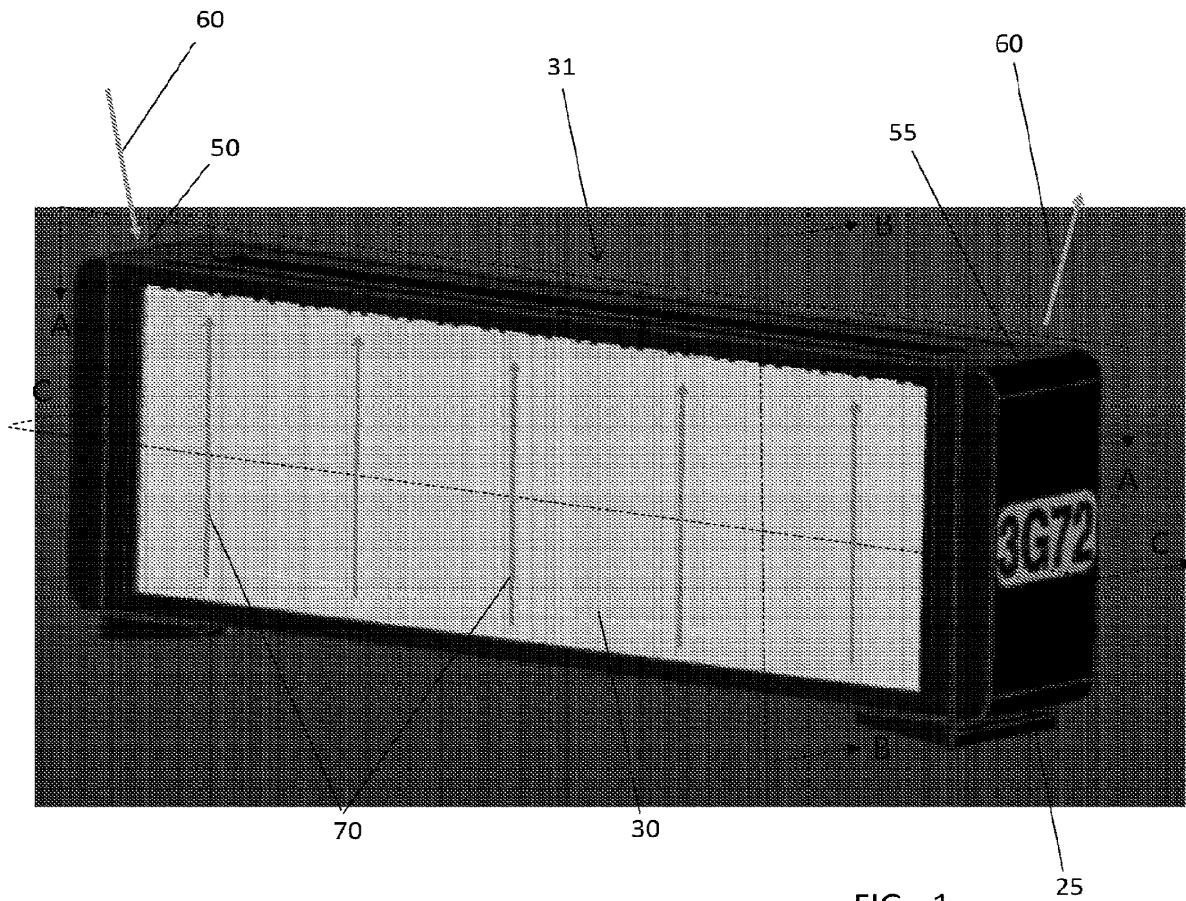
a closed loop plenum defined by the first thermal plate and the second thermal plate, wherein the closed loop plenum is configured to permit gaseous communication with each of the first closed loop channel and the second closed loop channel.

2. The display assembly of claim 1, further comprising:
a number of electronic components mounted to a rear surface of at least one of the first thermal plate and the second thermal plate.
3. The display assembly of claim 1, further comprising:
a number of closed loop fans, wherein said closed loop fans are spaced apart from one another and are each configured to propel circulating gas through the closed loop plenum and one or more of the first closed loop channel and the second closed loop channel.
4. The display assembly of claim 1, further comprising:
an open loop fan positioned to propel ambient air through one or more of the first open loop channel and the second open loop channel.
5. The display assembly of claim 1, further comprising:
a number of feet attached to said housing, wherein each of said feet has a lower surface which is configured to contact, and substantially match the pitch of, an upper surface of the roof of the vehicle.
6. The display assembly of claim 1, wherein:
each of the number of entrance apertures are spaced apart along a first end of each of the first and second thermal plates; and
each of the number of exit apertures are spaced apart along a second end of the first and second thermal plates.

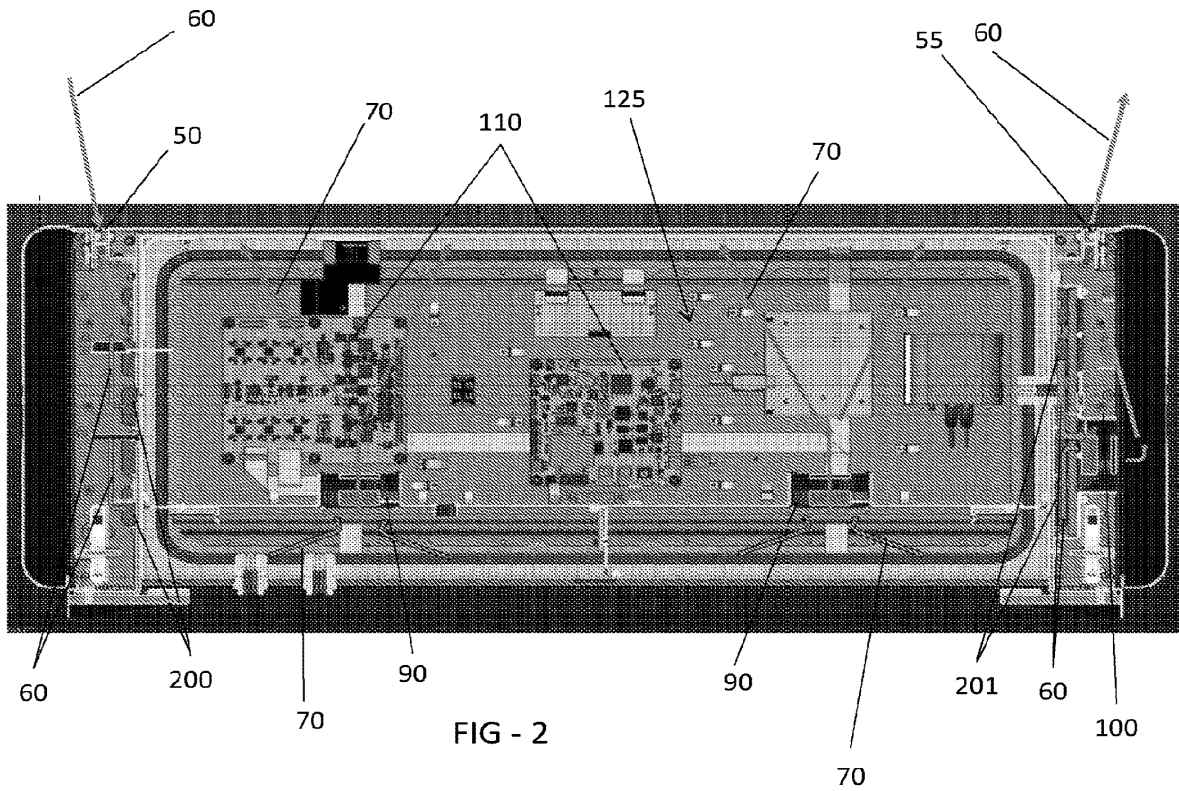
7. The display assembly of claim 6, wherein:
each of the number of entrance apertures are vertically spaced apart; and
each of the number of exit apertures are vertically spaced apart.

Manufacturing Resources International, Inc.
Patent Attorneys for the Applicant/Nominated Person
SPRUSON & FERGUSON

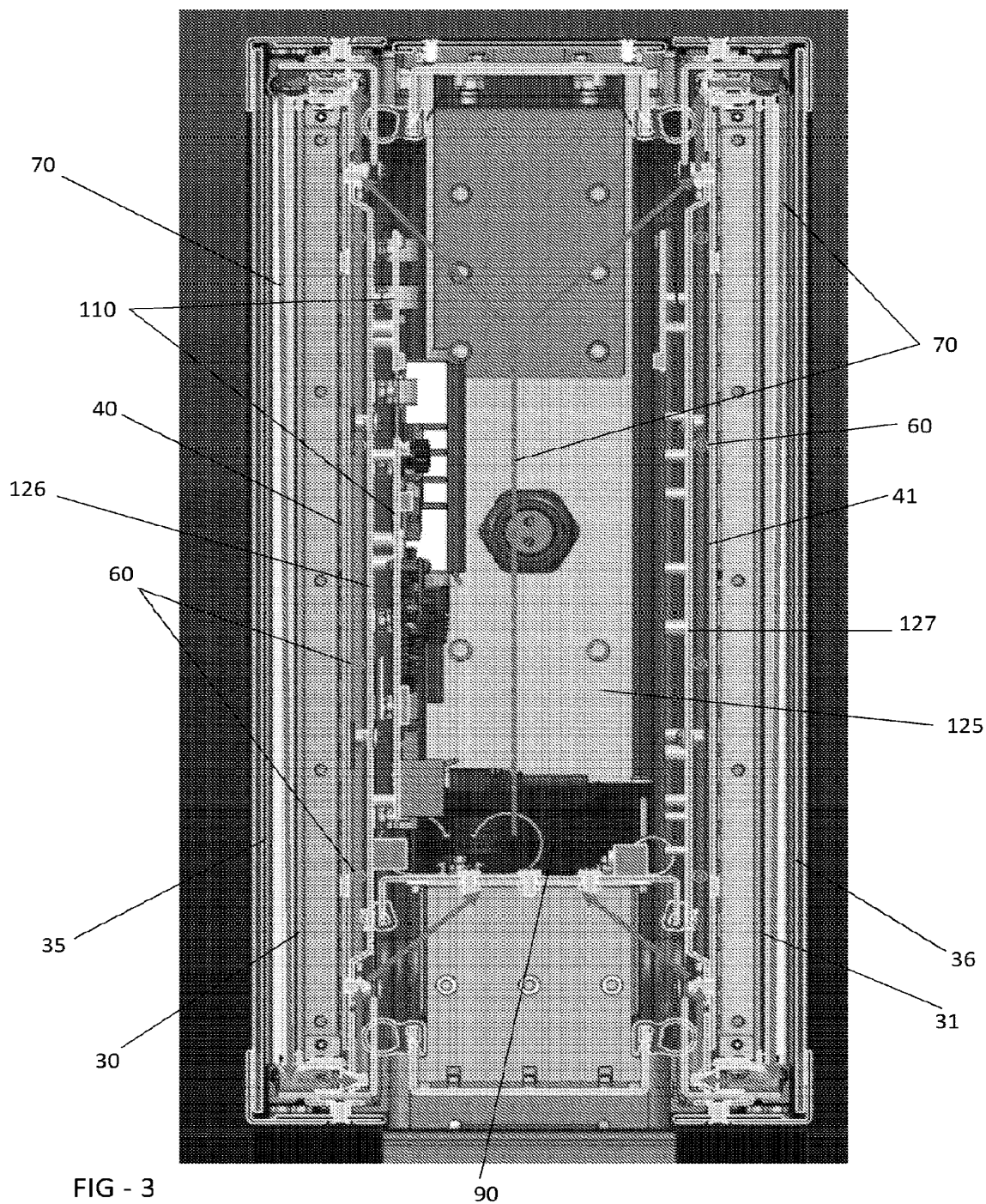
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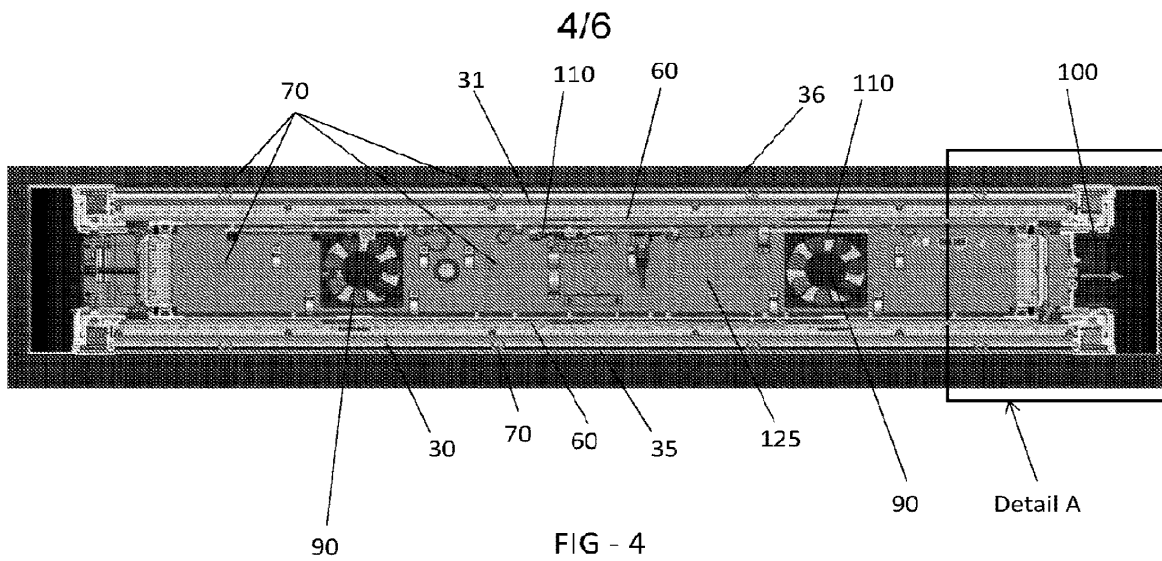


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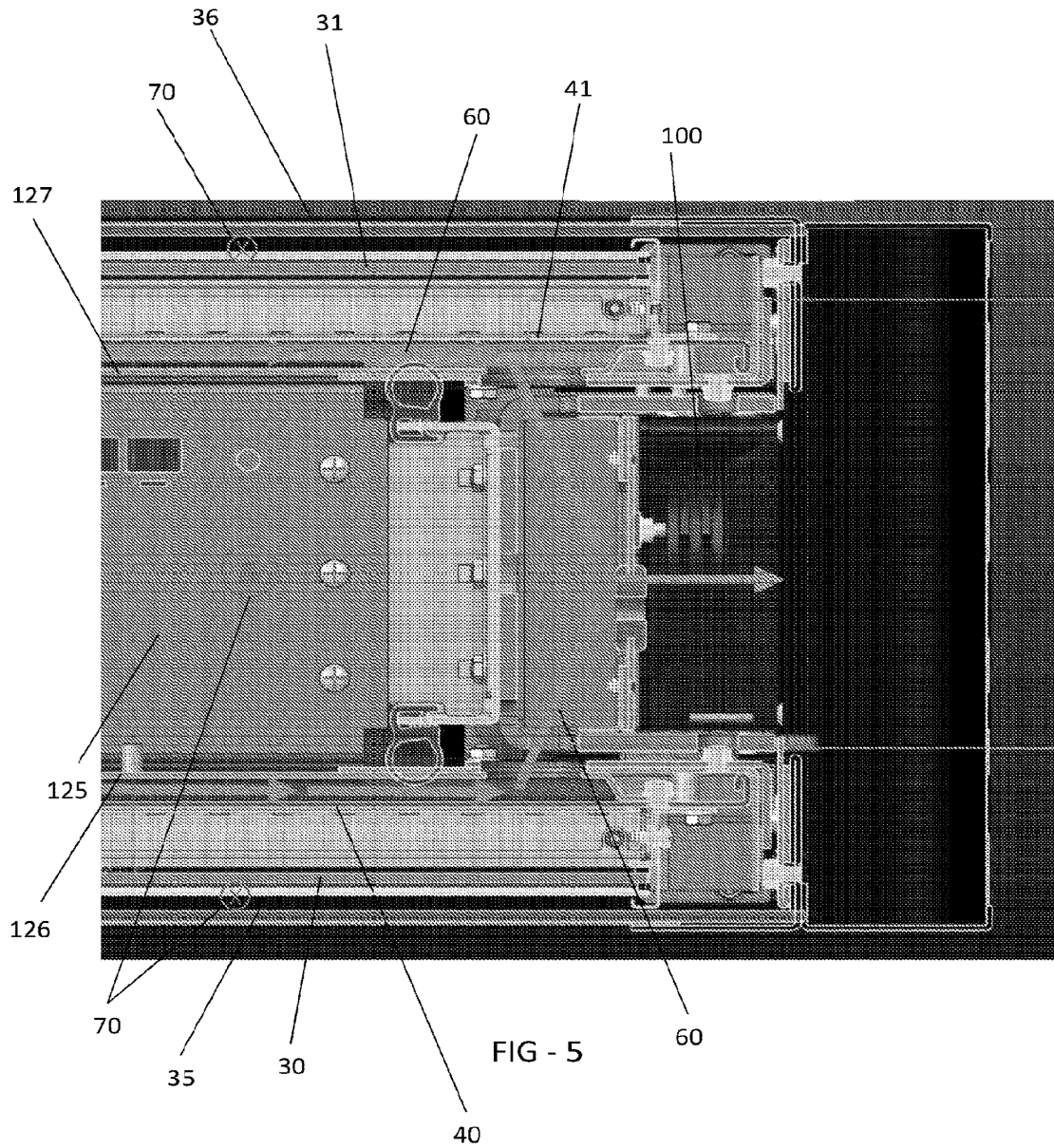


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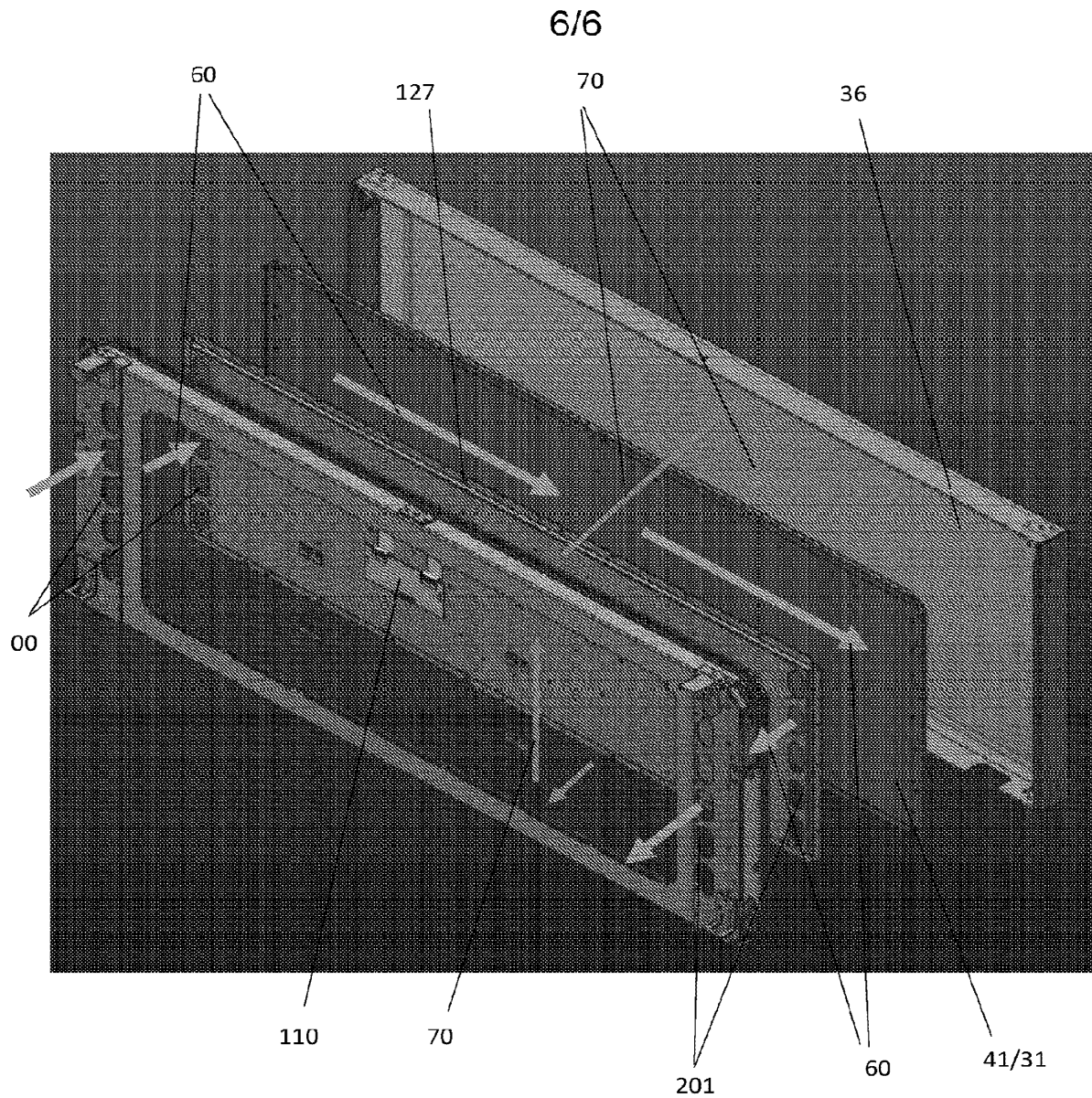


FIG - 6



Espacenet

JP2006176112A ELECTRONIC BUILT-IN SYSTEM

Applicants: HARMAN BECKER AUTOMOTIVE SYS

Inventors: NOISTERNIG RENE, RIEGER ROBBY

Classifications:

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ELECTRONIC BUILT-IN SYSTEM

Abstract

<P>PROBLEM TO BE SOLVED: To provide an electronic built-in system for installation in a support structure mounted in a passenger compartment of a vehicle. <P>SOLUTION: The system comprises at least one electronic module, a housing (100) for receiving the at least one electronic module, the housing (100) being mounted to the support structure of the vehicle comprises a front control panel (110) with operating elements for operating the electronic system, the front control panel facing the passenger compartment, a cooling unit (370) provided in the housing which is guiding cooling air through the housing for cooling the at least one electronic module, at least one first opening (140) provided in a outer wall portion of the housing (100) for supplying cooling air to the housing, at least one second opening (380) provided in an outer wall portion of the housing for removing the cooling air from the housing, wherein the at least first and the at least second openings are arranged at different wall portions of the housing, the different wall portions being separated from the passenger compartment by the support structure when the built in system is installed in the support structure. <P>COPYRIGHT: (C)2006,JPO&NCIPI

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(33) 優先権主張国 欧州特許庁 (EP)

(71) 出願人 504147933

ハーマン ベッカー オートモーティブ

システムズ ゲーエムペーハー

ドイツ国 デー 7 6 3 0 7 カールスバ

ッド、ベッカーゲーリングーシュトラ

ーセ 1 6

(74) 代理人 100078282

弁理士 山本 秀策

(74) 代理人 100062409

弁理士 安村 高明

(74) 代理人 100113413

弁理士 森下 夏樹

(72) 発明者 レネ ノアスターニッグ

ドイツ国 7 5 3 3 4 コンヴァイラー、

パークヴェーク 2 7

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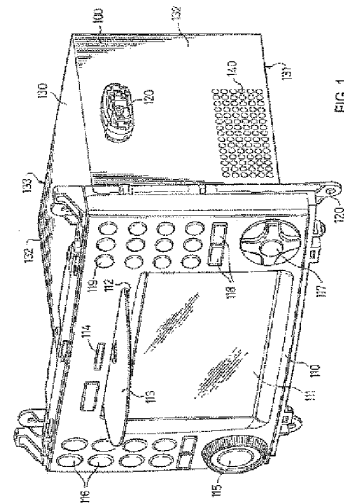
(54) 【発明の名称】 電子ビルトインシステム

(57) 【要約】

【課題】自動車の客室に取り付けられた支持構造に据え付ける電子ビルトインシステムを提供する。

【解決手段】システムは、電子モジュール、電子モジュールを受けるハウジング (100) で、自動車の支持構造に取り付けられたハウジング (100) は電子システムを操作する操作要素を有する前面制御パネル (110) を含むもの、客室に対面する前面制御パネル、電子モジュールを冷却するハウジングを通して冷却空気を誘導するハウジング内に設けられた冷却ユニット (370)、ハウジングに冷却空気を供給するハウジング (100) の外壁部に設けられる第1開口部 (140) と、ハウジングから冷却空気を除去するためにハウジングの外壁部に設けられる第2開口部 (380) で、第1と第2開口部はハウジングの異なる壁部に配置されるもの、ビルトインシステムが支持構造中に据え付けられる時、支持構造により客室から隔離される異なる壁部を含む。

【選択図】 図 1



【特許請求の範囲】

【請求項1】

自動車の客室内に取り付けられる支持構造に据え付けられるための、以下を含む電子ビルトインシステム：

少なくとも一つの電子モジュール（330-350）、

該少なくとも一つの電子モジュールを受けるためのハウジング（100）であって、自動車の支持構造に取り付けられる該ハウジング（100）は、電子システムを操作する操作要素を有し、客室に対面している前面制御パネル（110）を含むハウジング、

該ハウジング内に設けられ、該少なくとも一つの電子モジュールを冷却するためにハウジングを通して冷却空気を誘導する、冷却ユニット（370）、

該ハウジングへ冷却空気を供給するためにハウジング（100）の外壁部に設けられた、少なくとも一つの第1開口部（140）、

該ハウジングから冷却空気を除去するためにハウジングの外壁部に設けられた、少なくとも一つの第2開口部（380）であって、該少なくとも第1及び該少なくとも第2開口部（140、380）は該ハウジング（100）の異なる壁部に配置され、その異なる壁部は、ビルトインシステムが支持構造に据え付けられる時、支持構造によって客室から隔離される、少なくとも一つの第2開口部（380）。

【請求項2】

前記第1及び第2開口部（140、380）はハウジングの対面する壁部に配置される、請求項1に記載の電子ビルトインシステム。

【請求項3】

前記第1及び第2開口部（140、380）はハウジングのそれぞれの側壁に配置される、請求項1又は2に記載の電子ビルトインシステム。

【請求項4】

前記冷却ユニット（370）は冷却空気を除去するための第2開口部に隣接して置かれた換気装置を含む、請求項1～3のいずれかに記載の電子ビルトインシステム。

【請求項5】

前記第1及び第2開口部（140、380）はハウジングのそれぞれの側壁の下部に配置される、請求項1～4のいずれかに記載の電子ビルトインシステム。

【請求項6】

ラジオモジュール、オーディオモジュール、ナビゲーションモジュール、遠隔通信モジュール、及び記録媒体読み込みモジュールのうち少なくとも一つを更に含むことを特徴とする、請求項1～5のいずれかに記載の電子ビルトインシステム。

【請求項7】

前記ラジオモジュール、オーディオモジュール、ナビゲーションモジュール、遠隔通信モジュールのうち少なくとも一つはハウジング（100）の下部に配置されるのに対し、記録媒体読み込みモジュールはハウジング上部に配置される、請求項6に記載の電子ビルトインシステム。

【請求項8】

前記冷却ユニットは冷却フィンを含む、請求項1～7のいずれかに記載の電子ビルトインシステム。

【請求項9】

前記換気装置は、ハウジングから冷却空気を除去するための第2開口部を含む壁部に隣接して、該壁部と換気装置の間に置かれる冷却フィンを伴い、配置される、請求項8に記載の電子ビルトインシステム。

【請求項10】

前記支持構造は操作盤である、請求項1～9のいずれかに記載の電子ビルトインシステム。

【請求項11】

前記第1及び第2開口部はハウジング側壁に、熱を発生するモジュールがハウジング内部に第1及び第2開口部と同じ高さで配置されるのに対して、記録媒体読み込みモジュールはハウジング内に、熱を発生するモジュールと比して第1及び第2開口部とは大きく異なる高さで配置されるように、配置されることを特徴とする、請求項1～10のいずれかに記載の電子ビルトインシステム。

【請求項12】

以下を含む、自動車の電子ビルトインシステム：

熱を発生するモジュール及び取り外し可能な記録媒体(113)からデータを読み込むための少なくとも一つの光学読み込みモジュールを含む、いくつかの電子モジュールを受けるハウジング(100)、

電子モジュールを冷却するためハウジングを通して冷却空気を誘導するための冷却ユニット(370)

ハウジングへ冷却空気を供給するため、ハウジング外壁部に設けられた第1開口部(140)

ハウジングから冷却空気を除去するためにハウジング外壁部に設けられた第2開口部(380)であって、該第1及び第2開口部は、第1開口部から第2開口部までの経路を通る冷却空気は主に熱を発生するモジュールに沿って誘導されるようなハウジングでの位置に配置される、第2開口部(380)。

【請求項13】

前記第1及び第2開口部(140、380)はハウジングの対面する壁部に配置される、請求項12に記載の電子ビルトインシステム。

【請求項14】

前記第1及び第2開口部(140、380)は両方ともハウジング側壁下部に配置される、請求項12又は13に記載の電子ビルトインシステム。

【請求項15】

前記熱を発生するモジュールはハウジング(100)の下部でハウジング内に配置されるのに対し、光学読み込みモジュールはハウジング(100)上部に配置される、請求項12～14のいずれかに記載の電子ビルトインシステム。

【請求項16】

前記冷却ユニット(370)は、ハウジングから冷却空気を除去するための第2開口部に隣接して配置される換気装置を含む、請求項12～15のいずれかに記載の電子ビルトインシステム。

【請求項17】

前記冷却ユニットは、第2開口部と換気装置を含む壁部の間に配置される冷却フィン(420)を含む、請求項16に記載の電子ビルトインシステム。

【請求項18】

電子ビルトインシステムにおいてハードディスクを受ける取り付けユニット(320)を更に含む、請求項12～17のいずれかに記載の電子ビルトインシステム。

【請求項19】

ハードディスクを受ける取り付けユニット(320)はハウジング下部に配置される、請求項18に記載の電子ビルトインシステム。

【請求項20】

取り外し可能な前面制御パネル(110)を更に含むことを特徴とする、請求項12～19のいずれかに記載の電子ビルトインシステム。

【請求項21】

ハードディスクは、前面制御パネル(110)が取り外された状態で、取り付けユニット(320)に取り付け可能である、請求項20に記載の電子ビルトインシステム。

【請求項22】

ハウジング底部に配置される母プリント配線基板(310)を更に含むことを特徴とする、請求項12～21のいずれかに記載の電子ビルトインシステム。

【請求項23】

前記ハウジング（100）は2DINハウジングであり、支持構造の2DIN後退部に嵌まる、請求項12～22のいずれかに記載の電子ビルトインシステム。

【請求項24】

請求項1～23のいずれかに記載の電子ビルトインシステムを含むナビゲーションシステム。

【発明の詳細な説明】

【技術分野】

【0001】

本発明は、支持構造に据え付けるための電子ビルトインシステム、及びそのような電子ビルトインシステムを含むナビゲーションシステムに関する。本発明は特に、自動車の客室内の操作盤又はダッシュボードに取り付けられた電子ビルトインシステムに関する。

【背景技術】

【0002】

近年、自動車におけるマルチメディアシステムの使用が益々一般のこととなっている。通常、1つの中央ヘッドユニットにより制御されるこれらのマルチメディアシステムは、異なるマルチメディアシステムのための異なる電子モジュールを含む。これらの電子システムはしばしば、ある地形領域における出発地点から目的地までの経路を計算するためのナビゲーションモジュールを含む。更に、自動車の運転者に、該マルチメディアシステムに挿入することが出来るコンパクトディスク又はDVDによって提供される音楽又はラジオ再生を聞くことを可能にするオーディオモジュールが与えられる。更に、異なるラジオ番組を受信するためのラジオ受信機が提供される。加えて、これらのシステムにおいては、遠隔通信モジュールを用いることが、より一般的である。携帯電話は、しばしば該電子システムに組み込まれる。これらの電子システムは通常、自動車の客室の支持構造に、それが自動車の中央操作盤であろうとダッシュボードであろうと、組み込まれる。通常、自動車の換気システムのような多くの異なる制御ユニット及び形状が全て中央操作盤及びダッシュボードの後ろに含まれるため、ダッシュボードの中央操作盤の後ろの空間は限られている。

【0003】

更に、これらの電子システムは通常、マルチメディアシステムの作動状態を利用者に知らせるディスプレイを含む。例えば、地図データを表示したり、運転方向を表示することで、利用者を目的地まで誘導することが出来るディスプレイである。

【発明の開示】

【発明が解決しようとする課題】

【0004】

全ての異なる電子モジュールは、電子ビルトインシステムが組み込まれる支持構造の後ろの空間をほとんど必要としない一つのハウジングに組み込まれることが好ましい。

【0005】

複数の電子モジュールは非常にコンパクトに配置されるという事実のため、異なるモジュールからの熱の発生は取り組むべき因子となっている。異なる電子モジュールから生じる熱は放散されなければならない。従って、効果的に冷却されることが出来る電子ビルトインシステムが提供される必要性が存在する。更に、いくつかの電子部品は他の部品より多くの熱を生じる。従って、電子モジュールは大半の熱を生ずる電子モジュールが効果的に冷却されることが出来るように配置されている電子ビルトインシステムを提供する更なる必要性が存在する。

【課題を解決するための手段】

【0006】

（発明の要旨）

この必要性は、独立請求項で述べたように、電子ビルトインシステムによって満たされる。該独立請求項において、本発明の実施形態が述べられる。

【0007】

本発明の第1の実施形態によると、自動車の客室内に取り付けられた支持構造に据え付けられる電子ビルトインシステムは、少なくとも一つの電子モジュールを含む。更に、該少なくとも一つの電子モジュールを受けるハウジングが提供され、自動車の支持構造に取り付けられたハウジングは、電子システムを操作するための操作要素を有する前面制御パネルを含み、前面パネルは客室に直面している。ハウジングは支持構造に入れられ、前面パネルは客室から運転者によって制御されることが出来る。更に、該少なくとも一つの電子モジュールを冷却するために冷却空気をハウジングを通して誘導する冷却ユニットは、ハウジング内に与えられる。冷却ユニットは、該一つ又はそれ以上の電子モジュールによって生じる熱を放散させるのに役立つ。更に、冷却空気をハウジングに供給するために、少なくとも一つの第1開口部が、ハウジングの外壁部に設けられる。冷却空気をハウジングから除去するために、少なくとも一つの第2開口部が、ハウジングの外壁部に設けられる。空気取り入れ口として働く第1開口部及び空気排出口として働く第2開口部は、冷却空気をハウジングを通して誘導するのに役立つ。加えて、該少なくとも第1及び第2開口部は、ハウジングの異なる壁部分に配置される。該異なる壁部分は支持構造によって客室から隔離されている。この最後の特徴のために、いくつかの効果を達成できる。まず第1に、供給される冷却空気は第2開口部から生じている空気から分離される。第1及び第2開口部がハウジングの異なる壁部分に配置されているという事実から、冷却空気としてハウジングに供給される新しい空気として、ハウジングから出てくる暖められた空気を用いることは防げる。第2の利点は、客室から隔離されている支持構造の後ろの空間に第1開口部及び第2開口部が与えられる事実にある。もし、ハウジングに冷却空気を供給する第1開口部が前面壁部分又は前面制御パネル上に与えられていると、供給される冷却空気は客室の空気の一部となる。客室の空気中に存在するいかなる粒子、埃、又は煙はハウジングを通して誘導される。客室の空気がハウジングを通して誘導される時、埃又は煙の堆積はハウジング内に与えられる異なる電子モジュールの機能を損なう可能性がある。本発明の電子システムにおいて、冷却空気の供給用及び冷却空気の除去用開口部は、客室に直面していない壁部分上に配置される。ほとんどの冷却空気は客室からは来ず、自動車の支持構造及び操作盤の後ろの空間から来るという事実によって、ハウジング内の埃の堆積は最小に抑えられる。ハウジングには、ハウジングに空気が入るような、他の開口部又は後退部が設けられているので、ハウジングの残りの部分はハーメチックシールで又は空気が漏れないように密封されている訳ではないということは理解を要する。例として、電子ビルトインシステムは通常、前面制御パネルにコンパクトディスクのような記録媒体を導入するためのスリットを含む。このスリットを通しての空気の供給は完全には防ぐことが出来ない。しかし、空気供給用及び除去用の第1開口部及び第2開口部があれば、ハウジングを通して誘導される冷却空気の大部分は第1開口部を通してハウジングに侵入する。供給空気が第1開口部を通してハウジングに侵入する時、供給される空気が受ける抵抗は最小になる。

【0008】

本発明のもう一つ別の実施形態によると、第1及び第2開口部はハウジングの反対する壁部分に配置される。両開口部が反対する壁部分に配置されている時、第1開口部を通してハウジングに侵入する冷却空気は、ハウジングを離れる前にハウジング全体を通して通過するので、冷却空気はハウジングの大部分を通して誘導される。

【0009】

好ましくは、第1及び第2開口部はハウジングのそれぞれの側壁上に配置される。この場合、冷却空気はハウジングの幅全体を通して通過する。第1及び第2開口部はハウジングのそれぞれの側壁の下部上に配置されることが更に好ましい。この配置では、ハウジングの下部に冷却空気が供給されることが可能となる。該ハウジングの下部は換気される。ハウジング内の異なる電子モジュールの配置を設計する時、この空気流が考慮され、多量の熱を発生する電子モジュールは好ましくはハウジング下部に配置される。

【0010】

本発明のもう一つ別の実施形態によると、冷却ユニットは、冷却空気の除去のために第

2開口部に隣接した位置にある換気装置を含む。換気装置はハウジングを通した空気流を創出するのに役立つ。換気装置は空気を第2開口部の外に吹き出す。結果として、ハウジングを離れる冷却空気はハウジングを貫通する新鮮な空気を起こす。この冷却空気は主に、ハウジングのもう一つ別の側壁に設けられた第1開口部を通してハウジングに侵入し、ハウジング全体を通して誘導され、第2開口部を通してハウジングを出る。異なる電子モジュールがハウジング内で近くに配置されている時、該異なるモジュールを冷却するために換気装置が必要となる。

【0011】

本発明の一つの実施形態によると、電子ビルトインシステムは少なくとも、ラジオモジュール、オーディオモジュール、ナビゲーションモジュール、遠隔通信モジュール、又は記録媒体読み込みモジュールの一つを含む。記録媒体読み込みモジュールは、電子ビルトインシステムに挿入する取り外し可能記録媒体からデータを読み込むことが出来る。本発明の一つの好ましい実施形態によると、ラジオモジュール、オーディオモジュール、ナビゲーションモジュール、又は遠隔通信モジュールは、ハウジングの下部に配置される。それに対して、記録媒体読み込みモジュールはハウジング上部に配置される。電力増幅器を含むラジオモジュール及びオーディオモジュール、ナビゲーションモジュール、及び／又は遠隔通信モジュールは使用中に多量の熱を発生するので、これらのモジュールは冷却空気によって冷却されなければならない。記録媒体からデータを読み込むためのレーザーユニットを通常含む記録媒体読み込みモジュールは、他のモジュール程の熱を発生しない。更に、ハウジングを通して通過する冷却空気はまだ、記録媒体読み込みの適切な機能を妨げる可能性のある物体（小さな埃の粒子）を含む。これが、記録媒体読み込みモジュールは好ましくはハウジング上部に配置され、熱を発生するその他のモジュールは、開口部が空気供給及び空気排出のために設けられたハウジング下部に配置される理由である。冷却空気はもっぱら、ハウジング下部内に位置している電子モジュールに沿って誘導されるので、冷却空気は記録媒体読み込みモジュールに沿って誘導されない。このことは、記録媒体読み込みモジュールの読み込みサイクルが適切に機能することを保障するのに役立つ。

【0012】

電子ビルトインシステムにおいて、異なるモジュールは熱を発生するモジュールと発生する熱量が小さいので外部冷却の必要がないその他のモジュールに分けられる。これらのモジュールの一つは、DVD又はCDのような記録媒体からデータを読み込むのに通常、内部でレーザーが使われる記録媒体読み込みモジュールである。本発明によると、ハウジングの壁部に設けられた第1及び第2開口部は、熱を発生するモジュールが据え付けられているハウジングの部分が換気されるのに対し、記録媒体読み込みモジュールが与えられるハウジングの他の部分はもっと少量が換気されるように、配置される。このことは、第1開口部及び第2開口部は両方ともハウジング下部に配置されることが出来、オーディオモジュール、ナビゲーションモジュール、又は遠隔通信モジュールのような熱を発生するモジュールは、同様にハウジング下部に配置され、それに対し、記録媒体読み込みユニットはハウジング上部に設けられることを意味する。逆の配置もまた可能であることは理解を要する。二つの開口部及び熱を発生するモジュールはハウジング上部に設けられ、記録媒体読み込みモジュールはハウジング下部に設けられる。

【0013】

別の言い方をすれば、第1及び第2開口部はハウジングの側壁上第1高さに配置され、熱を発生するモジュールはハウジング内で、第1及び第2開口部とおおよそ同じ高さに配置される。しかし、記録媒体読み込みモジュールはハウジング内の別の高さに配置されるので、主に二つの開口部の高さでハウジングを通して通過する冷却流体は、記録媒体読み込みモジュールを通過しない。このことは、熱を発生するモジュールは、第1及び第2開口部とおおよそ同じ高さに配置されることを意味する。

【0014】

好ましくは、冷却ユニットは更に、電子ビルトインシステムの大部分の熱を発生する電

力増幅器を主に冷却するために設けられた冷却フィンを含む。電力増幅器に物理的に接続された冷却フィンは発生した熱を放散させる。冷却フィンの大きな表面は、発生した熱を効果的に放散させるのに役立つ。換気装置により供給された空気は冷却フィンを通して、第2開口部からハウジング外へ出る。好ましくは、冷却フィンは第2開口部と換気装置を含む壁部の間に配置される。冷却フィンが換気装置の下流に配置される時、換気装置は損傷したり、又は、冷却フィンから放散される熱い空気によって換気装置自体が劣化することはない。この熱い空気は第2開口部を通してハウジング外に直接誘導される。

【0015】

電子ビルトインシステムを効果的に冷却し、異なるモジュールが適切に機能することを保障するという必要性は、同様に、いくつかの電子モジュールを受けるハウジングを含み、そのモジュールは熱を発生するモジュール及び、取り外し可能な記録媒体からデータを読み出すための少なくとも一つの光学読み込みモジュールを含むような自動車の電子ビルトインシステムにより、達成される。電子ビルトインシステムは更に、電子モジュールを冷却するためにハウジングを通して冷却空気を誘導するための冷却ユニットを含む。加えて、第1開口部は、ハウジングに冷却空気を供給するために、ハウジングの外壁部に設けられる。加えて、第2開口部は、ハウジングから冷却空気を除去するために、ハウジングの外壁部に設けられる。本発明の一つの側面によると、第1及び第2開口部は、第1開口部から第2開口部へ通る冷却空気は主に熱を発生するモジュールに沿って誘導されるようなハウジングの位置に、配置される。多量の冷却空気は、熱を発生するモジュールに沿って誘導されるべきであり、光学読み込みモジュールに沿って誘導されるべきではない。光学読み込みモジュールは通常、記録媒体からデータを読み込むための読み込みユニットを含む。冷却空気中に含まれる小さな粒子は読み込みユニット上に堆積し、結果として、読み込みユニットが適切に機能することを妨げる恐れがあるので、冷却空気は読み込みユニットが適切に機能することを損なう可能性がある。

【0016】

既に上で触れたように、第1及び第2開口部は好ましくはハウジングの反対する壁部に配置され、特に二つの開口部はハウジングの側表面下部に配置される。

【0017】

第1及び第2開口部はハウジング側壁下部に配置されるため、冷却空気は主にハウジング下部に沿って誘導される。このため、熱を発生するモジュールはハウジング下部のハウジング内部に配置されるのに対して、光学読み込みモジュールはハウジング上部に配置される。

【0018】

好ましくは、電子ビルトインシステムは更に、電子ビルトインシステムにおいてハードディスクを受ける取り付けユニットを含む。電子システムがナビゲーションモジュールを含む時、道路網に関する情報を含み、速度制限、道路部に沿った住所範囲、道路のターン制限及び交差点、方向制限、などのような付加的な情報を含む地理データはハードディスクに記録されてよい。このハードディスクは、ハウジング内で付加的に配置される必要がある。

【0019】

好ましくは、ハードディスクを受ける取り付けユニットは、ほとんどの冷却空気が誘導されて通るハウジング下部にも同様に配置される。ハードディスクは取り付けユニットに固定されて据え付けられるので、取り外し可能な記録媒体からデータを読み込むための光学読み込みモジュールにおいて設けられる読み込みユニットがそうであるように、ハードディスクからのデータ読み込みのための読み込みユニットはより効果的に埃に対して保護されることが出来る。

【0020】

本発明のもう一つ別の実施形態によると、電子ビルトインシステムは着脱可能な前面制御パネルを含む。取り外した前面制御パネルを用いると、ハードディスクは取り付けユニットに取り付けられることが出来るか、又は取り外すことが出来る。好ましくは、前面制

御パネルは、自動車内の電子ビルトインシステムの据え付け後、ハードディスクを再取り付けする場合、自動車販売店又は自動車製造者が、ハードディスクを受けるための取り付けユニットを据え付けたり、ハードディスクを挿入することが出来るように、取り外すことが出来る。

【0021】

更に、母プリント配線基板又は主基板はハウジング内に設けられ、ハウジング底部に配置され、故にほとんどの冷却空気が通過するハウジング下部に配置されてよい。母基板は通常、熱も同様に発生する多くの異なる電子部品を含むので、母プリント配線基板は他の熱を発生するモジュールと同じ方法で冷却されるべきである。

【0022】

好ましくは、ハウジングは支持構造の2-D IN後退部中に嵌まる2-D INハウジングである。該D IN規格は、ラジオ又はナビゲーションシステムのような電子ビルトインシステムを収容するために必要な空間を記述するために、自動車で用いられる規格である。電子ビルトインシステムがナビゲーションモジュールを含む時、1-D INシステムにおけるよりも大きなディスプレイが用いられてよい。この場合、2-D INシステムを用いることが出来るので、付加的空間はディスプレイ及びシステムの異なる電子モジュールを制御するための制御ボタン用に与えられる。

【0023】

項目1. 自動車の客室内に取り付けられる支持構造に据え付けられるための、以下を含む電子ビルトインシステム:

(a) 少なくとも一つの電子モジュール(330-350)、

(b) 該少なくとも一つの電子モジュールを受けるためのハウジング(100)であって、自動車の支持構造に取り付けられる該ハウジング(100)は、電子システムを操作する操作要素を有し、客室に直面している前面制御パネル(110)を含むハウジング、

(c) 該ハウジング内に設けられ、該少なくとも一つの電子モジュールを冷却するためにハウジングを通して冷却空気を誘導する、冷却ユニット(370)、

(d) 該ハウジングへ冷却空気を供給するためにハウジング(100)の外壁部に設けられた、少なくとも一つの第1開口部(140)、

(e) 該ハウジングから冷却空気を除去するためにハウジングの外壁部に設けられた、少なくとも一つの第2開口部(380)であって、該少なくとも第1及び該少なくとも第2開口部(140、380)は該ハウジング(100)の異なる壁部に配置され、その異なる壁部は、ビルトインシステムが支持構造に据え付けられる時、支持構造によって客室から隔離される、少なくとも一つの第2開口部(380)。

【0024】

項目2. 前記第1及び第2開口部(140、380)はハウジングの対面する壁部に配置される、項目1に記載の電子ビルトインシステム。

【0025】

項目3. 前記第1及び第2開口部(140、380)はハウジングのそれぞれの側壁に配置される、項目1又は2に記載の電子ビルトインシステム。

【0026】

項目4. 前記冷却ユニット(370)は冷却空気を除去するための第2開口部に隣接して置かれた換気装置を含む、項目1〜3のいずれかに記載の電子ビルトインシステム。

【0027】

項目5. 前記第1及び第2開口部(140、380)はハウジングのそれぞれの側壁の下部に配置される、項目1〜4のいずれかに記載の電子ビルトインシステム。

【0028】

項目6. ラジオモジュール、オーディオモジュール、ナビゲーションモジュール、遠隔通信モジュール、及び記録媒体読み込みモジュールのうち少なくとも一つを更に含むことを特徴とする、項目1〜5のいずれかに記載の電子ビルトインシステム。

【0029】

項目 7. ラジオモジュール、オーディオモジュール、ナビゲーションモジュール、遠隔通信モジュールのうち少なくとも一つはハウジング (1 0 0) の下部に配置されるのに対し、記録媒体読み込みモジュールはハウジング上部に配置される、項目 6 に記載の電子ビルトインシステム。

【0030】

項目 8. 前記冷却ユニットは冷却フィンを含む、項目 1 ～ 7 のいずれかに記載の電子ビルトインシステム。

【0031】

項目 9. 前記換気装置は、ハウジングから冷却空気を除去するための第 2 開口部を含む壁部に隣接して、該壁部と換気装置の間に置かれる冷却フィンを伴い、配置される、項目 8 に記載の電子ビルトインシステム。

【0032】

項目 1 0. 前記支持構造は操作盤である、項目 1 ～ 9 のいずれかに記載の電子ビルトインシステム。

【0033】

項目 1 1. 前記第 1 及び第 2 開口部はハウジング側壁に、熱を発生するモジュールがハウジング内部に第 1 及び第 2 開口部と同じ高さで配置されるのに対して、記録媒体読み込みモジュールはハウジング内に、熱を発生するモジュールと比して第 1 及び第 2 開口部とは大きく異なる高さで配置されるように、配置されることを特徴とする、項目 1 ～ 1 0 のいずれかに記載の電子ビルトインシステム。

【0034】

項目 1 2. 以下を含む、自動車の電子ビルトインシステム：

(a) 熱を発生するモジュール及び取り外し可能な記録媒体 (1 1 3) からデータを読み込むための少なくとも一つの光学読み込みモジュールを含む、いくつかの電子モジュールを受けるハウジング (1 0 0) 、

(b) 電子モジュールを冷却するためハウジングを通して冷却空気を誘導するための冷却ユニット (3 7 0)

(c) ハウジングへ冷却空気を供給するため、ハウジング外壁部に設けられた第 1 開口部 (1 4 0)

(d) 第 1 及び第 2 開口部は、第 1 開口部から第 2 開口部までの経路を通る冷却空気は主に熱を発生するモジュールに沿って誘導されるようなハウジングでの位置に配置される、ハウジングから冷却空気を除去するためにハウジング外壁部に設けられた第 2 開口部 (3 8 0) 。

【0035】

項目 1 3. 前記第 1 及び第 2 開口部 (1 4 0 、 3 8 0) はハウジングの対面する壁部に配置される、項目 1 2 に記載の電子ビルトインシステム。

【0036】

項目 1 4. 前記第 1 及び第 2 開口部 (1 4 0 、 3 8 0) は両方ともハウジング側壁下部に配置される、項目 1 2 又は 1 3 に記載の電子ビルトインシステム。

【0037】

項目 1 5. 前記熱を発生するモジュールはハウジング (1 0 0) の下部でハウジング内に配置されるのに対し、光学読み込みモジュールはハウジング (1 0 0) 上部に配置される、項目 1 2 ～ 1 4 のいずれかに記載の電子ビルトインシステム。

【0038】

項目 1 6. 前記冷却ユニット (3 7 0) は、ハウジングから冷却空気を除去するための第 2 開口部に隣接して配置される換気装置を含む、項目 1 2 ～ 1 5 のいずれかに記載の電子ビルトインシステム。

【0039】

項目 1 7. 前記冷却ユニットは、第 2 開口部と換気装置を含む壁部の間に配置される冷却フィン (4 2 0) を含む、項目 1 6 に記載の電子ビルトインシステム。

【0040】

項目18. 電子ビルトインシステムにおいてハードディスクを受ける取り付けユニット(320)を更に含む、項目12～17のいずれかに記載の電子ビルトインシステム。

【0041】

項目19. ハードディスクを受ける取り付けユニット(320)はハウジング下部に配置される、項目18に記載の電子ビルトインシステム。

【0042】

項目20. 取り外し可能な前面制御パネル(110)を更に含むことを特徴とする、項目12～19のいずれかに記載の電子ビルトインシステム。

【0043】

項目21. ハードディスクは、前面制御パネル(110)が取り外された状態で、取り付けユニット(320)に取り付け可能である、項目20に記載の電子ビルトインシステム。

【0044】

項目22. ハウジング底部に配置される母プリント配線基板(310)を更に含むことを特徴とする、前記項目のいずれかに記載の電子ビルトインシステム。

【0045】

項目23. 前記ハウジング(100)は2DINハウジングであり、支持構造の2DIN後退部に嵌まる、前記項目のいずれかに記載の電子ビルトインシステム。

【0046】

項目24. 項目1～23のいずれかに記載の電子ビルトインシステムを含むナビゲーションシステム。

【発明を実施するための最良の形態】

【0047】

図1において、異なる電子モジュールを含む電子システムを示す。電子システムはハウジング100を含む。電子システムは、自動車の客室において収容構造又は支持構造(示されていない)内に据え付けられる。運転者は、電子システムを制御するための異なる操作要素を含む前面制御パネル110を見ることのみ出来る。示された例において、前面制御パネル110は、システムの作動モードに関する情報を表示するディスプレイ111を含む。電子システムが、自動車の運転者が予め決定された目的地へ誘導されるナビゲーション作動モードで働いている時、大きなディスプレイは特に有用である。異なる通り又は他の運転関連情報を示す地図データは、ディスプレイ111上に表示される。システムがラジオ又はオーディオ動作モードで働いている時、ディスプレイはラジオ局の名前及び受信周波数、又はオーディオコンパクトディスク又はDVDのトラックを表示できる。ディスプレイの上部には、コンパクトディスク又はDVD113のような記録媒体を挿入できるスロットが前面パネルに設けられる。SDカードのようなメモ리카ードを導入できる第2スロットが設けられてよい。前面制御パネルの左下に、音量を制御することに使用出来る、システムを入又は切にすることに使用出来る回転押しボタン115が設けられる。制御ボタン116は、電子システムの異なる動作モードを可にするために使用されてよい。各ボタン116は異なる動作モードを可にするために用いられてよい。例えば、一つのボタン116はラジオモードに切り換えるのに用いられてよく、もう一つ別のボタンはナビゲーションモードに切り換えるのに用いられてよい、などである。

【0048】

制御パネルの右下には、異なる動作モードを制御するためにロック117が設けられてよい。例えば、ナビゲーションモードにおける住所を選択するなどのためにである。ロック117の上部には、二つの前進及び後退ボタン118を設けることが出来、例えば、ラジオ動作モードにおいて周波数帯走査に用いられ、又はオーディオモードにおいて一つの曲目から他の曲目に移動するためのスキップボタンとして用いられてよい。右上隅には、いくつかのボタン119が示されており、主に遠隔通信動作モードにおいて用いる事が出来る。これらのボタン119は電話番号をダイヤルするために用いることが出来る。

【0049】

操作要素は完全に異なる方法で配置されることが出来、また同様に、他の操作要素が用いられることが出来るという事は、理解を要する。操作要素を前面制御パネル上に配置する異なる方法は本技術分野ではよく知られているので、その詳細な記述は省略されることが出来る。

【0050】

更に、自動車の操作盤（示されていない）へ電子ビルトインシステムを固定する固定要素120が設けられる。電子システムは、前面制御パネルは自動車の客室内の運転者又は他の乗客から触れることが出来、ハウジングの残りの部分はハウジングを支持する支持構造の後ろに隠されるような方法で、配置される。

【0051】

ハウジングは、一つの上壁130、一つの底壁131、二つの側壁132、及び一つの背壁133を含む。図1に見ることが出来るように、側壁132はその下部にあるいくつかの第1開口部140を含む。後で説明されるように、これらの第1開口部140は、ハウジング内に据え付けられる電子モジュールのための冷却空気を供給するために設けられる。該第1開口部140はシステムの空気取り入れ口として働く。

【0052】

第1開口部140は同様に図2に示され、ここではハウジング100は立体背面図に示される。図2に見ることが出来るように、背壁133はいくつかの後退部を含むので、異なるコネクタを付けることが出来る。背壁133の左下には、一組のコネクタ210が設けられ、GPS信号又はブルートゥース信号を受信するために用いられてよい。例えば、携帯電話のような遠隔通信ユニットからの受信である。コネクタ210に隣接して、ワイヤレスLANネットワークからの信号を受信することが出来、又は自動車の後ろの空間を制御するために設けられる後方カメラからのビデオ信号を受信することが出来る二つのコネクタ220が示される。コネクタ230は、後部座席の乗客が他の娯楽番組を使用出来るようにする後部座席娯楽システムとデータを交換するために設けられてよい。コネクタ240は、もし自動車に設けられていれば、テレビチューナーとデータを交換するために用いられてよい。接続システム250は、自動車に設けられる光学バスシステムとデータを交換するために用いられてよい。ここでは、全関連運転データが処理のために与えられる。加えて、USBインターフェース260が設けられてよい。更に、コネクタユニット270は自動車のアンテナによって受信されるラジオ信号を送信するために設けられてよい。図2に見ることが出来るように、全コネクタはハウジング100の下部に配置される。後で説明されるように、この事は、コネクタを含む全ての電子モジュール又は電子配線基板はハウジングの下部に配置されるという事実による。

【0053】

図3において、電子システムの立体前面図が示されるのに対して、図を明瞭にするため、ハウジング100は透過線で示され、前面制御パネル110は省略されている。ハウジング底部に、母プリント配線基板又は主基板310が設けられる。主基板310上に、取り付け構造又は取り付けユニット320がおかれ、この中にハードディスク325が据え付けられる。取り付けユニット320の側表面上では、接続セグメント321が、取り付けユニットの前部を後部に接続する。ここでは、取り付けユニットを主基板に取り付けるための取り付け突起322が設けられる。接続セグメント324は幅において、取り付けユニットの前部及び後部より小さい。後で説明されるように、この事は冷却空気が取り付けユニット320の上と下を通過するのに役立つ。

【0054】

ハードディスク325を伴う取り付けユニット320の上面には、チューナー基板331を有するチューナーモジュール330が据え付けられる。チューナーモジュール330に隣接して、他の電子モジュールを含むもう一つ別の拡張モジュール340が設けられる。側壁132に隣接して、電力増幅器350がハウジング後部に据え付けられてよい。加えて、図2に示されるコネクタが接続されるコネクタ基板360が設けられる。側壁

下部の近傍に換気装置370が設けられる。換気装置は、冷却空気がハウジングから、第1開口部140が設けられている側壁に直面する側壁に設けられている第2開口部380を通して流れるように、配置される。図4に同様に見ることが出来るように、換気装置は第1開口部140からハウジング下部を通して供給される空気を動かす。この冷却空気は対面の側壁に設けられる第2開口部380を通して除去される。熱を発生し、それ故に冷却されなければならない全ての電子部品はハウジング下部に置かれる。このハウジング下部において、ほとんどの冷却空気は開口部140から開口部380へ流れている。

【0055】

示される配置の一つの大きな利点は、取り入れられた空気は支持構造の後ろの空間から来ている、という事である。ほとんどの空気は、前面制御パネルに設けられることが出来る開口部を通しては来ない。この事は、異なる電子モジュールが機能する事を損なう埃又は煙又は他の小さな粒子がハウジング内へ導入される事を防ぐのに役立つ。更に、取り入れられた空気は排出される空気からは完全に分離されるので、第2開口部380を離れる暖められた冷却空気は、第1開口部140を通してハウジングに侵入する新鮮な空気としては用いられない。

【0056】

図4に、ハウジングの断面図が示される。ハウジングに供給される冷却空気は開口部140を通してハウジングに侵入する。取り付けユニット320の接続セグメント321は、空気流を上部と下部に分ける。上部の空気流は、取り付けユニット320の上表面及びその中に据え付けられたハードディスクを、取り付けユニット上部に収容されてはいるが、それでも第1及び第2開口部が設けられているハウジング部分内に収容されているチューナー基板330及び他の考えられる電子モジュールと共に、冷却する。

【0057】

供給空気のもう一方は、開口部380を通してハウジングを離れる前に、下向きに変向され、主基板310に沿って通過し、主基板上に設けられる異なる電子部品410を冷却することが出来る。図4に見ることが出来るように、冷却フィン420は側壁及び換気装置370の間に配置される。図3に見られるように、冷却フィン420は、左側壁に隣接する後部に据え付けられた電力増幅器（示されていない）によって発生する熱を放散するのに役立つ。電力増幅器は、多量の熱を発生する電子モジュールである。冷却フィンはこの熱を放散させなければならない。図4に見ることが出来るように、冷却フィンは、開口部380は二つのフィンの間に配置されるように異なるフィンが配置されるように、配置される。結果として、換気装置370によって開口部380を通して押し出される冷却空気は、冷却フィンに沿って誘導され、開口部380を通して容易に噴出することが出来る。第2開口部380の間にある接続部430と同じ高さにある冷却フィンの配置は、ハウジングから効果的に冷却空気を除去するのに役立つ。

【0058】

ハウジング上部、すなわち側壁に開口部が設けられていないハウジングの部分において、図1に示すコンパクトディスク113からデータを読み込むための光学読み込みモジュールが配置される。この記録媒体読み込み装置は、CD切り換え装置のように、例にある方法によって、六枚までのコンパクトディスクを含む一つの記録媒体又は複数の記録媒体を、収容することが出来る。図4に見ることが出来るように、光学読み取りモジュールはケース440に含まれる。第1及び第2開口部の配置から、そして異なる電子モジュールの配置から見て分かるように、光学読み取りモジュールはハウジング下部に流れている冷却空気によっては、非常に少ない程度にしか影響を受けない。この事は、冷却空気に含まれる粒子が読み込みモジュールが適切に機能する事を妨げる事を、防ぐのに役立つ。

【0059】

図5において、ハウジング内部にある異なる電子モジュールの後方俯瞰図を見ることが出来る。電力増幅器350は開口部380を含む側壁に隣接して配置されるので、電力増幅器350によって発生する熱は開口部380を通してハウジング外へ直接出ることが出来る。増幅器の上部には、冷却フィン420が設けられ、電力増幅器によって発生した熱

を放散させるのに役立つ。更に、異なる電子モジュール330、340及び異なるコネクタを有するコネクタ基板360が同様に、詳細に示される。

【0060】

図6では、前面制御パネル110がハウジング100から取り外されて示される。ハウジング上部において、ケース440は、スロット112の中へ、又はスロット114を通して挿入される記録媒体を読み込むための光学読み込みモジュールを収容するために示される。データ、特にナビゲーションモジュール用地図データ、を記録するために、ハードディスク325は取り付けユニット320に挿入されることが出来る。電子ビルトインシステムが自動車に据え付けられる時、ハードディスクはシステムに含まれる必要はない。しかしながら、ハードディスク325を後で付け足すことは可能である。このため、前面制御パネル110はハウジング上に着脱可能に配置されるので、前面パネルが取り外される時、ハードディスク325は取り付けユニット320に挿入されることが出来る。好ましくは、電子システムの配置を変更できるのはエンドユーザーではなく自動車販売店である。

【0061】

要約すると、本発明の電子システムは、自動車に含まれる異なる部品の効果的な冷却を与える。客室から来る空気の使用は、空気取り入れ口及び空気排出口が電子システムを担持する支持構造によって客室から隔離される空間に置かれるので、著しく防ぐことが出来る。加えて、空気を供給する開口部及び空気を除去する開口部は、冷却空気を必要とする電子部品は空気流の中に取り付けられるのに対して、CD読み込み装置のような冷却空気を必要としない他の電子部品は冷却空気によって換気されないか、はるかに少なく換気されるハウジングの部分に収容される、というように配置される。

【図面の簡単な説明】

【0062】

【図1】自動車に据え付けられる電子ビルトインシステムの斜視前面図である。

【図2】図1のシステムの斜視背面図を示す。

【図3】電子システムの異なる電子部品及び冷却システムの配置を想像図で表されたハウジングと共に示す。

【図4】電子システムの立体断面図を示す。

【図5】電子システムの電子モジュールの配置を斜視背面図で示す。

【図6】ハードディスクを導入するために取り外された前面制御パネルを伴う電子システムを示す。

【符号の説明】

【0063】

100 ハウジング
110 制御パネル
140 第1開口部
370 冷却ユニット
380 第2開口部

【図1】

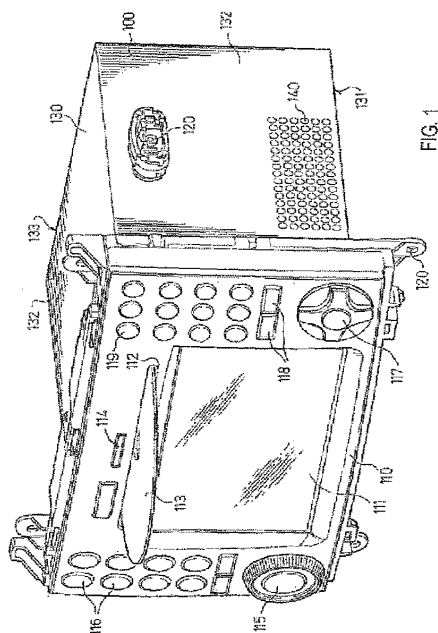


FIG. 1

【図2】

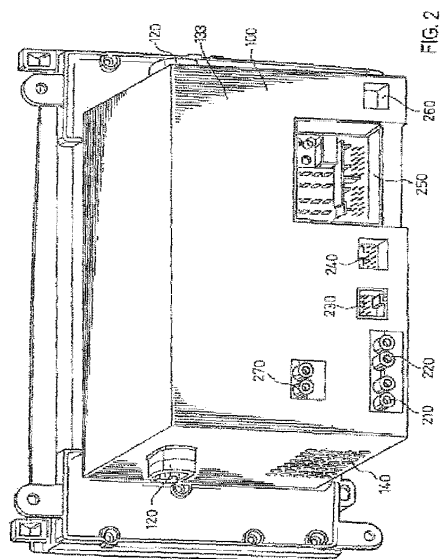


FIG. 2

【図3】

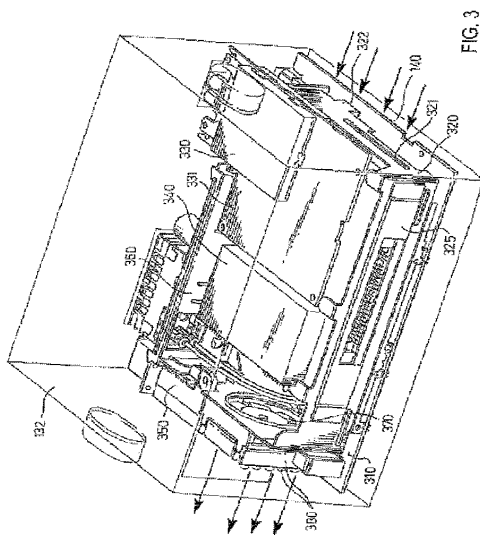


FIG. 3

【図4】

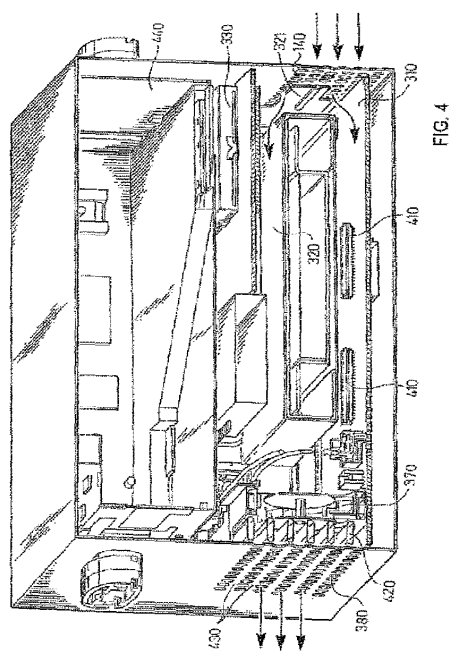
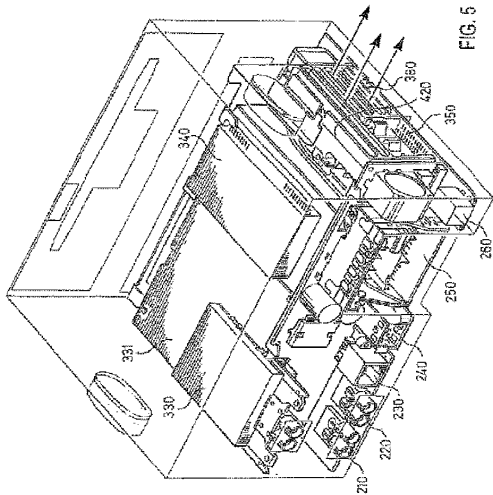
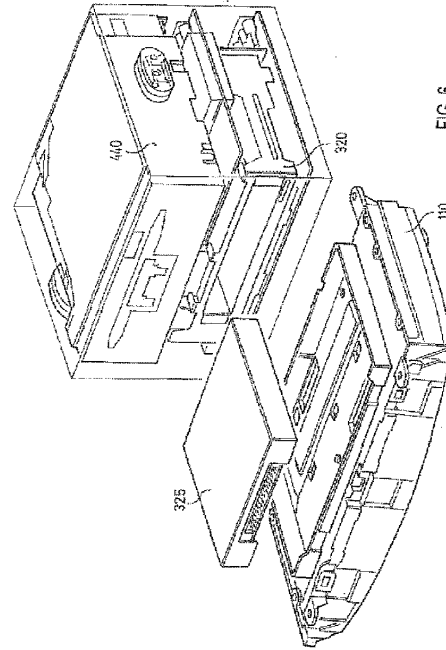


FIG. 4

【図5】



【図6】



(72)発明者 ロビー リーガー

ドイツ国 7 6 3 0 7 カールスバート, プフィンツタルシュトラッセ 1 4

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특허권자 Patentee

매뉴팩처링 리소시스 인터내셔널 인코포레이티드

미국 조지아 30005 알파레타 실로 로드 이스트 6415

발명자 Inventor

디아즈, 마르코스

미국 조지아 30005 알파레타 실로 로드 이스트 6415

위의 발명은 「특허법」에 따라 특허등록원부에 등록되었음을 증명합니다.

This is to certify that, in accordance with the Patent Act, a patent for the invention has been registered at the Korean Intellectual Property Office.



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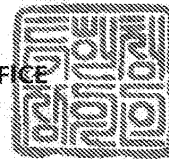
특허청장

COMMISSIONER,
KOREAN INTELLECTUAL PROPERTY OFFICE

박원주



QR코드로 현재기준
등록사항을 확인하세요





Espacenet

KR102104342B1 양면 표시장치 조립체를 위한 냉각 시스템

Applicants: 매뉴팩처링 리소시스 인터내셔널 인코포레이티드

Inventors: 디아즈, 마르코스

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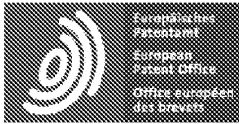
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양면 표시장치 조립체를 위한 냉각 시스템

Abstract

한 쌍의 전자 표시장치(30, 31)가 등을 맞대고 배치되어 차량에 장착되도록 구성된다. 한 쌍의 열 판(123, 127)이 전자 표시장치 뒤에 위치하며 한 쌍의 투명 패널(35, 36)이 전자 표시장치의 전면에 위치된다. 전자 표시장치와 투명 패널 사이의 공간을 통해 그리고 페루프 환기공간을 통해 페루프 공기가 수직으로 이동한다. 전자 표시장치의 후면과 열 판 사이의 공간을 통해 개루프 공기가 수평으로 이동한다.



Patent Translate

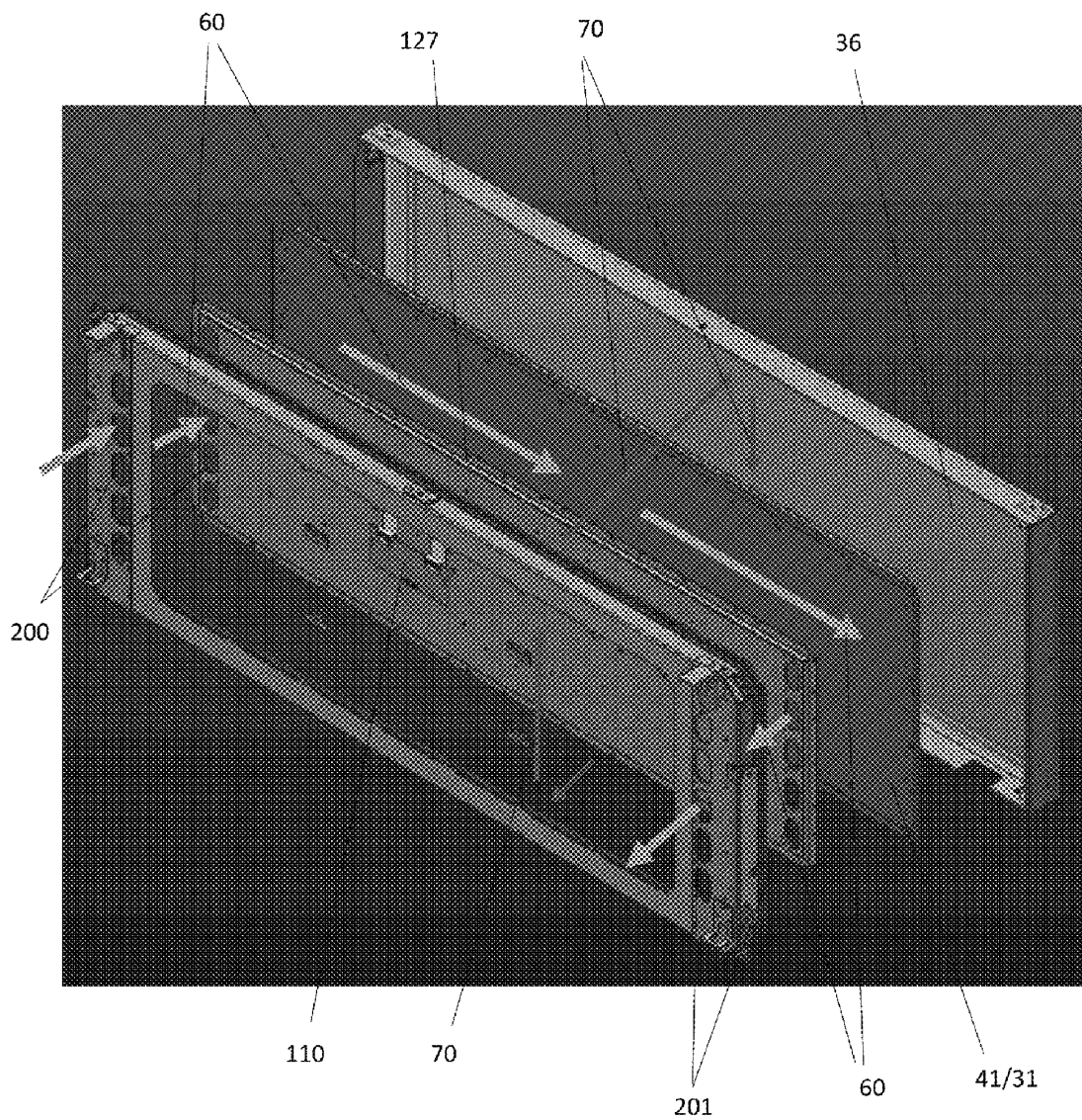
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ABSTRACT KR102104342

The pair of electronic display devices 30 and 31 are arranged to face each other and are mounted on the vehicle. A pair of heat plates 123 and 127 are located behind the electronic display device, and a pair of transparent panels 35 and 36 are located on the front surface of the electronic display device. The closed - loop air moves vertically through the space between the electronic display and the transparent panel and through the closed - loop ventilation space. The open - loop air moves horizontally through the space between the back of the electronic display and the heat plate.





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(73) 특허권자
메뉴팩처링 리소시스 인터내셔널 인코포레이티드
미국 조지아 30005 알파레타 실로 로드 이스트
6415

(72) 발명자
디아즈, 마르코스
미국 조지아 30005 알파레타 실로 로드 이스트
6415

(74) 대리인
이은철, 이우영, 전병기

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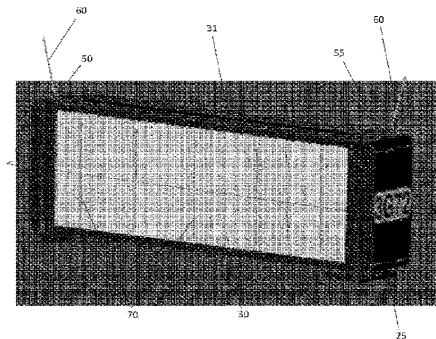
심사관 : 이상훈

(54) 발명의 명칭 양면 표시장치 조립체를 위한 냉각 시스템

(57) 요약

한 쌍의 전자 표시장치(30, 31)가 등을 맞대고 배치되어 차량에 장착되도록 구성된다. 한 쌍의 열 관(123, 127)이 전자 표시장치 뒤에 위치하며 한 쌍의 투명 패널(35, 36)이 전자 표시장치의 전면에 위치된다. 전자 표시장치와 투명 패널 사이의 공간을 통해 그리고 페루프 환기공간을 통해 페루프 공기가 수직으로 이동한다. 전자 표시장치의 후면과 열 관 사이의 공간을 통해 개루프 공기가 수평으로 이동한다.

도 1



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명세서

청구범위

청구항 1

삭제

청구항 2

삭제

청구항 3

삭제

청구항 4

삭제

청구항 5

삭제

청구항 6

삭제

청구항 7

삭제

청구항 8

삭제

청구항 9

삭제

청구항 10

삭제

청구항 11

삭제

청구항 12

삭제

청구항 13

삭제

청구항 14

차량의 지붕에 장착하는 표시장치 조립체에 있어서,

차량 지붕에 장착되도록 구성된 하우징;

각각 전면 및 후면을 구비하고, 등과 등을 맞대는 배열로 하우징 내에 위치하는 제1 및 제2 전자 표시장치;

제1 및 제2 전자 표시장치 중 하나의 전면 앞에 각각 위치하는 제1 및 제2 투명 패널;

제1 및 제2 전자 표시장치 중 하나의 후면 뒤에 각각 위치하는 제1 및 제2 열 판;

개루프 통로로서,

주변 공기를 흡입하기 위해 하우징에 위치하는 흡기구;

제1 및 제2 열 판 중의 하나와 제1 및 제2 전자 표시장치 중의 각각 하나의 후면 표면 사이에 각각 위치하는 제1 및 제2 개루프 채널;

흡기구와 제1 및 제2 개루프 채널 사이의 기상 소통을 허용

하도록 각각 구성되고, 각각의 제1 및 제2 열 판 위에 위치하는

다수의 입구공;

주변 공기를 배출하기 위해 하우징에 위치하는 배기구; 및

배기구와 제1 및 적어도 하나의 제2 개루프 채널 사이의 기상

소통을 허용하도록 각각 구성되고, 각각의 제1 및 제2 열 판 위에

위치하는 다수의 출구공;를 포함하여 구성되고,

개루프 통로는 주변 공기의 유동을 수용하고, 상기 수용된 유동의 제1

및 제2 분할 흐름이 각각의 상기 입구공을 경유하여 각각의 상기 제1

및 제2 개루프 채널을 통과하도록 하고, 그리고 상기 제1 및 제2 분할

흐름이 각각의 상기 출구공을 빠져나온 후, 재결합된 유동을 상기

배기구를 통해 배출하기 전에, 상기 제1 및 제2 분할 흐름을 재결합

하도록 구성되는, 상기 개루프 통로; 및

페루프 통로로서,

제1 및 제2 투명 패널 중의 하나와 제1 및 제2 전자 표시장치 중의

각각 하나 사이에 각각 위치하는 제1 및 제2 페루프 채널; 및

각각의 제1 및 제2 페루프 채널과 기상 소통을 허용하도록 구성되고,

제1 및 제2 열 판에 의해 정의되는 페루프 환기공간;으로 구성되는,

상기 페루프 통로;

를 포함하여 구성되는 표시장치 조립체.

청구항 15

제14항에 있어서, 제1 및 제2 열 판 중 적어도 하나의 후면에 장착되는 다수의 전자부품을 더 포함하여 구성되는 점을 특징으로 하는 표시장치 조립체.

청구항 16

제14항에 있어서, 이격되어 있으며, 각각이 페루프 환기공간 및 제1 및 제2 페루프 채널 중 하나 또는 그 이상의 채널을 통해 순환 가스를 추진하도록 구성된 다수의 페루프 팬을 더 포함하여 구성되는 점을 특징으로 하는 표시장치 조립체.

청구항 17

제14항에 있어서, 제1 및 제2 개루프 채널 중 하나 또는 그 이상의 채널을 통해 주변 공기를 추진하도록 설치되

는 개루프 팬을 더 포함하여 구성되는 점을 특징으로 하는 표시장치 조립체.

청구항 18

제14항에 있어서, 상기 하우징은 다수의 발을 포함하고, 각각의 상기 발은 차량 지붕 상부 표면에 장착되도록 상부 표면의 피치와 부합하여 접촉하도록 구성된 하부 표면을 가지는 점을 특징으로 하는 표시장치 조립체.

청구항 19

삭제

청구항 20

삭제

청구항 21

제14항에 있어서, 다수의 입구공 각각은 제1 및 제2 열 판 각각의 제1 단부를 따라 이격되어 위치하고; 및 다수의 출구공 각각은 제1 및 제2 열 판 각각의 제2 단부를 따라 이격되어 위치하는 점을 특징으로 하는 표시장치 조립체.

청구항 22

제21항에 있어서, 다수의 입구공 각각은 수직으로 이격되어 위치하고; 및 다수의 출구공 각각은 수직으로 이격되어 위치하는 점을 특징으로 하는 표시장치 조립체.

발명의 설명

기술 분야

[0001] 본 발명은 일반적으로 전자 표시장치의 냉각 시스템에 관한 것으로, 본 출원은 2016년 3월 4일 출원된 미국 가출원 제62/303,806호의 이점을 청구하며, 그 개시 내용은 본 명세서에 참조로 포함된다.

배경 기술

[0002] 전자 표시장치는 야외 환경이나 주변 온도가 높을 수 있는 지역에서 사용되거나 또는 표시장치 내의 온도를 상승시키는 태양열 부하와 같은 다른 열원이 있을 수 있는 장소에서 대체로 사용된다. 하지만, 표시장치의 일부 영역에 주변 공기를 주입하면 표시장치의 민감한 부분에 먼지와 오염물질이 유입되어 조기 고장을 일으킬 수 있어서 표시장치의 일부 영역은 냉각하기 어려울 수 있다.

발명의 내용

해결하려는 과제

[0003] 본 발명의 목적은 조립체의 하우징을 통해 공기와 같은 유체가 흐르는 다수의 유로를 포함하는 양면 표시장치 조립체를 제공하려는 것이다.

과제의 해결 수단

[0004] 본 발명의 모범적인 실시예는 전자 표시장치 하우징을 통해 공기와 같은 유체가 흐르는 다수의 개별 유로를 포함하여 구성될 수 있다. 적어도 하나의 경로는 페루프일 수 있으며 여러 다른 경로는 개루프를 제공할 수 있다. 페루프 경로는 전자 표시장치와 전면 투명 패널 사이를 통과할 뿐만 아니라 바람직하게 밀폐된 전자부품 구획을 순환한다. 주변 공기의 제2 경로가 제2 전자 표시장치 뒤를 통과하는 동안 주변 공기의 제1 개루프는 제1 전자 표시장치 뒤를 통과할 수 있다. 일부 실시예에서 개루프 공기는 또한 전자 부품을 가진 열 판으로부터 열을 제거하고 일부 개루프 공기는 또한 LED 백라이트(또는 LED 표시장치)로부터 열을 제거한다. 팬은 각 경로를 통과하는 유체의 양을 정밀하게 제어하도록 배치될 수 있다.

발명의 효과

[0005] 본 발명의 양면 표시장치 조립체는 개루프 경로와 폐루프 경로가 교차하지 않고 순환 가스로부터 주변 공기로 열 에너지를 전달하여, 오염물질의 유입을 막으면서 냉각을 할 수 있다.

도면의 간단한 설명

[0006] 도 1은 양면 표시장치 조립체의 모범적인 실시예의 정면이 보이는 사시도이며, 단면선 A-A, 단면선 B-B, 및 단면선 C-C를 표시하고 있다.

도 2는 도 1에 도시된 실시예에서 단면선 A-A에 의해 얻어진 측면 단면도이다.

도 3은 도 1에 도시된 실시예에서 단면선 B-B에 의해 얻어진 전면 단면도이다.

도 4는 도 1에 도시된 실시예에서 단면선 C-C에 의해 얻어진 단면도이며, 상세 A를 표시하고 있다.

도 5는 상세 A를 보여주는 상세 단면도이다.

도 6은 도 1에 도시된 실시예를 부분 분해하여 보여주는 도면이다.

발명을 실시하기 위한 구체적인 내용

[0007] 상술된 특징 외에도, 도면 및 모범적인 실시예의 설명으로부터 본 발명의 다른 특징이 명확하게 나타날 것이며, 여러 도면에 걸쳐 표시되는 유사한 참조 번호는 동일한 또는 균등한 특징을 의미한다.

[0008] 발명의 모범적인 실시예가 도시된 첨부 도면을 참조하여 본 발명이 보다 충실하게 설명된다. 그러나, 본 발명은 많은 다른 형태로 구체화될 수 있으며, 본 명세서에 기재된 모범적인 실시예에 한정되는 것으로 해석되지 않아야 한다. 오히려, 본 실시가 철저하고 완전해지도록 이러한 실시예들이 제공되며, 통상의 지식을 가진 자가 본 발명의 기술적 사상을 완전하게 실시할 수 있을 것이다. 도면에서, 계층 및 영역의 크기 및 상대적인 크기는 명확성을 위해 과장될 수 있다.

[0009] 본 명세서에서 사용되는 용어는 특정 실시예만을 설명하기 위한 것이며 발명을 제한하기 위한 것은 아니다. 여기에서 사용되는 것과 같이, 단수형식의 "a", "an" 및 "the"는 문맥이 달리 명시하지 않는 한 복수형도 포함한다. 또한 용어 "구성한다(comprises)" 및/또는 "구성하는(comprising)"라는 용어가 본 명세서에서 사용될 때에는, 명시된 특징, 정수, 단계, 동작, 요소 및/또는 구성의 존재를 명시할 수 있지만, 하나 이상의 다른 특징, 정수, 단계, 동작, 요소, 구성 및/또는 그 그룹의 존재 또는 추가를 배제하지 않는다.

[0010] 본 발명의 실시예는 본 발명의 이상적인 실시 (및 매개 구조)를 개략적인 나타내는 도면을 참조하여 설명한다. 따라서 예를 들어 제조 기술 및/또는 허용오차의 결과로서 나타나는 형상에는 다양한 차이가 예상된다. 따라서, 본 발명의 실시예는 여기에서 설명된 특정 형상에만 국한되는 것으로 해석되어서는 아니되며, 예를 들어 제조 결과에서 발생하는 형상에서의 편차를 고려해야 한다.

[0011] 달리 정의되지 않은 한, 여기에 사용된 모든 용어(기술적 및 과학적 용어 포함)는 본 발명이 속하는 기술의 당업자에 의해 일반적으로 이해되는 것과 동일한 의미를 가진다. 또한 일반적으로 사용되는 사전에서 정의된 것과 같은 용어는 관련된 기술의 맥락에서 의미하는 것과 일치하며, 이상화되거나 과도하게 형식적인 의미로 여기에서 정의되지 않는 한, 이상화되거나 과도하게 형식적인 의미로 해석되지 않을 것이다.

[0012] 도 1은 양면 표시장치 조립체의 모범적인 실시예의 정면이 보이는 사시도이며, 단면선 A-A, B-B, 및 C-C를 표시하고 있다. 일반적으로 설명하면, 본 실시예는 서로 등을 맞대고 하우징(25) 내에 위치하는 2개의 표시장치(30, 31)를 포함한다. 흡기구(50)는 주변 공기(60)가 유입되어 하우징(25)을 통과하여 흐르게 한다. 주변 공기(60)가 배기구(55)를 통해 하우징(25)으로부터 배출되는 것이 바람직하다. 순환 가스(70)는 하우징(25) 내에서 폐루프로 흐르고, 주변 공기(60)와는 본질적으로 혼합되지 않는 것이 바람직하다. .

[0013] 여기에 사용된 바와 같이, 주변 공기(60)라는 용어는 단순히 주변 환경을 표시장치 조립체에 제공하는 일반적인 대기 공기를 의미한다. 상기 주변 공기(60)에는 먼지, 흙, 꽃가루, 수증기 및 기타 입자들뿐만 아니라 다양한 종류의 기체 원소가 혼합되어 있는 것으로 알려져 있다. 또한 여기서 사용된 바와 같이 순환 가스(70)는 기체 물질로서, 다양한 종류의 가스 혼합물이거나 또는 순수한 기체 물질을 의미할 수 있다. 순환 가스(70)에는 상당량의 먼지, 흙, 꽃가루 또는 기타 형태의 입자들이 포함되지 않는 것이 바람직하다.

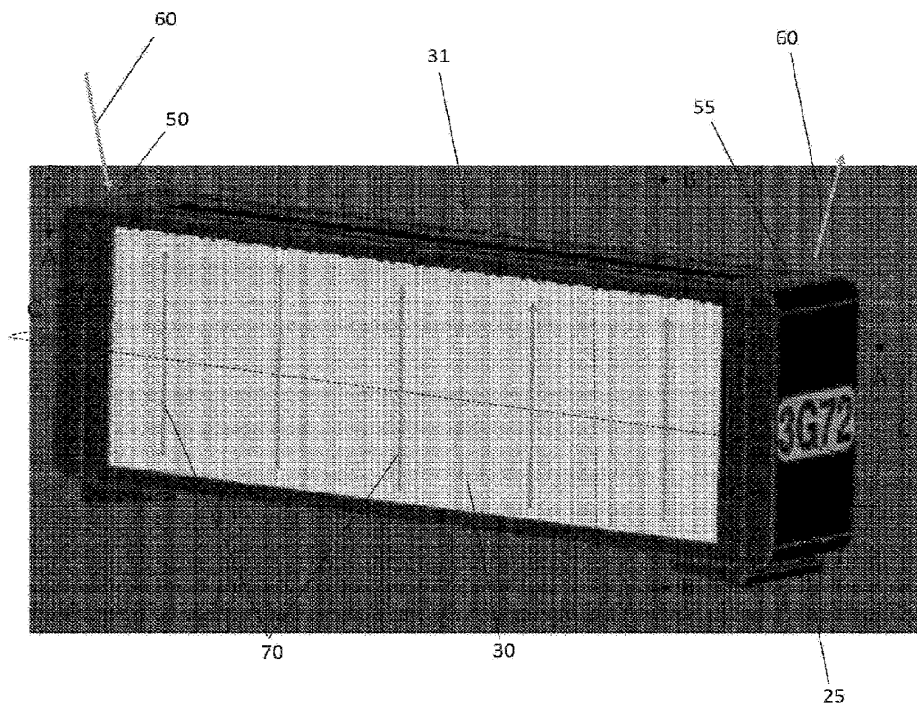
- [0014] 본 발명의 모범적인 실시에는 차량 장착용, 가급적이면 차량 지붕 장착용으로 구성될 수 있다. 하우징(25)은 차량 지붕 위에 장착할 수 있도록 크기가 특정될 수 있다. 또한 하우징(25)은 공기역학적 드래그(drag)를 최소화하도록 크기가 특정되고 개조될 수 있으며, 하우징(25)을 차량에 장착하기 위한 한쌍의 발(26, feet)을 포함할 수 있다. 상기 발(26)은 차량의 지붕에 고정되거나 차량 위 또는 내부에 배치된 내부 지지대에 고정되도록 크기가 특정되어 구성될 수 있다. 이러한 실시예에서, 하우징(25)은 가급적 얇고 둥근 모서리 및 공기역학적 드래그를 최소화하는 특징을 포함한다. 하우징(25)은 차량 이동에 의해 발생하는 힘을 수용하기 위해 구조적 강성 및 강도를 제공하는 다양한 강성 부재로 구성될 수 있다. 마찬가지로, 표시장치 조립체의 다양한 구성요소는 장착된 차량에 의해 야기되는 외력, 진동, 기타 충격을 견딜 수 있도록 구성될 수 있다. 예를 들어, 발(26) 및 표시장치 조립체의 다른 구성품은, 이에 제한되지는 않지만, 고무 패드 또는 다른 진동 및 충격 흡수 장치를 포함하여 구성될 수 있다.
- [0015] 도면에 도시된 바와 같이, 단면선 A-A는 조립체의 중심을 가로질러 수평으로 위치되고, 조립체를 수직 방향으로 절단한다. 단면선 B-B는 수직 방향으로 배향되어 있으며 조립체를 수평 방향으로 절단한다. 마지막으로 단면선 C-C는 수평 방향으로 배향되고 또한 조립체를 수평 방향으로 절단한다. 도 1의 단면선 화살표는 단면 형상을 얻기 위한 가상 절단의 방향을 나타낸다.
- [0016] 도 2는 도 1에 도시된 실시예의 측면 단면도로서, 단면선 A-A에 의해 얻어진 단면도이다. 주변 공기(60)는 흡기구(50)를 통해 하우징(25)에 들어갈 수 있으며, 그 후, 주변 공기는 입구 환기공간(entrance plenum)으로 향하고, 개루프 채널과 연결되는 복수의 입구공(200) 중 하나를 통과할 수 있다(아래에서 상세 설명). 주변 공기(60)는 바람직하게는 하나 이상의 팬(100)에 의해 당겨지지만, 팬(100)은 또한 주변 공기(60)를 밀기 위해 설치될 수 있거나 여러 팬을 사용하여 당기기/밀기의 조합을 만들 수 있다. 본 특징의 실시예에서는 팬(60)이 출구 환기공간(exit plenum) 근처에 위치하고, 주변 공기(60)는 다수의 출구공(201) 중 하나를 통과하여 개루프 채널로부터 수집되며, 이는 출구 환기공간 내에 모아지고, 배기구(55)를 통해 하우징(25)에서 빠져나간다.
- [0017] 아래에서 설명되는 바와 같이, 입구공(200)과 출구공(201)은 전자 표시장치(31) 뒤에서 작동하는 제1 개루프 채널과 기상 소통(gaseous communication)을 한다. 전자 표시장치(30) 뒤에서 작동하는 제2 개루프 채널과 기상 소통을 하는 다른 세트의 입구공과 출구공이 조립체의 반대편에 (도면에 보이지는 않지만) 설치되는 것이 바람직하다. 입구공(200)과 출구공(201)은 전자 표시장치(30, 31)의 폭에 걸쳐 서로 실질적으로 동일 거리에 분포되는 것이 바람직하다. 입구공(200)과 출구공(201)을 사용함으로써 주변 공기(60)가 순환 가스(70)와 실질적으로 혼합되거나 또는 밀폐된 전자부품 구획(125)에 들어가지 않고도 하우징(25) 및 개루프 채널을 통과할 수 있다.
- [0018] 순환 가스를 위한 페루프의 일부를 구성하는 밀폐된 전자부품 구획(125) 내에 다수의 전자 부품(110)이 배치되는 것이 바람직하다. 전자 부품(110)은 전원 모듈, 비디오 재생기, 전자 데이터 저장장치, 마이크로프로세서, 위성/무선 수신기/송신기, 및 타이밍과 제어용 보드 중의 하나 이상을 포함하여 구성된다. 전자 부품(110)의 적어도 일부는 표시장치(30, 31)와 전기적으로 연결되어 있을 수 있다.
- [0019] 하나 이상의 팬(90)이 전자 부품(110) 상부로 순환 가스(70)의 페루프를 강제할 수 있다. 두 개의 팬이 표시되어 있지만 이는 요구되는 사항이 아니다. 또한, 전자 부품(110) 상부로 순환 가스(70)를 밀어내는 것이 도시되어 있지만, 팬(90)이 순환 가스(70)를 당기도록 또한 위치될 수 있기 때문에 또는 다수의 팬(90)이 순환 가스(70)의 밀기/당기기 조합에 사용될 수 있기 때문에, 이는 요구되는 사항이 아니다.
- [0020] 도 3은 도 1에 도시된 실시예에서 단면선 B-B에 의해 얻어진 전면 단면도이다. 여기에서, 순환 가스(70)의 페루프가 명확하게 보일 수 있다. 상술한 바와 같이, 순환 가스(70)는 바람직하게는 밀폐된 전자부품 구획(125) 내의 전자 부품(110) 위로 이동하고, 그 후 분할되어 각각의 표시장치(30, 31)를 둘러싼다. 제1 표시장치(30)에 있어서, 투명 패널(35)은 바람직하게는 표시장치(30)의 전방에 위치되고 순환 가스(70)를 수용하기 위해서 표시장치(30)와 투명 패널(35) 사이에 페루프 채널을 형성한다. 순환 가스(70)는 표시장치(30)를 가로질러 이동하자마자, 밀폐된 전자부품 구획(125)으로 다시 들어가 폐쇄 루프를 다시 시작한다.
- [0021] 이와 유사하게, 제2 표시장치(31)와 관련되어, 투명 패널(36)이 바람직하게는 표시장치(31)의 전방에 배치되고, 표시장치(31)와 투명 패널(36) 사이에 순환 가스(70)를 수용하기 위한 페루프 채널을 형성한다. 순환 가스(70)는 표시장치(31)를 가로질러 이동하자마자, 밀폐된 전자부품 구획(125)으로 다시 들어가 페루프를 다시 시작한다.
- [0022] 도시된 바와 같이, 주변 공기(60)의 흐름은 적어도 두 개의 채널로 분할되는 것이 바람직하며, 각각의 표시장치 뒤에 하나의 개루프 채널이 있다. 표시장치(30)와 관련하여, 주변 공기(60)는 바람직하게는 표시장치(30)의 후

면과 밀폐된 전자부품 구획(125)의 열 벽(126, thermal wall) 사이 경로로 이동한다. 요구되지는 않지만, 직접(direct) LED 백라이트를 채용한 LCD를 표시장치(30)로 사용할 때, 주변 공기(60)는 LED 백라이트(40)의 후면과 열 벽(126) 사이를 이동하는 것이 바람직하다. 상술한 바와 같이, 다수의 전자 부품(110)은 열 벽(126, 127) 중 하나 또는 모두에 (또는 그 근처에) 부착되는 것이 바람직하다. 이러한 방법으로, 전자 부품(110)의 열은 벽(126, 127)으로 전달되고 (바람직하게는 전도(conduction)를 통해, 그러나 일부 대류 및 방사가 또한 발생할 수 있다), 주변 공기(60)의 흐름에 의해 제거될 수 있다.

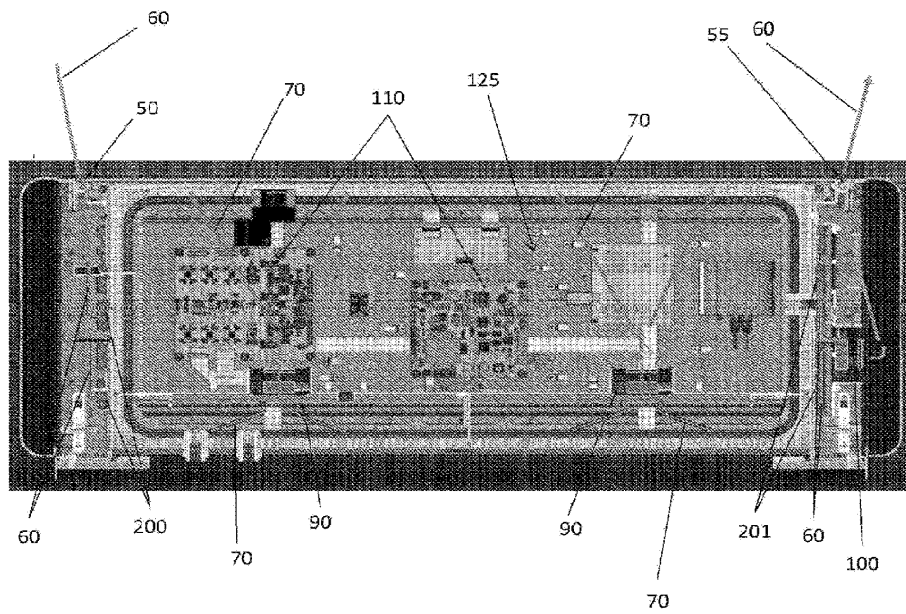
- [0023] 유사하게, 표시장치(31)에 있어서, 주변 공기(60)는 표시장치(31)의 후면과 밀폐된 전자부품 구획(125)의 열 벽 사이의 경로로 이동하는 것이 바람직하다. 요구되지는 않지만, 직접(direct) LED 백라이트를 채용한 LCD를 표시장치(31)로 사용할 때, 주변 공기(60)는 LED 백라이트(41)의 후면과 열 벽(127) 사이를 이동하는 것이 바람직하다. 본 실시예에서는 직접 LED 백라이트 LCD가 도시되지만 모든 실시예에서 이러한 표시장치 유형과 이와 관련된 백라이트가 필요하지 않다는 점을 분명히 주의해야 한다. 표시장치(30, 31)는 플라즈마, OLED, LCD (직접 점 등 또는 에지 점등), LED, 및 모든 유형의 전기 발광 폴리머 표시장치 중 하나가 될 수 있다.
- [0024] 도 4는 도 1에 도시된 실시예에서 단면선 C-C에 의해 얻어진 평면 단면도이며, 상세 A를 표시하고 있다. 상기 도 4에 있어서, 각각의 표시장치(30, 31) 뒤에 주변 공기(60)를 위한 2 개의 채널이 보여질 수 있다. 부연하면, 바람직하게는, 주변 공기(60)의 2 개의 경로는 전자 부품(110)뿐만 아니라 전자 표시장치(30, 31)로부터 (열 벽(126, 127)을 통해) 열을 제거할 수 있다.
- [0025] 도 5는 상세 A를 보여주는 상세 단면도이다. 주변 공기(60)는 각 개루프 채널을 통해 이동한 후 출구 환기공간에 모이고 팬(100)에 의해 표시장치 하우징(25)에서 강제 배출될 수 있다.
- [0026] 도 6은 도 1에 도시된 실시예를 부분 분해하여 보여주는 도면이다. 도면은 조립체의 한쪽 측면에 부품이 적층된 점을 보이는데, 예를 들면, 전자 표시장치(31)를 둘러싼 부품들의 적층된 형태를 보여준다. 주변 공기(60)는 바람직하게는 입구공(200)을 통해 안내되어, 열 판(thermal plate, 127)과 전자 표시장치(31)의 후면(본 실시예에서는 LED 백라이트(41)의 후면) 사이를 통과할 수 있다, 개루프 채널을 통과한 주변 공기(60)는 바람직하게 출구공(201) 밖으로 유도되어 출구 환기공간에 수집되고 표시장치 하우징에서 배출된다. 순환 가스(70)는 일반적으로 주변 공기(60)를 가진 개루프 채널을 둘러싼다. 즉, 개루프 주변 공기(60)는 순환 가스(70)의 페루프 중심을 통과한다.
- [0027] 상술한 바와 같이, 순환 가스(70)는 가압적 전자 부품(110) 위를 통과하여 밀폐된 전자부품 구획(125)을 지나 전면 투명 패널(36)과 전자 표시장치(31)의 전면 사이를 이동하며, 결국 밀폐된 전자부품 구획(125)으로 되돌아간다. 다시 한번 언급하면, 본 실시예의 절반만이 상기 부분 분해도에 도시된다. 상술한 바와 같이, 일반적으로 반대쪽 표시장치(30) 주변을 이동하는 순환 가스(70)의 제2 페루프가 있고, 표시장치(30) 뒤에 지나가는 주변 공기를 위한 제2 개루프 채널이 있을 것이다.
- [0028] 또한 도면에 표시된 다양한 냉각용 개루프 및 페루프는 수평 또는 수직 배열로 표시될 수 있지만, 특정 실시예에 따라 이 루프가 반전되거나 변경될 수 있다는 점을 분명히 고려해야 한다. 따라서 페루프는 수평 또는 수직으로 그리고 시계 방향 또는 반시계 방향으로 작동할 수 있다. 또한, 개루프는 수평 또는 수직일 수 있으며 왼쪽에서 오른쪽으로, 오른쪽에서 왼쪽으로, 그리고 위에서 아래로 또는 아래에서 위로 작동할 수 있다.
- [0029] 본 발명의 바람직한 실시예를 도시하고 설명함으로써, 본 발명이 속하는 기술분야에서 통상의 지식을 가진 자라면 본 발명의 기술적 사상을 일탈하지 아니하는 범위에서 다양한 변형 및 수정이 가능함을 알 수 있을 것이다. 또한, 상술된 구성 요소들 중 다수는 동일한 결과를 제공하며 본 발명의 기술적 사상에 속하는 다른 구성요소로 변경되거나 대체될 수 있다. 따라서, 청구 범위에 의해서만 본 발명을 제한하는 것이 목적이다.

도면

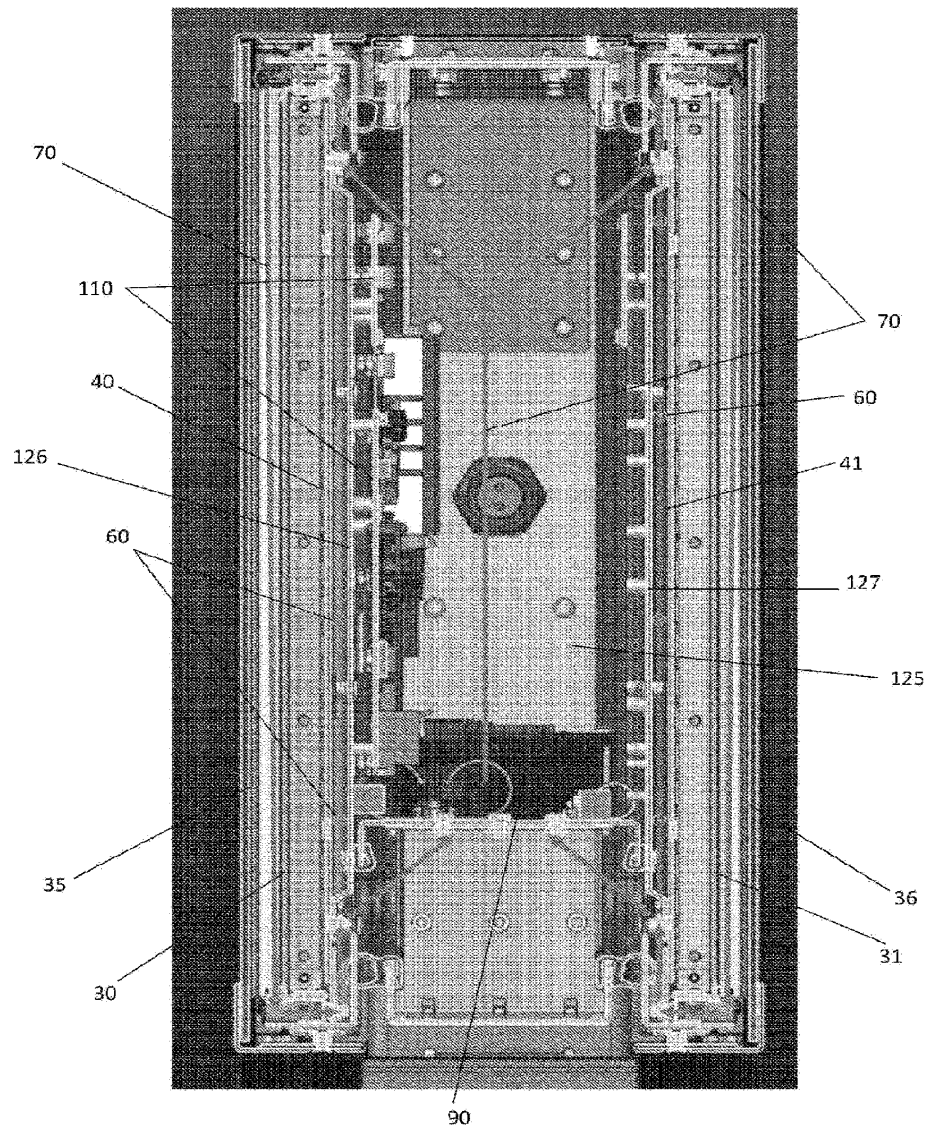
도면



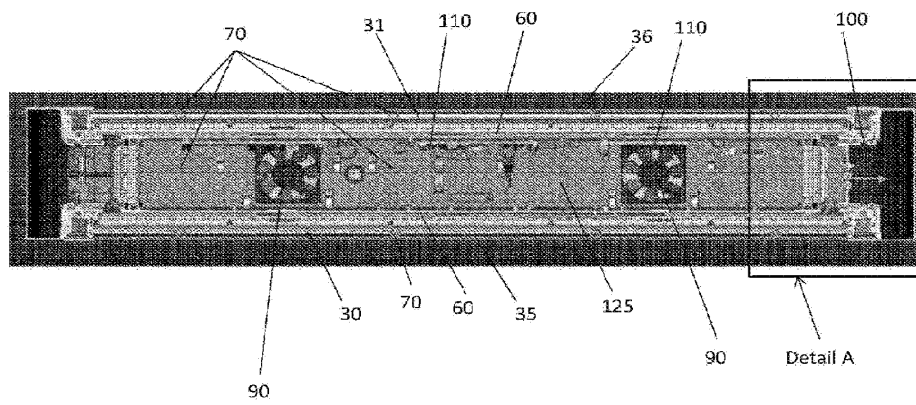
도면2



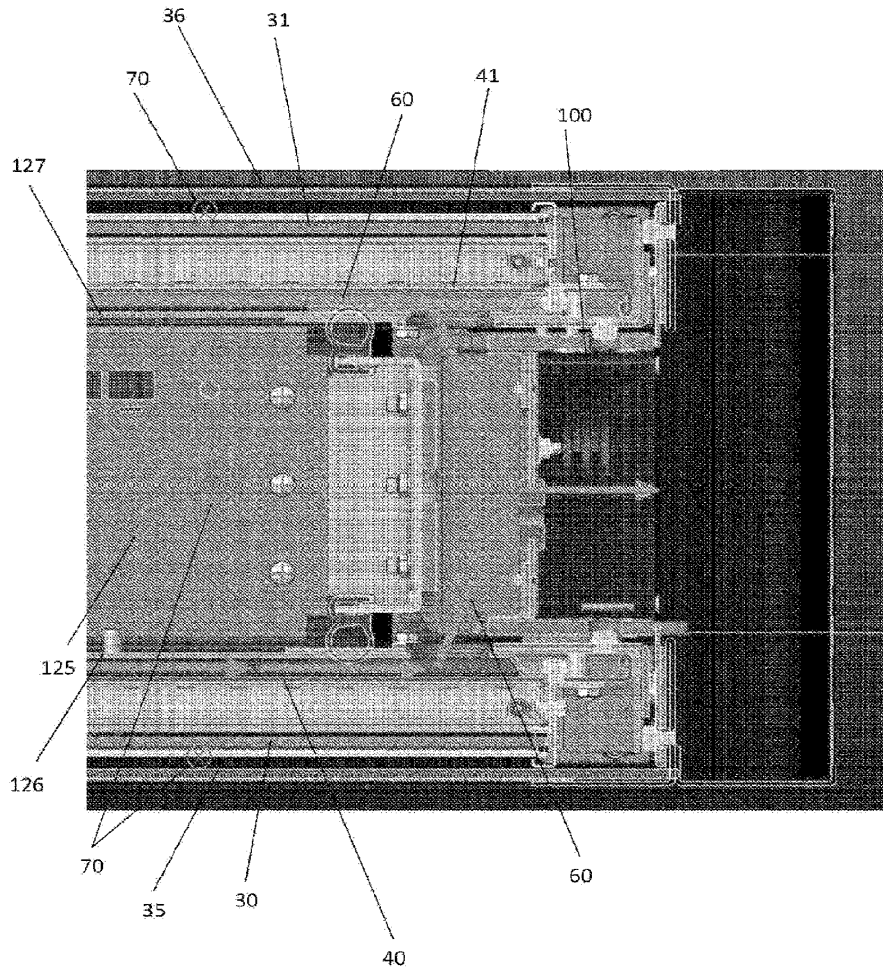
도면3



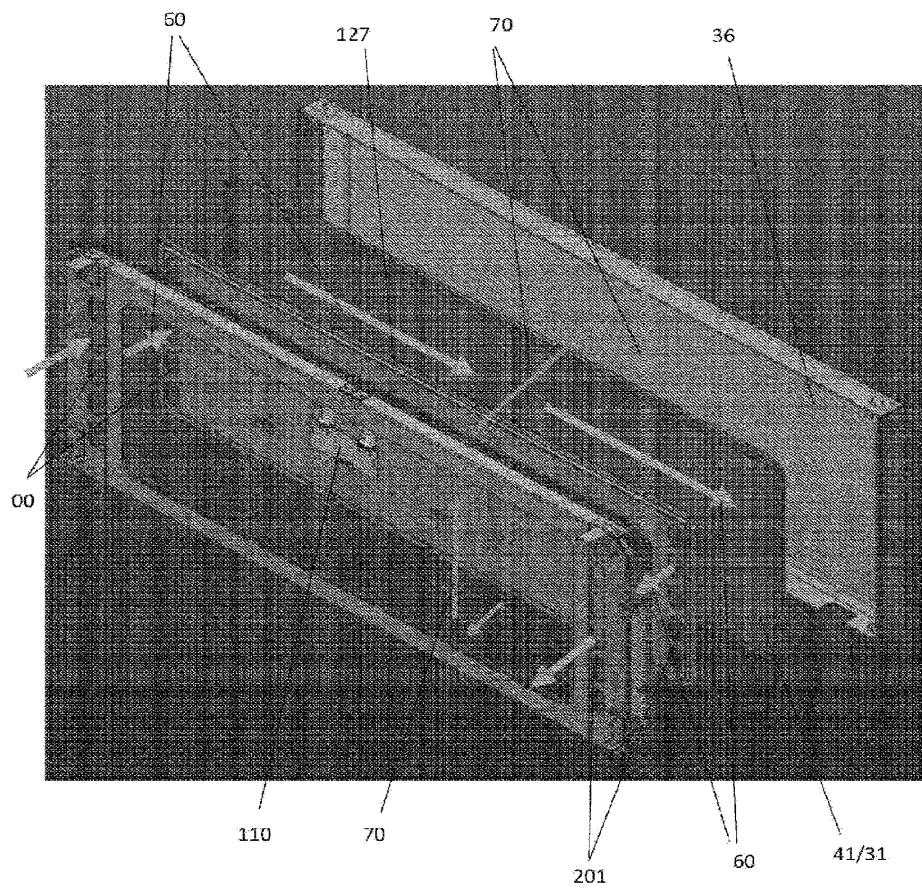
도면4



도면5

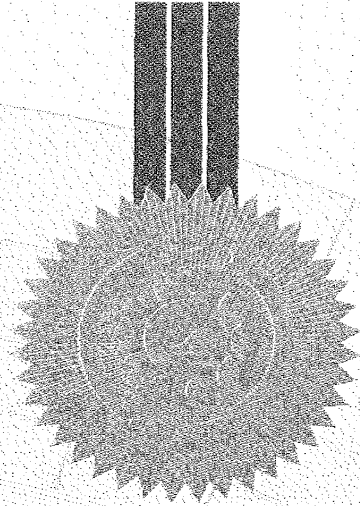


도면6



특허증

CERTIFICATE OF PATENT



특허

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전자 디스플레이용 외주 환기 시스템

특허권자 Patentee

매뉴팩처링 리소시스 인터내셔널 인코포레이티드

미국 조지아 30005 알파레타 실로 로드 이스트 6415

발명자 Inventor

데마스 라이언

미국 조지아 30005 알파레타 실로 로드 이스트 6415

위의 발명은 「특허법」에 따라 특허등록원부에 등록되었음을 증명합니다.

This is to certify that, in accordance with the Patent Act, a patent for the invention has been registered at the Korean Intellectual Property Office.



특허청

Korean Intellectual
Property Office

2020년 05월 04일

특허청장

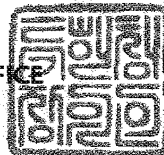
COMMISSIONER,

KOREAN INTELLECTUAL PROPERTY OFFICE

박원주



QR코드로 현재기준
등록사항을 확인하세요



[translation]

CERTIFICATE OF PATENT

PATENT NO.: 10-2109072

APPLICATION NO.: 10-2017-7026230

FILING DATE: September 18, 2017

REGISTRATION DATE: May 4, 2020

TITLE OF THE INVENTION: PERIMETER VENTILATION SYSTEM FOR
ELECTRONIC DISPLAY

PATENTEE: MANUFACTURING RESOURCES
INTERNATIONAL, INC.

INVENTOR(S): DEMARS, Ryan

DURATION: February 15, 2036

SPECIAL REMARKS:

- (1) The first three years' annuities were paid as the registration fee.
- (2) To maintain the patent right, you must pay the annuities covering the 4th through 16th year either annually before the expiration of the preceding years' annuity, or in a lump sum before such expiration.
- (3) It is our custom to give timely notice in all cases of the steps to be taken to maintain the patent right but we cannot be responsible for the consequences of omitting to do this.



Espacenet

KR102109072B1 전자 디스플레이용 외주 환기 시스템

Applicants: 매뉴팩처링 리소시스 인터내셔널 인코포레이티드

Inventors: 데마스 라이언

Classifications:

IPC **H05K7/20;**

CPC **H05K7/20972 (EP,US);**

Priorities: US201514624268A 2015-02-17; US2016017973W 2016-02-15

Application: KR102109072B1·2016-02-15

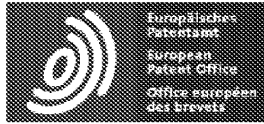
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전자 디스플레이용 외주 환기 시스템

Abstract

본 명세서에서 예시적인 실시예들은 전방 패널과 하우징에 의해 포워되는 전자 디스플레이를 구비하는 전자 디스플레이 조립체를 제공한다. 전방 패널의 외주의 일부 근처에 흡입 갭이 배치될 수 있고, 전방 패널의 외주의 반대편 부분의 근처에 배출 갭이 배치될 수 있다. 흡입 갭과 배출 갭의 사이에 버퍼 존이 형성될 수 있다. 개방 루프 유체가 흡입 갭으로 진입하도록 하여, 전자 디스플레이의 뒤에 있는 채널을 통과하고, 배출 갭으로 배출되게 유도하도록 배치될 수 있다. 이러한 팬은 개방 루프 유체를 선택적인 열 교환기를 통과하도록 유도할 수도 있다. 순환 팬이 순환 공기가 선택적인 열 교환기를 통과하도록 유도할 수 있다.

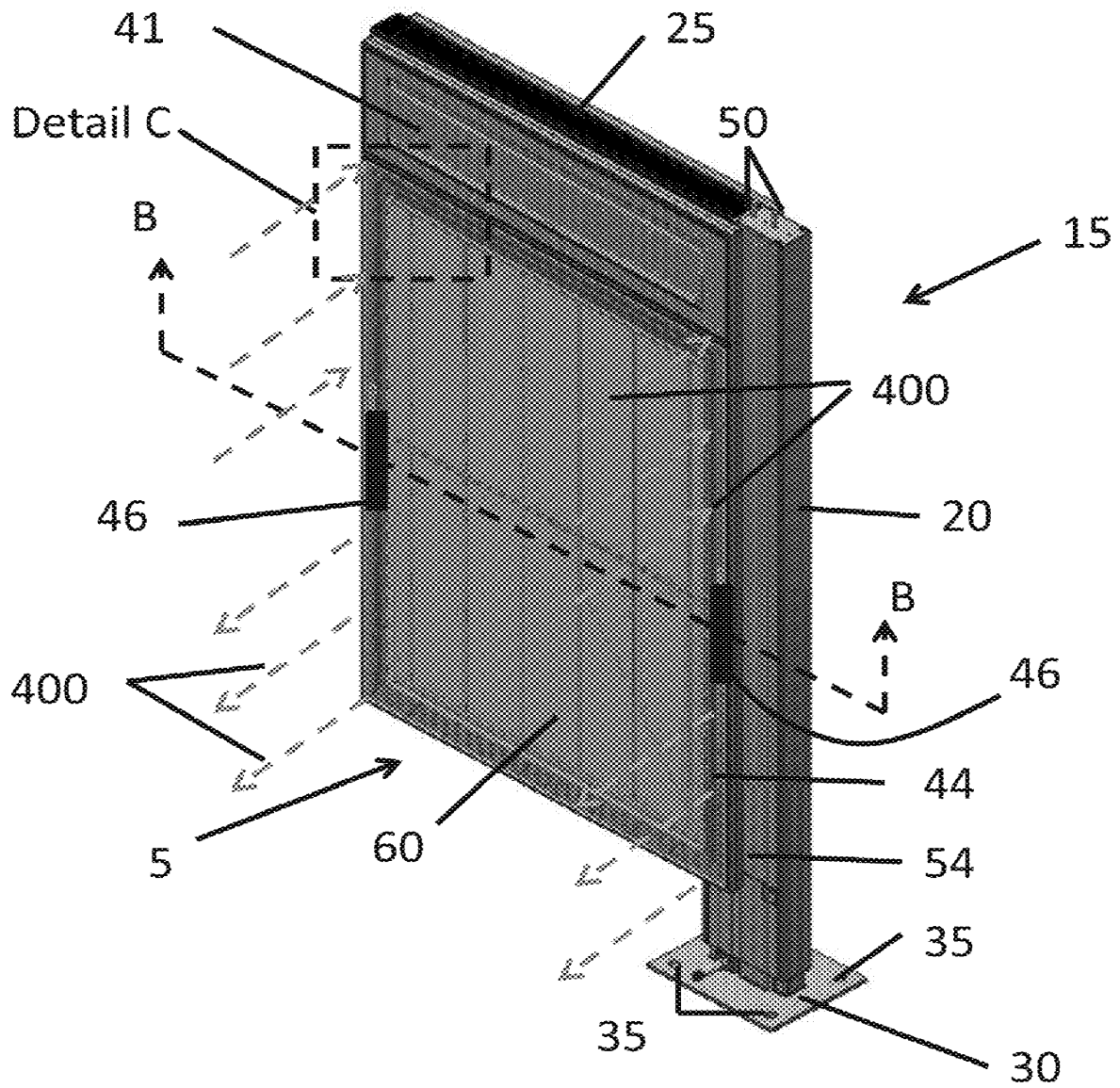


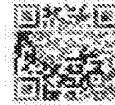
Notice

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ABSTRACT KR102109072

Exemplary embodiments herein provide an electronic display assembly having an electronic display surrounded by a front panel and a housing. An intake gap can be disposed near a portion of the outer periphery of the front panel, and an exhaust gap can be disposed near an opposite portion of the outer periphery of the front panel. A buffer zone may be formed between the suction gap and the discharge gap. It can be arranged to cause the open loop fluid to enter the intake gap, to pass through the channel behind the electronic display, and to lead to the exit gap. Such fans may direct open loop fluid through an optional heat exchanger. A circulation fan can direct the circulating air through an optional heat exchanger.





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WO2005/079129(2005.08.25.) 1부.*

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(73) 특허권자

매뉴팩처링 리소시스 인터내셔널 인코포레이티드

미국 조지아 30005 알파레타 싯로 로드 이스트

6415

(72) 발명자

테마스 라이언

미국 조지아 30005 알파레타 싯로 로드 이스트

6415

(74) 대리인

박장원

전체 청구항 수 : 총 9 항

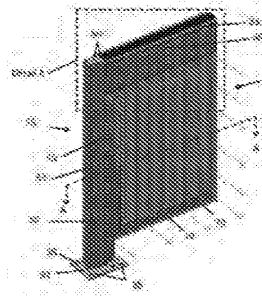
심사관 : 김기원

(54) 발명의 명칭 전자 디스플레이용 외주 환기 시스템

(57) 요약

본 명세서에서 예시적인 실시예들은 전방 패널과 하우징에 의해 포위되는 전자 디스플레이를 구비하는 전자 디스플레이 조립체를 제공한다. 전방 패널의 외주의 일부 근처에 흡입 잭이 배치될 수 있고, 전방 패널의 외주의 반대편 부분의 근처에 배출 잭이 배치될 수 있다. 흡입 잭과 배출 잭의 사이에 미퍼 존이 형성될 수 있다. 개방 루프 유체가 흡입 잭으로 진입하도록 하여, 전자 디스플레이의 뒤에 있는 패널을 통과하고, 배출 잭으로 배출되게 유도하도록 배치될 수 있다. 이러한 잭은 개방 루프 유체를 선택적인 열 교환기를 통과하도록 유도할 수도 있다. 순환 팬이 순환 공기가 선택적인 열 교환기를 통과하도록 유도할 수 있다.

도 1



(52) CPC특허분류
H05K 7/20164 (2013.01)

명세서

청구범위

청구항 1

전자 디스플레이;

전자 디스플레이를 위한 하우징;

하우징에서 전자 디스플레이의 전방에 위치되는 전방 채널로, 외주를 갖는 전방 채널;

상기 외주의 제1 수직 부분과 제1 수평 부분을 따라 배치되는, 주변 공기를 하우징 내로 흡입하기 위한 흡입 갭;

상기 외주의 제2 수직 부분과 제2 수평 부분을 따라 배치되는, 하우징으로부터 주변 공기를 배출하기 위한 배출 갭;

전자 디스플레이 위에 배치되는 채널;

흡입 갭으로부터 채널로 이동하는 개방 루프 유체에 대한 제1 가스 통로;

채널로부터 배출 갭으로 이동하는 개방 루프 유체에 대한 제2 가스 통로;

개방 루프 유체의 유동을 일으키도록 배치되는 팬;

흡입 갭과 배출 갭 사이에 배치되는 비퍼 영역;

비퍼 영역 내에 배치되는 중앙 격벽;

수직으로 배치되어, 제1 가스 통로의 적어도 일부분을 형성하는 제1 측부 채널;

수직으로 배치되어, 제2 가스 통로의 적어도 일부분을 형성하는 제2 측부 채널; 및

제1 측부 채널 내에 배치되는 채널 격벽;을 포함하는 것을 특징으로 하는 전자 디스플레이 조립체.

청구항 2

삭제

청구항 3

삭제

청구항 4

삭제

청구항 5

삭제

청구항 6

삭제

청구항 7

제1항에 있어서,

채널 격벽은 개방 루프 유체의 수직 유동을 실질적으로 방지하는 것을 특징으로 하는 전자 디스플레이 조립체.

청구항 8

제1항에 있어서,

흡입 캡과 배출 캡은 전자 디스플레이의 예정된 시청자를 향하는 것을 특징으로 하는 전자 디스플레이 조립체.

청구항 9

전자 디스플레이;

전자 디스플레이를 위한 하우징;

전자 디스플레이의 예정된 시청자를 향하도록 배치되는 하우징의 흡입 캡;

전자 디스플레이의 예정된 시청자를 향하도록 배치되는 하우징의 배출 캡;

전자 디스플레이 뒤에 배치되는 채널;

수직으로 배치되어, 흡입 캡과 채널 사이의 기체 연통을 허용하는 제1 측부 채널;

수직으로 배치되어, 채널과 배출 캡 사이의 기체 연통을 허용하는 제2 측부 채널;

개방 루프 유체가 흡입 캡으로 진입하여, 제1 측부 채널을 통과하고, 채널을 통과하고, 제2 측부 채널을 통과하여, 배출 캡 밖으로 유동하도록 배치되는 팬;

흡입 캡과 배출 캡 사이에 배치되는 비퍼 영역;

비퍼 영역과 동일한 수직 높이에 배치되는 중앙 격벽;

개방 루프 유체를 위한 제1 통로와 순환 가스를 위한 제2 통로를 포함하는 열 교환기;

순환 가스가 열 교환기를 통과하게 유도하도록 배치되는 순환 팬; 및

제1 측부 채널 내에 배치되는 채널 격벽을 포함하는 것을 특징으로 하는 전자 디스플레이 조립체.

청구항 10

삭제

청구항 11

삭제

청구항 12

삭제

청구항 13

삭제

청구항 14

제9항에 있어서,

채널은 LED 백라이트와 플레이트 사이 공간에 의해 형성되는 것을 특징으로 하는 전자 디스플레이 조립체.

청구항 15

제9항에 있어서,

흡입 캡은 조립체의 제1 수직 절단부에 배치되고, 배출 캡은 조립체의 반대편 수직 절단부에 배치되는 것을 특징으로 하는 전자 디스플레이 조립체.

청구항 16

제9항에 있어서,

제1 측부 채널로부터 개방 루프 유체를 수용하여, 전자 디스플레이 뒤에 있는 채널을 향하도록 하는, 전자 디스

플레이 위에 있는 도어 공동을 추가적으로 포함하는 것을 특징으로 하는 전자 디스플레이 조립체.

청구항 17

전자 디스플레이;

전방 패널;

상기 전방 패널과 함께 전자 디스플레이를 둘러싸는 하우징;

전자 디스플레이의 수직 중심보다 위에 배치되고, 전방 패널과 하우징의 사이에 배치되는 흡입 집;

전자 디스플레이의 수직 중심보다 아래에 배치되고, 전방 패널과 하우징의 사이에 배치되는 배출 집;

개방 루프 유체를 위한 제1 통로 및 순환 가스를 위한 별도의 제2 통로를 구비하는 열 교환기로, 제1 통로에 있는 개방 루프 유체가 제2 통로에 있는 순환 가스와 혼합되는 것을 방지하도록 구성되는, 열 교환기;

순환가스가 열 교환기를 통과하게 유도하도록 배치되는 순환 팬;

흡입 집과 배출 집 사이에, 그리고 전자 디스플레이의 수직 중심에 배치되는 중앙 격벽;

개방 루프 유체가 흡입 집으로 유입되고, 열 교환기를 통과하여, 배출 집으로 배출되도록 배치되는 팬;

수직으로 배치되어, 흡입 집과 열 교환기 사이에 기체 연통을 허용하는 제1 측부 채널;

수직으로 배치되어, 열 교환기와 배출 집 사이에 기체 연통을 허용하는 제2 측부 채널;

제1 측부 채널 내에 배치되는 제1 측부 채널 격벽; 및

제2 측부 채널 내에 배치되는 제2 측부 채널 격벽;을 포함하는 것을 특징으로 하는 전자 디스플레이 조립체.

청구항 18

삭제

청구항 19

삭제

청구항 20

제17항에 있어서,

제1 측부 채널 격벽과 제2 측부 채널 격벽은 실질적으로 개방 루프 유체의 수직 유동을 차단하는 것을 특징으로 하는 전자 디스플레이 조립체.

발명의 설명

기술 분야

[0001] 본 출원은 2015년 2월 17일에 출원된 미국특허출원 제14/624,268호의 우선권을 주장하며, 이는 본 명세서에 그 전체가 참조로써 인용된다.

[0002] 본 발명의 실시예들은 일반적으로 전자 디스플레이용 장착 및 냉각 시스템에 관한 것이다.

배경 기술

[0003] 전자 디스플레이는 때때로 속의 환경 또는 주위 온도가 높은 영역, 예컨대 태양 복사열(solar loading)과 같이 디스플레이 내 온도를 상승시키는 열원이 존재할 수 있는 영역에서 사용된다. 하지만, 디스플레이의 어떤 부분은 냉각시키기 어려울 수 있는데, 이는 단순회 주변 공기를 디스플레이의 일부에 흡입(ingest)하면, 디스플레이의 민감한 부분에 먼지 및 오염물이 유입되어 조기 고장을 초래할 수 있기 때문이다.

발명의 내용

[0004] 예시적인 실시예들은 디스플레이 조립체와 자립형 디스플레이 하우징을 포함할 수 있다. 디스플레이 조립체는

자립형 디스플레이 하우징 내에 장착될 수 있다. 디스플레이 조립체는 전방 패널의 외주를 따라 배치되는 흡입 겹과 전방 패널의 외주의 반대 부분을 따라 배치되는 배출 겹을 포함할 수 있다. 개방 루프 유체가 흡입 겹으로 진입하고, 전자 디스플레이의 뒤에 있는 채널을 통과하여, 배출 겹으로 배출되도록 유도하기 위해 팬이 배치될 수 있다.

[0005] 개방 루프 유체가 선택적인 열 교환기를 통과하도록 유도하는데 동일한 팬 또는 추가적인 팬이 사용될 수 있다. 폐쇄 루프 유체를 열 교환기에서 순환시키는데 추가적인 순환 팬이 사용될 수 있다.

[0006] 흡입 겹과 배출 겹 사이에 머퍼 영역이 배치될 수 있으며, 머퍼 영역은 일단 개방 루프 유체가 하우징 내에 흡입되면 개방 루프 유체의 수직 유동을 실질적으로 제한 또는 방해하는 하나 이상의 격벽을 포함하는 것이 바람직하다. 격벽들은 일반적으로 디스플레이 조립체의 수직 중심의 근처에 수평으로 배치된다. 하지만, 이는 필수적인 것은 아니다.

도면의 간단한 설명

[0007] 전술한 특징을 외에도, 본 발명의 다른 양태들이 도면들과 아래의 예시적 실시예들에 대한 설명에 의해 명백해질 것이다. 여기서 유사한 참조번호는 동일하거나 동등한 특징을 지칭한다.

도 1은 자립형 하우징에 수용된 전자 디스플레이 조립체의 예시적 실시예에 대한 전방 사시도이며, 단면선 A-A와 상세부 A를 나타낸다.

도 2는 도 1에 도시된 실시예의 정면도이며, 상세부 N을 나타낸다.

도 3은 도 2에 도시된 상세부 N에 대한 상세 정면도이다.

도 4는 도 1의 예시적 실시예의 후방 사시도이며, 단면선 B-B와 함께 상세부 C를 나타낸다.

도 5는 전방 패널이 제거된 도 1에 도시된 상세부 A의 전방 사시도이다.

도 6은 후방 패널이 제거된 도 1에 도시된 예시적 실시예의 후방 사시도이며, 상세부 D와 상세부 E를 나타낸다.

도 7은 도 1의 단면선 A-A를 따라 취한 일부 사시 단면도이며, 상세부 F를 나타낸다.

도 8은 도 7에 도시된 단면의 상세부 F를 평면 단면도이다.

도 9는 도 4의 단면선 B-B를 따라 취한 저면 사시 단면도이며, 상세부 K를 나타낸다.

도 10은 도 9에 도시된 상세부 K의 저면 단면도이며, 상세부 L을 나타낸다.

도 11은 도 1에 도시된 예시적 실시예의 정면도이며, 단면선 F-F, G-G 및 H-H를 나타낸다.

도 12a는 도 11의 단면선 F-F를 따라 취한 평면 단면도이며, 상세부 O 및 상세부 P를 나타낸다.

도 12b는 도 11의 단면선 G-G를 따라 취한 평면 단면도이며, 상세부 Q를 나타낸다.

도 12c는 도 11의 단면선 H-H를 따라 취한 평면 단면도이며, 상세부 R을 나타낸다.

도 13a는 도 12a의 상세부 O에 대한 평면 상세 단면도이다.

도 13b는 도 12b의 상세부 Q에 대한 평면 상세 단면도이다.

도 13c는 도 12c의 상세부 R에 대한 평면 상세 단면도이다.

도 14는 도 12a의 상세부 P에 대한 평면 상세 단면도이다.

도 15는 자립형 하우징이 제거된 상태로 도시되는, 도 6에 도시된 상세부 D에 대한 후방 사시도이다.

도 16은 도 4에 도시된 상세부 C에서 주변 구성요소들로부터 격리되는 후방 패널에 대한 전방 사시도이다.

도 17은 도 10의 도시된 상세부 L의 저면 단면도이다.

도 18은 도 6에 도시된 상세부 E를 자립형 디스플레이 하우징이 제거하여 나타낸 후방 사시도이다.

도 19a는 자립형 디스플레이 하우징이 제거되어 도시되는 도 1의 조립체에 대한 후방 사시도이며, 상세부 S를 나타낸다.

도 19b는 자립형 디스플레이 하우징과 전방 패널이 제거되어 도시되는 도 1의 조립체에 대한 전방 사시도이며,

상세부 T를 나타낸다.

도 20은 도 19a에 도시된 상세부 S의 후방 사시 상세도이다.

도 21은 도 19b에 도시된 상세부 T의 전방 사시 상세도이다.

도 22는 도 4의 절단선 B-B를 따라 취한 측면 사시 단면도이다.

도 23은 도 1의 조립체에서, 후방 패널, 자립형 디스플레이 하우징 및 디스플레이 조립체의 선택 부분을 나머지 모든 주변 구성요소로부터 격리시킨 전방 사시도이다.

도 24는 도 1의 조립체에서, 후방 패널과 디스플레이 조립체의 선택 부분을 나머지 모든 주변 구성요소로부터 격리시킨 것을 도시하는 평면도이며, 상세부 M을 나타낸다.

도 25는 도 23에 도시된 상세부 M의 전방 사시도이다.

도 26a는 자립형 디스플레이 하우징과 디스플레이 조립체의 선택 부분을 나머지 모든 주변 구성요소로부터 격리시켜 도시된 격벽에 대한 전방 사시도이다.

도 26b는 자립형 디스플레이 하우징과 디스플레이 조립체의 선택 부분을 나머지 모든 주변 구성요소로부터 격리시켜 도시된 격벽에 대한 또 다른 전방 사시도이다.

발명을 실시하기 위한 구체적인 내용

[0008] 이하에, 본 발명의 예시적인 실시예들이 도시된 첨부된 도면들을 참조하여, 보다 상세하게 본 발명이 설명된다. 하지만, 본 발명은 많은 다양한 형태로 구현될 수 있으며, 본 명세서에서 설명되는 예시적인 실시예들에 제한되는 것으로 해석되어서는 안된다. 오히려, 이들 실시예들은 본 개시가 철저하고 완전하게 이루어질 수 있도록 제공되며, 본 발명의 범위를 통상의 기술자에게 충분히 전달할 것이다. 도면에서, 중 및 영역의 크기와 상대적인 크기는 명확성을 위해 과장될 수 있다.

[0009] 본 명세서에서 사용된 용어는 특정 실시예들을 설명하기 위한 것일 뿐이며, 본 발명을 제한하려는 것은 아니다. 하지만, 본 명세서에 사용되는 단어 형태는 문맥상 따로 명확하게 명시되지 않는 한, 복수 형태를 포함하도록 의도된다. "포함한다" 및/또는 "포함하는"이라는 용어는 본 명세서에서 사용될 때, 명시된 특정, 정수, 단계, 동작, 요소를 및/또는 구성요소들의 존재를 나타내지만, 하나 이상의 다른 특정, 정수, 단계, 동작, 요소, 구성 요소 및/또는 이들의 그룹의 존재 또는 추가를 배제하지 않는 것으로 이해된다.

[0010] 본 발명의 실시예들은 본 발명의 이상적인 실시예들(및 중간 구조)을 개략적으로 도시하는 도면들을 참조하여 본원에 설명된다. 이와 같이, 예를 들어 제조 기술 및/또는 오차의 결과로, 도면들의 형상으로부터 변형될 수 있음을 알아야 한다. 따라서, 본 발명의 실시예들은 본 명세서에 도시되는 특정 영역의 형상에 제한되는 것으로 해석되어서는 안된다. 하지만, 본 발명의 실시예들은 예를 들어 제조로부터 초래되는 형상의 편차를 포함해야 한다.

[0011] 따로 정의되지 않는 한, 본 명세서에 사용되는 모든 용어들(기술 용어 및 과학 용어 포함)은 본 발명이 속하는 기술 분야의 통상의 기술자가 일반적으로 이해하는 것과 동일한 의미를 갖는다. 예컨대 일반적으로 사용되는 사전에서 정의되는 것과 같은 용어들은 관련 기술의 맥락에서의 의미와 일치하는 의미를 갖는 것으로 해석되어야 하며, 본 명세서에서 명백하게 정의하지 않는 한 최적화되거나 지나치게 문어적인 의미로 해석되지 않아야 한다.

[0012] 도 1은 전자 디스플레이 조립체(5)(이하, "조립체"라고 함)의 예시적인 실시예이다. 전자 디스플레이 조립체(5)는 조립체(5)의 전면의 대부분을 덮을 수 있는 전방 패널(10)을 포함한다. 전방 패널(10)은 투명하고, 바람직하게는 전방 패널(10)의 뒤에 고정되는 전자 디스플레이(70)의 앞에 배치될 수 있다. 예시적인 실시예에서, 전방 패널(10)은 터치 스크린이다. 외주 벽(55)은 전방 패널(10)을 둘러쌀 수 있다.

[0013] 자립형 디스플레이 하우징(15)이 조립체(5)를 둘러쌀 수 있으며, 조립체(5)를 저면에 부착하도록 구성될 수 있다. 예시적인 실시예에서, 자립형 디스플레이 하우징(15)은 깃발 형상이다. 또 다른 실시예에서, 자립형 디스플레이 하우징(15)은 버스 정류장에 통합될 수 있도록 크기 및 구성될 수 있다.

[0014] 자립형 디스플레이 하우징(15)은 기둥(20), 상부 빔(25)(beam) 및 기부(30)를 포함할 수 있다. 예시적인 실시예에서, 기부(30)는 예컨대 원형 홀과 같은 선택 개구(35)를 포함할 수 있으며, 예컨대 볼트와 같은締固裝置가 통과할 수 있도록 하여 저면에 기부(30)를 부착한다. 도시된 개구들(35)의 수 및 위치는 예시일 뿐이다. 자립형

디스플레이를 지면에 부착하기 위해 기둥(20)의 바닥 부가 지면에 매립될 수 있다. 일부 실시예에서, 이러한 매립은 상기 기둥(20)의 바닥 부를 콘크리트로 매립함으로써 달성될 수 있다. 자립형 디스플레이 하우징(15) 및 관련 구성요소들은 예컨대 스테인리스 강 또는 알루미늄과 같은 금속으로 구성될 수 있다.

[0015] 상부 빔(25)은 상부 빔(25)의 한쪽 면을 대부분 덮는 2차 디스플레이(40)를 추가적으로 포함할 수 있다. 예시적인 실시예에서, 이러한 2차 디스플레이(40)는 액정 디스플레이(LCD)이다. 다른 실시예에서, 2차 디스플레이(40)는 예컨대 백라이트와 같은 조명 장치와 예컨대 포스터와 같은 정적 디스플레이를 수용하기 위한 공동을 포함하는 정적 디스플레이일 수 있다.

[0016] 한 쌍의 세장형 부재(50)가 기둥(20)의 상부로부터 연장할 수 있다. 세장형 부재(50)는 자립형 디스플레이 하우징(15)을 더 고정하여 조립체(5)를 그 자리에 고정하도록 구성될 수 있다. 임의의 수 및 형상의 세장형 부재(50)가 고려된다. 예시적인 실시예들에서, 이러한 세장형 부재들(50)은 비스 속감장과 통할 수 있는 크기로 구성될 수 있다.

[0017] 후속하는 도면들에서 보다 상세하게 설명되는 바와 같이, 조립체(5)는 외주 벽(55)과 전방 패널(10) 사이에, 예컨대 주변 공기와 같은 유체가 조립체(5) 내외로 유동할 수 있도록 구성되는 챔(45)을 추가적으로 포함할 수 있다. 예시적인 실시예에서, 조립체(5)는 유동 라인으로 도시된 바와 같이, 조립체(5)의 상부 절반부는 유체가 흡입될 수 있도록 구성되고, 조립체(5)의 하부 절반부는 상기 유체가 배출될 수 있도록 구성될 수 있다. 이는 예시일 뿐이며, 다른 실시예들에서 조립체(5)의 상부 절반부는 유체의 배출을 허용하고, 조립체(5)의 하부 절반부는 상기 유체의 흡입을 허용하도록 구성될 수 있다.

[0018] 도 2 및 도 3은 상세하게 나타내기 위해 확대되고 크로스 해칭 영역으로 표시된, 조립체(5)의 외주를 따라 연장하는 챔(45)을 도시한다. 챔(45)은 비퍼 영역(46)을 추가적으로 포함할 수 있다. 비퍼 영역(46)은 바람직하게는 챔(45)의 흡입부 및 배출부 사이의 영역으로, 외부 공기의 유동을 허용하지 않는 영역일 수 있다. 다른 실시예에서, 비퍼 영역(46)은 외부 공기의 유동을 실질적으로 제한할 수 있다. 예시적인 실시예에서, 챔(45)은 전방 패널(10)의 외주 주위에 배치되지만, 비퍼 영역(46) 내에는 배치되지 않는다. 일 실시예에서, 비퍼 영역(46)은 디스플레이 조립체(5)의 수직 중심선 근처에 위치하고, 보편적으로 조립체(5)의 우측에는 제1 비퍼 영역이 있고, 조립체(5)의 좌측에는 제2 비퍼 영역이 있다.

[0019] 도 4에서, 조립체(5)는 조립체(5)의 배면의 대부분을 덮는 후방 패널(60)을 추가적으로 포함할 수 있다. 후방 외주벽(54)이 후방 패널(60)의 측면들을 둘러쌀 수 있다. 예시적인 실시예들에서, 후방 외주벽(54)은 외주벽(55)과 실질적으로 동일할 수 있다. 상부 빔(25)은 백라이트와 그래픽을 포함할 수 있는, 2차 디스플레이(40)와 유사한 3차 디스플레이(41)를 추가적으로 포함할 수 있다. 예컨대 백라이트와 같은 조명 유닛이 후방 패널(60)의 뒤에 배치될 수 있다. 후방 패널(60)의 배면 뒤에 공동이 위치할 수 있으며, 공동은 후방 패널(60) 내에 또는 뒤에 배치되는 예컨대 포스터와 같은 정적 디스플레이를 수용하도록 구성될 수 있다. 대안적인 실시예들에서, 전자 디스플레이 조립체(예컨대 LCD)가 후방 패널(60)의 뒤에 배치될 수 있다.

[0020] 도 1과 유사하게, 후속하는 도면들에서 보다 상세하게 설명되는 바와 같이, 조립체(5)는 후방 외주벽(54)과 후방 패널(60) 사이에, 예컨대 주변 공기와 같은 유체가 조립체(5) 내외로 유동할 수 있도록 구성되는 배면 챔(44)을 추가적으로 포함할 수 있다. 예시적인 실시예들에서, 조립체(5)는 유동 라인으로 도시된 바와 같이, 조립체(5)의 상부 절반부는 유체를 흡입할 수 있도록 구성되고, 조립체(5)의 하부 절반부는 상기 유체를 배출할 수 있도록 구성될 수 있으며, 이는 역전될 수 있다.

[0021] 본 발명의 예시적인 실시예들에서, 예컨대 상부 가장자리 및 하부 가장자리와 같이 후방 챔(44)의 선택된 부분을 따라서 개방 루프 유체(400)의 흡입 및 배출이 수행되지 않을 수 있다. 다른 실시예에서, 개방 루프 유체(400)의 흡입 및 배출은 비퍼 영역(46)을 제외한, 후방 챔(44)의 전체를 따라서 수행될 수 있다.

[0022] 도 5는, 전방 패널(10)이 제거되어, 전방 패널(10) 뒤 외주벽(55) 내에 부착될 수 있는 전자 디스플레이(70)가 드러나 있는 것을 도시한다. 조립체(5)는 전자 디스플레이(70) 위에, 디스플레이(70)와 2차 디스플레이(40) 사이에 배치되는 일련의 흡입 개구(65)를 추가적으로 포함할 수 있다. 도시된 흡입 개구들(65)은 예시적인 것일 뿐이며, 임의의 수 및 형상의 흡입 개구들(65)이 고려된다. 흡입 개구들(65)은, 예컨대 주변 공기와 같은 유체가 전자 디스플레이(70) 뒤로 유동하는 개방 루프로의 흡입을 용이하게 하도록 구성될 수 있다. 한 쌍의 측부 내부 채널(21, 22)이 전자 디스플레이(70)의 각각의 측면의 길이의 대부분으로 연장할 수 있다.

[0023] 도 6은, 후방 패널(60)이 제거되어, 후방 패널(60) 뒤에 고정되는 내부 후방 패널(80)이 드러나 있는 것을 도시한다. 내부 후방 패널(80)은 조립체(5)의 배면의 대부분을 덮을 수 있다. 조립체(5)는 내부 후방 패널(80)의 위,

배로는 후방 외주벽(54) 내에 위치하는 일련의 후방 흡입 개구(75)를 포함할 수 있다. 도시된 후방 흡입 개구들(75)은 예시적인 것일 뿐이며, 임의의 수 및 크기의 상기 개구들(75)이 고려된다. 후속하는 도면들에서 보다 상세하게 설명되는 바와 같이, 개구들(75)은 개방 루프 유체의 흡입을 용이하게 하도록 구성될 수 있다.

[0024] 유사하게, 조립체(5)는 내부 후방 패널(80) 아래에, 배로는 후방 외주벽(54) 내에 위치하는 일련의 후방 배출 개구(85)를 추가적으로 포함할 수 있다. 도시된 후방 배출 개구들(85)은 예시적인 것일 뿐이며, 임의의 수 및 형상의 후방 배출 개구들(85)이 고려된다. 후속하는 도면들에서 보다 상세하게 설명되는 바와 같이, 후방 배출 개구들(85)은 개방 루프 유체의 배출을 용이하게 하도록 구성될 수 있다. 선택적인 팬들(81)이 내부 후방 패널(80)의 뒤, 후방 배출 개구들(85)의 위에 부착될 수 있다. 팬들(81)은 개방 루프 유체의 유동을 제어하도록 구성될 수 있다. 임의의 수의 팬(81)이 고려된다. 다른 실시예들에서, 팬들(81)은 개방 루프 유동 경로를 따라 임의의 수의 위치에, 또는 흡입 개구들(75) 및 배출 개구들(85) 사이의 임의의 위치에 위치될 수 있다.

[0025] 도 7 및 도 8은 조립체(5) 및 자립형 디스플레이 하우징(15)의 하부 절편부를 도시한다. 기둥(20)의 반대 측에는 측면 빔(90)이 위치될 수 있고, 측면 빔(90)은 조립체(5)의 길이의 대부분으로 연장할 수 있다. 측면 빔(90)은 금속으로 구성될 수 있으며, 조립체(5)에 구조적 지지 및 강성을 제공하도록 구성될 수 있다. 조립체(5)의 내부에 전자 공동(16)이 배치될 수 있다. 전자 공동(16) 내에 또는 전자 공동(16)의 근처에 선택적인 열 교환기(100)가 부착될 수 있다. 예시적인 실시예에서, 열 교환기(100)는 적외선식 열교환기일 수 있지만, 다른 유형의 열 교환기, 특히 액류식 열교환기 등이 사용될 수 있다. 전자 공동(16) 내에는 일련의 전자 부품들(105)도 부착될 수 있다. 후속하는 도면들에서 보다 상세하게 설명되는 바와 같이, 예컨대 외부 공기와 같은, 개방 루프 유체(400)는 열 교환기(100)를 통해 순환할 수 있다. 예컨대 순환 가스(700)와 같은 폐쇄 루프 유체는 전자 공동들을 통해서뿐만 아니라, 전자 부품들(105)을 지나, 전자 부품들(105)을 통해, 그리고 열 교환기(100)를 통해서도 순환할 수 있다.

[0026] 후속하는 도면들에서 보다 상세하게 설명되는 바와 같이, 본 실시예에서 개방 루프 유체(400)는 챔(45) 및 선택적인 후방 챔(44)을 통해 배출될 수 있다. 유동 라인으로 표시된 바와 같이, 개방 루프 유체는 우측 채널(19)로부터 조립체(5)의 밖으로 지그재그 경로를 따를 수 있다. 대안적으로, 다른 형상의 경로가 사용될 수 있으며, 명시적으로 고려된다.

[0027] 전자 디스플레이(70)로서 액정 디스플레이를 사용할 때, 전자 디스플레이(70)의 뒤에 백라이트(106)이 배치될 수 있으며, 백라이트(106)은 직접 조명 LED 백라이트인 것이 바람직하다. 하지만, 예시적인 실시예들과 함께 다른 조명원이 사용될 수 있다. 개방 루프 유체(400)를 수송하는 채널(102)을 생성하기 위해, 백라이트(106) 뒤에 증배이트(104) 또는 다른 실질적으로 평평한 물체가 배치될 수 있다. 채널(102)은, 개방 루프 유체(400)가 디스플레이 조립체의 다른 부분, 특히 전자 구획부(16)로 진입하는 것을 방지하기 위해 밀봉되는 것이 바람직하다.

[0028] 도 9 및 도 10은 조립체(5)와 자립형 디스플레이 하우징(15)의 상부 절편부를 도시하며, 한 쌍의 선택적인 보강재(110)를 제외하면 도 7 및 도 8에 도시된 하부 절편부와 유사하다. 선택적인 보강재(110)는 후속하는 도면들에서 보다 상세하게 설명된다. 후속하는 도면에서 보다 상세하게 설명되는 바와 같이, 본 실시예에서 개방 루프 유체(400)는 챔(45)과 선택적인 후방 챔(44)을 통해 조립체(5)에 진입할 수 있다. 유동 라인으로 표시된 바와 같이, 개방 루프 유체(400)는 지그재그 경로를 따라 우측 채널(19)로 유동할 수 있다. 대안적으로, 다른 형상의 경로가 사용될 수 있으며, 명시적으로 고려된다.

[0029] 도 11은 도 1의 조립체의 정면도이며, 단면선 F-F, G-G 및 H-H를 나타낸다.

[0030] 도 12a 및 도 12b는, 후속적인 도면들에서 보다 상세하게 설명되는 바와 같이, 바람직하게는 조립체(5)의 수직 중심선 근처에 실질적으로 수평으로 배치되어 있는 한 쌍의 채널 격벽(130) 및 중앙 격벽(140)을 도시한다. 하지만, 다른 실시예들에서 한 쌍의 채널 격벽(130)과 중앙 격벽(140)은 수직 중심선으로부터 멀게, 조립체(5)의 윗면 또는 바닥 근처에 배치될 수도 있다.

[0031] 본 실시예에서, 도 12a는 개방 루프 유체(400)의 흡입부로서 지정되는 챔(45) (및 선택적인 후방 챔(44))의 영역을 도시한다.

[0032] 도 12c와 이들 도면에 도시된 바와 같이, 팬(81)은, 개방 루프 유체(400)가 챔(45)(및 선택적인 후방 챔(44))의 일반적으로 (여과되거나 여과되지 않은) 주변 공기의 흡입부로서 사용되는 부분으로 유입되어, 좌측 내부 채널(21)(흡입 채널)의 아래로 유동하고, 채널(102)을 지나/통과하여, 우측 내부 채널(22)의 아래로 유동하여, 챔(45)(및 선택적인 후방 챔(44))의 유체(400) 배출에 사용되는 부분으로 배출되도록 배치된다. 좌측 및 우측 내부 채널(21, 22)은 선택적인 것이며, 대안적인 실시예는, 챔(45)(및 선택적인 후방 챔(44))의 일반적으로 주변

공기의 흡입부로 사용되는 부분으로 유입되어, 채널(102)을 지나/통과하여, 챔(45)(및 선택적인 후방 챔(44))의 유체(400)의 배출구로 사용되는 부분으로 배출되는 개방 루프 유체(400)의 경로를 포함할 수 있음을 이해해야 한다.

- [0033] 도 12e는 도 11의 단면선 H-H를 따라 취해진 단면을 위에서 본 것이며, 상세부(R)를 나타낸다. 본 실시예에서, 이 도면은 챔(45)(및 선택적인 후방 챔(44))의 개방 루프 유체(400)의 배출구서 지칭되는 영역을 도시한다.
- [0034] 도 13a는 후방 챔(44)을 통한 개방 루프 유체(400)의 흡입을 도시한다. 개방 루프 유체(400)는 개구(122)를 통해 선택적인 도어 보강재(115)를 통과할 수 있다.
- [0035] 도 13b는 조립체의 예시적인 실시예의 선택적인 비퍼 영역(46)의 영역 내부를 도시한다. 이 실시예에서, 비퍼 영역(46)은 챔(45) 및 선택적인 후방 챔(44)에, 챔의 근처에, 또는 챔 내에, 개방 루프 유체(400)의 경로를 따라 배치되어 대량의 유체는 통과할 수 없도록 하는 하나 이상의 유체-차단 플러그를 포함하는 영역을 포함할 수 있다. 예시적인 실시예에서, 비퍼 영역(46)은 중앙 격벽(140)과 함께 채널 격벽들(130)을 포함할 수 있지만, 일부 실시예들은 (그 실시예에서 도어 보강재를 통해 유체(400)가 유동하지 못하는 경우) 채널 격벽(130)만 사용할 수도 있다. 일부 실시예에서, 채널 격벽들(130)을 좌측 채널(18) 및 우측 채널(19) 내에 배치하기 보다, 비퍼 영역(46)은 챔(44)의 단부에 또는 단부 근처에 배치되는 플러그를 포함할 수 있다. 일반적으로, 비퍼 영역은 수평이고, 조립체(5)의 수직 중심선의 근처에 배치되지만, 조립체(5)의 윗면 또는 바닥 근처에 배치될 수 있다.
- [0036] 비퍼 영역(46)은 조립체(5)의 앞 측면뿐만 아니라, (후방 챔(44)을 사용하는 경우) 전후방 모두에 존재하여, 비퍼 영역(46)이 조립체(5)의 좌우측 양측에서 전방 챔(45)(및 후방 챔(44))의 일부를 차단해야 한다는 것을 알 수 있다.
- [0037] 도 13c는 후방 챔(44)을 통한 개방 루프 유체(400)의 배출을 도시한다. 개방 루프 유체(400)는 개구(122)를 통해 도어 보강재(115)를 통과할 수 있다.
- [0038] 도 13a 내지 도 13c는 후방 챔(44)을 도시하고 있지만, 예시적인 실시예에서 전방 챔(45)은 후방 챔(44)과 유사한 배치를 갖는다는 것을 알아야 한다. 전방 챔(45)에 대한 것은 실질적으로 중복이 될 수 있으므로, 본원에는 도시되지 않았다.
- [0039] 도 14는 크로스 해치 영역으로 표시되는 챔(45)과 후방 챔(44)의 결합된 부분을 도시한다. 예시적인 실시예에서, 비퍼 영역(46)의 외측에서, 크로스 해치 영역은 개방 루프 유체(400)가 챔(45)(및 선택적인 후방 챔(44))의 안으로 또는 밖으로 유동할 수 있도록 한다.
- [0040] 도 15는 자립형 디스플레이 하우징(15)으로부터 격리된 조립체(5)를 도시한다. 전방 패널(10)의 바로 뒤에 도어 보강재(120)가 부착될 수 있다. 일부 실시예에서, 도어 보강재(120)는 전방 패널(10)의 배면에 부착될 수 있다. 도어 보강재(120)는 실질적으로 전방 패널(10)의 외주에 연장할 수 있다. 도어 보강재(120)는 금속, 또는 조립체(5)에 구조적 강성 및 강도를 제공하기에 적절한 단단한 다른 재료로 구성될 수 있다. 도어 보강재(120)는 개방 루프 유체(400)의 유동을 허용하는 일련의 개구(125)를 포함할 수 있다. 도시된 도어 보강재 개구들(125)은 단지 예시적인 것일 뿐이다. 임의의 수 및 형상의 개구들(125)이 고려된다.
- [0041] 도 16은 후방 패널(60)을 분리하여 도시한다. 예시적인 실시예에서, 후방 도어 보강재들(115)이 후방 패널(60)의 외주의 가장자리 주위에 부착되어, 후방 패널(60)의 플이 될 수 있다. 후방 패널(60), 후방 도어 보강재(115)의 내부 표면, 그리고 내부 후방 패널(80)(현재 도면에서는 도시되지 않음) 사이의 공간에 의해 도어 공동(17)이 형성된다. 후방 챔(44)을 통해 흡입된 개방 루프 유체(400)가 개구들(122)을 통해 후방 도어 보강재(115)를 통과하여 도어 공동(17)으로 이동하면, 이 유체는 개방 루프 유체(400b)로 간주될 수 있다. 도시된 개구들(122)은 예시적인 것일 뿐이며, 임의의 수 및 형상의 개구들이 고려된다. 새장형 부재 형태의 선택적인 보강재(110)가 실질적으로 후방 패널(60)의 길이로 연장할 수 있다. 선택적인 보강재(110)는 금속, 폴리머, 또는 후방 패널(60)에 구조적 강성 및 강도를 제공하기에 적절한 단단한 재료로 구성될 수 있다. 선택적 보강재(110)는, 개방 루프 유체(400b)가 선택적 보강재(110)를 통해 유동할 수 있도록 하는 일련의 개구들(135)을 포함할 수 있다. 도시된 선택적 보강재(110) 및 개구들(135)은 예시적인 것일 뿐이며, 임의의 수 및 형상의 선택적 보강재(110) 및 개구들(135)이 고려된다.
- [0042] 개방 루프 유체(400)의 일부로, 도어 공동(17) 내에서 이동하는 부분은 개방 루프 유체(400b)로서 지칭된다. 도시된 바와 같이, 개방 루프 유체(400b)는 내부 패널(80)의 뒤를 지나, 흡입 개구들(75)을 통해 채널(102)을 향하도록 유도될 수 있다. 예시적인 실시예에서, 유체(400b)는 유입 개구들(75)을 통해 유입되어, 유체(400b)를

채널(102)로 분배하는 좌측 채널(18)로 유도되어, 우측 채널(19)로 배출된다.

[0043] 도 17은 유동 라인을 통해 조립체(5)의 전후방을 통과한 개방 루프 유체(400a)의 순환을 도시한다. 개방 루프 유체는 챔(45)을 통해 흡입되어, 개구들(125)을 통해 도어 보강재(120)를 통과하며, 때때로 우측 내부 채널(22) 및 측면 챔(90)에 의해 부분적으로 한정되는 우측 채널(19)을 통해 수직으로 이동할 수 있다. 유사하게, 개방 루프 유체(400a)는 후방 챔(44)을 통해 유입되어, 개구들(122)을 통해 도어 보강재(115)를 통과하여 이동하며, 개구(135)를 통해 선택적 보강재들(110)을 통과하여, 우측 채널(19)에 진입할 수 있다. 조립체(5)의 반대 측에서도 유사한 경로가 취해질 수 있으며, 이때 개방 루프 유체는 때때로 좌측 내부 채널(21)과 기둥(20)에 의해 부분적으로 한정되는 좌측 채널(18)로 좌측으로 진입한다.

[0044] 조립체(5)의 반대편 단부에서, 개방 루프 유체의 배출에 대해 실질적으로 동일한 유동 경로가 역순으로 취해질 수 있다. 다시 말하자면, 예시적인 실시예에서, 조립체(5)의 상부 절반부에서 흡입이 수행되고, 조립체(5)의 하부 절반부에서 배출이 수행된다. 다른 실시예에서는, 조립체(5)의 하부 절반부에서 흡입이 수행되고, 조립체(5)의 상부 절반부에서 배출이 수행된다. 또 다른 실시예에서는, 흡입은 우측에서 수행되고, 배출은 좌측에서 수행되며, 조립체의 뒷면 가장자리 및 바닥 가장자리에 머피 양력(46)이 배치되어 두 유동 경로의 교차 흡입을 방지할 수 있다.

[0045] 도 18은 챔(45) 및 후방 챔(44)을 통해 흡입되고 난 후의 개방 루프 유체(400)에 대한 예시적인 유동 경로를 도시한다. 후방 챔(44)을 통해 흡입되는 개방 루프 유체(400)는 선택적 도어 보강재들(110) 사이의 도어 공동(17)을 따라 이동할 수 있으며, 개방 루프 유체(400b)로서 지칭될 수 있다. 개방 루프 유체(400b)는 그 다음, 후방 내부 채널(80)을 따라 수직으로 이동하여, 후방 흡입 개구들(75)을 통해 흡입될 수 있다. 개방 루프 유체(400)의 다른 부분은 좌측 채널(18)과 우측 채널(19)을 따라 이동할 수 있으며, 개방 루프 유체(400a)로서 지칭될 수 있다. 개방 루프 유체(400a)는 측부 채널들(18, 19)을 통해 수직으로 이동한 후, 상기 채널들의 상부를 통해 이동하여, 흡입 개구들(75)을 통해 흡입될 수 있다. 유사하게, 개방 루프 유체(400)는 챔(45)을 통해 흡입되어, 전방 채널(10)의 아래에 있는 도어 보강재 개구들(125)을 통해 이동하여, 흡입 개구들(65)을 통해 흡입될 수 있다.

[0046] 도 19a는 자립형 디스플레이(15)로부터 분리된 도 1의 조립체를 뒤에서 본 사시도이며, 상세부 S를 나타낸다.

[0047] 도 19b는 자립형 디스플레이(15)로부터 분리된 도 1의 조립체를 앞에서 본 사시도이며, 상세부 T를 나타낸다.

[0048] 도 20은 개방 루프 유체(400a)로서 지칭되는 개방 루프 유체(400)의 우측 채널(19)에서 이동하는 부분을 도시한다. 개방 루프 유체(400a)는 우측 채널(19) 내부에서 이동하고, 우측 내부 채널(22)의 상부를 거쳐, 흡입 개구들(75)로 이동할 수 있다.

[0049] 도 21은 도 20과 유사하지만, 전방의 관점에서 도시되었으며, 개방 루프 유체(400a)로서 지칭되는 개방 루프 유체(400)의 좌측 채널(18)에서 이동하는 부분을 도시한다. 개방 루프 유체(400a)는 좌측 채널(18) 내부에서 이동하고, 좌측 내부 채널(21)의 상부를 거쳐, 흡입 개구들(65)로 이동할 수 있다.

[0050] 도 22는 도 4의 절단선 B-B를 따라 취한 단면을 아래에서 본 사시도이다. 개방 루프 유체(400a/400b)가 다양한 흡입 개구들(75, 65)을 통해 흡입되면, 개방 루프 유체는 결합되어, 열 교환기(100)의 개방 루프 가스 통로들을 통해 이동하는 개방 루프 유체(400)의 제1 부분과, 채널(102)을 통과하도록 유도되는 개방 루프 유체(400)의 제2 부분으로 나뉜다.

[0051] 순환 가스(700)가 전자 부품들을 가로질러, 열 교환기(100)의 폐쇄 루프 가스 통로들뿐만 아니라, 폐쇄 루프를 형성하는 전자 디스플레이(70)와 전방 패널(10) 사이를 통과하도록 유도하는데 하나 이상의 순환 팬(32)이 사용된다. 이 실시예에서, 개방 루프 유체(400)가 관통형 게스킷 주위로 이동하는 동안, 순환 가스(700)는 관통형 게스킷(200) 내의 개구부를 통과하도록 하여, 개방 루프 유체(400)와 순환 가스(700)가 혼합되지 않도록 한다. 하지만, 이러한 설계는 반전될 수 있는데, 이때 순환 가스(700)는 관통형 게스킷(200)의 주위로 이동하고, 외부 공기(400)는 관통형 게스킷(200)을 통과하여 이동한다.

[0052] 좌측 내부 채널(21)을 횡단하여, 전자 디스플레이(70)의 뒤(여기서는 백라이트(106)의 뒤)에서 연장하는 채널(102)에 진입하기 위해, 관통형 게스킷(200)을 지나가는 개방 루프 유체(400)의 유동의 일부가 도시된다. 바람직하게는, 채널(102)은 전자 디스플레이(70)의 배면 (여기서는 백라이트(106)의 뒤) 및 플레이트(104) 사이의 공간으로서 정의된다. 바람직하게는 불결 모양이고, 바람직하게는 연속적인 히트 싱크로 열의 전도성 전달을 용이하게 하여, 개방 루프 유

체(400)와의 대류에 의해 제거되도록 한다.

- [0053] 열 교환기(100)는 순환 가스(700) 또는 개방 루프 유체(400)를 수용하는 채널들을 한정하는 복수의 층들을 포함하는 것이 바람직하다. 순환 가스(700)와 개방 루프 유체(400)의 혼합이 허용되지 않는 것이 바람직하다.
- [0054] 개방 루프 유체(400)의 유동은, 채널(102)을 통해 이동하고, 관통형 개스킷(200) 주위를 지나, 외측 내부 채널(22)로 진입하여, 최종적으로 챔(45)(및 선택적인 후방 챔(44))의 유체(400) 배출구로 지정되는 부분의 함으로 유도된다. 이 실시예에서, 순환 가스(700)는 열 교환기(100)를 빠져나와, 관통형 개스킷(200) 내의 개구부를 통과하여, 전자 디스플레이(70)와 전방 채널(10) 사이를 통과하는 것으로 도시된다.
- [0055] 바람직한 실시예에서, 열 교환기(100)는 직교류형 열교환기일 것이다. 하지만, 다양한 유형의 열 교환기가 공지되어 있으며, 다양한 유형의 열 교환기가 본 명세서의 실시예들 중 어느 하나와 함께 사용될 수 있다. 열 교환기(100)는 직교류, 병류, 또는 역류식 열 교환기일 수 있다. 예시적인 실시예에서, 열 교환기(100)는 복수의 얇은 판이 적층된 것으로 구성될 수 있다. 판들은 물결모양, 벌집 모양, 또는 관형으로 설계될 수 있으며, 복수의 채널/통로/튜브가 판의 길이 방향으로 연장한다. 각각의 판의 통로는 이웃하는 판들의 통로와 실질적으로 직각을 이루도록, 판들은 통로의 방향이 각 이웃하는 판과 교호(交互)되도록 직층될 수 있다. 따라서, 외부 공기 또는 순환 가스는, 가스의 경로에 평행하게 연장하는 채널들 또는 통로들을 구비하는 판들을 통해서만 예시적인 열 교환기에 진입할 수 있다. 판들이 교호되어 있기 때문에, 순환 가스와 개방 루프 유체는 서로 혼합한 판들에서 이동할 수 있으며, (바람직하게는, 열교환기가 적절하게 밀봉되어 있는 경우) 가스들이 혼합되지 않으면서 두 가스 사이에서 열이 전달될 수 있다.
- [0056] 열 교환기의 대안적인 설계에서, 한 쌍의 물결 모양, 벌집 모양, 또는 관형 모양의 판 사이에 개방 채널이 배치될 수 있다. 개방 채널은 이웃하는 판들의 통로와 직각을 이루는 방향으로 연장할 수 있다. 이 개방 채널은 이웃하는 판들의 통로 방향과 직각을 이루는 방향으로 판들의 양 반대 가장자리 사이에 두 개의 제로 스트림 또는 데이프 스트림(특히, VHB(very high bond) 데이프)을 배치함으로써 생성될 수 있다. 따라서, 제1 방향으로 열 교환기에 진입하는 가스는 개방 채널을 통해 (스트림 또는 데이프에 평행하게) 이동할 수 있다. 실질적으로 제1 방향과 직각을 이루는, 제2 방향으로 진입하는 가스는 이웃하는 판들의 통로를 통해 이동한다.
- [0057] 다른 유형의 직교류형 열 교환기는 제1 가스를 포함하고, 제2 가스의 경로와 직각을 이루어 연장하는 복수의 튜브를 포함할 수 있다. 제2 가스가 제1 가스를 수용하는 튜브 위로 유동함에 따라, 두 가스 사이에서 열이 교환된다. 많은 유형의 직교류형 열 교환기가 있으며, 임의의 유형의 열 교환기가 본 명세서의 실시예들과 사용될 수 있음은 명백하다.
- [0058] 예시적인 열 교환기는 측면들이 상대적으로 열 저항이 낮은 판들을 구비하여, 두 가스 사이에서 열이 쉽게 교환될 수 있도록 할 수 있다. 열 교환기를 생성하는데 여러 가지 재료가 사용될 수 있다. 바람직하게는, 사용되는 재료는 내식성, 내 부패성(rot resistance), 경량 및 저가여야 한다. 보편적으로, 높은 열 전도성 때문에 금속이 열 교환기에 사용되며, 이들 실시예에서도 금속이 사용될 수 있다. 하지만, 플라스틱 및 합성물들도 전자 디스플레이의 열 조건을 만족할 수 있음이 밝혀졌다. 예시적인 실시예는 열 교환기에 대한 판들을 구성하는 재료로서 폴리프로필렌을 이용한다. 폴리프로필렌은 약한 열 전도체처럼 보일 수 있지만, 작은 측면 두께 대비 큰 표면적은 전체 열 저항을 낮게 한다는 것이 밝혀졌다. 따라서, 예시적인 열 교환기는 플라스틱으로 제조되어, 얇고 경량의 디스플레이 조립체를 생산할 수 있다. 특히, 각 판의 층에 대해 물결 모양의 플라스틱이 사용될 수 있으며, 이때 판들은 교호 방식으로 직층된다. 즉, 각 이웃하는 판은 주변 판들과 직각을 이루는 방향으로 연장하는 채널들을 구비한다.
- [0059] 예시적인 실시예에서, 전자 디스플레이(70)는 직접 LED 백라이트 LCD이며, LED 백라이트는 열전도성 기판(바람직하게는, 금속 코어 PCB)에 장착되는 복수의 LED를 포함한다. LED 백라이트의 배면은 채널(102)과 열 전도적으로 연결할 수 있는 열 전도성 플레이트를 포함하는 것이 바람직하다.
- [0060] 순환 가스(700)와 개방 루프 유체(400)는 임의의 수의 가스 물질일 수 있다. 일부 실시예에서, 모든 가스로서 공기가 사용될 수 있다. 바람직하게는, 순환 가스(700)는 전자 디스플레이(70)의 앞을 이동하므로, 관찰자에게 보여지는 이미지에 영향을 주지 않도록 실질적으로 투명해야 한다. 바람직하게는, 순환 가스(700)는 이미지 품질에 악영향이 가지 않도록 하고 및/또는 내부 전자 부품의 손상을 방지하기 위해, 오염물 및/또는 미립자(예를 들어, 먼지, 오물, 꽃가루, 수증기, 연기 등)이 실질적으로 없어야 한다. 일반적으로, 예시적 실시예들은 개방 루프 유체(400)로서 주변 공기를 사용한다.
- [0061] 냉각 시스템은 연속적으로 작동할 수 있다. 하지만, 원하는 경우, 온도가 소정의 임계값에 도달하였는지 검출하

기 위해 전자 디스플레이 내에 온도 감지 장치가 포함될 수 있다. 이러한 경우, 디스플레이 내 온도가 소정의 온도에 도달할 때, 다양한 냉각 팬들이 선택적으로 결합될 수 있다. 소정의 임계값은 선택될 수 있고, 시스템은 허용 가능한 온도 범위 내에 디스플레이를 유지하도록 구성될 수 있다. 이 작업을 수행하는데 보편적인 온도 조절기 조절제가 사용될 수 있다. 온도 감지 장치로서, 열전대가 사용될 수 있다.

[0062] 도 23 내지 도 25는 바람직하게는, 실질적으로 수평으로, 조립체(5)의 수직 중심선 근처에 배치되는 중앙 격벽(140)을 도시한다. 하지만, 실시예들은 실질적으로 후방 패널(60)의 전면의 정중선을 따라 연장하는 수직 중심선으로부터 멀게, 조립체(5)의 뒷면 또는 바닥에 가깝게 중앙 격벽(140)을 배치할 수도 있다. 우측 채널 격벽(130)은 일반적으로 중앙 격벽(140)과 정렬되도록, 실질적으로 자립형 하우징(15)의 우측 내부 가장자리의 정중선을 따라 연장한다. 유사하게, 좌측 채널 격벽(130)은 중앙 격벽(140)과 정렬되도록 조립체(5)의 좌측 내부 가장자리에 부착될 수 있다.

[0063] 중앙 격벽(140), 우측 채널 격벽(130) 및 좌측 채널 격벽(130)(이하, 집합적으로 "수평 격벽"이라고 함)은 도어 공동(17)을 실질적으로 상부 절반부와 하부 절반부로 분리하도록 구성될 수 있다. 수평 격벽은 도어 공동(17)의 상부 절반부와 하부 절반부 사이에 실질적으로 기밀식 밀봉부를 형성하도록 구성될 수 있다. 선택적으로, 수평 격벽은 상부 절반부와 하부 절반부 사이에 기밀식 밀봉부를 제공하기 위해 수평 격벽과 함께 사용되는, 예컨대 폴리우레탄 폼과 같은 팽창 가능한 재료(expandable material)를 추가적으로 포함할 수 있다. 예시적인 실시예에서, 중앙 격벽(140)은 도어 공동(17)내에 기밀식 밀봉부를 생성하기 위해, 예컨대 폴리머와 같은 충분한 유연한 재료로 구성될 수 있다. 대안적인 실시예에서, 중앙 격벽(140)은 강성 재료로 구성될 수 있다. 예시적인 실시예에서, 우측 채널 격벽(130) 및 좌측 채널 격벽(130)은 강체일 수 있다.

[0064] 예시적인 실시예에서, 개방 루프 유체(400)는 챔(45)(및 선택적인 후방 챔(44)을 통해 조립체(5)의 상부 절반부에 흡입될 수 있다. 상기 개방 루프 유체(400a)는, 상기 유체의 일부가 우측 채널 격벽(130)에 도달하여 그 이상으로 이동하는 것이 방지될 때까지, 우측 채널 (19)을 따라서 이동할 수 있다. 유사하게, 개방 루프 유체(400a)는, 상기 유체의 일부가 좌측 채널 격벽(130)에 도달할 때까지 좌측 채널(18)을 따라 이동할 수 있다. 개방 루프 유체의 상기 부분들은, 이전의 도면에서 설명한 바와 같이, 최종적으로 흡입 개구들(65, 75)을 통해 흡입될 때까지, 반대 방향으로 수직으로 복귀하여 각각 우측 채널(19) 및 좌측 채널(18)의 상부 절반부에서 순환하도록 유도될 수 있다.

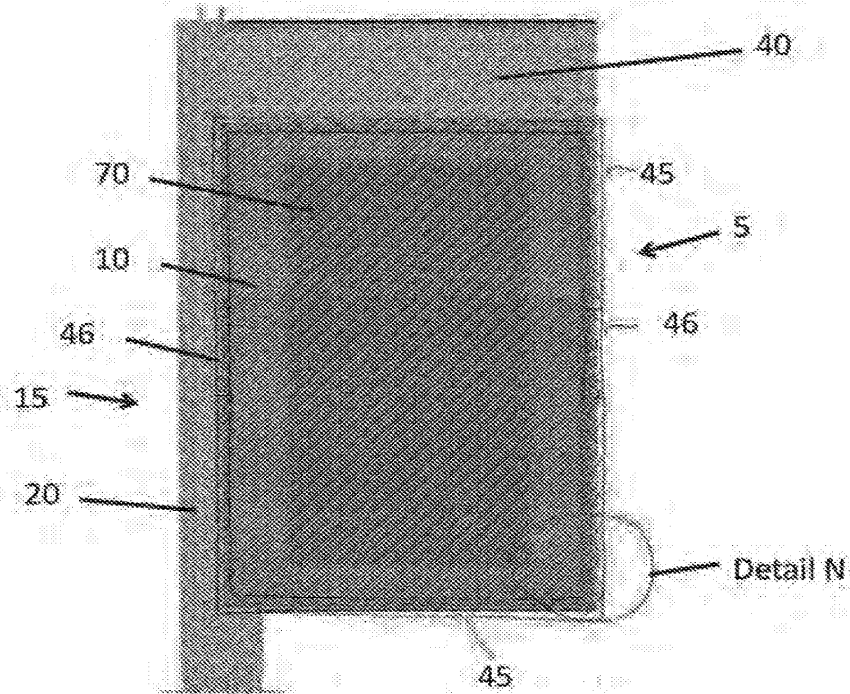
[0065] 유사한 방식으로, 도어 공동(18)을 따라 이동하는 개방 루프 유체(400b)는, 상기 유체(400b)의 일부가 중앙 격벽(140)에 도달하여 그 이상으로 이동하는 것이 방지될 때까지 수직으로 이동할 수 있다. 이러한 방식으로, 흡입된(하지만 열 교환기(100) 또는 채널(102)을 통해 이동하지 않은) 유체(400b)는, 열교환기(100) 또는 채널(102)을 통해 이동하여 챔(45)(및 선택적인 후방 챔(44) 밖으로 배출되어야 하는 유체(400b)와 혼합될 수 있다.

[0066] 이전의 도면에서 설명된 바와 같이, 개방 루프 유체(400)는 배출 개구들(85)을 통해 최종적으로 배출될 때까지 선택적인 열 교환기(100)에서 순환할 수 있다. 그 다음, 개방 루프 유체(400)는 최종적으로 우측 채널(19) 또는 좌측 채널(18)에 복귀하여, 그 안에서 수직으로 이동할 수 있다. 우측 채널 격벽(130) 및 좌측 채널 격벽(130) 각각은, 상기 개방 루프 유체가 조립체(5)의 정중선을 넘어서 이동하는 것을 방지하여, 조립체(5)의 각각의 절반부로부터의 개방 루프 유체가 혼합되는 것을 방지할 수 있다. 즉, 흡입 개구들(65, 75)을 통해 아직 흡입되지 않은 개방 루프 유체가 상기 흡입 개구들(65, 75)을 통해 이미 흡입된 개방 루프 유체와 혼합되지 않을 수 있다. 우측 격벽(130)과 좌측 격벽(130) 각각에 마주치게 된 개방 루프 유체는, 챔(45)(및 선택적인 후방 챔(44))을 통해 조립체(5)로부터 최종적으로 배출될 때까지 반대 방향으로 수직으로 복귀하도록 유도될 수 있다.

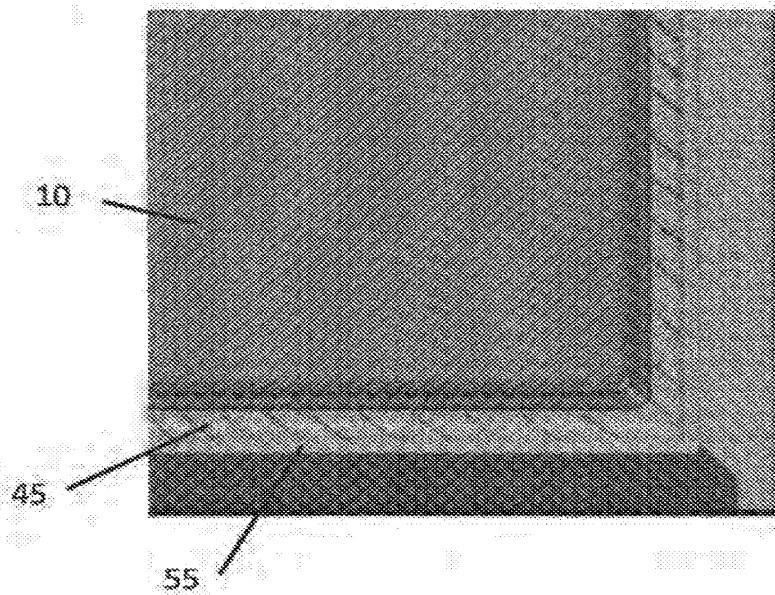
[0067] 도 26a 및 도 26b는 채널 격벽(130)의 예시적인 실시예를 도시한다. 이러한 실시예에서, (원하는 경우) 개방 루프 유체(400a)의 일부가 채널 격벽(130)을 통과하도록 허용되어, 개방 루프 유체들의 흡입 및 배출 사이의 제한된 양의 혼합이 허용될 수 있도록, 채널 격벽의 일부(141)가 조절될 수 있다. 이러한 실시예에서, 채널 격벽들(142)의 제2 부분이 채널 격벽들이 조절되지 않도록 고정되어, 흡입 개방 루프 유체와 배출 개방 루프 유체가 혼합되지 않도록 실질적으로 기밀 밀봉부를 제공할 수 있다. 다른 실시예들에서, 채널 격벽들(130)의 전체는 조절 가능할 수 있다. 또 다른 실시예들에서, 채널 격벽들(130)의 전체는 고정될 수 있다.

[0068] 개시된 실시예들의 사상 및 범위는 다양한 유형의 디스플레이에 냉각을 제공한다는 것을 이해해야 한다. 제한이 아닌 예시로서, 실시예들은, (모든 유형의) LCD, 발광 다이오드(LED), 유기 발광 다이오드(OLED), 전계 발광 디스플레이(FED), 발광 폴리머(LEP), OEL(organic electro luminescence), 플라즈마 디스플레이 및 다른 박막 패널 전자 이미지 조절제를 중 어느 하나 함께 사용될 수 있다. 또한, 실시예들은 아직 개발되지 않은 디스플레이를 포함하여, 다른 유형의 디스플레이와 사용될 수 있다. 특히, 시스템은 풀 컬러 평면 패널 OLED 디스플레이와

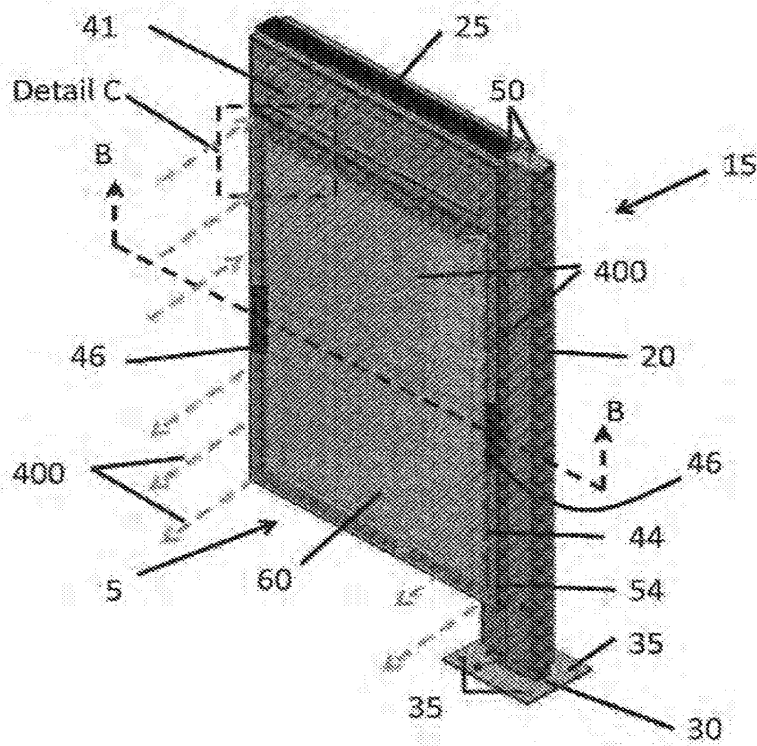
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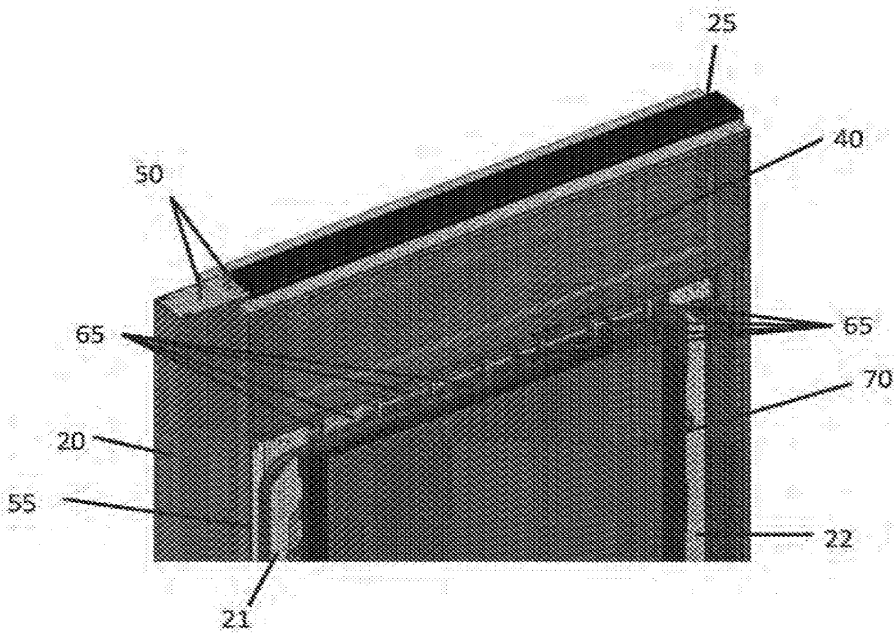
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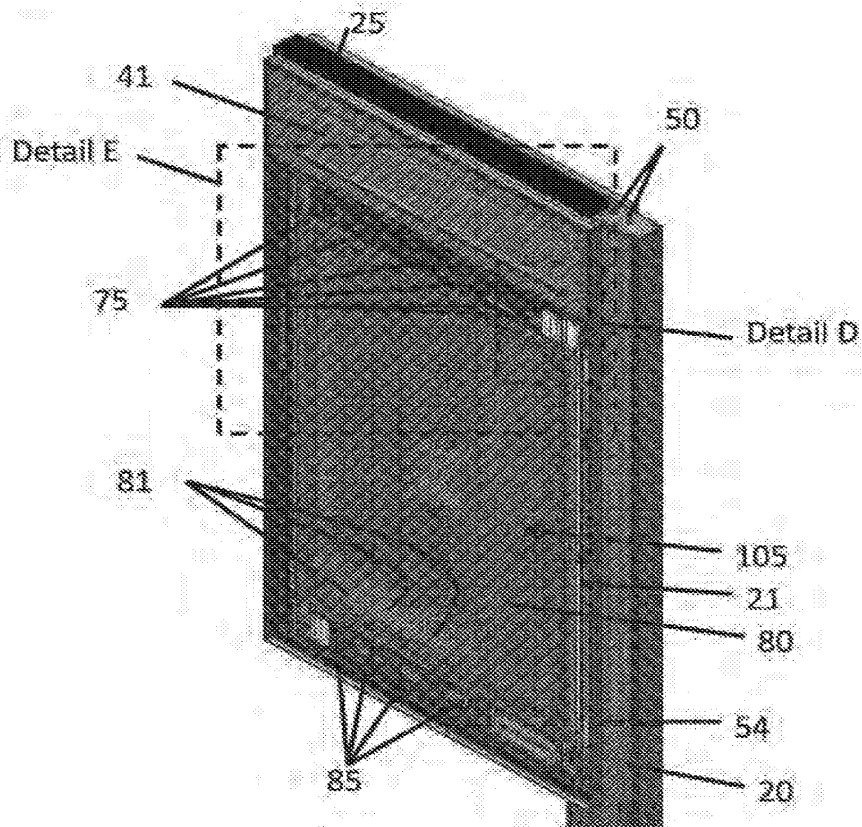
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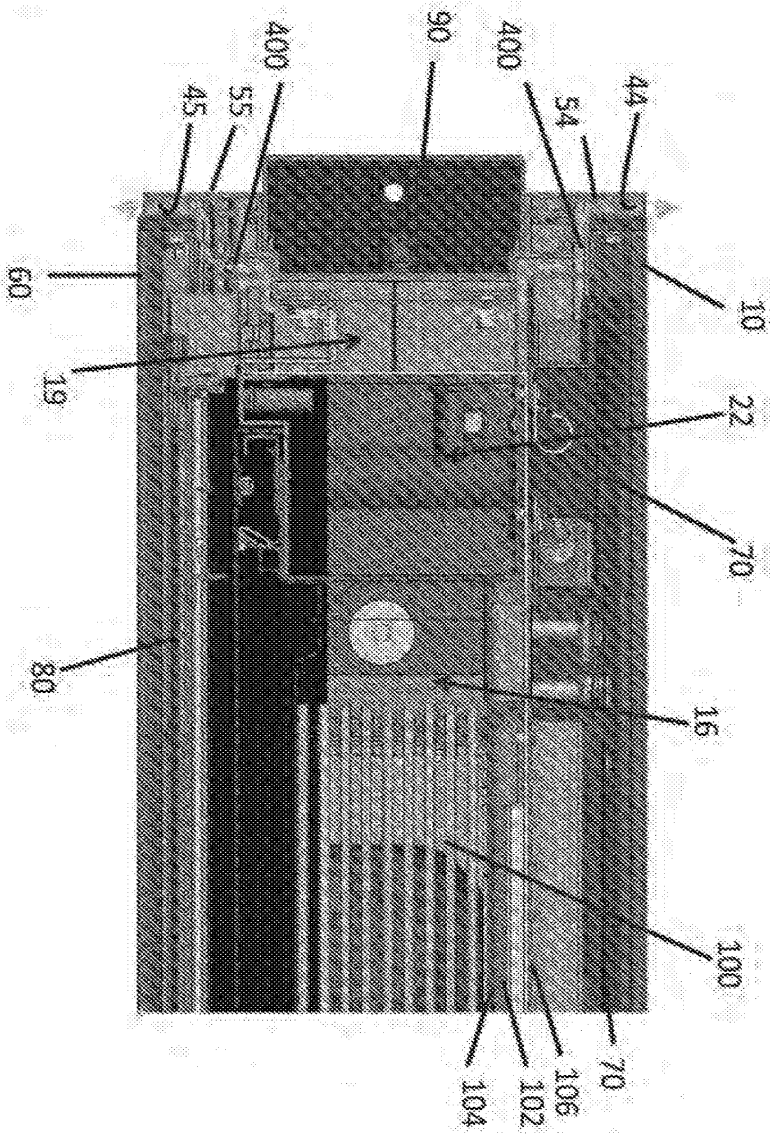


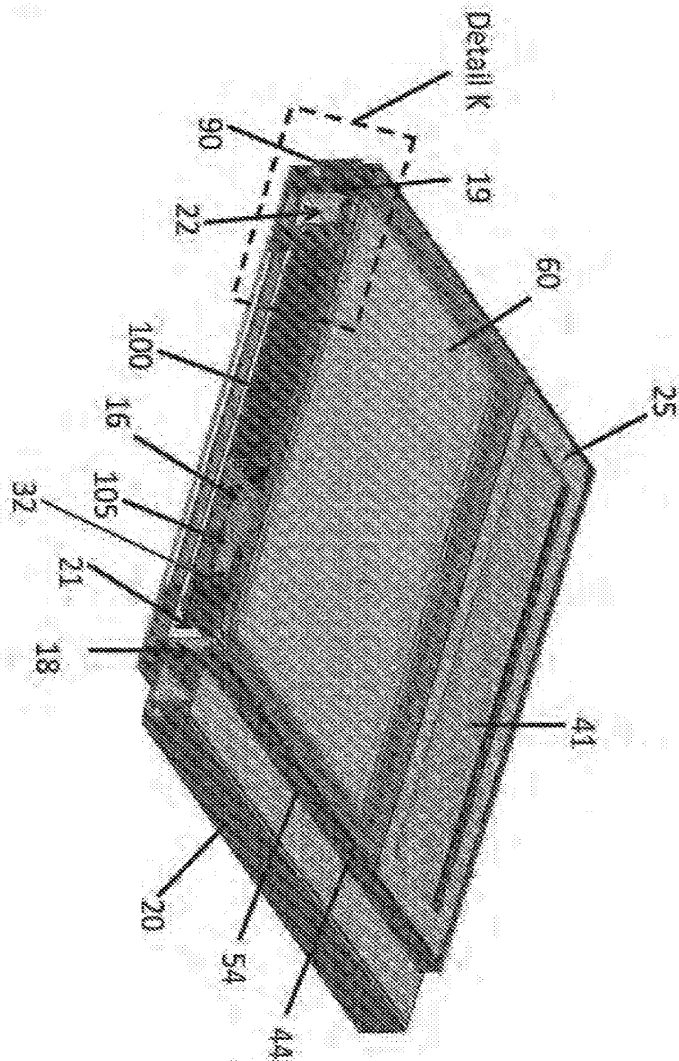
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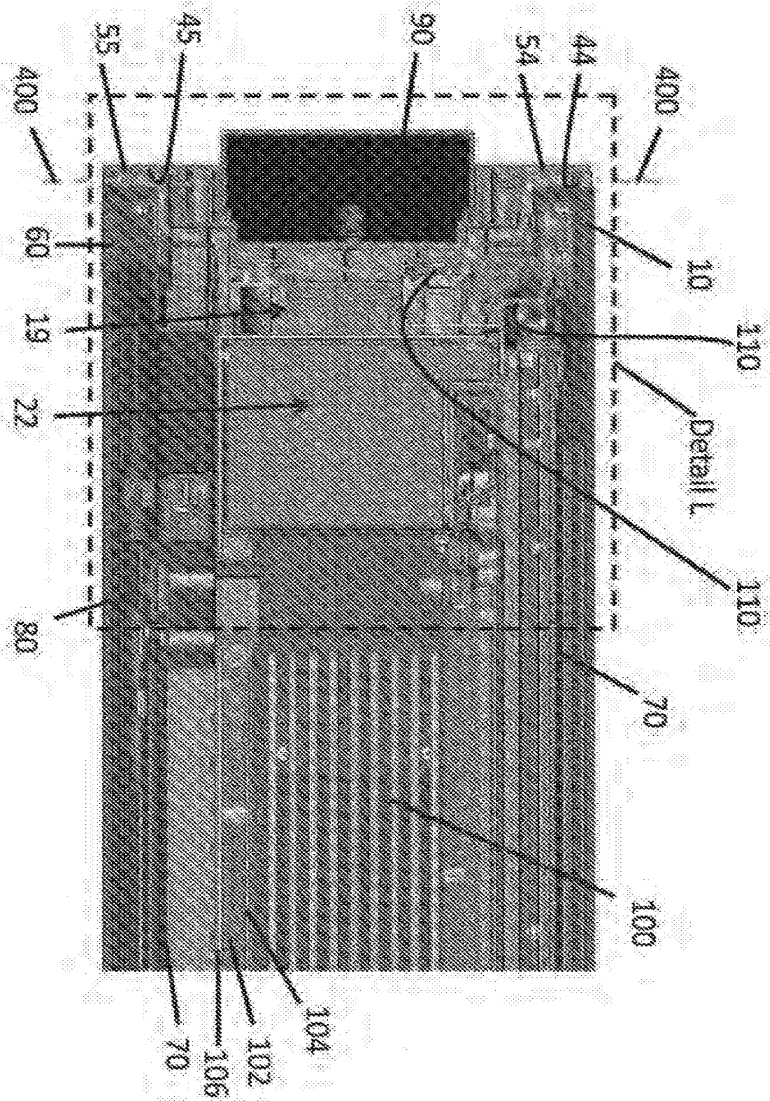


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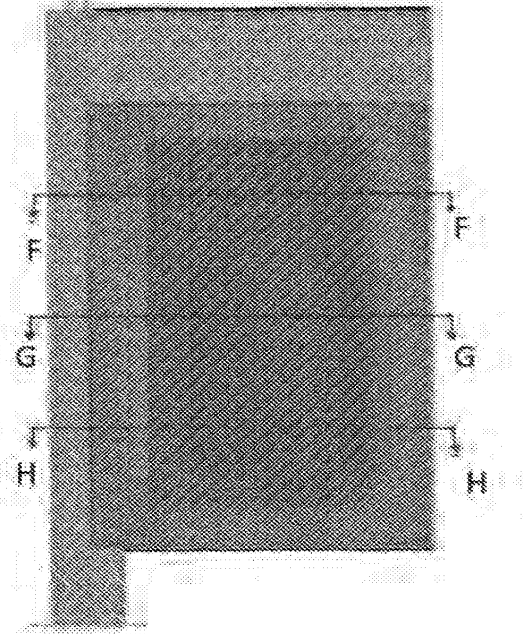


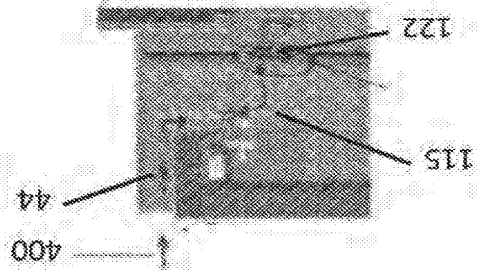
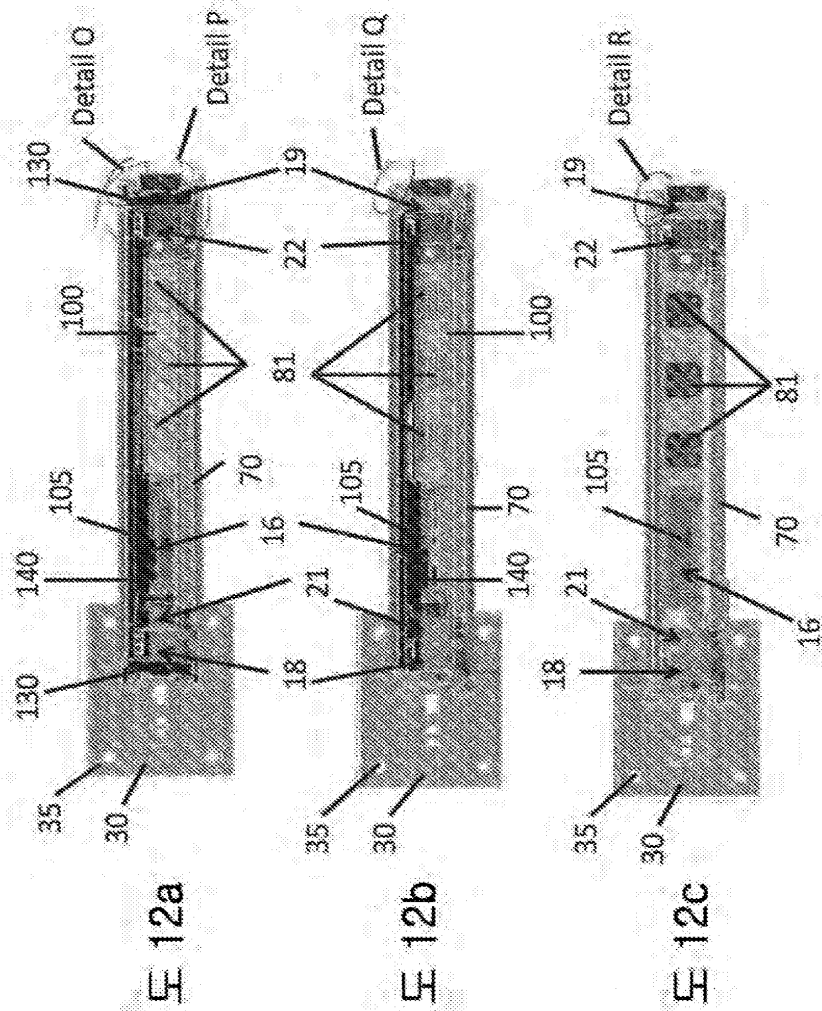




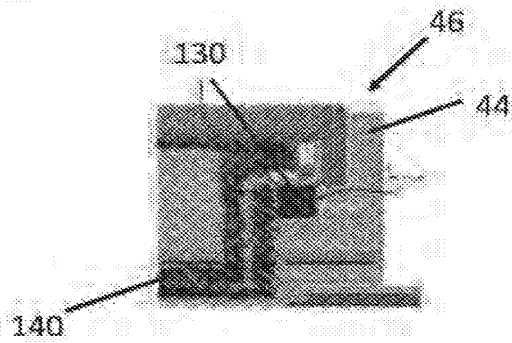


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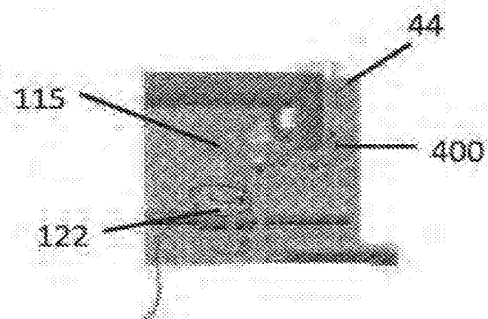




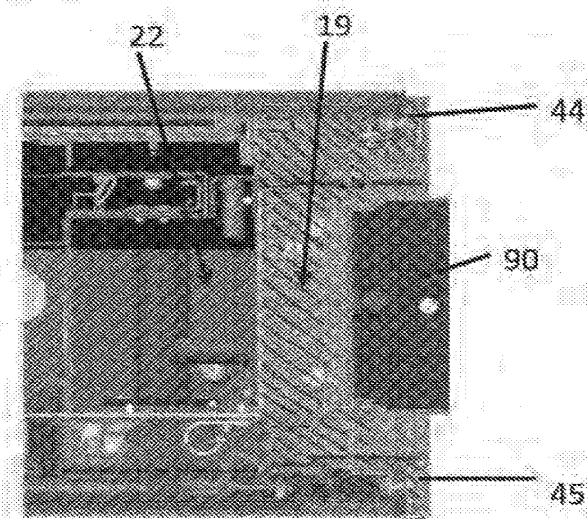
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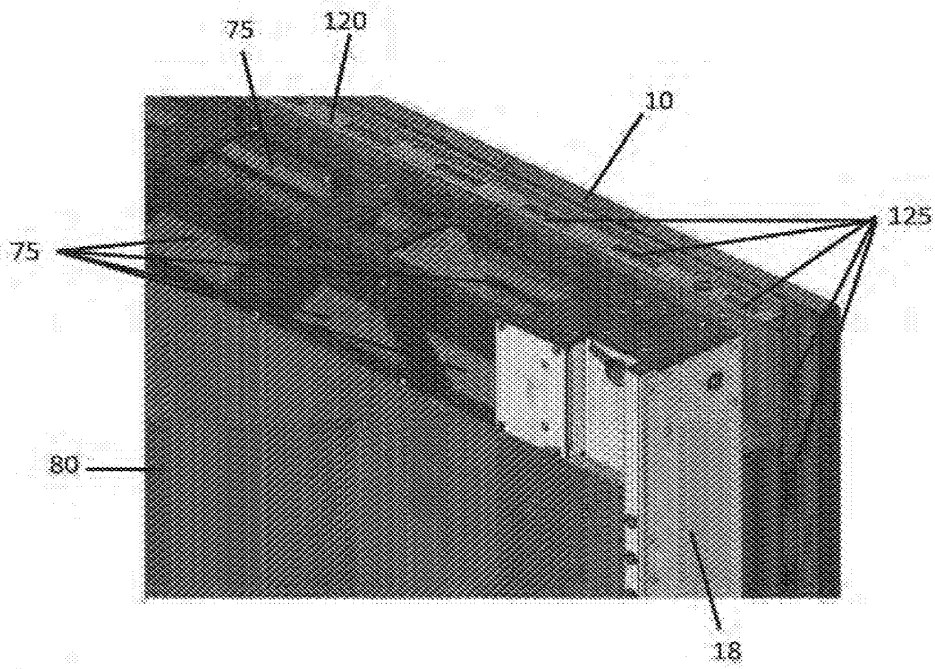
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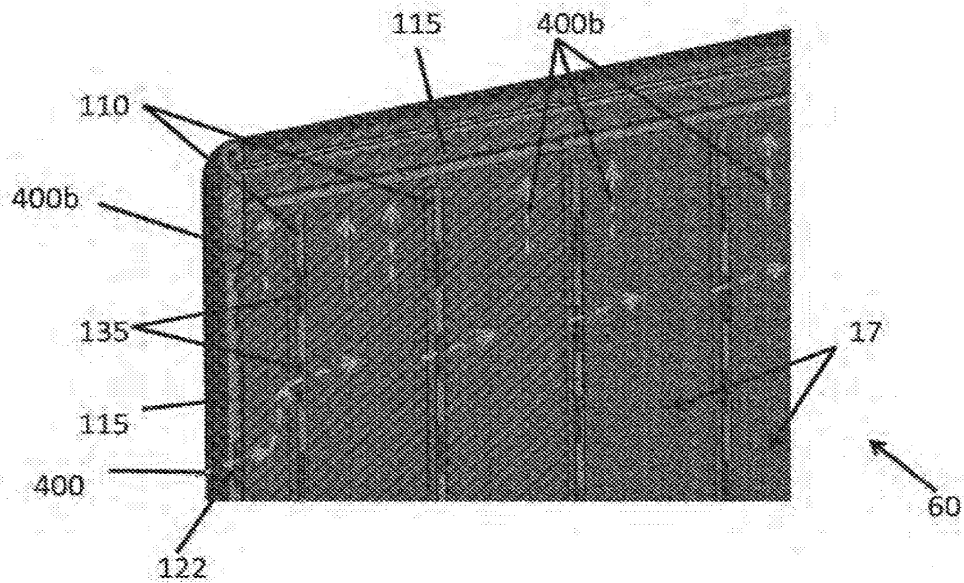
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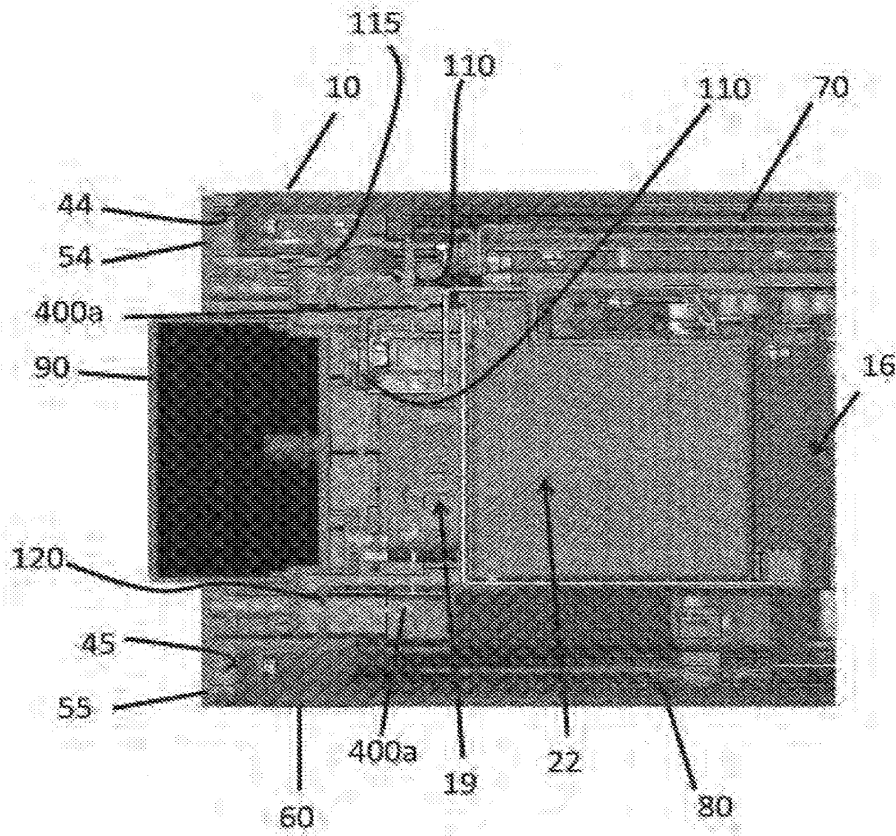
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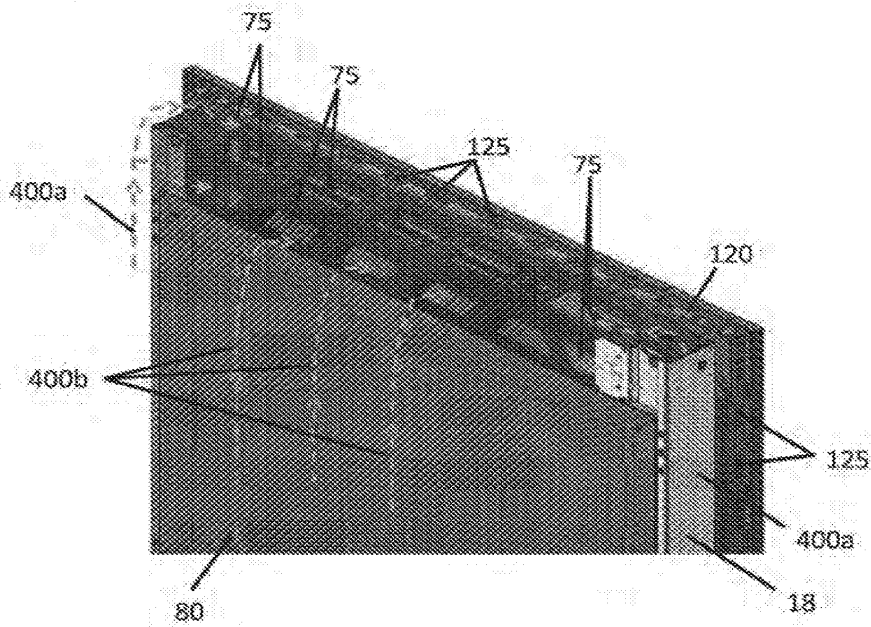
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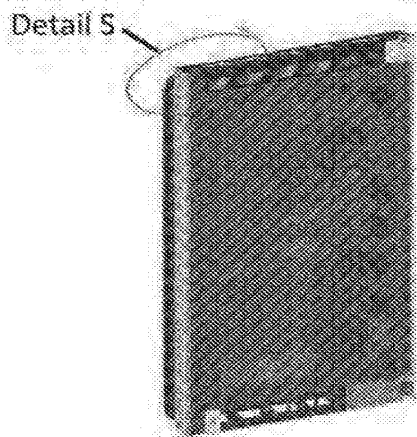
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도면 18

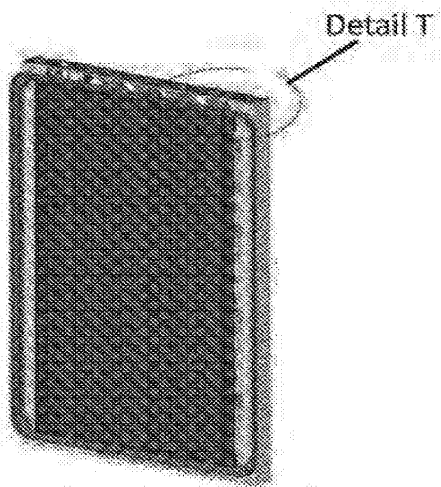


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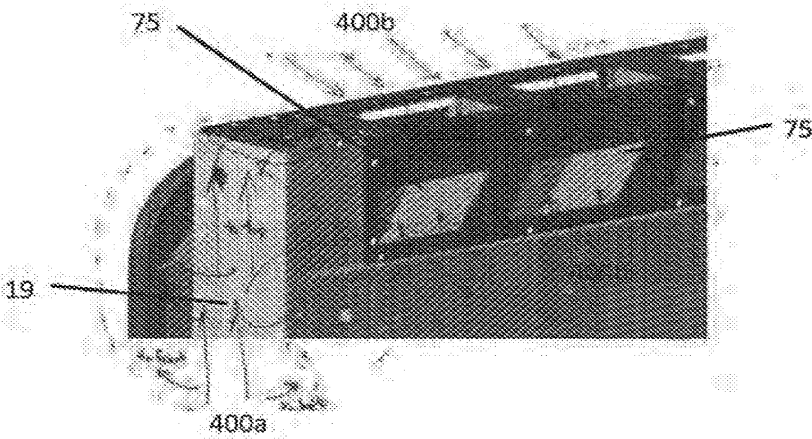


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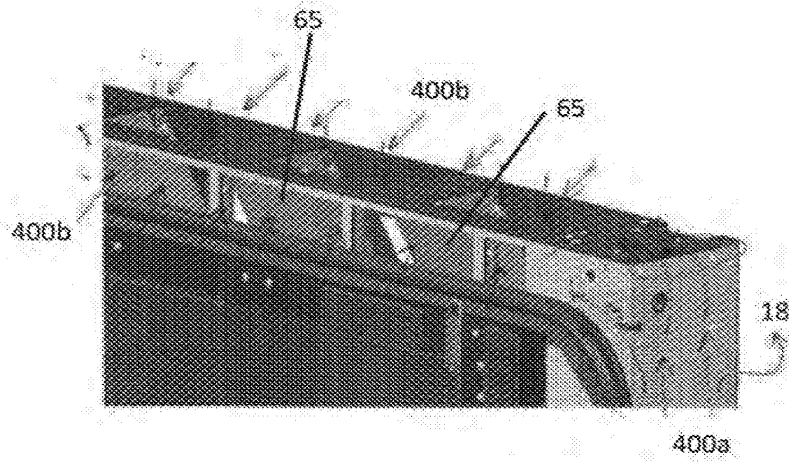
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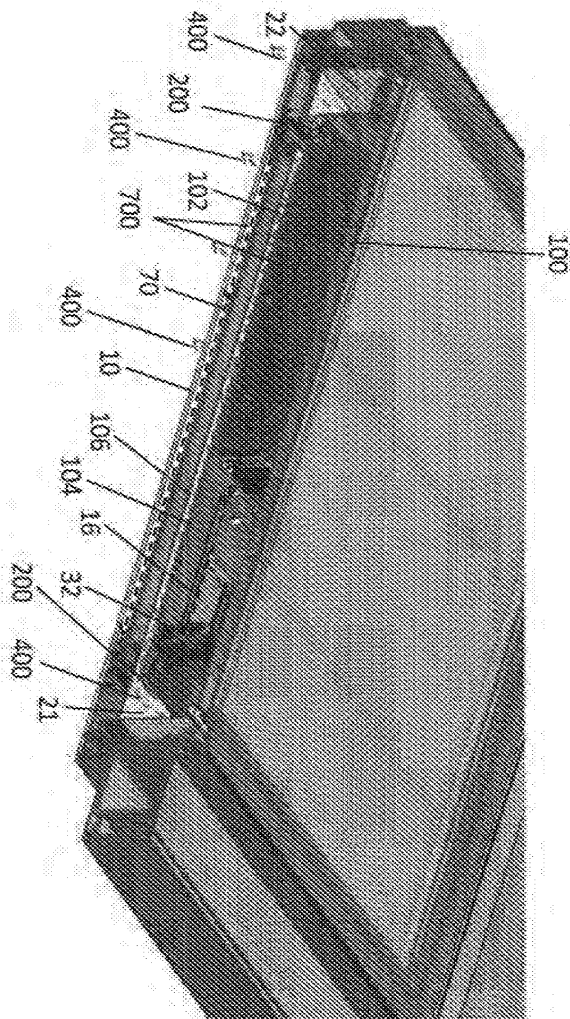
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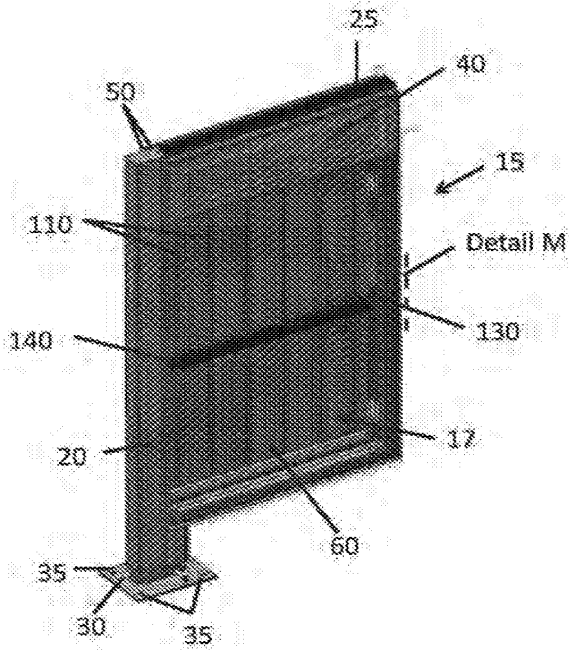
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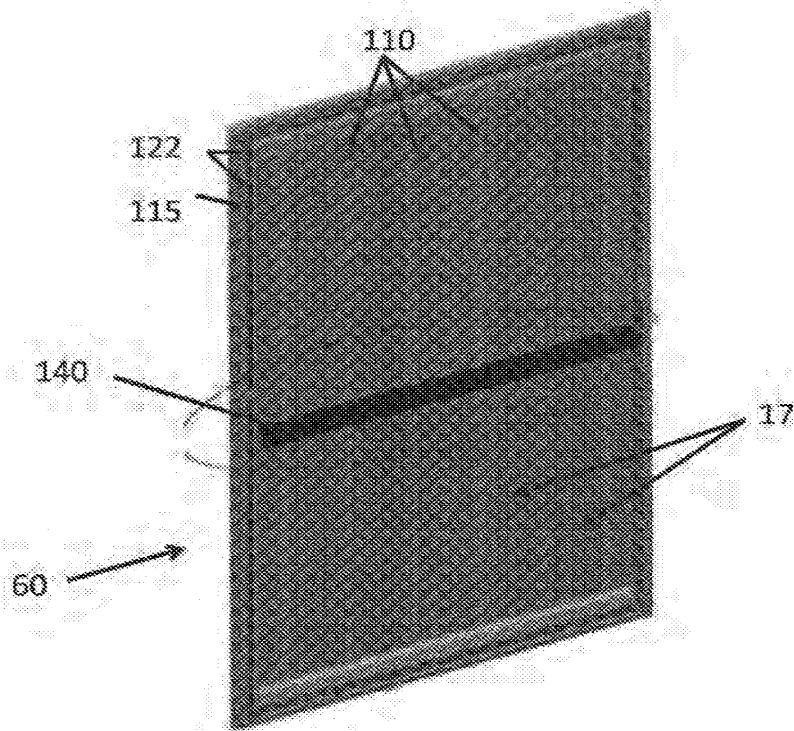
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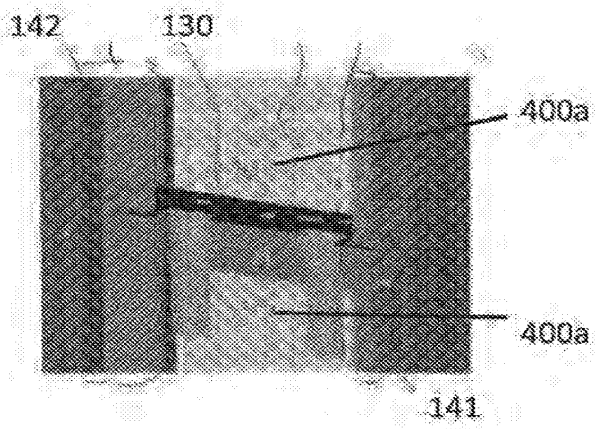


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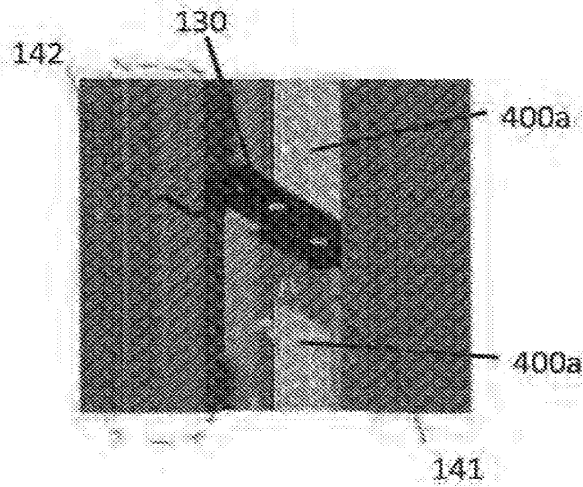




도면26a



도면26b



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- (71) **Applicant: FIREFLY SYSTEMS INC.** [US/US]; 488 8th Street, San Francisco, California 94103 (US).
- (72) **Inventors: KARDESLER, Onur;** c/o Firefly Systems Inc., 488 8th Street, San Francisco, California 94103 (US). **MC-CALEB, Alexander;** c/o Firefly Systems Inc., 488 8th Street, San Francisco, California 94103 (US). **HEAD, Sean;** c/o Firefly Systems Inc., 488 8th Street, San Francisco, California 94103 (US). **SUREN, Anil;** c/o Firefly Systems Inc., 488 8th Street, San Francisco, California 94103 (US). **GU-NAY, Kaan;** c/o Firefly Systems Inc., 488 8th Street, San Francisco, California 94103 (US). **YILDIZ, Vedat Taylan;**

c/o Firefly Systems Inc., 488 8th Street, San Francisco, California 94103 (US).

(74) **Agent: ISRAELSEN, R. Burns;** Maschoff Brennan, 1389 Center Drive, Suite 300, Park City, UT 84098 (US).

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(54) **Title:** VEHICLE-MOUNTED DYNAMIC CONTENT DELIVERY SYSTEMS

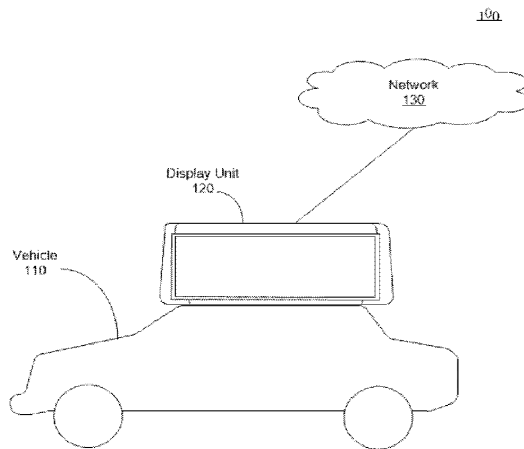


FIG. 1

(57) **Abstract:** A method is disclosed for displaying dynamic media content on a vehicle-mounted display as the vehicle travels along a route. The dynamic content may be audio or video content, and is selected based in part on sensor data, which may pertain to contextual or environmental factors. The content may be dynamically adjusted during playback, such as by bouncing or sharply changing direction during a sudden change in velocity or acceleration. Aside from motion-related factors, other contextual and environmental factors include weather, visibility, traffic, location, and time of day.

[Continued on next page]

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VEHICLE-MOUNTED DYNAMIC CONTENT DELIVERY SYSTEMS**CROSS-REFERENCE**

[0001] This application claims priority to U.S. Provisional Application. No. 62/747,052, filed on October 17, 2018, which is entirely incorporated herein by reference.

BACKGROUND

[0002] For decades, billboards have been erected to display content to drivers of vehicles on major roads. Displaying content on billboards makes it possible for hundreds of thousands of people to see the content daily.

[0003] Billboards may be installed at various locations, such as highways, roads or on buildings. The content of billboards may be changed on a periodic basis.

SUMMARY

[0004] As compared to stationary billboards, potentially even more people may be reached by displaying content on mobile billboards, such as displays mounted to trucks, trains, or other vehicles. Much of the content displayed on these billboards may not be targeted to specific demographics and may not be adjusted dynamically in response to external factors. Thus, many audiences may not be receptive to this displayed content.

[0005] Displaying dynamically adjustable, targeted content on vehicle-mounted display may be beneficial to content providers, as it may be possible to find many different audiences receptive to dynamically adjusted content along a traveled route.

[0006] In an aspect, a method for displaying media content on a vehicle is disclosed. The method comprises providing the vehicle comprising a display screen on an exterior portion of the vehicle, dynamically selecting the media content while the vehicle is travelling along a route, and displaying the media content dynamically selected in (b) on the display screen.

[0007] In some embodiments, the display screen is part of a display unit mounted on the exterior portion of the vehicle, where the display unit comprises one or more members selected from the group consisting of a global positioning system (GPS), a wireless transmitter, a wireless receiver, an optical sensor, an audio sensor, an accelerometer, and a gyroscope.

[0008] In some embodiments, the optical sensor is a camera or video unit.

[0009] In some embodiments, the optical sensor is a particle sensor.

[0010] In some embodiments, the media content is dynamically selected at least in part on (i) a speed, velocity or acceleration of the vehicle along a route, or (ii) contextual or environmental factors along the route.

- [0011] In some embodiments, the contextual factors include a geographic location of the vehicle along the route.
- [0012] In some embodiments, the contextual factors include a time of day in which the vehicle is travelling the route.
- [0013] In some embodiments, the environmental factors include traffic conditions or ambient lighting along the route.
- [0014] In some embodiments, the vehicle comprises a roof rack, and providing the vehicle with the display screen comprises fixing the display screen to the roof rack.
- [0015] In some embodiments, the environmental factors include weather conditions along the route.
- [0016] In some embodiments, the contextual factors include places of interest along the route.
- [0017] In some embodiments, places of interest include apartments, hotels, museums, parks, shopping centers, restaurants, and bars.
- [0018] In some embodiments, the contextual factors include entertainment events happening in a vicinity of the route.
- [0019] In some embodiments, wherein along the route, the vehicle undergoes a change in velocity or acceleration, and wherein the media content is dynamically adjusted in response to the change in velocity or acceleration.
- [0020] In some embodiments, along the route, the vehicle stops.
- [0021] In some embodiments, the method further comprises using a sensor to collect audio or video data along the route and using the audio or video data to dynamically select the media content.
- [0022] In some embodiments, the sensor captures a multi-angle video of conditions along the route.
- [0023] In some embodiments, the conditions are route conditions.
- [0024] In some embodiments, the method further comprises using a sensor to collect geographic data along the route and using the geographic data to dynamically select the media content.
- [0025] In some embodiments, the method further comprises using one or more sensors to collect environmental data.
- [0026] In some embodiments, the environmental data includes data indicative of visibility along the route.

[0027] In some embodiments, the method further comprises adjusting the media content in response to the change in visibility.

[0028] In some embodiments, the method further comprises determining one or more environmental conditions from the environmental data and adjusting the media content in response to the environmental conditions.

[0029] In some embodiments, the one or more environmental conditions includes air pollution or light pollution.

[0030] In some embodiments, the method further comprises logging information along the route.

[0031] In some embodiments, the method further comprises logging demographic information along the route.

[0032] In some embodiments, the demographic information includes a number of passengers along the route.

[0033] In some embodiments, the demographic information includes video of pedestrian or vehicle traffic along the route.

[0034] In some embodiments, the content is dynamically selected using a machine learning algorithm.

[0035] In another aspect, a system for displaying media content on a vehicle is disclosed. The system comprises a display screen mountable on an exterior portion of the vehicle and a controller operatively coupled to the display screen, wherein the controller is programmed to (i) dynamically select the media content while the vehicle is travelling along a route; and (ii) direct the media content dynamically selected in (i) to be displayed on the display screen.

[0036] In some embodiments, the controller is programmed to dynamically select the media content based at least in part on (i) a speed, velocity or acceleration of the vehicle along a route, or (ii) contextual or environmental factors along the route.

[0037] In some embodiments, the method further comprises a sensor for collecting audio or video data along the route.

[0038] In some embodiments, the sensor is a multi-angle camera.

[0039] In some embodiments, the system further comprises further comprising a logging module for storing information collected along the route.

[0040] In some embodiments, the system further comprises further comprising a sensor for determining the velocity and acceleration of the vehicle along the route.

[0041] In some embodiments, the media content is selected from content stored on an online portal.

[0042] In some embodiments, the online portal is configured to permit content providers to upload content.

[0043] In some embodiments, the online portal is configured to permit content providers to choose a time interval in which to display content.

[0044] In some embodiments, the online portal is configured to permit content providers to choose how often the content is played back.

[0045] In some embodiments, the online portal allows content providers to choose a bounded area in which media content playback occurs.

[0046] In some embodiments, the system communicates with connected devices using Wi-Fi and Bluetooth.

[0047] In another aspect, the present disclosure provides a method for determining an impression. The method can comprise (a) displaying media content on a screen during a first time period; (b) obtaining, using a camera, video of a subject adjacent to the screen; and (c) processing the video, using a gaze-tracking algorithm, to determine whether the subject looked at the screen during the time period.

[0048] In some embodiments, the media content can be an advertisement.

[0049] In some embodiments, the screen can be disposed on a vehicle.

[0050] In some embodiments, the camera can be integrated into the screen.

[0051] In some embodiments, the gaze-tracking algorithm can comprise a machine learning algorithm. The machine learning algorithm can comprise a convolutional neural network. Alternatively, the gaze-tracking algorithm can use geometric techniques.

[0052] In some embodiments, the method can further comprise, using a facial model, determining an emotional reaction of the subject to the advertisement.

[0053] In some embodiments, the method can further comprise selecting second media content to display on the screen during a second time period. The selecting can comprise considering the emotional reaction of the subject to the advertisement.

[0054] In some embodiments, the method can further comprise repeating (a) to (c) for a plurality of subjects other than the subject and computing an impression rate for the media content.

[0055] In another aspect, the present disclosure provides a method for determining a rate of engagement by a target group. The method can comprise (a) displaying media content on a

display screen at a first time at a first location and (b) determining, using mobile phone data, one or more subjects who were within a specified distance of the first location at the first time. The one or more subjects can comprise the target group. The method can further comprise (c) tracking, using the mobile phone data, a subset of the target group to a second location indicative of an engagement associated with the media content; and (d) determining the rate of engagement by processing a size of the subset and a size of the target group.

[0056] In some embodiments, the display screen can be on or mounted to a vehicle.

[0057] In some embodiments, the tracking can be performed within a specified time of the first time.

[0058] In some embodiments, the specified time can be at most one week.

[0059] Another aspect of the present disclosure provides a non-transitory computer readable medium comprising machine executable code that, upon execution by one or more computer processors, implements any of the methods above or elsewhere herein.

[0060] Another aspect of the present disclosure provides a system comprising one or more computer processors and computer memory coupled thereto. The computer memory comprises machine executable code that, upon execution by the one or more computer processors, implements any of the methods above or elsewhere herein.

[0061] Additional aspects and advantages of the present disclosure will become readily apparent to those skilled in this art from the following detailed description, wherein only illustrative embodiments of the present disclosure are shown and described. As will be realized, the present disclosure is capable of other and different embodiments, and its several details are capable of modifications in various obvious respects, all without departing from the disclosure. Accordingly, the drawings and description are to be regarded as illustrative in nature, and not as restrictive.

INCORPORATION BY REFERENCE

[0062] All publications, patents, and patent applications mentioned in this specification are herein incorporated by reference to the same extent as if each individual publication, patent, or patent application was specifically and individually indicated to be incorporated by reference. To the extent publications and patents or patent applications incorporated by reference contradict the disclosure contained in the specification, the specification is intended to supersede and/or take precedence over any such contradictory material.

BRIEF DESCRIPTION OF THE DRAWINGS

[0063] The novel features of the invention are set forth with particularity in the appended claims. A better understanding of the features and advantages of the present invention will be obtained by reference to the following detailed description that sets forth illustrative embodiments, in which the principles of the invention are utilized, and the accompanying drawings (also “Figure” and “FIG.” herein), of which:

[0064] FIG. 1 schematically illustrates an example of a system for displaying media content on a vehicle;

[0065] FIG. 2A schematically illustrates a display unit;

[0066] FIG. 2B schematically illustrates a circuit diagram of the display unit;

[0067] FIGs. 2C-F show multiple views of the display unit;

[0068] FIG. 3 shows an example of a method for displaying media content on the vehicle;

[0069] FIG. 4 schematically illustrates a self-serve portal for content providers;

[0070] FIG. 5 shows an analytics portal that may allow content providers to receive data about content presentation statistics;

[0071] FIG. 6 shows multiple views of a mobile application that may be used by a driver renting a display unit;

[0072] FIG. 7 shows a computer system that is programmed or otherwise configured to implement methods provided herein; and

[0073] FIG. 8 illustrates another display unit.

DETAILED DESCRIPTION

[0074] While various embodiments of the invention have been shown and described herein, it will be obvious to those skilled in the art that such embodiments are provided by way of example only. Numerous variations, changes, and substitutions may occur to those skilled in the art without departing from the invention. It should be understood that various alternatives to the embodiments of the invention described herein may be employed.

[0075] The term “media content,” as used herein, generally refers to visual and/or audio content for broadcast. The media content may be an image, audio, or video. Examples of media content include advertising content, alerts, and information material.

[0076] Whenever the term “at least,” “greater than,” or “greater than or equal to” precedes the first numerical value in a series of two or more numerical values, the term “at least,” “greater than” or “greater than or equal to” applies to each of the numerical values in that series of

numerical values. For example, greater than or equal to 1, 2, or 3 is equivalent to greater than or equal to 1, greater than or equal to 2, or greater than or equal to 3.

[0077] Whenever the term “no more than,” “less than,” or “less than or equal to” precedes the first numerical value in a series of two or more numerical values, the term “no more than,” “less than,” or “less than or equal to” applies to each of the numerical values in that series of numerical values. For example, less than or equal to 3, 2, or 1 is equivalent to less than or equal to 3, less than or equal to 2, or less than or equal to 1.

Systems and Methods for displaying media content on a vehicle

[0078] An aspect of the present disclosure provides methods for displaying media content on a vehicle. A method for displaying media content on a vehicle may comprise providing the vehicle comprising a display screen on an exterior portion of the vehicle. Next, the media content may be dynamically selected while the vehicle is travelling along a route. Next, the media content dynamically selected may be displayed on the display screen.

[0079] The display screen may be part of a display unit mounted on the exterior portion of the vehicle. The display unit may comprise one or more members selected from the group consisting of a global positioning system (GPS), a wireless transmitter, a wireless receiver, an optical sensor, an audio sensor, an accelerometer, and a gyroscope. The optical sensor may be a camera or video unit. As an alternative or in addition to, the optical sensor may be an infrared sensor or an ultraviolet sensor. The optical sensor may be a particle sensor (e.g., a sensor for measuring particles, such as a soot or pollution sensor). The wireless receiver may allow the display screen to computing devices in a local area. In some instances, the wireless receiver may allow the display unit to download content from one or more connected computing devices, in order to obtain data to provide instructions for the display unit to dynamically adjust or select media content.

[0080] The media content may be dynamically selected at least in part on the speed, velocity or acceleration of the vehicle along a route, or contextual or environmental factors along the route. The contextual factors may include a geographic location (or geolocation) of the vehicle along the route. The contextual factors may also include a time of day in which the vehicle is travelling the route. The environmental factors may include traffic conditions or ambient lighting along the route. The environmental factors may also include weather conditions along the route. The contextual factors may also include places of interest along the route. The places of interest may include apartments, hotels, museums, parks, shopping centers, restaurants, and bars. The contextual factors may also include entertainment events happening in a vicinity of the route.

[0081] Along the route, the vehicle may undergo a change in velocity or acceleration. The media content may be dynamically adjusted in response to the change in velocity or acceleration. Along the route, the vehicle may stop. The content may be adjusted by adopting a faster or slower framerate or rate at which media content is cycled or adjusting its motion in response to the changes in velocity or acceleration, according to events received by an accelerometer or a gyroscope. The display unit may display videos that are shorter in duration or static images when the vehicle moves at a faster speed and play longer content when the vehicle is at a standstill.

[0082] The media content may be selected and/or adjusted, and displayed on the display screen automatically without any involvement from a user. As an alternative, the media content may be selected by a user (e.g., through a mobile device of the user in communication with the display screen) and display upon request from the user. The user may be a driver of the vehicle, a remote user, or a passenger of the vehicle.

[0083] A sensor may be used to collect audio or video data along the route, and the audio or video data may be used to dynamically select the media content. The sensor may capture a multi-angle video of conditions along the route. The conditions may be route conditions. Further, the display unit may use a sensor to collect geographic data along the route and use the geographic data to dynamically select the media content. Route conditions may include vehicle traffic, pedestrian traffic, visibility, route topography (e.g., hilly, flat, winding roads, dirt road, one-way street), lighting, weather, climate, road conditions, traffic accidents, or other events or conditions external to the vehicle.

[0084] The one or more sensors may be used to collect environmental data. The environmental data may include data indicative of visibility along the route. The media content may be adjusted in response to the change in visibility.

[0085] One or more environmental conditions may be determined from the environmental data, and the media content may be adjusted in response to the environmental conditions. One or more environmental conditions may include air pollution or light pollution.

[0086] Information may be logged along the route, as data is collected from different sources as the vehicle travels along the route. Data may be collected by sensors or by devices that connect to the display unit over a network, such as a WiFi network or a cellular network.

[0087] Demographic information may be logged along the route. The logged demographic information may include a number of passengers along the route. The demographic information may include video of pedestrian or vehicle traffic along the route.

[0088] The content may be dynamically selected using a machine learning algorithm. For example, a machine learning algorithm may be used to predict the route a vehicle will travel, based on past traveling history. Content may then be allocated by the display unit in response to the predicted route. Example algorithms used may include logistic regression, linear regression, decision trees, and neural networks.

[0089] Another aspect of the present disclosure provides systems for displaying media content on a vehicle. A system for displaying media content on a vehicle may comprise a display unit mountable on an exterior portion of the vehicle. The display unit may include a controller operatively coupled to a display screen. The controller may be programmed to dynamically select the media content while the vehicle is travelling along a route; and may also direct the media content dynamically selected to be displayed on the display screen.

[0090] The controller may be programmed to dynamically select the media content based at least in part on a speed, velocity or acceleration of the vehicle along a route, or contextual or environmental factors along the route.

[0091] The system may include a sensor for collecting audio or video data along the route and the audio or video data may be used to dynamically select the media content. The sensor may be a camera that captures a multi-angle video of conditions along the route. The conditions may be route conditions. Further, the display unit may use a sensor to collect geographic data along the route and use the geographic data to dynamically select the media content. Route conditions may include vehicle traffic, pedestrian traffic, visibility, route topography (e.g., hilly, flat, winding roads, dirt road, one-way street), lighting, weather, climate, road conditions, traffic accidents, or other events or conditions external to the vehicle.

[0092] The system may include a logging module for storing information collected along the route. The logging module may be a database or data structure. Such information can include passenger information, route information, and/or weather information.

[0093] The system may also include a sensor for determining the velocity and acceleration of the vehicle along the route. Further, the system may use a sensor to collect geographic data along the route and use the geographic data to dynamically select the media content. Route conditions may include vehicle traffic, pedestrian traffic, visibility, route topography (e.g., hilly, flat, winding roads, dirt road, one-way street), lighting, weather, climate, road conditions, traffic accidents, or other events or conditions external to the vehicle.

[0094] The one or more sensors may be used to collect environmental data. The environmental data may include data indicative of visibility along the route. The media content may be adjusted in response to the change in visibility.

[0095] One or more environmental conditions may be determined from the environmental data, and the media content may be adjusted in response to the environmental conditions. One or more environmental conditions may include air pollution or light pollution.

[0096] Information may be logged along the route, as data is collected from different sources as the vehicle travels along the route. Data may be collected by sensors or by devices that connect to the display unit over a network, such as a Wi-Fi network or a cellular network.

[0097] Demographic information may be logged along the route. The logged demographic information may include a number of passengers along the route. The demographic information may include video of pedestrian or vehicle traffic along the route.

[0098] The media content displayed on the display screen may be selected from content stored on an online portal. The online portal may allow content providers to upload content for playback on the display unit's display screen. The content providers may be allowed to choose a time interval in which to display the uploaded content. The content providers may select a time interval that allows them to target a specific audience. For example, content displayed after midnight near bars may relate to local hotels. The online portal may also allow content providers to choose how often the content is replayed during the time interval. The content providers may be charged additionally for more plays of their content. The online portal may allow content providers to choose a bounded geographic area in which media content playback occurs. The area may be a square, triangular, or arbitrarily-shaped area. The area may be adjusted by the content provider before or during content presentation. The online portal also may allow content providers to collect data about their content as it is being displayed, including data regarding how many impressions the content receives from being displayed to external audiences.

[0099] The system may allow users to communicate with connected devices using Wi-Fi and Bluetooth. The system may connect to external devices, such as computing devices, and collect data from these devices over a network. This data may be combined with sensor data to select content for presentation. For example, the system may passively connect data from connected mobile phones including device identifiers and location information. The system may collect location information from Bluetooth Low Energy (BLE) beacons, in densely populated areas GPS information is unavailable or unreliable due to occlusions. The system may allow drivers and passengers to connect using an application and may receive demographic data from the

drivers and passengers. The system may be able to stream audio content from a connected Bluetooth device, and play the audio content for one or more external audiences.

[00100] **FIG. 1** schematically illustrates an example of a system 100 for displaying media content on a vehicle 110. The system 100 includes a vehicle, a display unit 120 mounted to the vehicle, and a network. The display unit is mounted on a roof of the vehicle 110. However, the display unit 120 may be mounted on other locations of the vehicle 120, such as, for example, a side or rear of the vehicle 120. As an alternative or in addition to, the display unit 120 may be integrated into a door or panel of the vehicle 120.

[00101] The display unit 120 may be mounted to the vehicle 110 using various approaches. For example, the display unit 120 is mounted to the roof of the vehicle 110 using two straps on opposing ends along a length of the display unit 120. As an alternative or in addition to, adhesive applied to a base of the display unit 120 may be used to secure the display unit 120 to the roof of the vehicle 110.

[00102] The system 100 may have at least 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or more display units. The display units may be of the same size or different sizes.

[00103] A display unit may have a width of at least about 0.1 meters (m), 0.2 m, 0.3 m, 0.4 m, 0.5 m, 0.6 m, 0.7 m, 0.8 m, 0.9 m, 1 m, 2 m, 3 m, 4 m, 5 m, 10 m, or greater. The display unit may have a width less than or equal to about 10 m, 5 m, 4 m, 3 m, 2 m, 1 m, 0.9 m, 0.8 m, 0.7 m, 0.6 m, 0.5 m, 0.4 m, 0.3 m, 0.2 m, 0.1 m, or less. The display unit may have a height of at least about 0.1 m, 0.2 m, 0.3 m, 0.4 m, 0.5 m, 0.6 m, 0.7 m, 0.8 m, 0.9 m, 1 m, 2 m, 3 m, 4 m, 5 m, 10 m, or greater. The display unit may have a height less than or equal to about 10 m, 5 m, 4 m, 3 m, 2 m, 1 m, 0.9 m, 0.8 m, 0.7 m, 0.6 m, 0.5 m, 0.4 m, 0.3 m, 0.2 m, 0.1 m, or less. The display unit may have a length of at least 0.1 m, 0.2 m, 0.3 m, 0.4 m, 0.5 m, 0.6 m, 0.7 m, 0.8 m, 0.9 m, 1 m, 2 m, 3 m, 4 m, 5 m, 10 m, or greater. The display unit may have a length less than or equal to about 10 m, 5 m, 4 m, 3 m, 2 m, 1 m, 0.9 m, 0.8 m, 0.7 m, 0.6 m, 0.5 m, 0.4 m, 0.3 m, 0.2 m, 0.1 m, or less.

[00104] The vehicle 110 may be a land vehicle, such as a car, train, truck, van, or bus, and also may be an airborne or seaborne vehicle, such as an airplane, helicopter, blimp, unmanned aerial vehicle (UAV), ship, or boat. The vehicle may be an autonomous or semi-autonomous vehicle. The vehicle 110 may be a personal vehicle, a taxicab, a self-driving vehicle, or a public or mass transportation vehicle. The vehicle 110 may transport passengers or cargo along a route and may allow the display unit to display media content and/or collect information along the route.

[00105] The display unit 120 may be mounted to the vehicle and displays dynamic media content to external audiences. The display unit may be purchased by, rented by, or leased to an owner or driver of the vehicle 110. The display unit 120 may be mounted on top, on the side, or above the trunk or license plate of the vehicle 110. The display unit may be stationary or may rotate in place.

[00106] The network 130 may connect to the display unit 120 and may enable the display unit 120 to interface with other network-connected devices. These network-connected devices may include, for example, computing devices, such as mobile phones, tablets, and desktop or laptop computers. For example, the display unit 120 may connect to a mobile device owned by the driver of the vehicle, in order for the driver to log information about the traveled route or to passively collect data from the driver's mobile device. The display unit may also passively collect data from other connected computing devices, or position information from devices such as Wi-Fi beacons. The network 130 may be a cellular network, a Wi-Fi network, or another type of network.

[00107] **FIG. 2A** schematically illustrates the display unit 120 from **FIG. 1**. The display unit 120 may include a display screen 210 mountable on an exterior portion of the vehicle, a controller 220 operatively coupled to the display screen 210, a power source unit 240, a sensor unit 230, and a storage unit 250.

[00108] The display screen 210 may display dynamic content to an audience that is positioned outside of the vehicle itself (e.g., on a sidewalk along the route). The displayed content may be dynamically selected responsive to data collected regarding contextual or environmental conditions. Contextual and environmental conditions may include the time of day, the amount of traffic, the acceleration and velocity of the vehicle, the amount of air and light pollution, and other factors observed along the vehicle's traveled route. The display unit may be programmed to display graphic image or video content in response to the contextual or environmental conditions. The display screen 210 may be a liquid crystal (LCD) display device, a flat panel cathode ray tube (CRT), a thin film transistor (TFT) display device, a plasma device, or another type of electronic display device.

[00109] The controller 220 may direct the playback of media content on the display screen. The controller may be a general-purpose computer or a mobile device running a mobile operating system. Alternatively, the controller may be an integrated circuit device such as a processor, microcontroller, Application-Specific Integrated Circuit (ASIC) device, or a Field

Programmable Gate Array (FPGA) device capable of executing instructions contained in one or more software programs. The controller 220 may be integrated with a sensor unit 230 including one or more sensors that collect data regarding environmental or contextual conditions. For example, the controller may be integrated with a sensor unit 230 including one or more of a global positioning system (GPS), a media sensor, an accelerometer, a gyroscope, a microphone, or another type of sensor. The sensor unit 230 may include storage to log sensor data. The sensor data 230 may also upload sensor data to an external server, such as a cloud server. The sensor data may be made accessible to the controller 220, in order to allow the controller 220 to select media content for presentation on the display screen 210.

[00110] The controller 220 may select content for presentation from the storage unit 250, in response to the collected data regarding environmental or contextual conditions. The storage unit 250 may be a memory unit that is co-located with the controller 230 on the same device. Alternatively, the storage unit may be located on a different device. The storage unit 250 may be a Random-Access Memory (RAM) device, a Read Only Memory (ROM) device, a flash memory device, or another type of storage device.

[00111] Alternatively, the controller 220 may stream content from a remote server. The controller may connect to this server using Wi-Fi or a cellular network, such as a 3G or 4G cellular broadband network. The server may be a web server from which publicly available content may be streamed, or a private server.

[00112] The power source unit 240 provides power to the components of the display unit. The power source unit 240 may be a battery, such as a lithium-ion battery, a set of AA batteries, or a set of AAA batteries. The power unit may receive power from a vehicle battery and alternator.

[00113] **FIG. 2B** schematically illustrates a circuit diagram of the display unit 120. In **FIG. 2B**, two display screens 210A and 210B are shown, as well as the controller 220, the power source unit 240, a cooling unit 255, and the sensor unit 230. Although two display screens are included in the figure, the display unit may have one display screen or more than two display screens. Components of the display unit circuit may be printed on one or more printed circuit boards (PCBs).

The power source unit 240 provides power to the display unit 120 and directs the provided power to the components within the display unit 120. The power source unit 240 includes a power supply 242 and a power distribution unit 244. The power source unit 240 may provide the components with direct current (DC) voltage.

[00114] The power supply 242 may supply power to the components of the display unit 120. The power supply may be a battery. The power supply may supply, for example, a symmetric voltage of +/- 12 V DC. The power supply 242 may include the battery and the alternator of the vehicle 110. The power supply 242 also may include an on/off switch connected to an accessory circuit. The accessory circuit may, for example, be supplied power through an accessory source such as the car cigarette lighter and may supply 12 V DC. The accessory circuit may also include a relay, which may turn on when power is supplied through the accessory source and may stay off when power is not supplied through the accessory source. The accessory circuit may also include an on/off switch, which breaks the connection and shuts off power to the rest of the display unit 120.

[00115] The power distribution unit 244 may direct the power from the power supply 242 to the other components of the display unit 120 using a plurality of wires and terminal blocks. The power distribution unit 244 may contain one or more DC converters to lower or raise the voltage supplied by the power supply 242, depending on the voltages required by the components of the display unit 120. For example, a car battery power supply may supply a system with a DC symmetric voltage of +/- 12 volts. But individual components of the display unit 120 may only be rated for +/- 5 volts of DC symmetric voltage. The power distribution unit 244 may use one or more terminal blocks to connect the components of the display unit 120 to the power supply. The terminal blocks fasten wires to terminals on the displays 210A and 210B in order to supply potential differences to the displays. The terminal blocks may enable each sub-display to receive 10 V (+5/-5 symmetric) from the power source unit 240. To hold a wire in place, a terminal block may use a spring-cage connection, in which the connecting wire is enclosed in a cage that is secured using a spring, a screw connection, in which the wire is held in place using a screw, a hybrid connection including screw and spring connections, or another type of connection.

[00116] Wires may supply a symmetric DC voltage of +/- 12 V to the power distribution unit. The DC converters may lower the supplied voltage to +/- 5 V. Then, the terminal blocks supply voltages of 10 V to each sub-display. The terminals receiving +5 V, in the circuit diagram, are B, D, F, G, I, and K. The terminals receiving -5 V (the ground terminals) are (A, C, E, H, J, and, L).

[00117] The display screens 210A and 210B may use LEDs to present content to one or more external audiences along the route. The display screens 210A and 210B may comprise multiple sub-displays. A sub-display may have a terminal, through which the sub-display may receive power serially from the power distribution unit 244. The display screens 210A and B may

receive the power after one or more DC converters raise or lower the voltage output from the power supply unit 242. For example, each sub-display may receive 10 V (+/- 5 V symmetric) from the power distribution unit 244, and the display screens may comprise 12 sub-displays, which each receive 5 V from the power source 240. The display screens 210A and 210B may receive content for presentation serially from a computing device, such as a mobile phone, laptop, or tablet.

[00118] In FIG. 2B, the input terminals in each of the sub-displays are labeled B, D, F, G, I, and K, and receive the voltage supplied by the power distribution unit 244. The ground terminals are labeled A, C, E, H, J, and, L. The 12 sub-displays are arranged in a 6x2 grid but may be arranged in another configuration. For example, the 12 sub-displays may be arranged as a 12x1 grid, a 4x3 grid, or a 3x4 grid. There may be more than 12 sub-displays, depending on the size of the sub-displays used. The LEDs used in the displays 210A and 210B may be, for example, SMD 2020 LEDs.

[00119] The cooling unit 255 prevents the display unit 120 from overheating. The cooling unit may include one or more heat sinks, fans, liquid cooling devices, heat pipes, or other cooling devices. A cooling unit fan may be able to operate at one or more speeds when the power source unit 240 supplies a voltage to the fan. For example, the fan may be able to operate at a fast speed or a medium speed. The fan may indicate its speed using one or more LEDs or other visual aids. For example, the fan may indicate a fast speed with a red LED, a medium speed with an orange LED, or that it is turned off with a blue LED.

[00120] The controller 220 may direct content to the display screens 210A and 210B for presentation and may adjust the presented content in response to received data from one or more sensors from a sensor unit 230. The controller 220 may include a computing unit 224 and a diagnosis unit 228.

[00121] The sensor unit 230 may include one or more sensors that collect data, such as environmental data and context data. The circuit diagram includes a temperature sensor and a light sensor, but the sensor unit 230 may include other sensors, including one or more of a particle sensor, an air pollution sensor, a humidity sensor, a microphone or noise meter, a gyroscope, a GPS, an accelerometer, a camera, a radar system, a light detection and ranging (LIDAR) system, or the like. As sensors collect data, they may place the data into one or more discrete groups, based on defined ranges of data values. For example, a temperature sensor may group temperatures above 60 F into a "high" temperature bucket and temperatures below 60 F into a "low" temperature bucket. A light sensor may group measurements of more than 1000 lux

as “bright” and of less than 1000 lux as “dark”. A light sensor may use one or more LEDs to provide a visual representation of the data it receives. For example, the temperature sensor may use a black LED to signify a cold temperature, a yellow LED to signify a mild temperature, and a red LED to signify a hot temperature. The light sensor may have green and white LEDs, for signifying ambient darkness and ambient lightness, respectively.

[00122] The data collected by the sensors in the sensor unit 230 can be shared with municipalities or sold to third-parties. For example, municipalities may be interested in obtaining micro-climate and air pollution data so that they can issue severe weather or air quality alerts. Ride-share and autonomous vehicle companies, on the other hand, may be interested in obtaining camera, radar, or LIDAR data.

[00123] The computing unit 224 may provide content to the display screens 210A and 210B for presentation. The computing unit may be a mobile computing device containing a mobile operating system (OS), such as an ANDROID® or iOS® operating system. The computing unit 224 may be built with a central processing unit (CPU) that operates in low-power environments. Because of this, the computing unit may receive a voltage that is lower than the voltage supplied by a vehicle battery or accessory circuit. This may be achieved by the one or more DC converters from the power source unit 240. The computing unit 224 may include storage to store content for presentation or may receive content from an external storage source over a network, such as the network 130. The computing unit 224 may connect to multiple sub-displays within the display screens 210A and 210B using a plurality of serial port connections. Data from the computing unit 224 may be transmitted to a sub-display using a serial cable, and from that sub-display to additional sub-displays within the display screen. The computing unit 224 may have one or more connection slots, such as flat cable connection slots, in order to transmit data to the display screens 210A and 210B. The computing unit 224 may have one or more serial ports for transmitting and receiving data. The computing unit 224 may receive information from the sensing unit 230 at the receiving port and use the received information to dynamically adjust playback of content. The computing unit 224 may transmit collected data from the route to an external application or service.

[00124] The diagnosis unit 228 enables inspection of the components of the display unit 120. The diagnosis unit 228 may be a circuit board including terminals that connect in parallel with the various components of the display unit 120, in order to measure voltages across the components. For example, the diagnosis unit 228 may measure the supplied voltage, the voltage across the fan, the power to the computing unit 224, and the voltage across the serial terminals of

the computing unit 224. The diagnosis unit 228 may also display the values received from sensors within the sensor unit 230, for example, by illuminating LEDs corresponding to the received sensor data. For example, the diagnosis unit may illuminate a black LED to signify a low temperature reading.

[00125] The display unit can be attached to the roof-rack of the vehicle.

[00126] FIGs. 2C-F show multiple views of the display unit 120. FIG. 2C shows an oblique view of the display unit 120, as well as a view of electronic components inside the display unit 120. These electronic components may include the electronic components described in FIG. 2B. FIGs. 2D, 2E, and 2F show different views of the exterior of the display unit 120. FIG. 2D shows a side view. FIG. 2E shows a front view. FIG. 2F shows an oblique view.

[00127] FIG. 3 shows an example of a method 300 for displaying media content on the vehicle 110. The process is implemented in a system including the vehicle 110 and the display unit 120.

[00128] In a first operation 301, the vehicle 110 is provided comprising a display screen on an exterior portion of the vehicle. The display screen may be purchased by or licensed to the owner of the vehicle. The display screen may be part of the display unit 120, also including the controller 220, the sensor unit 230, the power source unit 240, and the storage unit 250.

[00129] Next, in a second operation 302, the media content is dynamically selected by the controller 220 while the vehicle 110 is travelling along a route. The dynamically selected media content may be loaded by the controller onto the display screen via the storage unit 250, or it may be streamed from a computing device connected to a network, such as the network 130, and electronically coupled to the display screen. Individual content items may be manually selected (e.g., selected by the driver, an operator of the vehicle 110, or a passenger) or periodically selected (e.g., randomly or from a premade queue) according to a time interval. If individual content items are manually selected, they may still dynamically adjust in response to sensor events. In addition, the media content may be selected in response to events triggered when the display unit receives sensor data. The media content may originate from one or more content providers that have purchased one or more time intervals in which the display unit 120 streams their content to external audiences along the route. Depending on the route, different media content may be loaded into the display unit 120 or streamed by the display unit 120.

[00130] The controller 220 may select the media based in part on the speed, velocity, or acceleration of the vehicle along the route, or environmental or contextual factors along the route.

Information on motion, contextual, or environmental factors may be collected by one or more sensors within the sensor unit 230. For example, motion information may be collected by an accelerometer, a gyroscope, or both. Environmental or contextual factors may be collected by a global positioning system (GPS), a light sensor, a particle sensor, a photo or video camera, or another sensing device. Contextual factors may include the geographic location of the vehicle, the time of day, traffic conditions, ambient lighting, weather conditions, places of interest and entertainment venues. Places of interest may include apartments, hotels, museums, restaurants, parks, shopping centers, and bars.

[00131] Next, in a third operation 303, the media content dynamically selected by the controller 220 is displayed on the display screen 210. The media content is viewable by an audience external to the vehicle 110. The controller 220 directs playback of the dynamic media content and may select additional content items after the current content has finished playback. The controller 220 may select a piece of media content in response to the collected environmental and contextual data. The controller 220 may select content for display based on a hierarchy of environmental or contextual data. For example, positioning data may be classified as more important than air pollution data or light pollution data. When the vehicle reaches a particular landmark or region, an item with content matching the geographic region may be selected. The controller may also select based on a weighting of the environmental or contextual data. The controller 220 may weight environmental and contextual factors, such as positioning, pollution, lighting, traffic, velocity, and other data, and use the weighted factors in an algorithm to select content to display, based on the characteristics of the content. Example algorithms used to select content may be machine learning algorithms. The controller 220 may predict different external audiences corresponding to different sections of the route, according to logged historical route data and sensor data from the sensor unit 230. Content items may be matched to the predicted external audiences and presented based on their degrees of matching to predicted external audiences at different points along the route. For example, in a geographic area that gets crowded during rush hour, the controller may select content advertising public transit close to the area. Within an area at night containing popular nightlife attractions, the controller 220 may select content advertising popular hotels. The controller 220 may select the data based on instructions from a content provider, as specified by input instructions through a self-service portal for content providers.

[00132] The controller 220 may modify the playback of media content in response to retrieved data in real-time or near real-time. The controller 220 may program specific events to

occur in response to receiving data from sensors. For example, the controller 220 may respond to a change in acceleration, retrieved from accelerometer or gyroscope data, by changing the speed or direction of objects within the content. For example, in response to a vehicle braking sharply, an ad displaying moving text may cause the text to bounce or collide with the side of the display and sharply reverse direction. In response to pollution or decreased visibility, a content item may darken. In response to glare detected by a camera or light sensor, a content item may darken. The controller 220 may slow down or speed up playback of a content item when the vehicle moves at a faster or slower velocity.

[00133] **FIG. 4** is a diagram of a self-serve portal 400 for content providers. The self-serve portal allows a content provider to purchase a content presentation opportunity. The portal may allow a provider to upload content for presentation. Once the content is uploaded, the content provider may choose date and time ranges in which the content is to be presented. For example, a date range may be 8/17/17 - 8/18/17, and a time range within that date range may be 5:00 PM - 11:00 PM. In FIG. 3, one date range and associated time range is presented, but multiple non-contiguous date and time ranges may be chosen. The content provider may also choose a coverage zone bounding an area in which the content is to be presented. The content provider may choose one or more coverage zones, which may or may not be contiguous. When determining the coverage zone or zones, the content provider may be provided with information about the size of the zone, the purchase price for presenting content within the zone, and the size of the potential audience that will view the content as it drives along the route. The content provider may also choose a method to purchase the content presentation opportunity. The content presentation opportunity may be purchased electronically, using a credit card, debit card, payment service, or electronic check. The provider may be billed proportionally to the time period in which the content is presented, the area, the number of content presentations over the duration of the content presentation opportunity, the length and type of content presented, or some combination of these factors.

[00134] **FIG. 5** shows an analytics portal 500 that allows content providers to receive data about content presentation statistics. The analytics portal 500 may show statistics for content groupings, including where the content is being presented and the price charged per piece of content in each grouping. The analytics portal 500 may show a distribution of impressions of content played during a selected duration. The analytics portal 500 also may designate a time period with the largest number of content presentations, a day with the largest number of content presentations, the number of vehicles presenting the content, the demographics of the audience

being shown the content, and other data. The analytics portal 500 also may present to content providers a map showing how many drivers are currently presenting their content as well as the locations of the drivers presenting the content.

[00135] The analytics portal 500 may also display hardware information. The analytics portal 500 may display information about the display unit 120, including the type of board, screen, fan, and when the display unit 120 was last inspected. The analytics portal may also display information about how often the vehicle 110 was driven within a selected time period.

[00136] **FIG. 6** shows multiple views of a mobile application 600 that may be used by a driver renting a display unit. The driver may be a commercial vehicle driver, a person with a private car who performs ridesharing activities, a taxicab driver, or a bus driver. Upon purchasing the display unit, the owner of the vehicle may mount the display unit to his or her vehicle and earn money by displaying content to external audiences as he or she drives along a route. The mobile application may upload data obtained along the route from the sensors in the display unit, which may be seen by content providers. Within the application, a driver may view a total amount earned to date, as well as target earnings and methods to earn more money. A driver may also be able to report bugs or issues through the application and receive support for dealing with the reported issues.

Cameras

[00137] As mentioned above, the sensor unit 230 of the display unit 120 can have one or more cameras. The cameras can be disposed outside of the display unit 120 (e.g., on the roof or roof-rack of the vehicle on which the display unit 120 is installed), or they can be integrated into the display unit 120. The cameras can be integrated into the sides or top of the display unit 120. In some cases, the cameras can include a camera with a fish-eye lens located in the top of the vehicle. Together or separately, the cameras can generate a 360-degree view of the environment of the vehicle.

[00138] In some cases, the sensor unit 230 can instead have other types of imaging device such as infrared cameras, radar systems, LIDAR systems, or the like. Such imaging devices can perform some or all of the same functions described below.

[00139] The cameras can obtain images or video of the environment of the vehicle. The video can provide useful contextual information about (i) demographic groups in particular locations at particular times and (ii) advertising impressions.

[00140] For example, the video can indicate the age, gender, race, or nationality of people in the vicinity of the vehicle. Additionally, the video can indicate what clothing those people

wear, what products (e.g., backpacks, purses, mobile devices, strollers, vehicles) they use, whether they have children or pets, and whether they are in a relationship (e.g., based on whether they are holding hands with another person), to name a few examples.

[00141] Machine learning or computer vision algorithms implemented on the display or a remote server can process the video to provide these insights. For example, a machine learning algorithm can be configured to predict the age or classify the gender or race of a person in the video. A different machine learning or computer vision algorithm can be trained to classify products that people in the vicinity of vehicle are carrying. Such a machine learning algorithm or computer vision algorithm can classify the products by type (e.g., mobile device, backpack, etc.) or by brand (e.g., for products classified as a mobile device, whether the mobile device is an Android or Apple device). Other machine learning algorithms can be configured to predict whether a person in the video has children, pets, or a partner, e.g., based on the person's physical proximity to children, pets, or other people in the video. Still other machine learning algorithms can be configured to predict the occupation of a person in the video. Such machine learning algorithms can use features like the person's clothing, products, and walking direction to make such a prediction.

[00142] The machine learning algorithms can be supervised, semi-supervised, or unsupervised. A supervised machine learning algorithm can be trained using labeled training inputs, i.e., training inputs with known outputs. The training inputs can be provided to an untrained or partially trained version of the machine learning algorithm to generate a predicted output. The predicted output can be compared to the known output, and if there is a difference, the parameters of the machine learning algorithm can be updated. A semi-supervised machine learning algorithm can be trained using a large number of unlabeled training inputs and a small number of labeled training inputs. An unsupervised machine learning algorithm, e.g., a clustering algorithm, can find previously unknown patterns in data sets without pre-existing labels.

[00143] One example of a machine learning algorithm that can perform some of the functions described above, e.g., making classifications and predictions based on video data, is a neural network. Neural networks can employ multiple layers of operations to predict one or more outputs, e.g., the age of a person, from one or more inputs, e.g., frames of video of the person. Neural networks can include one or more hidden layers situated between an input layer and an output layer. The output of each layer can be used as input to another layer, e.g., the next hidden layer or the output layer. Each layer of a neural network can specify one or more transformation operations to be performed on input to the layer. Such transformation operations may be referred

to as neurons. The output of a particular neuron can be a weighted sum of the inputs to the neuron, adjusted with a bias and multiplied by an activation function, e.g., a rectified linear unit (ReLU) or a sigmoid function.

[00144] Training a neural network can involve providing inputs to the untrained neural network to generate predicted outputs, comparing the predicted outputs to expected outputs, and updating the algorithm's weights and biases to account for the difference between the predicted outputs and the expected outputs. Specifically, a cost function can be used to calculate a difference between the predicted outputs and the expected outputs. By computing the derivative of the cost function with respect to the weights and biases of the network, the weights and biases can be iteratively adjusted over multiple cycles to minimize the cost function. Training can be complete when the predicted outputs satisfy a convergence condition, such as obtaining a small magnitude of calculated cost.

[00145] Convolutional neural networks (CNNs) and recurrent neural networks can be used to classify or make predictions from images or video. CNNs are neural networks in which neurons in some layers, called convolutional layers, receive pixels from only small portions of an image or video. These small portions may be referred to as the neurons' receptive fields. Each neuron in such a convolutional layer can have the same weights. In this way, the convolutional layer can detect features, e.g., shapes or edges, in any portion of the input image.

[00146] RNNs, meanwhile, are neural networks with cyclical connections that can encode dependencies in time-series data, e.g., video frames. An RNN can include an input layer that is configured to receive a sequence of time-series inputs. An RNN can also include one or more hidden recurrent layers that maintain a state. At each time step, each hidden recurrent layer can compute an output and a next state for the layer. The next state can depend on the previous state and the current input. The state can be maintained across time steps and can capture dependencies in the input sequence. Such an RNN can be used to encode times-series features of a video.

[00147] One example of an RNN is a long short-term memory network (LSTM), which can be made of LSTM units. An LSTM unit can be made of a cell, an input gate, an output gate, and a forget gate. The cell can be responsible for keeping track of the dependencies between the elements in the input sequence. The input gate can control the extent to which a new value flows into the cell, the forget gate can control the extent to which a value remains in the cell, and the output gate can control the extent to which the value in the cell is used to compute the output

activation of the LSTM unit. The activation function of the LSTM gate can be the logistic function.

[00148] Other examples of machine learning algorithms that can be used to process video data are regression algorithms, decision trees, support vector machines, Bayesian networks, clustering algorithms, reinforcement learning algorithms, and the like.

[00149] The demographic information gleaned from the videos can be used to generate equivalent or substantially equivalent target and control groups of people. A target group can be a group of people who had an opportunity to view an advertisement on a display on a vehicle. A control group can be a demographically similar or identical group of people who did not have an opportunity to view the advertisement. Companies can measure the effectiveness of the advertisement by comparing (i) the engagement of the target group with the product, service, or message was that the subject of the advertisement to (ii) the engagement of the control group. The measure can be more accurate when the target group and the control group are demographically identical or substantially identical. The video collected by the vehicle, which can provide detailed demographic information about people in the vicinity of the vehicle, can aid in generating these identical target and control groups.

[00150] The information about products that people use can be used to do targeted advertising. For example, if the video data reveals that many people in a particular location at a particular time use a particular brand of backpack, the display can advertise other products made by the company that makes the brand of backpack.

[00151] The video can also be used to more accurately measure advertising impressions. To that end, the cameras can obtain video of people's faces and gazes. Thereafter, gaze-tracking algorithms can be used to process the video data to determine whether people in the vicinity of the vehicle actually viewed an advertisement on the vehicle's display. This data can be used to more accurately count the number of people who viewed an advertisement. A true count of people who viewed an advertisement can be used to compute a more accurate effectiveness metric of the advertisement than a count of people who simply had an opportunity to view the advertisement but may or may not have actually viewed it.

[00152] Gaze tracking algorithms can use geometric or statistical techniques to determine whether a person is looking a camera. In some cases, the camera may contain a particular type of LED that shines a light at the pupil and measures reflections. Geometric techniques can involve the use of two or more cameras. Statistical techniques can involve the use of, for example, convolutional neural networks trained on a data set comprising video or images of people looking

at particular points. Gaze tracking algorithms are discussed in detail at <https://arxiv.org/ftp/arxiv/papers/1708/1708.01817.pdf>, which is entirely incorporated herein by reference.

[00153] The video can also indicate reactions to advertisements on the display. The reactions can be used to optimize the type and form of advertisements that are shown on the display. For example, if video indicates that people are more responsive, or more often look at, advertisements with red backgrounds than blue backgrounds, the display can show advertisements with red backgrounds more often. Other aspects of advertisements, including font color, font size, and length, can be optimized in the same way.

[00154] Responsiveness to advertisements can be measured using one or more facial models. The facial models can be configured to predict a person's emotional response to an advertisement. For example, the facial models can classify a person as being happy, sad, or angry in response to viewing an advertisement. The facial model can use as features the facial features or expressions of the person, e.g., laughing, smiling, frowning, or scoffing. The facial model can be one of the machine learning algorithms described above, e.g., a neural network.

[00155] To optimize the type or form of an advertisement, the camera can obtain a large set of data comprising various advertisements and corresponding view rates and/or reactions to the advertisements. Each advertisement can be defined by a plurality of parameters, e.g., background color, font color, font size, length, and the like. Each advertisement can be associated with a view rate and a plurality of reactions. This data can be used, for example, to create a multiple-regression model or train a machine learning algorithm to optimize the parameters of an advertisement. The machine learning algorithm can be any of the machine learning algorithms described herein. In some cases, an advertisement selection algorithm can be adjusted or retrained as new impression and reaction data becomes available.

Tracking User Engagement Using Credit Card Identifiers

[00156] The display unit of FIG. 2 can be installed in taxis that accept credit cards. In some cases, a rider may see an advertisement on the display unit as he is entering a taxi and then swipe his credit card to pay for the taxi. The business responsible for the advertisement can track whether that user then uses that credit card at the business, which can indicate a conversion based on the advertisement.

Use of Mobile Location Data to Track Conversions/Engagements

[00157] Location-based mobile data can be used to track customer conversions or engagements. The display unit can maintain a log of the advertisements it displayed in particular

locations at particular times. Location data from mobile phones can be used to determine which people were in the vicinity of the display at the time and therefore had an opportunity to view the display and the advertisement.

[00158] The mobile data can then be used to determine, for example, if those people, within a specified time period, visited a store or other location selling the product or service that was the subject of the advertisement on the display. In some cases, other phone data may be available. For example, in addition to a person's location, the person's online activity may be available. If a person saw an advertisement for a product and then online shopped for that product, that may be considered an engagement or a conversion. This location-based and other mobile data may be obtained from third-parties, or it can be provided by the user directly to the company responsible for the advertisement. This method of determining customer engagement can be used in conjunction with any of the other methods described herein.

[00159] FIG. 8 shows a second implementation of the display unit. As depicted in FIG. 8, the display unit can have a length of at least about 0.7 meters (m), 0.8 m, 0.9 m, 1.0 m, 1.1 m, 1.2 m, 1.3 m, 1.4 m, 1.5 m or more. In one implementation, the display unit can have a length of 1.182 m. The display unit can have a height of at least about 0.1 m, 0.2 m, 0.3 m, 0.4 m, 0.5 m, or more. In one implementation, the display unit can have a height of 0.372 meters. The display unit can have a width of at least about 0.05, 0.1, 0.15, 0.2 meters. In one implementation, the display unit can have a width of 0.12 meters.

[00160] The display unit can have a thin bezel such that the screens of the display unit occupy 80-100% of the largest faces of the display unit. In one implementation, the screen can have a length of 1.120 m and a height of 0.320 m. The screen can be a unitary piece, or it can be made of several panels. For example, the screen can be made of 2, 3, 4, 5, 6, 7, 8, 9, 10 or more panels of equal or unequal size.

[00161] The display unit can be configured to attach to the bars of a standard roof rack.

Computer systems

[00162] The present disclosure provides computer systems that are programmed to implement methods of the disclosure. FIG. 7 shows a computer system 701 that is programmed or otherwise configured to process various types of data collected from sensors and dynamically select content for display by the display unit. The computer system 701 can regulate various aspects of data collection, prediction, and content selection of the present disclosure, such as, for example, storing data from sensors, storing content, and selecting data for presentation. The computer system 701 can be an electronic device of a user or a computer system that is remotely

located with respect to the electronic device. The electronic device can be a mobile electronic device.

[00163] The computer system 701 includes a central processing unit (CPU, also “processor” and “computer processor” herein) 705, which can be a single core or multi core processor, or a plurality of processors for parallel processing. The computer system 701 also includes memory or memory location 710 (e.g., random-access memory, read-only memory, flash memory), electronic storage unit 715 (e.g., hard disk), communication interface 720 (e.g., network adapter) for communicating with one or more other systems, and peripheral devices 725, such as cache, other memory, data storage and/or electronic display adapters. The memory 710, storage unit 715, interface 720 and peripheral devices 725 are in communication with the CPU 705 through a communication bus (solid lines), such as a motherboard. The storage unit 715 can be a data storage unit (or data repository) for storing data. The computer system 701 can be operatively coupled to a computer network (“network”) 730 with the aid of the communication interface 720. The network 730 can be the Internet, an internet and/or extranet, or an intranet and/or extranet that is in communication with the Internet. The network 730 in some cases is a telecommunication and/or data network. The network 730 can include one or more computer servers, which can enable distributed computing, such as cloud computing. The network 730, in some cases with the aid of the computer system 701, can implement a peer-to-peer network, which may enable devices coupled to the computer system 701 to behave as a client or a server.

[00164] The CPU 705 can execute a sequence of machine-readable instructions, which can be embodied in a program or software. The instructions may be stored in a memory location, such as the memory 710. The instructions can be directed to the CPU 705, which can subsequently program or otherwise configure the CPU 705 to implement methods of the present disclosure. Examples of operations performed by the CPU 705 can include fetch, decode, execute, and writeback.

[00165] The CPU 705 can be part of a circuit, such as an integrated circuit. One or more other components of the system 701 can be included in the circuit. In some cases, the circuit is an application specific integrated circuit (ASIC).

[00166] The storage unit 715 can store files, such as drivers, libraries and saved programs. The storage unit 715 can store user data, e.g., user preferences and user programs. The computer system 701 in some cases can include one or more additional data storage units that are external to the computer system 701, such as located on a remote server that is in communication with the computer system 701 through an intranet or the Internet.

[00167] The computer system 701 can communicate with one or more remote computer systems through the network 730. For instance, the computer system 1101 can communicate with a remote computer system of a user (e.g., a member of the external audience). Examples of remote computer systems include personal computers (e.g., portable PC), slate or tablet PC's (e.g., Apple® iPad, Samsung® Galaxy Tab), telephones, Smart phones (e.g., Apple® iPhone, Android-enabled device, Blackberry®), or personal digital assistants. The user can access the computer system 1101 via the network 730.

[00168] Methods as described herein can be implemented by way of machine (e.g., computer processor) executable code stored on an electronic storage location of the computer system 701, such as, for example, on the memory 710 or electronic storage unit 715. The machine executable or machine-readable code can be provided in the form of software. During use, the code can be executed by the processor 705. In some cases, the code can be retrieved from the storage unit 715 and stored on the memory 710 for ready access by the processor 705. In some situations, the electronic storage unit 715 can be precluded, and machine-executable instructions are stored on memory 710.

[00169] The code can be pre-compiled and configured for use with a machine having a processor adapted to execute the code or can be compiled during runtime. The code can be supplied in a programming language that can be selected to enable the code to execute in a pre-compiled or as-compiled fashion.

[00170] Aspects of the systems and methods provided herein, such as the computer system 701, can be embodied in programming. Various aspects of the technology may be thought of as “products” or “articles of manufacture” typically in the form of machine (or processor) executable code and/or associated data that is carried on or embodied in a type of machine readable medium. Machine-executable code can be stored on an electronic storage unit, such as memory (e.g., read-only memory, random-access memory, flash memory) or a hard disk. “Storage” type media can include any or all of the tangible memory of the computers, processors or the like, or associated modules thereof, such as various semiconductor memories, tape drives, disk drives and the like, which may provide non-transitory storage at any time for the software programming. All or portions of the software may at times be communicated through the Internet or various other telecommunication networks. Such communications, for example, may enable loading of the software from one computer or processor into another, for example, from a management server or host computer into the computer platform of an application server. Thus, another type of media that may bear the software elements includes optical, electrical and

electromagnetic waves, such as used across physical interfaces between local devices, through wired and optical landline networks and over various air-links. The physical elements that carry such waves, such as wired or wireless links, optical links or the like, also may be considered as media bearing the software. As used herein, unless restricted to non-transitory, tangible “storage” media, terms such as computer or machine “readable medium” refer to any medium that participates in providing instructions to a processor for execution.

[00171] Hence, a machine readable medium, such as computer-executable code, may take many forms, including but not limited to, a tangible storage medium, a carrier wave medium or physical transmission medium. Non-volatile storage media include, for example, optical or magnetic disks, such as any of the storage devices in any computer(s) or the like, such as may be used to implement the databases, etc. shown in the drawings. Volatile storage media include dynamic memory, such as main memory of such a computer platform. Tangible transmission media include coaxial cables; copper wire and fiber optics, including the wires that comprise a bus within a computer system. Carrier-wave transmission media may take the form of electric or electromagnetic signals, or acoustic or light waves such as those generated during radio frequency (RF) and infrared (IR) data communications. Common forms of computer-readable media therefore include for example: a floppy disk, a flexible disk, hard disk, magnetic tape, any other magnetic medium, a CD-ROM, DVD or DVD-ROM, any other optical medium, punch cards paper tape, any other physical storage medium with patterns of holes, a RAM, a ROM, a PROM and EPROM, a FLASH-EPROM, any other memory chip or cartridge, a carrier wave transporting data or instructions, cables or links transporting such a carrier wave, or any other medium from which a computer may read programming code and/or data. Many of these forms of computer readable media may be involved in carrying one or more sequences of one or more instructions to a processor for execution.

[00172] The computer system 701 can include or be in communication with an electronic display 735 that comprises a user interface (EI) 740 for providing, for example, content providers to view analytics. Examples of EI's include, without limitation, a graphical user interface (GUI) and web-based user interface.

[00173] Methods and systems of the present disclosure can be implemented by way of one or more algorithms. An algorithm can be implemented by way of software upon execution by the central processing unit 705. The algorithm can, for example, use sensor data to select content for presentation.

[00174] While preferred embodiments of the present invention have been shown and described herein, it will be obvious to those skilled in the art that such embodiments are provided by way of example only. It is not intended that the invention be limited by the specific examples provided within the specification. While the invention has been described with reference to the aforementioned specification, the descriptions and illustrations of the embodiments herein are not meant to be construed in a limiting sense. Numerous variations, changes, and substitutions will now occur to those skilled in the art without departing from the invention. Furthermore, it shall be understood that all aspects of the invention are not limited to the specific depictions, configurations or relative proportions set forth herein which depend upon a variety of conditions and variables. It should be understood that various alternatives to the embodiments of the invention described herein may be employed in practicing the invention. It is therefore contemplated that the invention shall also cover any such alternatives, modifications, variations or equivalents. It is intended that the following claims define the scope of the invention and that methods and structures within the scope of these claims and their equivalents be covered thereby.

CLAIMS**WHAT IS CLAIMED IS:**

1. A method for displaying media content on a vehicle, comprising:
 - (a) providing said vehicle comprising a display screen on an exterior portion of said vehicle;
 - (b) dynamically selecting said media content while said vehicle is travelling along a route; and
 - (c) displaying said media content dynamically selected in (b) on said display screen.
2. The method of claim 1, wherein said display screen is part of a display unit mounted on said exterior portion of said vehicle, which display unit comprises one or more members selected from the group consisting of a global positioning system (GPS), a wireless transmitter, a wireless receiver, an optical sensor, an audio sensor, an accelerometer, and a gyroscope.
3. The method of claim 2, wherein said optical sensor is a camera or video unit.
4. The method of claim 2, wherein said optical sensor is a particle sensor.
5. The method of claim 1, wherein in (b), said media content is dynamically selected at least in part on (i) a speed, velocity or acceleration of said vehicle along a route, or (ii) contextual or environmental factors along said route.
6. The method of claim 5, wherein said contextual factors include a geographic location of said vehicle along said route.
7. The method of claim 5, wherein said contextual factors include a time of day in which said vehicle is travelling said route.
8. The method of claim 5, wherein said environmental factors include traffic conditions or ambient lighting along said route.
9. The method of claim 1, wherein said vehicle comprises a roof rack, and wherein (a) comprises fixing said display screen to said roof rack.
10. The method of claim 5, wherein said environmental factors include weather conditions along the route.
11. The method of claim 5, wherein said contextual factors include places of interest along said route.
12. The method of claim 11, wherein places of interest include apartments, hotels, museums, parks, shopping centers, restaurants, and bars.
13. The method of claim 5, wherein said contextual factors include entertainment events happening in a vicinity of the route.

14. The method of claim 1, wherein along said route, said vehicle undergoes a change in velocity or acceleration, and wherein said media content is dynamically adjusted in response to said change in velocity or acceleration.
15. The method of claim 14, wherein along said route, said vehicle stops.
16. The method of claim 1, further comprising using a sensor to collect audio or video data along said route, and using said audio or video data to dynamically select said media content.
17. The method of claim 16, wherein said sensor captures a multi-angle video of conditions along said route.
18. The method of claim 17, wherein said conditions are route conditions.
19. The method of claim 1, further comprising using a sensor to collect geographic data along said route, and using said geographic data to dynamically select said media content.
20. The method of claim 1, further comprising using one or more sensors to collect environmental data.
21. The method of claim 20, wherein said environmental data includes data indicative of visibility along said route.
22. The method of claim 21, further comprising adjusting said media content in response to said change in visibility.
23. The method of claim 20, further comprising determining one or more environmental conditions from said environmental data, and adjusting said media content in response to said environmental conditions.
24. The method of claim 23, wherein said one or more environmental conditions includes air pollution or light pollution.
25. The method of claim 1, further comprising logging information along said route.
26. The method of claim 1, further comprising logging demographic information along said route.
27. The method of claim 26, wherein said demographic information includes a number of passengers along said route.
28. The method of claim 26, wherein said demographic information includes video of pedestrian or vehicle traffic along said route.
29. The method of claim 1, wherein said content is dynamically selected using a machine learning algorithm.

30. A system for displaying media content on a vehicle, comprising:
a display screen mountable on an exterior portion of said vehicle; and
a controller operatively coupled to said display screen, wherein said controller is programmed to (i) dynamically select said media content while said vehicle is travelling along a route; and (ii) direct said media content dynamically selected in (i) to be displayed on said display screen.
31. The system of claim 30, wherein said controller is programmed to dynamically select said media content based at least in part on (i) a speed, velocity or acceleration of said vehicle along a route, or (ii) contextual or environmental factors along said route.
32. The system of claim 30, further comprising a sensor for collecting audio or video data along said route.
33. The system of claim 32, wherein the sensor is a multi-angle camera.
34. The system of claim 30, further comprising a logging module for storing information collected along said route.
35. The system of claim 30, further comprising a sensor for determining the velocity and acceleration of the vehicle along said route.
36. The system of claim 30, wherein the media content is selected from content stored on an online portal.
37. The system of claim 36, wherein the online portal is configured to permit content providers to upload content.
38. The system of claim 36, wherein the online portal is configured to permit content providers to choose a time interval in which to display content.
39. The system of claim 36, wherein the online portal is configured to permit content providers to choose how often the content is played back.
40. The system of claim 36, wherein the online portal is configured to permit content providers to choose a bounded area in which media content playback occurs.
41. The system of claim 30, wherein the system communicates with connected devices using Wi-Fi and Bluetooth.
42. A method for determining an impression, comprising:
(a) displaying media content on a screen during a first time period;
(b) obtaining, using a camera, video of a subject adjacent to said screen; and
(c) processing said video, using a gaze-tracking algorithm, to determine whether said subject looked at said screen during said time period.

43. The method of claim 42, wherein said screen is disposed on a vehicle.
44. The method of claim 42, wherein said camera is integrated into said screen.
45. The method of claim 42, wherein said gaze-tracking algorithm comprises a machine learning algorithm.
46. The method of claim 45, wherein said machine learning algorithm comprises a convolutional neural network.
47. The method of claim 42, wherein said gaze-tracking algorithm uses geometric techniques.
48. The method of claim 42, further comprising, repeating (a) to (c) for a plurality of subjects other than said subject and computing an impression rate for said media content.
49. A method for determining a rate of engagement by a target group, comprising:
- (a) displaying media content on a display screen at a first time at a first location;
 - (b) determining, using mobile phone data, one or more subjects who were within a specified distance of said first location at said first time, which one or more subjects comprise said target group;
 - (c) tracking, using said mobile phone data, a subset of said target group to a second location indicative of an engagement associated with said media content; and
 - (d) determining said rate of engagement by processing a size of said subset and a size of said target group.
50. The method of claim 49, wherein said display screen is on or mounted to a vehicle.
51. The method of claim 49, wherein said tracking is performed within a specified time of said first time.
52. The method of claim 51, wherein said specified time is at most one week.
53. A system for determining an impression, comprising:
- a display screen mountable on an exterior portion of a vehicle, which display screen is configured to display media content during a first time period;
 - a camera configured to obtain video of a subject adjacent to said display screen; and
 - a controller operatively coupled to said display screen, wherein said controller is programmed to process said video, using a gaze-tracking algorithm, to determine whether said subject looked at said display screen during said time period.

54. A system for determining a rate of engagement by a target group, comprising:
- a display screen mountable on an exterior portion of a vehicle, which display screen is configured to display media content at a first time at a first location;
 - (b) determining, using mobile phone data, one or more subjects who were within a specified distance of said first location at said first time, which one or more subjects comprise said target group;
 - (c) tracking, using said mobile phone data, a subset of said target group to a second location indicative of an engagement associated with said media content; and
 - (d) determining said rate of engagement by processing a size of said subset and a size of said target group.

100

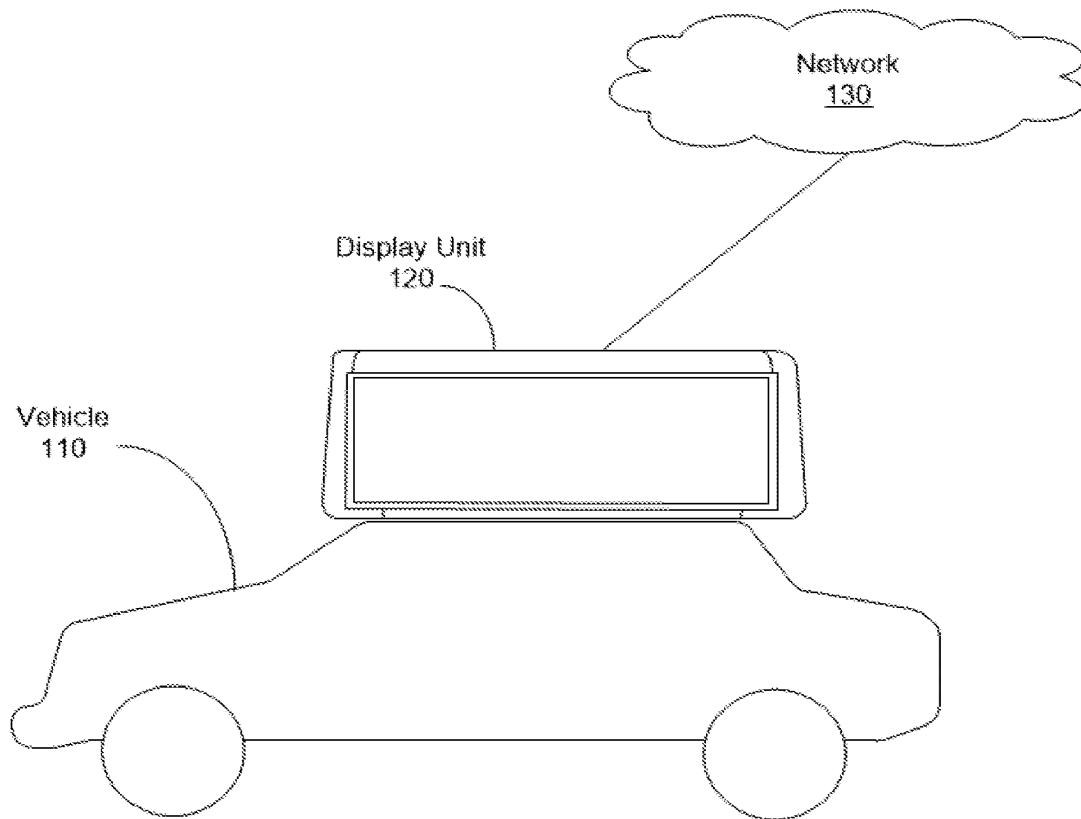


FIG. 1

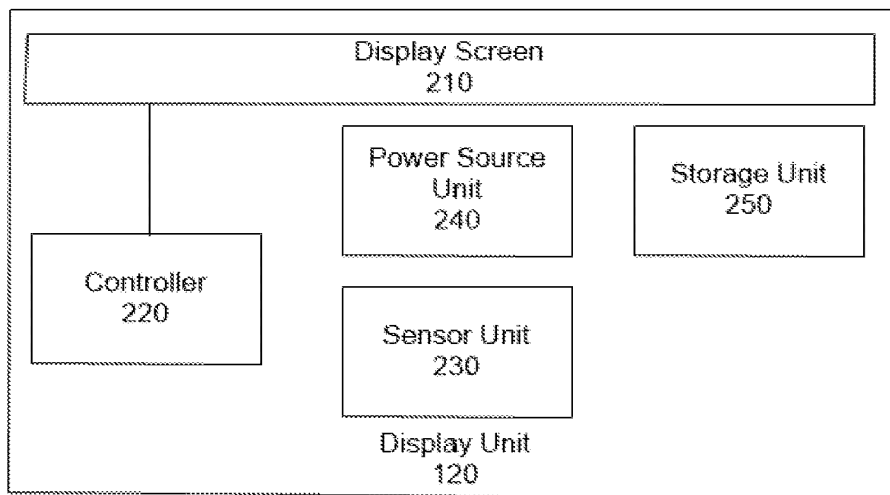
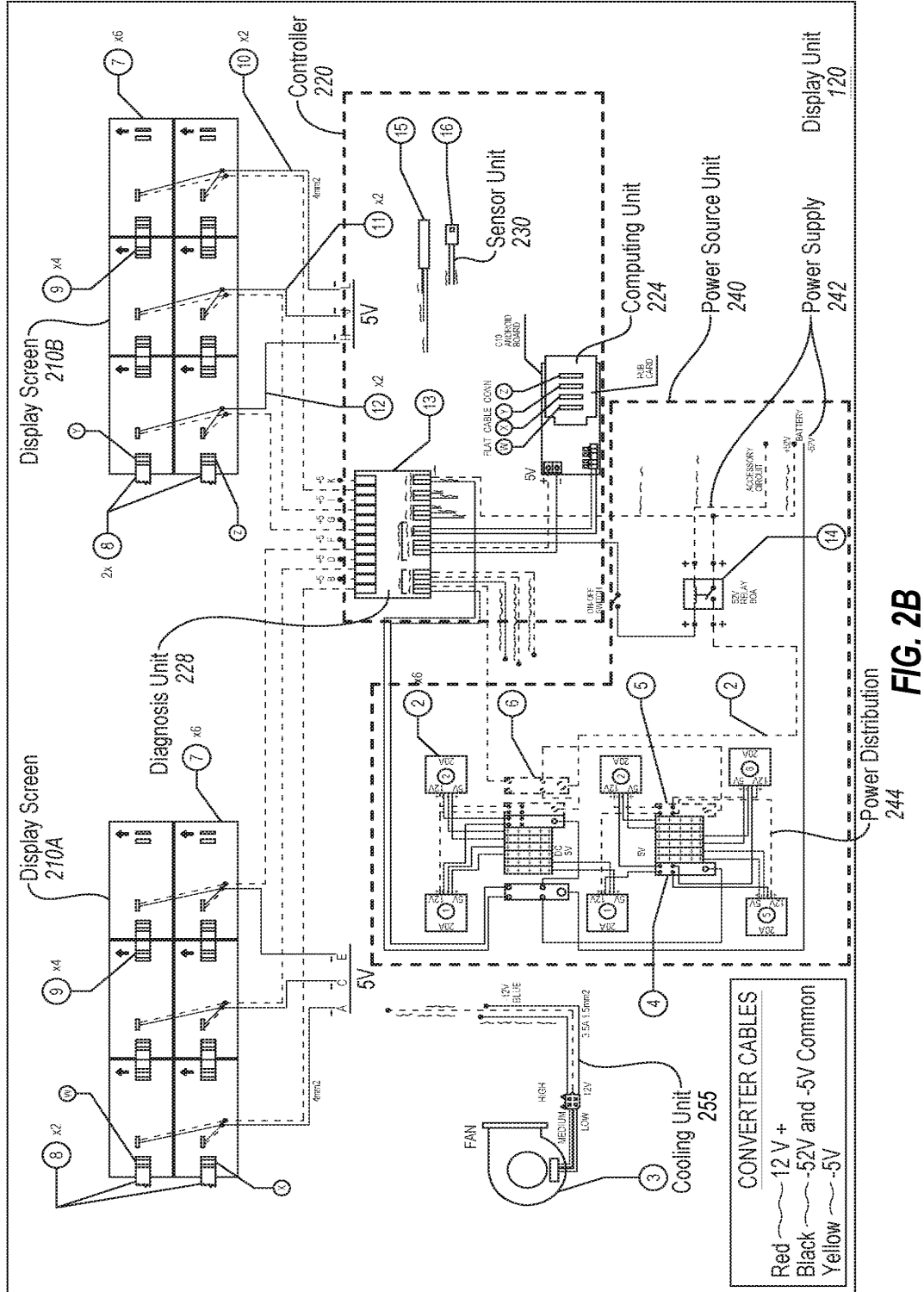


FIG. 2A



SUBSTITUTE SHEET (RULE 26)

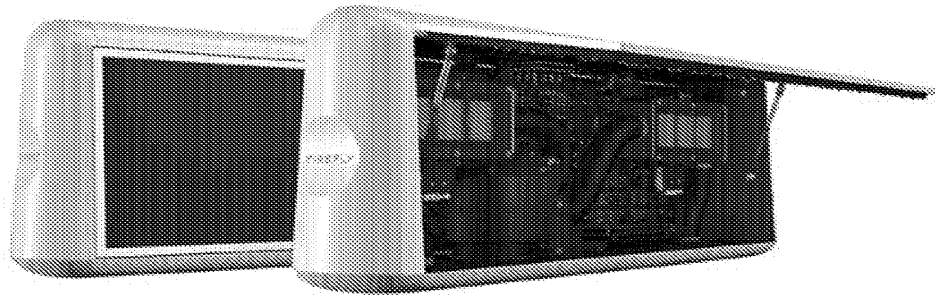


FIG. 2C

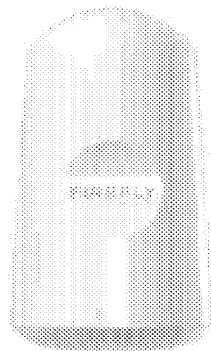


FIG. 2D

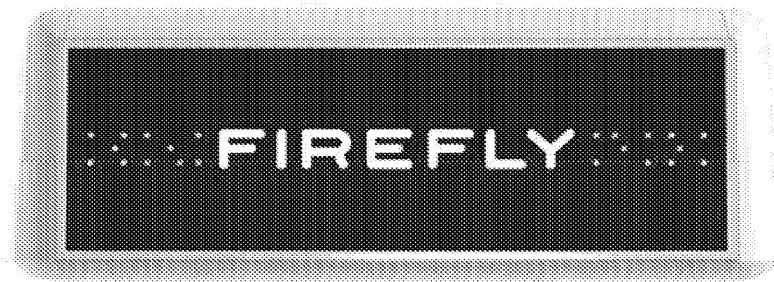


FIG. 2E

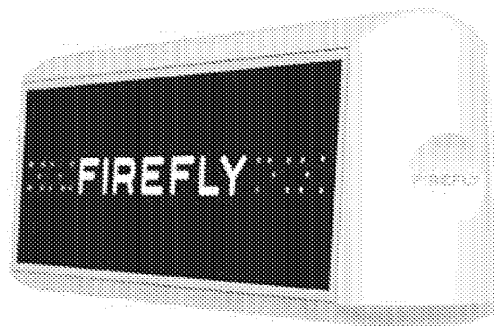


FIG. 2F

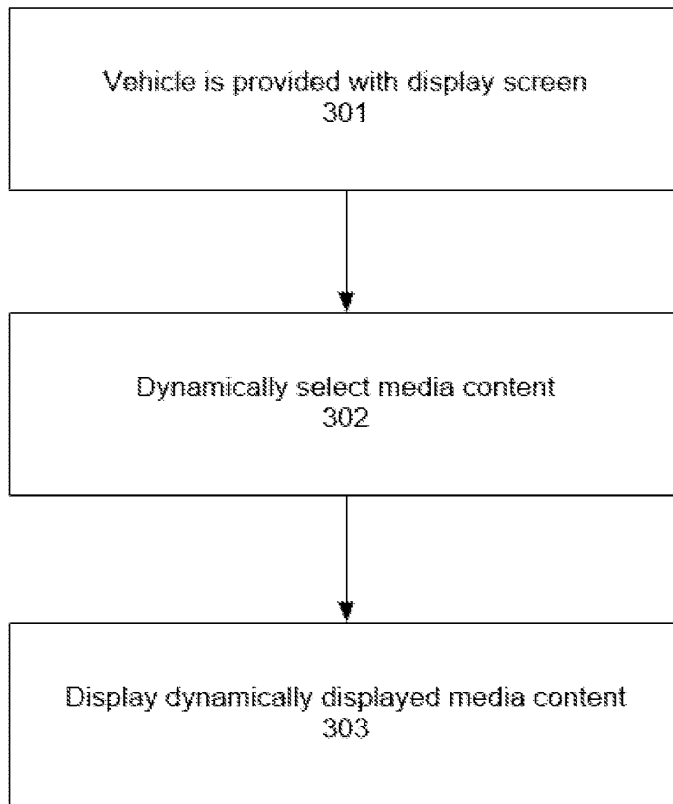
300

FIG. 3

On-Demand Outdoor Ad

Upload Your Designs

Choose Date & Time

8/17/17 - 8/18/17
5:00pm - 11:00pm

Choose Area

Size: 9,184,186 sq. ft.

Price: \$651.25 USD

Price: \$651.25 USD

Payment Info

FIG. 4

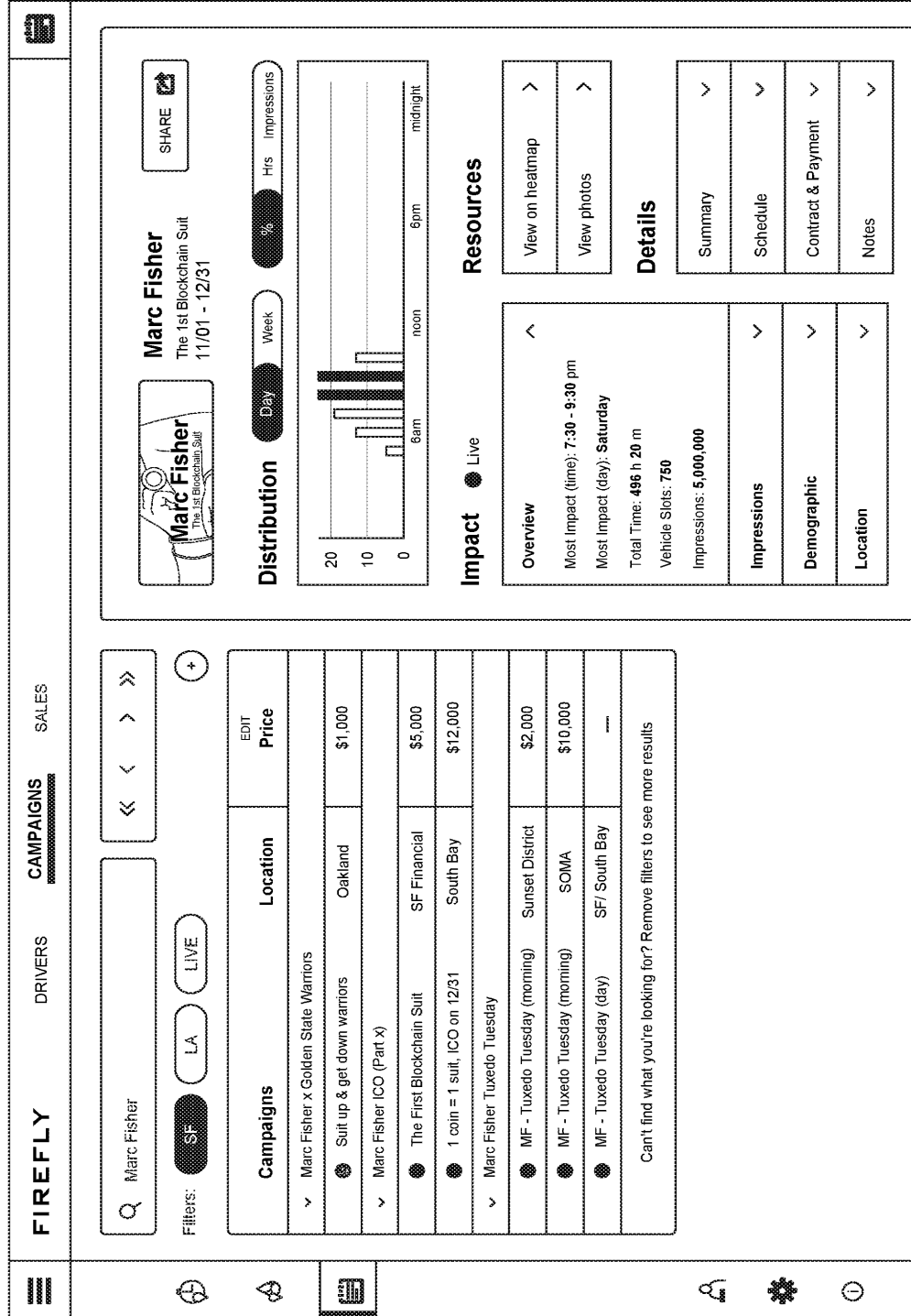
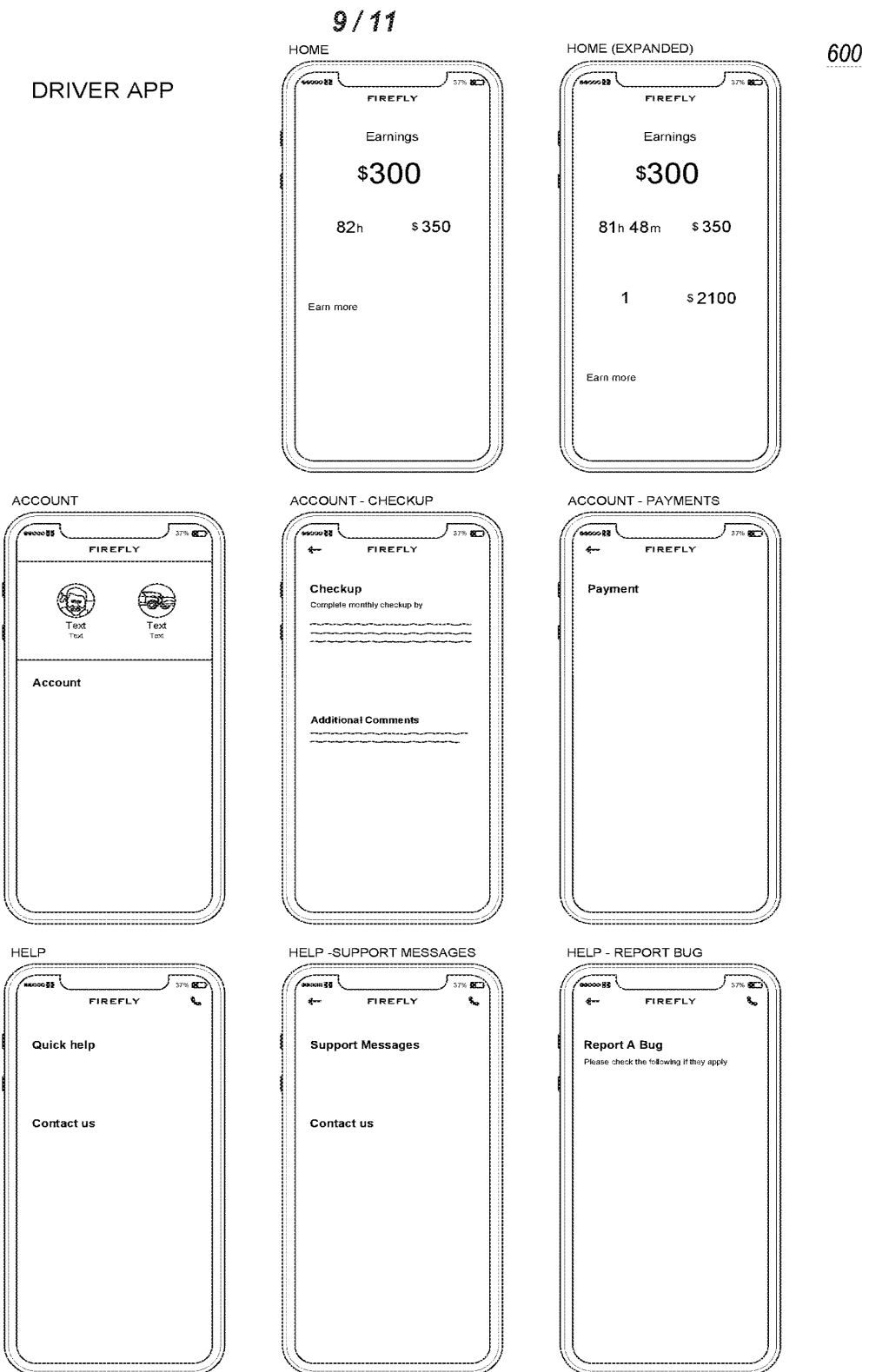


FIG. 5



SUBSTITUTE SHEET (RULE 26)

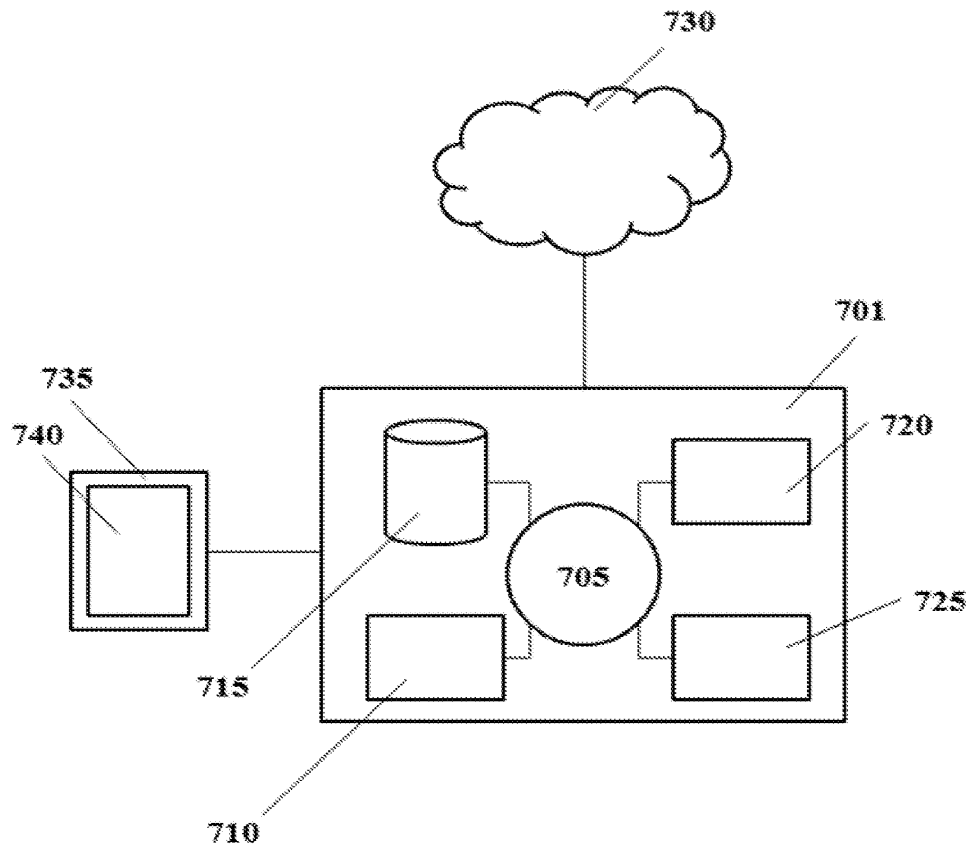


FIG. 7

11/11

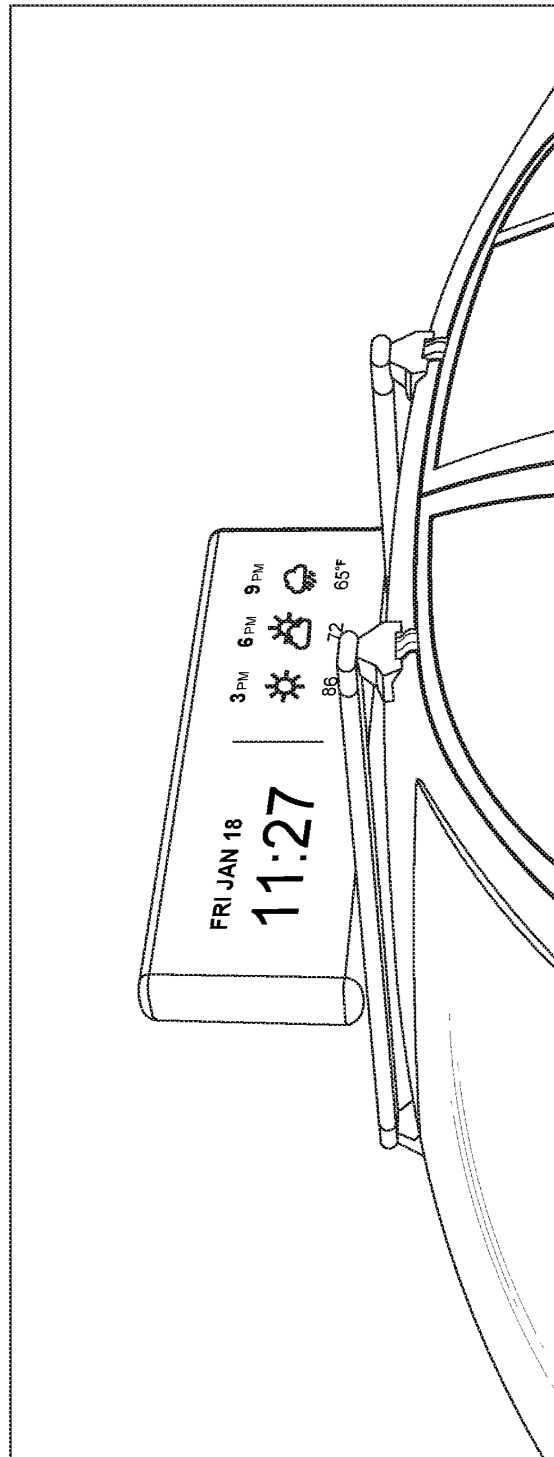


FIG. 8

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US19/56542

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fee must be paid.

Group I: Claims 1-41 are directed towards a method and system for displaying media content on a vehicle.

Group II: Claims 42-48 & 53 are directed towards a method and system for determining an impression.

Group III: Claims 49-52 & 54 are directed towards a method and system for determining a rate of engagement by a target group.

-continued in last supplemental box-

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
Group I: 1-41

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (2)) (July 2019)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US19/56542

A. CLASSIFICATION OF SUBJECT MATTER

IPC - H04W 4/23, 4/44; G06Q 30/02 (2020.01)

CPC - H04W 4/23, 4/44; G06Q 30/0266, 30/0265; H04L 67/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

See Search History document

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

See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2014/0052537 A1 (MODDOH INC.) 20 February 2014; paragraphs [0077], [0082], [0084], [0085], [0094], [0120]-[0126].	1-3, 5-8, 25-27, 30-31, 34, 36-41

Y		4, 9-24, 28-29, 32-33, 35
Y	US 2018/0053215 A1 (VENIAM, INC.) 22 February 2018; paragraphs [0050], [0237]-[0239], [0384].	4, 10, 14-15, 19-24, 29, 32-33, 35
Y	US 2012/0290394 A1 (SHAPIRO, K. et al.) 15 November 2012; paragraph [0045].	9
Y	US 2018/0032997 A1 (GORDON, G. et al.) 01 February 2018; paragraphs [0346], [0347], [0379], [0386], [0401], [0588].	11-13
Y	US 2013/0129149 A1 (NANDAKUMAR, P. et al.) 23 May 2013; paragraphs [0070], [0080].	16-18, 28
Y	TW 201526638 A (OTOBRITE ELECTRONICS INC) 01 July 2015; see machine translation.	17-18, 33

☐ Further documents are listed in the continuation of Box C.☐ 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

"D" document cited by the applicant in the international application

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" 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

"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

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

04 February 2020 (04.02.2020)

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Authorized officer

Shane Thomas

Telephone No. PCT Helpdesk: 571-272-4300

Form PCT/ISA/210 (second sheet) (July 2019)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US19/56542

.-***-Continued from Box No. III Observations where unity of invention is lacking -***-

The inventions listed as Groups I-III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The special technical features of Group I include at least providing said vehicle comprising a display screen on an exterior portion of said vehicle; dynamically selecting said media content while said vehicle is travelling along a route, which are not present in Groups II-III.

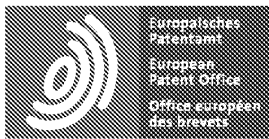
The special technical features of Group II include at least obtaining, using a camera, video of a subject adjacent to said screen; and processing said video, using a gaze-tracking algorithm, to determine whether said subject looked at said screen during said time period, which are not present in Groups I and III.

The special technical features of Group III include at least determining, using mobile phone data, one or more subjects who were within a specified distance of said first location at said first time, which one or more subjects comprise said target group; tracking, using said mobile phone data, a subset of said target group to a second location indicative of an engagement associated with said media content; and determining said rate of engagement by processing a size of said subset and a size of said target group, which are not present in Groups I-II.

The common technical features shared by Groups I-III are a method and system, comprising: displaying media content on a screen; and tracking engagement associated with the media content.

However, these common features are previously disclosed by US 2016/0093136A1 to BALLY GAMING INC. (hereinafter "Bally"). Bally discloses a method and system, comprising: displaying media content on a screen and tracking engagement associated with the media content (a system and method includes capturing images of the player's gaze with a camera while displaying a plurality of reference symbols at locations on the display during serial display of game video content; Abstract).

Since the common technical features are previously disclosed by the Bally reference, these common features are not special and so Groups I-III lack unity.



Espacenet

JP2006032890A CLOSED LOOP CIRCULATING RADIATOR AND SCREEN MODULE USING SAME

Applicants: METAL IND RES & DEV CT

Inventors: HUANG TSUNG-WEN, LAI CHYI-LANG

Classifications:

IPC **H01L23/467; H05K7/20;**CPC **H05K7/206 (EP);**

Priorities: TW93121717A 2004-07-21

Application: JP2006032890A 2004-12-08

Publication: JP2006032890A 2006-02-02

Published as: JP2006032890A; **TW200605758A; US2006018093A1**

CLOSED LOOP CIRCULATING RADIATOR AND SCREEN MODULE USING SAME

Abstract

<P>PROBLEM TO BE SOLVED: To provide a closed loop circulating radiator which efficiently radiates a heating value generated in a housing and reduces inside and outside temperature differences, and a screen module of a liquid crystal screen module or the like using the closed loop circulating radiator. <P>SOLUTION: A portion between an upper outlet 7 of a housing 2 and a lower inlet 8 of the housing 2 is communicated by means of a metal duct 3, and a closed loop thermal circulation is formed by the housing 2 and the metal duct 3. And, gas (refrigerant) filled in the housing 2 is circulated through the metal duct 3 and there is effectively and outside radiated a heat which is generated in the housing 2 by plural radiation fins 5 formed around the metal duct 3. With respect to a closed loop radiation circulating path, one piece or plurality may be sufficient. <P>COPYRIGHT: (C)2006,JPO&NCIP

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(71) 出願人 504451586
メタル インダストリーズ リサーチ ア
ンド デベロップメント センター
台湾 カオシュン シティ ナンジ ディ
ストリクト ガオナンゴン ロード ナン
バー1001
(74) 代理人 100081710
弁理士 福山 正博
(72) 発明者 ライ, チー ラン
台湾 カオシュン シティ ナンジ ディ
ストリクト ガオナンゴン ロード ナン
バー1001

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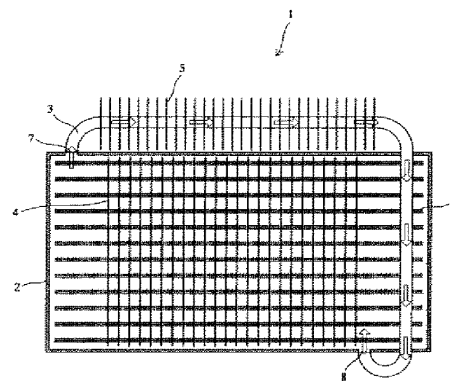
(54) 【発明の名称】 閉ループ循環式放熱装置およびそれを使用するスクリーンモジュール

(57) 【要約】

【課題】ハウジング内に発生する熱量を効率的に放熱して内外温度差を低減する閉ループ循環式放熱装置およびそれを使用する液晶スクリーンモジュール等のスクリーンモジュールを提供する。

【解決手段】ハウジング2の上方の出口7およびハウジング2の下方の入口8間を金属製導管3により連通させ、ハウジング2と金属製導管3により閉ループ式放熱循環を形成する。そして、ハウジング2の内部に充填させた気体(冷媒)を金属製導管3を介して循環させて、金属製導管3の周囲に形成された複数の放熱フィン5によりハウジング2の内部に発生する熱を外部へ効果的に放熱する。閉ループ式放熱循環路は、1個でも複数個でもよい。

【選択図】 図1



【特許請求の範囲】

【請求項1】

閉ループ循環式放熱装置において、
ハウジングの上方通口と下方通口を連通して閉ループ式放熱循環を形成する少なくとも1本の金属製導管と、該金属製導管に設けられた複数の放熱フィンとを含むことを特徴とする閉ループ循環式放熱装置。

【請求項2】

前記ハウジングは、液晶スクリーンモジュール又はその他の発光発熱ランプモジュールを内装することを特徴とする請求項1に記載の閉ループ循環式放熱装置。

【請求項3】

前記ハウジングの上方通口は、前記ハウジング内の気体の出口であり且つ前記ハウジングの下方通口は、前記ハウジング内の気体入口であることを特徴とする請求項1又は2に記載の閉ループ循環式放熱装置。

【請求項4】

前記ハウジングの出入口は、それぞれ1対設けられ且つ前記金属製導管の一端が前記出口に連通され、前記金属製導管の他端が前記入口に連通されていることを特徴とする請求項1、2又は3に記載の閉ループ循環式放熱装置。

【請求項5】

前記金属製導管は、前記出口から前記ハウジング内部の気体を導出し、更に前記入口から気体を導入することを特徴とする請求項1、2、3又は4に記載の閉ループ循環式放熱装置。

【請求項6】

前記放熱フィン、前記金属製導管の直径方向又は円周方向に沿って配列されることを特徴とする請求項1乃至5の何れかに記載の閉ループ循環式放熱装置。

【請求項7】

前記金属製導管が前記ハウジングに接続された出入口は、高分子材料等の断熱性材料を使用し、局部的な熱量の逆戻りを防止することを特徴とする請求項1乃至6の何れかに記載の閉ループ循環式放熱装置。

【請求項8】

前記閉ループ式放熱循環は、前記ハウジング内部の気体を外部と対流させることなく、前記金属製導管のみにより流動循環させることを特徴とする請求項1乃至7の何れかに記載の閉ループ循環式放熱装置。

【請求項9】

前記ハウジングの周りにファンを設け、前記放熱フィンを前記ファンにより強制空冷することを特徴とする請求項1乃至8の何れかに記載の閉ループ循環式放熱装置。

【請求項10】

前記ハウジングは、外表面に複数の放熱フィンを配置することを特徴とする請求項1乃至9の何れかに記載の閉ループ循環式放熱装置。

【請求項11】

複数の発熱体が内装され且つ出口および入口が設けられたハウジングと、
該ハウジングの前記出口および前記入口を連通して閉ループ式放熱循環を形成する少なくとも1本の金属製導管と、
該金属製導管の外面に形成された複数の放熱フィンとを備えることを特徴とするスクリーンモジュール。

【請求項12】

前記スクリーンモジュールは、液晶スクリーン、プラズマスクリーンおよびコンピュータスクリーン等の平面表示スクリーンであることを特徴とする請求項11に記載のスクリーンモジュール。

【請求項13】

前記ハウジングの出入口は、それぞれ1対設けられ、前記金属製導管の一端が前記1対の出口に連通され、前記金属製導管の他端が前記1対の入口に連通されることを特徴とする請求項11又は12に記載のスクリーンモジュール。

【請求項14】

前記金属製導管は、前記出口から前記ハウジング内部の気体を導出し、更に前記入口から前記気体を導入することを特徴とする請求項11、12又は13に記載のスクリーンモジュール。

【請求項15】

前記放熱フィンは、前記金属製導管の直径方向又は円周方向に沿って配列されることを特徴とする請求項11乃至14の何れかに記載のスクリーンモジュール。

【請求項16】

前記金属製導管が前記ハウジングに接続された前記出入口には、高分子材料等の断熱材料を使用して局部的に熱量の逆戻りを防止することを特徴とする請求項11乃至15の何れかに記載のスクリーンモジュール。

【請求項17】

前記閉ループ式放熱循環は、前記ハウジング内部の気体を外部と対流することなく前記金属製導管のみにより流動させることを特徴とする請求項11乃至16の何れかに記載のスクリーンモジュール。

【請求項18】

前記ハウジングの周りにファンを設け、前記放熱フィンを強制空冷することを特徴とする請求項11乃至17の何れかに記載のスクリーンモジュール。

【請求項19】

前記ハウジングは、外表面に複数の放熱フィンが設けられていることを特徴とする請求項11乃至18の何れかに記載のスクリーンモジュール。

【請求項20】

前記ハウジングの出口は前記ハウジングの上方に設けられ、前記ハウジングの入口は前記ハウジングの下方に設けられることを特徴とする請求項11乃至19の何れかに記載のスクリーンモジュール。

【請求項21】

前記発熱体は、発光発熱型のランプモジュールであることを特徴とする請求項11乃至20の何れかに記載のスクリーンモジュール。

【発明の詳細な説明】

【技術分野】

【0001】

本発明は放熱装置に関し、特にシステム内部の熱気をシステム外部へ導出して、事前に放熱循環させる閉ループ循環式放熱装置およびそれを使用するスクリーンモジュールに関する。

【背景技術】

【0002】

大規模集積回路（LSI）技術の進歩により、電子産業の急速的な発展に寄与し、各種電子機器又は装置の高密度および高速化を加速している。斯かる電子機器の高密度且つ高速化に派生する電子デバイス等からの発熱を如何に解決するかが最大の技術的課題である。

【0003】

例えば表示装置（表示器又はディスプレイ）等の電子機器にあっても、高画質（高解像度）と共に大表示画面化の要求が高まり、しかも薄型且つ軽量化の要求もあるので、高密度化が加速している。その結果、斯かる表示装置内部の発熱も、それに応じて増加している。斯かる表示装置の発熱をタイミングよく且つ効率的に放熱しないと、表示装置内部温度が急激に上昇し、使用する電子デバイスの信頼性が低下し、その表示安定性およびその動作寿命に著しい悪影響をもたらすこととなる。

【0004】

市場の要求に応じて新しい表示器が開発され、これら新製品の発熱量は益々増加傾向にある。斯かる新製品では、使用する電子デバイス又は部品自身の自然放熱では実際の要求を満足することができない。そこで、従来は発熱デバイスの表面に更に放熱装置（ヒートシンク等）を取り付けることにより放熱を補助している。しかし、必要とする放熱量が増加するにつれて、放熱装技術の更なる改善が望まれる。

【0005】

従来、放熱性能を高めるために、放熱フィンをできる限り薄く且つ高密度の設計とすることにより、放熱装置を構成する金属の熱伝導特性を利用して放熱量の増加を図っている。既存の放熱装置の1つは、ヒートパイプ（熱管放熱器）であり、ベース上に垂直に配置されている。このヒートパイプには、複数の放熱フィンが一定間隔で水平に形成配置されている。また、このヒートパイプの内部には、相変化し易く且つ化学的安定性が優れた液体作動物質が充填されており、その一端が熱源と接触し、内部の液体循環により熱量を他端へ伝達することにより放熱している。

【発明の開示】

【発明が解決しようとする課題】

【0006】

しかし、上述した従来の放熱フィンおよびヒートパイプ技術共に局所的な発熱のみしか放熱し得ない。そこで、例えば大型液晶表示パネル等のスクリーンモジュールにあっては、そのバックライトとして使用される光源等からの広範囲にわたる発熱を効果的に放熱して温度を降下させ、スクリーンモジュールの内外温度のアンバランスを解決することが不可能又は著しく困難であるという課題があった。その理由は、このスクリーンの外部温度は放熱フィン又はヒートパイプにより降下させることができて、スクリーンモジュール内部の発熱源の発熱を十分に放熱することができないからである。

【0007】

本発明は、従来技術の上述した課題に鑑みなされたものであり、斯かる課題を解決又は軽減する、即ち内部の発熱素子の発熱を比較的簡単な構成により効率的に放熱可能にする閉ループ循環式放熱装置を提供することを主たる目的とする。また、本発明の他の目的は、ハウジング内部の発熱を効率的に放熱してハウジングの内外温度差を低減するスクリーンモジュールを提供することである。

【課題を解決するための手段】

【0008】

本発明の閉ループ循環式放熱装置は、少なくとも1本の金属製導管および外表面に設けられた複数の放熱フィンを含んでいる。金属製導管の一端がハウジング上方の出口に、他端がハウジング下方の入口に設けられ、閉ループ式放熱循環を形成し、そして複数の放熱フィンがこの金属製導管の外表面に設けられている。

【0009】

より好ましくは、このハウジングの外表面にも複数の放熱フィンが形成配置されている。

【0010】

また、より好ましくは、このハウジングに液晶スクリーンモジュールその他の発光発熱ランプモジュールを内装する。

【0011】

更に、この放熱フィンは、金属製導管の直径方向又は円周方向に沿って配列される。また、例えばスクリーンモジュールの後方に延出させてもよい。

【0012】

更に、より好ましくは、この金属製導管は、ハウジングの出入口に接続され、局部的に高分子材料等の断熱材料を使用して熱量の逆戻りを防止する。

【0013】

尚、より好ましくは、ハウジングの外部にファンを取り付け、この放熱フィンに空気流を吹き付けて強制空冷する。

【発明の効果】

【0014】

本発明の閉ループ循環式放熱装置およびそれを使用するスクリーンモジュールによると、次の如き実用上の顕著な効果が得られる。即ち、ハウジング内部で発生する電子デバイスやランプ等による発熱を効率的に放熱してハウジングの内外温度差を低減可能である。また、ハウジングの上方出口および下方入口間に1又は複数の金属製導管を設けるので、構成が簡単であり、小型軽量化が可能である。更に、ハウジング内部のランプの光量を一層増加して表示輝度を改善したスクリーンモジュールを実現できる。

【実施例】

【0015】

以下、本発明による閉ループ循環式放熱装置の好適実施例の構成および作用を、添付図面を参照して詳細に説明する。

【0016】

先ず、図1は、本発明による閉ループ循環式放熱装置の第1実施例であるスクリーンモジュールの構成を示す説明図である。このスクリーンモジュール1は、主としてハウジング2、金属製導管3、複数の放熱フィン4、5およびランプ6により構成される。金属製導管3の一端はハウジング2の上方通口（又は出口）7に連通され、この金属製導管3の他端はハウジング2の下方通口（又は入口）8に連通されている。複数の放熱フィン4がハウジング2の後方（又は背面）に配列形成されている。また、複数の放熱フィン5が金属製導管3の直径方向又は円周方向に沿って一定間隔で設けられている。尚、ハウジング2および金属製導管3の内部には、熱伝導特性の優れた気体（冷媒）が充填されている。

【0017】

次に、図1に示すスクリーンモジュール1の作用を説明する。ハウジング2の発熱は、このハウジング2の後方に形成された複数の放熱フィン4により、その金属の熱伝導特性を利用して発散（又は放熱）される。一方、ハウジング2の内部に生じる発熱は、このハウジング2の上方出口7に連通する金属製導管3から導出される。即ち、この金属製導管3の内部の熱気は、図1中に矢印で示す方向に流れ（又は移動し）、この金属製導管3に設けられた複数の放熱フィン5の熱対流又は熱放射により大気中に放熱される。この金属製導管3内の熱気を冷却した後、ハウジング2の下方入口8を介してハウジング2内に導入されて閉ループ熱循環を形成する。この閉ループ熱循環により、ハウジング2の内部の温度を降下させ、ハウジング2の内外温度差を低減させる。

【実施例】

【0018】

次に、図2は、本発明による閉ループ循環式放熱装置の第2実施例であるスクリーンモジュール11の構成を示す説明図である。このスクリーンモジュール11は、主としてハウジング12、1対の金属製導管13、複数の放熱フィン14、15およびランプ16により構成されている。これら1対の金属製導管13の一端は、それぞれハウジング12の左右両側の上方出口17に連通され、これら金属製導管13の他端は、ハウジング12の中央外側に設けられた共用管道に纏められ、その下端は、再度分離されてそれぞれハウジング12の下方入口18に連通されている。複数の放熱フィン14がハウジング12の外側に配列形成されている。また、複数の放熱フィン15が1対の金属製導管13の直径方向又は円周方向に沿って、一定間隔で平行に配列形成されている。

【0019】

図2に示すスクリーンモジュール11の作用を説明する。ハウジング12が発生する熱量は、ハウジング12に形成された複数の放熱フィン14により、その金属の熱伝導特性を利用して大気中に発散又は放熱される。一方、ハウジング12の内部で発生する熱量は、このハウジング12の1対の上方出口17に連通下1対の金属製導管13から導出される。そして、図2中に矢印で示す方向に沿って流れ、その複数の放熱フィン15の外表面から熱対流又は熱放射により大気中に放熱される。1対の金属製導管13の熱気を冷却させた後、このハウジング12の下方入口18を解してハウジング12内に戻す。このよう

にして、1 対の閉ループ式放熱循環を形成し、ハウジング 1 2 内の温度を降下させ、ハウジング 1 2 の内外温度差を低減させる。

【0020】

尚、上述したスクリーンモジュール 1、1 1 は、液晶スクリーンモジュール、プラズマスクリーン等の表示パネルである。液晶スクリーンモジュールの場合には、ランプ 6、1 6 はバックライトとして作用し、好ましくは発熱発光ランプモジュールである。また、ハウジング 2、1 2 の出口 7、1 7 および入口 8、1 8 は、高分子材料等の断熱特性の優れた材料により形成されるのが好ましい。更に、ハウジングの周囲にファンを設けて、金属製導管およびハウジングに形成された放熱フィンを強制空冷すると、一層放熱効果が改善される。

【0021】

以上、本発明による閉ループ循環式放熱装置およびそれを使用するスクリーンモジュールの好適実施例の構成および作用を詳述した。しかし、斯かる実施例は本発明の単なる例示に過ぎず、何ら本発明を限定するものではないことに留意されたい。本発明の要旨を逸脱することなく、特定用途に応じて種々の変形変更が可能であること、当業者には容易に理解できよう。

【図面の簡単な説明】

【0022】

【図1】本発明による閉ループ循環式放熱装置を使用するスクリーンモジュールの第1 実施例の構成を示す説明図である。

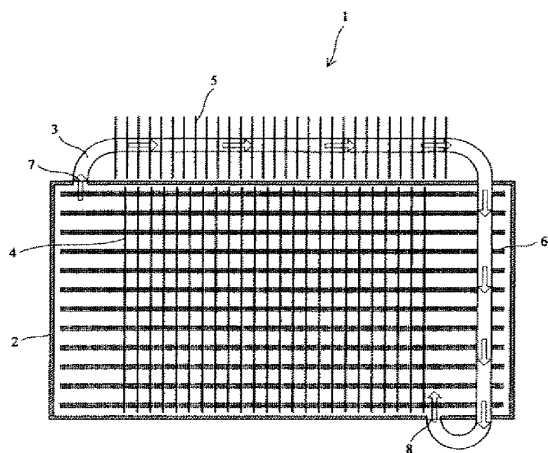
【図2】本発明による閉ループ循環式放熱装置を使用するスクリーンモジュールの第2 実施例の構成を示す説明図である。

【符号の説明】

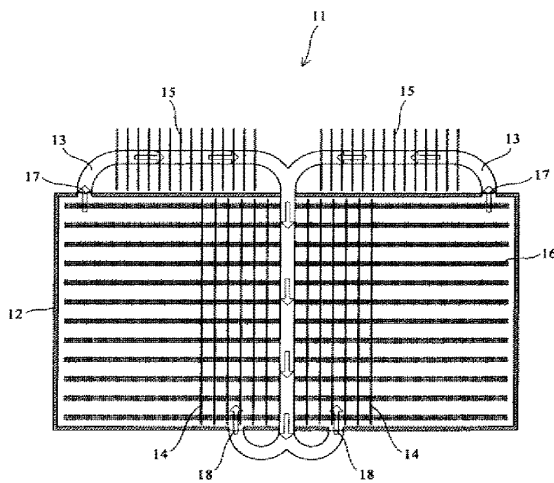
【0023】

- 1、1 1 スクリーンモジュール
- 2、1 2 ハウジング
- 3、1 3 金属製導管
- 4、1 4、5、1 5 放熱フィン
- 6、1 6 ランプ
- 7、1 7 出口（上方通口）
- 8、1 8 入口（下方通口）

【図1】



【図2】



(72)発明者 ファン, ツウン ウェン

台湾 カオシュン シティ ナンジ ディストリクト ガオナンゴン ロード ナンバー 1 0 0 1

F ターム(参考) 5E322 AA01 BB03 DB06

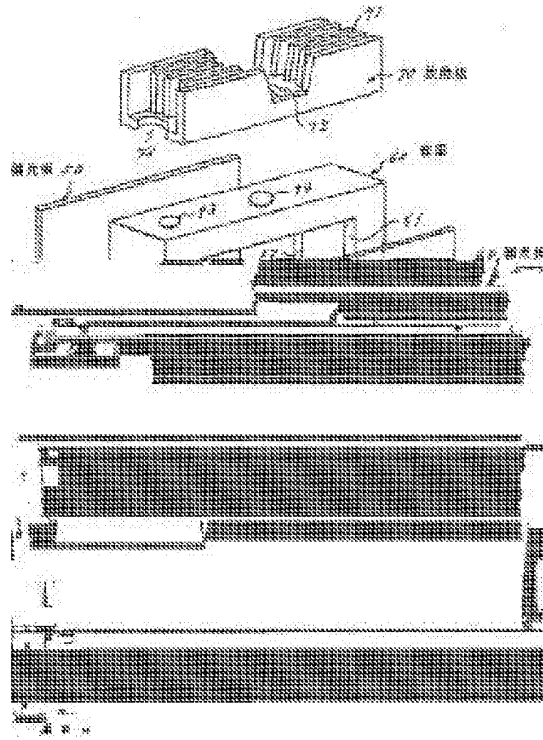
5F036 AA01 BA03 BB05



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Bibliographic data: JP2002006282 (A) — 2002-01-09**LIQUID CRYSTAL DISPLAY DEVICE****Inventor(s):** SUZUKI SHINGO ± (SUZUKI SHINGO)**Applicant(s):** TOSHIBA CORP ± (TOSHIBA CORP)**Classification:** - **international:** **G02F1/13; G02F1/1333; G09F9/00; H04N5/74;**
(IPC1-7): G02F1/13; G02F1/1333; G09F9/00;
H04N5/74- **cooperative:****Application number:** JP20000192361 20000627 Global Dossier**Priority number (s):** JP20000192361 20000627**Abstract of JP2002006282 (A)**

PROBLEM TO BE SOLVED: To provide a liquid crystal display device in which temperature increase is prevented by cooling a liquid crystal panel and a polarizing plate with a cooling liquid and which device can be efficiently cooled with a simple structure. SOLUTION: A container is disposed on the optical axis of the light from a light source. The container has an insert port where a liquid crystal panel can be inserted and has a window on each face in the entrance side and exit side for light, with each window covered with a first or second polarizing plate. After the liquid crystal panel is inserted into the container, the insert port is closed and sealed to form a space in the container by the first and second polarizing plates and the aforementioned sealing means. Then a light-transmitting cooling medium is injected into the space to absorb the heat generating in the liquid crystal panel and polarizing plates and to radiate the heat to the outside through the container.



(51)Int.Cl. ⁷	識別記号	F I	デモコード ⁸ (参考)
G 0 2 F 1/13	5 0 5	G 0 2 F 1/13	5 0 5 2 H 0 8 8
		1/1333	2 H 0 8 9
G 0 9 F 9/00	3 0 4	G 0 9 F 9/00	3 0 4 B 5 C 0 5 8
	3 6 0		3 6 0 Z 5 G 4 3 5
H 0 4 N 5/74		H 0 4 N 5/74	B
審査請求 未請求 請求項の数6 O L (全 5 頁)			

(21)出願番号	特願2000-192361(P2000-192361)	(71)出願人	000003078 株式会社東芝 東京都港区芝浦一丁目1番1号
(22)出願日	平成12年6月27日(2000.6.27)	(72)発明者	鈴木 進吾 埼玉県深谷市幡経町一丁目9番地2号 株 式会社東芝深谷工場内
		(74)代理人	100083161 弁理士 外川 英明

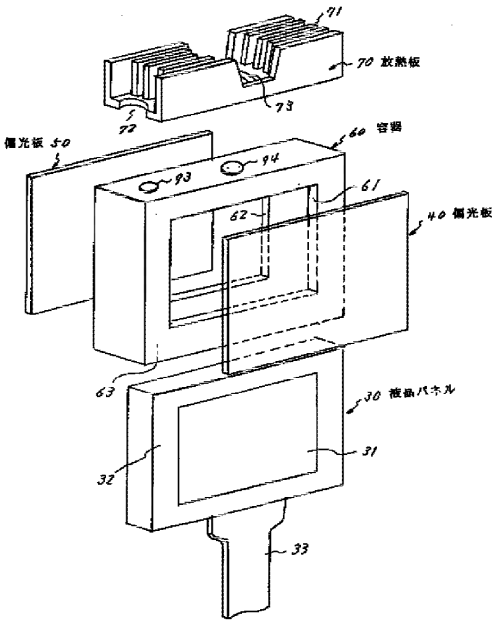
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(54)【発明の名称】 液晶表示装置

(57)【要約】

【課題】 液晶パネル及び偏光板を冷却液により冷却することで温度上昇を防ぎ、かつ簡単な構成で効率良く冷却することができる液晶表示装置を提供する。

【解決手段】 光源からの光の光軸上に容器を配置し、この容器には液晶パネルを挿入可能な挿入口を備えるとともに、光の入射側および出射側に面してそれぞれ窓を形成し、各窓をそれぞれ第1、第2の偏光板で塞ぐようにする。また容器に液晶パネルを挿入した後、挿入口を塞いで封止し、第1、第2の偏光板及び前記封止手段によって容器内部に空間を形成し、この空間内に透光性冷却媒体を注入して、液晶パネルや偏光板に発生する熱を吸収し、さらに容器を介して外部へ熱を放散する。



【特許請求の範囲】

【請求項1】 光源と、この光源の光軸上に配置された液晶パネル、及び前記光軸上の液晶パネルの入射側及び出射側にそれぞれ配置された第1、第2偏光板を有する液晶表示装置であって、

前記光軸上に配置され、前記液晶パネルを挿入可能な挿入口を備えるとともに、前記入射側および出射側に面してそれぞれ窓を形成し、入射側の窓及び出射側の窓をそれぞれ前記第1、第2の偏光板で塞ぐようにした容器と、

前記容器に前記液晶パネルを挿入した後、前記挿入口を塞ぐ封止手段と、

前記容器に挿入された液晶パネルを位置決めする手段と、

前記第1、第2の偏光板及び前記封止手段によって形成される前記容器の内部空間に注入された透光性冷却媒体とを具備したことを特徴とする液晶表示装置。

【請求項2】 前記容器は、前記冷却媒体の温度変化による体積変化を吸収する圧力弁を備えたことを特徴とする請求項1記載の液晶表示装置。

【請求項3】 前記容器の封止手段は、硬化樹脂で成ることを特徴とする請求項1記載の液晶表示装置。

【請求項4】 前記液晶パネルは、この液晶パネルに信号を供給するケーブルを備え、このケーブルと液晶パネルの結合部を前記封止手段で固定したことを特徴とする請求項1記載の液晶表示装置。

【請求項5】 前記容器は、熱伝導性の高い材料で形成され、その内部に前記液晶パネルが挿入されたとき、液晶パネルの側面を支持する位置決め用のガイド溝を形成してなることを特徴とする請求項1記載の液晶表示装置。

【請求項6】 光源からの光の光軸上に配置される液晶パネルと、

前記液晶パネルに信号を供給するため、前記液晶パネルに結合したケーブルと、

前記光軸上の液晶パネルの入射側及び出射側にそれぞれ配置される第1、第2偏光板と、

前記光軸上に配置され、前記液晶パネルを挿入可能な挿入口を備えるとともに、前記入射側および出射側に面してそれぞれ窓を形成し、入射側の窓及び出射側の窓をそれぞれ前記第1、第2の偏光板で塞ぐようにした容器と、前記容器に前記液晶パネルを挿入した後、前記挿入口を塞ぐとともに、前記液晶パネルと前記ケーブルの結合部を固定する硬化樹脂と、

前記第1、第2の偏光板及び前記硬化樹脂によって形成される前記容器の内部空間に注入された透光性冷却媒体と、

前記冷却媒体の温度変化による体積変化を吸収するため、前記容器に設けた圧力弁と、

前記容器の熱を外部に放散するための放熱板とを具備し

たことを特徴とする液晶表示装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、液晶表示素子を使用してスクリーン上に任意の映像を投影する液晶表示装置に係り、特に液晶表示素子の冷却装置に関するものである。

【0002】

【従来の技術】従来の液晶表示装置として、液晶プロジェクタがあるが、その構成を図5、図6を参照して説明する。図5は単板式の液晶プロジェクタであり、光源1からの光をリフレクタ2で反射し、赤外線や紫外線等の不要光をフィルタ3で除去し、コンデンサレンズ4及びリレーレンズ5を介して液晶パネル6に照射するようにしている。液晶パネル6は映像信号によって駆動されるため、映像信号によって透過率が変化し、液晶パネル6に入射した光は映像光となって出射し、集光レンズ7及び投射レンズ8を介してスクリーン9に投影される。尚、前記液晶パネル6の入射側及び出射側にはそれぞれ偏光板（図示せず）が配置されている。

【0003】また図6はR（赤）、G（緑）、B（青）用の液晶パネルを有する三板式の液晶プロジェクタを示している。図6において、11は光源であり、この光源11からの白色光は赤外線や紫外線等の不要光をフィルタ12で除去した後、ダイクロイックミラー14によりR光とGB光に分光され。分離されたR光はミラー15で反射され、レンズ16を介してR用の液晶パネル17に照射される。

【0004】またダイクロイックミラー14により分離されたGB光はダイクロイックミラー18によりG光とB光に分光され、G光はレンズ19を介してG用の液晶パネル20に照射され、B光はレンズ21を介してB用の液晶パネル22に照射される。

【0005】さらに、液晶パネル17を透過したR光はダイクロイックミラー23を透過し、液晶パネル20を透過したG光はダイクロイックミラー23で反射され、それぞれダイクロイックミラー24を透過して投射レンズ25に入射する。また液晶パネル22を透過したB光はミラー26で反射され、かつダイクロイックミラー24で反射され投射レンズ25に入射する。つまり、ダイクロイックミラー14、18は光分離手段を構成し、ダイクロイックミラー23、24は光合成手段を構成している。

【0006】こうしてR、G、B用の液晶パネル17、20、22をR、G、Bの原色信号で駆動することにより、カラー画像を投射することができる。尚、前記液晶パネル17、20、22の入射側及び出射側にはそれぞれ偏光板が配置されているが、図では省略している。

【0007】上述したような液晶プロジェクタでは、光源からの光は液晶パネルや周辺の光学素子に吸収され熱

となるため、この熱によって液晶パネル等の特性が劣化してしまう。このため、従来では各種の冷却装置が使用されている。この冷却方式は大別して空冷式と液冷式に分けられる。

【0008】空冷式は、軸流ファンやシロッコファンを用いて液晶パネルや偏光板に冷却風を送り、空気の流れによって直接冷却するものである。しかしながら空冷式の欠点は騒音を発生することと、ゴミやほこりを吸い込んでしまうことである。ゴミやほこりを吸い込んだ場合、それが液晶パネル面に付着すると投影画像に影響を及ぼすため、ゴミを吸収するフィルターを設けたり、ダクトを設けてより強い風を送るようにしているが、装置が複雑かつ大型になる欠点がある。また、より強い風を送るにはファンの回転数を高める必要があり、騒音の発生を防ぐことは困難であった。

【0009】一方、液冷式は液晶パネルのガラス面に直接冷却液を接触させて温度を下げる方式であり、風冷式のような騒音を発生することはないが、液晶パネルと入射側及び出射側の偏光板を1つの槽で一度に冷やすことは難しく、液晶パネルの入射側を液冷にし、出射側を空冷にする方法も取られている。また液冷式の一例として特開平11-119202号に記載の例もあるが、冷却液を封入する容器の構造や液洩れ防止の構造が複雑であった。

【0010】

【発明が解決しようとする課題】このように従来の液晶表示装置では、液晶パネル等を冷却する場合、空冷式では騒音が発生したりゴミやほこりの付着という問題点があり、液冷式では構造上の改善がさらに求められていた。本発明は、上述の問題点を鑑み、効率のよい冷却装置を備えた液晶表示装置を提供することを目的とするものである。

【0011】

【課題を解決するための手段】本発明の液晶表示装置は、光源と、この光源の光軸上に配置された液晶パネル、及び前記光軸上の液晶パネルの入射側及び出射側にそれぞれ配置された第1、第2偏光板を有する液晶表示装置であって、前記光軸上に配置され、前記液晶パネルを挿入可能な挿入口を備えとともに、前記入射側および出射側に面してそれぞれ窓を形成し、入射側の窓及び出射側の窓をそれぞれ前記第1、第2の偏光板で塞ぐようにした容器と、前記容器に前記液晶パネルを挿入した後、前記挿入口を塞ぐ封止手段と、前記容器に挿入された液晶パネルを位置決めする手段と、前記第1、第2の偏光板及び前記封止手段によって形成される前記容器の内部空間に注入された透光性冷却媒体とを具備したことを特徴とする。

【0012】本発明によれば、前記容器に液晶パネルを挿入して、前記挿入口を封止手段で塞ぎ、前記容器の窓を第1、第2の偏光板で塞ぐことで冷却媒体の室を形成

することができ、この室内に冷却媒体を注入することにより、液晶パネルや偏光板に発生する熱を冷却媒体によって吸収し、さらに容器を介して外部へ熱を放散することができる。

【0013】

【発明の実施の形態】以下、図面を参照して本発明の実施の形態について説明する。図1は本発明の液晶表示装置の一実施の形態を示す分解斜視図であり、冷却構造を主体に説明したものである。また、図2は組立てた状態を示す断面図である。

【0014】図1において、30は液晶パネル、40、50は液晶パネル30の入射側及び出射側の偏光板、60は容器、70は放熱板である。

【0015】液晶パネル30は、2枚のガラス板の間に液晶を封入したもので、一方のガラス板に共通電極を形成し、他方のガラス板に画素電極としてのTFTを配置しており、映像表示面31と周囲のフレーム32を有している。また、前記電極を制御するため、映像信号や水平・垂直駆動信号等を供給するフラットケーブル33が結合され、底面から引き出されている。

【0016】また、入射側の偏光板40及び出射側の偏光板50は、図2に示すようにそれぞれガラス41、51の一面にフィルム状の偏光素子42、52を貼り合わせて成る。

【0017】また、容器60は、アルミなどの熱伝導率の高い物質で作られ、光の入射側及び出射側にはそれぞれ、窓61、62が形成され、この窓61、62を前記偏光板40、50によって塞ぐようにしている。偏光板40、50は、図2に示すようにその外周部が紫外線硬化接着剤43、53によって、窓61、62を塞ぐように貼り付けられる。また、容器60の底辺には前記液晶パネル30を挿入可能な挿入口63が設けられている。尚、偏光板40及び偏光板50は、偏光素子42、52が外側に位置する例を図示しているが、偏光素子42、52が内側になるように窓61、62に貼り付けても良い。

【0018】図3は、容器60を底辺側から見た断面図であり、側壁64、65の内面には、液晶パネル30が挿入されたときに、その左右の外周をガイドするための溝66、67を形成している。そして、液晶パネル30が容器60内に挿入された後、前記挿入口63には、図2に示すように光路に当たらない範囲でウレタン又はエポキシ等の2液硬化性樹脂68が充填され、液晶パネル30の底部の固定と挿入口63の封鎖を行うようにしている。

【0019】また、容器60の天井部には、図4で示すように冷却液80を注入するための注入口69が設けられ、さらに容器60内部の圧力調整を行う圧力弁90が取り付けられている。注入口69にはゴムなどのパッキン91が嵌められ、それにOリング92を介して栓部材

93が挿入されるようになっている。また圧力弁90は、容器60の天井部に形成された穴(図示せず)を塞ぐように取り付けられ、この圧力弁90を天井部に固定するため、押え部材94がネジ95等によって取り付けられている。

【0020】さらに、容器60の天井部には放熱板70が取り付けられる。放熱板70は、複数のフィン71を有し、図1に示すように前記注入口69や圧力弁90に対向する位置には窪み72や穴73が形成されている。なお、放熱板70は容器60と一体構造として成形しても良い。

【0021】こうして、容器60は偏光板40、50及び硬化樹脂68によって密閉され、注入口69を介して冷却媒体としての冷却液80が注入されることになる。尚、冷却液80としては透光性の冷媒が使用され、例えばエチレングリコールやグリセリン、あるいはこれらの水溶液、又はエチレングリコールとグリセリンの混合液等が適している。また冷却液80が注入された後、冷却液80の温度が変化して体積が膨張収縮しても、調圧用の圧力弁90によって吸収され、冷却液80の圧力を一定に保つことができる。

【0022】上記したように、本発明の冷却装置は、容器60に液晶パネル30を挿入して硬化樹脂68と偏光板40、50で密閉するという簡単な構成で冷却液80の室を形成することができる。

【0023】そして液晶パネル30に発生する熱は冷却液80によって吸収され、さらに熱は容器60を介して外部へ放散され、放熱板70によってさらに放熱される。また偏光板40、50も冷却液80に接することになるから、偏光板40、50の熱も冷却液80によって吸収され、容器60、放熱板70を介して外部に放熱される。

【0024】また、図2に示すように液晶パネル30の上辺の周囲にも冷却液80が満たされているから、冷却液80が液晶パネル30の一方の面から他方の面へと自然対流し冷却効果も高くなる。また冷却液80の温度変化による体積の膨張収縮は圧力弁90によって吸収することができる。

【0025】さらに本発明の構成では、液晶パネル30のフラットケーブル33は、容器60の底部から取出され、かつ硬化樹脂68で固定されているので、信号供給線路の配線を簡略化することができ、ケーブル33と液晶パネルとの結合部が外れることもない。

【0026】なお、本発明で述べた冷却装置は、図5のような単板式プロジェクタ及び図6に示すような多板式プロジェクタの液晶パネル及び偏光板の冷却として利用することができる。

【0027】

【発明の効果】以上のように本発明に使用する冷却装置は、簡単な構成で冷却室を形成することができ、そこに収納される液晶パネルは冷却液によって効率よく冷却することができる。また偏光板も液晶パネルと同様に冷却液により冷却することができる。したがって、空冷に比較して騒音を発生することもない。

【図面の簡単な説明】

【図1】本発明の一実施の形態による液晶表示装置の主要部の構成を示す斜視図。

【図2】図1の一実施の形態を組立て、側面からみた断面図。

【図3】図1の一実施の形態を組立て、底面からみた断面図。

【図4】本発明に使用する容器の天井部の構成を説明する断面図。

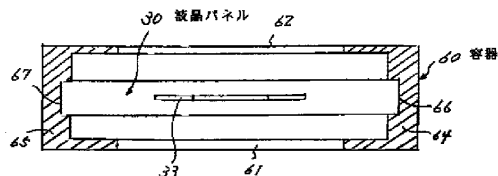
【図5】単板式液晶プロジェクタの構成を示す構成図。

【図6】多板式液晶プロジェクタの構成を示す構成図。

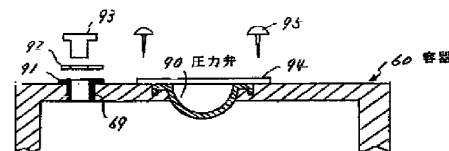
【符号の説明】

30…液晶パネル
40、50…偏光板
60…容器
61、62…窓
63…挿入口
66、67…ガイド溝
69…注入口
70…放熱板
80…冷却液
90…圧力弁

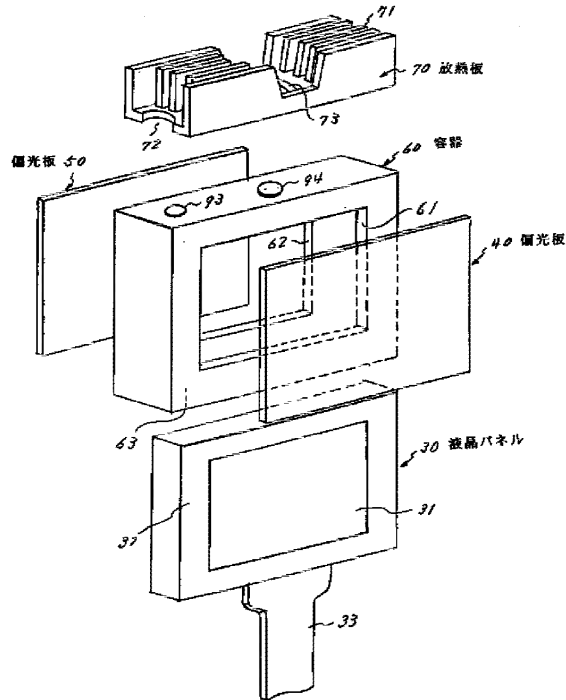
【図3】



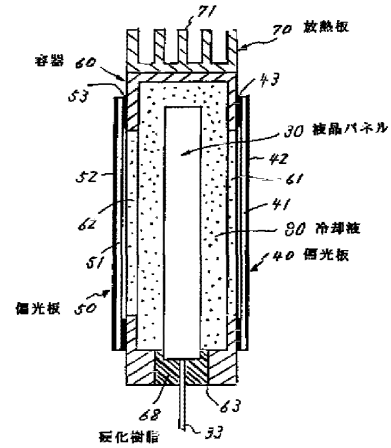
【図4】



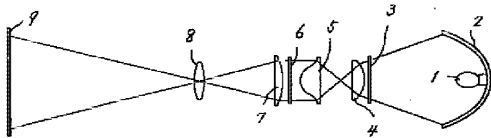
【図1】



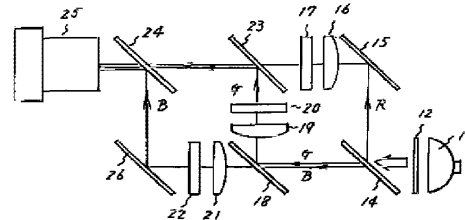
【図2】



【図5】

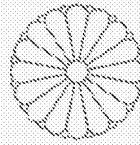


【図6】



フロントページの続き

Fターム(参考) 2H088 EA12 HA05 HA18 MA20
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5C058 AA06 AB05 BA23 BA30 BA35
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特 許 証

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特許第6688402号
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発明の名称
(TITLE OF THE INVENTION)

両側面ディスプレイ・アセンブリ用の冷却システム

特許権者
(PATENTEE)

アメリカ合衆国 30005 ジョージア、アルファレッタ、シロー・ロード・イースト 6415
国籍・地域 アメリカ合衆国
マニファクチャリング・リソース・インターナショナル・インコーポレーテッド

発明者
(INVENTOR)

マルコス・ディアス

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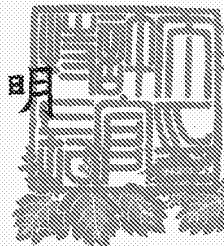
令和 2年 4月 7日(April 7, 2020)

この発明は、特許するものと確定し、特許原簿に登録されたことを証する。
(THIS IS TO CERTIFY THAT THE PATENT IS REGISTERED ON THE REGISTER OF THE JAPAN PATENT OFFICE.)

令和 2年 4月 7日(April 7, 2020)

特許庁長官
(COMMISSIONER, JAPAN PATENT OFFICE)

松 永 明



特許証送付先

住所

〒102-0082

東京都千代田区一番町2-7番2 理工図書ビル4階

氏名

下田 容一郎

様

重要

特許料の納付について

- ・特許権を維持するには、存続期間の満了（特許出願の日から20年）までの各年について所定の特許料の納付が必要です。なお、**第4年以降の納付に関しては、特許庁から納付についての通知は送付いたしませんので、納付期限の管理はご自身でお願いします。**
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<https://www.jpo.go.jp/index.html>

特許権設定登録通知書				
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出願日	平成29年 3月 6日			
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受領金額	10,500円			
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特許料納付期限日

納付年分	納付期限日
第 4年分	令和 5年(2023年) 4月 7日
第 5年分	令和 6年(2024年) 4月 7日
第 6年分	令和 7年(2025年) 4月 7日
第 7年分	令和 8年(2026年) 4月 7日
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第 9年分	令和10年(2028年) 4月 7日
第10年分	令和11年(2029年) 4月 7日
第11年分	令和12年(2030年) 4月 7日
第12年分	令和13年(2031年) 4月 7日
第13年分	令和14年(2032年) 4月 7日
第14年分	令和15年(2033年) 4月 7日
第15年分	令和16年(2034年) 4月 7日
第16年分	令和17年(2035年) 4月 7日
第17年分	令和18年(2036年) 4月 7日

（注）納付期限日が行政機関の休日にあたるときは、その日の翌日がある期間の末日となります。

問い合わせ先 審査業務課登録室
電話 03(3581)1101 (代表)
特許担当 内線 2708

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Bibliography	Close	Drawings	Close
(19) [Publication country] Japan Patent Office (JP) (12) [Kind of official gazette] Published examined patent application (B2) (11) [Patent number] Japanese Patent No. 6688402 (P6688402) (24) [Registration date] Reiwa 2(2020) April 7 (2020.4.7) (45) [Publication date] Reiwa 2(2020) April 28 (2020.4.28) (54) [Title of the invention] The cooling system of both sides for a display assembly (51) [International Patent Classification] G09F 9/00 (2006.01) G09F 9/40 (2006.01) H05K 7/20 (2006.01) H04N 5/64 (2006.01)		1 2 3 4 5 6 Enlarge and Rotate figure 1	

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H05K 7/20 H

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[Date of request for examination] Heisei 30(2018) September 27 (2018.9.27)

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(32) [Priority date] Heisei 28(2016) March 4 (2016.3.4)

(33) [Priority claim country/region or organization] United States of America (US)

(73) [Patentee]

[Identification Number]510135614

[Name]Manufacturing ***** International Inc.

(74) [Representative]

[Identification number] 100067356

[Patent attorney]

[Name] SHIMODA, Yo-ichiro

(74) [Representative]

[Identification number] 100160004

[Patent attorney]

[Name] SHIMODA, Norimasa

(74) [Representative]
[Identification number] 100120558
[Patent attorney]
[Name] SUMIYOSHI, Katsuhiko
(74) [Representative]
[Identification number] 100148909
[Patent attorney]
[Name] TAKIZAWA, Masanori
(74) [Representative]
[Identification number] 100192533
[Patent attorney]
[Name] Nara **
(72) [Inventor]
[Name] Marcos Diaz
[Examiner] NAKAMURA, Naoyuki
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[Document] JP 2011 - 014593A (JP, A)
(58) [Search field] (Int.Cl., DB name)
G09F 9/00 - 9/46
G09G 3/00 - 3/38
H04N 5/64
H05K 7/20
G02F 1/13357

Scope of Claims	Close
(57) [Claim(s)] [Claim 1] A display assembly mounted on a roof of a vehicle. A housing adapted to be mounted on the roof of the vehicle ; In the housing, 1 and 2 electronic displays arranged back-to-back and having front and rear surfaces ; A 1 and a 2 transparent panel, each of which is disposed in front of the front surface of one of the 1 and 2 electronic displays ; A 1 and a 2 thermal plate, each of which is disposed behind the back of one of the 1 and 2 electronic displays ; An open loop path, said open loop path comprising : A suction opening located in the housing to take up ambient air ; A 1 and a 2 open loop channel, each of which is disposed between one of said 1 and 2 heat plates and one of said 1 and 2 displays ; A plurality of inlet openings disposed in each of said 1 and 2 heat plates, each of said inlet openings being in gas communication between said inlet opening and at least one of said 1 and 2 open loop channels ; A discharge opening located in the housing for discharging ambient air ; A plurality of outlet openings arranged in each of said 1 and 2 heat plates, each of said outlet openings being between said discharge opening and at least one of said 1 and 2 open loop channels ; A plurality of outlet openings connected in gas communication ; It ** and the aforementioned open loop course, Allowing the flow of ambient air to be admitted to the 1 and 2 portions of the rec	

eived stream through the inlet opening and into the 1 and 2 open loop channels ;
The open loop path is configured to couple the 1 and 2 segments after exiting the outlet opening and to drain the combined stream through the discharge opening.

A closed loop path, wherein the closed loop path is a closed loop path.

A 1 and a 2 closed loop channel, each of which is arranged between one of the 1 and the 2 transparent panel and one of the 1 and the 2 display ;

A closed loop plenum defined by said 1 and 2 heat plates, said closed loop plenum being configured to be in gas communication with said 1 and 2 closed loop channels ;

A closed loop path

****,

A display assembly.

[Claim 2]

A display assembly according to claim 1, wherein :

A plurality of electronic components mounted on a back of at least one of said 1 and 2 thermal plates.

Further provided is a display assembly.

[Claim 3]

A display assembly according to claim 1, wherein :

A plurality of closed loop fans, each of which is arranged spaced apart from each other and which is configured such that a circulating gas travels through the closed loop plenum and at least one of the 1 and 2 closed loop channels.

Further provided is a display assembly.

[Claim 4]

A display assembly according to claim 1, wherein :

An open loop fan arranged so that ambient air travels through at least one of said 1 and 2 open loop channels.

Further provided is a display assembly.

[Claim 5]

A display assembly according to claim 1, wherein :

The housing has a plurality of legs.

A display assembly, wherein each of said plurality of legs has a lower surface configured to contact and substantially conform to an upper surface of said roof of said vehicle.

[Claim 6]

A display assembly according to claim 1, wherein :

Each of the plurality of inlet openings is spaced along a 1 end of the 1 and 2 heat plates.

Each of the plurality of outlet openings is spaced along a 1 end of the 2 and 2 heat plates.

A display assembly.

[Claim 7]

A display assembly according to claim 6, wherein :

Each of the plurality of inlet openings is vertically spaced.

Each of said plurality of outlet openings is vertically spaced.

A display assembly.

Detailed Description

Close

[Detailed description of the invention]

[Technical field]

[0001]

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present invention claims the priority of U.S. Provisional Patent Application No. 62/303,806, filed March 4, 2016, which is incorporated herein by reference in its entirety.

[0002]

(Technical field)

[0002] Embodiments of the present invention generally relate to cooling systems for electronic displays.

[Background of the Invention]

[0003]

(Background)

[0003] Electronic displays are sometimes used in an outdoor environment or other areas where the ambient temperature is high, or other areas where the ambient temperature is high, other heat sources that increase in temperature in the display, such as a solar load, and the like. However, some portions of the display are difficult to cool. This is because simply sucking ambient air into that portion of the portion causes dust to be introduced into and contaminate the sensitive portion of the display which could lead to premature failure.

[Summary of the invention]

[Means for solving the problem]

[0004]

(Summary of an invention concept)

[0004] An exemplary embodiment includes various channels of fluid, e.g., air, passing through an electronic display housing. At least one channel is a closed loop and some other channels can provide an open loop. The closed loop flow path preferably circulates through the sealed electronics compartment and passes between the electronic display and the front transparent panel. A 1 open loop of ambient air passes behind the 1 electronic display, while a 2 flow path of ambient air can pass behind the 2 display. In some embodiments, open loop air may also remove heat from a thermal plate having an electronic component, and in some embodiments, open loop air may also remove heat from an LED backlight (LED display).

[Brief Description of the Drawings]

[0005]

BRIEF DESCRIPTION OF THE DRAWINGS

In addition to the features described above, other aspects of the present invention will become apparent from the following description of the drawings and from the description of the exemplary embodiments of the invention, wherein : 0005. In the drawings, like reference numerals common to several figures represent ide

ntical or equivalent features.

[Fig. 1]FIG. 1 is a front perspective view of an exemplary embodiment of a double-sided display assembly, also showing cutting lines A-A, B-B, and C-C, 0006.

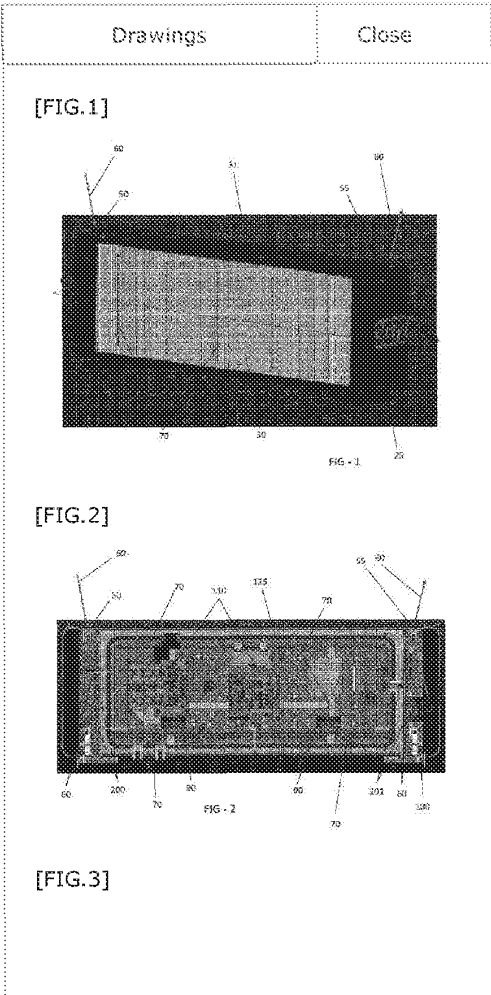
[Fig. 2]FIG. 0007 is a side cross-sectional view of the embodiment of FIG. 1 taken along line A-A of FIG. 2 ;.

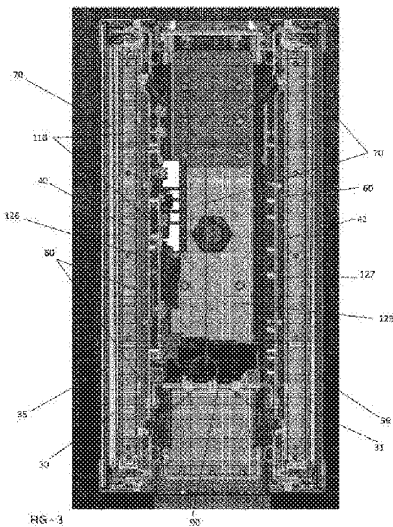
[Fig. 3]FIG. 0008 is a front cross-sectional view of the embodiment of FIG. 1 taken along line B-B of FIG. 3 ;.

[Fig. 4][0009] FIG. 4 is a top cross-sectional view of the embodiment of FIG. 1 taken along line C-C, showing the location of Detail A.

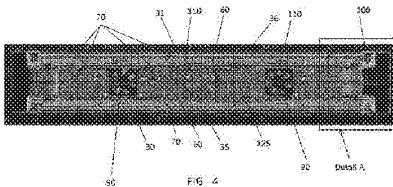
[Fig. 5][0010] FIG. 5 is a detailed perspective view of Detail A.

[Fig. 6][0011] FIG. 6 is an exploded view of a portion of the embodiment of FIG. 1 ;.

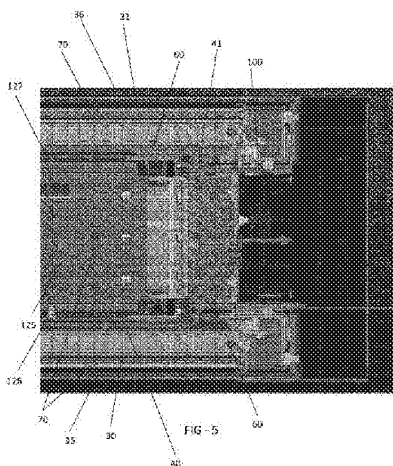




[FIG.4]



[FIG.5]



[FIG.6]

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 (33) 優先権主張国・地域又は機関
 米国 (US)

(73) 特許権者 510135614
 マニファクチャリング・リソース・イ
 ンターナショナル・インコーポレーテッド
 アメリカ合衆国 30005 ジョージア
 、アルファレッタ、シロー・ロード・イー
 スト 6415
 (74) 代理人 100067356
 弁理士 下田 容一郎
 (74) 代理人 100160004
 弁理士 下田 憲雅
 (74) 代理人 100120558
 弁理士 住吉 勝彦
 (74) 代理人 100148909
 弁理士 瀧澤 匡則

最終頁に続く

(54) 【発明の名称】 両側面ディスプレイ・アセンブリ用の冷却システム

(57) 【特許請求の範囲】

【請求項 1】

車両のルーフにマウントされるディスプレイ・アセンブリであって、
前記車両の前記ルーフにマウントされるように適合されたハウジングと、
前記ハウジング内で、背合わせで配置され、且つ、前面及び背面を有する、第1及び第2の電子ディスプレイと、
 各々が前記第1及び第2の前記電子ディスプレイのうちの一つの前記前面の前に配置される第1及び第2の透明パネルと、
 各々が前記第1及び第2の前記電子ディスプレイのうちの一つの前記背面の後に配置される第1及び第2の熱プレートと、
開ループ進路であって、前記開ループ進路が、
周辺空気を取り込むように前記ハウジング内に位置する吸入開口と、
 各々が前記第1及び第2の前記熱プレートのうちの一つと前記第1及び第2の前記ディスプレイのうちの一つとの間に配置される第1及び第2の開ループ・チャンネルと、
前記第1及び第2の前記熱プレートの各々に配置される複数の入口開口であって、各々が前記吸入開口と前記第1及び第2の前記開ループ・チャンネルの少なくとも1つとの間にガスで連絡される、前記複数の入口開口と、
周辺空気を排出するように前記ハウジング内に位置する排出開口と、
前記第1及び第2の前記熱プレートの各々に配置される複数の出口開口であって、各々が前記排出開口と前記第1及び第2の前記開ループ・チャンネルの少なくとも1つとの間に

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にガスで連絡される、前記複数の出口開口と、

を有し、前記閉ループ進路が、

周辺空気の流れを受け入れて、受け入れた流れの第1の分割部分及び第2の分割部分に前記入口開口を通して前記第1及び第2の開ループ・チャンネルに移動させることを許可し、前記第1及び第2の前記分割部分を前記出口開口を出た後に結合させ、結合した流れに前記排出開口を通して排出させるように構成される、前記閉ループ進路と、

閉ループ進路であって、前記閉ループ進路が、

各々が前記第1及び第2の前記透明パネルのうちのひとつと前記第1及び第2の前記ディスプレイのうちのひとつとの間に配置される第1及び第2の開ループ・チャンネルと、

前記第1及び第2の前記熱プレートによって規定される閉ループ・プレナムであって、前記第1及び第2の前記閉ループ・チャンネルにガスで連絡されるように構成される前記閉ループ・プレナムと、

を有する、前記閉ループ進路と、

を備える、

ディスプレイ・アセンブリ。

【請求項2】

請求項1に記載のディスプレイ・アセンブリであって、

前記第1及び第2の前記熱プレートのうちの少なくとも1つの背面にマウントされる複数の電子コンポーネントを

更に備えるディスプレイ・アセンブリ。

【請求項3】

請求項1に記載のディスプレイ・アセンブリであって、

各々が、間をあけて配置され、且つ、前記閉ループ・プレナムと前記第1及び第2の前記閉ループ・チャンネルの少なくとも1つとを通して循環ガスが進むように構成される、複数の閉ループ・ファンを

更に備えるディスプレイ・アセンブリ。

【請求項4】

請求項1に記載のディスプレイ・アセンブリであって、

前記第1及び第2の前記閉ループ・チャンネルの少なくとも1つを通して周辺空気が進むように配置される閉ループ・ファンを

更に備えるディスプレイ・アセンブリ。

【請求項5】

請求項1に記載のディスプレイ・アセンブリであって、

前記ハウジングは、複数の脚部を有し、

前記複数の脚部の各々は、前記車両の前記ルーフの上面に、接触し且つほぼ一致するように構成される下面を有するディスプレイ・アセンブリ。

【請求項6】

請求項1に記載のディスプレイ・アセンブリであって、

前記複数の入口開口の各々は、前記第1及び第2の前記熱プレートの第1の端に沿って間隔をあけて配置され、

前記複数の出口開口の各々は、前記第1及び第2の前記熱プレートの第2の端に沿って間隔をあけて配置される、

ディスプレイ・アセンブリ。

【請求項7】

請求項6に記載のディスプレイ・アセンブリであって、

前記複数の入口開口の各々は、垂直方向に間隔をあけて配置され、

前記複数の出口開口の各々は、垂直方向に間隔をあけて配置される、

ディスプレイ・アセンブリ。

【発明の詳細な説明】

【技術分野】

【0001】

(関連出願の相互参照)

[0001] 本発明は、2016年3月4日付けで出願された米国仮特許出願第62/303,806の優先権を主張し、その参照によってその全体を本明細書に組み込むものとする。

【0002】

(技術分野)

[0002] 本発明の実施形態は、概して、電子ディスプレイ用の冷却システムに関連する。

【背景技術】

【0003】

(背景)

[0003] 電子ディスプレイは、時には、アウトドア環境、又は、周囲温度が高い他のエリア若しくは太陽光負荷等のディスプレイ内温度を上昇させる他の熱源がある他のエリアに使用される。しかしながら、そのディスプレイの幾つかの部分は、冷却するのが難しい。それは、その部分に周辺空気を単に吸入するだけでは、早期の故障に繋がりがねないディスプレイの敏感な部分にちりを導入しその部分を汚染してしまうからである。

【発明の概要】

【課題を解決するための手段】

【0004】

(発明的な概念の概要)

[0004] 例示的な実施形態は、電子ディスプレイ・ハウジングを通過する例えば空気等の流体の多様な流路を備えている。少なくとも1つの流路は、閉ループであり、他の幾つかの流路は、開ループを提供することができる。閉ループの流路は、好ましくは、密閉された電子機器区画を通して循環するとともに、電子ディスプレイとフロント透明パネルとの間を通過する。周辺空気からなる第1開ループは、第1電子ディスプレイの背後を通過する一方、周辺空気からなる第2流路は、第2ディスプレイの背後を通過することができる。幾つかの実施形態において、開ループの空気はまた、電子コンポーネントを有する熱プレートからの熱を取り去ることができ、幾つかの実施形態において、開ループの空気はまた、LEDバックライト(LEDディスプレイ)からの熱を取り去ることができる。

【図面の簡単な説明】

【0005】

(図面の簡単な説明)

[0005] 上述の特徴に加えて、本発明の他の態様は、後続の、図面及び例示的な実施例の記述から明らかになるであろう。なお、図面において、いくつかの図に共通する同様の参照符号は、同一の又は均等の特徴を表している。

【図1】[0006] 図1は、両側面ディスプレイ・アセンブリの例示的な実施形態の正面斜視図であり、切断線A-A、B-B及びC-Cも示している。

【図2】[0007] 図2は、切断線A-Aに沿って得られる図1の実施形態の側断面図である。

【図3】[0008] 図3は、切断線B-Bに沿って得られる図1の実施形態の正面断面図である。

【図4】[0009] 図4は、切断線C-Cに沿って得られる図1の実施形態の頂面断面図であり、Detail(細部)Aの位置も示している。

【図5】[0010] 図5はDetail Aの詳細斜視図である。

【図6】[0011] 図6は、図1の実施形態の一部の分解図である。

【発明を実施するための形態】

【0006】

(例示的な実施形態の詳細な説明)

[0012] 本発明は、本発明の例示的な実施形態が示されている添付の図面を参照することによって、より完全に理解することができる。しかしながら、本発明は、本明細書に記載された例示的な実施形態に限定されるものではない。むしろ、例示的な実施形態の提供

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により、本開示は、全くの完全なものとなり、また、当該技術分野の当業者は、発明の範囲を完全に理解することができる。但し、図面においては、層及び領域の大きさ、相対的な大きさは、明確化のために誇張されている場合がある。

【0007】

【0013】 本明細書での用語は、特定の実施形態のみを説明するために使用され、本発明を限定する意図はない。また、明細書において使用されている、単数形は、明らかにその文脈から異なることが明示されていない限り、複数形をも含む意図を持っている。また、用語「備える」及び／又は「備えている」は、本明細書における使用において、記載された特徴、整数、ステップ、動作、構成及び／又は要素の存在を明示していることを理解することができるが、1又は複数の他の特徴、整数、ステップ、動作、構成、構成要素、及び／又はそれらの群の存在を排除するものではない。

【0008】

【0014】 本発明の実施形態は、本発明の理想的な実施形態（及び中間構造）が図示された概要である図面を参酌しながら、以下に説明する。従って、結果として図示された形状における変更、例えば、製造上の技法及び／又は許容誤差などは、予期されている。従って、本発明の実施形態は、本出願で図示された領域の特定の形状に限定されることを意図しておらず、例えば製造からの結果物の形状には偏差を含むものである。

【0009】

【0015】 他に定義しない限り、本明細書で使用される用語（技術用語及び科学用語を含む）は、本発明が属する技術分野の当業者によって通常理解される意味を持つ。例えば一般的に用いられる辞書で定義された用語は、関連技術の文脈における意味と一致する意味を持つように理解されるべきであり、特に本明細書で定義されない限り理想的な意味又は過度に正式な意味で解釈されるものではない。

【0010】

【0016】 図1は、両側面ディスプレイ・アセンブリの例示的な実施形態の正面斜視図であり、切断線A-A、B-B及びC-Cも示している。一般的に、例示的な実施形態は、背合わせでハウジング25内に配置される2つのディスプレイ30及び31を備えている。吸入開口50は、周辺空気60の流れをハウジング25内に入れてハウジング25を通過させることを許容する。周辺空気60は、好ましくは、排出開口55を通してハウジング25から排出される。循環ガス70の閉ループは、同様にハウジング25内を移動するが、好ましくは、実質的な手法で周辺空気60と混合されることはない。

【0011】

【0017】 本明細書において、周辺空気60の用語は、単に、アセンブリを取り囲む環境を提供する普通の大気からなる空気を意味する。この周辺空気60は、異なる型のガス要素の混合と、ちり、ほこり、花粉、水蒸気、その他の微粒子と、を含むことが知られている。また、本明細書において、循環ガス70は、異なる型のガスの混合であってもよく、或いは、純粋なガス物質であってもよく、従って、任意のガス物質ということの意味することができる。好ましくは、循環ガス70は、実質的な量のちり、ほこり、花粉、水蒸気、又は、その他の型の微粒子を含まない。

【0012】

【0018】 本発明の例示的な実施形態は、車両に、好ましくはそのループに、マウントされるように構成される。ハウジング25は、車両ループの頂上に取り付けられるように構成され、そのサイズが決定される。更に、ハウジング25は、空気力学的抗力を最小限に抑えるように適合され、そのサイズが決定されてもよい。ハウジング25は、ハウジング25を車両にマウントするための一対の脚部26を備えることができる。脚部26は、車両ループに固定されるか、又は車両の上若しくは車両の内に配置される内部支持部に固定されるように構成され、そのサイズが決定される。このような実施形態において、ハウジング25は、好ましくは、薄く、空気力学的抗力を最小限に抑えるように丸い角及び他の特徴構造を有することができる。ハウジング25は、移動中の車両に起因する力に適応する構造上の剛性及び強度を提供するために、様々な補強部材を備えることができる。同様に、ディスプレイ

・アセンブリの様々な構成は、移動中の車両に起因する力に適応するのに十分な剛性材料で構成され又はその材料からなる。更に、ハウジングとディスプレイ・アセンブリの様々な構成要素とは、車両に搭載される時の力、振動、その他の厳格性に対抗できるように構成することができる。例えば、限定されるものではないが、脚部26及びディスプレイ・アセンブリの様々な構成要素は、ラバー・パッド、その他の振動衝撃吸収部を備えることができる。

【0013】

【0019】 図示されるように、切断線A-Aは、アセンブリの中心を水平に下方に配置され、アセンブリを垂直に切断する。切断線B-Bは、垂直に向き、アセンブリを水平に切断する。最後に、切断線C-Cは、水平に向き、アセンブリを同様に水平に切断する。図1における切断線の矢印は、切断図を得るように仮想的な切断方向を示している。 10

【0014】

【0020】 図2は、切断線A-Aに沿って得られる図1の実施形態の側断面図である。周辺空気60は、吸入開口50を通過してハウジング25に入り、そこでは、その後に入口プレナム(plenum)内に導かれ、以下に詳細に説明するように、開ループ・チャンネルに接続する複数の入口開口200のうちの一つを通過する。周辺空気60は、好ましくは、一又は複数のファン100によって引かれるが、ファン100はまた、周辺空気60を押すように配置することができる、或いは、幾つかのファンは、押す／引くの組み合わせで使用することができる。この特定の実施形態において、ファン100は、出口プレナムの近くに配置され、そこでは、周辺空気60は、複数の出口開口201のうちの一つを通して移動することによって開ループ・チャンネルから集められ、出口プレナムから集められ、排出開口55を介してハウジング25から出るように導かれる。 20

【0015】

【0021】 以下詳細に説明するように、入口開口200及び出口開口201は、電子ディスプレイ31の背後を走る第1開ループ・チャンネルにガスで連絡されている。好ましくは、アセンブリの反対側にもう1組の入口開口及び出口開口が存在し(図示せず)、これらは、電子ディスプレイ30の背後を走る第2開ループ・チャンネルに連絡されている。開口200及び201は、好ましくは、電子ディスプレイ30/31の幅の中に、互いに実質的に等距離で分布している。開口200/201は、循環ガス70との実質的な混合なしで、又は、シールされた電子機器区画125への侵入なしで、周辺空気60によるハウジング25及び開ループ・チャンネルの通過を可能にする。 30

【0016】

【0022】 複数の電子コンポーネント110は、好ましくは、循環ガス70用の開ループの一部を形成する密閉された電子機器区画125内に配置される。電子コンポーネント110は、以下の一又は複数を備えることができる：電源モジュール、ビデオ・プレーヤ、電子データ・ストレージ、マイクロプロセッサ、衛生／無線／受信機／送信機、及び、タイミング制御ボード。電子コンポーネント110の少なくとも幾つかは、ディスプレイ30及び31と電気的に接続することができる。

【0017】

【0023】 一又は複数のファン90は、開ループの循環ガス70を電子コンポーネント110上に強制することができる。2つのファン90で示されているが、これが必須ではない。加えて、図示されるように電子コンポーネント110上の循環ガス70を押し込む一方、これに限定されないが、ファン90が循環ガス70を引くように配置することもでき、或いは、幾つかのファン90が循環ガス70を押す／引くの組み合わせで使用することができる。 40

【0018】

【0024】 図3は、切断線B-Bに沿って得られる図1の実施形態の正面断面図である。ここでは、開ループの循環ガス70が明確に示されている。上述したように、循環ガス70は、好ましくは、シールされた電子機器区画125内の電子コンポーネント110の上を移動し、その後、ディスプレイ30及び31の各々を包むように分割される。第1ディスプレイ30に関して、透明パネル35は、好ましくは、循環ガス70を受け入れるためにディスプレイ30と透明パ 50

ネル35との間の閉ループ・チャンネルを規定するように、ディスプレイ30の前に配置される。循環ガス70が一旦ディスプレイ30を横切って超えて移動すると、再び閉ループを開始するために、シールされた電子機器区画125へと戻される。

【0019】

[0025] 同様に、第2ディスプレイ31に関して、透過パネル36は、好ましくは、循環ガス70を受け入れるためにディスプレイ31と透過パネル36との間の閉ループ・チャンネルを規定するように、ディスプレイ31の前に配置される。循環ガス70が一旦ディスプレイ31を横切って超えて移動すると、再び閉ループを開始するために、シールされた電子機器区画125へと戻される。

【0020】

[0026] 図示されるように、周辺空気60の流れは、好ましくは、少なくとも2つのチャンネルに分割されて、各ディスプレイの背後を1つの閉ループ・チャンネルが移動する。ディスプレイ30に関して、周辺空気60の経路は、好ましくは、ディスプレイ30の背面とシールされた電子機器区画125の熱壁126との間を移動する。限定されないが、ディスプレイ30としてダイレクトLEDバックライトLCDを使用する場合、周辺空気60は、好ましくは、LEDバックライト40の背面と熱壁126との間を移動する。上述したように、複数の電子コンポーネント110は、好ましくは、熱壁126及び127の一つ又は両方に、或いはその近くに、取り付けることができる。このように、電子コンポーネント110からの熱は、壁126及び127に移動し（好ましくは、伝導を介するが、同時に対流及び放熱が少し起きてもよい）、周辺空気60の流れによって除去される。

【0021】

[0027] 同様に、ディスプレイ31に関して、周辺空気60の経路は、好ましくは、ディスプレイ31の背面とシールされた電子機器区画125の熱壁127との間を移動する。限定されないが、ディスプレイ31としてダイレクトLEDバックライトLCDを使用する場合、周辺空気60は、好ましくは、LEDバックライト41の背面と熱壁127との間を移動する。実施形態としてダイレクトLEDバックライトLCDが図示されているが、この型のディスプレイ及びこれに関連するバックライトは、各実施形態において必須ではないことに、特に留意されたい。ディスプレイ30及び31は、次の中からの任意の一つとすることができる：プラズマ、OLED、LCD（直接照明又はエッジ照明）、LED、及び、任意の型のエレクトロルミネッセンス・ポリマー・ディスプレイ。

【0022】

[0028] 図4は、切断線C-Cに沿って得られる図1の実施形態の頂面断面図であり、Detail（細部）Aの位置も示している。この図を参照すれば、ディスプレイ30及び31の各々の背後に、周辺空気60用の2つのチャンネルが示されている。再び、好ましくは、周辺空気60の2つの経路は、電子ディスプレイ30及び31並びに電子装置110からの熱を（熱壁126及び127を介して）取り除くことができる。

【0023】

[0029] 図5はDetail Aの詳細斜視図である。周辺空気60が一旦閉ループ・チャンネルの各々を通過して移動すると、出口プレナムによって集められ、ファン100によってディスプレイ・ハウジング25の外部に押し出されるようになる。

【0024】

[0030] 図6は、図1の実施形態の一部の分解図である。ここには、アセンブリの片側の構成要素、すなわちディスプレイ31を囲むコンポーネントの積み重ねが示されている。周辺空気60は、好ましくは、入口開口200を通して導入され、熱プレート127と電子ディスプレイ31の背後（この実施形態において、LEDバックライト41の背面）との間を通過することができる。閉ループ・チャンネルを一旦通過すると、周辺空気60は、好ましくは、出口開口201の外に導かれ、結果として、出口プレナムに集めてディスプレイ・ハウジングの外に出すことができる。循環ガス70は、概して、周辺空気60を有する閉ループ・チャンネルを取り囲むことができる。言い換えれば、閉ループ周辺空気60は、循環ガス70の閉ループの中心を通過する。

【0025】

[0031] 上述したように、循環ガス70は、好ましくは、電子コンポーネント110の上を通過し、シールされた電子機器区画125を出て、透明プレート36と電子ディスプレイ31の間を移動し、最終的には、シールされた電子機器区画125に戻る。再び、実施形態の半分だけが部分分解図に図示されていることに留意されたい。一般的には、図示し、上述したように、対向するディスプレイ30の周りを移動する第2閉ループ循環ガス70と、ディスプレイ30の後を通る周辺空気60用の第2開ループ・チャンネルと、が存在する。

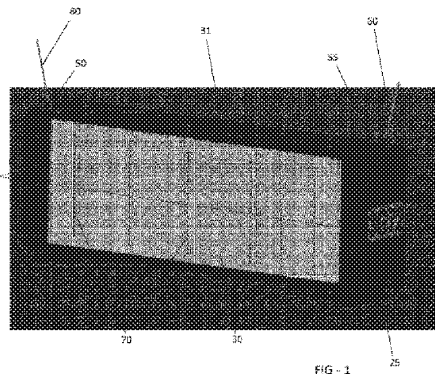
【0026】

[0032] 図面において様々な開及び閉の冷却ループが水平又は垂直の配置で示されたことに留意すべきであるが、特定の実施形態に依存して、逆にするか変更できることは、明確に意図されている。したがって、閉ループは、水平方向又は垂直方向に、また、時計回り方向又は半時計回り方向に、流れることができる。

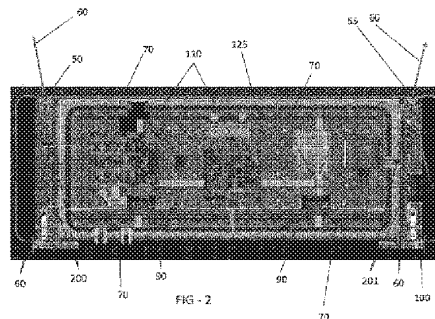
【0027】

[0033] 本発明の好ましい実施形態を示し、説明したが、当業者は、特許請求の範囲に記載された発明の範囲内で、説明した発明に変化をもたらす多くの変形及び修正を理解することができるであろう。加えて、上述の要素の多くは、特許請求の範囲に記載された発明の精神に含まれ、同じ結果を提供することができる異なる要素によって、変更又は置換されることができる。したがって、発明の範囲は、特許請求の範囲の記載のみによって規定されることが意図されている。

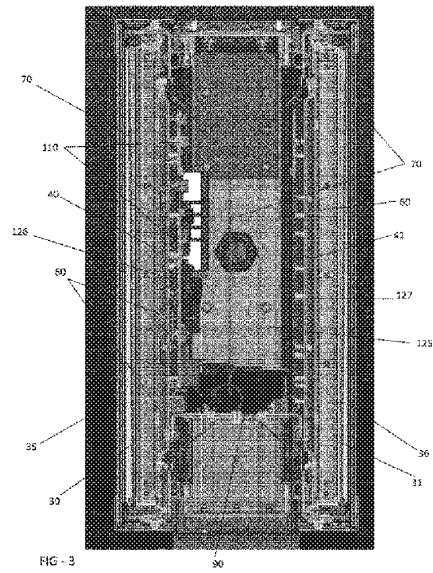
【図1】



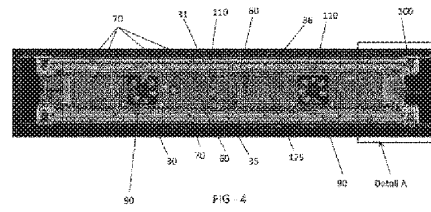
【図2】



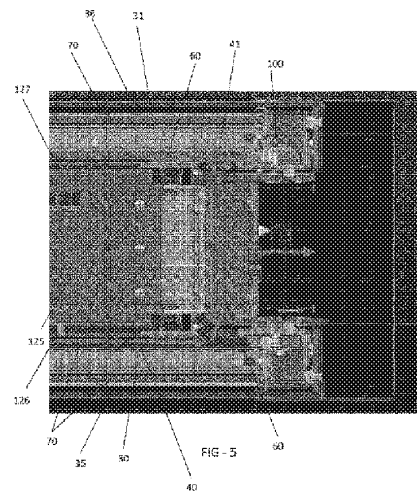
【図 3】



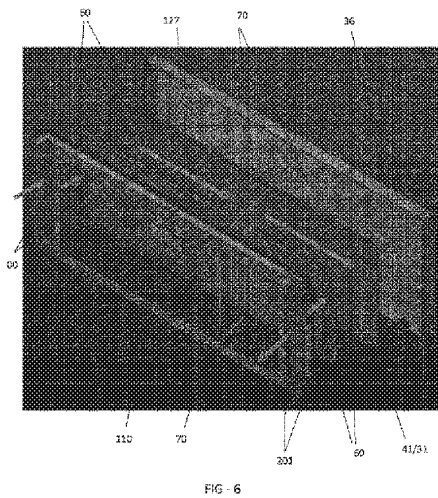
【図 4】



【図 5】



【図 6】



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(74)代理人 100192533

弁理士 奈良 如紘

(72)発明者 マルコス・ディアス

アメリカ合衆国 3 0 0 0 5 ジョージア、 アルファレッタ、 シロー・ロード・イースト 6
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審査官 中村 直行

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G 0 9 G	3/00	—	3/38
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H 0 5 K	7/20		
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44	Non Patent Literature	NOVITSKY_Driving_LEDs_Vs_CFLs_for_LCD_backlighting_2007.pdf	1106740	no	6
			2293b7d13e69db3d7d7cdc906908c6348538ba79		
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45	Non Patent Literature	FEDERMAN_Cooling_Flat_Panel_Displays_2011.pdf	1396057	no	4
			1f334ad7c7768e308ddf1f43831f1fb6c18083ae		
Warnings:					
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46	Non Patent Literature	Zeeff_EMAnalysisofLCDmonitor.pdf	32280	no	1
			7b0bd09845fb84e162687874b519e3bae5309b71		
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47	Non Patent Literature	VERTIGO_FlexVue_Totem_Brochure.pdf	2044016	no	6
			18dd9b0cc5840935b1010ec953fb57e3271f76f3		
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48	Non Patent Literature	VERTIGO_FlexVue_Totem_Shelter.pdf	914634	no	2
			d39883bc9f454c18a1defe820d95006d2c420f2d		
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49	Non Patent Literature	VERTIGO_All_Products_Catalogue.pdf	2859332	no	14
			913f6f5f61b4166517728011d54aa98288a4eac1		
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			f8272e3df9f02d9de079bd1fce867ea4c95db2cf		
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51	Non Patent Literature	CIVIQ_55L.pdf	767760	no	4
			ed43e0b216e257a95fec55c409f48f92c592efdb		
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52	Non Patent Literature	WANKHEDE_EvaluationofCoolingSolutionsforOutdoorElectronics_Sept_2007.pdf	595644	no	6
			8cf8a695a27438456e0403f81c90fdfa82737626		
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53	Non Patent Literature	NAVY_GuideManualofCoolingMethodsforElectronicEquipment_1955.pdf	20420906	no	212
			c0158fa5d99991c9ee5a6ca1efdfa456982d716c		
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54	Non Patent Literature	CIVIQ_Invalidity_Claim_Charts_AppendixA_through_AppendixD.pdf	593686	no	51
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55	Non Patent Literature	2018_01_24_MRI_v_Civiq_Defendants_Initial_Invalidity_Contentions.pdf	473959	no	51
			d12f862dd8b55407ecb24d926dd04d1323151efa		
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56	Non Patent Literature	SCOTT_Cooling_of_Electronic_Equipment.pdf	6020724	no	119
			ae847b379687797966f0434dab357343c2a5245a		
Warnings:					
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57	Non Patent Literature	SERGENT_Thermal_Management_Handbook_For_Electronic_Assemblies.pdf	9784350	no	190
			8aecc304534759219b52d5c5cf440421444f6c2		
Warnings:					
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58	Non Patent Literature	YEH_Thermal_Management_of_Microelectronic_Equipment.pdf	5553990	no	148
			044262cf6e9da244f63da579895e685eeb60cf42		
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59	Non Patent Literature	Appendix_I_Initial_Invalidity_Claim_Charts_US_Patent_No_9173325.pdf	122864	no	4
			5c7599fe0eb7a2df0c38dadd3bf1a599a232b479		
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60	Foreign Reference	JP6688402_B2.pdf	6051720	no	21
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	Filing Date	2020-07-20
	First Named Inventor	William Dunn
	Art Unit	2835
	Examiner Name	Michael A Matey
	Attorney Docket Number	MAN2241-045R

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	1	KR10-1904363	KR	B1	2018-09-27	Manufacturing Resources International, Inc.		×
	2	WO2018/200260	WO	A1	2018-11-01	Manufacturing Resources International, Inc.		□
	3	WO2018/200905	WO	A1	2018-11-01	Manufacturing Resources International, Inc.		□

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4	CN108700739	CN	A	2018-10-23	Manufacturing Resources International, Inc.	☒
5	CA2809019	CA	C	2019-09-25	Manufacturing Resources International, Inc.	☐
6	JP2004286940	JP	A	2004-10-14	Hitachi Ie Systems Co Ltd.	☒
7	EP3423886	EP	A0	2019-01-09	Manufacturing Resources International, Inc.	☐
8	KR20000000118	KR	U	2000-01-15	Samsung Electronics Co., Ltd.	☒
9	KR20000047899	KR	A	2000-07-25	Sony Corp.	☒
10	KR1020040067701	KR	A	2004-07-30	Curie Lab Holdings Limited	☒
11	AU2017216500	AU	B2	2019-01-17	Manufacturing Resources International, Inc.	☐
12	AU2016220308	AU	B2	2019-03-21	Manufacturing Resources International, Inc.	☐
13	AU2015229457	AU	B2	2019-03-07	Manufacturing Resources International, Inc.	☐
14	KR10-1958375	KR	B1	2019-03-08	Manufacturing Resources International, Inc.	☒

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15	EP3468321	EP	A1	2019-04-10	Manufacturing Resources International, Inc.		☐
16	EP3138372	EP	B1	2019-05-08	Manufacturing Resources International, Inc.		☐
17	JP2019-512721	JP	A	2019-05-16	Manufacturing Resources International, Inc.		☐
18	KR10-2006-0070176	KR	A	2006-06-23	Samsung Electronics Co., Ltd		☒
19	BRPI0820231-1	BR		2019-02-12	Manufacturing Resources International, Inc.		☒
20	CA27982777	CA	C	2019-06-25	Manufacturing Resources International, Inc.		☐
21	EP3117693	EP	B1	2019-08-07	Manufacturing Resources International, Inc.		☐
22	CN107251671	CN	B	2019-08-02	Manufacturing Resources International, Inc.	Patent No. ZL201680010005.X	☐
23	KR10-2010515	KR	B1	2019-08-07	Manufacturing Resources International, Inc.		☒
24	JP6526245	JP	B2	2019-05-17	Manufacturing Resources International, Inc.		☒
25	EP2567283	EP	B1	2019-10-16	Manufacturing Resources International, Inc.		☐

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26	CA2888494	CA	C	2019-09-24	Manufacturing Resources International, Inc.	☐
27	KR10-2013-0126034	KR	A	2013-11-20	Daesung Eltec Co., Ltd.	☐
28	JP2002-6282	JP	A	2002-01-09	Toshiba Corp	☒
29	KR10-0563049	KR	B1	2006-03-24	Samsung SDI Co., Ltd.	☒
30	KR10-2063885	KR		2020-01-02	Manufacturing Resources International, Inc.	☒
31	KR10-2067751	KR	B1	2002-01-13	Manufacturing Resources International, Inc.	☒
32	EP3615978	EP	A1	2020-03-04	Manufacturing Resources International, Inc.	☐
33	EP3616481	EP	A1	2020-03-04	Manufacturing Resources International, Inc.	☐
34	WO2015/138609	WO	A2	2015-09-17	Manufacturing Resources International, Inc.	☐
35	EP2909829	EP	B1	2020-02-12	Manufacturing Resources International, Inc.	☐
36	JP2011-14593	JP	A	2011-01-20	Hitachi High-Technologies Corp	☒

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37	EP3624574	EP	A1	2020-03-18	Manufacturing Resources International, Inc.	☐
38	AU2017228430	AU	B2	2020-03-05	Manufacturing Resources International, Inc.	☐
39	JP2006-176112	JP	A	2006-07-06	Harman Becker Automotive Sys	☒
40	KR10-2104342	KR	B1	2020-04-20	Manufacturing Resources International, Inc.	☒
41	KR10-2109072	KR	B1	2020-05-04	Manufacturing Resources International, Inc.	☒
42	WO2020/081687	WO	A1	2020-04-23	Firefly Systems Inc.	☐
43	JP6688402	JP	B2	2020-04-07	Manufacturing Resources International, Inc.	☒
44	JP2006-32890	JP	A	2006-02-02	Metal Ind Res & Dev CT	☒
45	JP2002006282	JP	A	2002-01-09	Toshiba Corp.	☒

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Signature	/Adam J. Smith/	Date (YYYY-MM-DD)	2020-08-26
Name/Print	Adam J. Smith	Registration Number	72962

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CARTA PATENTE Nº PI 0820231-1

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(21) Número do Depósito: PI 0820231-1

(22) Data do Depósito: 17/11/2008

(43) Data da Publicação do Pedido: 22/05/2009

(51) Classificação Internacional: G02F 1/1333; G02F 1/13357.

(30) Prioridade Unionista: US 61/033,058 de 03/03/2008; US 61/033,064 de 03/03/2008; US 12/191,834 de 14/08/2008; US 61/053,713 de 16/05/2008; US 11/941,728 de 16/11/2007; US 61/115,333 de 17/11/2008; US 12/234,360 de 19/09/2008; US 12/234,307 de 19/09/2008; US 12/235,200 de 22/09/2008; US 12/237,365 de 24/09/2008; US 61/039,454 de 26/03/2008; US 61/076,126 de 26/06/2008; US 61/057,599 de 30/05/2008.

(54) Título: SISTEMA E MÉTODO PARA CONTROLE TÉRMICO DE UM VISOR ELETRÔNICO

(73) Titular: MANUFACTURING RESOURCES INTERNATIONAL, INC.. Endereço: 1600 Union Hill Road, Alpharetta GA 30005 US, ESTADOS UNIDOS DA AMÉRICA(US)

(72) Inventor: WILLIAM R. DUNN.

Prazo de Validade: 10 (dez) anos contados a partir de 12/02/2019, observadas as condições legais

Expedida em: 12/02/2019

Assinado digitalmente por:
Liane Elizabeth Caldeira Lage
Diretora de Patentes, Programas de Computador e Topografias de Circuitos Integrados



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Bibliographic data: WO2009065125 (A2) — 2009-05-22

SYSTEM AND METHOD FOR THERMALLY CONTROLLING AN ELECTRONIC DISPLAY

Inventor(s): DUNN WILLIAM R [US] ± (DUNN, WILLIAM, R)

Applicant(s): MFG RESOURCES INT INC [US]; DUNN WILLIAM R [US] ±
(MANUFACTURING RESOURCES INTERNATIONAL, INC, ; DUNN,
WILLIAM, R)

Classification: - international:
- cooperative: G02F1/133382; G02F1/133385; H05K7/20972;
G02F2001/133628; G02F2201/36

Application number: WO2008US83792 20081117 Global Dossier

Priority number(s): US20070941728 20071116 ; US20080033058P 20080303 ;
US20080033064P 20080303 ; US20080039454P 20080326 ;
US20080053713P 20080516 ; US20080057599P 20080530 ;
US20080076126P 20080626 ; US20080191834 20080814 ;
US20080234307 20080919 ; US20080234360 20080919 ;
US20080235200 20080922 ; US20080237365 20080924 ;
US20080115333P 20081117

Also published as: WO2009065125 (A3) BRPI0820231 (A2) CA2705814 (A1)
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KR20150139625 (A) KR20170091176 (A) KR20180043849 (A)
KR20190026976 (A) RU2010124380 (A) RU2493575 (C2) less

Abstract of WO2009065125 (A2)

Embodiments relate generally to various thermal control features for electronic displays. One feature comprises a closed loop isolated gas chamber, where a first chamber is in contact with the display surface and transfers heat between the isolated gas and the display surface. A second chamber is in gaseous communication with the first chamber and is adapted to heat or cool the isolated gas and reintroduce the isolated gas into the first chamber. Another feature uses constricted convection to facilitate the cooling of the backlight assembly for the electronic display. Another feature uses an air curtain to further heat or cool the exterior viewing surface of the

display. Another feature uses a linear polarizer with an insulating gap to reduce the solar loading of the display stack and provide insulation from the ambient air temperature. Another feature uses a fluid system to contact fluid coolant with the display surface in order to cool the display. Each of the features may be used alone, or in combination to provide the proper operating temperature for the display depending on its desired operating environment.

