

# Oppo smartphone with pop-up display or side-slide screen

Application Date: 17.04.2018 - Publication Date: 29.01.2019



## OPPO PATENT CLAIMS

1. A display panel, which is characterized by comprising: First display screen; The second display screen is movably connected to the first display screen; The flexible circuit board is connected between the first display screen and the second display screen; wherein the first display screen and the second display screen are connected to the external control mainboard through the flexible circuit board; the first display screen and the second display screen are connected to the outside through the flexible circuit board;
2. The display panel of claim 1, wherein the display panel further comprises a common driving circuit, wherein the first display screen and the second display screen are electrically connected with the common driving circuit; the first display screen and the second display screen are electrically connected with the common driving circuit;
3. The display panel as claimed in claim 2, wherein, the public driving circuit is arranged on one of the first display screen or the second display screen, with the flexible circuit board; the common driving circuit is electrically connected with the flexible circuit board.
4. The display panel as claimed in claim 2, wherein, wherein the common driving circuit is arranged on the flexible circuit board.
5. The display panel as claimed in claim 1, wherein, the display panel further comprises a first driving circuit and a second driving circuit, the first display screen is electrically connected with the first driving circuit; wherein the second driving circuit is electrically connected with the second driving circuit; the second display screen is electrically connected with the second driving circuit.
6. The display panel as claimed in claim 5, wherein, the first driving circuit is arranged on the first display screen, the second driving circuit is arranged on the second display screen, wherein the first driving circuit and the second driving circuit are electrically connected with the flexible circuit board; the first driving circuit and the second driving circuit are electrically connected with the flexible circuit board;
7. The display panel as claimed in claim 5, wherein, wherein the first driving circuit and the second driving circuit are arranged on the flexible circuit board; the first driving circuit and the second driving circuit are arranged on the flexible circuit board.
8. The display panel of claim 1, wherein the display panel is a foldable display panel, wherein the first display screen is rotatably connected to the second display screen through a hinge mechanism.
9. The display panel as claimed in claim 1, wherein, the display panel is a slidable display panel, the first display screen is slidably connected to the second display screen through a guide rail mechanism; Or, the display panel is a telescopic display panel, wherein the first display screen is movably connected to the second display screen through a telescopic mechanism.
10. The electronic device is characterized by comprising any one of claims 1-9, and the display panel, and further comprises a control mainboard, a first shell and a second shell; the second shell is movably connected to the first shell, the first display screen is arranged on the first shell, and the second display screen is arranged on the second shell, with the control mainboard through a connector; the flexible circuit board is electrically connected with the control mainboard through a connector;

## TECHNICAL FIELD

The invention relates to the technical field of electronic equipment, in particular to an electronic equipment and a display panel thereof

### Background technology

At present, daily work, life and network of people are more and more tight. Intelligent electronic equipment rapidly permeates on the market, and is a powerful power for the development of mobile internet. Under the background, the intelligent electronic equipment is concerned with more and more users, wherein the intelligent mobile phone, a tablet personal computer and the like; a plurality of types of intelligent terminals such as tablet computers become electronic products favored by consumers;

Current intelligent electronic equipment is not limited to communication functions, and also has the functions of game entertainment, internet surfing and the like so as to meet the requirements of different user groups. However, the electronic equipment is only provided with only one display screen, when an user needs to perform large interface display or operation (such as operating a large-scale network game, watching a movie and the like) the content of the image needing to be displayed by the electronic equipment can be limited by the display screen, so that the user is very inconvenient to use.

### Practical novel content

In view of the above, the embodiments of the present application provide a display panel and a method capable of being flexibly adapted to user requirements. And is characterized in that the material is prepared from the following raw materials in parts by weight: the electronic equipment using the display panel is used for solving the technical problem.

The embodiment of the invention provides a display panel which comprises a first display screen, a second display screen and a flexible circuit board. The second display screen is movably connected to the first display screen; the flexible circuit board is connected between the first display screen and the second display screen. The first display screen and the second display screen are connected to the outside control mainboard through the flexible circuit board.

Further, in some embodiments, the display panel further includes a common drive circuit, the first display screen and the second display screen are electrically connected with the common driving circuit, wherein the first display screen and the second display screen are driven by a common driving circuit; the first display screen and the second display screen are driven by a common driving circuit;

Further, in some embodiments, the common drive circuit is arranged in one of the first display screen or the second display screen, with the flexible circuit board; the common driving circuit is electrically connected with the flexible circuit board;

Further, in some embodiments, the common drive circuit is disposed on a flexible circuit board.

Further, in some embodiments, the display panel further includes a first drive circuit and a second drive circuit, the first display screen is electrically connected with the first driving circuit; the second display screen is electrically connected with the second driving circuit; the first display screen is electrically connected with the first driving circuit;

Further, in some embodiments, the first drive circuit is disposed on the first display screen, the second driving circuit is arranged on the second display screen; the first driving circuit and the second driving circuit are electrically connected with the flexible circuit board;

Further, in some embodiments, the first driving circuit and the second driving circuit are both arranged on the flexible circuit board.

Further, in some embodiments, the display panel is a foldable display panel, wherein the first display screen is rotatably connected to the second display screen through a hinge mechanism; the first display screen is connected with the first display screen through a hinge mechanism;

Further, in some embodiments, the display panel is a slidable display panel, the first display screen is slidably connected to the second display screen through the guide rail mechanism; Or the display panel is a telescopic display panel; the first display screen is movably connected to the second display screen through a telescopic mechanism.

The embodiment of the invention further provides electronic equipment and the display panel comprising the electronic equipment, and further comprises a control mainboard, a first shell and a second shell. The second housing is movably connected to the first housing, and the first display screen is disposed on the first housing, the second display screen is arranged on the second shell; the flexible circuit board is electrically connected with the control mainboard through the connector;

Compared with the prior art, the electronic equipment and the display panel thereof are provided, a first display screen and a second display screen, wherein the first display screen and the second display screen can move relative to each other, and the user can control one or both of the first display screen and the second display screen to display the image content according to requirements, so that the display panel is adapted to the required playing content. In addition, the first display screen and the second display screen are electrically connected to the common flexible circuit board, so that the number of the components of the display panel is relatively small, the arrangement of components of the electronic equipment can be simplified, and the cost can be reduced.

## BRIEF DESCRIPTION OF THE DRAWINGS

In order to more clearly illustrate the technical solutions of the present application, the accompanying drawings required to be used in the embodiments are introduced briefly in the following, and apparently, the present invention will be described in detail with reference to the accompanying drawings, in which: the accompanying drawings in the following description are only some embodiments of the present application, and persons of ordinary skill in the art will appreciate that, other drawings can be obtained according to the accompanying drawings on the premise of not paying any creative work.

FIG. 1 is a perspective view of a display panel according to a first embodiment of the present application;  
FIG. 2 is a three-dimensional schematic view of a display panel according to a second embodiment of the present application;  
FIG. 3 is a three-dimensional schematic view of a display panel according to a third embodiment of the present application;  
FIG. 4 is a stereoscopic schematic view of a display panel according to an embodiment of the present application;  
FIG. 5 is a three-dimensional schematic diagram of an electronic device according to another embodiment of the present application;  
FIG. 6 is a three-dimensional schematic diagram of an electronic device according to another embodiment of the present application.

### Specific implementation mode

The technical solutions in the embodiments of the present application will be clear with reference to the accompanying drawings in the embodiments of the present application, apparently, the described embodiments are merely a part of the embodiments of the present application, rather than all embodiments. Based on the embodiments of the present application, and all other embodiments obtained by persons of ordinary skill in the art without creative efforts, which belongs to the protection scope of the present application.

The embodiment of the invention provides a display panel which comprises a first display screen, a second display screen and a flexible circuit board, wherein the second display screen is movably connected to the first display screen, the flexible circuit board is connected between the first display screen and the second display screen. The first display screen and the second display screen are connected to the outside control mainboard through the flexible circuit board.

The embodiment of the invention further provides the electronic equipment with the display panel, the electronic equipment further comprises a mainboard, a first shell and a second shell, the second shell is movably connected to the first shell, and the first display screen is arranged on the first shell, the second display screen is arranged on the second shell, and the flexible circuit board is electrically connected with the control mainboard through the connector.

According to the display panel and the electronic equipment, the two display screens which can move relatively are arranged, and the user can control one or two of the two display screens to display the image content according to requirements, so that the display panel is adapted to the required playing content; in addition, the first display screen and the second display screen are connected to a flexible circuit board, and the flexible circuit board is connected to the control mainboard through a circuit board can simplify the arrangement of electronic elements of the electronic equipment of the double-display screen, reduce the number of structures of the control mainboard and reduce the cost.

In the research process created by the invention, the inventor finds that the single-screen display panel of the traditional electronic equipment is found, the area of the display screen is very limited, when an user needs to perform large interface display or operation (such as operating a large-scale network game, watching a movie and the like)) the content of the image needing to be displayed by the electronic equipment can be limited by the display screen, so that the user is very inconvenient to use.. In order to solve the problem, part of the electronic equipment adopts a large display screen design (such as a 5 inch or larger size display screen)) so that the problem that the display interface is too small can be solved to a certain extent by the electronic equipment, and the problem that the electronic equipment is too large in size, convenient to operate or carry and inconvenient to carry is solved. Therefore, in the application, the inventor focuses on the improvement method enabling the display panel to be flexibly adapted to the required display content.

In the above-mentioned research process, the inventor finds, two or more movable display screens are adopted as a display panel of the electronic equipment, and controlling one or more of the two or more display screens to carry out image display according to requirements, so that the display panel can be adapted to the required playing content, and the small size is kept.

Further, the inventor further discovers that when two or more movable display screens are adopted, and each display screen needs to adopt a driving circuit which is adaptive to each other, and is connected to a control mainboard of the electronic equipment through a respective unique flexible circuit board, so that the electronic components of the electronic equipment are more complex in arrangement and relatively high in cost.. Therefore, the inventor further researches how to flexibly adapt the display panel to the premise that the required display content is required, so that the production cost is reduced.

The research of the inventor comprises the following steps: for each display screen, the driving circuit of each display screen and the flexible circuit board of each display screen, different arrangement modes are adopted for connection and arrangement schemes, the arrangement complexity of the internal structure of the electronic equipment and the influence of the production cost are reduced.. A lot of research and analysis are carried out, and the inventor finds that in the electronic equipment, and the plurality of display screens are connected to the control mainboard through the public flexible circuit board, so that the arrangement of components of the electronic equipment can be simplified, and the cost can be reduced.

Aiming at the problems, the embodiment of the invention provides the display panel and the electronic equipment with the display panel, so as to simplify the arrangement of components of the electronic equipment and reduce the cost.

Referring to FIG. 1, a display panel 100 according to a first embodiment of the present application includes a first display screen 10, the second display screen 30 and the flexible circuit board 50 are movably connected with the second display screen 30, the flexible circuit board 50 is connected between the first display screen 10 and the second display screen 30. The display panel 100 can be a liquid crystal display panel.

Connection method between the first display screen 10 and the second display screen 30 is not limited. For example, in some embodiments, the first display screen 10 and the second display screen 30 are rotatably connected together through a hinge mechanism 101 (as shown in FIG.) to enable the display panel 100 to be presented as a foldable or reversible display panel structure; or, in other embodiments, the first display screen 10 is slidably connected to the second display screen 30 through a guide rail mechanism, the first display screen 10 can slide relative to the second display screen 30, such that the display panel 100 is presented as a slidable display panel structure; or, in some embodiments, the first display screen 10 is movably connected to the second display screen 30 via a telescoping mechanism the first display screen 10 can extend out of the second display screen 30 or retract into the second display screen 30, so that the display panel 100 is presented as a telescopic display panel structure.

Flexible circuit board 50 for connecting to external control mainboard, so as to allow the first display screen 10 and the second display screen 30 to play the image content according to the control instruction of the control mainboard. Further, the flexible circuit board 50 is provided with a connector 70, and the connector 70 is electrically connected with the control mainboard.

Further, the display panel 100 further includes a common drive circuit 90, the common driving circuit 90 is arranged on the flexible circuit board 50, and the common driving circuit 90 is used for driving the first display screen 10 and the second display screen 30 to play the image content. Specifically, the common driving circuit 90 is used for providing driving voltage to the first display screen 10 and the second display screen 30, so that the first display screen 10 and the second display screen 30 are started and work. Common drive circuit 90 and common flexible circuit board 50, so that the first display screen 10 and the second display screen 30 can share a driving circuit, and the number of the flexible circuit board and the connector of the traditional display panel is saved, so that the number of components of the display panel 100 is relatively small, the structure of the display panel 100 can be simplified, and the cost can be reduced.

In the embodiment of the present application, the setting position of the common driving circuit 90 is not limited, and the flexible printed circuit board 50 can be arranged on other parts except the flexible printed circuit board 50.. For example, the common drive circuit 90 May be disposed within the first display screen 10, and the second display screen 30 can also be arranged in the second display screen 30, the public driving circuit 90 can be arranged in any one of the first display screen 10 or the second display screen 30, and is electrically connected with the flexible circuit board 50;

Referring to FIG. 2, a display panel 200 provided in a second embodiment of the present application, the structure of the display panel 100 is substantially the same as that of the display panel 100 in the first embodiment, and the display panel 200 also comprises a first display screen 10, a second display screen 30 and a flexible circuit board 50, wherein the first display screen 10 is movably connected with the second display screen 30, the flexible circuit board 50 is connected between the first display screen 10 and the second display screen 30. Compared with the display panel 100 in the first embodiment, the display panel 200 of the second embodiment is different in that, the display panel 200 comprises a first driving circuit 92 and a second driving circuit 94.

The first driving circuit 92 and the second driving circuit 94 are all arranged on the flexible circuit board 50. The first driving circuit 92 is electrically connected with the first display screen 10 and is used for driving the first display screen 10 to work. The second driving circuit 94 is electrically connected with the second display screen 30 and is used for driving the second display screen 30 to work. The first display screen 10 and the second display screen 30 are each provided with a dedicated driving circuit, and the special driving circuit is arranged on the common flexible circuit board 50, the display effect of the display panel 200 can be improved on the basis that the structure of the display panel 100 is simplified and the cost is reduced.

Setting positions of the first driving circuit 92 and the second driving circuit 94 are not limited, and the flexible printed circuit board 50 and the flexible printed circuit board 50 can be arranged on other parts except the flexible printed circuit board 50.. For example, the first driving circuit 92 May be disposed in the first display screen 10 and electrically connected to the flexible circuit board 50, the second driving circuit 94 can be arranged in the second display screen 30 and electrically connected with the flexible circuit board 50; or, the first driving circuit 92 and the second driving circuit 94 can be arranged in any one of the first display screen 10 or the second display screen 30, and is electrically connected with the flexible circuit board 50;

In some embodiments, the number of the first display screen 10 and the second display screen 30 May be one. It is to be understood that, in other embodiments, the number of the first display screen 10 and the second display screen 30 is not limited.. For example, referring to FIG. 3, a display panel 300 provided in a third embodiment of the present application is provided, a first display screen 10 and two second display screens 30, the two second display screens 30 are respectively connected to two opposite sides of the first display screen 10, and the second display screen 30 is connected to the first display screen 10 through the hinge structure 101, the first display screen 10 and the two second display screens 30 are electrically connected with the flexible circuit board 50, is driven by a common driving circuit 90 It is to be understood that in other embodiments, the first display screen 10 and the second display screen 30 can be two or more than two.

Please refer to FIG. 4, which is based on the display panel 100 and 200, the embodiment of the invention further provides the electronic equipment 400, the electronic device 400 can be, but is not limited to, an electronic device such as a mobile phone, a tablet computer, an intelligent watch and the like.. The electronic equipment 400 according to the embodiment is illustrated by taking a mobile phone as an example.

In this embodiment, the electronic device 400 includes the display panel 100, 200 provided in any of the embodiments described above, and further comprises a first shell 401, a second shell 403 and a control mainboard (not shown in the figure). The first housing 401 is movably connected to the second housing 403, and the first display screen 10 is mounted on the first housing 401, the second display screen 30 is arranged on the second shell 403, and the control mainboard is arranged in any one of the first shell 401 or the second shell 403, and the control mainboard is electrically connected with the flexible circuit board 50 through the connector 70.

In the embodiment of the present application, the connection manner between the first housing 401 and the second housing 403 is not limited. For example, in the embodiment shown in FIG. 4, the first shell 401 and the second shell 403 are connected through a hinge mechanism (not shown)) can be rotationally connected together to enable the electronic equipment 400 to be presented as a foldable or reversible electronic equipment structure; or, please refer to FIG. 5, in other embodiments, the first housing 401 is slidably connected to the second housing 403 through a guide rail mechanism (not shown), the first housing 401 can slide relative to the second housing 403, so that the electronic device 400 can be presented as a slidable electronic device structure; or, referring to FIG. 6, in some embodiments, the first housing 401 is movably connected to the second housing 403 through a telescoping mechanism (not shown), the first housing 401 can extend out of the second housing 403, or retract into the second housing 403 so that the electronic device 400 can be presented as a telescopic electronic device structure.

Compared with the prior art, the electronic equipment and the display panel thereof are provided, a first display screen and a second display screen, wherein the first display screen and the second display screen can move relative to each other, the first display screen and the second display screen are electrically connected to a common flexible circuit board, so that the number of the components of the display panel is relatively small, the arrangement of components of the electronic equipment can be simplified, and the cost can be reduced.

In the description of the specification, reference is made to the term "one embodiment", "some embodiments" and "examples", the description of "specific examples" or "some examples" is intended to refer to specific features described in connection with the embodiment or example, structure, material or characteristic is included in at least one embodiment or example of the present application.. In this specification, the illustrative expressions for the foregoing terms do not necessarily have to be directed to the same embodiment or example. Moreover, the specific features and structures described are described, materials or features may be combined in any one or more embodiments or examples in a suitable manner.. In addition, under the condition of not conflict with each other, the technical personnel in the art can combine and combine different embodiments or examples described in the specification and the features of different embodiments or examples.

In addition, the terms "first" and "second" are used only for purposes of description, and cannot be understood to indicate or imply a relative importance or to implicitly indicate the number of the indicated technical features.. Thus, the features defining the "first" and "second" may either explicitly or implicitly include at least one of the features.. In the description of the present application, the meanings of "multiple" are at least two, for example, two, three and the like, unless limitation to the specific limitation is defined otherwise.

Finally, it should be noted that the above embodiments are only used to illustrate the technical solutions of the present application and are not limited thereto; although the application is described in detail with reference to the foregoing embodiments, persons of ordinary skill in the art will understand: the technical solutions described in the embodiments can still be modified, or the technical features in the technical solutions can be equivalently replaced; and the modification or replacement, does not drive the essence of the corresponding technical solution to depart from the spirit and scope of the technical solutions of the embodiments of the present application.

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