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(54) **SLANTED TYPE CARD EDGE CONNECTOR ASSEMBLY**

(71) Applicant: **FOXCONN INTERCONNECT TECHNOLOGY LIMITED**, Grand Cayman (KY)

(72) Inventors: **ZHUANG-XING LI**, Kunshan (CN); **WEN-JUN TANG**, Kunshan (CN); **XUE-WU BU**, Kunshan (CN)

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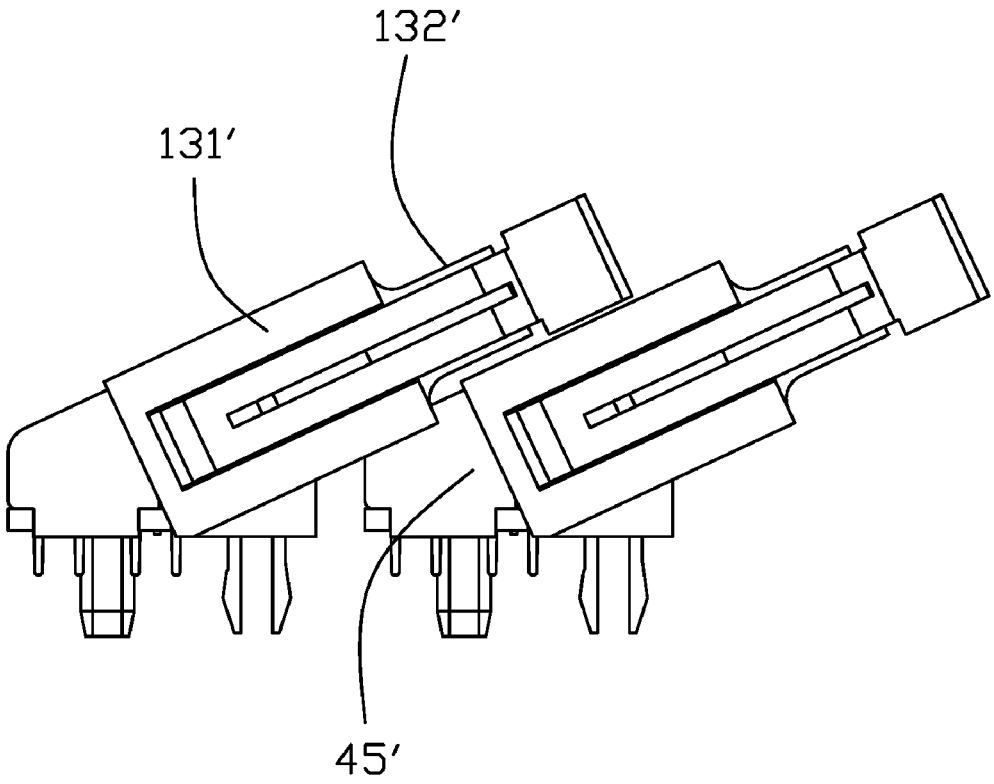
(52) **U.S. Cl.**

CPC ***H01R 12/721*** (2013.01); ***H01R 12/716*** (2013.01); *H01R 12/57* (2013.01); ***H01R 12/83*** (2013.01); ***H01R 12/7029*** (2013.01); ***H01R 12/724*** (2013.01)

(57) **ABSTRACT**

A card edge connector includes an insulative housing with a pair of opposite side walls extending along a longitudinal direction with a central slot therebetween in the transverse direction perpendicular to the longitudinal direction. A pair of towers are located at two opposite ends of the housing in the longitudinal direction. The housing is essentially obliquely mounted upon a printed circuit board. Each tower has a lower/first part and an upper/second part in the vertical direction perpendicular to the longitudinal direction and the transverse direction. The width dimension in the transverse direction of the upper part is smaller than that of the lower part.



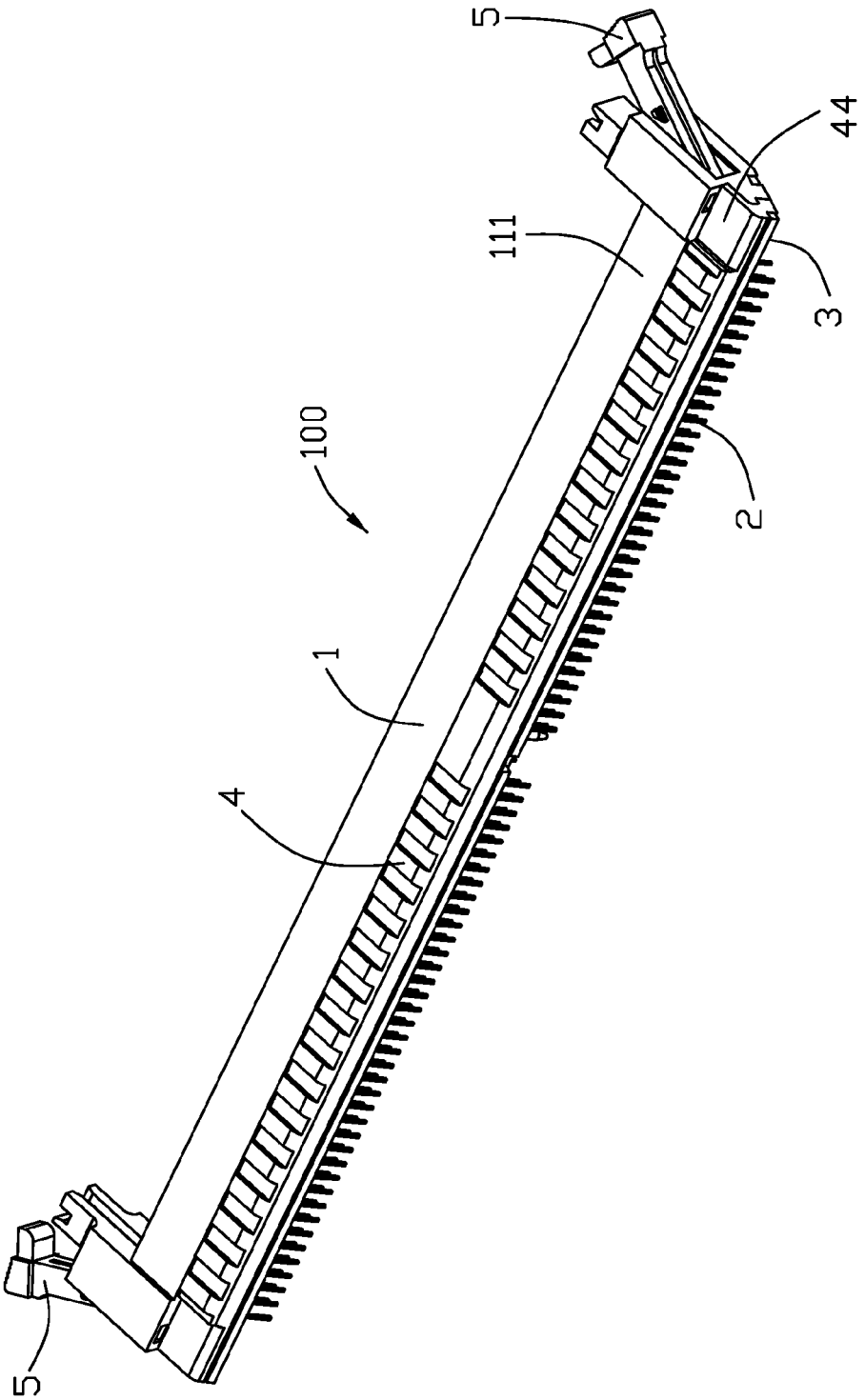


FIG. 1

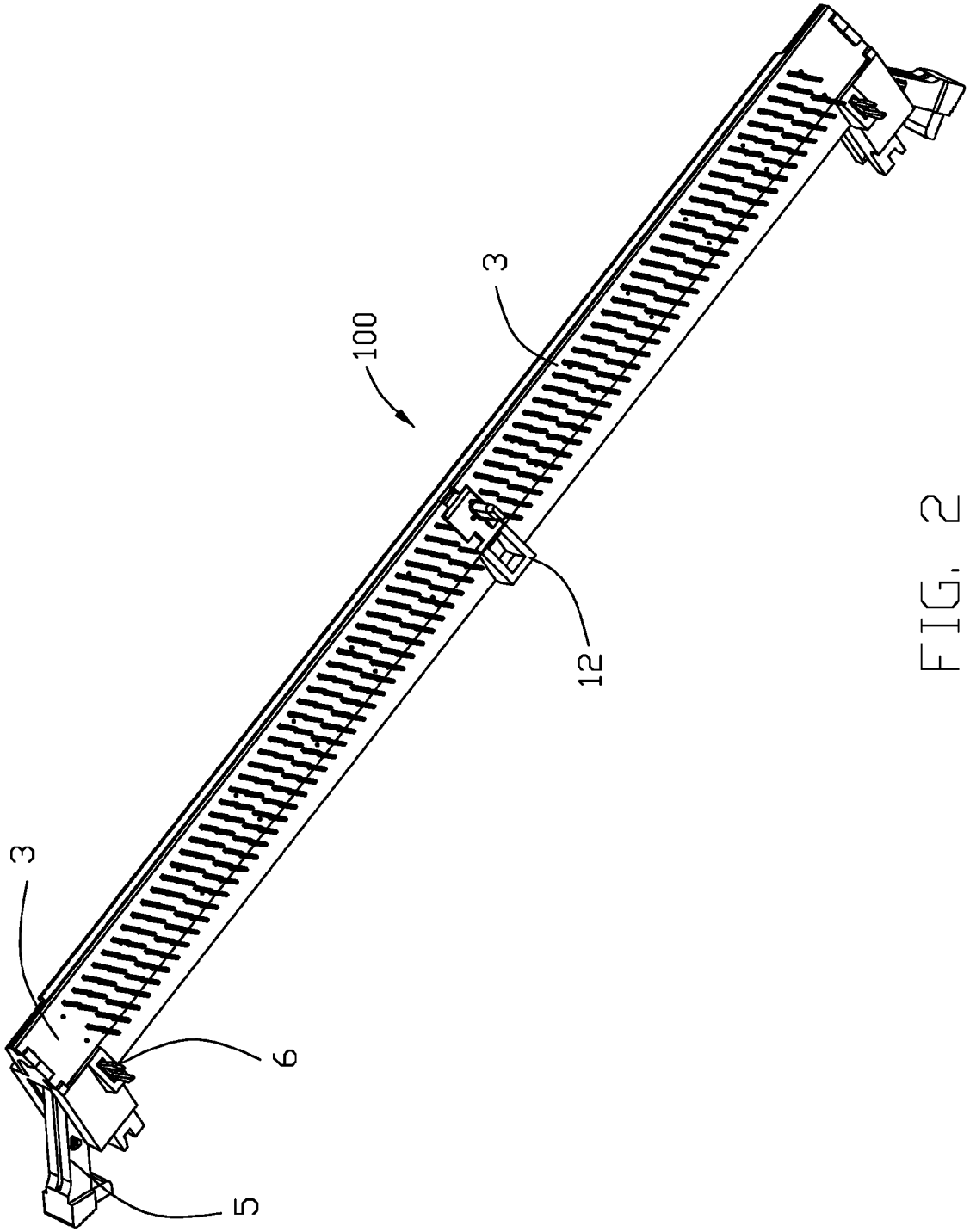


FIG. 2

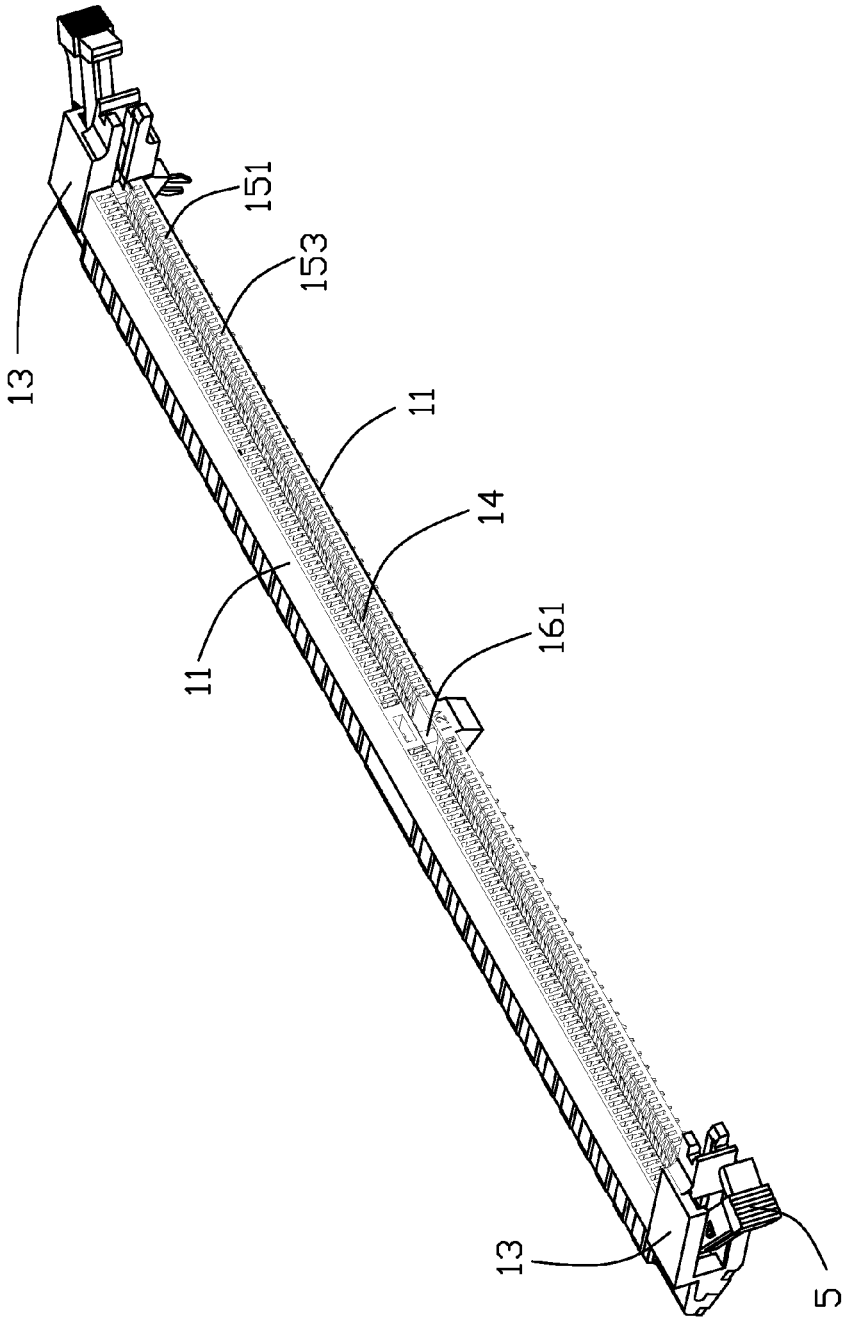


FIG. 3

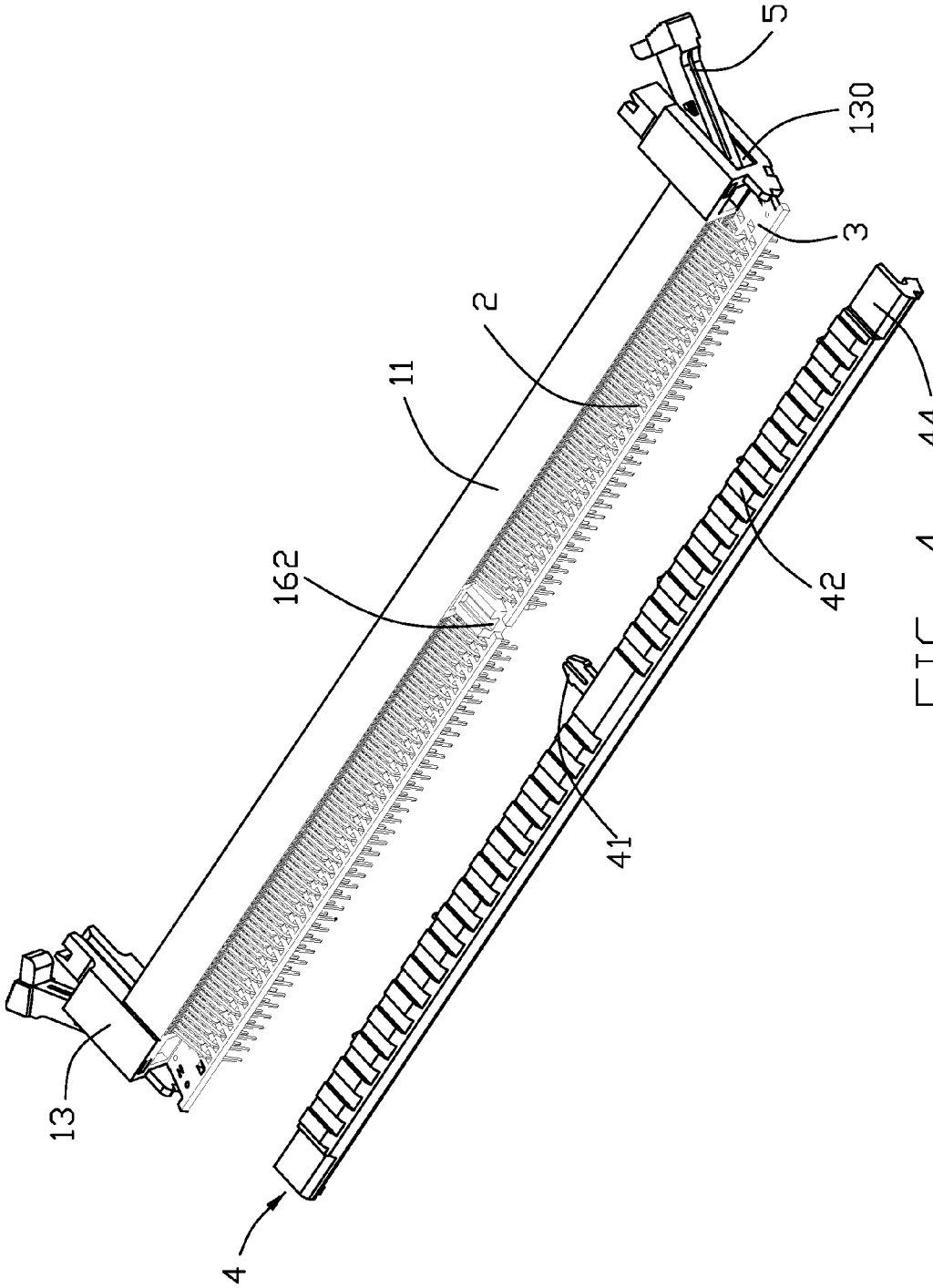


FIG. 4

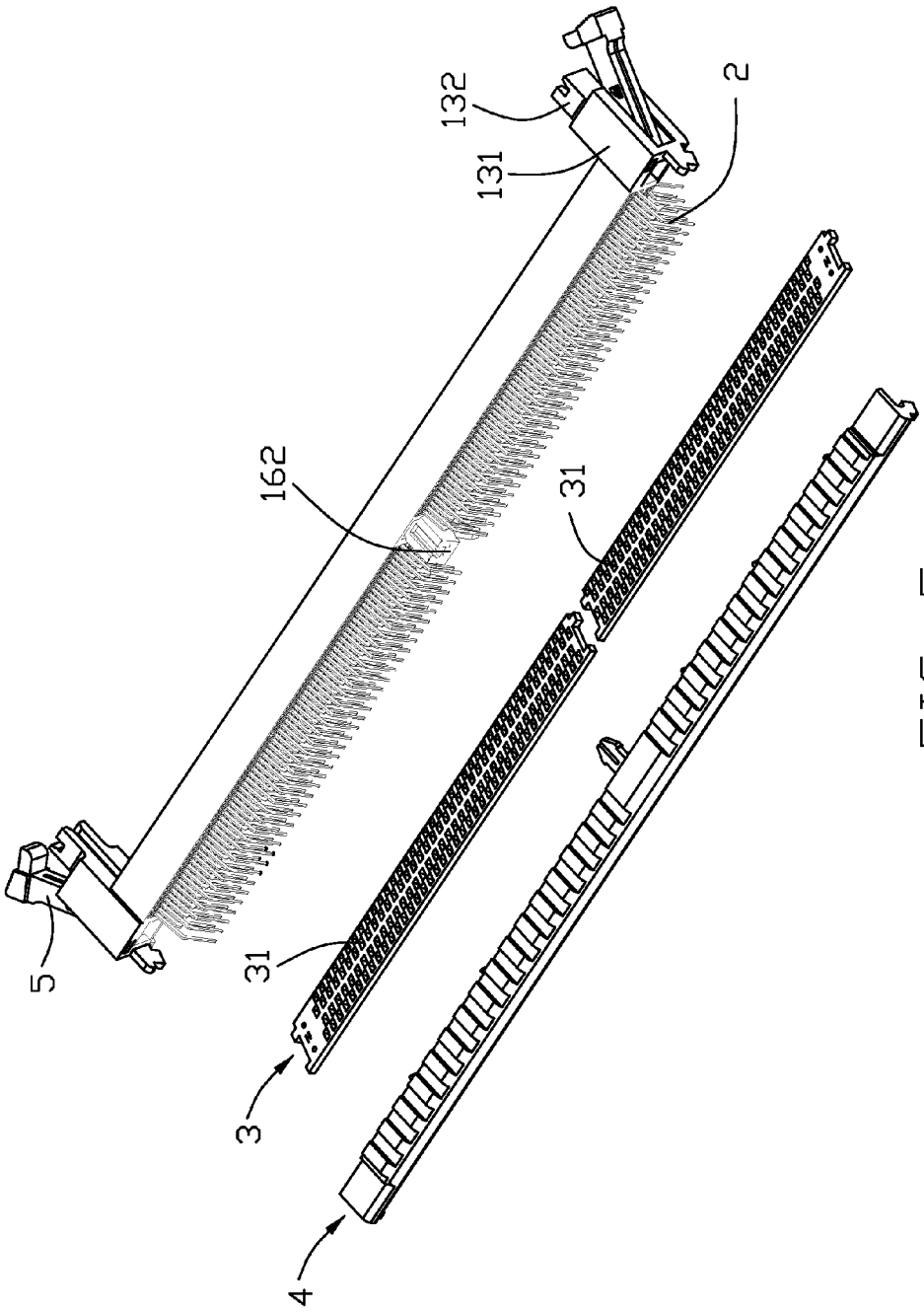


FIG. 5

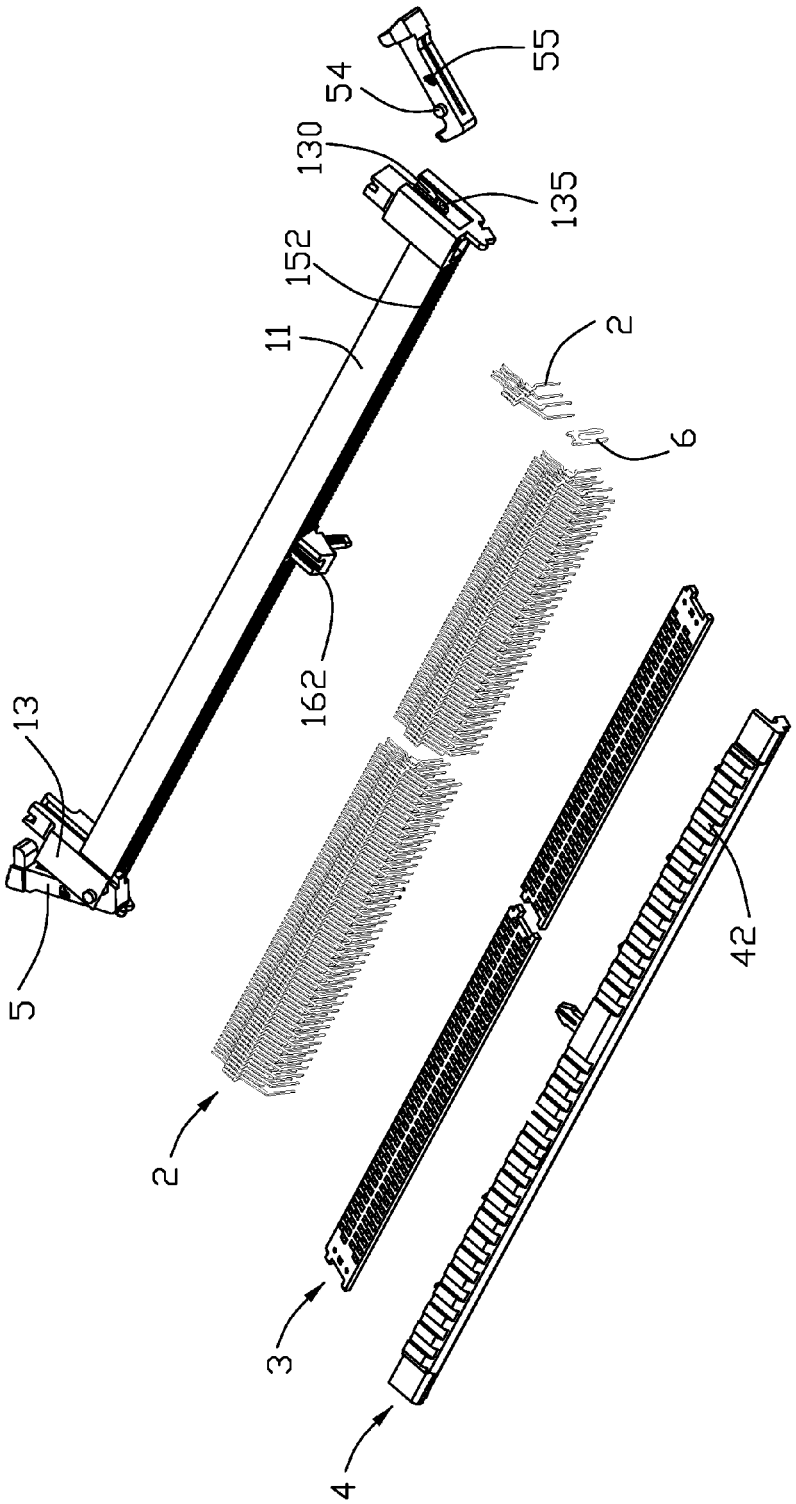


FIG. 6

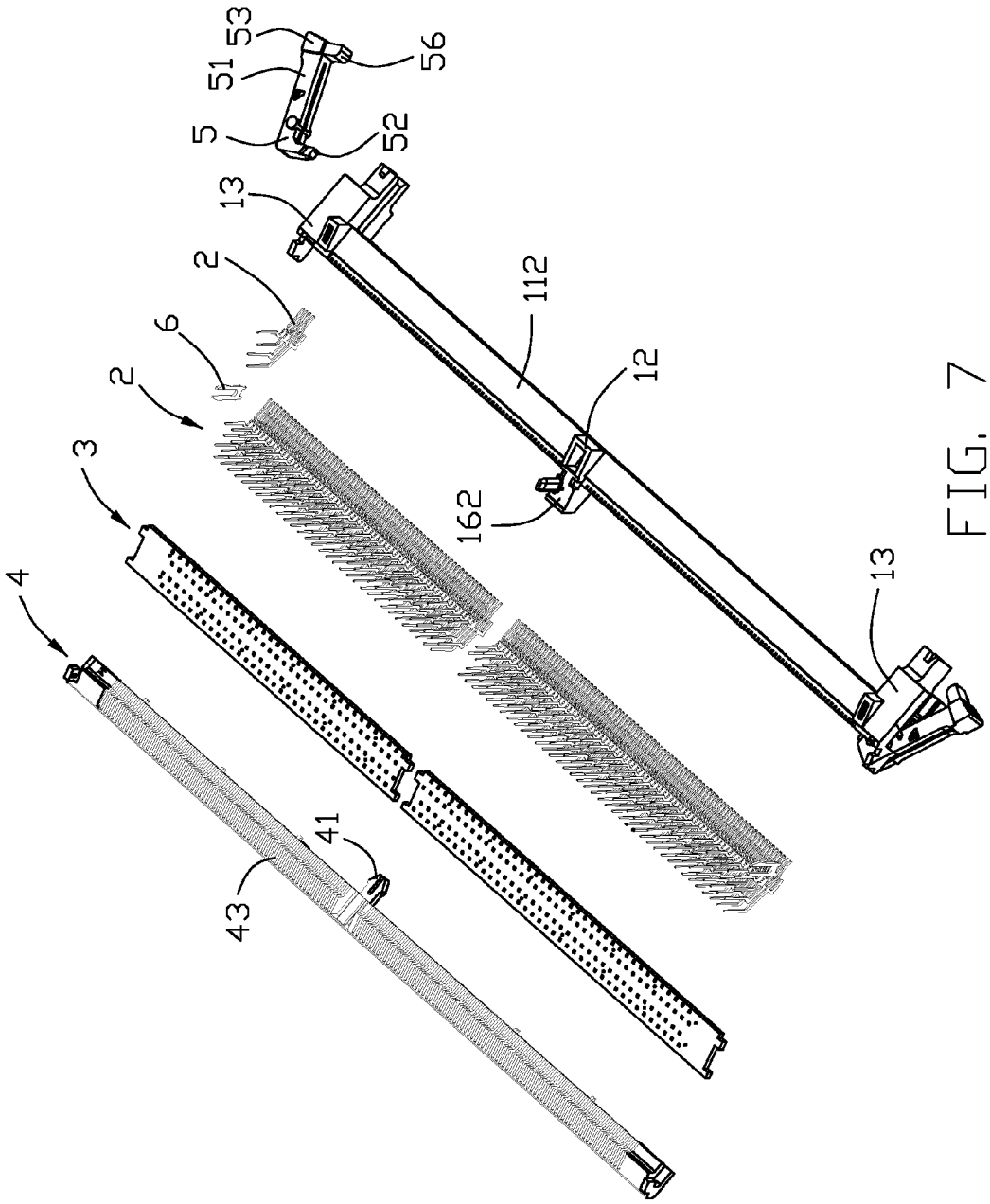


FIG. 7

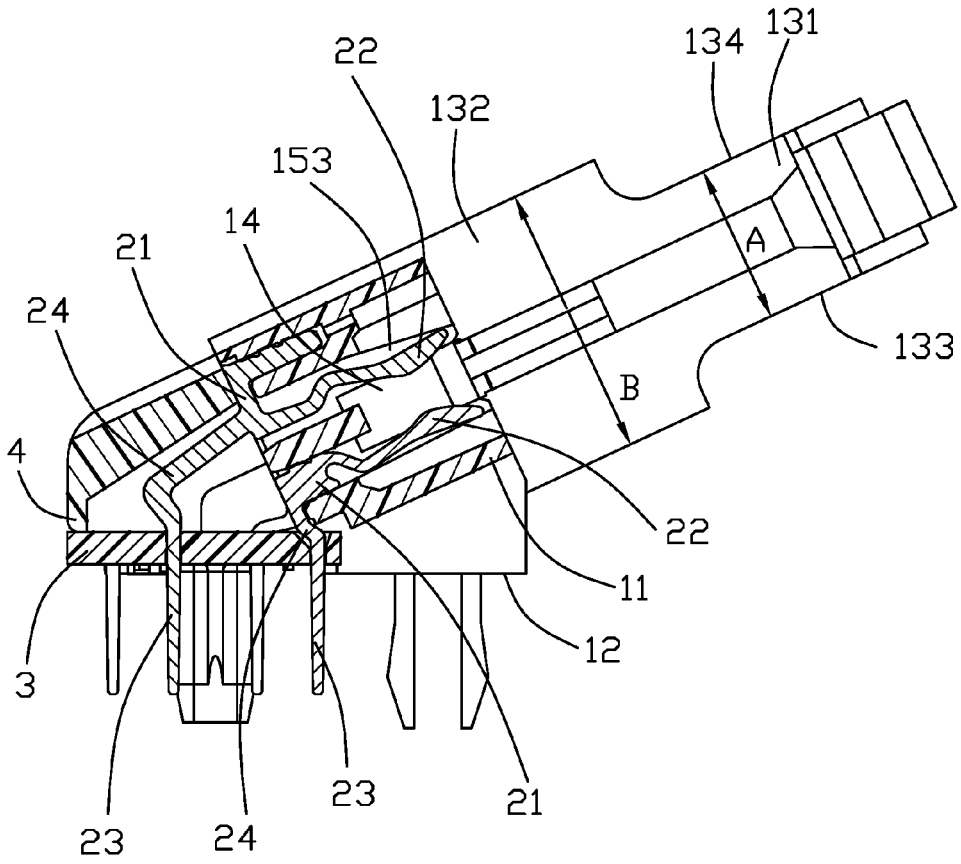


FIG. 8

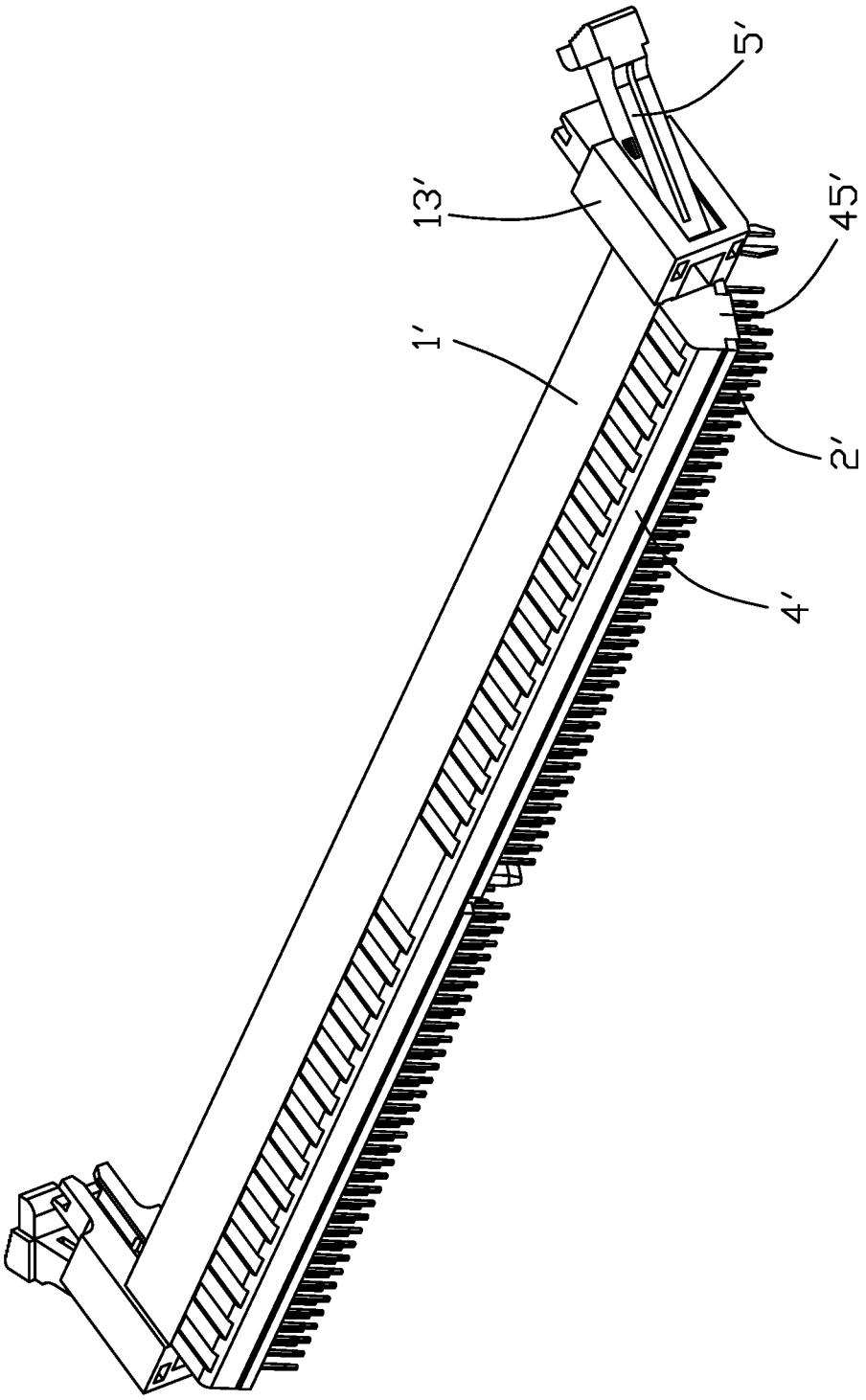


FIG. 9

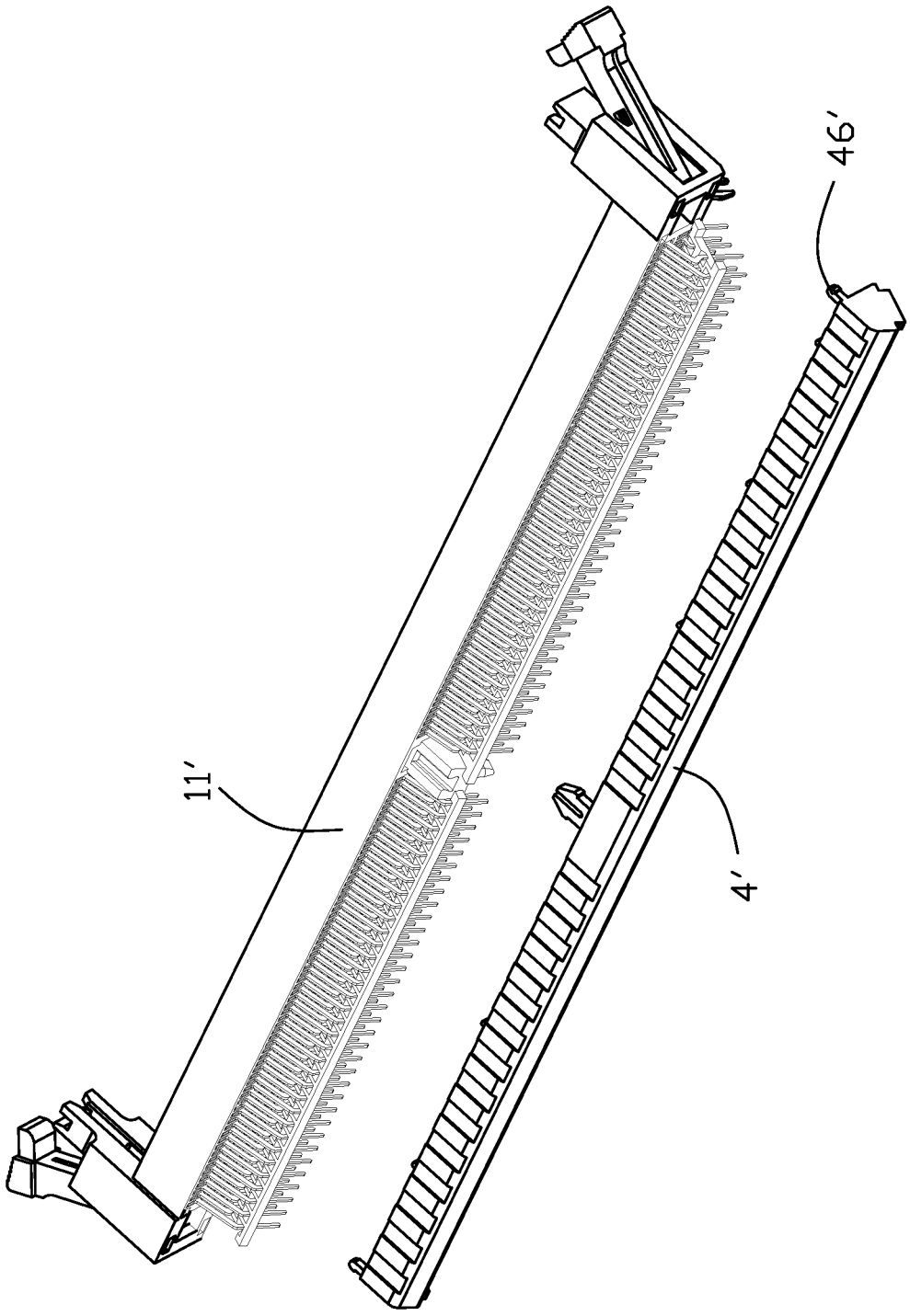


FIG. 10

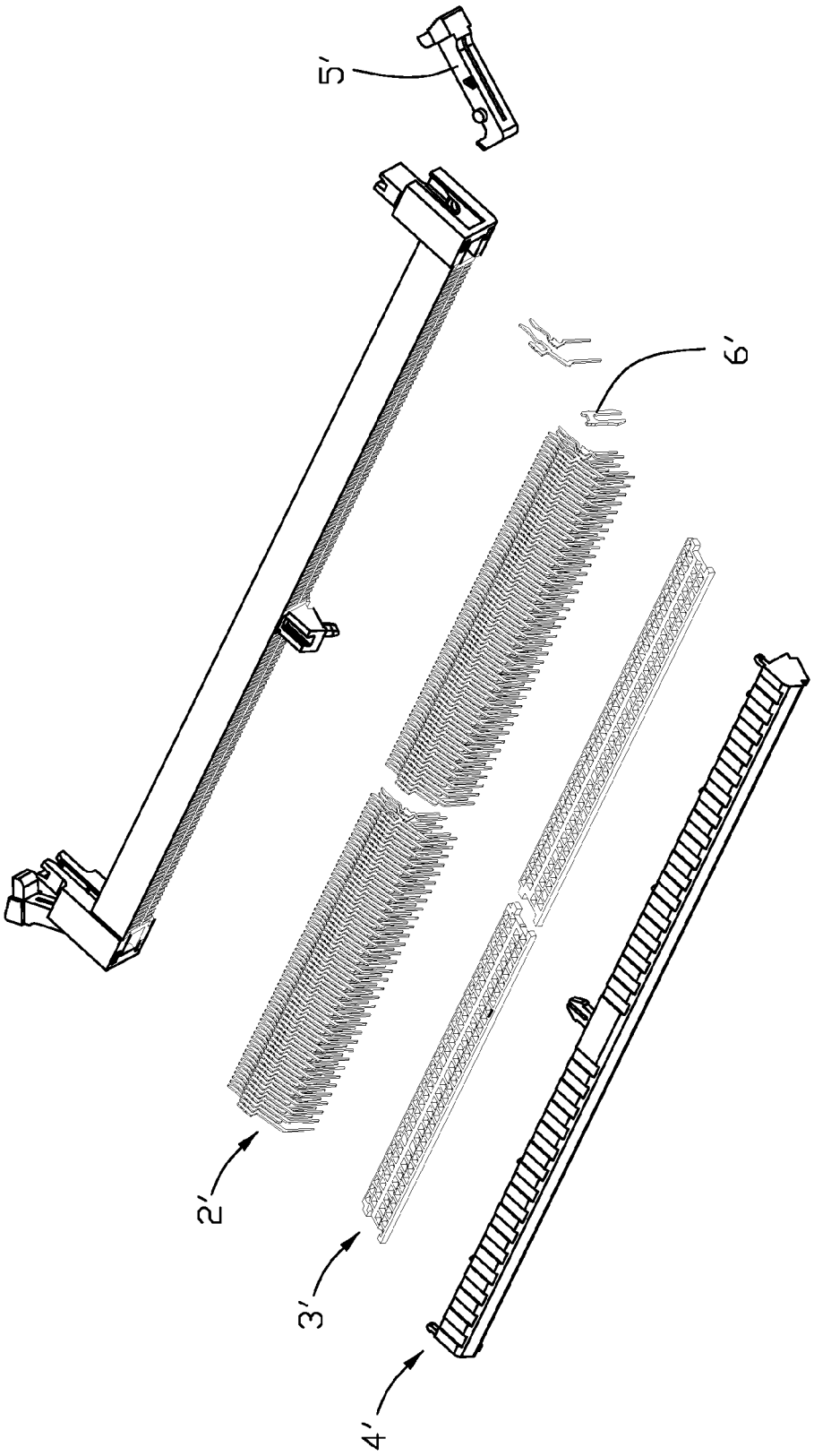


FIG. 11

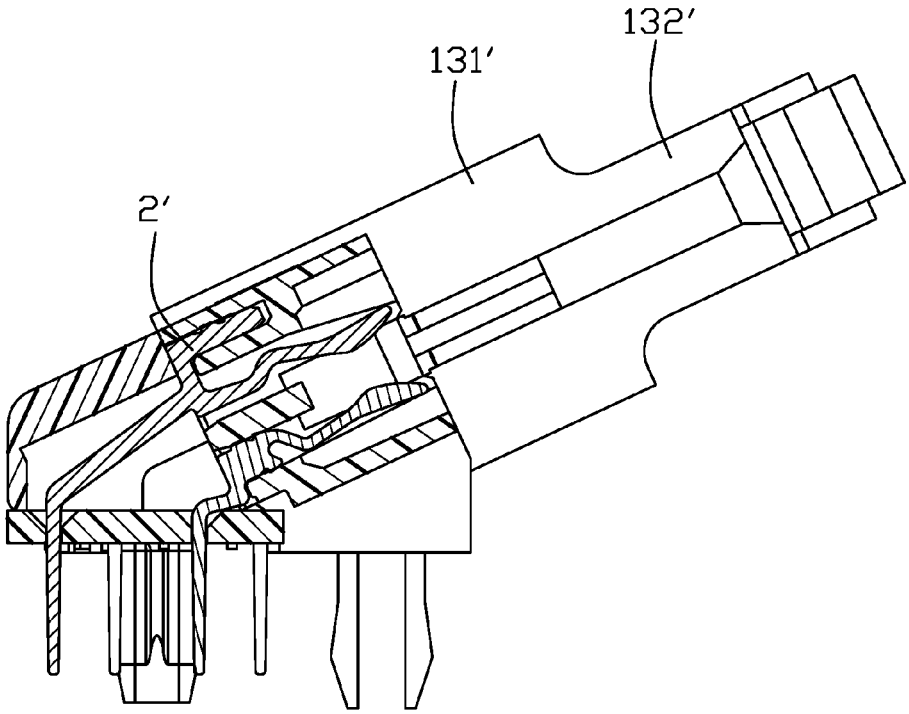


FIG. 12

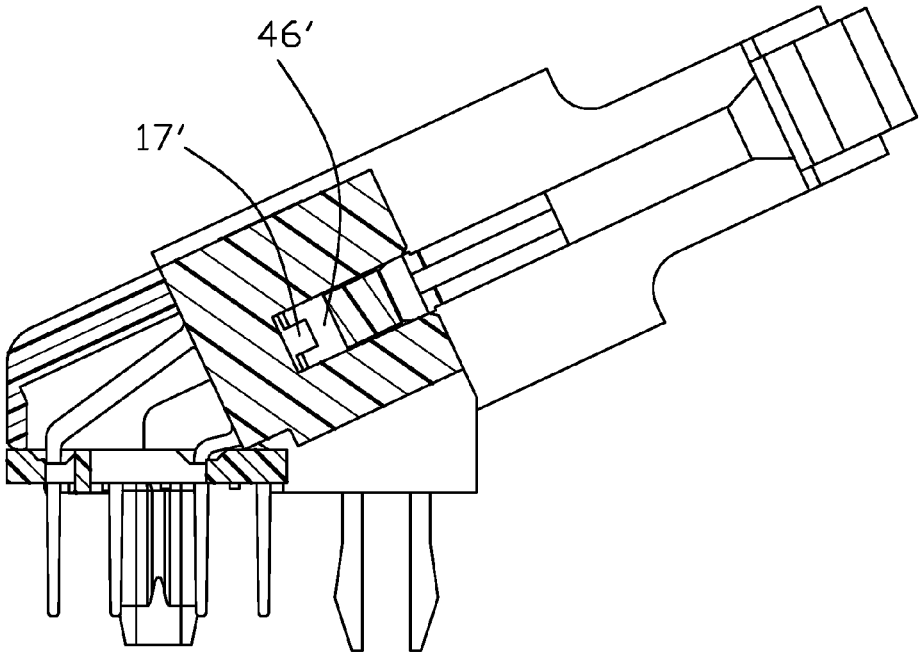


FIG. 13

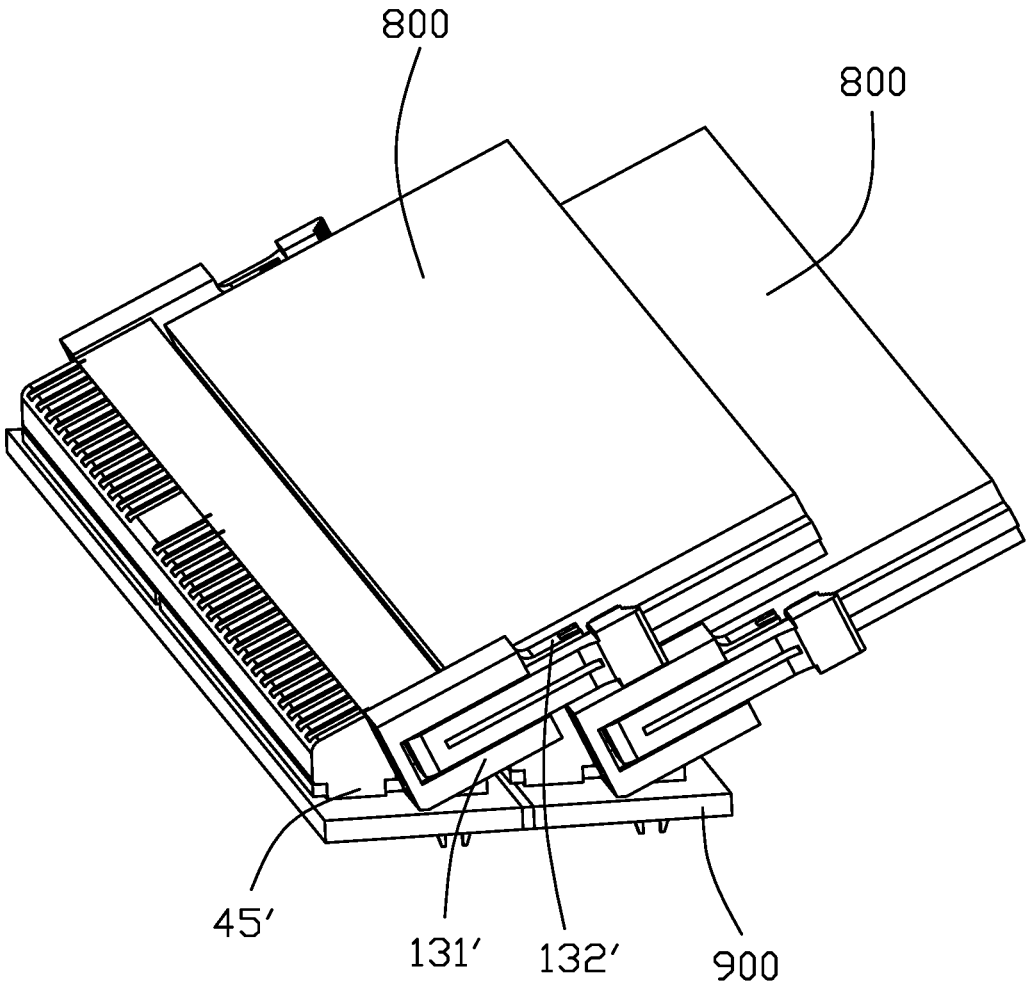


FIG. 14

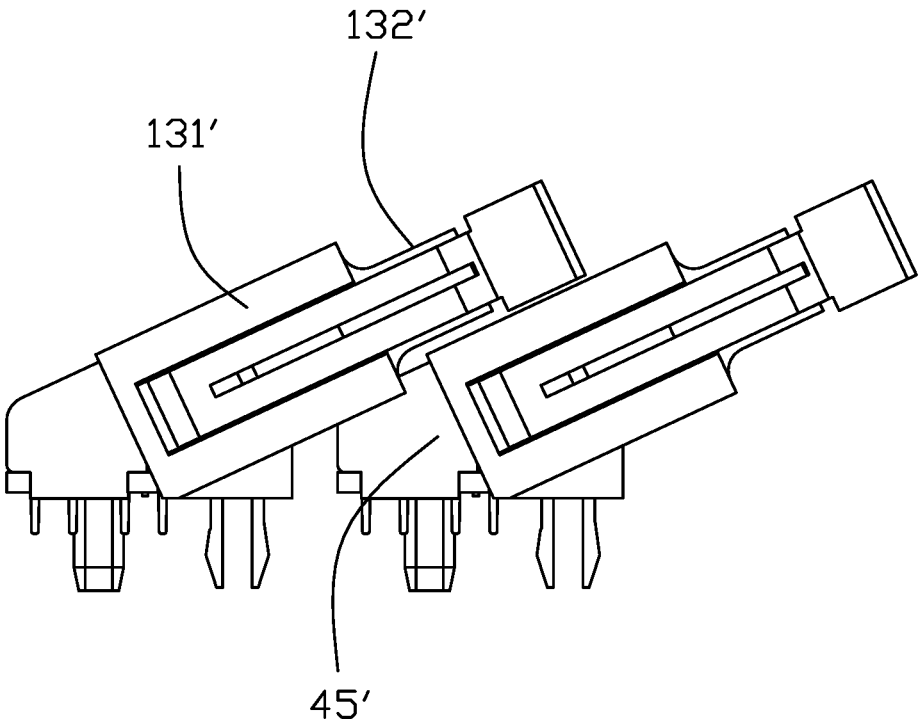


FIG. 15

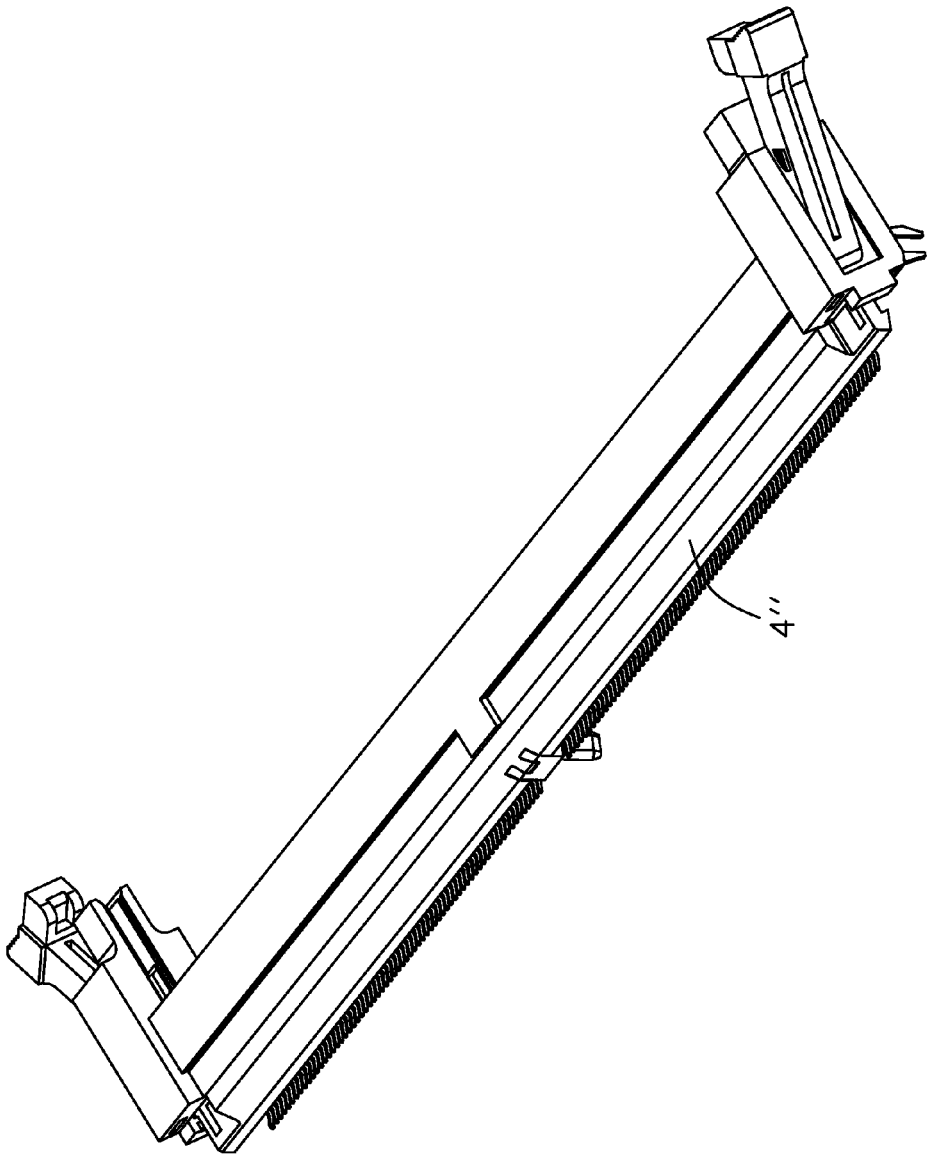


FIG. 16

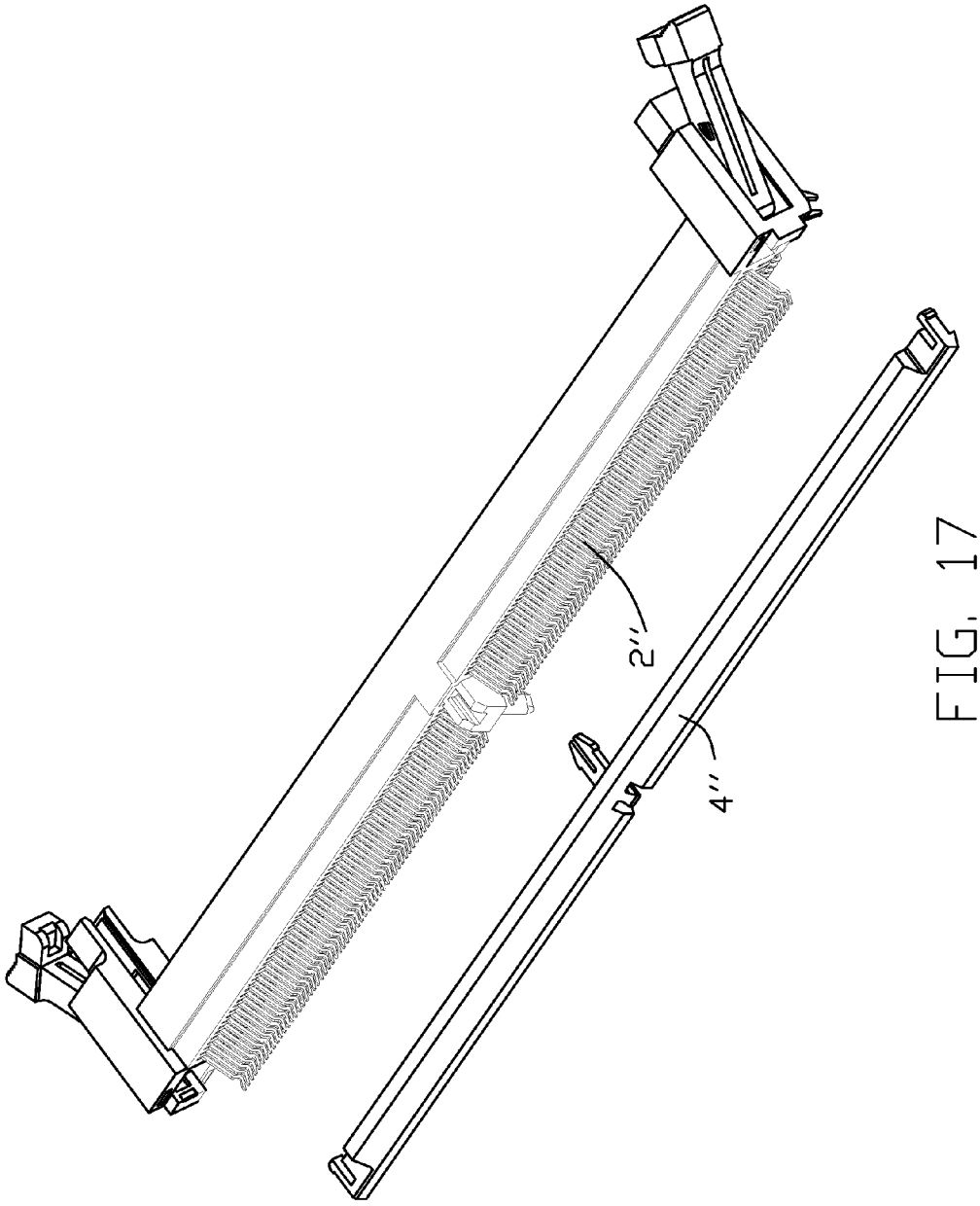


FIG. 17

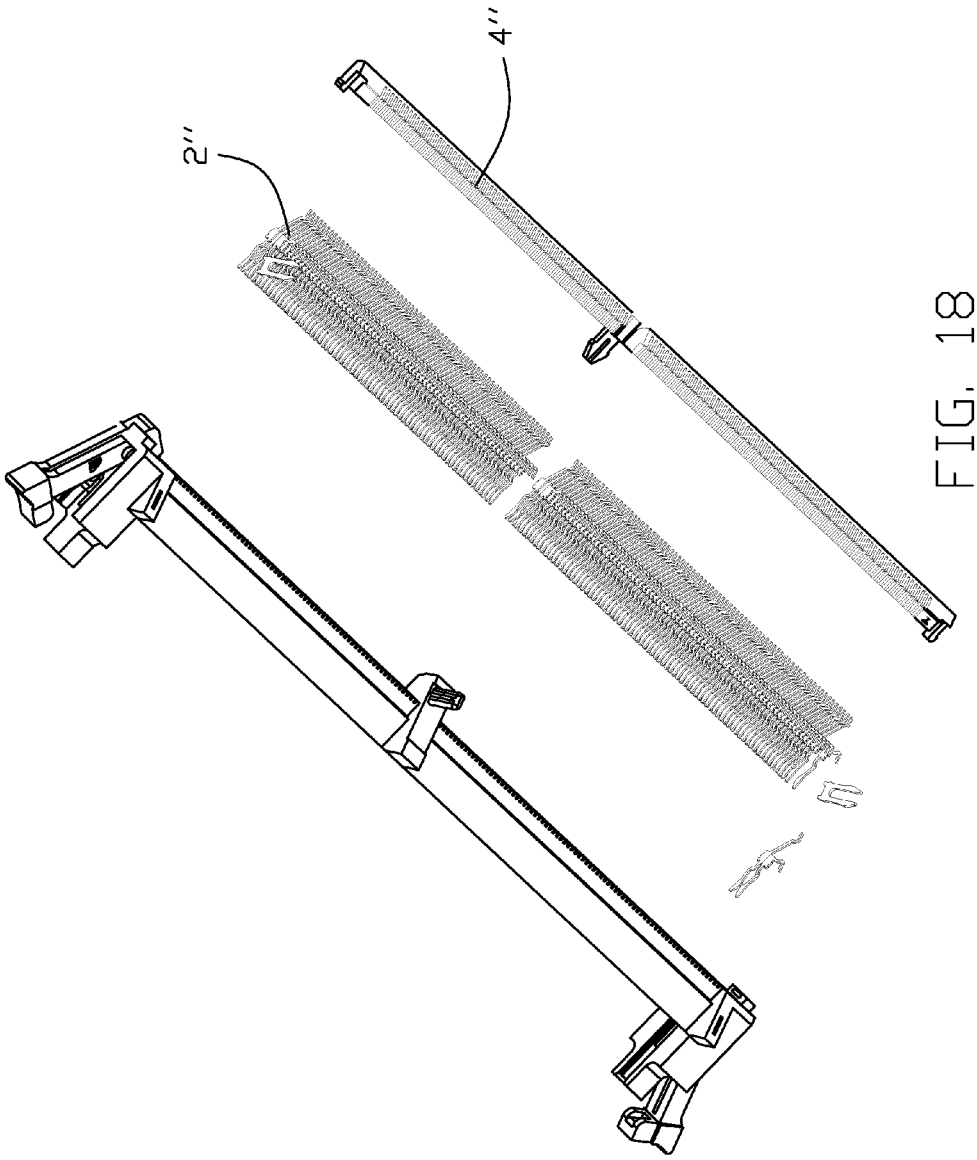


FIG. 18

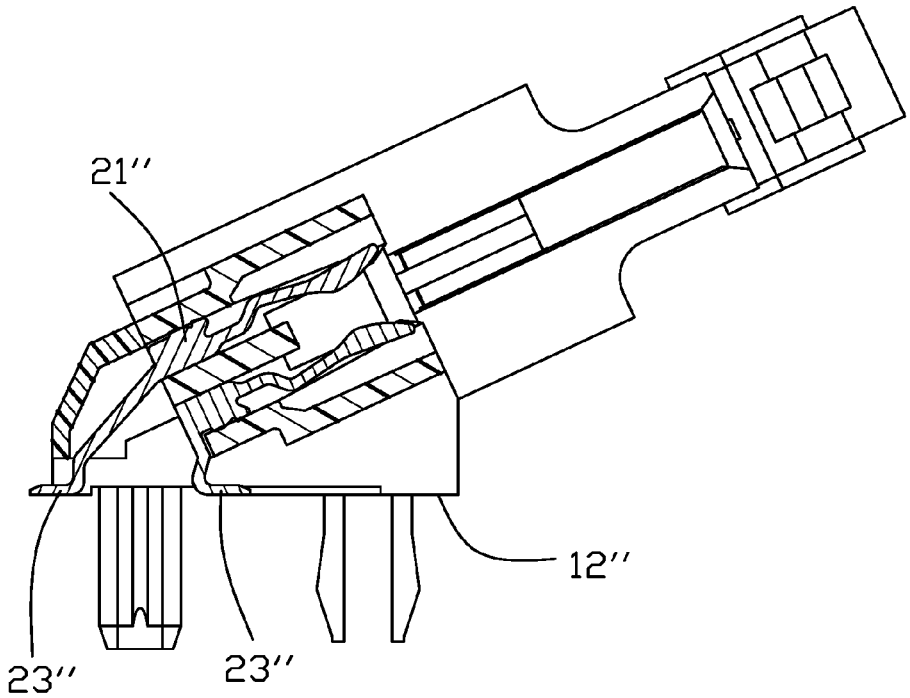


FIG. 19

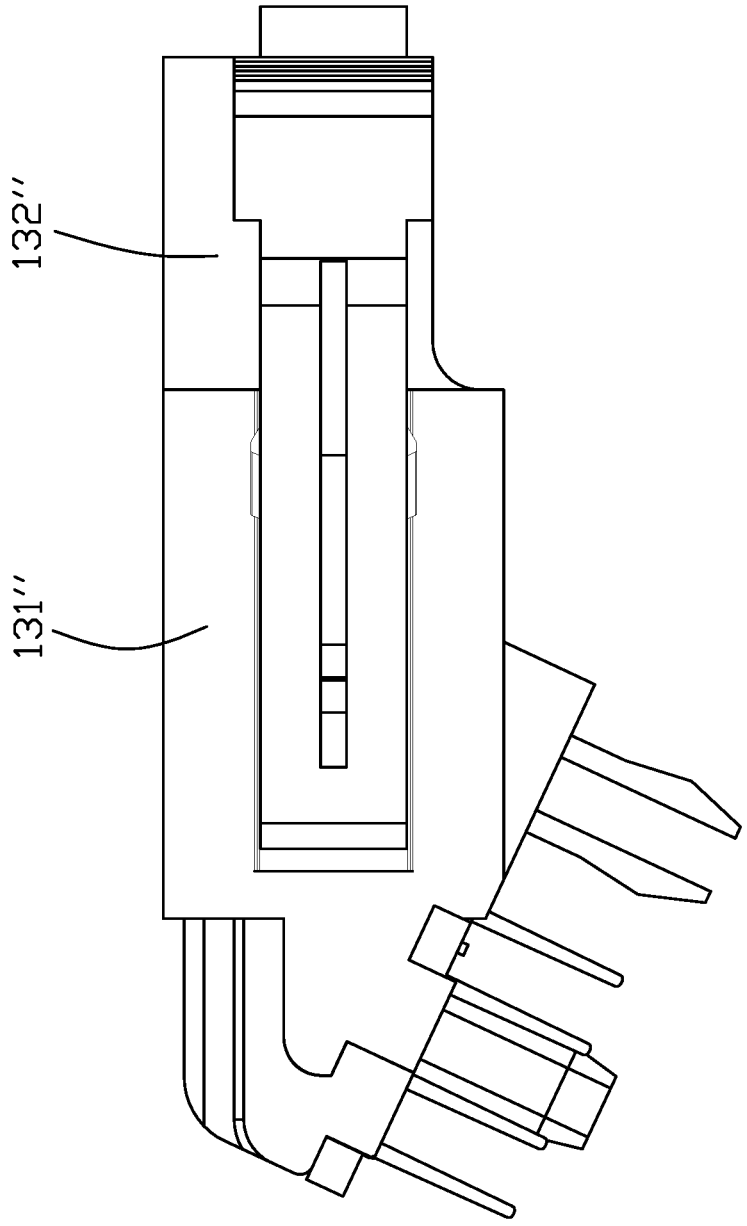


FIG. 20

SLANTED TYPE CARD EDGE CONNECTOR ASSEMBLY

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a card edge connector, and particularly to a slanted type card edge connector.

2. Description of Related Arts

[0002] U.S. Pat. No. 5,964,606 discloses a slanted type card edge connector including an insulative housing having a pair of opposite side walls extending along a longitudinal direction with a central slot therebetween in the transverse direction, a mounting face for mounting to a printed circuit board, and a pair of towers respectively located by two opposite ends of the housing and extending perpendicular to the corresponding side walls. The tower essentially has a same dimension in the transverse direction so it is relatively difficult to reduce the distance between two neighboring slanted type connectors in the front-to-back direction on the printed circuit board when two slanted type card edge connectors are densely positioned with each other in the front-to-back direction.

[0003] A new design for densely arranging two slanted type card edge connectors in the front-to-back direction is desired.

SUMMARY OF THE INVENTION

[0004] A card edge connector includes an insulative housing with a pair of opposite side walls extending along a longitudinal direction with a central slot therebetween in the transverse direction perpendicular to the longitudinal direction. A pair of towers are located at two opposite ends of the housing in the longitudinal direction. The housing is essentially obliquely mounted upon a printed circuit board with a mounting face in the bottom so as to have an acute angle formed between the mounting face and the downward exterior surface of the lower side wall. A pair of rotatble ejectors are disposed in the corresponding towers, respectively. Each tower has a lower/first part and an upper/second part in the vertical direction perpendicular to the longitudinal direction and the transverse direction. The width dimension in the transverse direction of the upper part is smaller than that of the lower part. Therefore, when two slanted type card edge connectors are densely arranged with each other along the front-to-back direction on the printed circuit board, the upper part of the front card edge connector is essentially intimately located above the bottom region of the lower part of the rear card edge connector in the transverse direction, and a portion of the lower part of the rear card edge connector is intimately located above and aligned with a corresponding portion of the lower part of the front card edge connector in the vertical direction for achieving the maximum density for saving space on the printed circuit board.

BRIEF DESCRIPTION OF THE DRAWING

[0005] FIG. **1** is a perspective view of a card edge connector according to the first embodiment of the invention;

[0006] FIG. **2** is another perspective view of the card edge connector of FIG. **1**;

[0007] FIG. **3** is another perspective view of the card edge connector of FIG. **1**;

[0008] FIG. **4** is an exploded perspective view of the card edge connector of FIG. **1**;

[0009] FIG. **5** a further exploded perspective view of the card edge connector of FIG. **4**;

[0010] FIG. **6** is a further exploded perspective view of the card edge connector of FIG. **5**;

[0011] FIG. **7** is another exploded perspective view of the card edge connector of FIG. **6**;

[0012] FIG. **8** is a cross-sectional view of the card edge connector of FIG. **1**;

[0013] FIG. **9** is a perspective view of the card edge connector according to a second embodiment of the invention;

[0014] FIG. **10** is an exploded perspective view of the card edge connector of FIG. **9**;

[0015] FIG. **11** is a further exploded perspective view of the card edge connector of FIG. **10**;

[0016] FIG. **12** is a cross-sectional view of the card edge connector of FIG. **9**;

[0017] FIG. **13** is another cross-sectional view of the card edge connector FIG. **9**;

[0018] FIG. **14** is a perspective view of the card edge connector assembly having two card edge connectors densely disposed upon a printed circuit board in the front-to-back direction;

[0019] FIG. **15** is a side view of the two card edge connectors densely arranged with each other in the front-to-back direction of FIG. **14**;

[0020] FIG. **16** is a perspective view of the card edge connector according to a third embodiment of the invention;

[0021] FIG. **17** is an exploded perspective view of the card edge connector of FIG. **16**;

[0022] FIG. **18** is a further exploded perspective view of the card edge connector of FIG. **17**;

[0023] FIG. **19** is a cross-sectional view of the card edge connector of FIG. **16**; and

[0024] FIG. **20** is a side view of the card edge connector according to a fourth embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0025] A card edge connector **100** includes an insulative housing **1**, a plurality of terminals **2**, two insulative fixing blocks **3**, an insulative cover **4** and a board lock **6**.

[0026] Referring to FIGS. **1-8**, the insulative housing **1** includes a pair of side walls **11** extending along a longitudinal direction, a mounting face **12**, a pair of towers **13** located at two opposite ends of the housing **1** and extending in a vertical direction perpendicular to the longitudinal direction. A central slot **14** is formed between the pair of side walls in the transverse direction perpendicular to both the longitudinal direction and the vertical direction. The housing **1** is obliquely mounted upon a printed circuit board with an acute angle formed between an exterior surface of the lower side wall and the mounting face **12**. In other words, the housing **1** essentially extends in a plane, which is defined by the longitudinal direction and the vertical direction, is perpendicular to the transverse direction while being oblique to the mounting face **12**. In generally, such an acute angle is 25 degrees. The tower **13** forms a receiving space **130** in which an ejector **5** is pivotally mounted. The tower **13** includes a lower/first part **131** and an upper/second part **132**. As shown

in FIG. **8**, a width A of upper part **132** in the transverse direction is smaller than the width B of the lower part **131**. In other words, a pair of recesses (not labled) in the upper part **132** compared with the lower part **131**. Further referring to FIGS. **14-15**, the connector **100** is used to connect a module **800** to the printed circuit board **900**. Notably, the width A is defined between the exterior surface **133** of the upper part **132** and the exterior surface **134** of the upper part **132**. The housing **1** forms a front face **152** and the rear face **151** with a plurality of passageways **153** therebetween. The housing **1** further forms an upward face **111** and a downward face **112**. The housing further includes a key **161** to divide the central slot **14**, and a divider **162** corresponding the to key **161**.

[0027] The terminals **2** are disposed in the passageways **153** by two sides of the central slot **14**. Each terminal **2** includes a base **21** retained to the corresponding side wall **11**, a contacting section **22** extending from one side of the base **21** into the central slot **14**, a mounting section **23** extending from the other side of the base **21** out of the housing **1**, and an extension **24** between the base **21** and the mounting section **23**. In this embodiment, the upper row terminal **2** has a retention post (not labeled) beside the contacting section **22** while the lower row terminal **2** has the base **21** with barbs thereon for retention.

[0028] The fixing block **3** is located between the tower **13** and the divider **162** and includes four rows of through holes **31** to receive the corresponding mounting section **23** of the terminals **2**.

[0029] The cover **4** is mounted upon the housing **1** and the fixing blocks **3** to cover the extensions **24**. The cover **4** includes a hook **41** for securing to the housing **1**, a plurality of ribs **42**, a plurality of slots **43** for receiving the corresponding extensions **24**. In this embodiment, the cover **4** has the same dimension with the housing **1** along the longitudinal direction so as to form at two longitudinal ends a pair of upward faces **44** with corresponding recesses thereof for accommodating a lower part **131** of the tower **13** of a front neighboring connector **100** when two neighboring connectors **100** are densely arranged with each other along a front-to-back direction on the printed circuit board.

[0030] The ejector **5** includes a main body **51**, a kicker **52** extending from the lower portion of the main body **51** and into the central slot **14**, a handler **53** extending from the upper portion of the main body **51**, and a locker **56** extending from the upper portion of the main body **51** opposite to the handler **53**. The ejector **5** further includes a pair of pivotal shafts **54** for allowing the ejector **5** to be rotated in the receiving space **130**, and a pair of engagement blocks **56** for retaining to the corresponding tower **13** when the ejector **5** is located in the locking position. A board lock **6** is used for securing to the printed circuit board.

[0031] Referring to FIGS. **9-15**, in the second embodiment the ejector **5'**, the fixing blocks **3'** and board lock **6'** and terminals **2** are same with those in the first embodiment. The insulative housing **1** and the cover **4'** are different from those in the first embodiment wherein the cover **4'** is shortened along the longitudinal direction to be comply with only the side wall **11'** but leaving the cutouts **45'** in front of the corresponding tower **13'** in comparison with the recesses **44** in the cover **4**. The cover **4** includes a hook **46'** to be engaged within the corresponding hole **17'** in the housing **1'**.

[0032] Referring to FIGS. **16-19**, in the third embodiment the mounting sections **23"** of the terminals **2"** are mounted to the printed circuit board in a surface mounting manner rather than a through hole manner. The cover **4"** further performs the tail retention function without the corresponding fixing blocks.

[0033] Referring to FIG. **20**, in the fourth embodiment, the upper part **132** only has the downward recess for accommodating the bottom region of the lower part of the rear connector **100** when the two connectors **100** are densely arranged with each other in the front-to-back direction while the upward recess of the first embodiment no longer exists for increasing the strength of the tower **13**.

[0034] In brief, the feature of the invention is to provide a recessed upper part of the tower so as to have the bottom region of the lower part of the tower of the rear card edge connector received within the recess of the upper part of the tower of the front card edge connector without interference when the front card edge connector and the rear card edge connector are densely arranged with each other in the front-to-back direction which is perpendicular to the longitudinal direction while being oblique to the transverse direction and the vertical direction. Precisely speaking, such a recess is formed in a downward face of the upper part of the tower of the front card edge connector to receive an upward face of the bottom region of the lower part of the tower of the rear card edge connector as shown in FIG. **15**. Another feature of the invention is to have the upper side wall wider than the lower side wall in the transverse direction so as to have the terminals **2** in the upper side wall has the additional retention post beside the corresponding contacting section **22** in the transverse direction.

What is claimed is:

1. A card edge connector for mounting to a printed circuit board, comprising:

an insulative housing including a pair of side walls extending along a longitudinal direction with a central slot therebeween in a transverse direction perpendicular to said longitudinal direction,

said housing forming a mounting face for mounting toward the printed circuit board wherein the housing extends in a plane oblique to said mounting face;

a pair of towers located at two ends of the housing in said longitudinal direction, each of said towers including a lower part and an upper part extending in a vertical direction perpendicular to both said longitudinal direction and said transverse direction;

a pair of ejectors rotatably disposed in the corresponding towers, respectively; wherein

a width of the upper part along the transverse direction is dimensioned smaller than that of the lower part for densely arranging, on the printed circuit board, two card edge connectors in a front-to-back direction which is perpendicular to the longitudinal direction while being oblique to both said vertical direction and said transverse direction.

2. The card edge connector as claimed in claim **1**, further including a plurality of terminals by two sides of the central slot, wherein the side walls includes an upper side wall and a lower side wall with the central slot therebetween, and the terminals in the upper side wall are wider than those in the lower side wall in the transverse direction.

3. The card edge connector as claimed in claim **2**, further including a cover to shield mounting sections of the corresponding terminals.

4. The card edge connector as claimed in claim **3**, wherein said cover has a similar dimension with the housing in the longitudinal direction, and includes recesses in an upper surface at two ends thereof corresponding to the towers.

5. The card edge connector as claimed in claim **3**, wherein said cover is shorter than the housing without reaching two opposite positions corresponding to the towers.

6. The card edge connector as claimed in claim **1**, wherein the upper part has a recess in a downward face for receiving a bottom region of the lower part of the tower of another card edge connector therebehind in said front-to-back direction.

7. The card edge connector as claimed in claim **1**, wherein said ejector includes an handler at a top end having a width similar to that of the upper part.

8. An electrical connector assembly comprising:

a printed circuit board;

a front connector and a rear connector same with each other and densely arranged upon the printed circuit board in a front-to-back direction, each of said first connector and said second connector including:

an insulative housing including a pair of side walls extending along a longitudinal direction with a central slot therebeween in a transverse direction perpendicular to said longitudinal direction,

said housing forming a mounting face for mounting toward the printed circuit board wherein the housing extends in a plane oblique to said mounting face;

a pair of towers located at two ends of the housing in said longitudinal direction, each of said towers including a lower part and an upper part extending in a vertical direction perpendicular to both said longitudinal direction and said transverse direction;

a pair of ejectors rotatably disposed in the corresponding towers, respectively; wherein

a width of the upper part along the transverse direction is dimensioned smaller than that of the lower part to form therein a recess so that the recess formed in the upper part of the tower of the front connector receives a bottom region of the lower part of the rear connector; wherein

said front-to-back direction is perpendicular to the longitudinal direction while being oblique to both said vertical direction and said transverse direction.

9. The electrical connector assembly as claimed in claim **8**, further including a plurality of terminals by two sides of the central slot, wherein the side walls includes an upper side wall and a lower side wall with the central slot therebetween, and the terminals in the upper side wall are wider than those in the lower side wall in the transverse direction.

10. The electrical connector assembly as claimed in claim **9**, further including a cover to shield mounting sections of the corresponding terminals.

11. The electrical connector assembly as claimed in claim **10**, wherein said cover has a similar dimension with the housing in the longitudinal direction, and includes recesses in an upper surface at two ends thereof corresponding to the towers.

12. The card edge connector as claimed in claim **10**, wherein said cover is shorter than the housing without reaching two opposite positions corresponding to the towers.

13. The card edge connector as claimed in claim **8**, wherein said ejector includes an handler at a top end having a width similar to that of the upper part.

14. A card edge connector for mounting to a printed circuit board, comprising:

an insulative housing including a pair of side walls extending along a longitudinal direction with a central slot therebeween in a transverse direction perpendicular to said longitudinal direction,

said housing forming a mounting face for mounting toward the printed circuit board wherein the housing extends in a plane oblique to said mounting face;

a pair of towers located at two ends of the housing in said longitudinal direction, each of said towers including a lower part and an upper part extending in a vertical direction perpendicular to both said longitudinal direction and said transverse direction;

a pair of ejectors rotatably disposed in the corresponding towers, respectively; and

a plurality of terminals by two sides of the central slot;

wherein the side walls includes an upper side wall and a lower side wall with the central slot therebetween, and the terminals in the upper side wall are wider than those in the lower side wall in the transverse direction.

15. The card edge connector as claimed in claim **14**, wherein each of the terminals in the upper side wall has a base from which a retention post and a contacting section commonly extends in a spaced manner in the transverse direction while each of the terminals in the lower side wall has a barbed base from which a contacting section extends.

* * * * *