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ping dong
NAME

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Industrial Technology Research

[71] **Applicant**

Institute Foundation

Address

Hsinchu County, Taiwan

[72] **Inventor**

Zhang Baoqi Liu Changhe Zhang
Yuxian Zhong Junfu

[74] **Patent agency** Beijing Lvcheng Tongye
Property Agency Co., Ltd.

Agent Liang Hui Xu Jinguo

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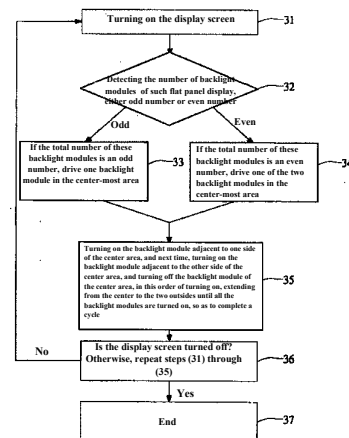
[54] **Invention title**

Adjustment Method for Backlight of Flat Panel

Display

[57] **Summary**

The present invention relates to an adjustment method for backlight of flat panel display, comprising: Turning on the display screen; detecting the number of backlight modules of such flat panel display, either odd number or even number; if the total number of these backlight modules is an odd number, drive one backlight module in the center-most area; if the total number of backlight modules is an even number, drive one of the two backlight modules in the center-most area; turning on the backlight module adjacent to one side of the center area, next time, turning on the backlight module adjacent to the other side of the center area, and turning off the backlight module in the center area, in this order of turning on, extending from the center to the two outsides until all the backlight modules are turned on, so as to complete a cycle; end.



1. An adjustment method for backlight of flat panel display, characterized in that it comprises:

Step 31, turning on the display screen;

5 Step 32) detecting the number of backlight modules of such flat panel display, either an odd number or an even number;

Step 33, if the total number of these backlight modules is an odd number, drive one backlight module in the center-most area;

Step 34, if the total number of these backlight modules is an even number, drive one of the two backlight modules in the center-most area;

10 Step 35, turning on the backlight module adjacent to one side of the center area, and next time, turning on the backlight module adjacent to the other side of the center area, and turning off the backlight module of the center area, in this order of turning on, extending from the center to the two outsides until all the backlight modules are turned on, so as to complete a cycle;

15 Step 36, is the display screen turned off? Otherwise, repeat steps 31 through 35; and

Step 37, end.

2. An adjustment method for backlight of flat panel display as described in Claim 1, wherein such flat panel display is a liquid crystal display.

20 3. An adjustment method for backlight of flat panel display as described in Claim 1, wherein such flat panel display is an organic light-emitting diode display.

4. An adjustment method for backlight of flat panel display, that comprises:

Step 41, turning on the display screen;

25 Step 42, detecting the number of backlight modules of such flat panel display, either odd number or even number;

Step 43, turning on one of two backlight modules in the outer-most area of two sides, and next time, turning on the backlight module adjacent to the outermost area of the other side, and then turning on one of the two backlight modules second adjacent to the two outsides. In this order of turning on, extending from the two outermost sides to the center until all the backlight modules are turned on, extending from the center to the two outer-most sides to turn on and off the backlight modules, so as to complete a cycle;

30 Step 44, if the total number of these backlight modules is an odd number, then the last backlight module drove is the one in the center-most area;

35 Step 45, if the total number of these backlight modules is an even number, then the last backlight module drove is the one of the two backlight modules in the center-most area;

Step 46, is the display screen turned off? Otherwise, repeat steps 41 through 45; and

40

Step 47, end.

5. An adjustment method for backlight of flat panel display as described in Claim 1, wherein such flat panel display is a liquid crystal display.

6. An adjustment method for backlight of flat panel display as described in
5 Claim 1, wherein such flat panel display is an organic light-emitting diode display.

Adjustment Method for Backlight of Flat Panel Display

5 Technical Field

The present invention relates to a method of adjusting or driving the backlight of flat panel displays, particularly, by changing the light emission sequence of backlight modules to improve the phenomenon of uneven brightness of the picture.

10 Background Art

The development of electronic products has only been a matter of recent decades, but its development speed is overriding other industries, especially computer-related peripheral and audiovisual products, due to people's work or leisure needs, further and considerable progress have been made, new products are constantly being introduced. Taking Display as an example, a traditional display is constructed by a traditional Cathode Ray Tube (CRT), which has the following disadvantages:

1. Conventional displays are non-planar, so distorted images appear on the screen when watching.

2. The CRT consumes a lot of power in terms of electricity, meaning it consumes a lot of electric power, and also generates high temperature and hotness of the display.

3. Restricted by the large size of traditional CRT, the volume of display cannot be reduced, then sometimes it is inconvenient due to too little space that can be used.

Because traditional displays have the aforementioned defects, some manufacturers have invested in the development of the next generation of displays, wherein it includes liquid crystal displays and plasma displays, etc.. But for now, it seems that the manufacturing technology of liquid crystal displays is relatively mature, and its price level has been reduced to close to that of traditional CRT displays; in addition, such liquid crystal display has many advantages, such as low radiation, low power consumption, small volume, and relatively large viewing angle, so they are popular with the general user.

At present, liquid crystal displays are mostly used for displays of computer displays, LCD TVs, and 3C appliance products, such as cell phones and digital cameras. The application levels are relatively wide. Since the liquid crystal material does not produce any light from itself when it is displayed, it is difficult for human eyes to make direct observation. Therefore, almost all liquid crystal display panels add a number of backlight modules to make screen of the liquid crystal display clear through sufficient brightness, but in order to save power consumed by the liquid crystal display, all backlight modules will not be illuminated at the same time. It must be illuminated with the liquid crystal pixels in sequence from top to bottom, or from bottom to top, so as to achieve the purpose of clearly displaying and saving power. When using the traditional mode in which the backlight modules are illuminated, for instance, while several lamps in the upper half of the screen are illuminated, several

lamps in the lower half of the screen are turned off. Although such time period is extremely short, at this time, the human eyes can still detect the problem of uneven brightness of the screen, then there are doubts about manufacturing quality of the liquid crystal display screen. Therefore, how to avoid this phenomenon becomes the problem for which the present invention is to be improved.

Summary of the Invention

Based on solving defects in the above mentioned prior art, the main purpose of the present invention is to propose an adjusting method or driving method for backlight of flat panel display, using changes in light emission sequence of the backlight modules to solve display delay and improve the phenomenon of uneven brightness of the picture.

In order to achieve the above purposes, the first implementation method of the adjustment method for backlight of flat panel display of the present invention includes the following steps:

Step 31, turning on the display screen;

Step 32, detecting the number of backlight modules of such flat panel display, either odd number or even number;

Step 33, if the total number of these backlight modules is an odd number, drive one backlight module in the center-most area;

Step 34, if the total number of these backlight modules is an even number, drive one of the two backlight modules in the center-most area;

Step 35, turning on the backlight module adjacent to one side of the center area, and next time, turning on the backlight module adjacent to the other side of the center area, and turning off the backlight module of the center area, in this order of turning on, extending from the center to the two outsides until all the backlight modules are turned on, so as to complete a cycle;

Step 36, is the display screen turned off? Otherwise, repeat steps (31) through (35); and

Step 37, end.

In order to achieve the above purposes, the second implementation method of the adjustment method for backlight of flat panel display of the present invention includes the following steps:

Step 41, turning on the display screen;

Step 42, detecting the number of backlight modules of such flat panel display, either odd number or even number;

Step 43, turning on one of two backlight modules in the outer-most area of two sides, and next time, turning on the backlight module adjacent to the outermost area of the other side, and then turning on one of the two backlight modules second adjacent to the two outsides. In this order of turning on, extending from the two outermost sides to the center until all the backlight modules are turned on, extending from the center to the two outer-most sides to turn on and off the backlight modules,

so as to complete a cycle;

Step 44, if the total number of these backlight modules is an odd number, then the last backlight module drove is the one in the center-most area;

Step 45, if the total number of these backlight modules is an even number, then
5 the last backlight module drove is the one of the two backlight modules in the center-most area; and

Step 46, is the display screen turned off? Repeat steps 41 through 45; and

Step 47, end.

The present invention solves the problem of display delay, and improves the
10 phenomenon of uneven brightness of the picture.

Description of the Attached Drawings

Figures 1A and 1B are diagrams for the first example indicating illumination sequence of backlight modules of the display screen in the present invention;

Figures 2A and 2B are diagrams for the second example indicating illumination sequence of backlight modules of the display screen in the present invention;

Figure 3 is a time control diagram of the scan line and backlight modules in the present invention;

Figure 4A is a schematic diagram of the display screen after the first backlight module in the present invention is illuminated;

Figure 4B is a schematic diagram of the display screen after the second backlight module in the present invention is illuminated;

Figure 4C is a schematic diagram of the display screen after the third backlight module in the present invention is illuminated;

Figure 4D is a schematic diagram of the display screen after the fourth backlight module in the present invention is illuminated;

Figure 4E is a schematic diagram of the display screen after the fifth backlight module in the present invention is illuminated;

Figure 4F is a schematic diagram of the display screen after the sixth backlight module in the present invention is illuminated;

Figure 5 is the first implementation flow chart on adjustment of backlight modules in the present invention;

Figure 6 is the second implementation flow diagram on adjustment of backlight modules in the present invention.

Description on marks in the attached drawings:

1—Display screen

11—First backlight module

12—Second backlight module

13—Third backlight module

14—Fourth backlight module

15—Fifth backlight module

16—Sixth backlight module

- 2—Display screen
21—First backlight module
22—Second backlight module
23—Third backlight module
5 24—Fourth backlight module
25—Fifth backlight module
Step 31—Turning on the display screen
Step 32—Detecting the number of backlight modules of such flat panel display,
either odd number or even number
10 Step 33—If the total number of these backlight modules is an odd number, drive
one backlight module in the center-most area
Step 34—If the total number of these backlight modules is an even number,
drive one of the two backlight modules in the center-most area
15 Step 35—Turning on the backlight module adjacent to one side of the center
area, and next time, turning on the backlight module adjacent to the other side of the
center area, and turning off the backlight module of the center area, in this order of
turning on, extending from the center to the two outsides until all the backlight
modules are turned on, so as to complete a cycle
20 (35) Step 36—Is the display screen turned off? Otherwise, repeat steps (31) through
Step 37—End
Step 41—Turning on the display screen
Step 42—Detecting the number of backlight modules of such flat panel display,
either odd number or even number
25 Step 43—Turning on one of two backlight modules in the outer-most area of
two sides, and next time, turning on the backlight module adjacent to the outermost
area of the other side, and then turning on one of the two backlight modules second
adjacent to the two outsides. In this order of turning on, extending from the two
outermost sides to the center until all the backlight modules are turned on, extending
30 from the center to the two outer-most sides to turn on and off the backlight modules,
so as to complete a cycle
Step 44—If the total number of these backlight modules is an odd number, then
the last backlight module drove is the one in the center-most area
Step 45—If the total number of these backlight modules is an even number, then
35 the last backlight module drove is the one of the two backlight modules in the center-
most area
Step 46—Is the display screen turned off? Repeat steps (41) through (45)
Step 47—End

40

Detailed Description of Embodiments

The technical means used to achieve the purpose of the present invention and its efficacy are explained by the following text in conjunction with the attached drawings. The present technical means are mainly applied to liquid crystal displays (LCD) and organic light-emitting diodes (OLED). The examples listed in the attached drawings are only for auxiliary illustration, but the technical means of the present application are not limited to the attached drawings.

Please refer to Figures 1A and 1B, which are diagrams for the first example indicating illumination sequence of backlight modules of the display screen in the present invention, wherein an even number of backlight modules (six in this example) are provided in one display screen 1 in the attached drawing. The center area of such display screen 1 includes the first backlight module 11 and the second backlight module 12, extending outwardly in sequence, the third backlight module 13, the fourth backlight module 14, the fifth backlight module 15, and the sixth backlight module 16. The display screen is showed in the order in which the backlight modules are illuminated, such as: Step S11 is to illuminate the first backlight module 11; Step S12 is to illuminate the second backlight module 12 and turn off the first backlight module [12]; Step S13 is to illuminate the third backlight module 13 and turn off the second backlight module 12; Step S14 is to illuminate the fourth backlight module [13] and turn off the third backlight module [12]; Step S15 is to illuminate the fifth backlight module [12] and turn off the fourth backlight module [13]; Step S16 is to illuminate the sixth backlight module [11] and turn off the fifth backlight module [12]. When the display screen 1 is not turned off, take steps S11 through S16 as a continuous cycle for lighting.

Please refer to Figures 2A and 2B, which are diagrams for the second example indicating illumination sequence of backlight modules of the display screen in the present invention, wherein an odd number of backlight modules (five in this example) are provided in one display screen 2 in the attached drawing. The backlight module in the center area of such display screen 2 is the first backlight module 21, extending outwardly in sequence, the second backlight module 22, the third backlight module 23, the fourth backlight module 24, and the fifth backlight module 25. The display screen is showed in the order in which the backlight modules are illuminated, such as: Step S21 is to illuminate the first backlight module 21; Step S22 is to illuminate the second backlight module 22 and turn off the first backlight module [22]; Step S23 is to illuminate the third backlight module 23 and turn off the second backlight module 22; Step S24 is to illuminate the fourth backlight module [23] and turn off the third backlight module [22]; Step S25 is to illuminate the fifth backlight module [22] and turn off the fourth backlight module [23]. When the display screen 2 is not turned off, take steps S21 through S25 as a continuous cycle for lighting.

As disclosed in Figures 1A, 1B and 2A, 2B in combination, whether it is an odd number or even number of backlight modules, the lighting sequence of backlight modules of the display screen is extending outward from the center point to light up and turn off. Of course, those skilled in the art may also light up backlight modules in sequence extending from outside to the center point to light up and turn off.

Please refer to Figure 3, it is a time control diagram of the scanning line and backlight module of the present invention, wherein the X-axis coordinates of the diagram represent the sequence in which the backlight modules are turned on. The sequence in which the backlight modules are turned on in the diagram is arranged as follows: circulation in the

sequence of first backlight module->second backlight module->third backlight module->first backlight module, etc.. The Y-axis coordinates of the attached drawing represent positions of the scanning lines. In this example, the scanning line positions are arranged from top to bottom, line 1 in sequence to line 480; these scanning lines are evenly divided into six parts, assuming that these backlight modules are in six sets. Therefore, each set of backlight module covers 80 scanning lines, then it can be learned that the first backlight module covers from line 161 to line 240; the second backlight module covers from line 241 to line 320; the third backlight module covers from line 81 to line 160; the fourth backlight module covers from line 321 to line 400; the fifth backlight module covers from line 1 to line 80; the sixth backlight module covers from line 401 to line 480. With reference to this attached drawing and Figures 1A, 1B and 2A, 2B, the corresponding relationship between the scanning line and the backlight module can be understood.

Please refer to Figure 4A, it is a schematic diagram of the display screen after the first backlight module in the present invention is illuminated, in which the first backlight module at the center area of the display screen is illuminated, and the second, third, fourth, fifth, and sixth backlight modules are turned off.

Please refer to Figure 4B, it is a schematic diagram of the display screen after the second backlight module in the present invention is illuminated, in which the second backlight module at the center area of the display screen is illuminated, and the first, third, fourth, fifth, and sixth backlight modules are turned off.

Please refer to Figure 4C, it is a schematic diagram of the display screen after the third backlight module in the present invention is illuminated, in which the third backlight module adjacent to the center area of the display screen is illuminated, and the first, second, fourth, fifth, and sixth backlight modules are turned off.

Please refer to Figure 4D, it is a schematic diagram of the display screen after the fourth backlight module in the present invention is illuminated, in which the fourth backlight module adjacent to the center area of the display screen is illuminated, and the first, second, third, fifth, and sixth backlight modules are turned off.

Please refer to Figure 4E, it is a schematic diagram of the display screen after the fifth backlight module in the present invention is illuminated, in which the fifth backlight module at the outer-most area of two sides of the display screen is illuminated, and the first, second, third, fourth, and sixth backlight modules are turned off.

Please refer to Figure 4F, it is a schematic diagram of the display screen after the sixth backlight module in the present invention is illuminated, in which the sixth backlight module at the outer-most area of two sides of the display screen is illuminated, and the first, second, third, fourth, and fifth backlight modules are turned off.

According to the disclosure in Figures 1A, 1B and 2A, 2B, the following implementation flow chart can be organized:

Please refer to Figure 5, it is the first implementation flow chart on adjustment of backlight modules in the present invention, including the following steps:

Step 31—Turning on the display screen;

5 Step 32—Detecting the number of backlight modules of such flat panel display, either odd number or even number;

Step 33—If the total number of these backlight modules is an odd number, then drive one backlight module in the center-most area;

Step 34—If the total number of these backlight modules is an even number, then drive one of the two backlight modules in the center-most area;

10 Step 35—Turning on the backlight module adjacent to one side of the center area, and next time, turning on the backlight module adjacent to the other side of the center area, and turning off the backlight module of the center area, in this order of turning on, extending from the center to the two outsides until all the backlight modules are turned on, so as to complete a cycle;

15 Step 36—Is the display screen turned off? Otherwise, repeat steps 31 through 35; and Step 37—End.

Please refer to Figure 6, it is the second implementation flow chart on adjustment of backlight modules in the present invention, including the following steps:

Step 41—Turning on the display screen;

20 Step 42—Detecting the number of backlight modules of such flat panel display, either odd number or even number;

Step 43—Turning on one of two backlight modules in the outer-most area of two sides, and next time, turning on the backlight module adjacent to the outer-most area of the other side, and then turning on one of the two backlight modules second adjacent to the two
25 outsides. In this order of turning on, extending from the two outer-most sides to the center until all the backlight modules are turned on, extending from the center to the two outer-most sides to turn on and off the backlight modules, so as to complete a cycle;

Step 44—If the total number of these backlight modules is an odd number, then the last backlight module drove is the one in the center-most area;

30 Step 45—If the total number of these backlight modules is an even number, then the last backlight module drove is the one of the two backlight modules in the center-most area;

Step 46—Is the display screen turned off? Repeat steps 41 through 45; and

Step 47—End.

35 In summary, the structural features and various examples of the present invention have been disclosed in detail; the main technical means is to use changes in light emission sequence of the backlight modules to improve the phenomenon of uneven brightness of the picture.

40 The above mentioned are only preferred examples of the present invention, and cannot define the scope of implementation of the present invention. Any equivalent changes and modifications made in accordance with claims of the present invention belong to protection scope of the present invention.

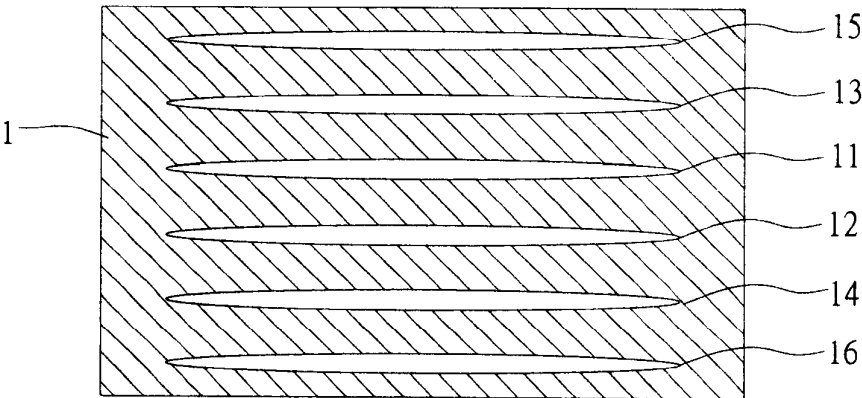


Figure 1A

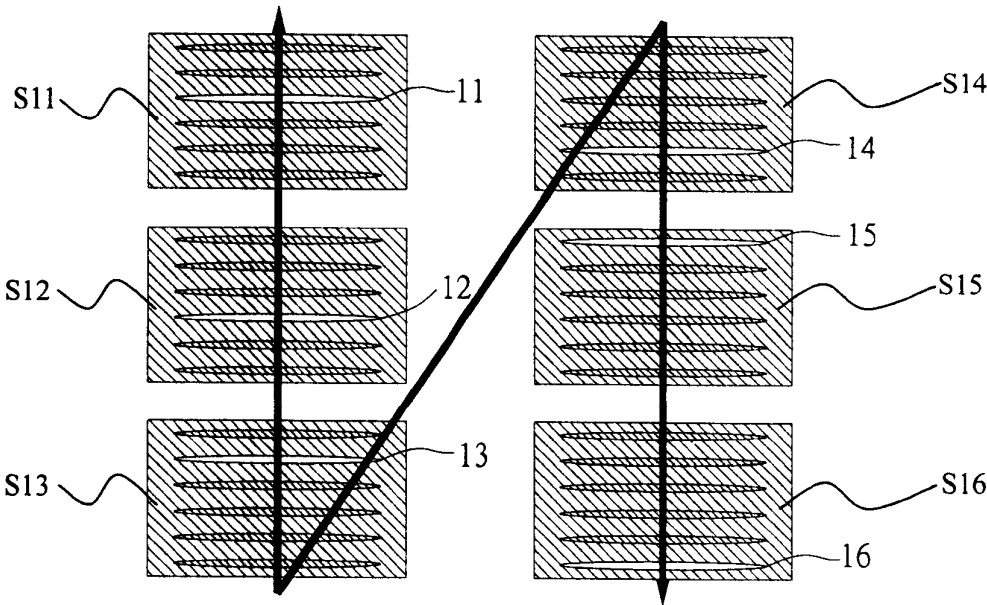
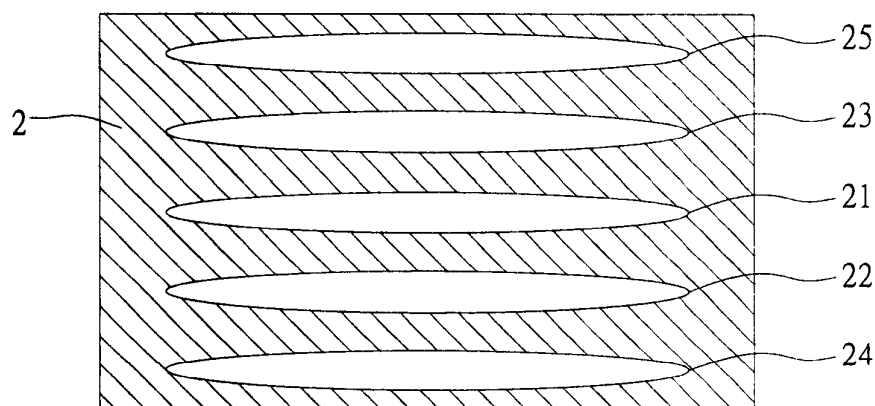
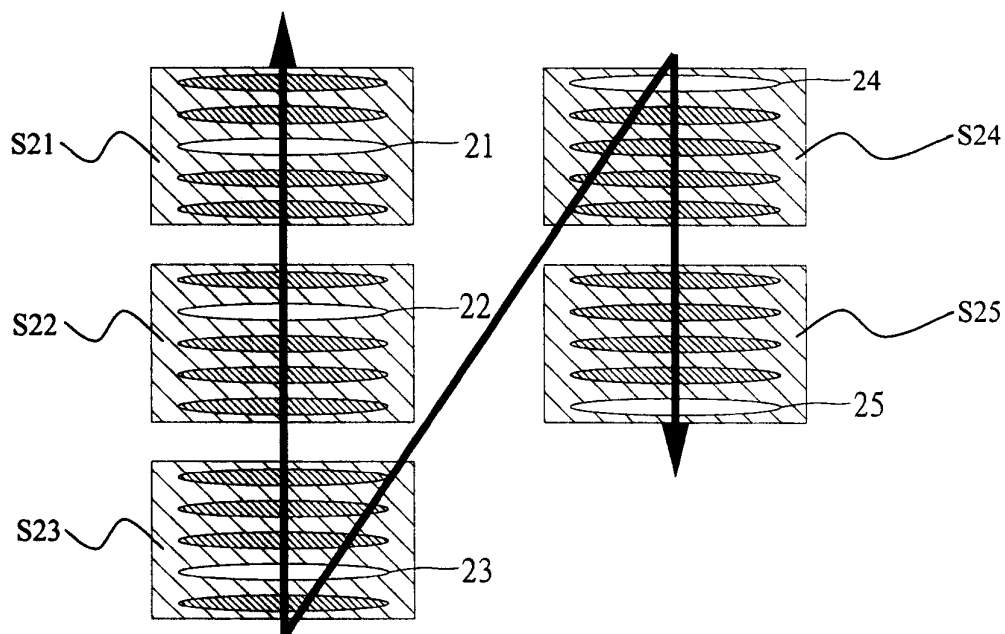


Figure 1B

**Figure 2A****Figure 2B**

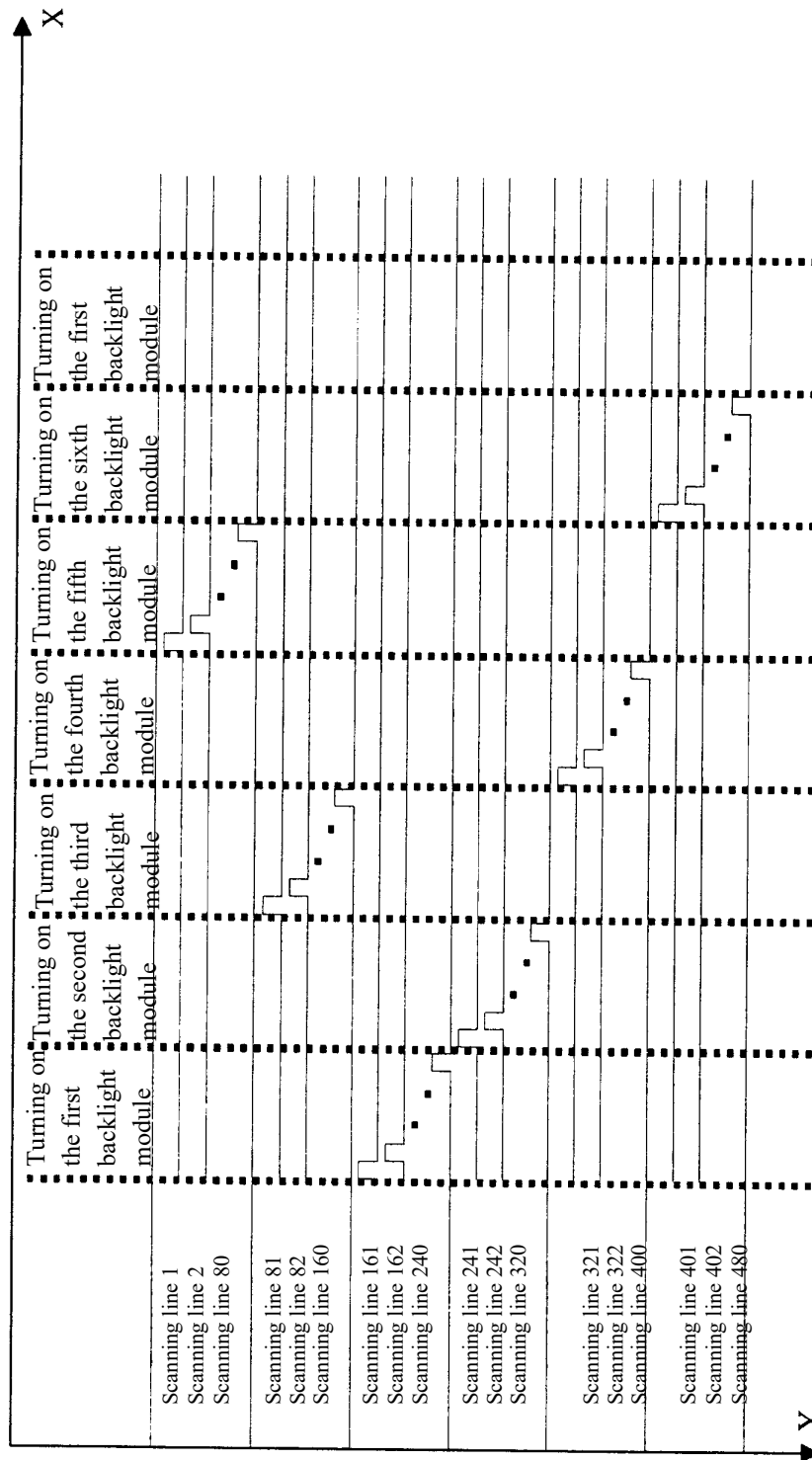


Figure 3

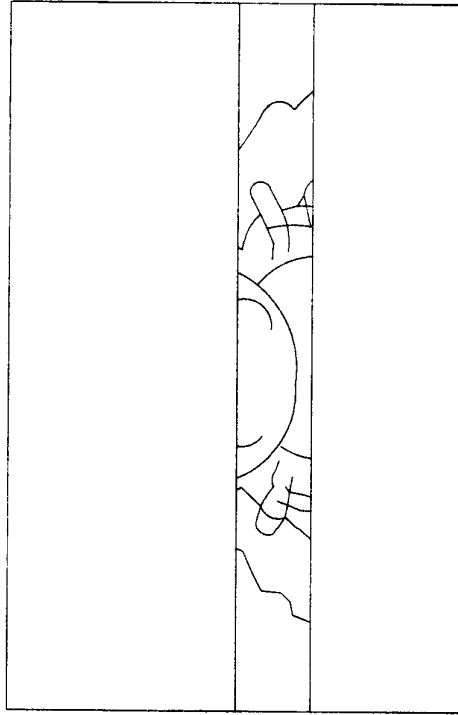


Figure 4B

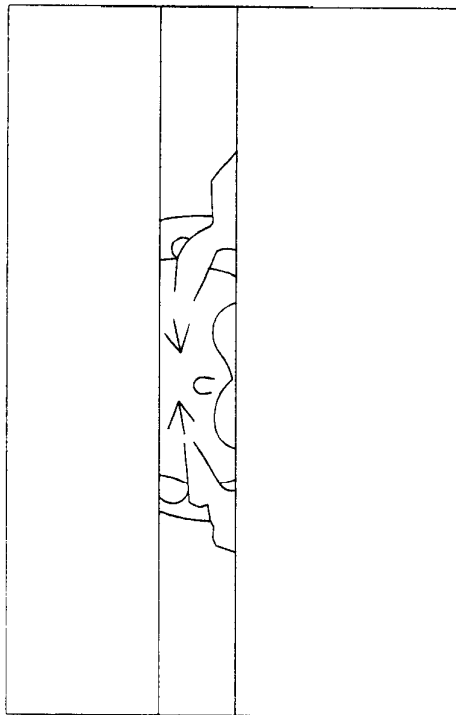


Figure 4A

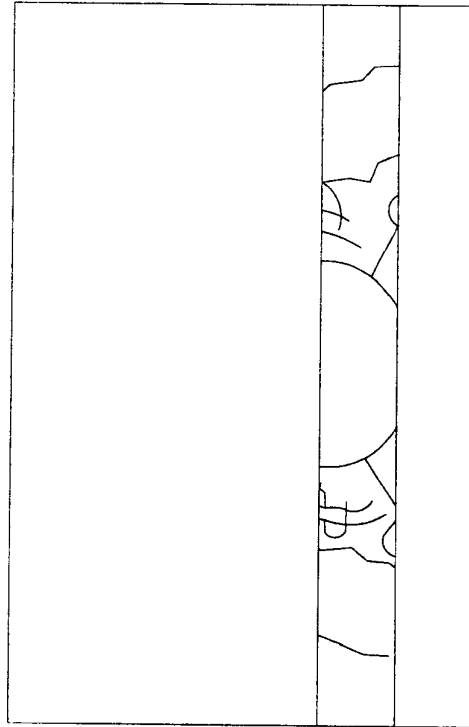


Figure 4D

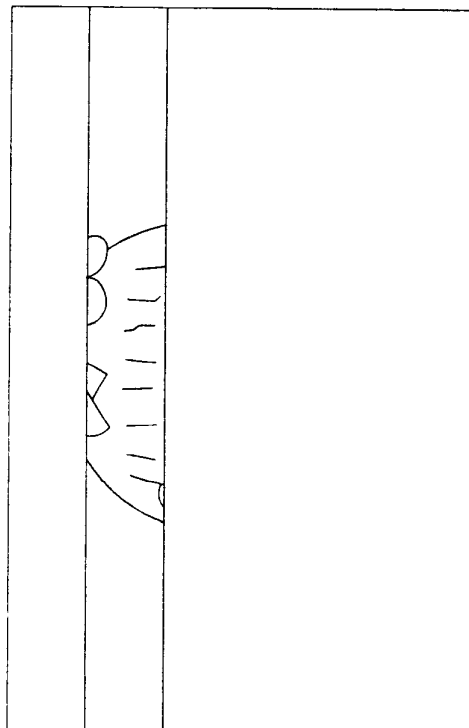


Figure 4C

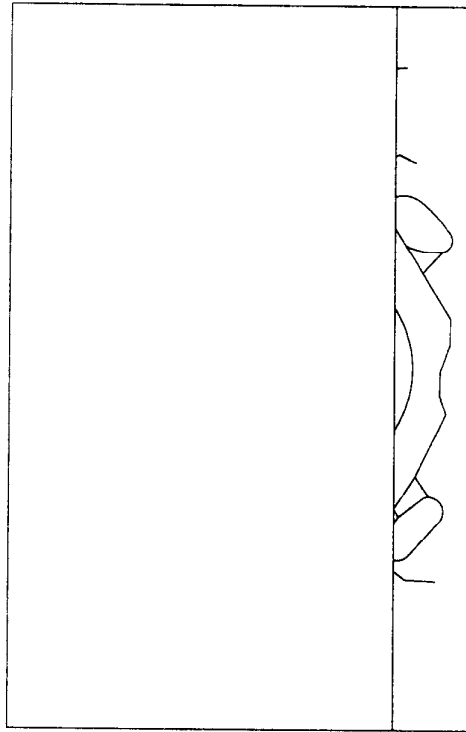


Figure 4F

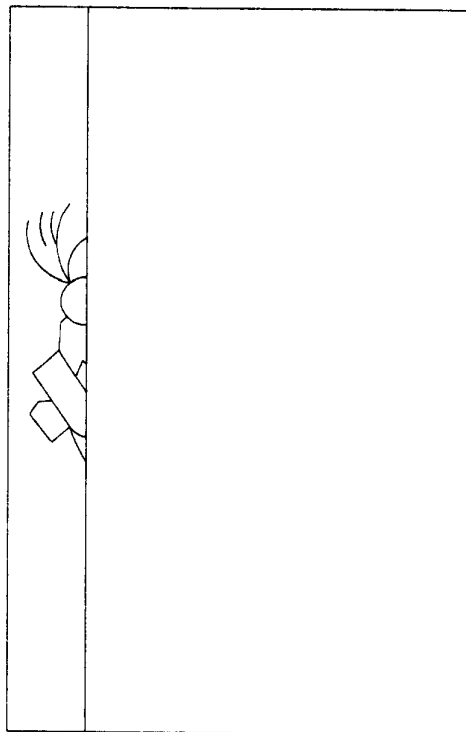
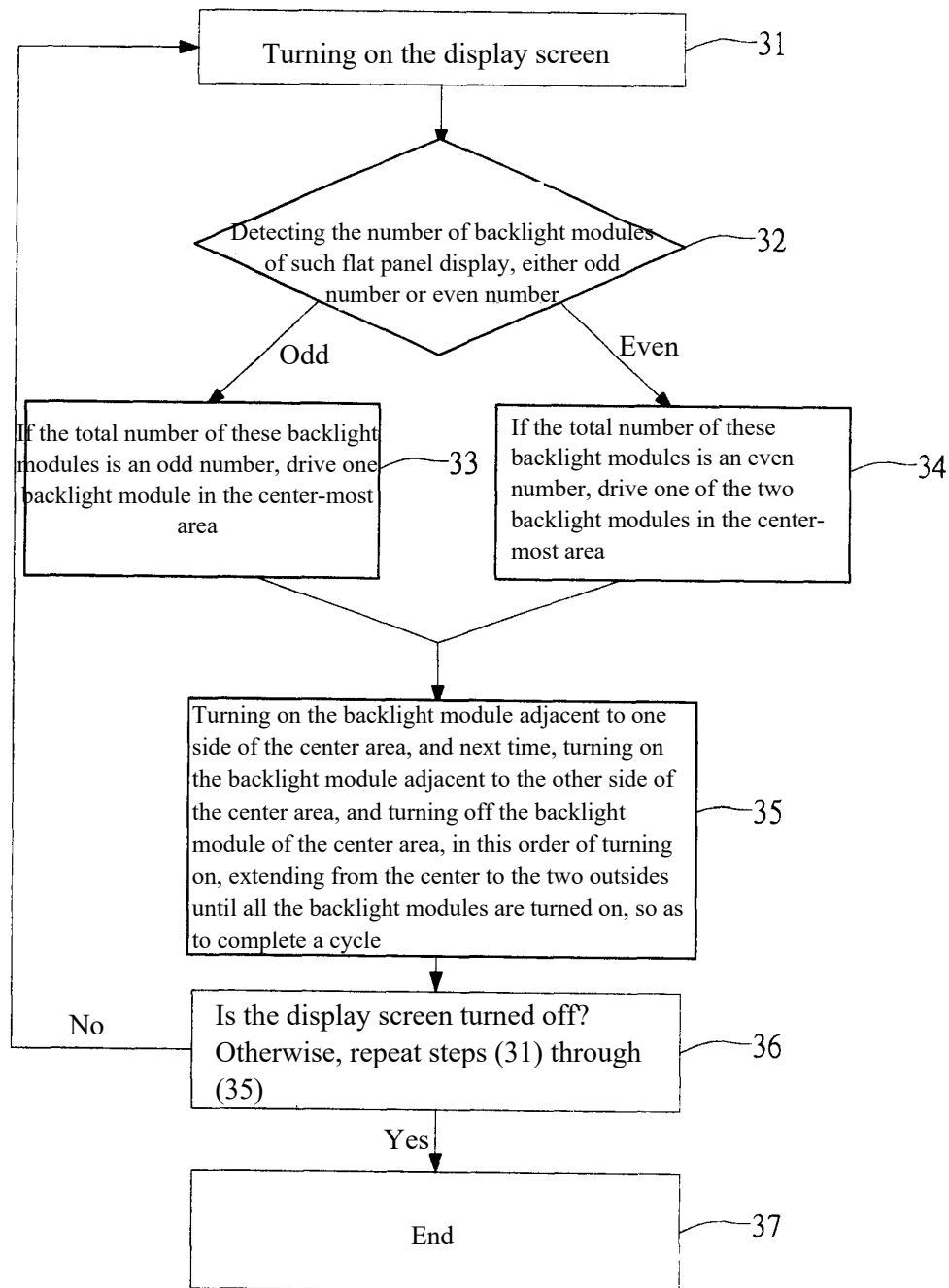
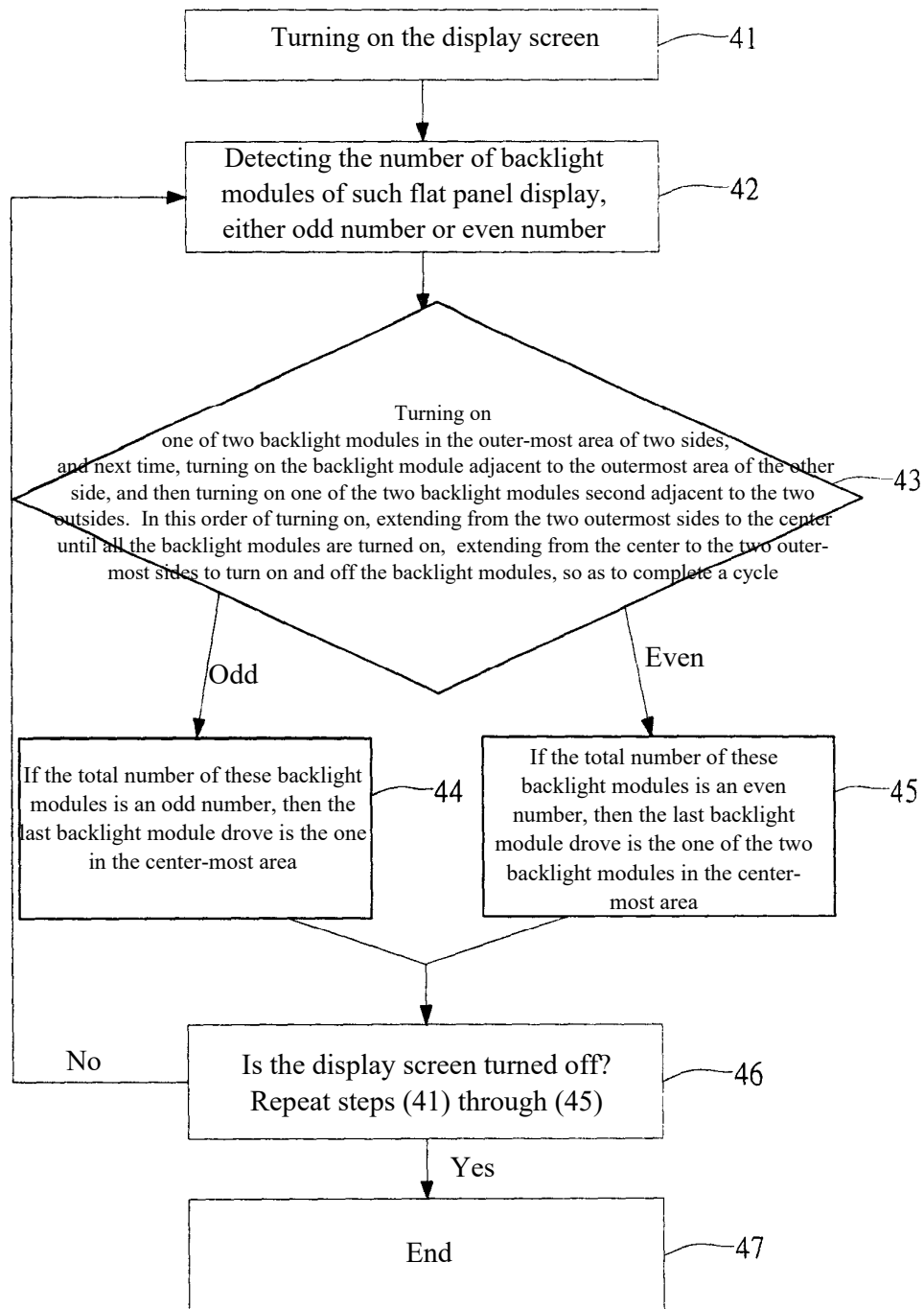


Figure 4E

**Figure 5**

**Figure 6**