SPLICING SCREEN, DISPLAY DEVICE AND MOBILE TERMINAL

FIELD

The present disclosure relates to a technical field of electronic equipment, and more particularly to a splicing screen, a display device and a mobile terminal.

BACKGROUND

A flexible screen is obviously superior to a screen, not only in lighter and thinner dimension, but also in lower consumption than an original component, which is conductive to improving endurance of a device. Meanwhile, the flexible screen has much higher durability than previous screens due to its characteristics of bendability and good flexibility, and the probability of accidental damage to the device is reduced.

SUMMARY

The present disclosure aims to provide a splicing screen, a display device and a mobile terminal, in which the splicing screen facilitates attachment of the fingerprint identification module.

In order to solve the above technical problems, the present disclosure provides a splicing screen, including: a flexible screen, a hard LED screen and a flexible circuit board. The flexible screen has an opening running through the flexible screen, and the hard LED screen is arranged in the opening. A signal line in the hard LED screen is bonded to the flexible circuit board, and a signal line in the flexible circuit board is bonded to the flexible screen.

In an embodiment, the flexible screen has a display area for displaying image, and the opening is in the display area.

In an embodiment, the splicing screen further includes a glass cover plate on a surface of the splicing screen for displaying image.

Furthermore, the glass cover plate is superposed on the surface of the entire splicing screen through an optically clear adhesive.

In an embodiment, the splicing screen further includes a first cover plate on a surface of the flexible screen for displaying image; and a second cover plate on a surface of the hard LED screen for displaying image, a side wall of the first cover plate adhering to a side wall of the second cover

plate.

In an embodiment, the flexible screen further has a non-display area connected with the display area integrally.

In an embodiment, the flexible screen has a display area for displaying image and a non-display area connected with the display area integrally, and the opening is in the non-display area.

In an embodiment, the first cover plate is a flexibly bendable plastic cover plate, and the second cover plate is a glass cover plate.

In an embodiment, the flexible screen is an organic light-emitting diode screen.

In an embodiment, the signal line in the hard LED screen is a thin film transistor circuit, and the signal line in the flexible circuit board is another thin film transistor circuit.

In an embodiment, a front surface of the flexible screen and a front surface of the hard LED screen are flush and spliced into a surface of the splicing screen, a rear surface of the flexible screen and a rear surface of the hard LED screen are spliced into another surface of the splicing screen.

In an embodiment, the opening is processed by laser cutting or through a numerically-controlled machine tool.

In an embodiment, the signal line in the hard LED screen, i.e. a thin film transistor (TFT) circuit in the hard LED screen is hot-pressed to the flexible circuit board through a Flex On Glass (FOG) technology, and the signal line is hot-pressed by the flexible circuit board to a TFT circuit of the flexible screen through the FOG technology, such that the hard LED screen is electrically coupled with the flexible screen.

The present disclosure further provides a display device including a fingerprint identification module and the above splicing screen.

In an embodiment, the hard LED screen has a non-display surface, and the fingerprint identification module is hot-pressed on the non-display surface.

In an embodiment, the fingerprint identification module is an optical fingerprint identification component; or the fingerprint identification module is an infrared fingerprint identification component.

In an embodiment, the hard LED screen defines a hollow accommodating groove, size of the accommodating groove is smaller than that of the hard LED screen, and the fingerprint

identification module is accommodated in the accommodating groove.

In an embodiment, size of the hard LED screen is the same as that of the fingerprint identification module. The display device is configured to display image and perform touch operation from a user

The present disclosure further provides a mobile terminal including the above display device.

In an embodiment, the hard LED screen has a front surface and a rear surface arranged opposite to each other, the front surface faces a user and can perform touch and display operations, and the rear surface is located in an interior of the mobile terminal.

For the splicing screen according to the present disclosure, by providing the LED screen in the opening of the flexible screen, providing the LED screen with the opening of the flexible screen, and splicing the flexible screen and the LED screen into the splicing screen, the splicing screen is bendable, and the position of the LED screen enhances the rigidity of the splicing screen to a certain extent, such that it is convenient to apply the splicing screen to various devices and mount various components (like the fingerprint identification module) to the splicing screen, thereby improving the reliability of the splicing screen.

The display device and the mobile terminal adopt the above splicing screen, and since the splicing screen is provided with the LED screen, the fingerprint identification module can be mounted to the LED screen well, improving the reliability of the display device and the mobile terminal.

BRIEF DESCRIPTION OF THE DRAWINGS

To describe technical solutions in embodiments of the present disclosure more clearly, the following will briefly introduce the accompanying drawings required for the description of the embodiments. Obviously, the accompanying drawings described below only show some embodiments of the present disclosure, and those skilled in the art can obtain other drawings based on these drawings without paying creative efforts.

Fig. 1 is a schematic view of a mobile terminal according to embodiments of the present disclosure.

Fig. 2 is a sectional view of a display device in the mobile terminal illustrated in Fig. 1, which is taken along line I-I.

Fig. 3 is a schematic view of a display device.

Fig. 4 is a schematic view of another display device.

DETAILED DESCRIPTION

Technical solutions in embodiments of the present disclosure will be described clearly and completely in combination with reference to the accompanying drawings in the embodiments of the present disclosure.

In the specification, unless specified or limited otherwise, relative terms such as “central”, “longitudinal”, “lateral”, “front”, “rear”, “right”, “left”, “inner”, “outer”, “lower”, “upper”, “horizontal”, “vertical”, “above”, “below”, “up”, “top”, “bottom” as well as derivative thereof (e.g., “horizontally”, “downwardly”, “upwardly”, etc.) should be construed to refer to the orientation as then described or as shown in the drawings under discussion. These relative terms are for convenience of description and do not require that the present disclosure be constructed or operated in a particular orientation.

In the present invention, unless specified or limited otherwise, the terms “mounted,” “connected,” “coupled,” “fixed” and the like are used broadly, and may be, for example, fixed connections, detachable connections, or integral connections; may also be mechanical or electrical connections; may also be direct connections or indirect connections via intervening structures; may also be inner communications of two elements, which can be understood by those skilled in the art according to specific situations.

In addition, terms such as “first” and “second” are used herein for purposes of description and are not intended to indicate or imply relative importance or significance or to imply the number of indicated technical features. Thus, the feature defined with “first” and “second” may comprise one or more of this feature. In the description of the present invention, the term “a plurality of” means two or more than two, unless specified otherwise.

In an embodiment, a splicing screen is provided. The splicing screen includes a flexible screen having an opening running through the flexible screen; an LED screen provided in the opening; a flexible circuit board, a signal line in the LED screen being bonded to a flexible circuit board, and a signal line in the flexible circuit board being bonded to the flexible screen.

Fig, 1 illustrates a mobile terminal 100 according to an embodiment of the present disclosure. The mobile terminal 100 may be any device that has communication and storage functions, such as a tablet computer, a mobile phone, an e-reader, a remote controller, a personal computer (PC), a notebook computer, a vehicle-mounted device, a network television, a wearable device, and other

network-enabled smart devices. The mobile terminal 100 has a display device 10, and the display device 10 is mainly used to display image and perform touch operation from a user.

Referring to Figs. 1 and 2, the display device 10 includes a fingerprint identification module 2 and a splicing screen 1. By providing the splicing screen 1 with the fingerprint identification module 2, the mobile terminal 100 can be operated by means of the fingerprint identification module 2, for example, unlocking the mobile terminal 100. The splicing screen 1 includes a flexible screen 11 and a hard screen 12, the flexible screen 11 has an opening 11c running through the flexible screen 11, and the hard screen 12 is arranged in the opening 11c. A signal line in the hard screen 12 is bonded to a flexible circuit board 13, and a signal line in the flexible circuit board 13 is bonded to the flexible screen 11, so as to achieve electrical coupling between the hard screen 12 and the flexible screen 11. The flexible circuit board 13 is arranged below the flexible screen 11. It should be understand by those skilled in the art, the flexible circuit board 13 can be arranged at any needed position, as long as the hard screen 12 is electrically coupled with the flexible screen 11. The fingerprint identification module 2 is arranged on the hard screen 12, whereby the display device 10 has a fingerprint identification function.

The splicing screen 1 is bendable, and the position of the hard screen 12 enhances rigidity of the splicing screen 1 to a certain extent, such that it is convenient to apply the splicing screen 1 to various devices and mount various components (like the fingerprint identification module) to the splicing scree, thereby improving the reliability of the splicing screen 1. The display device 10 and the mobile terminal 100 adopt the above splicing screen 1, and since the splicing screen 1 is provided with the hard screen 12, the fingerprint identification module can be mounted to the hard screen 12 well, improving the reliability of the display device 10 and the mobile terminal 100.

It could be understood that, referring to Fig. 2, the flexible screen 11 is an organic light-emitting diode (OLED) screen. The flexible screen 11 has a first front surface 11a and a first rear surface 11b arranged opposite to each other; the first front surface 11a is a surface that faces the user and can perform touch and display operations, while the first rear surface 11b is generally located in an interior of the mobile terminal 100. The first front surface 11a has a display area D1 and a non-display area D2 connected integrally, and the display area D1 is used for image display and touch.

It could be understood that the opening 11c is processed out of the flexible screen 11 by laser cutting. Certainly, in other embodiments, the opening 11c can be processed out of the flexible screen 11 in other manners, for example, through a numerically-controlled machine tool.

The hard screen 12 is a light-emitting diode (LED) screen. The hard screen 12 has a second front surface 12a and a second rear surface 12b arranged opposite to each other; the second front surface 12a is a surface that faces the user and can perform touch and display operations, while the second rear surface 12b is generally located in the interior of the mobile terminal 100. The hard screen 12 is substantially consistent with the opening 11c in terms of size and shape, so the hard screen 12 can be provided in the opening 11c well to ensure the integrity of the splicing screen 1.

Specifically, the flexible screen 11 is electrically coupled with the hard screen 12 in such a way that the signal line in the hard screen 12, i.e. a thin film transistor (TFT) circuit in the hard screen 12, is hot-pressed to the flexible circuit board 13 through a FOG (Flex On Glass FPC) technology, and the signal line is hot-pressed by the flexible circuit board 13 to a TFT circuit of the flexible screen 11 through the FOG technology, such that the hard screen 12 is electrically coupled with the flexible screen 11. The flexible circuit board 13 plays a role of signal transfer, and the signal line in the hard screen 12 is bonded to the flexible screen 11 through the relay of the signal line in the hard screen 12, so as to achieve the electrical coupling between the hard screen 12 and the flexible screen 11. After the flexible circuit board 13 is re-coupled to a motherboard of the mobile terminal 100, the motherboard can control the display of the flexible screen 11 and the hard screen 12.

The first front surface 11a of the flexible screen 11 and the second front surface 12a of the hard screen 12 are flush and spliced into a first surface of the splicing screen 1. The first rear surface 11b of the flexible screen 11 and the second rear surface 12b of the hard screen 12 are spliced into a second surface of the splicing screen 1.

It could be understood that a size of the flexible screen 11 is much larger than a size of the hard screen 12, i.e. the splicing screen 1 is mainly composed of the flexible screen 11, so as to ensure relatively small thickness and good bendability of the splicing screen 1.

It could be understood that the flexible screen 11 has the display area D1 for image display, and the opening 11c is located in the display area D1. By providing the opening 11c in the display area D1 of the display screen, the strength of the position where the opening 11c is provided in the display area D1 is enhanced. Certainly, in other embodiments, the flexible screen 11 can be located in the non-display area D2 of the flexible screen 11.

It could be understood that, referring to Fig. 2, the splicing screen 1 further includes a glass cover plate 14, and the glass cover plate 14 is arranged on a surface of the splicing screen 1 that displays images. Specifically, the splicing screen 1 is bent into a required shape, the glass cover

plate 14 is arranged on the first surface of the entire splicing screen 1 through an OCA (Optically Clear Adhesive), the splicing screen 1 can has a definite shape due to the rigidity of the glass cover plate 14, and the entire glass cover plate 14 can ensure simplified installation of the splicing screen 1.

Further, referring to Fig. 2, the hard screen 12 has a non-display surface, and the fingerprint identification module 2 is hot-pressed on the non-display surface. Specifically, the non-display surface of the hard screen 12 is the second rear surface 12b of the hard screen 12. The hard screen 12 has certain strength, so the fact that the fingerprint identification module 2 is hot-pressed on the second rear surface 12b of the hard screen 12 will not cause damage to the hard screen 12, thereby improving the reliability of the splicing screen 1. Moreover, the hard screen 12 is provided in the opening 11c, the opening 11c is located in the display area D1 of the flexible screen 11, and the fingerprint identification module 2 is hot-pressed on the second rear surface 12b of the hard screen 12, that is, the fingerprint identification module 2 is accommodated within the display device 10, so the hard screen 12 cannot only perform fingerprint identification, but also perform display, so as to increase a screen-to-body ratio of the mobile terminal 100.

It could be understood that the size of the hard screen 12 is the same as that of the fingerprint identification module 2, so as to further reduce the proportion of the hard screen 12 in the splicing screen 1 and ensure good bendability of the splicing screen 1.

It could be understood that the fingerprint identification module 2 is an optical fingerprint identification component. Certainly, in other embodiments, the fingerprint identification module 2 can be an infrared fingerprint identification component.

During manufacturing of the mobile terminal 100, the hard screen 12 is first provided in the opening 11c of the flexible screen 11, and then the fingerprint identification module 2 is hot-pressed to the second rear surface 12b of the hard screen 12, so that the fingerprint identification module 2 is accommodated in the mobile terminal 100. The user can perform a fingerprint identification operation by pressing the hard screen 12, and the hard screen 12 can display together with the flexible screen 11 when no fingerprint identification operation is performed.

For the splicing screen 1 according to the present disclosure, by providing the hard screen 12 in the opening 11c of the flexible screen 11, and splicing the flexible screen 11 and the hard screen 12 into the splicing screen 1, this splicing screen 1 is bendable, and the position of the hard screen 12 enhances the rigidity of the splicing screen 1 to a certain extent, such that it is convenient to

apply the splicing screen 1 to various devices and mount various components (like the fingerprint identification module) to the splicing screen, thereby improving the reliability of the splicing screen 1.

Fig. 3 illustrates another display device 20. The splicing screen 1 further includes a first cover plate 15 and a second cover plate 16. The first cover plate 15 is arranged on a surface of the flexible screen 11 that displays images, i.e. the first front surface 11a. The second cover plate 16 is arranged on a surface of the hard screen 12 that displays images, i.e. the second front surface 12a, and a side wall 16a of the second cover plate 16 adheres to a side wall 15a of the first cover plate 15. Specifically, the first cover plate 15 is a flexibly bendable plastic cover plate, while the second cover plate 16 is a glass cover plate. The flexibly bendable plastic cover plate ensures that the splicing screen 1 can have good bendability.

Fig. 4 illustrates still another display device 30. According to the display device 30, the hard screen 12 can define a hollow accommodating groove 2a, that is, the size of the accommodating groove 2a is smaller than that of the hard screen 12, and hence the fingerprint identification module 2 is accommodated in the accommodating groove 2a. The part of the hard screen 12 outside the accommodating groove 2a can provide certain rigidity for the fingerprint identification module 2 when the splicing screen 1 is bent, to prevent the fingerprint identification module 2 from being bent here, which affects the accuracy of the fingerprint identification module 2. It could be understood that the accommodating groove 2a is not in communication to the glass cover plate 14 above the second front surface 12a.

The display device 10, 20, 30 and the mobile terminal 100 according to the present disclosure adopt the above splicing screen 1, and since the splicing screen 1 is provided with the hard screen 12, the fingerprint identification module can be attached to the hard screen 12 well, improving the reliability of the display device 10 and the mobile terminal 100.

The above are preferred embodiments of the present disclosure, and it should be noted that those skilled in the art can make various improvements and modifications without departing from the principle of the present disclosure, and these improvements and modifications are also regarded as the protection scope of the present disclosure.

CLAIMS

1. A splicing screen (1), comprising:

a flexible screen (11) having an opening (11c) running through the flexible screen (11);

a hard LED screen (12) provided in the opening (11c);

a flexible circuit board (13), a signal line in the hard LED screen (12) being bonded to the flexible circuit board (13), and a signal line in the flexible circuit board (13) being bonded to the flexible screen (11).

2. The splicing screen (1) according to claim 1, wherein the flexible screen (11) has a display area (D1) for displaying image, and the opening (11c) is in the display area (D1).

3. The splicing screen (1) according to claim 2, further comprising a glass cover plate (14) on a surface of the splicing screen (1) for displaying image.

4. The splicing screen (1) according to claim 3, wherein the glass cover plate (14) is superposed on the surface of the entire splicing screen (1) through an optically clear adhesive.

5. The splicing screen (1) according to claim 2, further comprising:

a first cover plate (15) on a surface of the flexible screen (11) for displaying image; and

a second cover plate (16) on a surface of the hard LED screen (12) for displaying image, a side wall of the first cover plate (15) adhering to a side wall of the second cover plate (16).

6. The splicing screen (1) according to claim 2, wherein the flexible screen (11) further has a non-display area (D2) connected with the display area (D1) integrally.

7. The splicing screen (1) according to claim 1, wherein the flexible screen (11) has a display area (D1) for displaying image and a non-display area (D2) connected with the display area (D1) integrally, and the opening (11c) is in the non-display area (D2).

8. The splicing screen (1) according to claim 5, wherein the first cover plate (15) is a flexibly bendable plastic cover plate, and the second cover plate (16) is a glass cover plate.

9. The splicing screen (1) according to any one of claims 1 to 8, wherein the flexible screen (11) is an organic light-emitting diode screen.

10. The splicing screen (1) according to any one of claims 1 to 9, wherein the signal line in the hard LED screen (12) is a thin film transistor circuit, and the signal line in the flexible circuit board (13) is another thin film transistor circuit.

11. The splicing screen (1) according to any one of claims 1 to 10, wherein a front surface (11a) of the flexible screen (11) and a front surface (12a) of the hard LED screen (12) are flush and

spliced into a surface of the splicing screen (1), a rear surface (11b) of the flexible screen (11) and a rear surface (12b) of the hard LED screen (12) are spliced into another surface of the splicing screen (1).

12. The splicing screen (1) according to any one of claims 1 to 11, wherein the opening (11c) is processed by laser cutting or through a numerically-controlled machine tool.

13. The splicing screen (1) according to any one of claims 1 to 12, wherein the signal line in the hard LED screen (12), i.e. a thin film transistor (TFT) circuit in the hard LED screen (12) is hot-pressed to the flexible circuit board (13) through a Flex On Glass (FOG) technology, and the signal line is hot-pressed by the flexible circuit board (13) to a TFT circuit of the flexible screen (11) through the FOG technology, such that the hard LED screen (12) is electrically coupled with the flexible screen (11).

14. A display device (10), comprising a fingerprint identification module (2) and a splicing screen (1) according to any one of claims 1 to 13, the fingerprint identification module (2) being provided on the hard LED screen (12).

15. The display device (10) according to claim 14, wherein the hard LED screen (12) has a non-display surface (D2), and the fingerprint identification module (2) is hot-pressed on the non-display surface (D2).

16. The display device (10) according to claim 14 or 15, wherein the fingerprint identification module (2) is an optical fingerprint identification component; or the fingerprint identification module (2) is an infrared fingerprint identification component.

17. The display device (10) according to any one of claims 14 to 16, wherein the hard LED screen (12) defines a hollow accommodating groove (2a), size of the accommodating groove (2a) is smaller than that of the hard LED screen (12), and the fingerprint identification module (2) is accommodated in the accommodating groove (2a).

18. The display device (10) according to any one of claims 14 to 17, wherein size of the hard LED screen (12) is the same as that of the fingerprint identification module (2).

19. A mobile terminal (100), comprising a display device (10) according to any one of claims 14 to 18, the display device (10) is configured to display image and perform touch operation from a user.

20. The mobile terminal (100) according to claim 19, wherein the hard LED screen (12) has a front surface and a rear surface arranged opposite to each other, the front surface faces a user and can perform touch and display operations, and the rear surface is located in an interior of the

mobile terminal (100).