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Touch input device

Abstract

A touch input device includes a circuit board, a plurality of illuminant elements disposed on the circuit board, a spacer disposed over the circuit board, a plurality of light guide plates, a shielding sheet, and a top plate. The circuit board has a board edge and an upper surface having a plurality of sensing regions. The spacer has a light-leaking edge and a plurality of accommodation holes for accommodating the illuminant elements and the light guide plates. The shielding sheet includes a main section covering the spacer, a first extension section covering the light-leaking edge and the board edge, and a second extension section combined with the circuit board. The main section has a plurality of light permeable regions respectively corresponding to the light guide plates. The top plate is disposed on the main section and has a plurality of light-exit regions.

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Background/Summary

CROSS REFERENCE TO RELATED APPLICATIONS (1) This application claims the priority benefit of U.S. provisional application Ser. No. 63/472,823 filed on Jun. 14, 2023 and also claimed the priority benefit of Taiwan patent application No. 113100307, filed on Jan. 3, 2024. The entirety of the above-mentioned patent applications is hereby incorporated by reference herein and made a part of this specification.

BACKGROUND OF THE INVENTION
1. Field of the Invention
(1) The invention generally relates to an input device for an electronic device. Particularly, the invention relates to a touch input device.
2. Description of the Prior Art
(2) The input device of electronic devices, such as a keyboard, is pressed by the user to transmit an input signal to the electronic device. A common keyboard includes a plurality of independent keys, and the types of keys may be, for example, mechanical keys, membrane switch keys, or optical sensing switch keys. Mechanical keys have a complicated structure and are large in size, not suitable for use in electronic devices in need of thinning feature (such as laptop computers). Keyboards currently used in thin type electronic devices mainly use membrane switch keys, but more and more keyboards are beginning to use optical sensing switch keys as the type of keys of the keyboard.
(3) As the functions of thin type electronic devices increase, in addition to the keyboard, the input device also includes a touch bar. The touch bar has multiple touch areas for users to perform touch operations, making the electronic device perform different functions. A conventional touch bar has a backlight module disposed inside to illuminate the touch bar. If the backlight module is poorly assembled, light leakage may occur in the touch bar.
SUMMARY OF THE INVENTION
(4) It is an object of the invention to provide an touch input device, which can prevent from leaking light.
(5) In an embodiment, the invention provides a touch input device including a circuit board, a plurality of illuminant elements, a spacer, a plurality of light guide plates, a shielding sheet, and a top plate. The circuit board has an upper surface, a lower surface, and a board edge. The upper surface has a plurality of sensing regions arranged along a long axis direction. The plurality of illuminant elements are disposed on the upper surface of the circuit board and arranged along the long axis direction. The spacer is disposed over the upper surface of the circuit board. The spacer has a top surface, a bottom surface, and a light-leaking edge. The spacer has a plurality of accommodation holes penetrating through the top surface and the bottom surface and corresponding to the plurality of sensing regions. The light-leaking edge corresponds to the board edge of the circuit board. The plurality of illuminant elements extend into the plurality of accommodation holes, respectively. The plurality of light guide plates are disposed in the plurality of accommodation holes, respectively. The shielding sheet includes a main section, a first extension section, and a second extension section. The main section covers the top surface of the spacer and has a plurality of light permeable regions. The light permeable regions are arranged along the long

axis direction and respectively correspond to the plurality of light guide plates. The first extension section covers the light-leaking edge of the spacer and the board edge of the circuit board. The second extension section is connected to the first extension section and combined with the lower surface of the circuit board. The top plate is disposed on the main section of the shielding sheet. The top plate has a plurality of light-exit regions arranged along the long axis direction and respectively corresponding to the plurality of light permeable regions of the main section of the shielding sheet.
(6) By covering the light-leaking edge of the spacer and the board side of the circuit board with the first extension section of the shielding sheet, light from the illuminant elements can be blocked to prevent the leakage of light.
(7) In another embodiment, the invention provides a touch input device including a circuit board, a plurality of illuminant elements, a reflective layer, a spacer, a plurality of light guide plates, a shielding sheet, and a top plate. The circuit board has an upper surface and a lower surface. The upper surface has a plurality of sensing regions arranged along a long axis direction. The plurality of illuminant elements are disposed on the upper surface of the circuit board and arranged along the long axis direction. The reflective layer includes a main reflective section, a first extension section, and a second extension section. The main reflective section is disposed on the upper surface of the circuit board and has a plurality of through holes. The plurality of through holes are arranged along the long axis direction, and the plurality of illuminant elements extend through the plurality of through holes, respectively. The spacer is disposed over the main reflective section of the reflective layer. The spacer has a top surface, a bottom surface, and a light-leaking edge. The spacer has a plurality of accommodation holes penetrating through the top surface and the bottom surface. The plurality of accommodation holes are arranged along the long axis direction and respectively corresponding to the plurality of sensing regions and the plurality of through holes. The plurality of illuminant elements extend into the plurality of accommodation holes, respectively. The plurality of light guide plates are disposed in the plurality of accommodation holes of the spacer, respectively. The shielding sheet covers the top surface of the spacer. The shielding sheet has a sheet edge and a plurality of light permeable regions. The sheet edge corresponds to the light-leaking edge of the spacer. The plurality of light permeable regions are arranged along the long axis direction and respectively correspond to the plurality of light guide plates. The top plate is disposed on the shielding sheet. The top plate has a plurality of light-exit regions arranged along the long axis direction and respectively correspond to the plurality of light permeable regions of the shielding sheet. The first extension section of the reflective layer covers the light-leaking edge of the spacer and the sheet edge of the shielding sheet. The second extension section of the reflective layer is connected to the first extension section and combined with the top plate.
(8) By covering the light-leaking edge of the spacer and the sheet edge of the shielding sheet with the first extension section of the reflective layer, light from the illuminant elements can be blocked to prevent the leakage of light.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) FIG. **1** is a perspective view of the touch input device in a first embodiment of the invention.
(2) FIG. **2** is an exploded view of the touch input device in the first embodiment of the invention.
(3) FIG. **3** is a partially exploded view of the touch input device in the first embodiment of the invention.
(4) FIG. **4** is a perspective view of the touch input device in the first embodiment of the invention from another viewing angle, wherein the backside of the touch input device is shown.
(5) FIG. **5** is a schematic cross-sectional view of FIG. **1** along the **5**-**5** direction.

(6) FIG. **6** is a schematic cross-sectional view of the touch input device in a second embodiment of the invention.
(7) FIG. **7** is a schematic cross-sectional view of the touch input device in a third embodiment of the invention.
(8) FIG. **8** is a partially exploded view of the touch input device in a fourth embodiment of the invention.
(9) FIG. **9** is a schematic cross-sectional view of the touch input device in the fourth embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

(10) In order to illustrate the invention more clearly, the preferred embodiments will be described in detail with reference to the drawings. Referring to FIG. **1** to FIG. **5**, the touch input device **1** in a first embodiment is shown. In this embodiment, the touch input device **1** has a rectangular shape. For illustration, a long axis direction X, a short axis direction Y, and a stacking direction Z which are perpendicular to each other are defined. The touch input device **1** includes a circuit board **10**, a plurality of illuminant elements **22**, a spacer **24**, a plurality of light guide plates **34**, a shielding sheet **36**, and a top plate **50**.
(11) The circuit board **10** has an upper surface **102**, a lower surface **104**, and a board edge **106**. In this embodiment, the circuit board **10** has two long sides **10***a*, **10***b* and two short sides **10***c*, **10***d*. The two long sides **10***a*, **10***b* are opposite to each other in the short axis direction Y, and each of the long sides **10***a*, **10***b* extends along the long axis direction X. The two short sides **10***c*, **10***d* are opposite to each other in the long axis direction X, and each of the short sides **10***c*, **10***d* extends along the short axis direction Y. The upper surface **102** has a plurality of sensing regions **12**, and the sensing regions **12** are arranged along the long axis direction X and coupled to a sensing circuit **14**. Each sensing region **12** is configured to sense a touch operation of the user to generate a corresponding touch signal. The lower surface **104** is provided with a reading component **18** and a light source driving component **20**. The reading component **18** is electrically coupled to the sensing regions **12** through the sensing circuit **14** to obtain the touch signal generated by each of the sensing regions **12**.
(12) The illuminant elements **22** are disposed on the upper surface **102** of the circuit board **10** and arranged along the long axis direction X. The illuminant elements **22** are electrically coupled to the light source driving component **20** through a light source circuit **16** on the upper surface **102** of the circuit board **10**. Through the light source circuit **16**, the light source driving component **20** drives each of the illuminant elements **22** to emit light. In this embodiment, in the short axis direction Y, each of the illuminant elements **22** is located at one side of each of the sensing regions **12**. Each of the illuminant elements **22** is taken the light-emitting diode as an example and has a side light-emitting surface **222**. Each side light-emitting surface **222** faces toward each sensing region **12** in the short axis direction Y. More specifically, each of the illuminant elements **22** is located between each of the sensing regions **12** of the circuit board **10** and one of the long sides (e.g. **10***b*), and the other long side (e.g. **10***a*) is farther away from the illuminant elements **22**. One of the two long sides **10***a*, **10***b* of the circuit board **10** that is closer to the illuminant elements **22** (e.g. **10***b*) constitutes the board edge **106**.
(13) In this embodiment, the touch input device **1** can optionally include a reflective layer **60**. The reflective layer **60** is disposed on the upper surface **102** of the circuit board **10**. The reflective layer **60** is disposed on the upper surface **102** of the circuit board **10** along the stacking direction Z. For example, the reflective layer **60** is implemented as a reflective plate and glued on the upper surface **102** of the circuit board **10**, but not limited thereto. The reflective layer **60** can be a reflective coating, which is coated on the upper surface **102** of the circuit board **10**. The reflective layer **60** has a plurality of openings **602** and a plurality of through holes **604**. The openings **602** are arranged along the long axis direction X and respectively correspond to the sensing regions **12** of the circuit board **10**. In the stacking direction Z, each sensing region **12** is located within each opening **602**.

The through holes **604** are arranged along the long axis direction X, and the illuminant elements **22** extend through the through holes **604**, respectively. The reflective layer **60** has an upper reflective surface **60***a*, and the upper reflective surface **60***a* faces away from the circuit board **10**. In an embodiment, the reflective layer **60** may not be provided with the openings **602**, and the sensing regions **12** of the circuit board **10** are covered by the reflective layer **60**. Each sensing region **12** can still sense the touch operation of the user.

(14) The spacer **24** is disposed over the upper surface **102** of the circuit board **10** along the stacking direction Z. The spacer **24** has a top surface **242**, a bottom surface and a light-leaking edge. In this embodiment, the spacer **24** is disposed on the reflective layer **60** along the stacking direction Z. For example, the spacer **24** can be glued on the upper reflective surface **60***a* of the reflective layer **60**, so the reflective layer **60** is disposed between the upper surface **102** of the circuit board **10** and the bottom surface **244** of the spacer **24**. The spacer **24** has a plurality of accommodation holes **26**, which penetrate through the top surface **242** and the bottom surface **244**. The accommodation holes **26** are arranged along the long axis direction X and respectively correspond to the openings **602** and the through holes **604** of the reflective layer **60** and the sensing regions **12** of the circuit board **10**. A spacer rib **28** is formed between two adjacent accommodation holes **26**, i.e., the spacer rib **28** separates two adjacent accommodation holes **26**.

(15) In this embodiment, the spacer **24** has a first spacer section **30** and a second spacer section **32** in the short axis direction Y. The first spacer section **30** has the accommodation holes **26**, and the illuminant elements **22** extend into the accommodation holes **26**, respectively. In the short axis direction Y, the length of the first spacer section **30** is larger than the length of the second spacer section **32**. The spacer **24** has two opposite long sides **24***a*, **24***b* in the short axis direction Y, and each of the long sides **24***a*, **24***b* extends along the long axis direction X. One of the long sides **24***a*, **24***b* (e.g. **24***a*) is located at the first spacer section **30**, and the other long side (e.g. **24***b*) is located at the second spacer section **32**. One of the two long sides **24***a*, **24***b* which is closer to the illuminant elements **22** (i.e., the long side **24***b* of the second spacer section **32**) constitutes the light-leaking edge **246**. The light-leaking edge **246** of the spacer **24** corresponds to the board edge **106** of the circuit board **10**, and in the stacking direction, the light-leaking edge **246** is located above the board edge **106** of the circuit board **10**.

(16) In this embodiment, each opening **602** and each through hole **604** of the reflective layer **60** are located within the accommodation hole **26** in the stacking direction Z. In an embodiment, the reflective layer **60** can be omitted, so the spacer **24** is directly disposed on the circuit board **10**, and the bottom surface **244** of the spacer **24** directly faces the upper surface **102** of the circuit board **10**.

(17) The light guide plates **34** are respectively disposed in the accommodation holes **26** of the spacer **24**, and the side light-emitting surface **222** of each of the illuminant elements **22** faces toward each of the light guide plates **34**. Each of the light guide plates **34** has a receiving portion. In this embodiment, the receiving portion is taken a notch **342** as an example, but not limited thereto. The receiving portion can be a concave groove or a through hole. Each notch **342** is formed by recessing from a side of the respective light guide plate **34**. Each of the illuminant elements **22** extends into the notch **342** of the light guide plate **34**. Each notch **342** surrounds the side light-emitting surface **222** of the respective illuminant elements **22**. The side light-emitting surface **222** of the illuminant element **22** faces the wall surface of the notch **342** of the light guide plate **34**. The notch **342** has a long light-input side **342***a* and two short light-input sides **342***b*. The long light-input side **342***a* faces the side light-emitting surface **222** of the illuminant element **22** in the short axis direction Y, and the two short light-input sides **342***b* are located at two opposite sides of the side light-emitting surface **222** of the illuminant element **22** in the long axis direction X. Light emitted from the side light-emitting surface **222** of the illuminant element **22** majorly enters the light guide plate **34** from the long light-input side **342***a*. Light emitted from the side light-emitting surface **222** toward two sides can enter the light guide plates **34** from the two short light-input sides **342***b* to promote the amount of light entering the light guide plate **34**.

(18) In an embodiment, each of the illuminant elements **22** can be located at one side of the light guide plate **34**, and the light guide plate **34** may not be provided with the receiving portion, so light emitted from the side light-emitting surface **222** of the illuminant element **22** can enter the light guide plate **34** from the side of the light guide plate **34**.
(19) The shielding sheet **36** includes a main section **38**, a first extension section **40**, and a second extension section **42**. The main section **38** covers the top surface **242** of the spacer **24**. For example, the main section **38** is glued on the top surface **242** of the spacer **24**. The main section **38** confines the light guide plates **34** within the accommodation holes **26** of the spacer **24**. The main section **38** has a plurality of light permeable regions **382**. The light permeable regions **382** are arranged along the long axis direction X and respectively correspond to the light guide plates **34**. Each light guide plate **34** is located under each light permeable region **382** in the stacking direction Z.
(20) The first extension section **40** covers the light-leaking edge **246** of the spacer **24** and the board edge **106** of the circuit board **10**. The second extension section **42** is connected to the first extension section **40** and combined with the lower surface **104** of the circuit board **10**. For example, the second extension section **42** is glued on the lower surface **104** of the circuit board **10**. The first extension section **40** can be combined with the light-leaking edge **246** of the spacer **24** and the board edge **106** of the circuit board **10** by adhesives. Alternatively, the first extension section **40** may not be combined with the light-leaking edge **246** of the spacer **24** and the board edge **106** of the circuit board **10**. More specifically, the first extension section **40** is connected to one side of the main section **38** that is closer to the light-leaking edge **246** of the spacer **24**, and the first extension section **40** extends downward along the stacking direction Z to further cover the edge of the reflective layer **60**. The second extension section **42** extends along the short axis direction Y and at least extends to the lower surface **104** of the circuit board **10** to be located right below the second spacer section **32** of the spacer **24** to prevent the second extension section **42** from warping with respect to the lower surface **104** of the circuit board **10**. In this embodiment, an end of the second extension section **42** extends in the short axis direction Y to be below the hole wall **26***a* of the accommodation hole **26** and does not extend to be right below the illuminant element **22**.
(21) In this embodiment, the shielding sheet **36** includes a transparent substrate **44** and at least one shielding layer disposed on the transparent substrate **44**. The at least one shielding layer overlaps the illuminant elements in the stacking direction Z. In this embodiment, the at least one shielding layer can be a two-layered structure including a reflector layer **46** and an absorption layer **48**. An inner surface **442** of the transparent substrate **44** is configured to combine the shielding sheet **36** with the circuit board **10**. The reflector layer **46** can be a white paint coated on an outer surface **444** of the transparent substrate **44**. The absorption layer **48** can be a black paint coated on the outer side of the reflector layer **46**, and the edge of the reflector layer **46** is covered by the absorption layer **48**. On the main section **38**, the absorption layer **48** has a plurality of hollow regions **482**, and each hollow region **482** and the underlying portion of the transparent substrate **44** constitute each light permeable region **382**. In an embodiment, the at least one shielding layer can be a single-layered structure. For example, only one of the reflector layer **46** and the absorption layer **48** is disposed.
(22) The top plate **50** is disposed on the main section of the shielding sheet **36**. The top plate **50** has a plurality of light-exit regions **502**, and each light-exit region **502** can be, for example, a symbol/character. The light-exit regions **502** are arranged along the long axis direction X and correspond to the light permeable regions **382** of the main section **38** of the shielding sheet **36**. Each light-exit region **502** of the top plate **50**, each light permeable region **382** of the main section **38** of the shielding sheet **36**, and each sensing region **12** of the circuit board **10** overlap in the stacking direction Z. In this embodiment, the top plate **50** includes a transparent plate **52** and a bottom layer **54**. For example, the transparent plate **52** can be a glass plate, and the front surface of the transparent plate **52** is an operation surface **522**, and the operation surface **522** is provided for the user to touch. The bottom layer **54** can be a bottom paint, which has a light-shielding effect and

is printed on the backside of the transparent plate **52** to define the shape of the light permeable regions **382**. The bottom layer **54** can be disposed on the main section **38** of the shielding sheet **36** by adhesives. The top plate **50** has a plate edge **504**. The plate edge **504** extends along the long axis direction X and adjacent to the first extension section **40** of the shielding sheet **36**.

(23) Light emitted from each illuminant element **22** enters each light guide plate **34** and then is emitted out from the operation surface **522** through each light permeable region **382** of the shielding sheet **36** and each light-exit region **502** of the top plate **50**. When the user touches the operation surface **522** at a position corresponding to any of the light-exit regions **502** of the top plate **50**, the sensing region **12** of the circuit board **10** under the touched light-exit region **502** will sense the touch operation of the user. Since the light-leaking edge **246** of the spacer **24** is covered by the first extension section **40** of the shielding sheet **36**, the leakage of light can be prevented. Accordingly, the user will not see light that leaks from the plate edge **504** of the top plate **50**. Moreover, since each light guide plate **34** is located in the accommodation hole **26** of the spacer **24**, and adjacent accommodation holes **26** are separated by the spacer rib **28** of the spacer **24**, light from the light guide plate **34** in the accommodation hole **26** will not enter the adjacent accommodation hole **26** to influence light emitted from the adjacent light-exit region **502**.

(24) FIG. **6** illustrates the touch input device **2** in a second embodiment of the invention, which substantially has the same structure as the first embodiment, but different in that the second extension section **42** of the shielding sheet **36** extends to the lower surface **104** of the circuit board **10** to be located right below the illuminant elements **22**. Compared with the first embodiment, in this embodiment, the second extension section **42** has a larger coupling area with the lower surface **104** of the circuit board **10**, that can reduce the possibility of the second extension section **42** warping with respect to the lower surface **104** of the circuit board **10**.

(25) FIG. **7** illustrates the touch input device **3** in a third embodiment of the invention, which substantially has the same structure as the second embodiment, but different in that the second extension section **42** of the shielding sheet **36** extends to the lower surface **104** of the circuit board **10** to be located right below the sensing regions **12**. In this embodiment, the second extension section **42** has a much larger coupling area with the lower surface **104** of the circuit board **10**, so the coupling strength will be much stronger, and the second extension section **42** is less prone to warp with respect to the lower surface **104** of the circuit board **10**.

(26) Moreover, in this embodiment, the second extension section **42** of the shielding sheet **36** can be optionally provided with a plurality of heat dissipation holes **422**. The heat dissipation holes **422** are arranged along the long axis direction X and respectively located right under the illuminant elements **22**. As such, heat from each of the illuminant elements **22** can be transferred to the circuit board **10** and then dissipated through each of the heat dissipation holes **422**.

(27) FIGS. **8** and **9** illustrate the touch input device **4** in a fourth embodiment of the invention, which substantially has the same structure as the first embodiment, but different in that: the reflective layer **60** includes a main reflective section **62**, a first extension section **64**, and a second extension section **66**. The main reflective section **62** is disposed on the upper surface **102** of the circuit board **10**, and the main reflective section **62** has the openings **602** and the through holes **604**. The first extension section **64** is connected to the main reflective section **62**, and the first extension section **64** extends upward along the stacking direction Z. The second extension section **66** of the reflective layer **60** is connected to the first extension section **64** and combined with the top plate **50**. More specifically, the second extension section **66** is combined with the bottom of the top plate **50**. For example, the second extension section **66** is combined with the bottom layer **54** of the top plate **50** by adhesives. In an embodiment, the main reflective section **62** may not be provided with the openings **602**.

(28) The spacer **24** is disposed on the main reflective section **62** of the reflective layer **60**. For example, the spacer **24** is disposed on the upper reflective surface **60***a* of the main reflective section **62** of the reflective layer **60** by adhesives. In the short axis direction Y, each illuminant element **22**

is located between each sensing region **12** of the circuit board **10** and the light-leaking edge **246** of the spacer **24**.
(29) The shielding sheet **36** is constituted by the main section **38** and not provided with the first extension section **40** and the second extension section **42** as the first embodiment. The shielding sheet **36** has a sheet edge **36***a*, and the sheet edge **36***a* corresponds to the light-leaking edge **246** of the spacer **24**. In other words, the sheet edge **36***a* is located above the light-leaking edge **246** in the stacking direction Z. In this embodiment, the transparent substrate **44** at the sheet edge **36***a* is not covered by the absorption layer **48**. The first extension section **64** of the reflective layer **60** covers the light-leaking edge **246** of the spacer **24** and the sheet edge **36***a* of the shielding sheet **36**.
(30) Since the light-leaking edge **246** of the spacer **24** and the sheet edge **36***a* of the shielding sheet **36** are covered by the first extension section **64** of the reflective layer **60**, the leakage of light can be prevented, and the user will not see light leaking from the plate side **504** of the top plate **50**. It is noted that since the transparent substrate **44** of the shielding sheet at the sheet edge **36***a* is not covered by the absorption layer **48**, the first extension section **64** of the reflective layer **60** will reflect light from the transparent substrate **44** at the sheet edge **36***a* back to the light guide plates **34**. Therefore, the amount of light input to the light guide plates **34** can be increased, and the brightness of light from the light-exit regions **502** of the top plate **50** can be correspondingly enhanced.
(31) Although the preferred embodiments of the present invention have been described herein, the above description is merely illustrative. The preferred embodiments disclosed will not limit the scope of the present invention. Further modification of the invention herein disclosed will occur to those skilled in the respective arts and all such modifications are deemed to be within the scope of the invention as defined by the appended claims.

Claims

1. A touch input device, comprising: a circuit board having an upper surface, a lower surface, and a board edge, the upper surface having a plurality of sensing regions arranged along a long axis direction; a plurality of illuminant elements disposed on the upper surface of the circuit board and arranged along the long axis direction; a spacer disposed over the upper surface of the circuit board, the spacer having a top surface, a bottom surface, and a light-leaking edge, the spacer having a plurality of accommodation holes penetrating through the top surface and the bottom surface and respectively corresponding to the plurality of sensing regions, the light-leaking edge corresponding to the board edge of the circuit board, wherein the plurality of illuminant elements extend into the plurality of accommodation holes, respectively; a plurality of light guide plates disposed in the plurality of accommodation holes, respectively; a shielding sheet comprising a main section, a first extension section, and a second extension section, the main section covering the top surface of the spacer and having a plurality of light permeable regions, the light permeable regions arranged along the long axis direction and respectively corresponding to the plurality of light guide plates, the first extension section covering the light-leaking edge of the spacer and the board edge of the circuit board, the second extension section connected to the first extension section and combined with the lower surface of the circuit board; and a top plate disposed on the main section of the shielding sheet, the top plate having a plurality of light-exit regions arranged along the long axis direction and respectively corresponding to the plurality of light permeable regions of the main section of the shielding sheet.
2. The touch input device of claim 1, wherein each of the illuminant elements is located between each of the sensing regions of the circuit board and the board edge.
3. The touch input device of claim 2, wherein the circuit board further having two long sides in a short axis direction; each of the two long sides extends along the long axis direction; one of the two long sides of the circuit board closer to the plurality of illuminant elements constitutes the board

edge.
4. The touch input device of claim 3, wherein the spacer further having a first spacer section and a second spacer section in the short axis direction; the first spacer section has the accommodation holes; the second spacer section has the light-leaking edge; the second extension section of the shielding sheet extends to the lower surface of the circuit board to be located right below the second spacer section of the spacer.
5. The touch input device of claim 4, wherein the second extension section of the shielding sheet extends to the lower surface of the circuit board to be located right below the plurality of illuminant elements, or the second extension section of the shielding sheet extends to the lower surface of the circuit board to be located right below the plurality of sensing regions.
6. The touch input device of claim 5, wherein the second extension section of the shielding sheet extends to be right below the plurality of sensing regions; the second extension section of the shielding sheet has a plurality of heat dissipation holes arranged along the long axis direction and respectively located right under the plurality of illuminant elements.
7. The touch input device of claim 2, wherein each of the plurality of light guide plates has a receiving portion; each of the plurality of illuminant elements extends into the receiving portion of each of the plurality of light guide plates; each of the plurality of illuminant elements has a side light-emitting surface facing a wall surface of the receiving portion.
8. The touch input device of claim 1, further comprising a reflective layer disposed between the upper surface of the circuit board and the bottom surface of the spacer; the reflective layer has a plurality of through holes arranged along the long axis direction; the plurality of illuminant elements extend through the plurality of through holes, respectively.
9. The touch input device of claim 8, wherein the reflective layer further having a plurality of openings; the plurality of openings are arranged along the long axis direction and respectively correspond to the plurality of accommodation holes and the plurality of sensing regions of the circuit board.
10. The touch input device of claim 1, wherein each of the plurality of light-exit regions of the top plate, each of the plurality of light permeable regions of the main section of the shielding sheet, and each of the plurality of sensing regions of the circuit board overlap in a stacking direction.
11. The touch input device of claim 10, wherein the shielding sheet further comprises a transparent substrate and at least one shielding layer disposed on the transparent substrate; the at least one shielding layer overlaps the plurality of illuminant elements in the stacking direction.
12. A touch input device, comprising: a circuit board having an upper surface and a lower surface, the upper surface having a plurality of sensing regions arranged along a long axis direction; a plurality of illuminant elements disposed on the upper surface of the circuit board and arranged along the long axis direction; a reflective layer comprising a main reflective section, a first extension section, and a second extension section, wherein the main reflective section is disposed on the upper surface of the circuit board and has a plurality of through holes, the plurality of through holes are arranged along the long axis direction, and the plurality of illuminant elements extend through the plurality of through holes, respectively; a spacer disposed over the main reflective section of the reflective layer, the spacer having a top surface, a bottom surface, and a light-leaking edge, the spacer having a plurality of accommodation holes penetrating through the top surface and the bottom surface, the plurality of accommodation holes arranged along the long axis direction and respectively corresponding to the plurality of sensing regions and the plurality of through holes, wherein the plurality of illuminant elements extend into the plurality of accommodation holes, respectively; a plurality of light guide plates disposed in the plurality of accommodation holes of the spacer, respectively; a shielding sheet covering the top surface of the spacer, the shielding sheet having a sheet edge and a plurality of light permeable regions, the sheet edge corresponding to the light-leaking edge of the spacer, the plurality of light permeable regions arranged along the long axis direction and respectively corresponding to the plurality of light guide

plates; and a top plate disposed on the shielding sheet, the top plate having a plurality of light-exit regions arranged along the long axis direction and respectively corresponding to the plurality of light permeable regions of the shielding sheet, wherein the first extension section of the reflective layer covers the light-leaking edge of the spacer and the sheet edge of the shielding sheet; the second extension section of the reflective layer is connected to the first extension section and combined with the top plate.

13. The touch input device of claim 12, wherein the main reflective section has a plurality of openings; the plurality of openings are arranged along the long axis direction and respectively correspond to the plurality of accommodation holes and the plurality of sensing regions of the circuit board.

14. The touch input device of claim 12, wherein the second extension section of the reflective layer is combined with a bottom of the top plate.

15. The touch input device of claim 12, wherein each of the plurality of illuminant elements is located between each of the plurality of sensing regions of the circuit board and the light-leaking edge of the spacer.

16. The touch input device of claim 15, wherein the spacer further having two long sides opposite to each other in a short axis direction; each of the two long sides extends along the long axis direction; one of the two long sides closer to the plurality of illuminant elements constitutes the light-leaking edge.

17. The touch input device of claim 15, wherein each of the plurality of light guide plates has a receiving portion; each of the plurality of illuminant elements extends into the receiving portion of each of the plurality of light guide plates; each of the plurality of illuminant elements has a side light-emitting surface facing a wall surface of the receiving portion.

18. The touch input device of claim 12, wherein each of the plurality of light-exit regions of the top plate, each of the plurality of light permeable regions of a main section of the shielding sheet, and each of the plurality of sensing regions of the circuit board overlap in a stacking direction.

19. The touch input device of claim 18, wherein the shielding sheet further comprises a transparent substrate and at least one shielding layer disposed on the transparent substrate; the at least one shielding layer overlaps the plurality of illuminant elements in the stacking direction.

20. The touch input device of claim 19, wherein the transparent substrate of the shielding sheet at the sheet edge is not covered by the at least one shielding layer.