

U.S. Patent No. 7,868,880 - Claims Listing

No.	Limitation
1P	A display apparatus for displaying image information corresponding to display data, comprising:
1.1	a display panel including a plurality of display pixels arranged thereon in vicinities of respective intersections of a plurality of scanning lines arranged in a row direction and a plurality of data lines arranged in a column direction;
1.2	a plurality of bias lines provided on the display panel along the scanning lines, respectively;
1.3	a scanning drive unit which sequentially applies a scanning signal to each of said plurality of scanning lines and sets the display pixels corresponding to each said scanning line to a selection state;
1.4	a data drive unit which generates a gradation signal corresponding to the display data and supplies the gradation signal to the display pixels set to the selection state;
1.5	a power source drive unit which supplies to the display pixels a drive voltage for controlling a drive state of each of the display pixels;
1.6	a state setting unit; and
1.7.1	a drive control unit which controls the power source drive unit to operate to set the display pixels to a non-display operation state during a non-display period in which the display pixels do not display the display data, and controls the scanning drive unit to operate to set the display pixels to the selection state during the non-display period,
1.7.2	wherein each of the plurality of display pixels comprises an optical element and a display drive circuit which controls an operation of the optical element, the display drive circuit comprising an electric charge accumulation circuit which holds a voltage component corresponding to the gradation signal, a supply control circuit which generates a drive current having a predetermined current value based on the voltage component held in the electric charge accumulation circuit, and which supplies the drive current to the optical element, and a writing control circuit which controls a supply state of electric charges, based on the gradation signal, to the electric charge accumulation circuit, and
1.7.3	wherein the state setting unit eliminates a bias state set corresponding to the display data based on the gradation signal to the display drive circuit of the display pixels in each row, generates a setting signal for setting a specific bias state, applies the setting signal to each of the bias lines, and

	applies the setting signal to the display pixels for each row of the display panel.
2P	A drive control method of controlling a display apparatus to display image information corresponding to display data, wherein the display apparatus comprises a display panel including a plurality of display pixels arranged thereon in vicinities of intersections of a plurality of scanning lines arranged in a row direction and a plurality of data lines arranged in a column direction, and each of the plurality of display pixels has an optical element and a display drive circuit which controls an operation of the optical element, the method comprising:
2.1	sequentially setting the display pixels to a selection state, row by row;
2.2	sequentially supplying a gradation signal corresponding to the display data to the display pixels in each row set to the selection state;
2.3	setting each of the display pixels to a display operation state with said display pixels in a bias state corresponding to the gradation signal; and
2.4.1	in a non-display period including a period in which the display pixels are set to a selection state, setting the display pixels to a non-display operation state in which the display data is not displayed,
2.4.2	wherein the setting the display pixels to the display operation state is performed by applying to the display drive circuit a first voltage for setting the optical element to a forward bias state, and by holding a voltage component corresponding to the gradation signal in the display drive circuit, and
2.4.3	wherein the setting of each display pixel to the non-display operation state comprises setting a specific bias state by eliminating the bias state set, corresponding to the gradation signal, to the display drive circuit of the display pixel.
3P	A display apparatus for displaying image information corresponding to display data, comprising:
3.1	a display panel including a plurality of display pixels arranged thereon in vicinities of respective intersections of a plurality of scanning lines

	arranged in a row direction and a plurality of data lines arranged in a column direction;
3.2	a scanning drive unit which sequentially applies a scanning signal to each of said plurality of scanning lines and sets the display pixels corresponding to each said scanning line to a selection state;
3.3	a data drive unit which generates a gradation signal corresponding to the display data and supplies the gradation signal to the display pixels set to the selection state;
3.4	a power source drive unit which supplies to the display pixels a drive voltage for controlling a drive state of each of the display pixels; and
3.5.1	a drive control unit which sets a period including a select period in which the scanning drive unit sets the display pixels to the selection state as a non-display period in which the display pixels do not display the display data, and controls a voltage value of the drive voltage supplied from the power source drive unit to set the display pixels to a non-display operation state during the non-display period,
3.5.2	wherein each of the plurality of display pixels has an optical element and a display drive circuit which controls an operation of the optical element, the display drive circuit having a first switch circuit including a control terminal and a conduction channel having a first end and a second end, the drive voltage being applied to the first end of the conduction channel, a first end of the optical element being connected to the second end of the conduction channel, and a second end of the optical element being set to a given potential.
4	The display apparatus according to claim 3 , wherein the power source drive unit selectively supplies, as the drive voltage, a first voltage for setting the display pixels to a display operation state in a bias state corresponding to the gradation signal, and a second voltage for setting the display pixels to the non-display operation state.
5	The display apparatus according to claim 4 , wherein the drive control unit controls the power source drive unit to supply the first voltage as the drive voltage in a display period in which the display pixels display the display data, and to supply the second voltage as the drive voltage in the non-display period.
6P	The display apparatus according to claim 3 , further comprising:

6.1	a plurality of bias lines provided on the display panel along the scanning lines, respectively; and
6.2	a state setting unit which eliminates a bias state set corresponding to the display data based on the gradation signal to the display drive circuit of the display pixels in each row, generates a setting signal for setting a specific bias state, applies the setting signal to each of the plurality of bias lines, and applies the setting signal to the display pixels for each row of the display panel.
7	The display apparatus according to claim 6 , wherein the drive control unit controls the state setting unit to supply the setting signal to the bias lines corresponding to the display pixels during a portion of the non-display period.
8P	The display apparatus according to claim 6 , wherein each of the display pixels comprises:
8.1	an electric charge accumulation circuit which holds a voltage component corresponding to the gradation signal;
8.2	a supply control circuit which generates a drive current having a predetermined current value based on the voltage component held in the electric charge accumulation circuit, and which supplies the drive current to the optical element; and
8.3	a writing control circuit which controls a supply state of electric charges, based on the gradation signal, to the electric charge accumulation circuit,
8.4	wherein the supply control circuit includes the first switch circuit and is configured to supply the drive current to the optical element via the conduction channel, and wherein the electric charge accumulation circuit is connected to the control terminal of the first switch circuit.
9	The display apparatus according to claim 8 , wherein the optical element comprises a light emitting element which performs a light emitting operation at a luminance corresponding to a value of the drive current applied thereto.
10	The display apparatus according to claim 9 , wherein the data drive unit comprises a circuit which generates, as the gradation signal, a gradation current having a current value to cause the light emitting element to perform a light emitting operation with a luminance gradation corresponding to the display data.

11	The display apparatus according to claim 9 , wherein the light emitting element comprises an organic electroluminescent element.
12.1	The display apparatus according to claim 8 , wherein the display panel includes a plurality of power source lines corresponding respectively to rows of the display panel, and the drive voltage is supplied to the power source lines, and
12.2	wherein the first end of the conduction channel of the first switch circuit of each of the display pixels is connected to one of the power source lines.
13P	The display apparatus according to claim 12 , wherein the writing control circuit of each of the display pixels comprises:
13.1	a conduction channel having a first end connected with one of the data lines and a second end connected with the control terminal of the first switch circuit of the supply control circuit via the electric charge accumulation circuit; and
13.2	a control terminal connected with one of the scanning lines.
14	The display apparatus according to claim 8 , wherein the display drive circuit further comprises a bias control circuit which discharges electric charges accumulated in the electric charge accumulation circuit, and applies one of no voltage and a reverse bias voltage to the supply control circuit.
15P	The display apparatus according to claim 14 , wherein the bias control circuit comprises:
15.1	a conduction channel having a first end connected with one of the scanning lines and a second end connected with the control terminal of the first switch circuit of the supply control circuit; and
15.2	a control terminal connected with one of the bias lines.
16P	The display apparatus according to claim 14 , wherein the display drive circuit comprises:
16.1	a second switch circuit including a control terminal connected with one of the scanning lines, and a conduction channel having a first end to which the drive voltage is applied and a second end to which a control terminal of the first switch circuit is connected;

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