According to ~~a first~~ an aspect, there is provided a color filter in which a black matrix is formed on a transparent substrate, a pixel including a red auxiliary pixel, a green auxiliary pixel, a blue auxiliary pixel and an auxiliary pixel of a fourth color is formed at an opening in the black matrix, or at the opening in the black matrix and on the black matrix, the line width L1 of the black matrix between the auxiliary pixel of the fourth color and each of other auxiliary pixels is from 0 to 4.5 μm, the auxiliary pixels each contain a colorant and a resin, and the tristimulus value (Y) of the auxiliary pixel of the fourth color according to the CIE 1931 color system is in the range of $70 \leq Y \leq 99$.

In an embodiment, the line width L1B of the black matrix between the auxiliary pixel of the fourth color and the blue auxiliary pixel is from 0 to 3.5 μm.

In an embodiment, a relationship between the value L1 and the broadest line width L2 of the black matrix satisfies the following: $0 \leq L1/L2 \leq 0.8$.

In an embodiment, in the pixel, the width L3 of the auxiliary pixel of the fourth color on the black matrix is from 0 to 2.0 μm.

In an embodiment, the area of each of the auxiliary pixels of red, green, blue and the fourth color is from 240 to 3120 μm^2.

In an embodiment, the concentration of the colorant in the auxiliary pixel of the fourth color is from 0.3 to 3% by mass.

In an embodiment, the film thickness of the auxiliary pixel of the fourth color is from 0.8 to 2.0 μm.

In an embodiment, the tristimulus value (Y) of the auxiliary pixel of the fourth color according to the CIE 1931 color system is in the range of $75 \leq Y \leq 90$.

~~According to a second aspect, there is provided~~ Disclosed herein is a display device comprising the above color filter.

EFFECTS OF THE INVENTION

[0012]

The color filter as per embodiments of the present invention can obtain a high transmittance and a good white balance, can prevent color shift due to white spots, and can be improved in aperture ratio.

[0013]

The display device having the color filter as per ~~embodiments of the present invention~~ the above disclosure is high in both of transmittance and aperture ratio, and thus can be improved in light-use-efficiency.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

Fig. 1 is a schematic view illustrating a cross section of a black matrix formed on a transparent substrate, the section being vertical to the longitudinal direction of an opening in the black matrix.

CLAIMS

1. A color filter in which a black matrix is formed on a transparent substrate, a pixel comprising a red auxiliary pixel, a green auxiliary pixel, a blue auxiliary pixel and an auxiliary pixel of a fourth color is formed at an opening in the black matrix, or at the opening in the black matrix and on the black matrix,

the line width L1 of the black matrix between the auxiliary pixel of the fourth color and each of other auxiliary pixels is from 0 to 4.5 μm, the auxiliary pixels each contain a colorant and a resin, and the tristimulus value (Y) of the auxiliary pixel of the fourth color according to the CIE 1931 color system is in the range of $70 \leq Y \leq 99$.

2. The color filter according to claim 1, wherein the line width L1B of the black matrix between the auxiliary pixel of the fourth color and the blue auxiliary pixel is from 0 to 3.5 μm.

3. The color filter according to claim 1 or 2, wherein a relationship between the value L1 and the broadest line width L2 of the black matrix satisfies the following: $0 \leq L1/L2 \leq 0.8$.

4. The color filter according to any one of claims 1 to 3, wherein in the pixel, the width L3 of the auxiliary pixel of the fourth color on the black matrix is from 0 to 2.0 μm.

~~5. The color filter according to any one of claims 1 to 4, wherein the area of each of the auxiliary pixels of red, green, blue and the fourth color is from 240 to 3120 μm^2.~~

~~6. The color filter according to any one of claims 1 to 5, wherein the concentration of the colorant in the auxiliary pixel of the fourth color is from 0.3 to 3% by mass.~~

~~7. The color filter according to any one of claims 1 to 6, wherein the film thickness of the auxiliary pixel of the fourth color is from 0.8 to 2.0 μm.~~

~~8. The color filter according to any one of claims 1 to 7, wherein the tristimulus value (Y) of the auxiliary pixel of the fourth color according to the CIE 1931 color system is in the range of $75 \leq Y \leq 90$.~~

~~9. A display device comprising the color filter according to any one of claims 1 to 8.~~