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1. That I am a citizen of the United Kingdom of Great Britain and Northern Ireland and a translator to RWS Group Ltd, of Europa House, Chiltern Park, Chiltern Hill, Chalfont St Peter, Buckinghamshire, United Kingdom.
2. That I am well acquainted with the Chinese and English languages.
3. That the attached is, to the best of my knowledge and belief, a true translation into the English language of the accompanying document “CN202661975U (Chen '975)”.
4. That I believe that all statements made herein of my own knowledge are true and that all statements made on information and belief are true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the patent application in the United States of America or any patent issuing thereon.



For and on behalf of RWS Group Ltd

The 14th day of August 2023

(54) Title of utility model

Touch display device

(57) Abstract

5 A touch display device, comprising a flat panel
display component, a sensing signal transceiver module,
a control module and an outer casing; the sensing signal
transceiver module is annularly disposed around the flat
panel display component; the flat panel display
10 component, the sensing signal transceiver module and the
control module are all packaged in the outer casing; the
flat panel display component comprises a liquid crystal
display; the sensing signal transceiver module comprises
sensing signal transmitter/receiver pairs and a printed
15 circuit board; the sensing signal transmitter/receiver
pairs are all electrically connected to the printed
circuit board, each sensing signal transmitter/receiver
pair comprising a sensing signal transmitter and a
sensing signal receiver; the printed circuit board is
20 annularly disposed around the liquid crystal display, and
the printed circuit board is perpendicular to a panel of
the liquid crystal display; and the sensing signal
transmitter/receiver pairs electrically connected to the
printed circuit board are disposed at a front side of a
display face of the liquid crystal display.

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1. A touch display device, comprising a flat panel display component, a sensing signal transceiver module, a control module and an outer casing, wherein the sensing
5 signal transceiver module is annularly disposed around the flat panel display component; the flat panel display component, the sensing signal transceiver module and the control module are all packaged in the outer casing; the flat panel display component comprises a liquid crystal
10 display; the sensing signal transceiver module comprises sensing signal transmitter/receiver pairs and a printed circuit board; the sensing signal transmitter/receiver pairs are all electrically connected to the printed circuit board, each sensing signal transmitter/receiver
15 pair comprising a sensing signal transmitter and a sensing signal receiver; characterized in that the printed circuit board is annularly disposed around the liquid crystal display, and the printed circuit board is perpendicular to a panel of the liquid crystal display;
20 the sensing signal transmitter/receiver pairs electrically connected to the printed circuit board are disposed at a front side of a display face of the liquid crystal display, and the sensing signal transmitters and the sensing signal receivers are correspondingly disposed
25 at left and right sides and top and bottom sides of the liquid crystal display respectively; and sensing signals transmitted by the sensing signal transmitters form a sensing signal detection network at the front side of the display face of the liquid crystal display.

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2. The touch display device as claimed in claim 1, characterized in that the printed circuit board comprises four or more small circuit boards annularly disposed around the liquid crystal display, the small circuit
35 boards being electrically connected together and fixed head-to-tail, and the printed circuit board is a rigid PCB or a flexible PCB.

3. The touch display device as claimed in claim 2, characterized in that the control module is electrically connected to the printed circuit board, and the control module is fixed to a side of the small circuit board that
5 corresponds to the liquid crystal display, or another side.

4. The touch display device as claimed in claim 2, characterized in that the control module is disposed on
10 the bottom casing, and a flexible flat cable for transmitting power and data is connected between the control module and the printed circuit board.

5. The touch display device as claimed in claim 1,
15 characterized in that the printed circuit board comprises four or more small circuit boards annularly disposed around the liquid crystal display, the small circuit boards being fixedly connected together head-to-tail, the printed circuit board is a rigid PCB or a flexible PCB,
20 the control module is disposed on the bottom casing, and a flexible flat cable for transmitting power and data is connected between the control module and the small circuit boards forming the printed circuit board.

25 6. The touch display device as claimed in any one of claims 2, 3, 4 and 5, characterized in that the outer casing comprises a top casing and a bottom casing, the flat panel display component and the sensing signal transceiver module both being disposed in the bottom
30 casing; the top casing is a four-cornered frame body matched in size to the bottom casing, and the four-cornered frame-shaped top casing covers the bottom casing; the display face of the liquid crystal display is aligned within the four-cornered space enclosed by the
35 four-cornered frame body, and the sensing signal transceiver module is received between the top casing and the bottom casing; engagement grooves are correspondingly provided on the top casing and the bottom casing, the

printed circuit board perpendicular to the liquid crystal display is engaged in the engagement grooves, and the printed circuit board is fixed by means of the engagement grooves.

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7. The touch display device as claimed in claim 1, characterized in that the sensing signal transmitter/receiver pair is an infrared transmitter/receiver pair, the infrared transmitter/receiver pair comprising an infrared transmitter and an infrared receiver, and the infrared transmitter being a surface-mount infrared LED.

8. The touch display device as claimed in claim 7, characterized in that a light exit gap is reserved between the top casing and the display face of the liquid crystal display; the infrared transmitter and infrared receiver of the infrared transmitter/receiver pair are correspondingly disposed in the light exit gap.

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9. The touch display device as claimed in claim 8, characterized in that a light filter strip is provided in the light exit gap between the top casing and the liquid crystal display, the light filter strip being located at a front side of the infrared transmitter and infrared receiver of the infrared transmitter/receiver pair.

10. The touch display device as claimed in claim 9, characterized in that the flat panel display component further comprises a touch panel, the touch panel covering one side of the display face of the liquid crystal display, and the touch panel being made of transparent tempered glass plate.

Touch display device

Technical field

[0001] The present utility model relates to the field
5 of display touch control, in particular to a display
device using touch control.

Background art

[0002] For convenience of operation, when people use
10 touch screens instead of a mouse or keyboard to work, we
need to first touch the touch screen mounted at the front
end of the display with a finger or other object, then
the system locates the selected information input
15 according to the icon or menu position touched by the
finger, the touch screen consisting of a touch detection
component and a touch screen controller. The touch
detection component is installed in front of the display
screen, and used to detect the position touched by the
20 user, and upon receipt thereof, send it to the touch
screen controller. The main function of the touch screen
controller is to receive touch information from a touch
point detection apparatus, convert it to touch point
coordinates, then send these to a CPU; at the same time,
it can receive and execute commands sent by the CPU.

25 [0003] Regarding digital products using touch screen
technology as described above, their main advantage is
that they integrate the function of a control keyboard
and a display screen so that the display screen
simultaneously has the functions of a keyboard; such
30 touch screen technology can not only increase the area
of the display screen as much as possible within an
effective area, but also considerably improves the
appearance of the digital product as a whole. By means
of the touch screen technology described above, the
35 dimensions of a display screen can be increased as much
as possible without increasing the overall volume of the
digital product, thus making it possible to play
television and animated videos via a digital product

equipped with a touch screen. Infrared touch screens account for a certain proportion of the touch screens appearing on the market at present; for example, the two patent products disclosed in patent no. 200720052423.3 and patent no. 200720051069.2 are common infrared touch display apparatuses, mainly comprising a flat panel display component (comprising a liquid crystal display screen), four printed circuit boards surrounding the flat panel display component, and an outer frame, with infrared transmitters and infrared receivers soldered to the printed circuit boards, wherein the infrared transmitters and infrared receivers are all disposed at a front side of a display face of the flat panel display component, and the infrared transmitters and infrared receivers are correspondingly disposed at left and right sides and top and bottom sides around the flat panel display component respectively, such that an infrared grating detection network is formed at the front side of the display face of the flat panel display component. When a user taps a point on the display face of the flat panel display component with a finger or other object, two infrared rays passing through this position will be blocked, such that infrared receivers are unable to receive the infrared rays transmitted by the infrared transmitters corresponding thereto; a control system of the infrared touch display apparatus can promptly compute the position of the touch point, then run a corresponding program according to a command corresponding to the touch point position, thereby realizing a touch operation on the flat panel display component.

[0004] The printed circuit boards in the infrared touch display apparatus with such a structure as described above are arranged in such a way as to be parallel to the flat panel display component, and there are multiple defects in the structure thereof, specifically as follows:

[0005] Firstly, the printed circuit boards used to connect the infrared transmitters and infrared receivers

are embedded around the flat panel display component, and the printed circuit boards are arranged in the same plane as the flat panel display component; consequently, when the outer frame of the flat panel display component is packaged, the outer frame needs to package the printed circuit boards, and as a result, the dimensions of the outer frame of the flat panel display component are also correspondingly larger, causing the infrared touch display apparatus to appear very thick and heavy.

10 [0006] Secondly, in order to ensure that the infrared rays transmitted and received by the infrared transmitters and infrared receivers are parallel to the flat panel display component, the infrared transmitters and infrared receivers need to undergo a pin-bending process step before being mounted on the printed circuit boards by soldering, or are first mounted on the printed circuit boards by soldering and then undergo pin-bending; this not only involves complex process steps and increases the manufacturing cost, but also the pin-bending might affect the lifespan and stability of the infrared transmitters and infrared receivers.

15 [0007] As society continues to develop, the trend of development in liquid crystal displays at the present time is in all cases towards ultra-thin and ultra-narrow; frames used in conventional infrared touch screens generally all need to be twenty-odd millimeters wide, and this is chiefly limited by the width of arrangement of the printed circuit boards used to connect the abovementioned infrared transmitters and infrared receivers. As a result, it is difficult to use infrared touch technology on many ultra-thin, ultra-narrow displays. The main technical defects which exist in conventional infrared touch display apparatuses when they are specifically implemented have been set out above, and these are the main problems that the present utility model seeks to study and solve.

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Summary of the utility model

[0008] An objective of the present utility model is to provide a touch display device, which is a product with the same character as a conventional touch display apparatus. The main technical problem that it seeks to solve is as follows: Conventional touch display apparatuses are limited by the width of printed circuit boards used to connect sensing signal transmitters and sensing signal receivers, so outer frames of corresponding width need to be made; as a result, the outer frames generally all need to be twenty-odd millimeters wide, so it is difficult to realize touch technology by using sensing signal transmission/reception on many ultra-thin, ultra-narrow displays. The above is the main technical problem to be solved by the present utility model.

[0009] To solve the abovementioned technical problem, the present utility model employs the following technical solution: the present utility model provides a touch display device, comprising a flat panel display component, a sensing signal transceiver module, a control module and an outer casing, wherein the sensing signal transceiver module is annularly disposed around the flat panel display component; the flat panel display component, the sensing signal transceiver module and the control module are all packaged in the outer casing; the flat panel display component comprises a liquid crystal display; the sensing signal transceiver module comprises sensing signal transmitter/receiver pairs and a printed circuit board; the sensing signal transmitter/receiver pairs are all electrically connected to the printed circuit board, each sensing signal transmitter/receiver pair comprising a sensing signal transmitter and a sensing signal receiver; the printed circuit board is annularly disposed around the liquid crystal display, and the printed circuit board is perpendicular to a panel of the liquid crystal display; characterized in that the sensing signal transmitter/receiver pairs electrically connected to the printed circuit board are disposed at a

front side of a display face of the liquid crystal display, and the sensing signal transmitters and the sensing signal receivers are correspondingly disposed at left and right sides and top and bottom sides of the liquid crystal display respectively; and sensing signals transmitted by the sensing signal transmitters form a sensing signal detection network at the front side of the display face of the liquid crystal display.

5 [0010] Preferred arrangement: the printed circuit board comprises four or more small circuit boards annularly disposed around the liquid crystal display, the small circuit boards being electrically connected together and fixed head-to-tail, and the printed circuit board is a rigid PCB or a flexible PCB.

15 [0011] Preferred arrangement: the control module is electrically connected to the printed circuit board, and the control module is fixed to a side of the small circuit board that corresponds to the liquid crystal display, or another side.

20 [0012] Preferred arrangement: the control module is disposed on the bottom casing, and a flexible flat cable for transmitting power and data is connected between the control module and the printed circuit board.

[0013] Preferred arrangement: the printed circuit board
25 comprises four or more small circuit boards annularly disposed around the liquid crystal display, the small circuit boards being fixedly connected together head-to-tail, the printed circuit board is a rigid PCB or a flexible PCB, the control module is disposed on the
30 bottom casing, and a flexible flat cable for transmitting power and data is connected between the control module and the small circuit boards forming the printed circuit board.

[0014] Preferred arrangement: the outer casing
35 comprises a top casing and a bottom casing, the flat panel display component and the sensing signal transceiver module both being disposed in the bottom casing; the top casing is a four-cornered frame body

matched in size to the bottom casing, and the four-cornered frame-shaped top casing covers the bottom casing; the display face of the liquid crystal display is aligned within the four-cornered space enclosed by the
5 four-cornered frame body, and the sensing signal transceiver module is received between the top casing and the bottom casing; engagement grooves are correspondingly provided on the top casing and the bottom casing, the printed circuit board perpendicular to the liquid crystal
10 display is engaged in the engagement grooves, and the printed circuit board is fixed by means of the engagement grooves.

[0015] Preferred arrangement: the sensing signal transmitter/receiver pair is an infrared
15 transmitter/receiver pair, the infrared transmitter/receiver pair comprising an infrared transmitter and an infrared receiver, and the infrared transmitter being a surface-mount infrared LED.

[0016] Preferred arrangement: a light exit gap is
20 reserved between the top casing and the display face of the liquid crystal display; the infrared transmitter and infrared receiver of the infrared transmitter/receiver pair are correspondingly disposed in the light exit gap.

[0017] Preferred arrangement: a light filter strip is
25 provided in the light exit gap between the top casing and the liquid crystal display, the light filter strip being located at a front side of the infrared transmitter and infrared receiver of the infrared transmitter/receiver pair.

30 [0018] Preferred arrangement: the flat panel display component further comprises a touch panel, the touch panel covering one side of the display face of the liquid crystal display, and the touch panel being made of transparent tempered glass plate.

35 [0019] Compared with the prior art, the present patent application has the following technical effects: When the flat panel display component and the sensing signal transceiver module are packaged in the outer casing of

the touch display device provided by the present utility model, due to the fact that the printed circuit board is perpendicular to the liquid crystal display, a frame of the four-cornered frame-shaped top casing only needs to be able to cover the sensing signal transmitter/receiver pairs and the printed circuit board, a board surface of which is perpendicular to the frame; it is thus possible to reduce the width of the top casing to a very large extent, and furthermore make the frame of the touch display device ultra-narrow. When the solution of the present utility model is adopted, the width of the frame can be reduced to 3.6 mm. Moreover, due to the fact that the printed circuit board is perpendicular to the liquid crystal display while the sensing signal transmitter/receiver pairs are parallel to the liquid crystal display, when the pins of the sensing signal transmitter/receiver pairs are soldered to the printed circuit board, there is no need to perform a pin-bending process step, so the number of manufacturing process steps is reduced, and the manufacturing cost is likewise reduced; furthermore, because the pins of the sensing signal transmitter/receiver pairs do not undergo bending, they have a longer service life and better stability.

Brief description of the drawings

[0020] Fig. 1 is a partial schematic sectional drawing of a preferred embodiment of the present utility model.

[0021] Fig. 2 is an exploded partial schematic sectional drawing of a preferred embodiment of the present utility model.

[0022] Fig. 3 is a partial schematic sectional drawing of another embodiment of the present utility model.

[0023] Fig. 4 is a partial schematic sectional drawing of a third preferred embodiment of the present utility model.

Detailed description of the utility model

[0024] A touch display device proposed by the present utility model is described in more detail below with reference to Figs. 1 - 4 and preferred embodiments.

5 [0025] As shown in Fig. 1, the present utility model provides a touch display device, comprising a flat panel display component 10, a sensing signal transceiver module 20, a control module 30 and an outer casing 40, wherein the sensing signal transceiver module 20 is annularly disposed around the flat panel display component 10; and
10 the flat panel display component 10, the sensing signal transceiver module 20 and the control module 30 are all packaged in the outer casing 40.

[0026] The flat panel display component 10 comprises a liquid crystal display 11.

15 [0027] The sensing signal transceiver module 20 comprises sensing signal transmitter/receiver pairs 21 and a printed circuit board 22; the sensing signal transmitter/receiver pairs 21 are all electrically connected to the printed circuit board 22, each sensing
20 signal transmitter/receiver pair 21 comprising a sensing signal transmitter and a sensing signal receiver.

[0028] The printed circuit board 22 is annularly disposed around the liquid crystal display 11, and the printed circuit board 22 is perpendicular to a panel of
25 the liquid crystal display 11.

[0029] The sensing signal transmitter/receiver pairs 21 electrically connected to the printed circuit board 22 are disposed at a front side of a display face of the liquid crystal display 11, and the sensing signal
30 transmitters and the sensing signal receivers are correspondingly disposed at left and right sides and top and bottom sides of the liquid crystal display 11 respectively; sensing signals transmitted by the sensing signal transmitters form a sensing signal detection
35 network at the front side of the display face of the liquid crystal display 11.

[0030] The control module 30 is electrically connected to the printed circuit board 22; the control module 30

controls the operation of the liquid crystal display 11 and the sensing signal transmitter/receiver pairs 21.

[0031] The outer casing 40 comprises a top casing 41 and a bottom casing 42, the flat panel display component 10 and the sensing signal transceiver module 20 both being disposed in the bottom casing 42; the top casing 41 is a four-cornered frame body matched in size to the bottom casing 42, and the four-cornered frame-shaped top casing 41 covers the bottom casing 42; the display face of the liquid crystal display 11 is aligned within the four-cornered space enclosed by the four-cornered frame body, and the sensing signal transceiver module 20 is received between the top casing 41 and the bottom casing 42.

[0032] During specific implementation of the present utility model, when the flat panel display component 10 and the sensing signal transceiver module 20 are packaged in the outer casing 40, due to the fact that the printed circuit board 22 is perpendicular to the liquid crystal display 11, a frame of the four-cornered frame-shaped top casing 41 only needs to be able to receive the length of the sensing signal transmitter/receiver pairs 21 and the printed circuit board 22 perpendicular thereto; it is thus possible to reduce the width of the top casing 41 to a very large extent, and furthermore make the frame of the touch display device ultra-narrow. When the solution of the present utility model is adopted, the width of the frame can be reduced to 3.6 mm, taking up less space in a surface frame of an existing display device, with little change to the process and structure, and enhancing the integrity of touch and display. Moreover, due to the fact that the printed circuit board 22 is perpendicular to the liquid crystal display 11 while the sensing signal transmitter/receiver pairs 21 are parallel to the liquid crystal display 11, when the pins of the sensing signal transmitter/receiver pairs 21 are soldered to the printed circuit board 22, there is no need to perform a pin-bending process step, so the number of manufacturing process steps is reduced, and the

manufacturing cost is likewise reduced; furthermore, because the pins of the sensing signal transmitter/receiver pairs 21 do not undergo bending, they have a longer service life and better stability.

5 [0033] Preferred embodiments: As shown in Figs. 1, 2 and 3, the printed circuit board 22 is a rigid PCB or a flexible PCB, and the printed circuit board 22 comprises four or more small circuit boards annularly disposed around the liquid crystal display 11; the small circuit
10 boards are electrically connected together and fixed head-to-tail. The control module 30 is fixedly connected to the small circuit board; by fixing the control module 30 to the small circuit board, the internal structure of the present utility model is made more compact. The
15 control module 30 is fixed to a side of the small circuit board that corresponds to the liquid crystal display 11, or another side.

[0034] Preferred embodiment: As shown in Fig. 4, the printed circuit board 22 comprises four or more small
20 circuit boards annularly disposed around the liquid crystal display 11; the small circuit boards are electrically connected together and fixed head-to-tail. The control module 30 is disposed on the bottom casing 42, and a flexible flat cable for transmitting power and
25 data is connected between the control module 30 and the printed circuit board 22. The use of a flexible flat cable to connect the control module 30 to the sensing signal transceiver module 20 allows normal operation of the sensing signal transceiver module 20 to be controlled
30 by means of the control module 30, and connection by flexible flat cable can facilitate fitting, removal, replacement and repair of the control module 30.

[0035] Preferred embodiment: As shown in Fig. 4, the printed circuit board 22 is a rigid PCB or a flexible
35 PCB, and the printed circuit board 22 comprises four or more small circuit boards annularly disposed around the liquid crystal display 11; the small circuit boards are fixedly connected together head-to-tail. The control

module 30 is disposed on the bottom casing 42, and a flexible flat cable for transmitting power and data is connected between the control module 30 and the small circuit boards forming the printed circuit board 22. The use of a flexible flat cable to electrically connect the control module 30 to the small circuit boards can facilitate removal, replacement and repair of the control module 30 and the small circuit boards, preventing a situation where the entire sensing signal transceiver module 20 is affected by damage to an extremely small number of the sensing signal transmitter/receiver pairs 21.

[0036] Preferred embodiment: As shown in Fig. 2, engagement grooves 411 are correspondingly provided on the top casing 41 and the bottom casing 42; the printed circuit board 22 perpendicular to the liquid crystal display 11 is engaged in the engagement grooves 411, and the printed circuit board 22 is fixed by means of the engagement grooves 411.

[0037] Preferred embodiment: the sensing signal transmitter/receiver pair 21 is an infrared transmitter/receiver pair, the infrared transmitter/receiver pair comprising an infrared transmitter and an infrared receiver; the infrared transmitter is a surface-mount infrared LED.

[0038] Preferred embodiment: As shown in Fig. 2, a light exit gap 43 is reserved between the top casing 41 and the display face of the liquid crystal display 11; the infrared transmitter and infrared receiver of the infrared transmitter/receiver pair are correspondingly disposed in the light exit gap 43.

[0039] Preferred embodiments: As shown in Figs. 1, 2, 3 and 4, a light filter strip 44 is provided in the light exit gap 43 between the top casing 41 and the liquid crystal display 11, the light filter strip 44 being located at a front side of the infrared transmitter and infrared receiver of the infrared transmitter/receiver pair; the light filter strip 44 is used to filter out

external light rays, so that the infrared transmitter and infrared receiver can selectively transmit and receive light.

[0040] Preferred embodiments: As shown in Figs. 1, 2, 3
5 and 4, the flat panel display component 10 further comprises a touch panel 12, the touch panel 12 covering one side of the display face of the liquid crystal display 11, and the touch panel 12 being made of transparent tempered glass plate; the liquid crystal display 11
10 located at the display window 411 is protected against external forces by means of the touch panel 12 made of transparent tempered glass plate.

[0041] In summary, the technical solution of the present utility model can achieve the abovementioned utility
15 model objective fully and effectively. Furthermore, the structural principles and functional principles of the present utility model have all been fully verified in embodiments and can achieve the expected effects and objectives, and embodiments of the present utility model
20 can be changed according to these principles. Thus, the present utility model includes all replacement content within the scope mentioned in the patent application scope. Any equivalent changes made within the patent application scope of the present utility model are
25 included in the patent scope of this application.

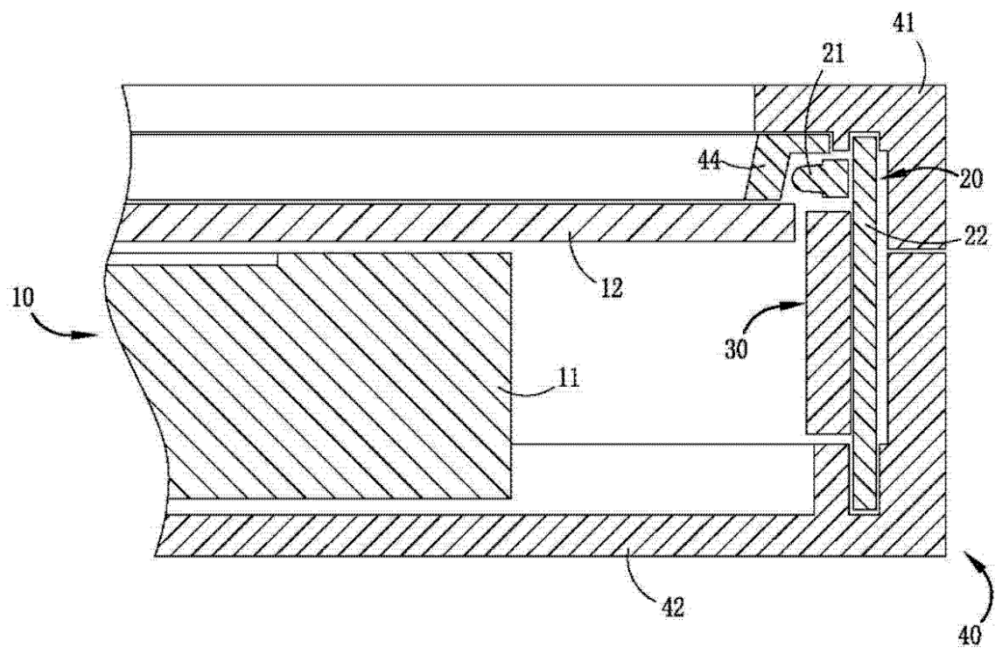


Fig. 1

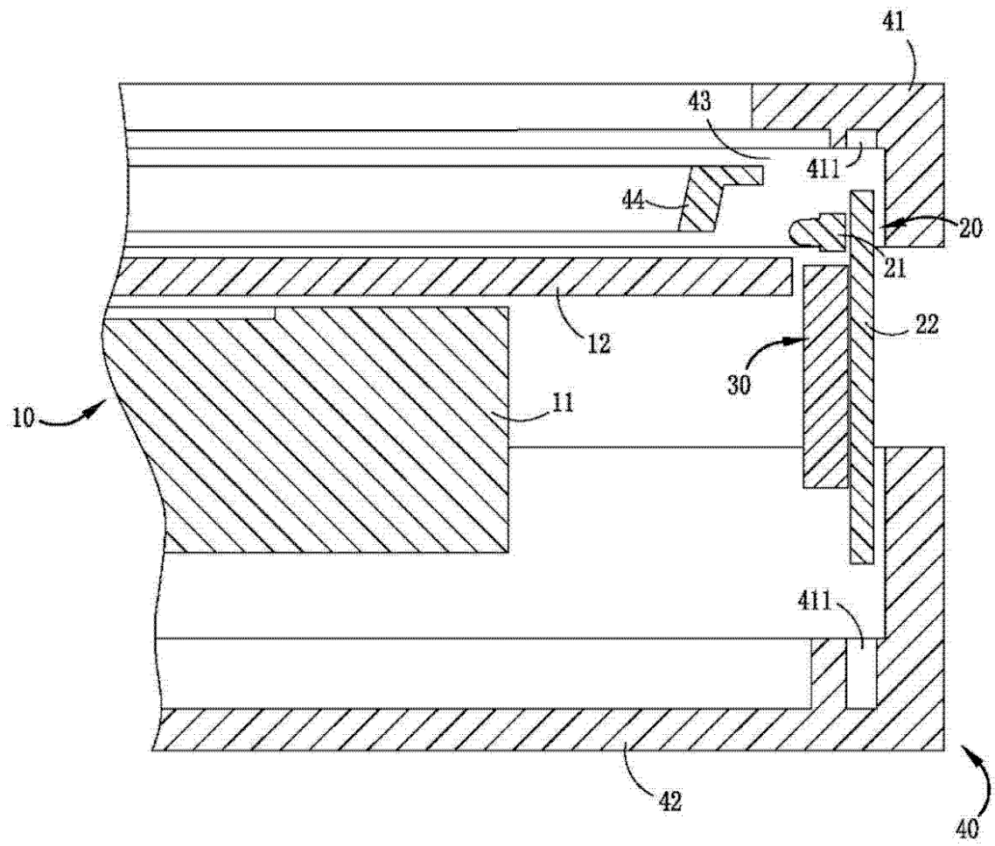


Fig. 2

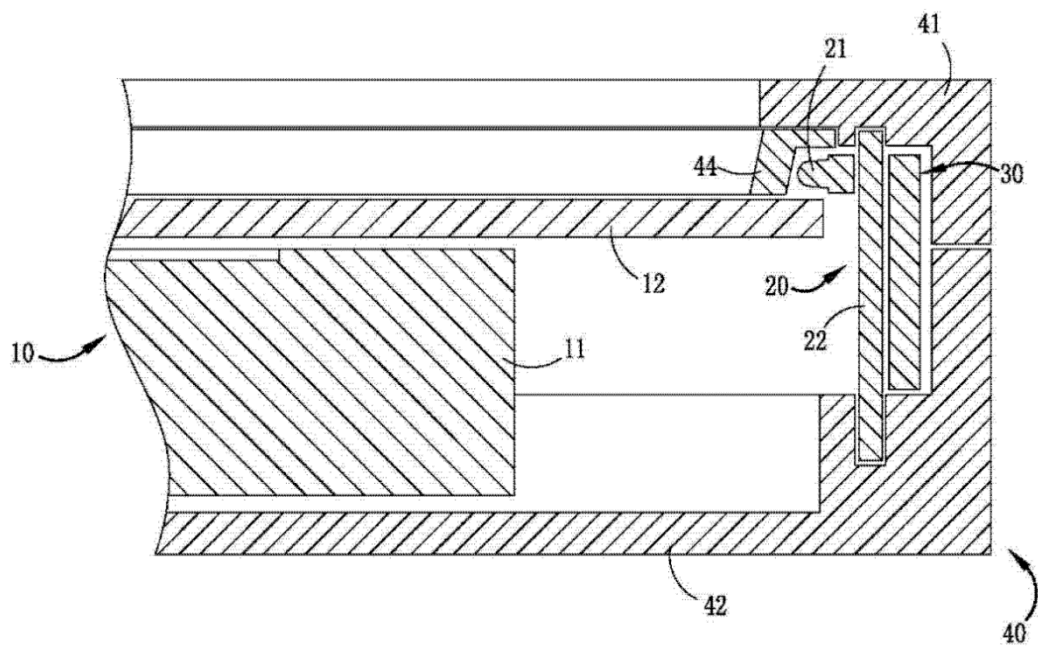


Fig. 3

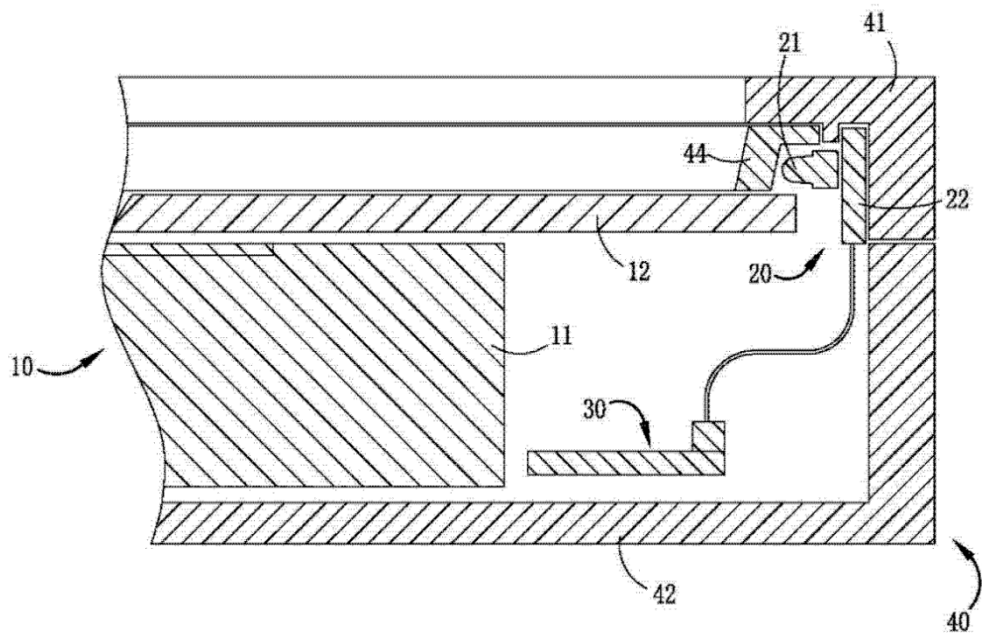


Fig. 4