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United States Patent	12387886
Kind Code	B2
Date of Patent	August 12, 2025
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Five-way key and display device

Abstract

A five-way key and a display device. A keycap of the five-way key includes a cap body and at least two clamping ribs, where a bottom end of the cap body is provided with an open receiving cavity, and the at least two clamping ribs are arranged on an inner wall of the receiving cavity and are used for clamping a push rod of the five-way key in an interference fit mode. According to the embodiments, the keycap is tightly connected with the push rod of the five-way key in an interference fit mode, so that a user can flexibly and accurately operate the five-way key, the problem complex assembly of existing five-way keys is avoided, and the defective rate is reduced.

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Appl. No.:	18/264637
Filed (or PCT Filed):	September 14, 2022
PCT No.:	PCT/CN2022/118691
PCT Pub. No.:	WO2024/055189
PCT Pub. Date:	March 21, 2024

Prior Publication Data

Document Identifier	Publication Date
US 20250029798 A1	Jan. 23, 2025

Publication Classification

Int. Cl.: H01H13/14 (20060101); **G06F3/02** (20060101)

U.S. Cl.:

CPC H01H13/14 (20130101); **G06F3/0202** (20130101);

Field of Classification Search

CPC: H01H (13/14); H01H (21/22); H01H (21/24); H01H (25/04); H01H (25/041); H01H (2025/048); H01H (2221/012); G06F (3/0202); G06F (3/02)

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Background/Summary

TECHNICAL FIELD

(1) The application relates to the technical field of five-way keys, in particular to a five-way key and a display device.

BACKGROUND

(2) Computers, liquid crystal displays, mobile phones and similar products, such as direction controllers of game machines and mobile phone rollers are developing towards a function concentration direction, which features integration of multiple operation functions on one function key. Five-way keys are widely used in mobile phones, computers, liquid crystal displays and other electronic devices because of they are convenient and flexible to operate and occupy a small space.

(3) A keycap of an existing five-way key is fixed on a push rod, and the push rod and the keycap are fixed in such a way that glue undergoes a polyaddition chemical reaction under the catalysis of trace water in the air to realize bonding. The existing five-way key has the disadvantages that the

assembly process is complex, the defective rate and cost are high, the keycap is poor in universality, and the keycap cannot be replaced when damaged.

(4) The content in the background art is only the technology known to the inventor, and does not represent the prior art in this field.

SUMMARY

(5) The application aims to provide a five-way key and a display device, so as to overcome the disadvantages of an existing five-way key that the assembly process is complex, the defective rate and cost are high, a keycap is poor in universality, and the keycap cannot be replaced when damaged.

(6) According to one aspect of the application, a five-way key is provided. A five-way key comprising a keycap, wherein the keycap comprises a cap body and at least two clamping ribs, wherein a bottom end of the cap body is provided with an open receiving cavity, and the at least two clamping ribs are arranged on an inner wall of the receiving cavity and are used for clamping a push rod of the five-way key in an interference fit manner.

(7) According to some embodiments, the cap body and the at least two clamping ribs are integrally formed.

(8) According to some embodiments, the at least two clamping ribs comprise two pairs of clamping ribs, wherein the clamping ribs are distributed on the inner wall of the receiving cavity with a 90° angle between adjacent clamping ribs.

(9) According to some embodiments, the at least two clamping ribs comprise straight clamping ribs with clamping surfaces, wherein a normal of the clamping surface points to an axial center along a radial direction of the receiving cavity.

(10) According to some embodiments, an arc-shaped elastic arm is arranged between the straight clamping ribs.

(11) According to some embodiments, the straight clamping ribs are slightly deformed and the arc-shaped elastic arm is deformed outward, so that the push rod of the five-way key is sandwiched between the straight clamping ribs.

(12) According to some embodiments, the at least two clamping ribs comprise oblique clamping ribs inclined clockwise in a circumferential direction of the receiving cavity.

(13) According to some embodiments, the oblique clamping ribs are slightly deformed in the inclined direction and the arc-shaped elastic arm is deformed outward, so that the push rod of the five-way key is sandwiched between the oblique clamping ribs.

(14) According to some embodiments, the oblique clamping ribs are inclined clockwise by 45°-60° in the circumferential direction of the receiving cavity.

(15) According to some embodiments, an open end of the receiving cavity is provided with a chamfer for the push rod of the five-way key to enter the receiving cavity.

(16) According to one aspect of the application, a display device is provided, comprising the five-way key as described above.

(17) According to the five-way key and the display device, the straight clamping ribs or oblique clamping ribs are arranged on the inner wall of the receiving cavity of the keycap, allowing the push rod of the five-way key to be received in the receiving cavity of the keycap in an interference fit manner, so that the assembly process of the five-way key is simple, the processing and assembly cost is reduced, and the yield is improved; besides, the universality of the keycap of the five-way key is good, and the keycap can be replaced when damaged.

(18) For a better understanding of the features and technical content of the application, please refer to the following detailed description and drawings of the application, but the description and drawings are only used to illustrate the application, but do not limit the scope of protection of the application in any way.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) The implementations of the invention will be described in detail with reference to the accompanying drawings. Here, the drawings that form a part of the disclosure are used to provide a further understanding of the disclosure. The illustrative embodiments of the disclosure and their description are used to explain the disclosure, and do not constitute an improper limitation of the disclosure. In the drawings:

(2) FIG. 1 shows a structural diagram of a five-way key after assembly according to an exemplary embodiment of the application.

(3) FIG. 2 shows a structural diagram of a keycap according to an exemplary embodiment of the application.

(4) FIG. 3 shows a structural diagram of a keycap with straight clamping ribs according to an exemplary embodiment of the application.

(5) FIG. 4 shows a sectional view of a keycap with straight clamping ribs according to an exemplary embodiment of the application.

(6) FIG. 5 shows a diagram of an assembled structure of a keycap with straight clamping ribs and a push rod according to an exemplary embodiment of the application.

(7) FIG. 6 shows a structural diagram of a keycap with oblique clamping ribs according to an exemplary embodiment of the application.

(8) FIG. 7 shows a sectional view of a keycap with oblique clamping ribs according to an exemplary embodiment of the application.

(9) FIG. 8 shows a diagram of an assembled structure of a keycap with oblique clamping ribs and a push rod according to an exemplary embodiment of the application.

DETAILED DESCRIPTION OF EMBODIMENTS

(10) Only some exemplary embodiments are briefly described below. As those skilled in the art can realize that the described embodiments can be modified in various different ways without departing from the spirit or scope of the invention. Therefore, the drawings and description are to be regarded as illustrative rather than restrictive in nature.

(11) In the description of the invention, it should be understood that directional or positional relationships indicated by the terms such as “center”, “longitudinal”, “transverse”, “length”, “width”, “thickness”, “upper”, “lower”, “front”, “rear”, “left”, “right”, “vertical”, “horizontal”, “top”, “bottom”, “inner”, “outer”, “clockwise” and “counterclockwise” are based on the directional or positional relationships shown in the drawings, which are only for the convenience of describing the invention and simplifying the description, but do not indicate or imply that the referred devices or elements must have a specific orientation or be constructed and operated in a specific orientation, so they cannot be understood as limiting the invention. Further, the terms “first” and “second” are only used for descriptive purposes, and cannot be understood as indicating or implying relative importance or implicitly indicating the number of indicated technical features. Therefore, the features defined with “first” and “second” may include one or more of the features explicitly or implicitly. In the description of this invention, “multiple” means two or more, unless otherwise specifically defined.

(12) In the description of the invention, it should be noted that the terms “install” and “connect” should be understood in a broad sense unless otherwise specified and defined. For example, it can be fixed connection, detachable connection or integrated connection; it can be mechanical connection or electric connection or communication; and it can be direct connection, indirect connection through intermediate media or internal communication of two elements or interaction of two elements. For those of ordinary skill in the art, the specific meaning of the terms mentioned above in the present invention should be construed to specific circumstances.

(13) In the invention, unless otherwise explicitly specified and limited, the first feature being “above” or “below” the second feature may include direct contact between the first and second features, or may also include that the first and second features are not in direct contact but are in contact through other features therebetween. Further, the first feature being “above” the second feature includes that the first feature is directly above and obliquely above the second feature, or simply indicates that the first feature is higher in horizontal height than the second feature. The first feature being “below” the second feature includes that the first feature is directly below and obliquely below the second feature, or simply indicates that the first feature is lower in horizontal height than the second feature.

(14) The following provides many different embodiments or examples for implementing different structures of the present invention. In order to simplify the disclosure of the present invention, components and arrangements of specific examples are described below. Of course, they are only examples and are not intended to limit the present invention. In addition, the present invention may repeat reference numerals and/or reference letters in different examples, and such repetition is for the sake of simplicity and clarity, and does not itself indicate the relationship between the various embodiments and/or arrangements discussed. In addition, the present invention provides examples of various specific processes and materials, but those of ordinary skill in the art can realize the application of other processes and/or the use of other materials.

(15) With the popularization of touch panel technology, keys on a display tend to be replaced by a five-way key, because the original keys on the display can only be used in a simple control interface or multiple keys need to be installed and integrated with software and hardware control. A smarter control interface can be realized by using a five-way key in a display.

(16) At present, five-way keys are generally installed on liquid crystal displays in the market, and a keycap needs to be installed on a push rod of the five-way key. The manufacturing process of the existing keycap is complicated. After being manufactured, the keycap needs to be installed on the push rod, glue needs to be dripped between the keycap and the push rod by a glue dispenser, and then a board is used for fixation. After the glue is preliminarily solidified, the function of the five-way key needs to be tested with the board removed, and after the glue is completely solidified, the hand feeling of the keycap needs to be tested. Due to the limited impact which can be borne by the five-way key, the keycap installed thereon needs to be higher than surrounding parts to achieve a good hand feeling. It can be seen that in the existing technical field of five-way keys, the process of assembling the keycap to the push rod is complicated, the defective rate and cost are high, the keycap is poor in universality, and the keycap cannot be replaced when damaged.

(17) The application aims to solve the problems of the keycap of the existing technical field of five-way keys.

(18) The preferred embodiments of the present invention will be described hereinafter with reference to the accompanying drawings. It should be understood that the preferred embodiments described here are only used to illustrate and explain the present invention, and are not used to limit the application.

(19) FIG. 1 shows a structural diagram of a five-way key after assembly according to an exemplary embodiment of the application. FIG. 2 shows a structural diagram of a keycap according to an exemplary embodiment of the application.

(20) As shown in FIGS. 1-2, according to an exemplary embodiment of the application, the application discloses a five-way key. A keycap **100** of the five-way key comprises a cap body **101** and at least two clamping ribs, wherein a bottom end of the cap body **101** is provided with an open receiving cavity, and the at least two clamping ribs are arranged on an inner wall of the receiving cavity and are used for clamping a push rod **210** of the five-way key **200** in an interference fit manner.

(21) In this application, at least two clamping ribs are arranged on the inner wall of the receiving cavity of the cap body **101**, and a receiving space between the at least two clamping ribs can be

slightly deformed, so that the push rod **210** of the five-way key **200** is inserted between the at least two clamping ribs, and the push rod **210** is sandwiched between the at least two clamping ribs in an interference fit manner through the slight deformation of the at least two clamping ribs. Therefore, the keycap **100** can be firmly fixed on the push rod **210** without glue, and the assembly process of the keycap **100** becomes simpler.

(22) In this application, the at least two clamping ribs may be a pair of clamping ribs, which are oppositely arranged on the inner wall of the receiving cavity of the cap body **101**, or two pairs of clamping ribs which are distributed on the inner wall of the receiving cavity with a 90° angle between adjacent clamping ribs. The number of the at least two clamping ribs is not specifically limited in this application, and can be determined according to the actual requirements of the keycap **100**. In this application, two pairs of clamping ribs are arranged on the inner wall of the receiving cavity of the cap body **101**. Of course, other angles can be formed between adjacent clamping ribs, as long as the same effect of interference fit between the clamping ribs and the push rod as achieved in this application can be realized. In this application, the clamping ribs arranged in pairs can be oppositely arranged on the inner wall of the receiving cavity of the cap body **101**. In addition, the clamping ribs in this application may not be oppositely arranged, and adjacent clamping ribs can be formed in any angle, as long as the clamping ribs and the push rod can achieve interference fit. For example, three clamping ribs can be arranged and distributed on the inner wall of the receiving cavity of the cap body **101** with a 60° angle between adjacent clamping ribs (not shown).

(23) In this application, the shape and size of the cap body **101** of the keycap **100** can be designed according to the requirements of actual products, which is not limited by this application. The existing keycap **100** has poor universality. As the five-way key **200** for different products have different requirements, each product requires a distinct keycap **100**. However, the keycap **100** in this application is universal, and the cap body **101** can be designed in one shape, as long as at least two clamping ribs are provided to realize interference fit with the push rods **210** of the five-way key **200** of different models.

(24) In addition, if the keycap **100** is damaged, the whole five-way key **200** may have to be replaced for an existing product, because it is glued together. However, in this application, the keycap **100** can be removed, so the keycap **100** can be replaced alone, thus reducing the cost of the whole product. Because the cap body **101** of the keycap **100** of the application can be slightly deformed, under the impact of an external force, the impact force can be buffered to protect the internal structure of the five-way key **200**. Moreover, by making the cap body **101** with a slightly deformed material, the hand feeling can also be enhanced.

(25) According to the embodiment of the application, the cap body **101** and the at least two clamping ribs are integrally formed, in other words, the keycap is integrally formed. The keycap **100** in this application can be processed through injection molding or 3D printing by using related product molds, which is not limited by this application, and the processing means can be determined according to the actual needs of the keycap **100**.

(26) The at least two clamping ribs in the application comprise straight clamping ribs **110** and oblique clamping ribs **130**, and the straight clamping ribs **110** or the oblique clamping ribs **130** can penetrate through the receiving cavity of the whole cap body **101**.

(27) FIG. 3 shows a structural diagram of a keycap with straight clamping ribs according to an exemplary embodiment of the application. FIG. 4 shows a sectional view of a keycap with straight clamping ribs according to an exemplary embodiment of the application. FIG. 5 shows a diagram of an assembled structure of a keycap with straight clamping ribs and a push rod according to an exemplary embodiment of the application.

(28) As shown in FIGS. 3-5, according to the embodiment of the application, the at least two clamping ribs comprise straight clamping ribs **110** with clamping surfaces, and a normal of the clamping surface points to an axial center along a radial direction of the receiving cavity. An arc-

shaped elastic arm **120** is arranged between adjacent straight clamping ribs **110**. In this application, two pairs of straight clamping ribs **110** can be oppositely arranged on the inner wall of the receiving cavity of the cap body **101**.

(29) In this application, the two pairs of straight clamping ribs **110** are distributed on the inner wall of the receiving cavity with a 90° angle between adjacent clamping ribs. Of course, the number of pairs of straight clamping ribs **110** is not limited in this application, and can be determined according to actual needs. Alternatively, one pair of straight clamping ribs **110** can be oppositely arranged on the inner wall of the receiving cavity of the cap body **101**. By arranging the arc-shaped elastic arm **120** between the straight clamping ribs **110**, the clamping force of the straight clamping ribs **110** is greater and the elasticity is better.

(30) The arc-shaped elastic arm **120** arches toward the outside of the receiving cavity of the cap body **101**, and the clamping force of the straight clamping ribs **110** can be changed with the arching magnitude. An end of the arc-shaped elastic arm **120** is connected to a side surface of the straight clamping rib **110**, and the side surfaces are two sides adjacent to a surface abutting against the push rod **210**. The clamping force of the straight clamping ribs **110** can be adjusted by changing the radian of the arc-shaped elastic arm **120**. In this application, the tangent of the radian of the end of the arc-shaped elastic arm **120** can be perpendicular to the side surface of the straight clamping rib **110**, or an angle is formed between the tangent of the radian of the end of the arc-shaped elastic arm **120** and the side surface of the straight clamping rib **110**.

(31) When the push rod **210** of the five-way key **200** is inserted between the straight clamping ribs **110**, the straight clamping ribs **110** are slightly deformed and the arc-shaped elastic arm **120** is deformed outward. At this point, the fit size of the receiving cavity of the cap body **101** is the same as the size of the push rod **210**, so that the push rod **210** can be clamped between the straight clamping ribs **110**. Therefore, it is more convenient to assemble and disassemble the keycap **100** and the push rod **210**, and the five-way key **200** can be assembled and disassembled through physical change.

(32) In this application, a bottom of the receiving cavity of the cap body **101** is provided with a boss **140**. When the push rod **210** is inserted into the receiving cavity of the cap body **101**, the boss **140** abuts against the top of the push rod **210**, and the boss **140** play a role in maintaining the embedding depth of the push rod **210** in the receiving cavity, as can be seen in FIGS. 4-5.

(33) In this application, an open end of the receiving cavity on the cap body **101** is provided with a chamfer for guiding the push rod **210** of the five-way key **200** into the receiving cavity, which makes assembly easier.

(34) The material of the keycap **100** can be ABS resin, so that the keycap **100** can be slightly deformed.

(35) FIG. 6 shows a structural diagram of a keycap with oblique clamping ribs according to an exemplary embodiment of the application. FIG. 7 shows a sectional view of a keycap with oblique clamping ribs according to an exemplary embodiment of the application. FIG. 8 shows a diagram of an assembled structure of a keycap with oblique clamping ribs and a push rod according to an exemplary embodiment of the application.

(36) As shown in FIGS. 6-8, according to the embodiment of the application, the at least two clamping ribs comprise oblique clamping ribs **130**, which are inclined clockwise in a circumferential direction of the receiving cavity, and a normal of a clamping surface of the oblique clamping rib **130** points to an axial center along a radial direction of the receiving cavity. In this application, two pairs of oblique clamping ribs **130** can be oppositely arranged on the inner wall of the receiving cavity of the cap body **101**.

(37) An arc-shaped elastic arm **120** can also be arranged between adjacent oblique clamping ribs **130** in this application.

(38) In this application, the two pairs of oblique clamping ribs **130** are distributed on the inner wall of the receiving cavity with a 90° angle between adjacent clamping ribs. Of course, the number of

pairs of oblique clamping ribs **130** is not limited in this application, and can be determined according to actual needs. Alternatively, one pair of oblique clamping ribs **130** can be inclined clockwise and oppositely arranged on the inner wall of the receiving cavity of the cap body **101**. By arranging the arc-shaped elastic arm **120** between the oblique clamping ribs **130**, the clamping force of the oblique clamping ribs **130** is greater and the elasticity is better.

(39) Optionally, the arc-shaped elastic arm **120** arches toward the outside of the receiving cavity of the cap body **101**, and the clamping force of the oblique clamping ribs **130** can be changed with the arching magnitude. An end of the arc-shaped elastic arm **120** is connected to a side surface of the oblique clamping rib **130**, and the side surfaces are two sides adjacent to a surface abutting against the push rod **210**. The clamping force of the oblique clamping ribs **130** can be adjusted by changing the radian of the arc-shaped elastic arm **120**. In this application, the tangent of the radian of the end of the arc-shaped elastic arm **120** can be perpendicular to the inclined side surface of the oblique clamping rib **130**, or an angle is formed between the tangent of the radian of the end of the arc-shaped elastic arm **120** and the inclined side surface of the oblique clamping rib **130**.

(40) When the push rod **210** of the five-way key **200** is inserted between the oblique clamping ribs **130**, the oblique clamping ribs **130** are slightly deformed in the inclined direction and the arc-shaped elastic arm **120** is deformed outward. At this point, the fit size of the receiving cavity of the cap body **101** is the same as the size of the push rod **210**, so that the push rod **210** can be clamped between the oblique clamping ribs **130**. Therefore, it is more convenient to assemble and disassemble the keycap **100** and the push rod **210**, and the five-way key **200** can be assembled and disassembled through physical change.

(41) According to the embodiment of the application, the oblique clamping ribs **130** are inclined clockwise by 45° - 60° in the circumferential direction of the receiving cavity. In this application, when the inclination angle is 60° , the clamping effect of the oblique clamping ribs **130** is better.

(42) In this application, a bottom of the receiving cavity of the cap body **101** is provided with a boss **140**. When the push rod **210** is inserted into the receiving cavity of the cap body **101**, the boss **140** abuts against the top of the push rod **210**, and the role of the boss **140** is to maintain the embedding depth of the push rod **210** in the receiving cavity, as can be seen in FIGS. 7-8.

(43) According to the embodiment of the application, an open end of the receiving cavity on the cap body **101** is provided with a chamfer for guiding the push rod **210** of the five-way key **200** into the receiving cavity, which makes assembly easier.

(44) The material of the keycap **100** can be ABS resin, so that the keycap **100** can be slightly deformed.

(45) According to the five-way key **200** in this application, the keycap **100** is assembled on the push rod **210** of the five-way key **200**, and interference fit is formed between the keycap **100** and the push rod **210**. The push rod **210** of the five-way key **200** in this application can be square or round, so the keycap **100** in this application has good versatility. The five-way key **200** is electrically connected to a PCBA board **300** of a liquid display. The five-way key **200** can be used as a five-way switch of the liquid display, and the operation function of the five-way key **200** can be realized by changing the direction of the push rod **210**.

(46) According to an exemplary embodiment of the application, a display device is disclosed, comprising the keycap **100** as described above. Based on the above description of the keycap **100** of the application, the keycap **100** of the application can be applied to the display device and keys thereof, so as to solve the problem of complicated assembly process of existing keys, reduce the cost, improve the yield, improve the universality of the keycap **100** of the key, and make the keycap **100** replaceable in case of damage.

(47) Finally, it should be noted that the above are only exemplary embodiments of the disclosure, and not intended to limit the disclosure. Although the disclosure is described in detail with reference to the foregoing embodiments, it is still possible for those skilled in the art to modify the technical schemes of the foregoing embodiments or replace some of the technical features therein

equivalently. Any modification, equivalent substitution, improvement, etc. made within the spirit and principle of the disclosure should be included in the protection scope of the disclosure.

Claims

1. A five-way key, comprising: a keycap, wherein the keycap comprises: a cap body, with a bottom end of the cap body being provided with an open receiving cavity; and at least two clamping ribs arranged on an inner wall of the receiving cavity and used for clamping a push rod of the five-way key in an interference fit manner; wherein the at least two clamping ribs comprise straight clamping ribs with clamping surfaces, wherein a normal of the clamping surface points to an axial center along a radial direction of the receiving cavity; and an arc-shaped elastic arm is arranged between the straight clamping ribs.
2. The five-way key according to claim 1, wherein the cap body and the at least two clamping ribs are integrally formed.
3. The five-way key according to claim 1, wherein the at least two clamping ribs comprise: two pairs of clamping ribs, wherein the clamping ribs are distributed on the inner wall of the receiving cavity with a 90° angle between adjacent clamping ribs.
4. The five-way key according to claim 1, wherein the straight clamping ribs are slightly deformed and the arc-shaped elastic arm is deformed outward, so that the push rod of the five-way key is sandwiched between the straight clamping ribs.
5. The five-way key according to claim 1, wherein the at least two clamping ribs comprise: oblique clamping ribs inclined clockwise in a circumferential direction of the receiving cavity.
6. The five-way key according to claim 5, wherein the oblique clamping ribs are slightly deformed in the inclined direction and the arc-shaped elastic arm is deformed outward, so that the push rod of the five-way key is sandwiched between the oblique clamping ribs.
7. The five-way key according to claim 5, wherein the oblique clamping ribs are inclined clockwise by 45°-60° in the circumferential direction of the receiving cavity.
8. The five-way key according to claim 1, wherein an open end of the receiving cavity is provided with a chamfer for the push rod of the five-way key to enter the receiving cavity.
9. A display device, wherein the display device comprises a five-way key comprising a keycap, and the keycap comprises: a cap body, with a bottom end of the cap body being provided with an open receiving cavity; and at least two clamping ribs arranged on an inner wall of the receiving cavity and used for clamping a push rod of the five-way key in an interference fit manner, wherein the at least two clamping ribs comprise straight clamping ribs with clamping surfaces, wherein a normal of the clamping surface points to an axial center along a radial direction of the receiving cavity; and an arc-shaped elastic arm is arranged between the straight clamping ribs.
10. The display device according to claim 9, wherein the cap body and the at least two clamping ribs are integrally formed.
11. The display device according to claim 9, wherein the at least two clamping ribs comprise: two pairs of clamping ribs, wherein the clamping ribs are distributed on the inner wall of the receiving cavity with a 90° angle between adjacent clamping ribs.
12. The display device according to claim 9, wherein the straight clamping ribs are slightly deformed, and the arc-shaped elastic arm is deformed outward, so that the push rod of the five-way key is sandwiched between the straight clamping ribs.
13. The display device according to claim 9, wherein the at least two clamping ribs comprise: oblique clamping ribs inclined clockwise in a circumferential direction of the receiving cavity.
14. The display device according to claim 13, wherein the oblique clamping ribs are slightly deformed in the inclined direction and the arc-shaped elastic arm is deformed outward, so that the push rod of the five-way key is sandwiched between the oblique clamping ribs.
15. The display device according to claim 13, wherein the oblique clamping ribs are inclined

clockwise by 45° - 60° in the circumferential direction of the receiving cavity.

16. The display device according to claim 9, wherein an open end of the receiving cavity is provided with a chamfer for the push rod of the five-way key to enter the receiving cavity.
