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DISPLAY DEVICE

Abstract

A head up display device includes a backlight, a display element, a plate for holding the display element, a heat dissipation portion that dissipates heat generated from the display element, and a mirror for reflecting an image light emitted from the display element. The plate has a member which is substantially parallel to an emission surface of the display element and is mounted to the display element via a material having a thermal conductivity higher than that of air.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS [0001] The present application is based on PCT filing PCT/JP2019/042203, filed Oct. 28, 2019, which claims priority to JP 2019-063109, filed Mar. 28, 2019, and is a continuation of U.S. patent application Ser. No. 18/512,014, allowed, which is a continuation of U.S. patent application Ser. No. 17/598,295, now U.S. Pat. No. 11,860,463, the entire contents of each are incorporated herein by reference.

TECHNICAL FIELD
[0002] The present invention relates to a head up display.
BACKGROUND ART
[0003] In a vehicle such as an automobile, generally, information such as vehicle speed and engine speed is displayed on an instrument panel within a dashboard. A screen of a car navigation system or the like is displayed on a display incorporated in the dashboard or installed on the dashboard. At the time of visually recognizing the information thereon, a driver needs to largely move his or her line of sight, and accordingly, there has been known a head up display (Head Up Display, it may be referred to as "HUD" in the following) that projects information such as vehicle speed and car navigation instructions onto a windshield or the like to display a virtual image thereon.
[0004] In an automobile parked for a long time under the blazing sun, a temperature on a surface of a liquid crystal panel (LCD panel) provided in the HUD rises above a heat resistant temperature of a polarizing plate, and a possibility of damage therein increases. Therefore, it is necessary to cool the LCD panel. In particular, when the sunlight retrogrades an emission optical path of an image light of the HUD and enters a housing of the HUD, the sunlight is condensed by a concave mirror and a lens arranged along the emission optical path of the image light, and the surface temperature of the LCD panel or the temperature of the environment in which the LCD panel is installed rises, which may exceed the heat resistant temperature of the polarizing plate on the surface of the LCD panel.
[0005] With this regard, as a technique for improving heat resistance of a display device, Patent Literature 1 discloses "a display unit comprises: a display member including a display surface that emits display light corresponding to an image; a heat storage member having a thermal conductivity that is arranged at a position on the display surface of the display member not blocking the display light passing through a display area; and a thermally conductive adhesion layer that is provided between the display member and heat storage member and composed of a thermally conductive adhesive" (excerpted from Abstract).
CITATION LIST
Patent Literature
[0006] Patent Literature 1: JP-A-2018-36379

SUMMARY OF INVENTION

Technical Problem

[0007] Not only the sunlight entering the HUD will result in rise in the temperature of the display surface within the HUD. A liquid crystal panel is generally used as a display device, and in the case of using an LED as a backlight, heat generated when the LED emits light also increases the temperature of the liquid crystal panel. Accordingly, in order to improve the heat resistance of the liquid crystal panel within the HUD, it is necessary to consider an influence of the heat generated by the backlight in addition to an influence of the sunlight.

[0008] With this regard, a technique for dissipating, from the heat sink, the heat generated from the backlight has been known. Since the HUD is accommodated in a dashboard and used, it is limited to the size that can be accommodated in a narrow dashboard space. Accordingly, there has been a demand to improve the heat resistance of the liquid crystal panel and secure the heat dissipation performance of the backlight without making the size of the HUD exceed the limitation.

[0009] However, Patent Literature 1 only aims to improve the heat resistance of the display surface, and thus cannot satisfy the demand mentioned above.

[0010] The present invention has been made in view of the problems above, and an object thereof is to provide an HUD that can improve heat resistance of a liquid crystal panel and secure heat dissipation of a backlight while downsizing a body thereof.

Solution to Problem

[0011] In order to solve the problems above, the present invention includes the technical features described in the scope of claims. As one aspect of the present invention, provided is a head up display for displaying a virtual image to a driver, the head up display comprising: an image display device that includes a backlight, a liquid crystal panel, and a plate for holding a periphery of an emission surface, from which an image light is emitted, provided on the liquid crystal panel; a virtual image optical system that includes a lens for transmitting the image light emitted from the liquid crystal panel, and a concave mirror for reflecting the image light to form an optical path of the image light; a housing that accommodates the virtual image optical system; and a heat sink that dissipates heat generated from the backlight, the heat sink being arranged in a state where at least a portion thereof is exposed to an outside of the housing, the plate being formed of a material having a thermal conductivity higher than that of air and provided with an emission surface exhaust heat path, and the emission surface exhaust heat path being formed to: include a holding region fixed to the periphery of the emission surface directly or via a material having a thermal conductivity higher than that of air, and an intermediate region connecting the holding region and the heat sink; connect an end portion, which is opposite to the holding region, of the intermediate region with the heat sink directly or via a material having a thermal conductivity higher than that of air; extend from the emission surface to the heat sink via the plate; and have a thermal gradient greater than that of a heat transfer path for transferring the heat from the emission surface to the heat sink by using air as a medium.

Advantageous Effects of Invention

[0012] According to the present invention, it is possible to provide an HUD that can improve heat resistance of a liquid crystal panel and secure heat dissipation of a backlight while downsizing a body thereof. The objects, configurations, and effects other than those described above will be clarified by explanation of the embodiment below.

Description

BRIEF DESCRIPTION OF DRAWINGS

[0013] FIG. **1** is a schematic configuration view of a head up display (HUD) according to the present embodiment.

[0014] FIG. **2** is a perspective view of an appearance example of an HUD, especially showing an outer housing thereof.
[0015] FIG. **3** is a perspective view illustrating a state where the HUD of FIG. **2** is disassembled into components.
[0016] FIG. **4** is a perspective view illustrating a state where an image display device of FIG. **3** is disassembled into components.
[0017] FIG. **5** is a cross-section view of an A-A′ line of FIG. **3**.
[0018] FIG. **6** illustrates a comparative example in which cooling performance of an image display device having heat generation countermeasure components according to the present embodiment is compared with that of a conventional image display device.
[0019] FIG. **7** is a cross-section view of an example of an image display device including an LCD plate (heat generation countermeasure components).
[0020] FIG. **8** is a cross-section view of another example of an image display device including an LCD plate (heat generation countermeasure components).

DESCRIPTION OF EMBODIMENTS

[0021] Hereinafter, an embodiment of the present invention will be described with reference to the drawings. Throughout the drawings for explaining the embodiment, basically, the same members are provided with the same reference signs, and repetitive explanation therefor will be omitted. On the other hand, there are cases where a portion provided with a reference sign in a drawing is referred in other drawings with the same reference sign without being illustrated therein again. Furthermore, in the following embodiment, an example in which a head up display (HUD) is installed in a vehicle such as an automobile will be described, meanwhile, the present invention is also applicable to other vehicles such as trains and aircrafts. In addition, the present invention is also applicable to an HUD used for a purpose other than vehicles.
[0022] FIG. **1** is a schematic configuration view of a head up display (HUD) **1** according to the present embodiment. FIG. **2** is a perspective view of an appearance example of the HUD **1**, especially showing an outer housing **50**.
[0023] As illustrated in FIG. **1**, the HUD **1** includes an image display device **30** having a liquid crystal panel, a virtual image optical system **40** having a lens unit **43** and a concave mirror **41** which enlarge image light emitted from the image display device **30**, and the outer housing **50** that accommodates the virtual image optical system **40**.
[0024] The image display device **30** is attached to the outer housing **50** in a state where at least a portion of a heat sink **31***b* is exposed to the outside of the outer housing **50** (see FIG. **2**). The heat sink **31***b* may be configured such that fins **31***b***2** (see FIG. **4**) are exposed to the outside of the outer housing **50** while a heat transfer plate **31***b***1** is accommodated in the outer housing **50** (see FIG. **5**), or the heat transfer plate **31***b***1** and the fins **31***b***2** are exposed to the outside of the outer housing **50** (see FIG. **8**).
[0025] The concave mirror **41** is rotated by a mirror drive unit **42**, thereby changing an angle for reflecting the image light toward a wind shield **3**. The image light is reflected by the concave mirror **41**, and then projected on the windshield **3** of a vehicle **2**. The eye of the driver **5** receives the image light projected on the wind shield **3**, which causes the driver **5** to visually recognize a virtual image **80** in front of the vehicle **2**.
[0026] Here, a projection target member is not limited to the wind shield **3** as long as being able to receive the image light projection, and it may be such as a combiner. Furthermore, the present embodiment uses, as the image display device **30**, a projector and a Liquid Crystal Display (LCD) having a backlight **31***a*.
[0027] The lens unit **43** for adjusting an optical distance between the concave mirror **41** and the image display device **30** is provided between the concave mirror **41** and the image display device **30**. Accordingly, along an emission direction of the image light from the image display device **30**, the lens unit **43** and the concave mirror **41** are arranged in order nearest from the image display

device **30** to form the virtual image optical system **40**, and accommodated in the inside of the outer housing **50**.

[0028] FIG. **3** is a perspective view illustrating a state where the HUD **1** of FIG. **2** is disassembled into components.

[0029] As illustrated in FIG. **3**, an optical component holding member **53** of the HUD **1** is accommodated in an outer case **54**, and furthermore, an upper part of the HUD **1** is covered by an outer cover portion **51**. The outer case **54** and the outer cover portion **51** form the outer housing **50** of the HUD **1** illustrated in FIG. **1**. The image display device **30** is mounted to an opening provided on the outer case **54**.

[0030] The outer cover portion **51** has an opening through which the image light is emitted toward the wind shield **3**, and the opening is covered with an antiglare plate **52** (glare trap).

[0031] The optical component holding member **53** is a member for holding the concave mirror **41** and the lens unit **43**.

[0032] The outer case **54** may include a main substrate **70** on which a control circuit for controlling the backlight **31***a* (see FIG. **4**) and its operation is mounted, and other components such as the mirror drive unit **42** having a motor. The outer case **54** is provided with an attachment and detachment mechanism such as screw holes and an opening through which the image light enters, so that the image display device **30** can be attached thereto and detached therefrom.

[0033] In the present embodiment, the image display device **30** is modularized, thereby making it possible to be integrally attached and detached with respect to the outer case **54** by such as screws. As a result, for example, only the image display device **30** can be replaced without removing or disassembling the HUD **1** itself. Furthermore, since the image display device **30** is attached to the HUD **1** in a state where the heat sink **31***b* is exposed to the outside of the outer housing **50** of the HUD **1**, it is possible to improve the heat dissipation, and further obtain an advantageous effect of reduction in failure and degradation due to heat.

[0034] FIG. **4** is a perspective view illustrating a state where the image display device **30** of FIG. **3** is disassembled into components. The image display device **30** is configured to display an image when a display element **33**, such as the LCD panel, modulates light from the backlight **31***a* based on an image signal received from the main substrate **70** via a flexible cable **34**. The displayed image is output to the virtual image optical system **40**, and then the virtual image **80** that can be visually recognized by the driver **5** is generated.

[0035] As the backlight **31***a*, for example, a Light Emitting Diode (LED) which is a relatively inexpensive and reliable solid-state light source is used. The surface emission type backlight **31***a* is employed in order to increase the output. In the example of FIG. **4**, the backlight **31***a* is mounted on the image display device **30** as an LED substrate.

[0036] The luminous efficiency of an LED relative to input power is 20% to 30% and the remainder is mostly converted to heat though it varies depending on emission colors. Accordingly, a frame **35** to which the backlight **31***a* is attached is formed of a member having a thermal conductivity higher than that of air (for example, a metal material such as aluminum). The heat sink **31***b* is connected to a lower end of the frame **35**.

[0037] A light guide **32***b* and a diffusion plate **32***c* are used to efficiently guide divergent light from the backlight **31***a* to the display element **33**. In this case, in order to prevent adhesion of dust or the like, for example, it is preferable to cover the entire of the light guide **32***b*, diffusion plate **32***c*, and display element **33** by using outer members **36***a*, **36***b*.

[0038] An LCD plate **33***b* of the display element **33** holds a periphery of a polarizing plate forming an emission surface **33***a* through which the image light is emitted.

[0039] Furthermore, in the example of FIG. **4**, in order to capture the divergent light from the backlight **31***a* and convert it into parallel light, a plurality of light funnels **32***a* formed of such as collimator lenses is provided. An opening provided on each light funnel **32***a* for capturing the divergent light from the backlight **31***a* has, for example, a planer shape and optically connected to the backlight **31***a* with a medium interposed therebetween, or has a projecting shape and provided with a condensing function. Accordingly, the divergent light is made parallel as much as possible to reduce an incidence angle of light that enters on an interface of each light funnel **32***a*. As a result, after the divergent light passes through the light funnels **32***a*, the divergent angle can be further reduced, thereby making it easy to control the light from the light source passing toward the display element **33** after being reflected by the light guide **32***b*.

[0040] Furthermore, in order to improve the use efficiency of the divergent light from the backlight **31***a*, polarization conversion is performed by using a Polarizing Beam Splitter (PBS) at a connection portion between each light funnel **32***a* and the light guide **32***b* to convert the direction into a desirable polarization direction. Accordingly, it is possible to improve the efficiency of the light incident on the display element **33**. In the case of aligning the polarization direction of the light from the light source in this manner, it is preferable to use a material having less birefringence as a material of the light guide **32***b*. Accordingly, when the direction of polarization is rotated and passes through the display element **33**, for example, it is possible to suppress a problem of occurrence of coloring at the time of black display.

[0041] FIG. **5** illustrates an A-A′ cross-section of FIG. **3** to show a structure of the image display device **30**. In the image display device **30**, the backlight **31***a* is arranged on the heat sink **31***b*, and the light funnels **32***a* are provided on the backlight **31***a*. The light emitted through the light funnels **32***a* is reflected by the light guide **32***b* toward the diffusion plate **32***c*, and enters the emission surface **33***a*.

[0042] In the image display device **30**, the heat sink **31***b* is arranged at a position that is intersecting an extended surface of the plane including the emission surface **33***a* as well as off the optical path of the image light.

[0043] The display element **33** includes the plate-shaped LCD plate **33***b* provided with an opening whose size is allowed to include the emission surface **33***a*. The LCD plate **33***b* is arranged on a front surface of the emission surface **33***a* (emission direction of the image light). The LCD plate **33***b* is formed of a material having a thermal conductivity higher than that of air.

[0044] The LCD plate **33***b* includes a holding region **331** for holding the periphery of the polarizing plate that forms the emission surface **33***a*, and an intermediate region **332** for connecting the holding region **331** and the heat sink **31***b*.

[0045] The back surface of the holding region **331** (surface facing the emission surface **33***a*) and the polarizing plate forming the emission surface **33***a* are fixed with each other directly or via a material having a thermal conductivity higher than that of air. In FIG. **5**, the LCD plate **33***b* abuts on the emission surface **33***a*, meanwhile, the LCD plate **33***b* may be attached to the emission surface **33***a* via a material **38** whose thermal conductivity is higher than that of air as illustrated in FIG. **8**.

[0046] The intermediate region **332** is formed as a plane substantially parallel to the plane including the emission surface **33***a*, and arranged at a position off the optical path of the image light to be emitted from the emission surface **33***a*. A lower end of the intermediate region **332** (end portion located on the side opposite to the holding region **331**) is in direct contact with the heat sink **31***b*, or in non-direct contact with the heat sink **31***b* via a material having a thermal conductivity higher than that of air.

[0047] A type of the “material having a thermal conductivity higher than that of air” is arbitrary as long as the material can form an emission surface exhaust heat path configured to allow the heat to be dissipated from a region of the emission surface **33***a* which is exposed to air, and have a heat gradient greater than a heat transfer path for transferring heat to the heat sink **31***b* by using air as a medium. In the emission surface exhaust heat path, the heat is transferred from the emission surface **33***a* to the heat sink **31***b* through the holding region **331** and the intermediate region **332** of the LCD plate **33***b*. For example, the “material having a thermal conductivity higher than that of air” may be a metal material such as aluminum, copper, and iron, or a non-metal material such as ceramic, carbon, and silicon.

[0048] The LCD plate **33***b* is formed of one member, and provided thereon with an opening for forming an optical path of the image light. The LCD plate **33***b* is also provided on a part thereof with the holding region **331**, and provided on another part thereof with the intermediate region **332**. On the LCD plate **33***b*, the holding region **331** is brought into direct contact (close contact) with the peripheral portion of the emission surface **33***a*, and the intermediate region **332** is brought into direct contact (close contact) with the heat sink **31***b*. In this connection, the one member referred herein does not necessarily mean a structure which is formed in a planar shape by using a single plate member, but includes any structure as long as it is formed of a single member and does not have an interfacial thermal resistance caused by connection of a plurality of members within the LCD plate **33***b*.

[0049] Since the LCD plate **33***b* is formed of a single plate member, an interfacial thermal resistance does not occur between the holding region **331** and the intermediate region **332**. As a result, it is possible to suppress the interface thermal resistance of the emission surface exhaust heat path extending from the emission surface **33***a* to the heat sink **31***b* to the total value of an interface thermal resistance from the emission surface **33***a* to the LCD plate **33***b* and that from the LCD plate **33***b* to the heat sink **31***b*, thereby improving the thermal conductivity more than a case of forming the emission surface exhaust heat path through other members.

[0050] FIG. **6** illustrates a comparative example in which cooling performance of the image display device **30** having heat generation countermeasure components according to the present embodiment is compared with that of a conventional image display device. FIG. **6** illustrates a conventional image display device (hereinafter, referred to as a "conventional device") on its left side while illustrating the image display device **30** according to the present embodiment on its right side. These two image display devices are placed in the same environmental conditions, and then each backlight **31***a* is turned on. As a result, in a predetermined test condition (for example, as a test condition, using the energy of sunlight condensed on the LCD at an environmental temperature 25° C.), the surface temperature of the emission surface **33***a* of the image display device **30** according to the present embodiment is lower than that of the conventional device by 7.6 degrees, the surface temperature of the backlight **31***a* of the image display device **30** is lower than that of the conventional device by 10.4 degrees, and the surface temperature of the heat sink **31***b* is lower than that of the conventional device by 7.2 degrees, respectively. This result shows that the structure provided with the emission surface exhaust heat path improves not only the cooling performance of the emission surface **33***a*, but also the cooling performance of the backlight **31***a* and the heat sink **31***b*.

[0051] According to the present embodiment, the heat on the emission surface **33***a* is guided to the heat sink **31***b* via the LCD plate **33***b*, and thus can be efficiently dissipated to the outside of the outer housing **50**. As a result, it is possible to suppress the temperature rise of the emission surface **33***a*.

[0052] Furthermore, in the present embodiment, the heat sink **31***b* which is a member provided in advance as a heat countermeasure of the backlight **31***a* is used to dissipate the heat on the emission surface **33***a*. As a result, a member provided thereon in advance can be effectively used to suppress the temperature rise of the emission surface **33***a*.

[0053] Still further, in the present embodiment, the intermediate region **332** of the LCD plate **33***b* is provided between the holding region **331** and the heat sink **31***b*. Since this space has not been effectively used in the prior art, in other words, this region is an empty area, the emission surface exhaust heat path can be formed without reducing the space inside the outer housing **50** (without changing arrangement positions of other members). As a result, it is possible to suppress the temperature rise on the emission surface **33***a* without changing the size of the outer housing **50**.

[0054] Furthermore, connecting the LCD plate **33***b* to the heat sink **31***b* increases a heat capacity of the heat sink **31***b*. As a result, the heat sink **31***b* can improve a cooling effect of the backlight **31***a*.

[0055] The present invention is not limited to the embodiment described above, and various modifications can be made as long as they are not departing from the concept of the invention. For example, the embodiment described above has been explained in detail in order to clarify the present invention, but is not necessarily limited to those having all the configurations described. In addition, a part of the configuration of the present embodiment can be replaced with that of another embodiment, and the configuration of another embodiment can be added to the configuration of the present embodiment. Furthermore, it is possible to add, delete, or replace another configuration with respect to a part of the configuration of the present embodiment.
[0056] For example, in the image display device **30** according to the embodiment above, the backlight **31***a* is formed of a surface light source, and since a surface of the surface light source and the emission surface **33***a* are arranged on different planes, the optical path until the divergent light enters the emission surface **33***a* includes an inflection point at the position of the light guide **32***b*.
[0057] On the other hand, the present invention also can be applied to so-called a direct projection type image display device **30***a* as illustrated in FIG. **7**, which allows the light emitted from the backlight **31***a* to enter the emission surface **33***a* without bending the optical path of the light. The image display device **30***a* of FIG. **7** includes the light funnels **32***a* approximately on the center of the width direction of the backlight **31***a* (lateral direction of FIG. **7**), and includes a lens holding housing **37***a* on each end in the width direction of the backlight **31***a*. The lens holding housing **37***a* holds the lens **37** at the side opposite to the backlight **31***a*.
[0058] On an emission surface of the lens **37**, a diffusion plate holding housing **32***c***1** which stands in contact with each end of the lens **37** along the radial direction thereof is provided. The diffusion plate holding housing **32***c***1** holds the diffusion plate **32***c* at the side opposite to the lens **37**. The diffusion plate **32***c* is in contact with the frame **35** at the side opposite to the diffusion plate holding housing **32***c***1**, and the frame **35** holds the emission surface **33***a*.
[0059] The light emitted from the backlight **31***a* passes through the light funnels **32***a*, is condensed by the lens **37**, diffused by the diffusion plate **32***c*, and emitted through the emission surface **33***a*.
[0060] As described above, in the image display device **30***a*, the emission surface **33***a* is located at the side opposite to the heat sink **31***b* via the backlight **31***a* which serves as a heating element. Accordingly, the intermediate region **332** of the LCD plate **33***b* surround each side of the backlight **31***a* to connect the holding region **331** with the heat sink **31***b*. As a result, an emission surface exhaust heat path can be formed even in the case where the positional relationship between the heat sink **31***b* and the emission surface **33***a* is different from that of the embodiment above, thereby making it possible to dissipate the heat from the heat sink **31***b*.
[0061] In the case of an image display device **30***b* illustrated in FIG. **8**, the heat sink **31***b* is not provided on an extended surface of the emission surface **33***a*, but on a position off the extended surface thereof. Even the image display device **30***b* configured as above can form an emission surface exhaust heat path when the intermediate region **332** of the LCD plate **33***b* connects the holding region **331** with the heat sink **31***b*. As a result, regardless of the shape of the heat sink **31***b* and a position thereof with respect to the emission surface **33***a*, it is possible to form the emission surface exhaust heat path.
[0062] Furthermore, the intermediate region **332** of the LCD plate **33***b* may be connected to the heat sink **31***b* not only directly, but also via a heat conductive sheet formed of a material having a thermal conductivity higher than that of air.
REFERENCE SIGNS LIST
[0063] **1**: HUD [0064] **2**: vehicle [0065] **3**: wind shield [0066] **5**: driver [0067] **30**: image display device [0068] **30***a*: image display device [0069] **30***b*: image display device [0070] **31***a*: backlight [0071] **31***b*: heat sink [0072] **32***a*: light funnel [0073] **32***b*: light guide [0074] **32***c*: diffusion plate [0075] **32***c***1**: diffusion plate holding housing [0076] **33**: display element [0077] **33***a*: emission surface [0078] **33***b*: LCD plate [0079] **34**: flexible cable [0080] **35**: frame [0081] **36***a*: outer member [0082] **36***b*: outer member [0083] **37**: lens [0084] **37***a*: lens holding housing [0085] **40**:

virtual image optical system [0086] **41**: concave mirror [0087] **42**: mirror drive unit [0088] **43**: lens unit [0089] **50**: outer housing [0090] **51**: outer cover portion [0091] **52**: antiglare plate [0092] **53**: optical component holding member [0093] **54**: outer case [0094] **70**: main substrate [0095] **80**: virtual image [0096] **331**: holding region [0097] **332**: intermediate region

Claims

1. A head up display device comprising: a backlight; a display element; a plate for holding the display element; a heat dissipation portion that dissipates heat generated from the display element; and a mirror for reflecting an image light emitted from the display element, wherein the plate has a member which is substantially parallel to an emission surface of the display element, and the plate is mounted to the display element via a material having a thermal conductivity higher than that of air.
2. The head up display device according to claim 1, wherein the heat dissipation portion is arranged on a position offset from an optical path of the image light emitted from the display element.
3. The head up display device according to claim 1, wherein the emission surface of the display element is located at a side opposite to the heat dissipation portion via the backlight.
4. The head up display device according to claim 1, wherein the heat dissipation portion is arranged on a position intersecting an extended surface of the emission surface of the display element.
5. The head up display device according to claim 1, wherein the plate includes a holding region in contact with at least a portion of the display element, directly or via the material having the thermal conductivity higher than that of air.
6. The head up display device according to claim 1, wherein the plate is formed of a member including an area forming an optical path of the image light, and the area is equal to or larger than a size of the emission surface of the display element.
7. The head up display device according to claim 1, wherein the backlight is in contact with a heat transfer plate that transfers heat generated from the backlight.
8. The head up display device according to claim 1, wherein the heat dissipation portion is a heat sink that dissipates heat generated from the backlight.
9. The head up display device according to claim 8, wherein the heat sink includes fins exposed to an outside of a housing.