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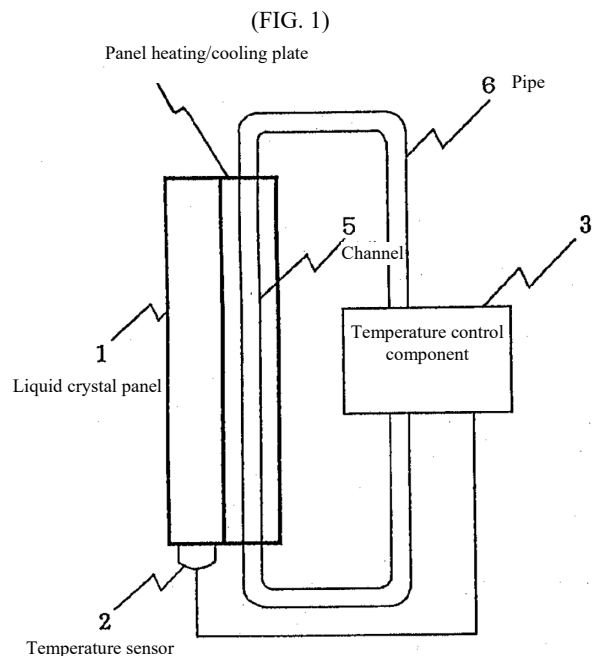
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(54) (TITLE OF THE INVENTION) HEATING/COOLING SYSTEM FOR LIQUID CRYSTAL PANEL

(57) (ABSTRACT)

(OBJECTIVE) Enable the use of a liquid crystal panel beyond its operating temperature range.

(CONFIGURATION) A panel heating/cooling plate 4 is adjointly provided on the back face of a liquid crystal panel 1, and a temperature control component 3 performs control according to the temperature reported by a temperature sensor 2, raising or lowering the temperature of the heating/cooling material passed through a channel 5 so as to heat or cool the panel heating/cooling plate 4. As a result, the liquid crystal panel 1 is heated or cooled in the same way when the panel heating/cooling plate 4 is heated or cooled, such that the temperature of the liquid crystal panel is adjusted to within the operating temperature range even if the temperature of the environment in which the panel is installed is beyond the operating temperature range.



(SCOPE OF PATENT CLAIMS)

(CLAIM 1) Heating/cooling system for liquid crystal panel comprising a panel heating/cooling plate, which comprises a high heat conductive plate positioned adjacently to the back face of a liquid crystal panel, in the interior of which a channel for heating/cooling material is formed; a temperature sensor that measures the temperature of the liquid crystal panel; and a temperature control component that adjusts the temperature of the heating/cooling material that is passed through the channel in the panel heating/cooling plate in accordance with the detection signal of a temperature sensor.

(CLAIM 2) Heating/cooling system for liquid crystal panel set forth in claim 1, characterized in that the panel heating/cooling plate is transparent.

(CLAIM 3) Heating/cooling system for liquid crystal panel set forth in claim 1, characterized in that the heating/cooling material is a gas, and the temperature control component performs control by changing the gas pressure.

(CLAIM 4) Heating/cooling system for liquid crystal panel set forth in claim 1, characterized in that the heating/cooling material is a fluid, and the temperature control component performs control by changing the temperature of the fluid.

(DETAILED DESCRIPTION OF THE INVENTION)

(0001)

(FIELD OF INDUSTRIAL APPLICATION) The present invention relates to a heating/cooling system for liquid crystal panel that makes it possible to use a liquid crystal panel beyond its operating temperature range.

(0002)

(PRIOR ART) It is well known that liquid crystal panels are used in the display instrument of notebook PCs and word processors. However, the operating temperature range in models that use a self-illuminating active matrix is 0-60 °C, whereas the operating temperature range in models that use a backlight-transmitting passive matrix is 0-50 °C.

(0003)

(PROBLEM TO BE SOLVED BY THE INVENTION) The operating temperature range for a liquid crystal panel, as described above, is 0-60 °C or 0-50 °C. The problem is that, in view of actual working temperature conditions, this temperature range limits the scope of applications.

(0004) Specifically, for example, a liquid crystal panel cannot be used outdoors in cold climates that attain sub-freezing temperatures, and may prove challenging to use outdoors in hot climates that approach the upper limit of the operating temperature range. It is also necessary to meet the needs of users who require operability in temperatures beyond the upper limit of the operating temperature range of a liquid crystal panel.

(0005) The present invention was devised in view of these problems, having as its objective to provide a heating/cooling system for liquid crystal panel that broadens the range of applications for a liquid crystal panel.

(0006)

(MEANS FOR SOLVING THE PROBLEM) To achieve the aforesaid objective, the cooling/heating system for liquid crystal panel of the present invention is configured as follows. Namely, the heating/cooling system for liquid crystal panel of the present invention is characterized in that it comprises a panel heating/cooling plate, which comprises a high heat conductive plate positioned adjacently to the back face of a liquid crystal panel, in the interior of which a channel for heating/cooling material is formed; a temperature sensor that measures the temperature of the liquid crystal panel; and a temperature control component that adjusts the temperature of the heating/cooling material that is passed through the channel in

the panel heating/cooling plate in accordance with the detection signal of a temperature sensor.

(0007) Here, the panel heating/cooling plate may comprise a transparent high heat conductive plate. The heating/cooling material may be a gas or a fluid. The temperature control component thus adjusts the temperature of the heating/cooling material by either changing the gas pressure or controlling the fluid temperature.

(0008)

(ACTION) Next is a description of the action of the heating/cooling system for liquid crystal panel of the present invention configured in the manner described above. In the present invention, the panel heating/cooling plate is heated when the temperature of the environment in which the liquid crystal panel is installed is lower than the minimum operating temperature, and the panel heating/cooling plate is conversely cooled when the environmental temperature is near the maximum operating temperature, so that in both cases the temperature of the liquid crystal panel is adjusted to within the operating temperature range.

(0009) Accordingly, this extends the temperature range in which the liquid crystal panel is able to operate toward both a lower and a higher temperature, thereby extending the range of applications for a liquid crystal panel.

(0010)

(EMBODIMENT EXAMPLE) An embodiment example of the present invention is described below with reference to the drawings. FIG. 1 shows the heating/cooling system for liquid crystal panel in an embodiment example of the present invention. In FIG. 1, the liquid crystal panel 1 is, for example, an active matrix type. A temperature sensor 2 is attached to this liquid crystal panel 1 to measure the temperature of the environment in which the panel is installed, which is supplied to the temperature control component 3.

(0011) Additionally, a panel heating/cooling plate 4 is bonded to the back face of the liquid panel 1. The panel heating/cooling plate 4 comprises a high heat transmission plate, in the interior of which a channel 5 for heating/cooling material is formed in an articulated manner. The entry and exit of this channel 5 are connected, respectively to the pipe 6 and the temperature control component 3. In short, the heating/cooling material circulates between the panel heating/cooling plate 4 and the temperature control component 3.

(0012) Note that, if the liquid crystal panel 1 is a passive matrix type, a transparent panel heating/cooling plate 4 is used. This is done to enable the transmission of a backlight.

(0013) The temperature control component 3 performs control in accordance with the temperature reported by the temperature sensor 2, raising the temperature of the heating/cooling material to heat the panel heating/cooling plate 4, or lowering the temperature of the heating/cooling material to cool the panel heating/cooling plate 4. In concrete terms, this is achieved by increasing or reducing the gas pressure if the heating/cooling material is a gas, or by increasing or reducing the water temperature if the heating/cooling material is a fluid (for example water).

(0014) As a result, the liquid crystal panel 1 is heated or cooled in the same way when the panel heating/cooling plate 4 is heated or cooled, such that the temperature of the liquid crystal panel remains within the operating temperature range even when the environment in which the panel is installed is beyond the operating temperature range.

(0015)

(EFFECT OF THE INVENTION) As described above, the heating/cooling system for liquid crystal panel of the present

invention heats the panel heating/cooling plate when the temperature in which the liquid crystal panel is installed is below the minimum operating temperature, and conversely cools the panel heating/cooling plate when the environmental temperature is near or above the maximum operating temperature, so that in either case the temperature of the liquid crystal panel is adjusted to within the operating temperature range. In short, this makes it possible to extend the operating temperature range of the liquid crystal panel toward both a lower and a higher temperature, which has the effect of expanding the range of applications of a liquid crystal panel.

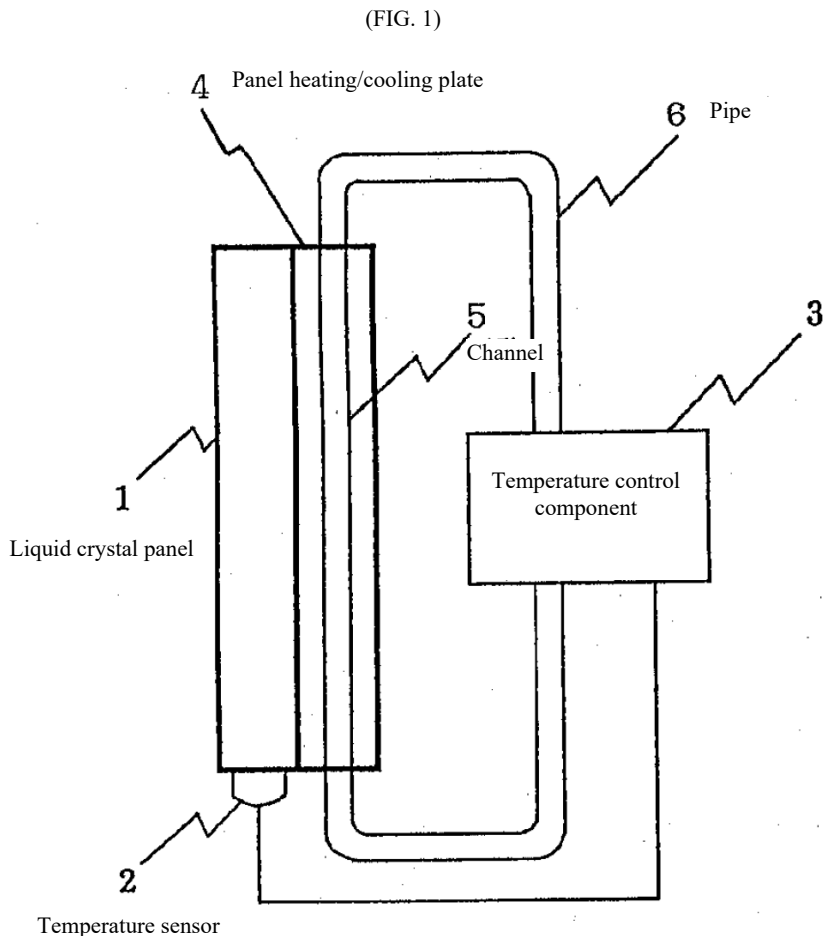
(BRIEF DESCRIPTION OF THE DRAWINGS)

(FIG. 1) Schematic drawing of the heating/cooling system for

liquid crystal panel in one embodiment example of the present invention.

(DESCRIPTION OF THE SYMBOLS)

- 1: Liquid crystal panel
- 2: Temperature sensor
- 3: Temperature control component
- 4: Panel heating/cooling plate
- 5: Channel
- 6: Pipe

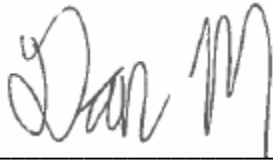


CERTIFICATE OF TRANSLATION

I, Dan McCourt, hereby certify that the document identified below, translated from Japanese into English, is true and accurate, to the best of my knowledge and belief.

Reference: JP1996152604A

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Dan McCourt

Sworn to before me this
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