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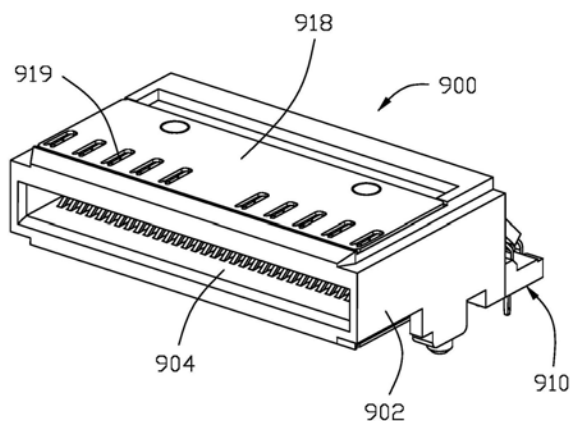
(54)发明名称

电连接器

(57)摘要

本发明公开了一种电连接器,其包括绝缘本体、收容于所述绝缘本体内的端子模组及接地件,所述绝缘本体包括用于收容插头连接器的前腔和在前后方向上与前腔相对的后腔,所述端子模组组装在所述后腔,所述端子模组包括上端子模组、下端子模组和在垂直于前后方向的竖直方向上夹在上端子模组和下端子模组之间的屏蔽模组,所述上端子模组包括上绝缘体和若干与上绝缘体一体成型的上端子,所述上端子包括一对上接地端子和一对设置于该对上接地端子之间的上差分信号端子,所述下端子模组包括下绝缘体和若干与下绝缘体一体成型的下端子,所述下端子包括一对下接地端子和一对设置于该对下接地端子之间的下差分信号端子,所述屏蔽模组设有屏蔽片,所述接地件与屏蔽模组配合并将上接地端子和下接地端子与至少一个屏蔽片机械

和电性连接。



1. 一种电连接器,其包括绝缘本体、收容于所述绝缘本体内的端子模组及接地件,所述绝缘本体包括用于收容插头连接器的前腔和在前后方向上与前腔相对的后腔,所述端子模组组装在所述后腔,所述端子模组包括上端子模组、下端子模组和在垂直于前后方向的竖直方向上夹在上端子模组和下端子模组之间的屏蔽模组,所述上端子模组包括上绝缘体和若干与上绝缘体一体成型的上端子,所述上端子包括一对上接地端子和一对设置于该对上接地端子之间的上差分信号端子,所述下端子模组包括下绝缘体和若干与下绝缘体一体成型的下端子,所述下端子包括一对下接地端子和一对设置于该对下接地端子之间的下差分信号端子,所述屏蔽模组设有屏蔽片,其特征在于:所述接地件与屏蔽模组配合并将上接地端子和下接地端子与至少一个屏蔽片机械和电性连接,所述接地件包括绝缘体和若干收容于绝缘体内的端子,所述绝缘体包括若干水平通道,所述屏蔽片设有若干舌板,所述舌板收容于水平通道内以机械和电性连接端子。

2. 根据权利要求1所述 的电连接器,其特征在于,所述接地件与屏蔽模组配合并将上接地端子和下接地端子与所有的屏蔽片机械和电性连接。

3. 根据权利要求2所述 的电连接器,其特征在于,所述接地件与屏蔽模组配合以机械和电性连接屏蔽片、上端子模组和下端子模组。

4. 根据权利要求1所述 的电连接器,其特征在于,每个端子包括上端和与上端相对的下端,所述上端和下端均延伸出绝缘体以分别机械和电性连接上接地端子和下接地端子。

5. 根据权利要求1所述 的电连接器,其特征在于,所述绝缘本体包括用于收容端子的竖直通道,所述竖直通道与水平通道交错排列,所述舌板收容于水平通道内以横向电性连接端子。

6. 根据权利要求4所述 的电连接器,其特征在于,所述上绝缘体和下绝缘体均设有若干通孔以供上端和下端延伸出绝缘体并分别与上接地端子和下接地端子机械和电性连接。

7. 根据权利要求2所述 的电连接器,其特征在于,所述接地件包括一对柔性电路板,其中一个所述柔性电路板机械和电性连接所述上接地端子与屏蔽片,另一所述柔性电路板机械和电性连接所述下接地端子与屏蔽片。

8. 根据权利要求2所述 的电连接器,其特征在于,所述电连接器包括位于绝缘本体上表面的上金属接地片,所述上金属接地片包括若干延伸至绝缘本体前腔的接地脚。

9. 根据权利要求8所述 的电连接器,其特征在于,所述电连接器包括位于绝缘本体下表面的下金属接地片,所述下金属接地片包括若干延伸至绝缘本体前腔的接地脚。

电连接器

【技术领域】

[0001] 本发明涉及一种电连接器,尤其涉及一种适于传输高速信号的电连接器。

【背景技术】

[0002] 目前高速电连接器具有若干传输通道,每个传输通道传输速率在25Gbit/s或50Gbit/s。2014年7月1日,美国专利第US 62/399,272号公开了一种设有若干端子的电连接器,所述电连接器用于在电子设备之间进行传输。所述端子包括若干接地端子,接地耦合组件与接地端子电性连接以根据需要调节电连接器的性能。

【发明内容】

[0003] 本发明主要目的是提供一种具有传输高速信号装置的电连接器。

[0004] 为解决上述技术问题,本发明采用如下技术方案:一种电连接器,其包括绝缘本体、收容于所述绝缘本体内的端子模组及接地件,所述绝缘本体包括用于收容插头连接器的前腔和在前后方向上与前腔相对的后腔,所述端子模组组装在所述后腔,所述端子模组包括上端子模组、下端子模组和在垂直于前后方向的竖直方向上夹在上端子模组和下端子模组之间的屏蔽模组,所述上端子模组包括上绝缘体和若干与上绝缘体一体成型的上端子,所述上端子包括一对上接地端子和一对设置于该对上接地端子之间的上差分信号端子,所述下端子模组包括下绝缘体和若干与下绝缘体一体成型的下端子,所述下端子包括一对下接地端子和一对设置于该对下接地端子之间的下差分信号端子,所述屏蔽模组设有屏蔽片,所述接地件与屏蔽模组配合并将上接地端子和下接地端子与至少一个屏蔽片机械和电性连接。

[0005] 本发明电连接器中接地件与屏蔽模组配合并将上接地端子和下接地端子与屏蔽片机械和电性连接,增强电连接器的传输速率。

【附图说明】

[0006] 图1是符合本发明第一实施例的与插头连接器配合的插座连接器前部向下的立体图。

[0007] 图2是图1所示的插座连接器后部向上的立体图。

[0008] 图3是图1所示的插座连接器前部向下的分解图。

[0009] 图4是图3所示的插座连接器后部向上的立体图。

[0010] 图5是图3所示的插座连接器前部向下进一步的分解图。

[0011] 图6是图3所示的插座连接器后部向上进一步的分解图。

[0012] 图7是图1所示的插座连接器端子模组前部向下的分解图。

[0013] 图8是图7所示的端子模组后部向上的分解图。

[0014] 图9是图7所示的端子模组前部向下进一步的分解图。

[0015] 图10是图9所示的端子模组后部向上进一步的分解图。

- [0016] 图11是图1所示的没有插头连接器插入的插座连接器的剖视图。
- [0017] 图12是图1所示的设有插头连接器插入的插座连接器的剖视图。
- [0018] 图13是图1所示的插座连接器的剖视图,所述插座连接器设有与上端子模组和下端子模组的接地端子电性连接的屏蔽片。
- [0019] 图14是符合本发明第二实施例的与插头连接器配合的插座连接器后部向上的立体图。
- [0020] 图15是图14所示的插座连接器前部向下的分解图。
- [0021] 图16是图14所示的插座连接器后部向上的分解图。
- [0022] 图17是上金属接地片和下金属接地片的接地脚与图14所示的插座连接器上端子模组和下端子模组的接地端子连接的前视图,所述插座连接器设有绝缘本体,为清晰说明本图移除了插头连接器。
- [0023] 图18是图14所示的插座连接器端子模组前部向下的分解图。
- [0024] 图19是图18所示的端子模组后部向上的分解图。
- [0025] 图20是图18所示的端子模组后部向上的分解图,其中,端子模组未设有下端子模组。
- [0026] 图21是图20所示的端子模组后部向上的立体图。
- [0027] 图22是图15所示的端子模组后部向上的分解图。
- [0028] 图23是图22所示的端子模组后部向上的立体图。
- [0029] 图24是图18所示的端子模组共用接地端子模组的立体图。
- [0030] 图25是图18所示的端子模组接地端子子模组的剖视图。
- [0031] 图26是图18所示的端子模组接地端子子模组中的端子的立体图。
- [0032] 图27是图18所示的插座连接器的剖视图。
- [0033] 图28是图18所示的插座连接器另一视角的剖视图。
- [0034] 图29是符合本发明第三实施例的与插头连接器配合的插座连接器前部向下的立体图。
- [0035] 图30是图29所示的插座连接器前部向下的分解图。
- [0036] 图31是图30所示的插座连接器后部向上的分解图。
- [0037] 图32是图30所示的插座连接器端子模组的立体图。
- [0038] 图33是图29所示的插座连接器端子模组前部向下的分解图。
- [0039] 图34是图29所示的端子模组后部向上的分解图。
- [0040] 图35是图34所示的端子模组下端子模组后部向上的立体图,其中,柔性电路板未向后弯折。
- [0041] 图36是图35所示的端子模组下端子模组后部向下的立体图。
- [0042] 图37是图35所示的下端子模组后部向上的立体图,其中,柔性电路板已向后弯折。
- [0043] 图38是图29所示的插座连接器的剖视图。
- [0044] 图39是符合本发明第四实施例的插座连接器前部向下的立体图。
- [0045] 图40是图39所示的插座连接器后部向下的立体图。
- [0046] 图41是图39所示的插座连接器后部向上的立体图。
- [0047] 图42是图39所示的插座连接器端子模组的侧视图。

- [0048] 图43是图42所示的插座连接器的分解图。
- [0049] 图44是图43所示的插座连接器端子模组前端的分解图。
- [0050] 图45是图43所示的插座连接器端子模组后端的分解图。
- [0051] 图46是图44所示的端子模组接地部分前端的分解图。
- [0052] 图47是图45所示的端子模组接地部分后端的分解图。
- [0053] 图48是图39所示的插座连接器的剖视图。

【具体实施方式】

[0054] 如图1-12所示,为符合本发明第一实施例的插座连接器900,其包括设有前腔904和在前后方向上与前腔904相对的后腔906的绝缘本体902、端子模组910、上金属接地片918及在竖直方向上与上金属接地片918相对的下金属接地片920。所述前腔904用于收容互补插头连接器的对接舌板,所述后腔906用于收容端子模组910。所述端子模组910包括上端子模组912和下端子模组914及在竖直方向上设置于上端子模组912和下端子模组914之间的屏蔽模组916。所述上金属接地片918设有接地脚919,所述接地脚919位于绝缘本体902的上表面且延伸至绝缘本体902的前腔904内。所述下金属接地片920设有接地脚921,所述接地脚921位于绝缘本体902的下表面且延伸至绝缘本体902的前腔904内。所述绝缘本体902设有若干延伸穿过绝缘本体902的上壁和下壁的槽903,用于接地脚919、921延伸至绝缘本体902的前腔904内。

[0055] 所述上端子模组912包括上绝缘体924和若干通过注塑成型工艺成型于上绝缘体924上的上端子922。所述上端子922包括若干对上接地端子9220和若干对差分信号端子9221,每对差分信号端子9221设置于一对上接地端子9220之间。每个上接地端子9220的前端9222长于差分信号端子9221的前端9223。当插头连接器插入至前腔904,上接地端子9220可通过接触/偏转分别与相应的接地脚919进行机械和电性连接。当插头连接器未插入至前腔904,上接地端子9220无法通过接触/偏转分别与相应的接地脚919进行机械和电性连接。同样的,所述下端子模组914包括下绝缘体924和若干通过注塑成型工艺成型于下绝缘体924下的下端子922。所述下端子922包括若干对下接地端子9220和若干对差分信号端子9221,每对差分信号端子9221设置于一对下接地端子9220之间。每个下接地端子9220的前端9222长于差分信号端子9221的前端9223。当插头连接器插入至前腔904,下接地端子9220可通过接触/偏转分别与相应的接地脚919进行机械和电性连接。当插头连接器未插入至前腔904,下接地端子9220无法通过接触/偏转分别与相应的接地脚919进行机械和电性连接。所述屏蔽模组916包括间隔件932及通过注塑成型工艺与间隔件932连接的屏蔽片930以分离上端子模组912和下端子模组914。每个上端子912和下端子914均设有向下延伸且设置与绝缘本体902底部表面之外的尾部950以安装在电路板上。所述屏蔽片930包括若干向下延伸且设置于尾部950上表面之外的屏蔽脚960,所述屏蔽脚960通过穿孔方式安装在电路板上。

[0056] 图13为图1所示的插座连接器900'的剖视图。所述插座连接器900'包括屏蔽片930',所述屏蔽片930'通过上连接部941'与上端子模组912'的接地端子9220'机械和电性连接并通过下连接部942'与上端子模组912'的接地端子9220'机械和电性连接。

[0057] 如图14-28所示,为符合本发明第二实施例的插座连接器800。与第一实施例相比,

增加了组装在屏蔽片830上的共用接地端子模组840以建立屏蔽片830、上接地端子8820和下接地端子8860之间的机械和电性连接。所述共用接地端子模组840包括设有若干竖直通道844的绝缘体842,所述竖直通道844用于收容若干端子846。每个端子846基本上为分叉的双束结构,其包括相对设置的上端848和下端849,所述上端848和下端849均延伸出绝缘体842并分别与上端子和下端子中相应的接地端子8220,8260机械和电性连接。上绝缘体824包括若干供上端848分别延伸与上接地端子8220机械并电性连接的通孔8120。下绝缘体828包括若干供下端848分别延伸与下接地端子8220机械并电性连接的通孔8140。所述绝缘体842进一步包括若干与竖直通道844交替排布的水平通道850。屏蔽片830包括若干收容相应的水平通道850的舌板831并在横向方向的侧边接触相应的端子846。在本实施例中,接地路径建立在上端子模组812和下端子模组814的接地端子、端子846的上端848和下端849以及屏蔽片830的舌板831到电路板(未图示)之间,所述插座连接器800设置于该电路板上。如图17所示,上金属接地片818和下金属接地片820的接地脚819,821与上端子模组812和下端子模组814中的接地端子8220,8260连接,为清晰说明本图移除了插头连接器。因此,上金属接地片818、下金属接地片820、上接地端子8220、下接地端子8260、共用接地端子模组840及屏蔽片830接地连接在一起。

[0058] 如图29-38所示,为符合本发明第三实施例的电连接器700。与第二实施例的电连接器800相比,所述共用接地端子模组被设有相应接地电路路径的一对柔性电路板770取代,通过焊接或压缩,所述柔性电路板770分别机械和电性连接屏蔽片730与上端子模组712和下端子模组714中的接地端子7220,7260。

[0059] 如图29-38所示,为符合本发明第四实施例的电连接器600。所述电连接器600包括收容端子模组组件610的绝缘本体602。端子模组组件610包括设有若干上端子622的上端子模组612、设有若干下端子626的下端子模组614以及设置于上端子模组612和下端子模组614之间的接地模组616。所述上端子622成型于上绝缘体624内,所述下端子626成型于下绝缘体628内。所述接地模组616包括与中间绝缘体640的接地端子646连接的金属屏蔽片630。在竖直方向上,接地端子646进一步连接上端子622和下端子624中被选择的接地端子6220,6260以短路屏蔽片630中被选择的接地端子6220,6260。端子模组组件610也许会涉及到第二实施例。绝缘本体602进一步包括收容对接连接器凹口的突起以防误插。

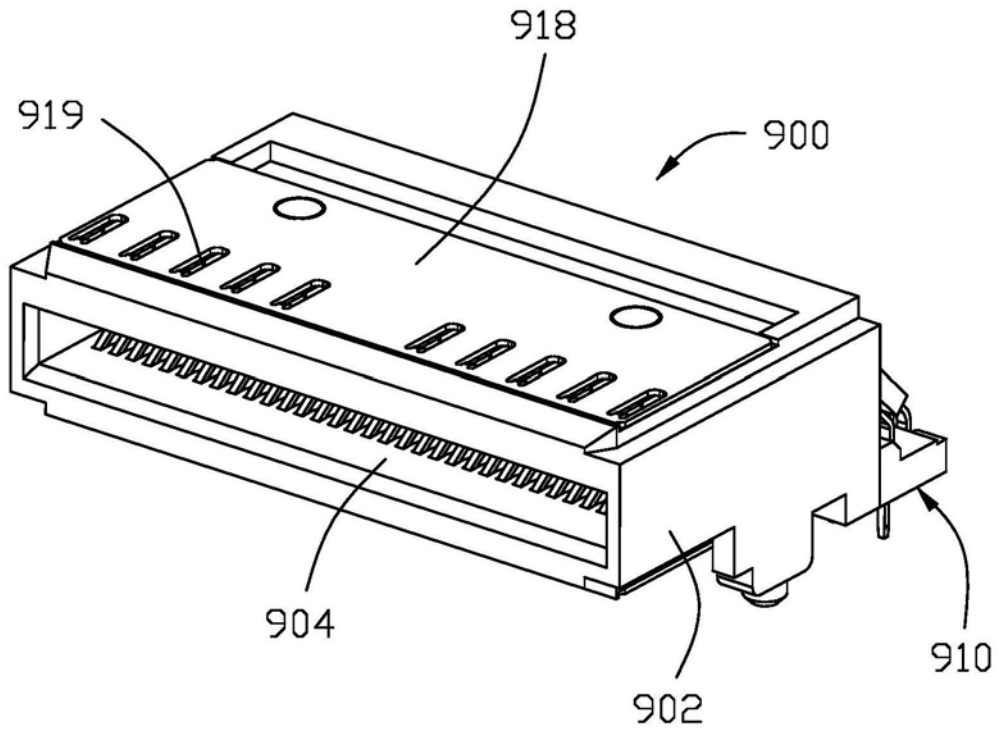


图1

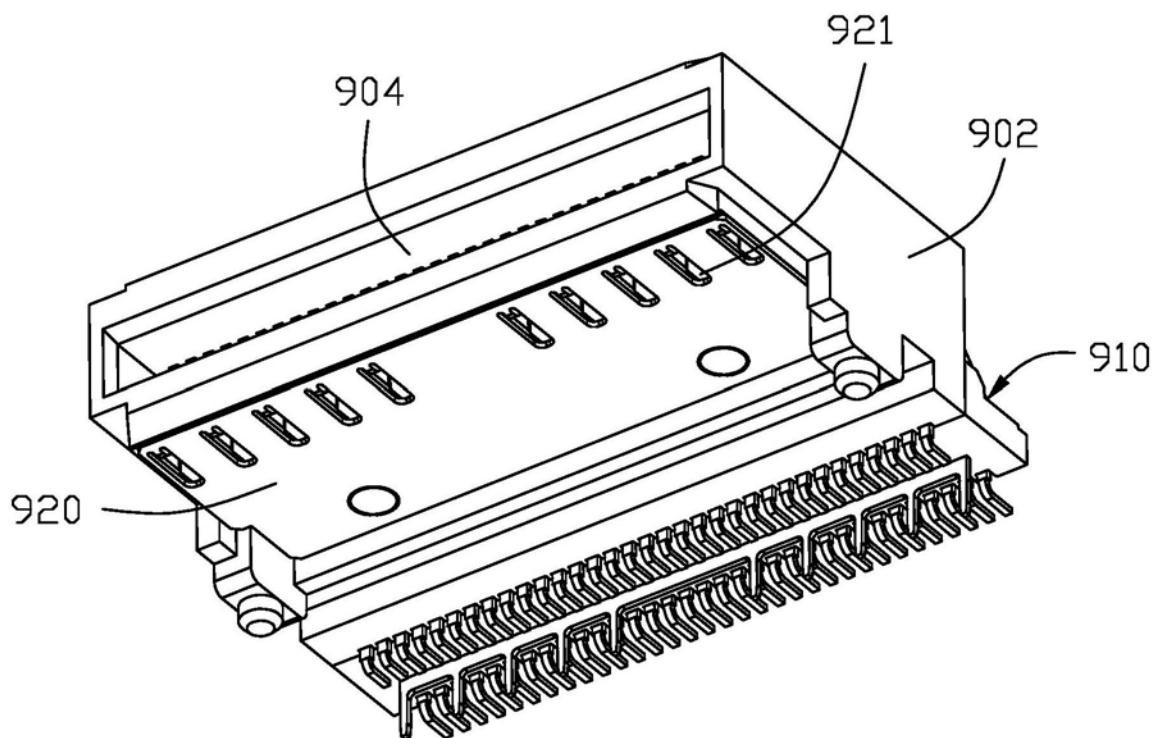


图2

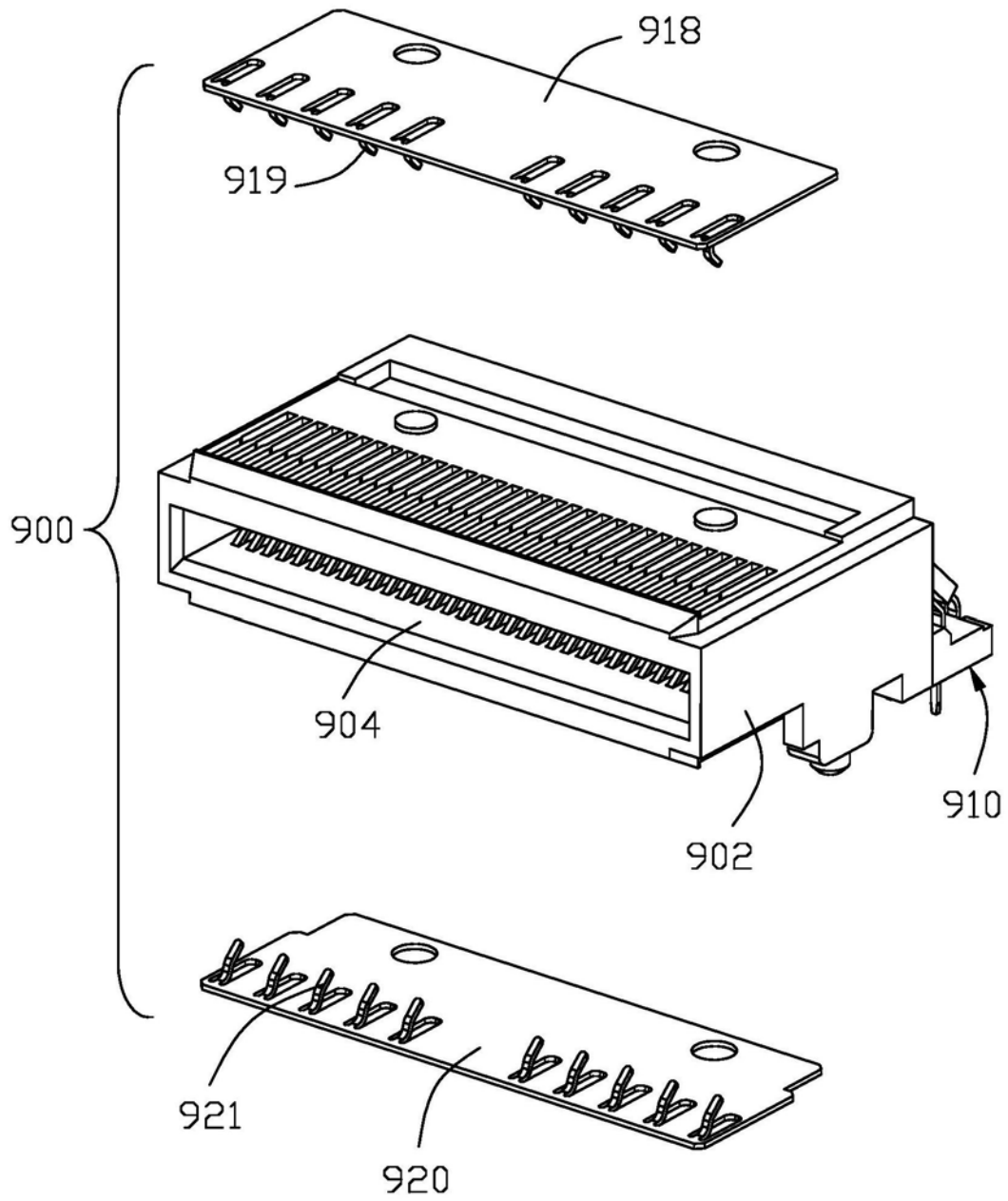


图3

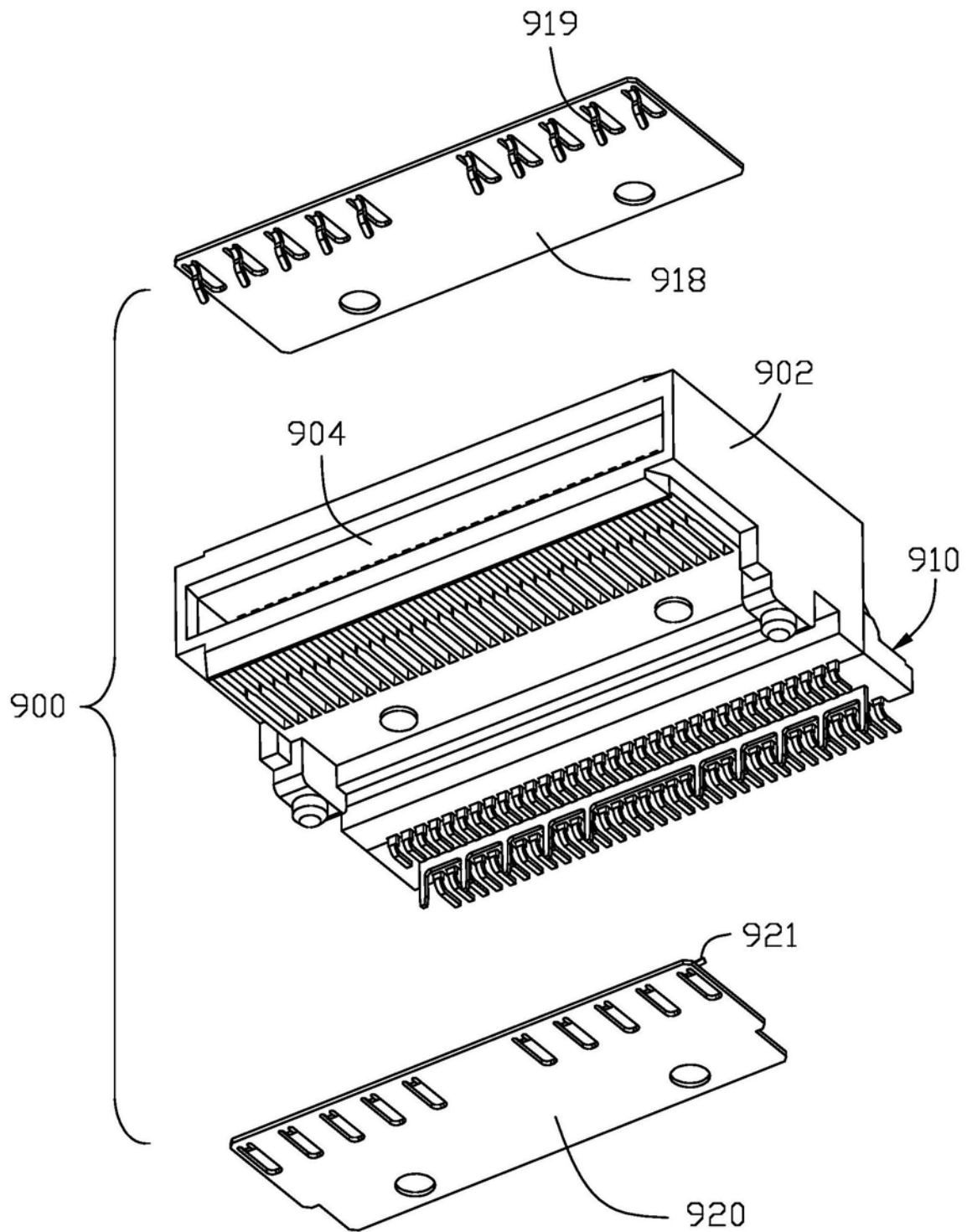


图4

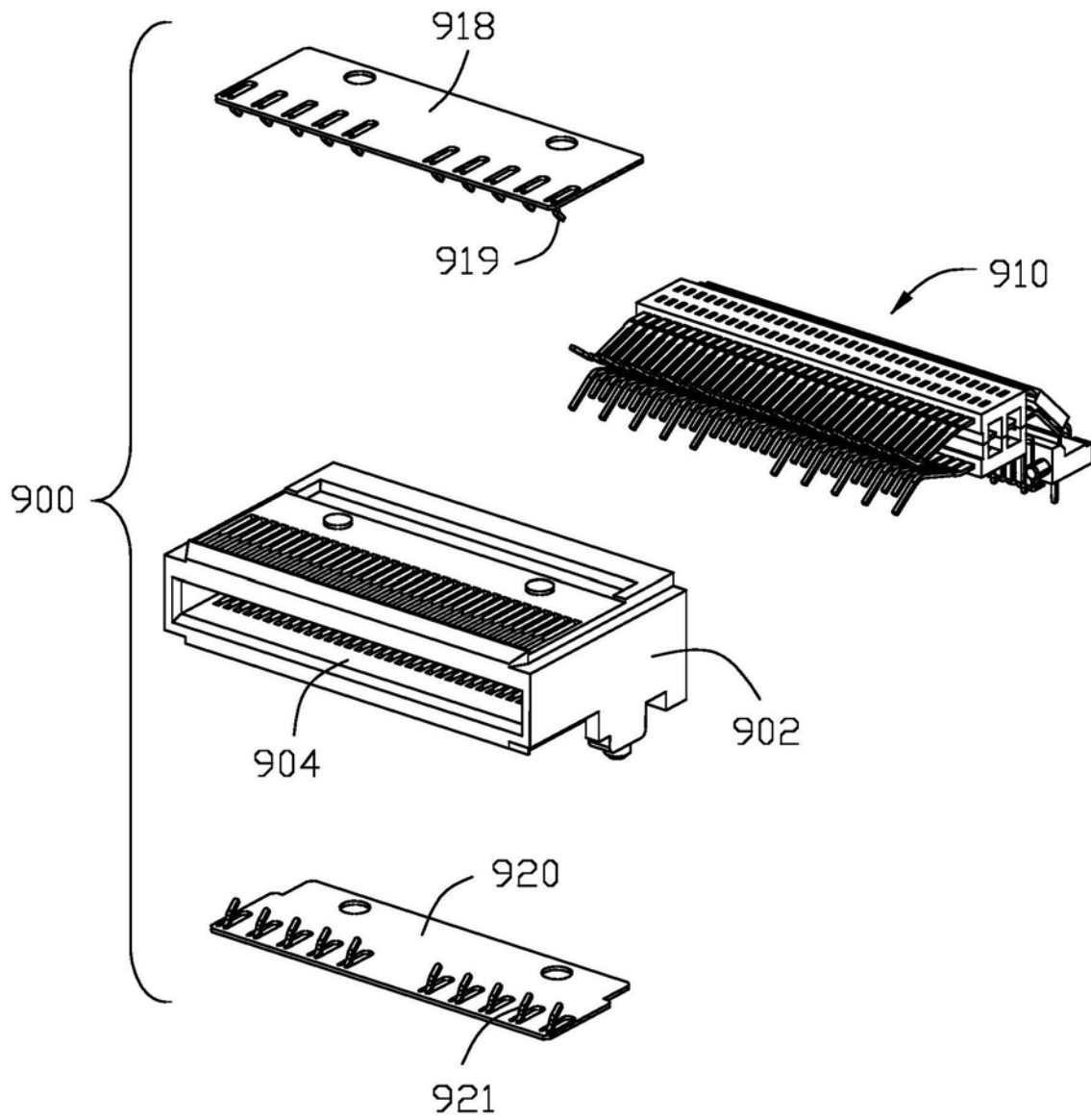


图5

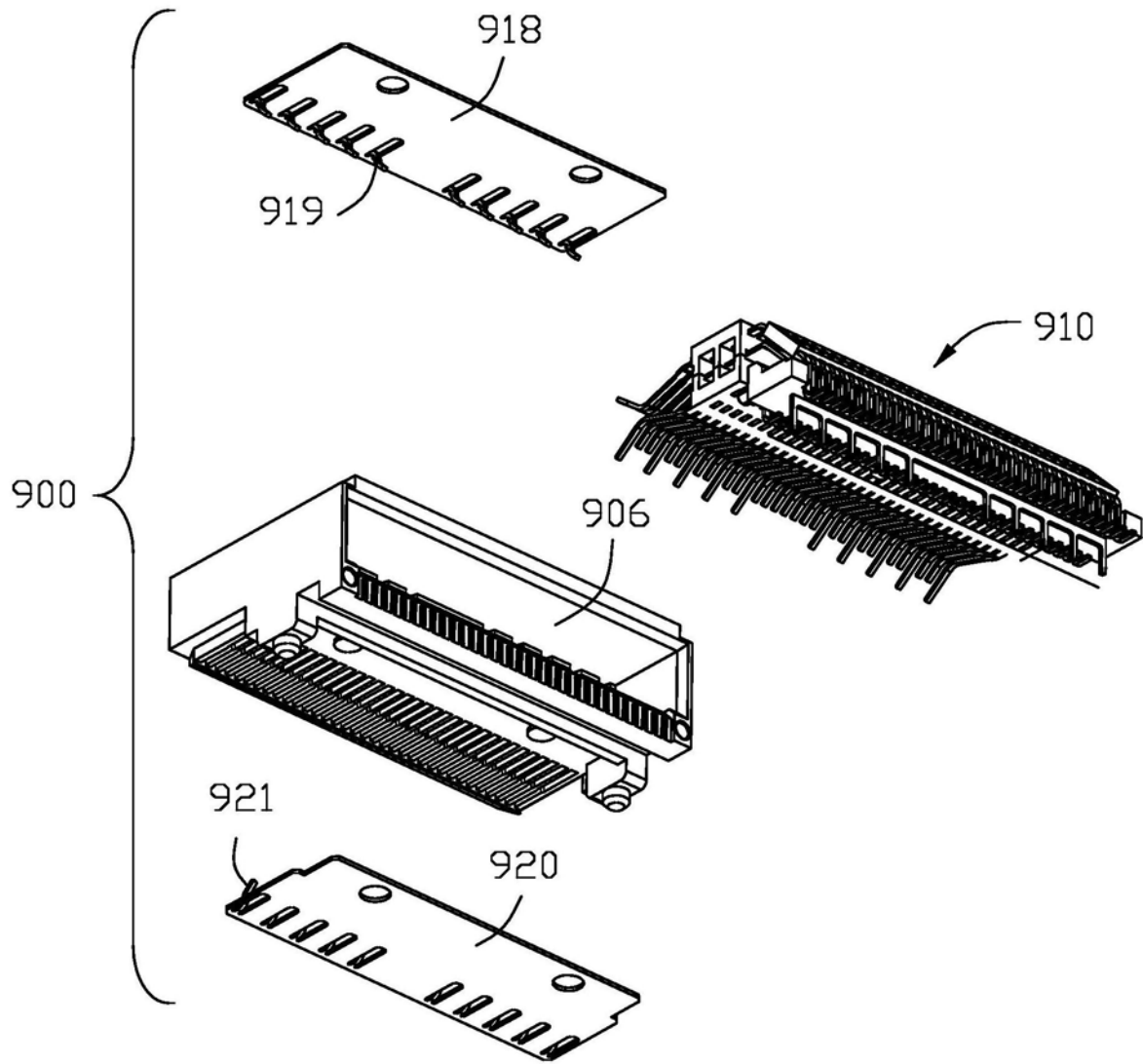


图6

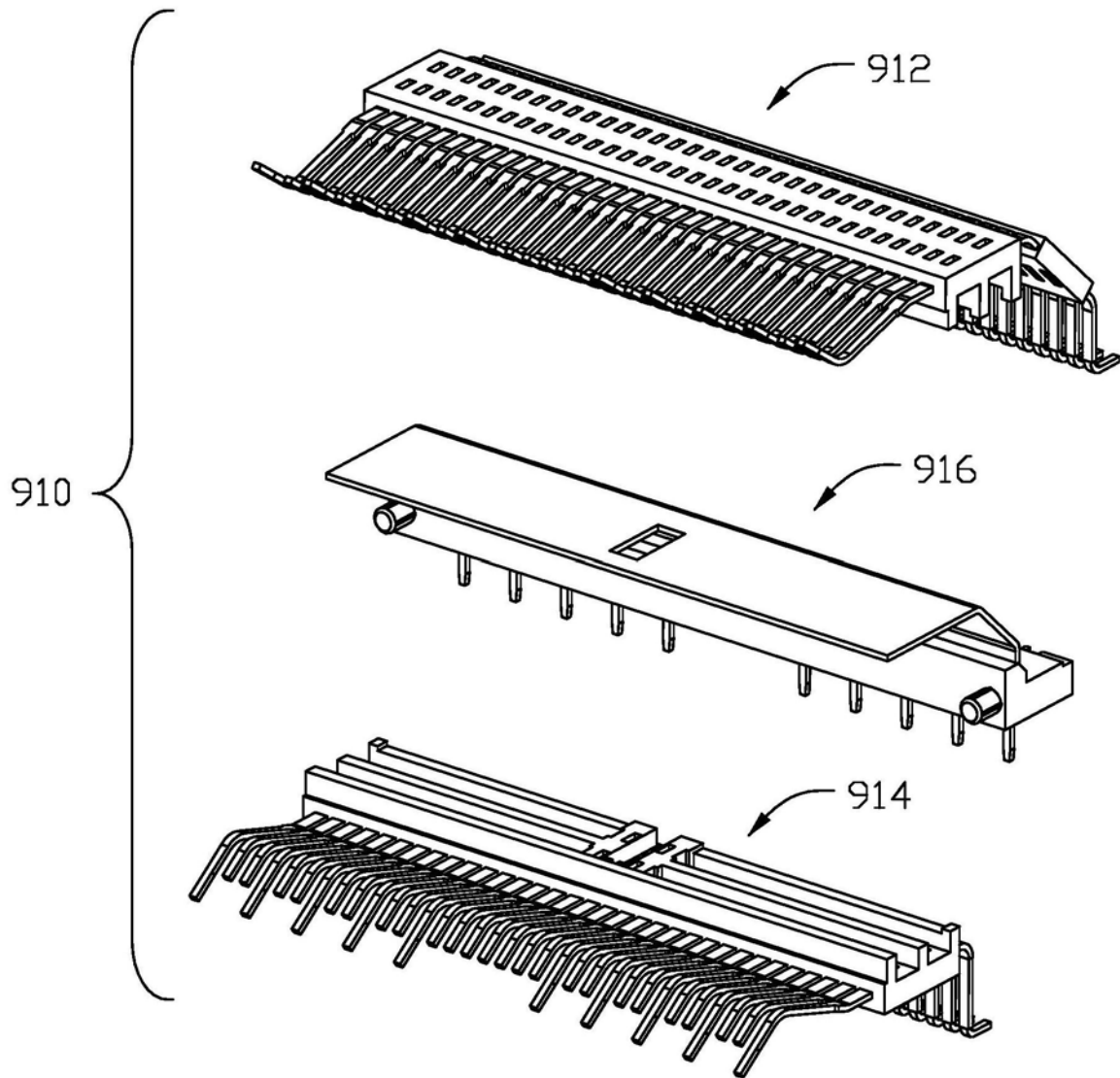


图7

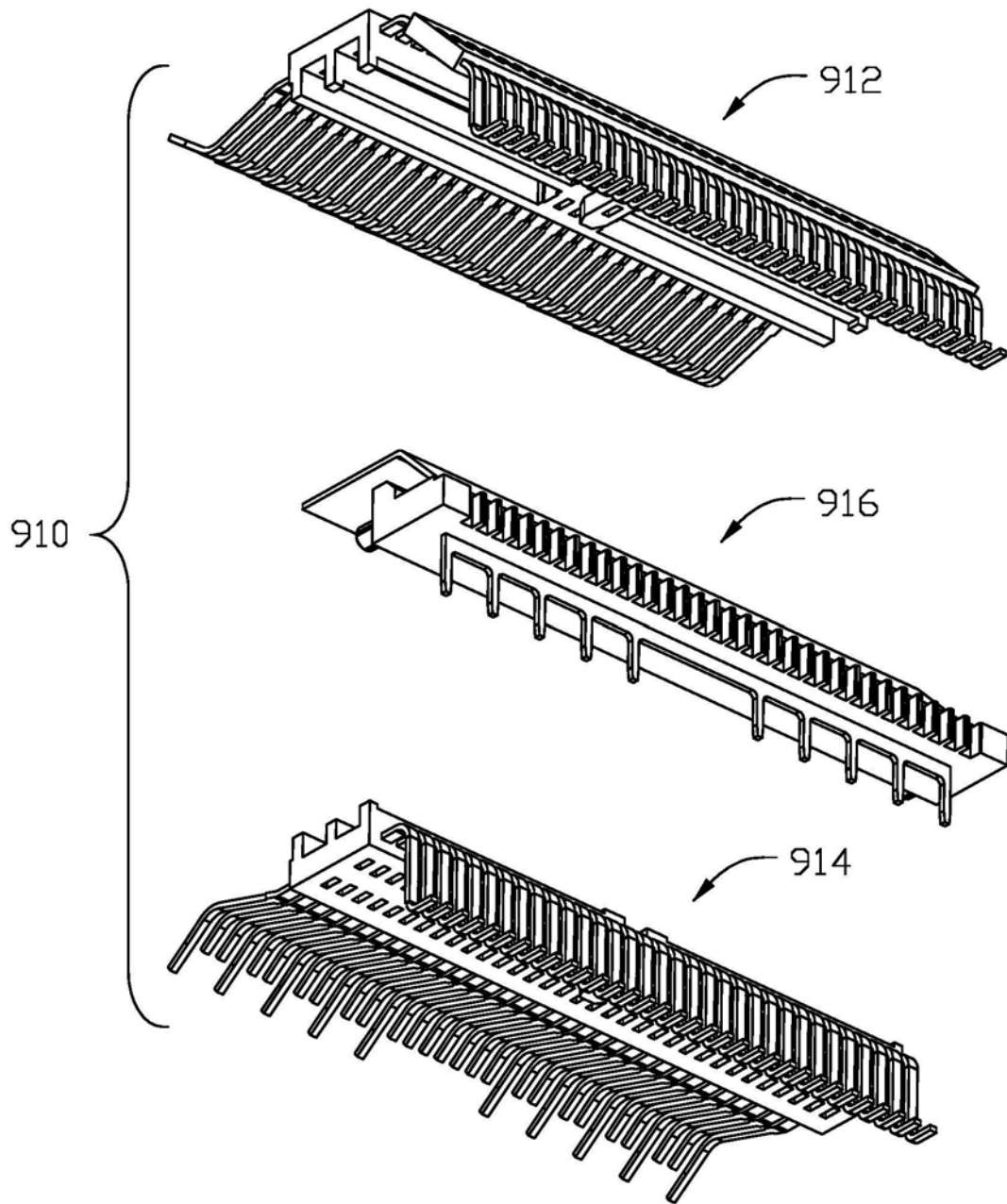


图8

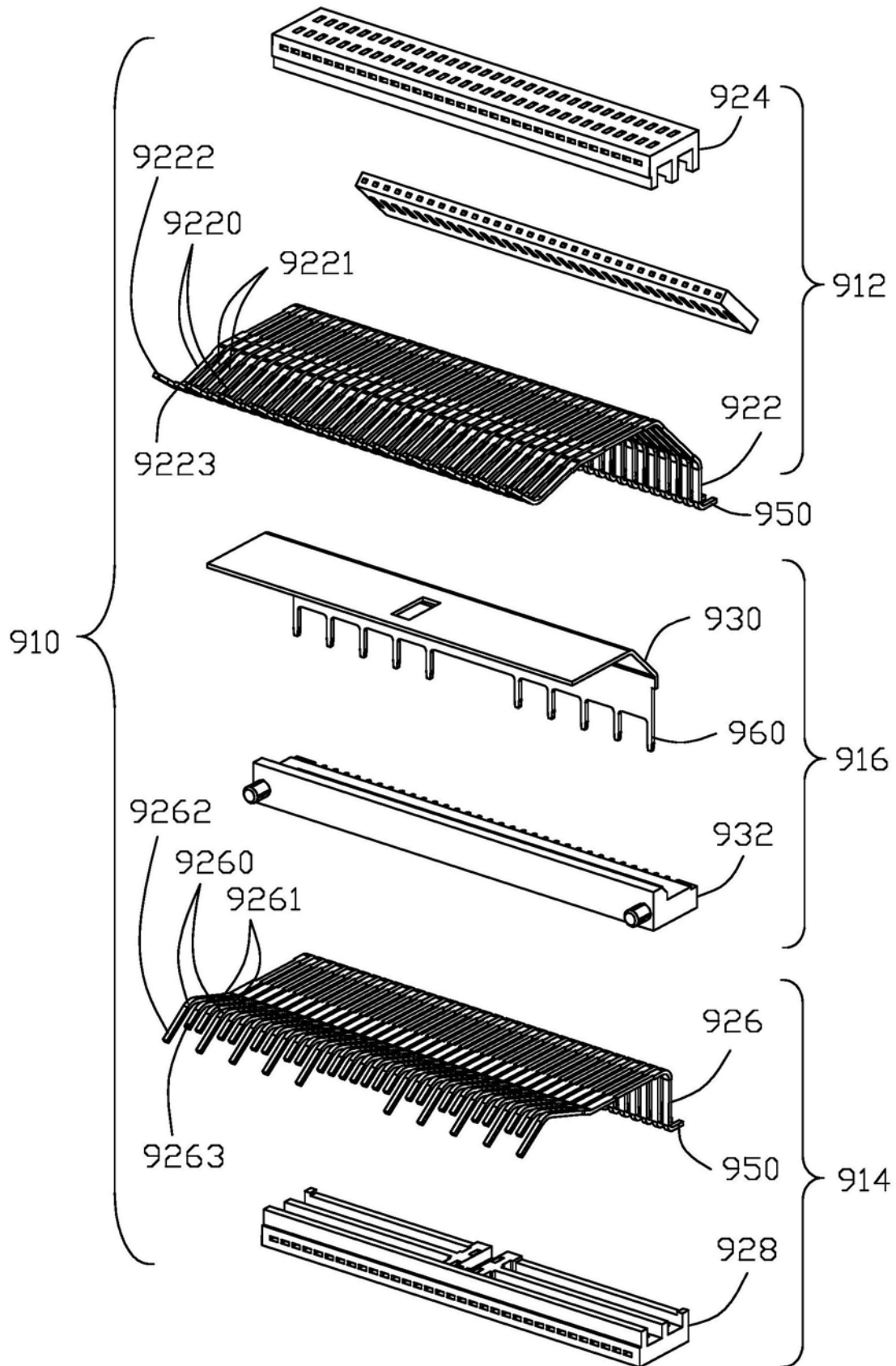


图9

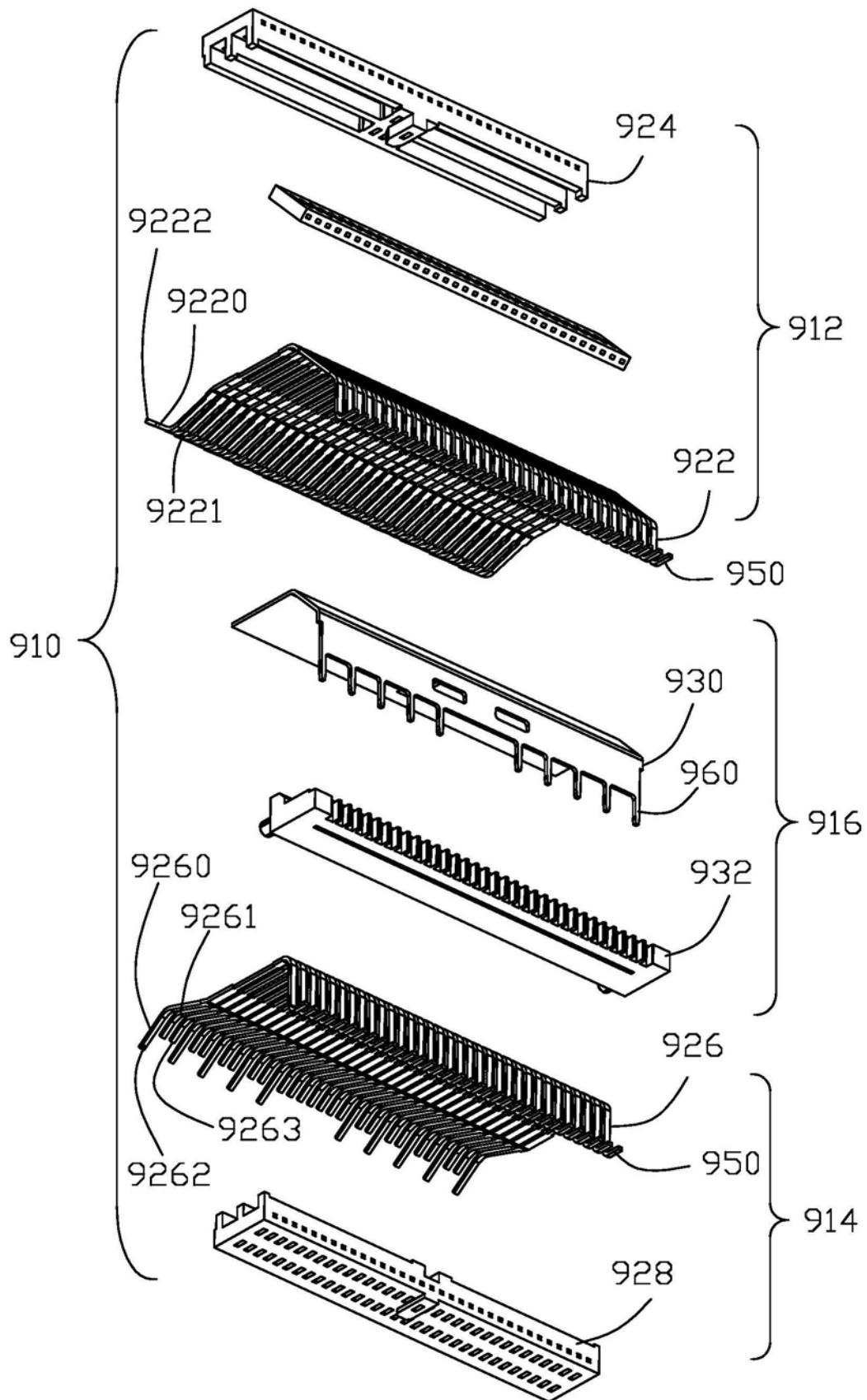


图10

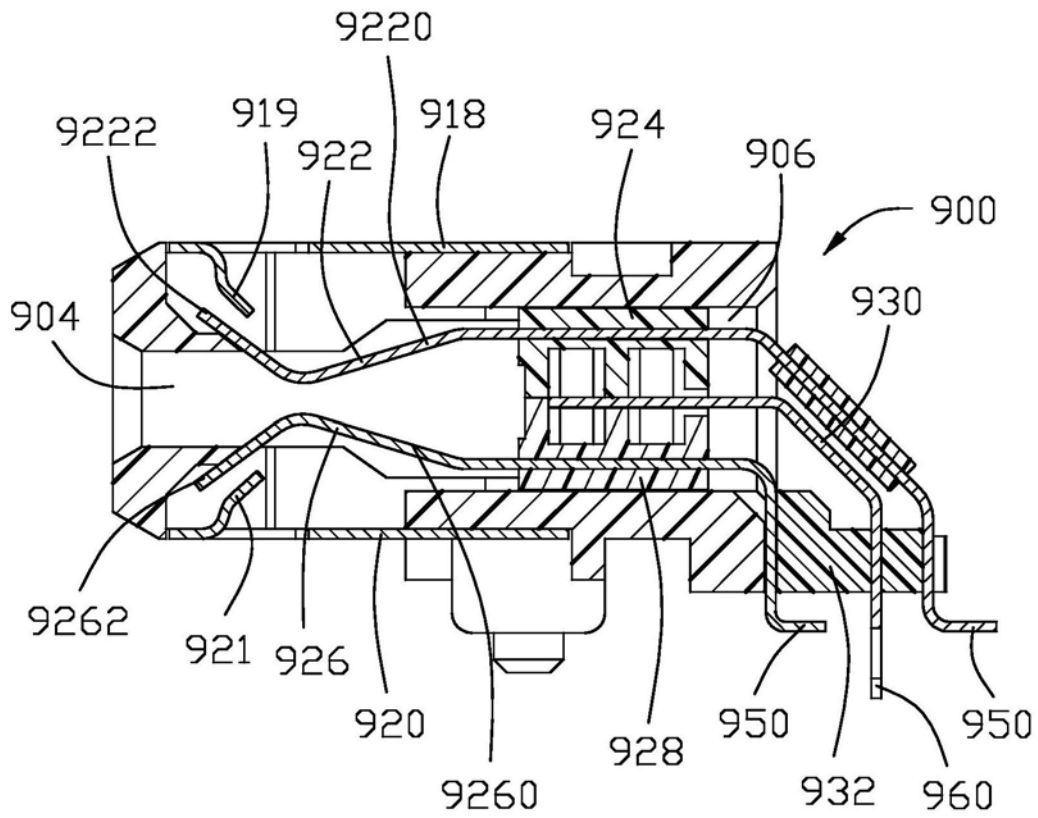


图11

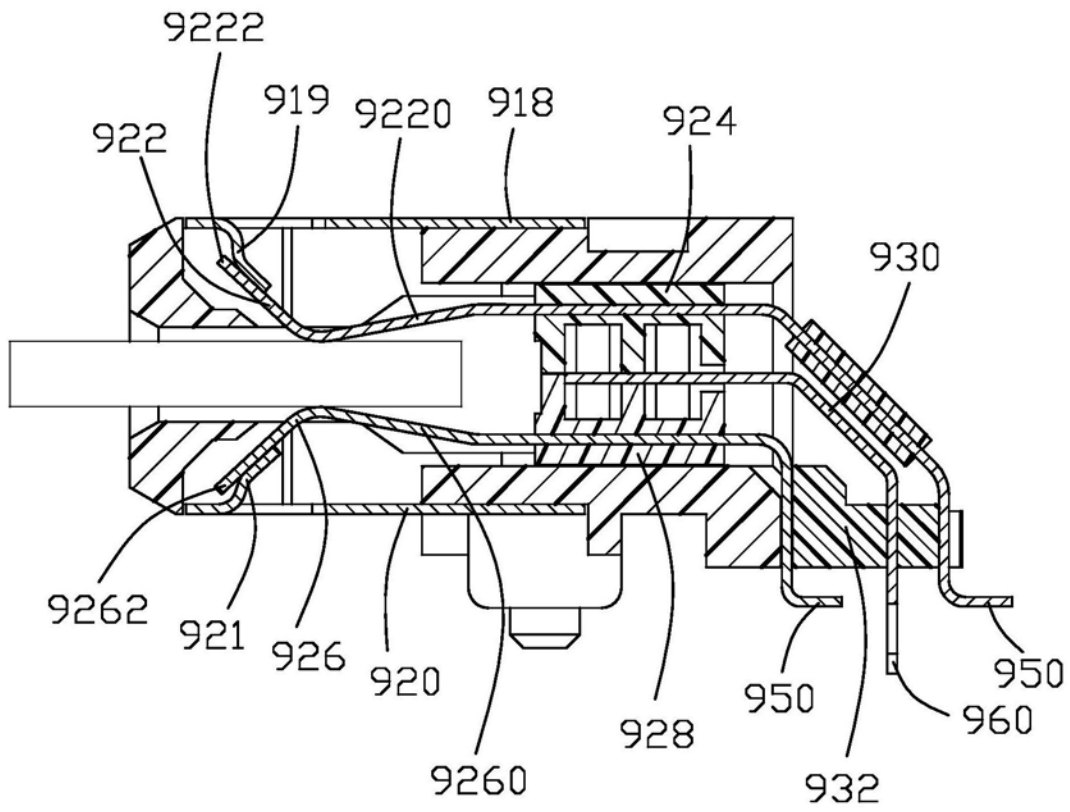


图12

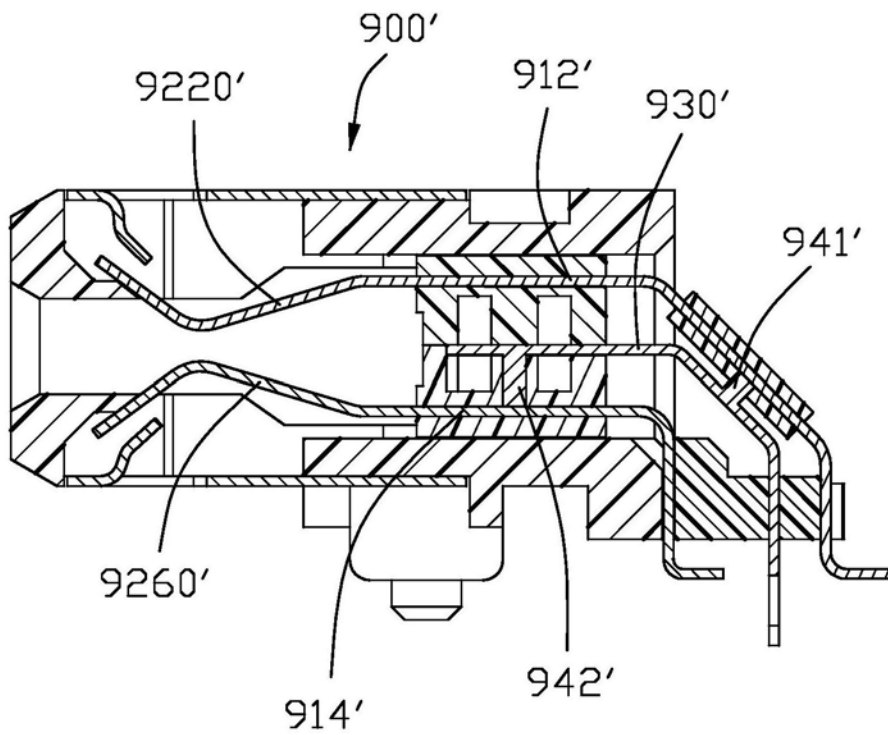


图13

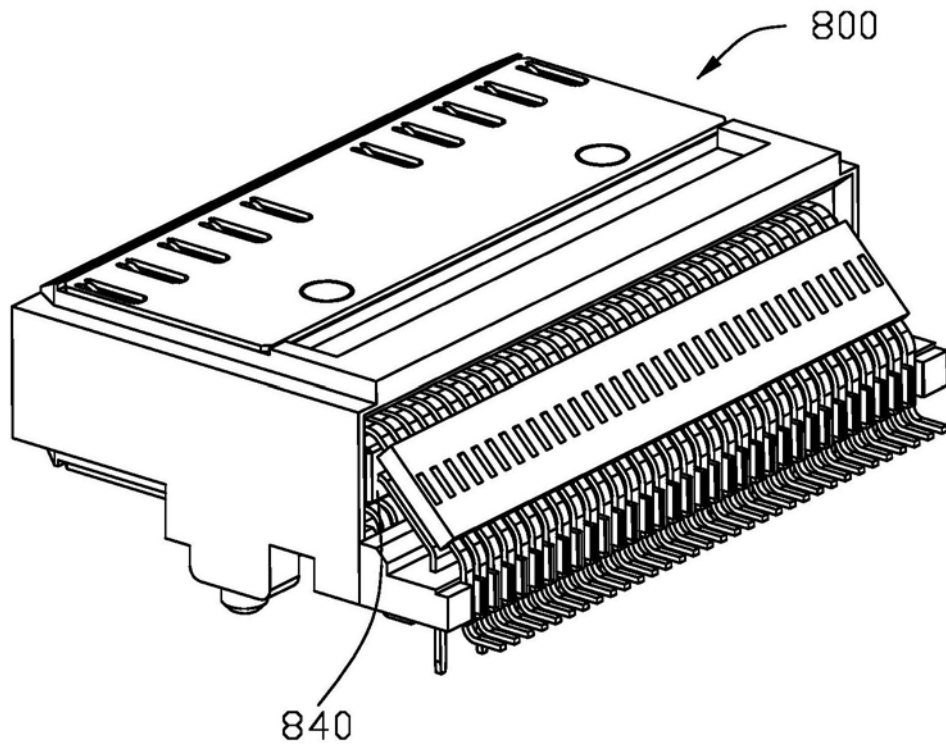


图14

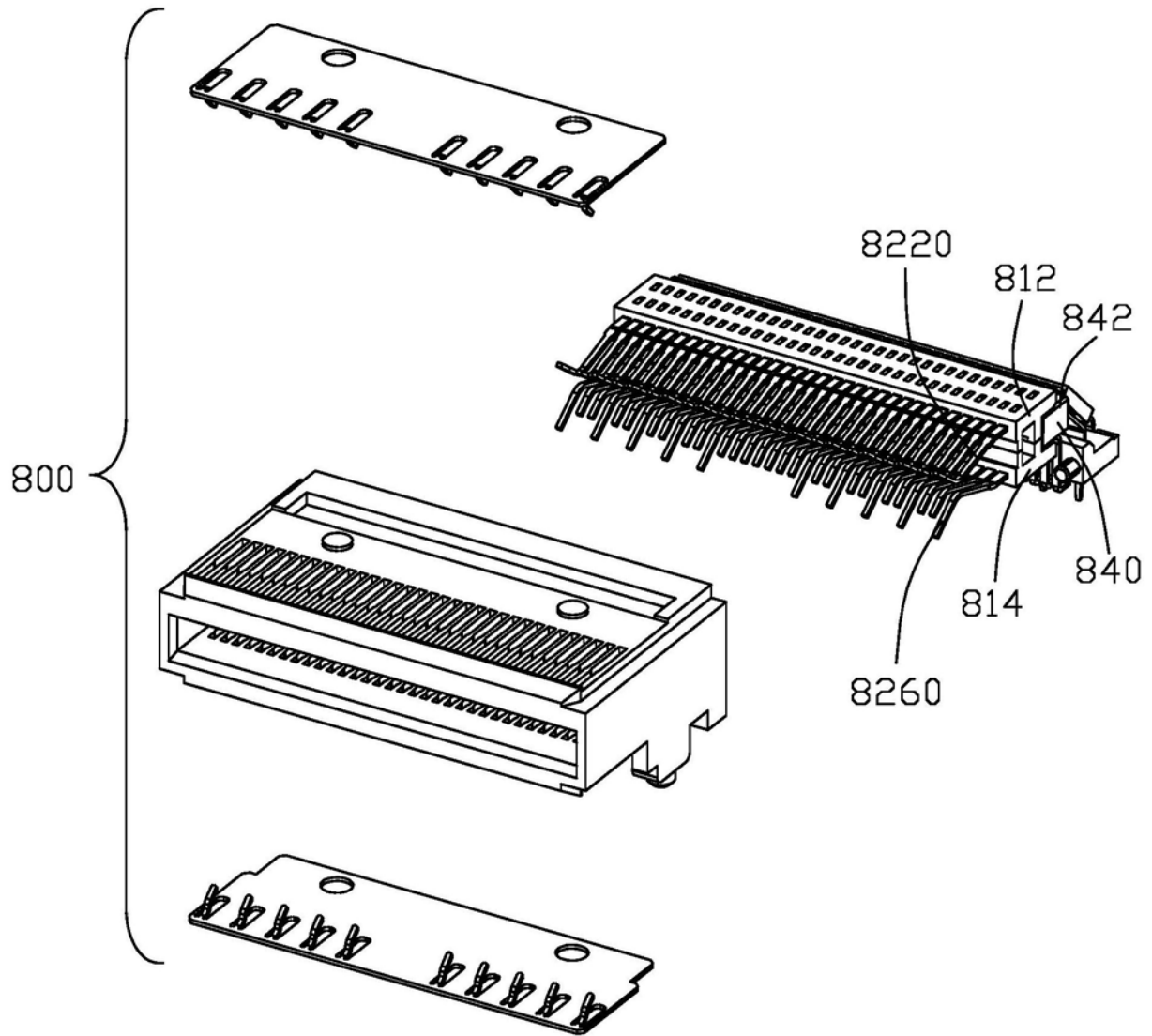


图15

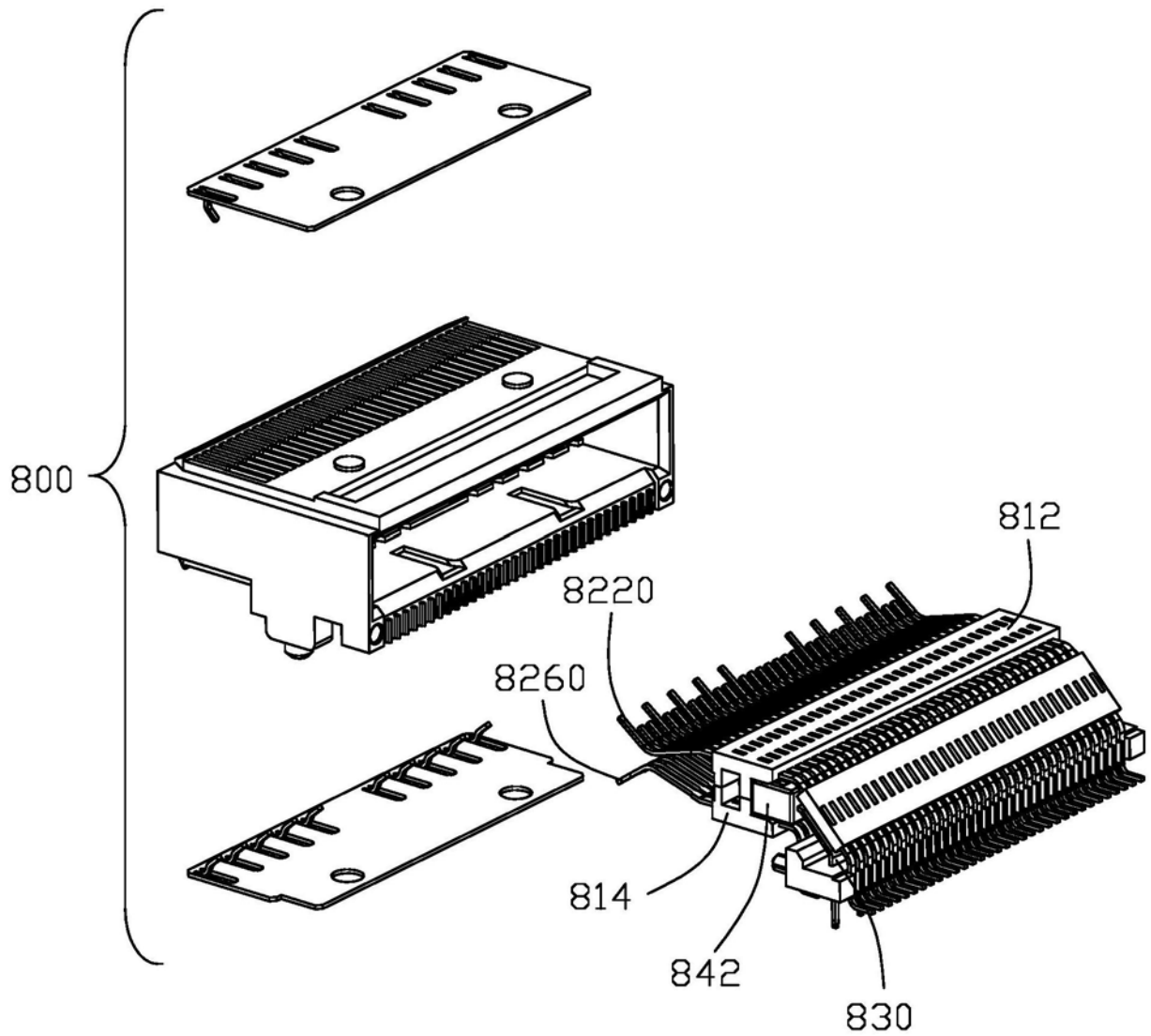


图16

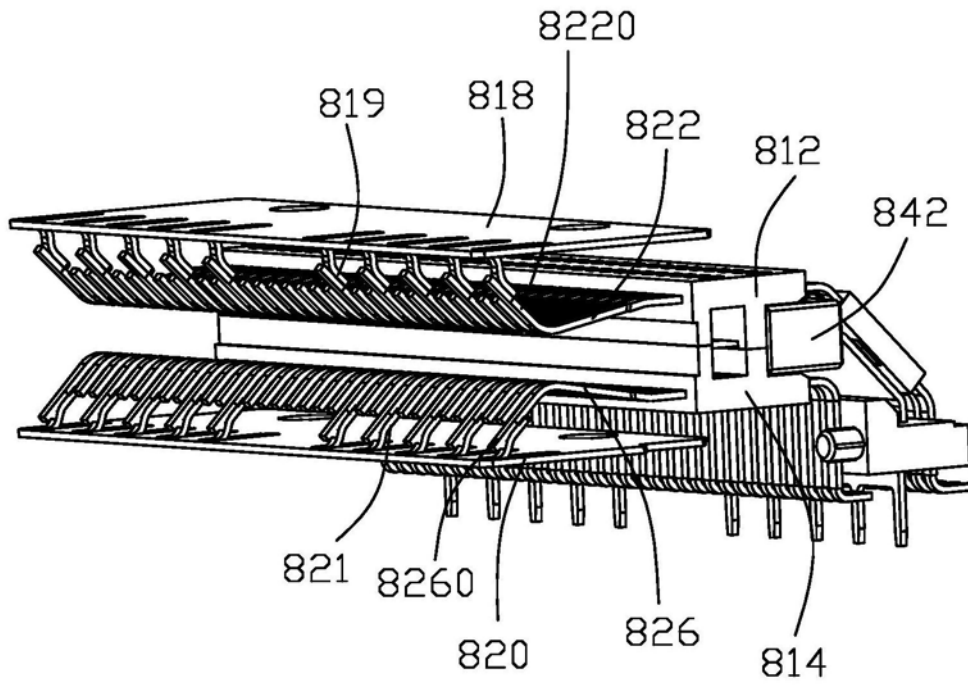


图17

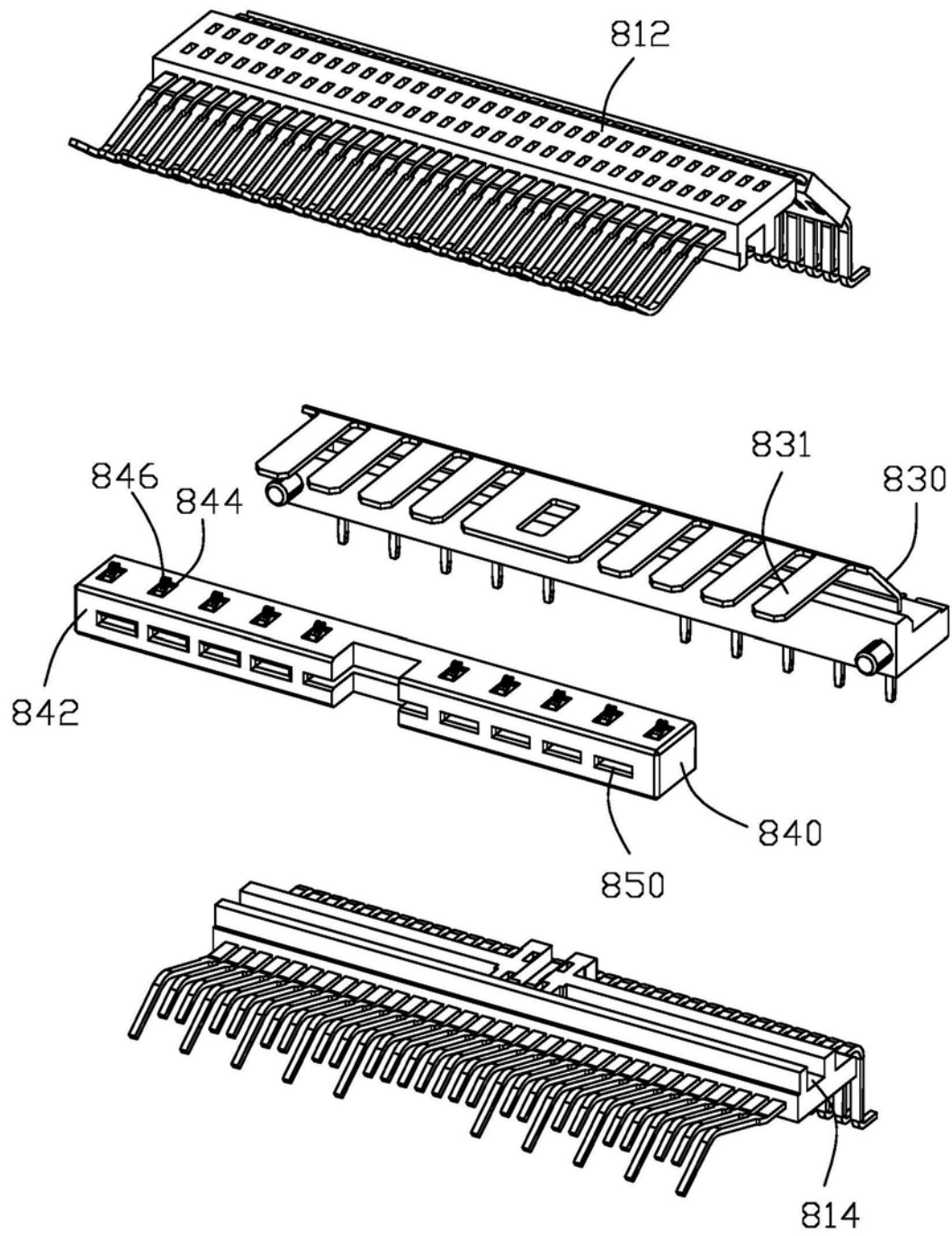


图18

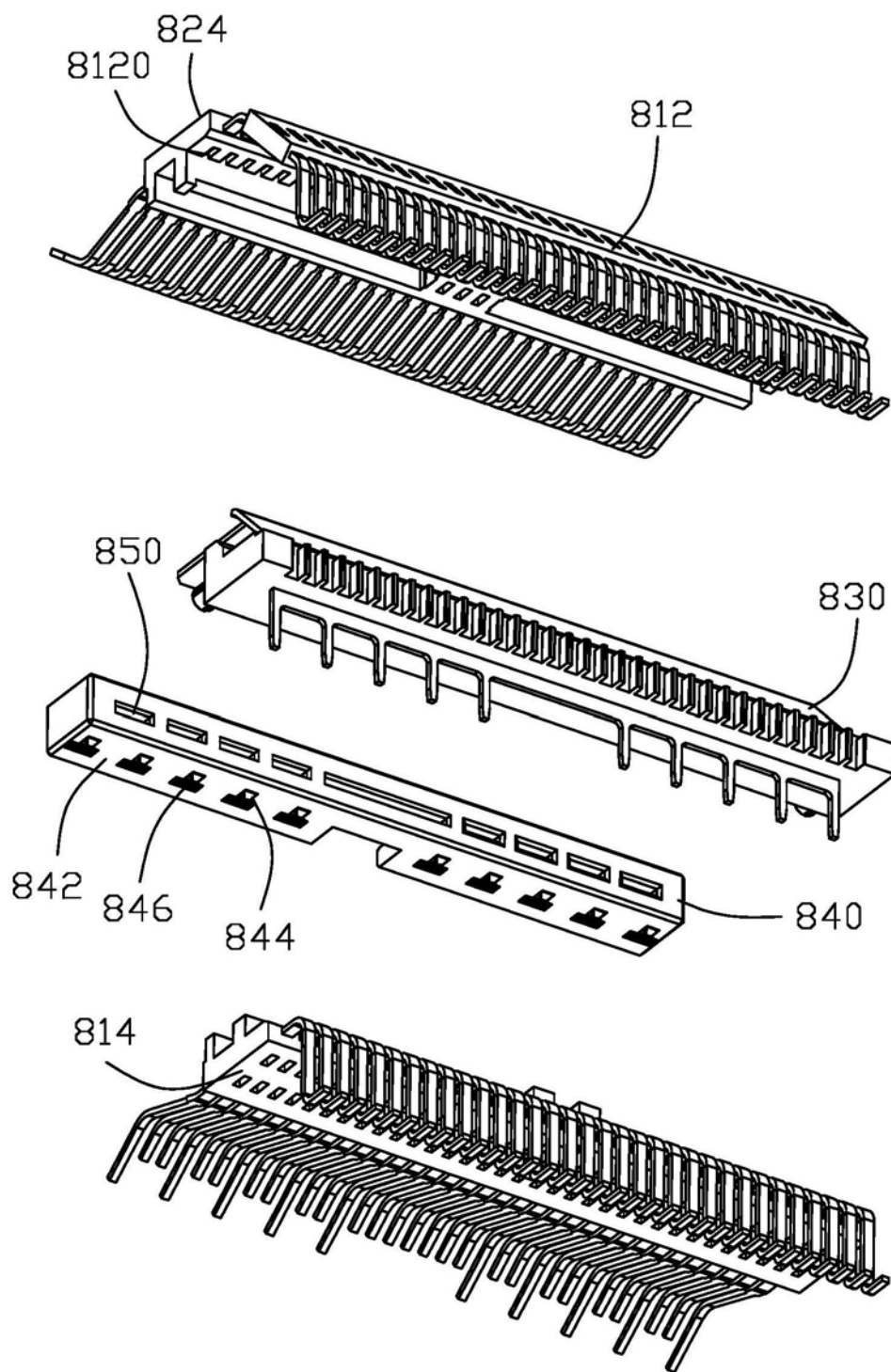


图19

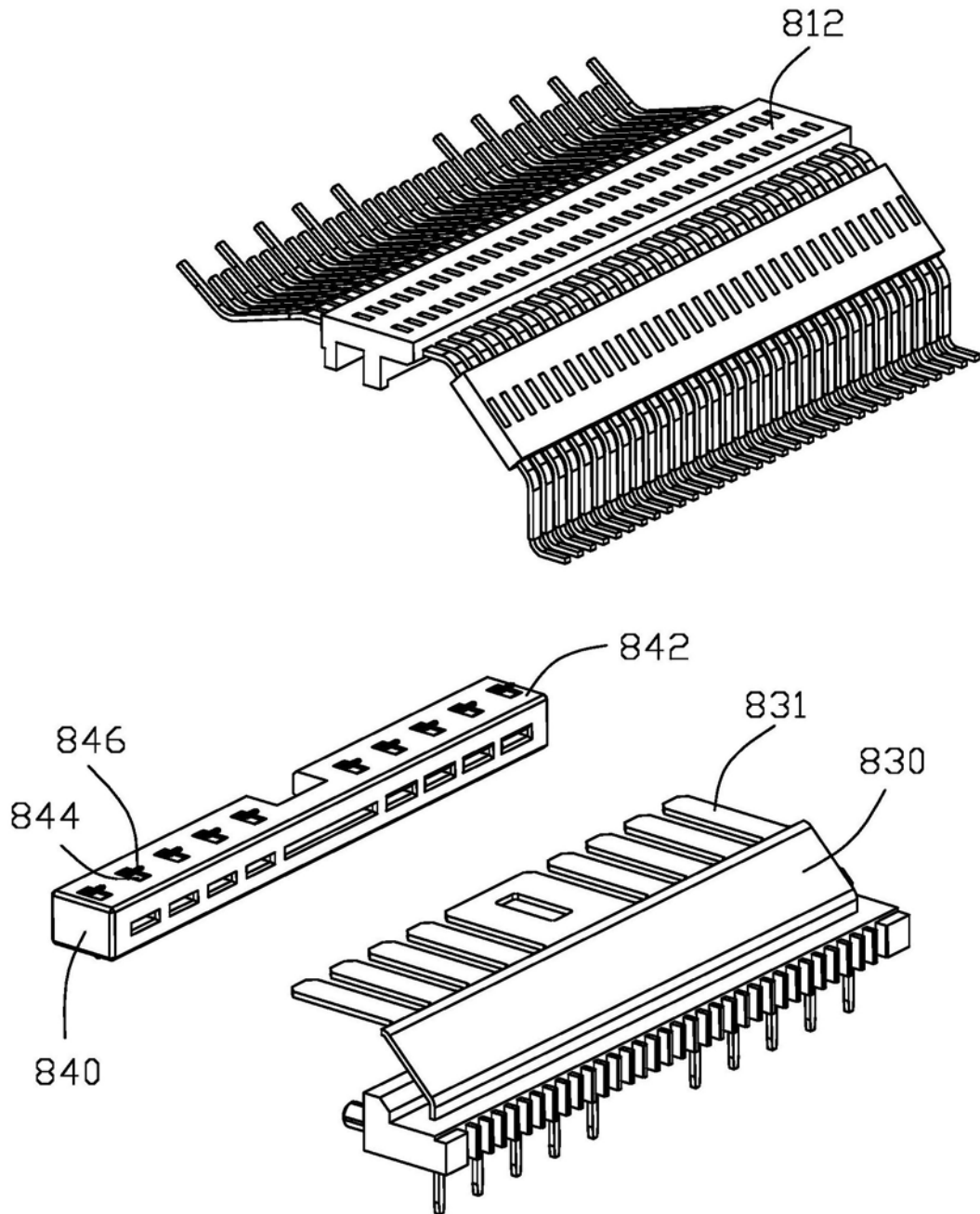


图20

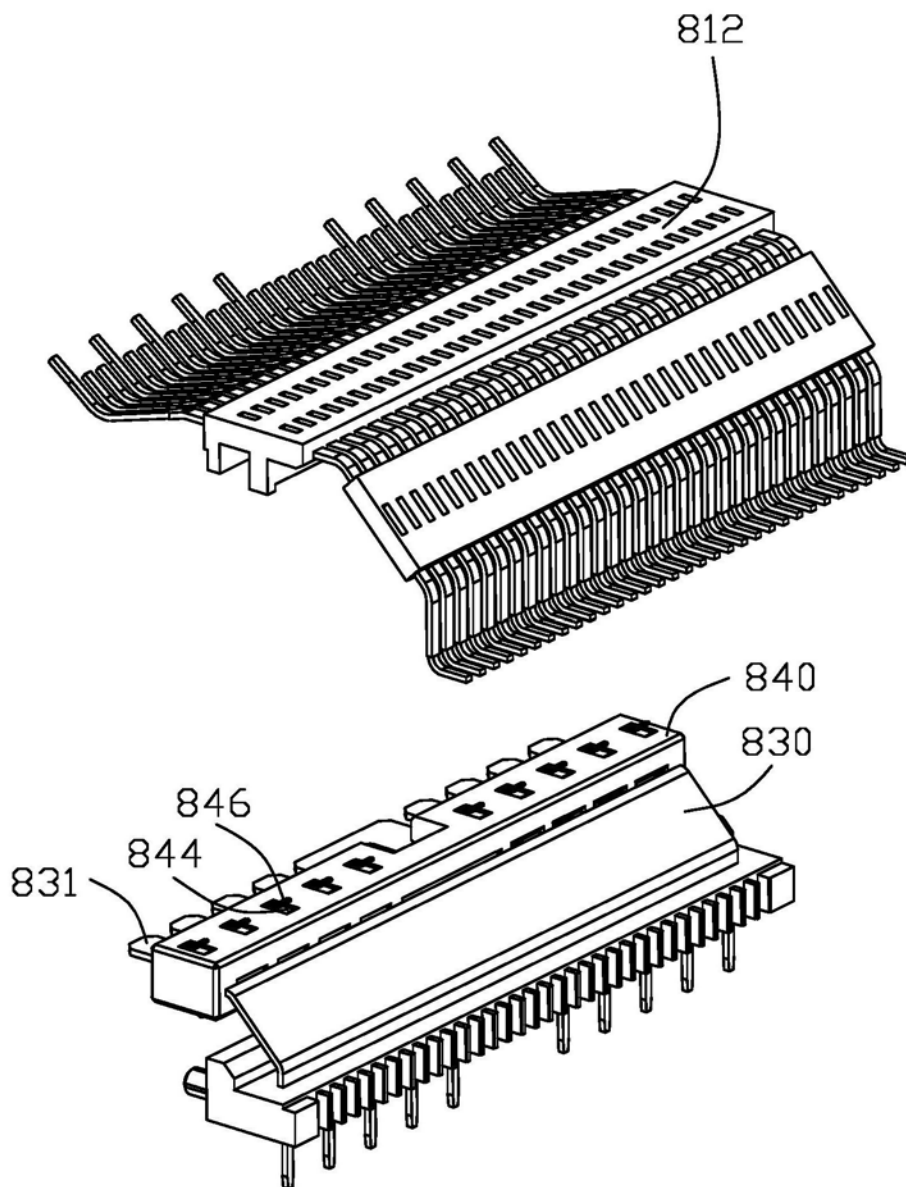


图21

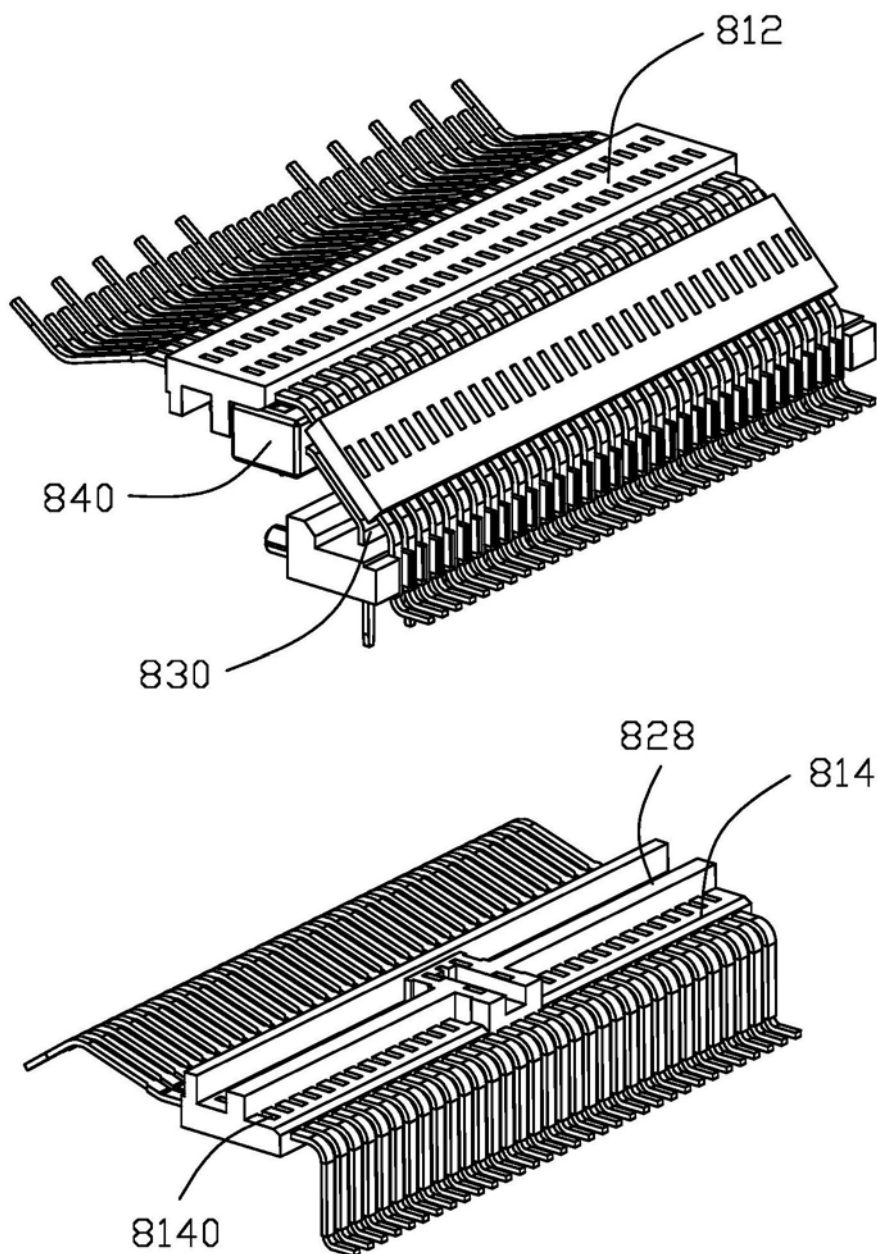


图22

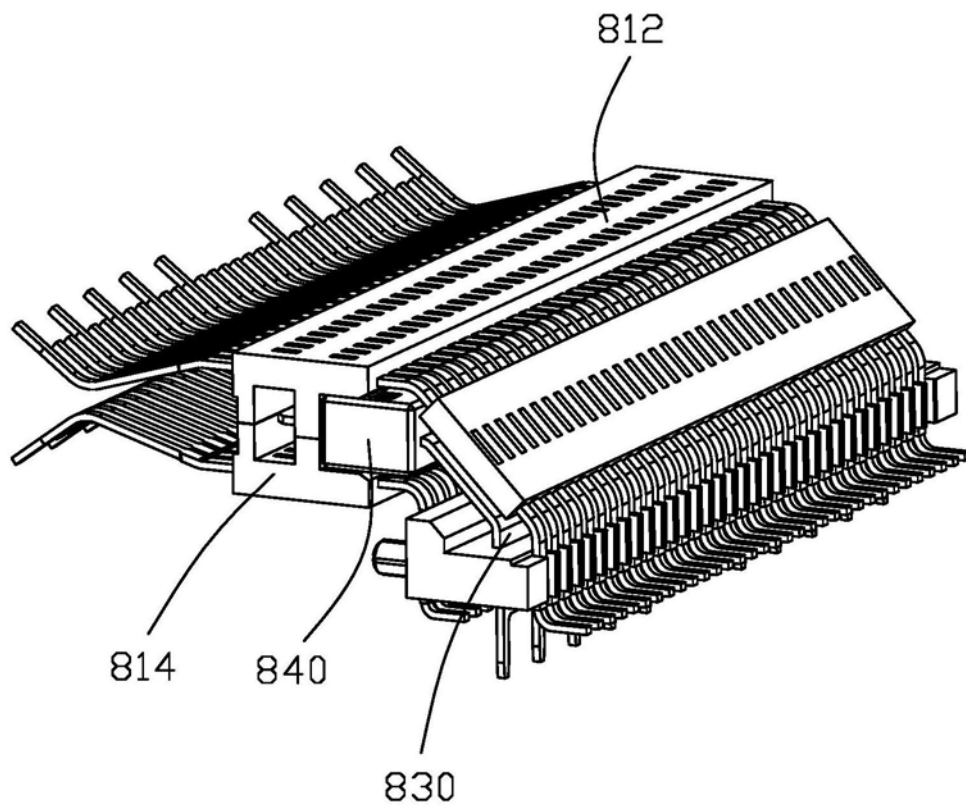


图23

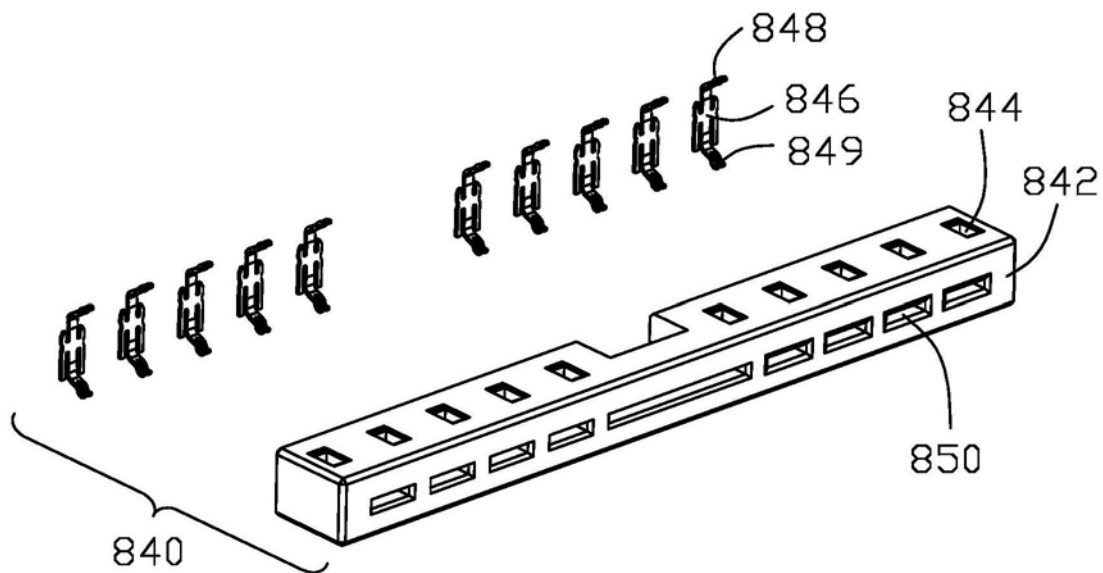


图24

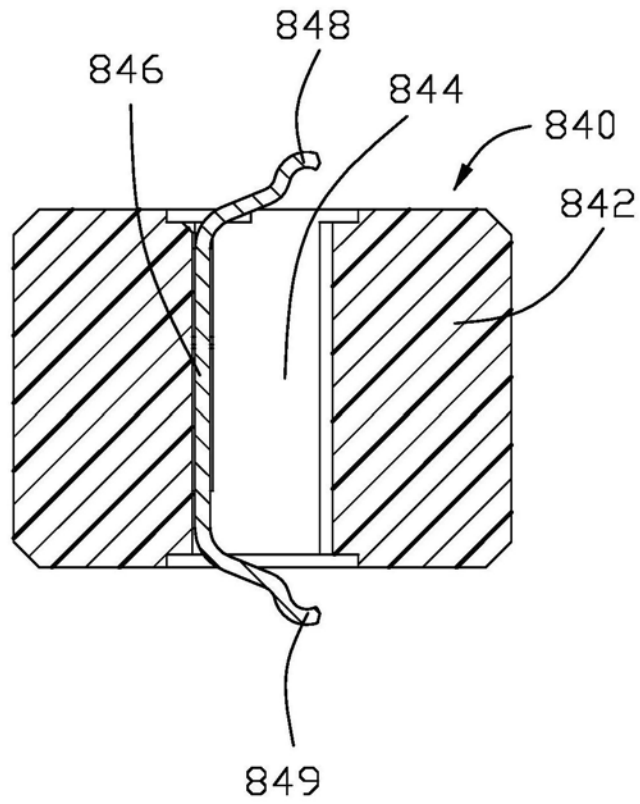


图25

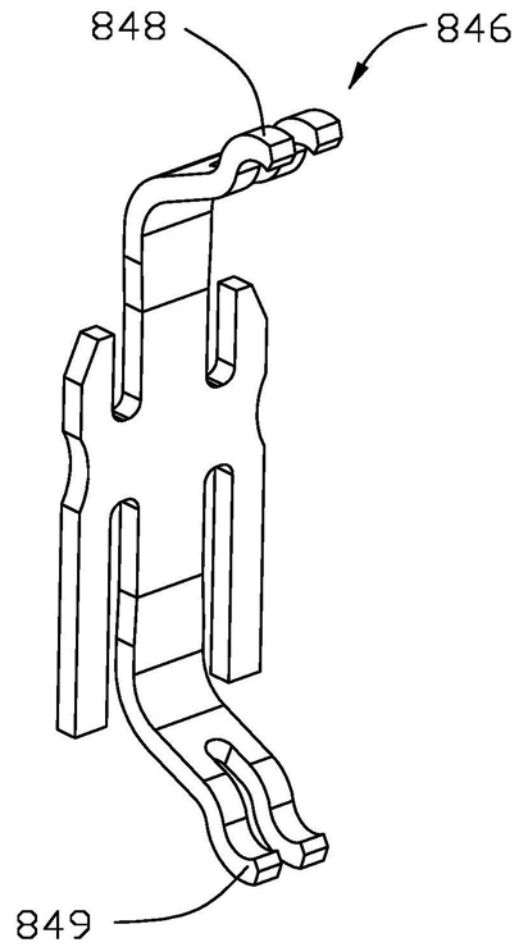


图26

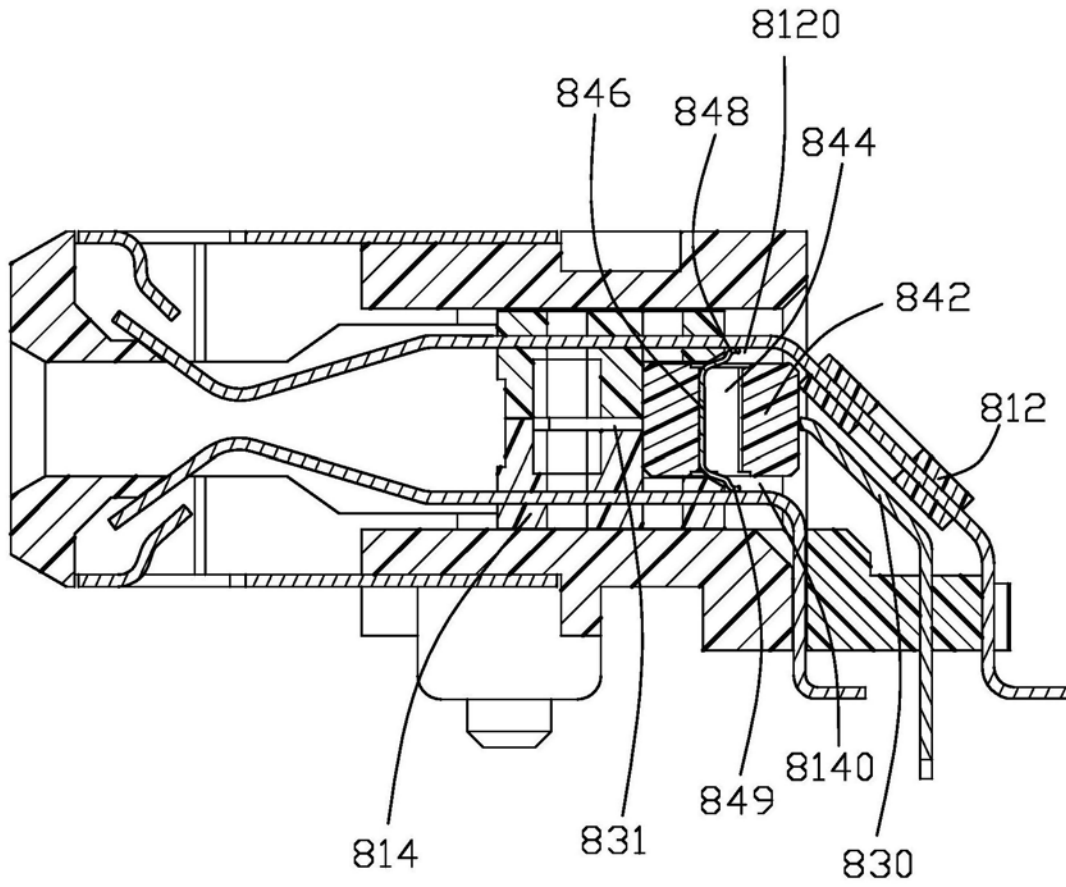


图27

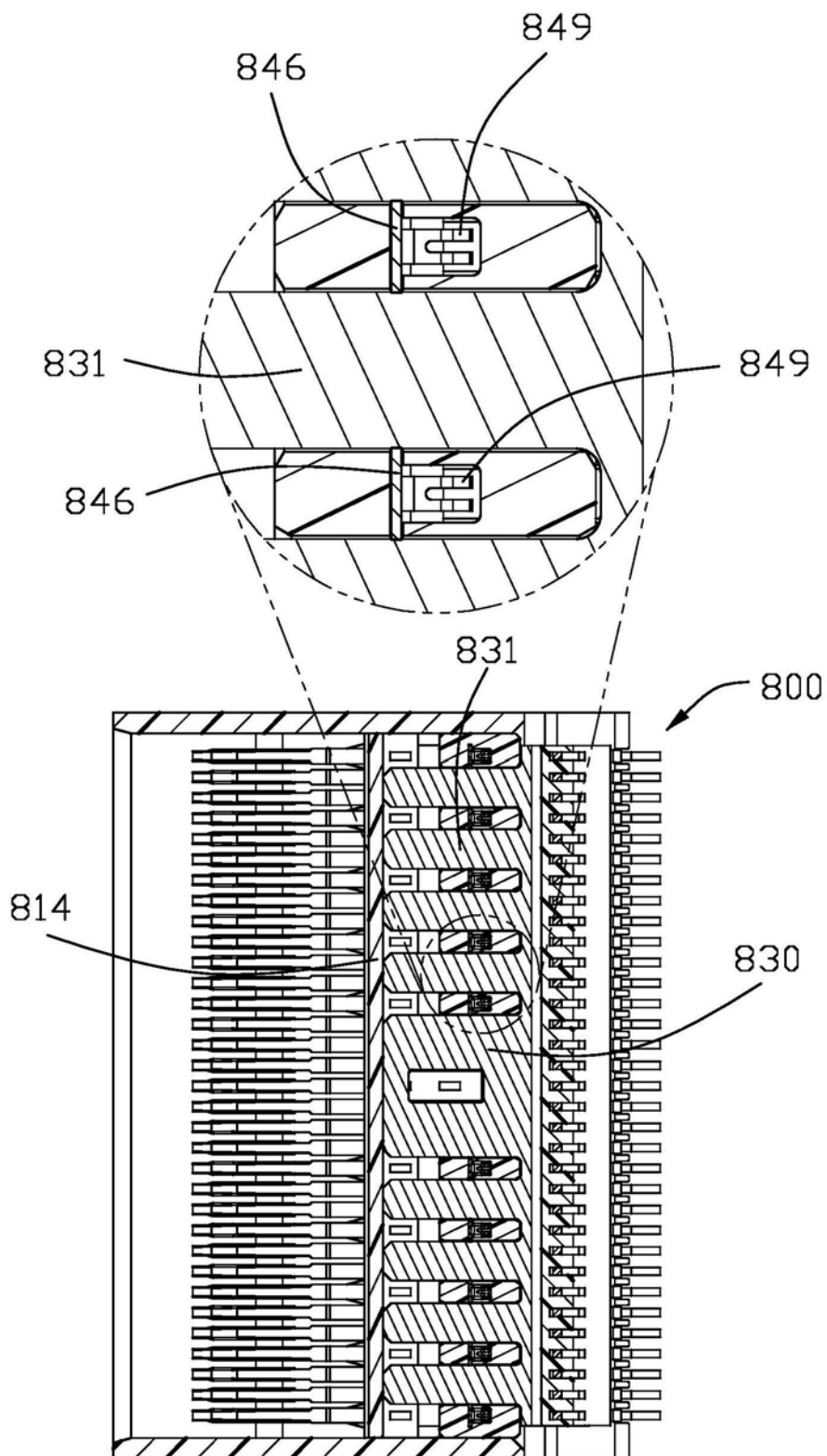


图28

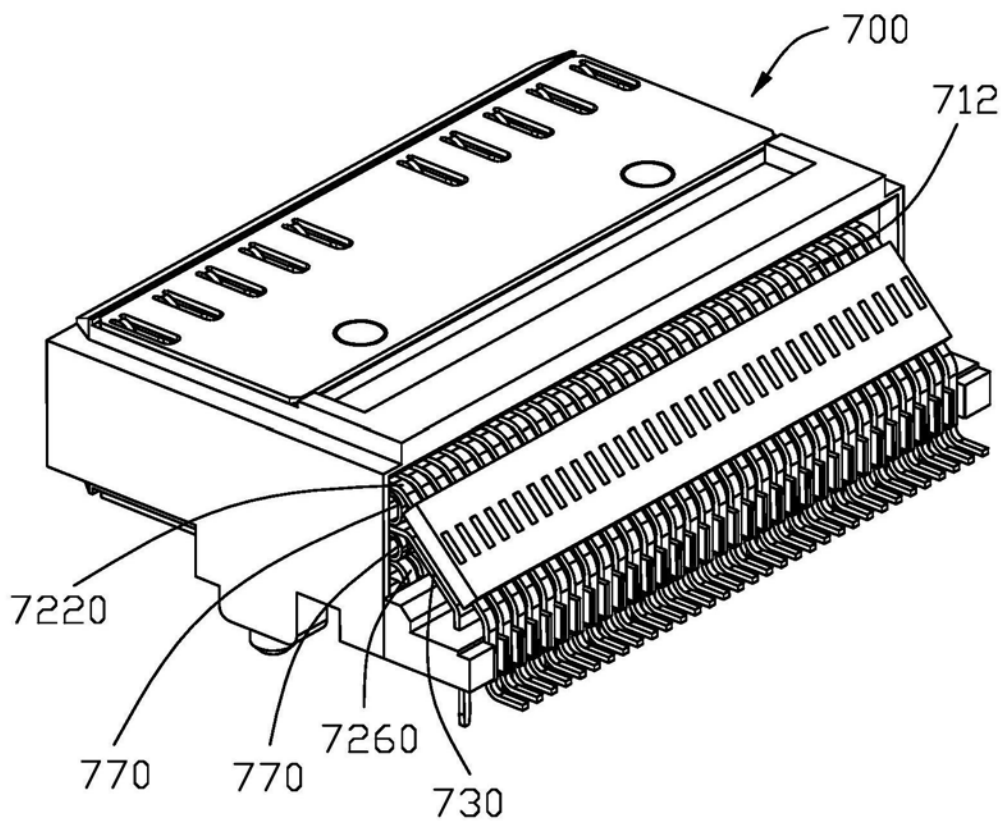


图29

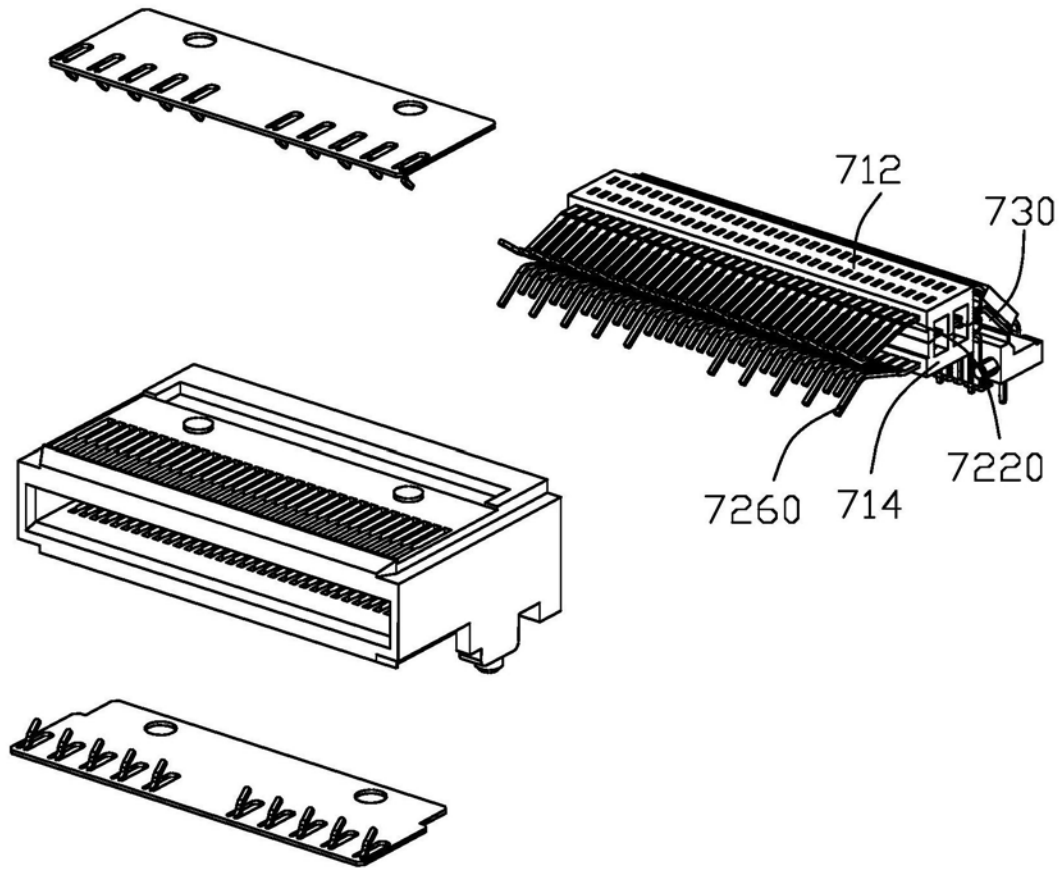


图30

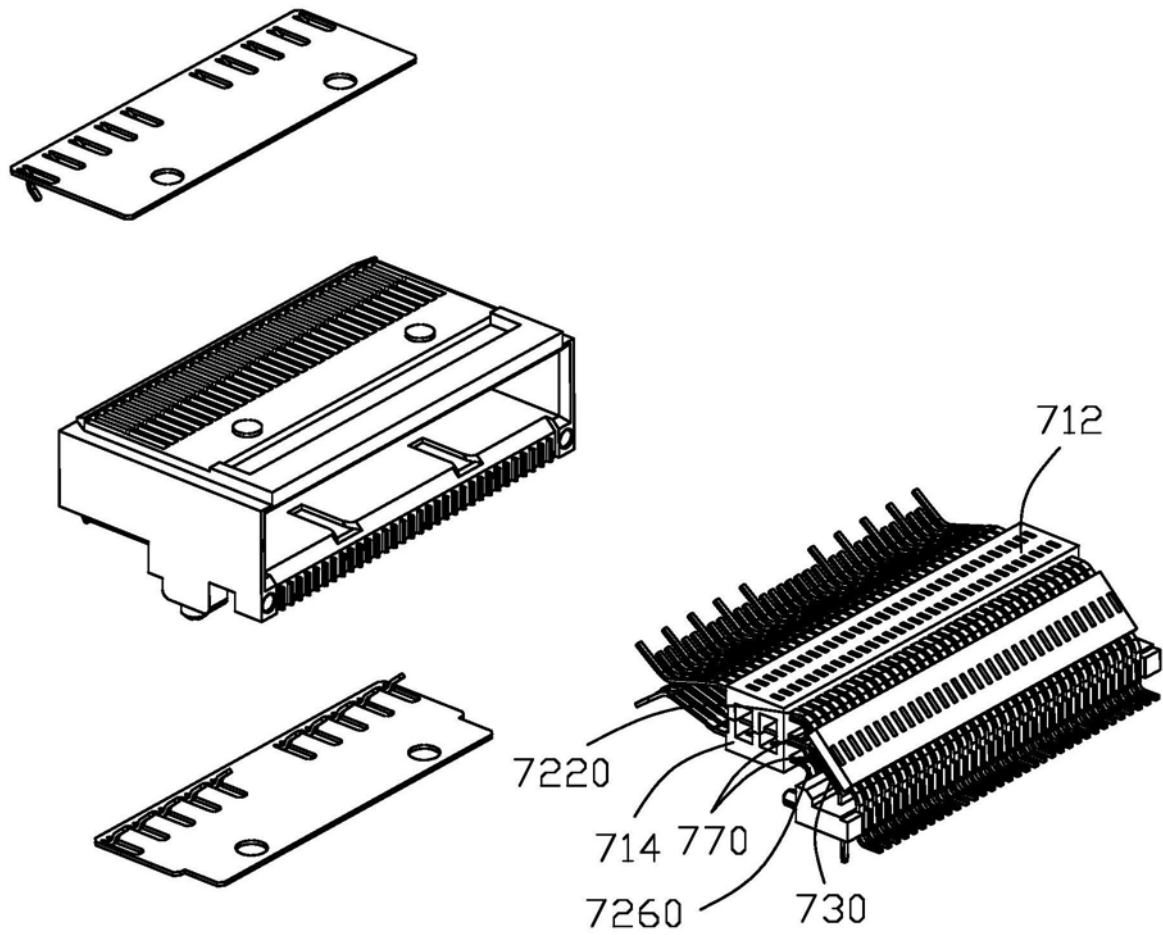


图31

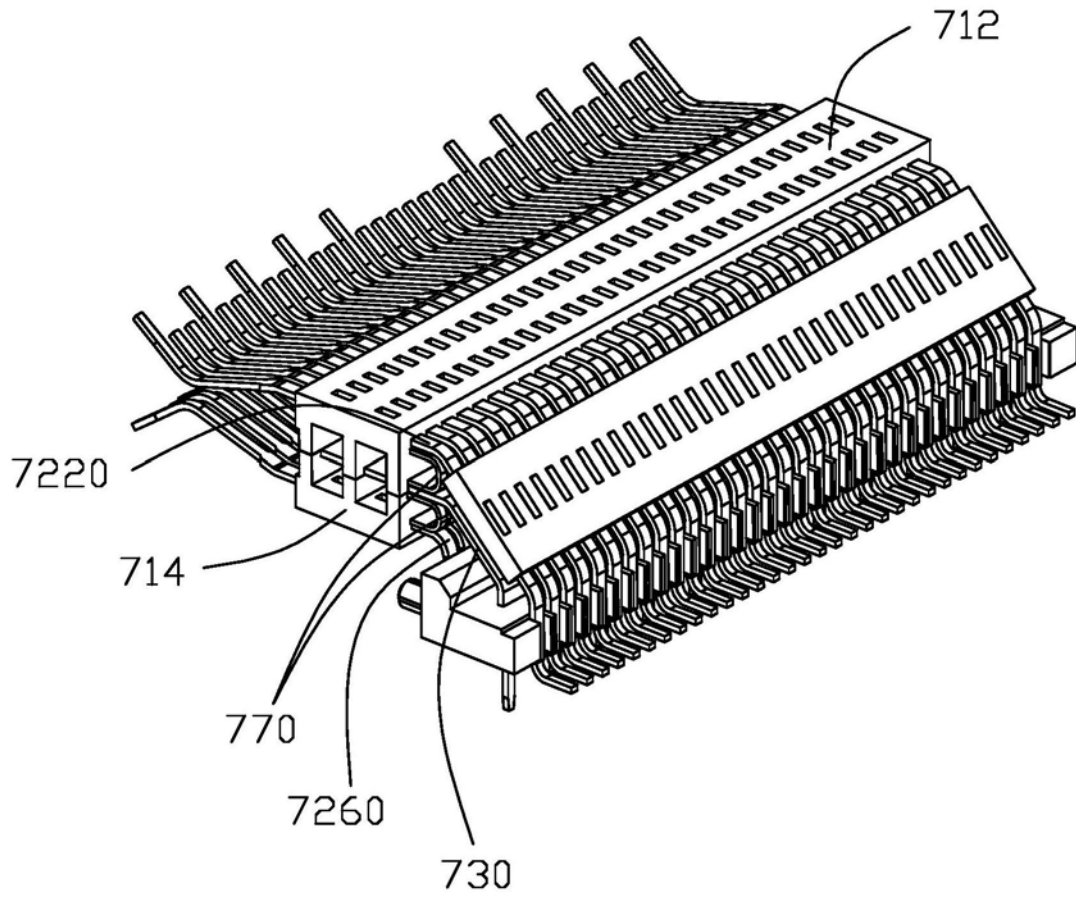


图32

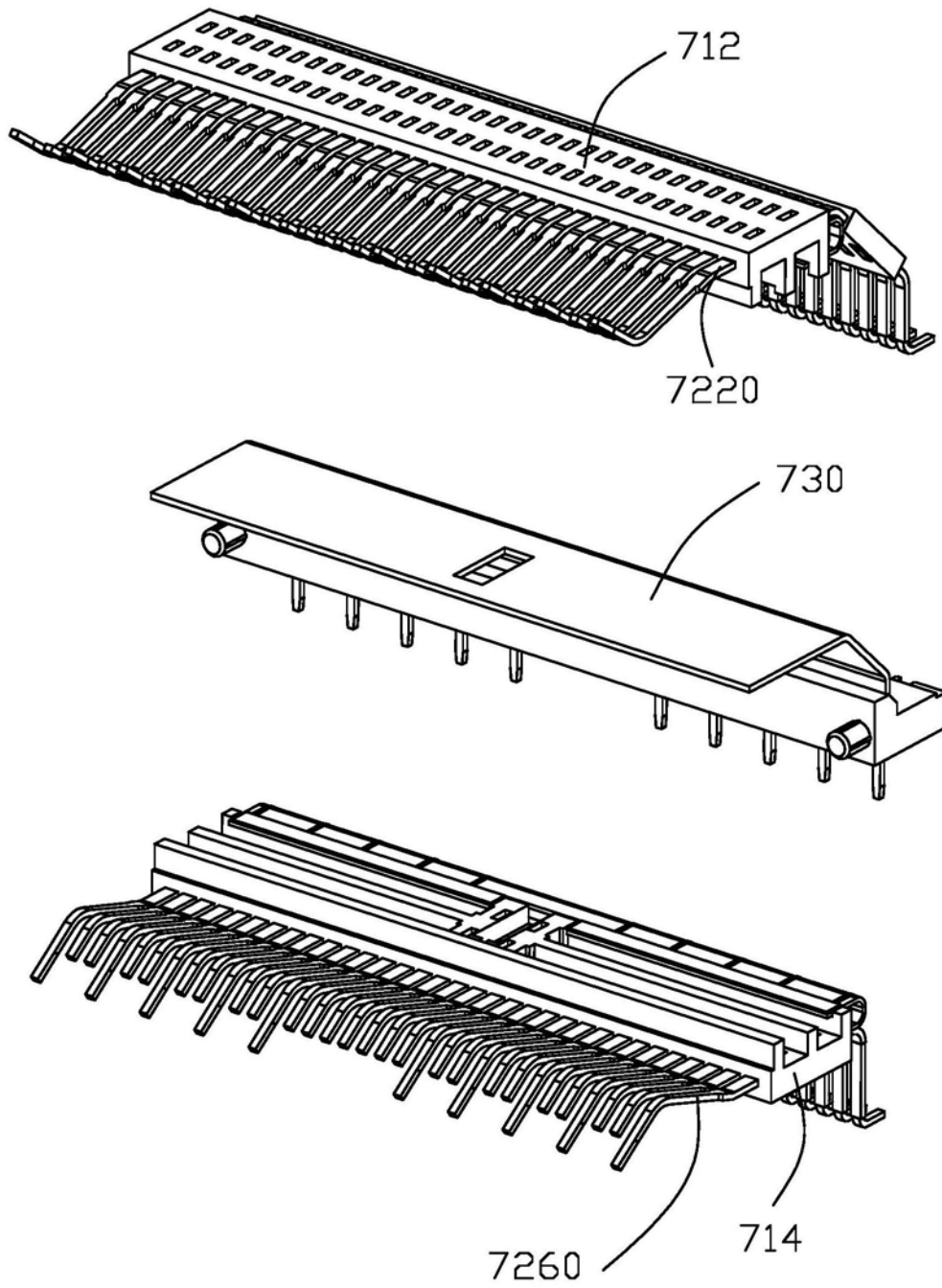


图33

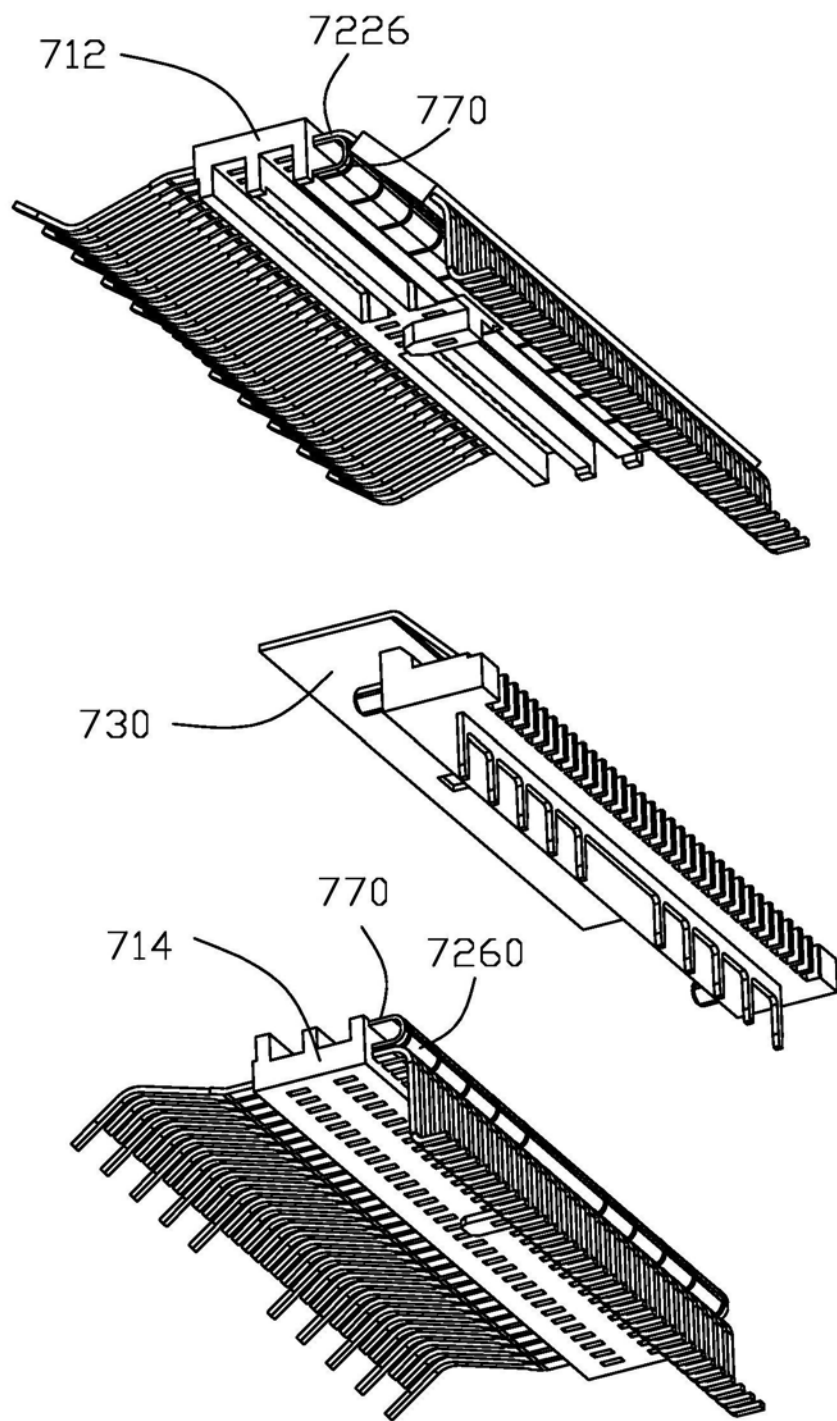


图34

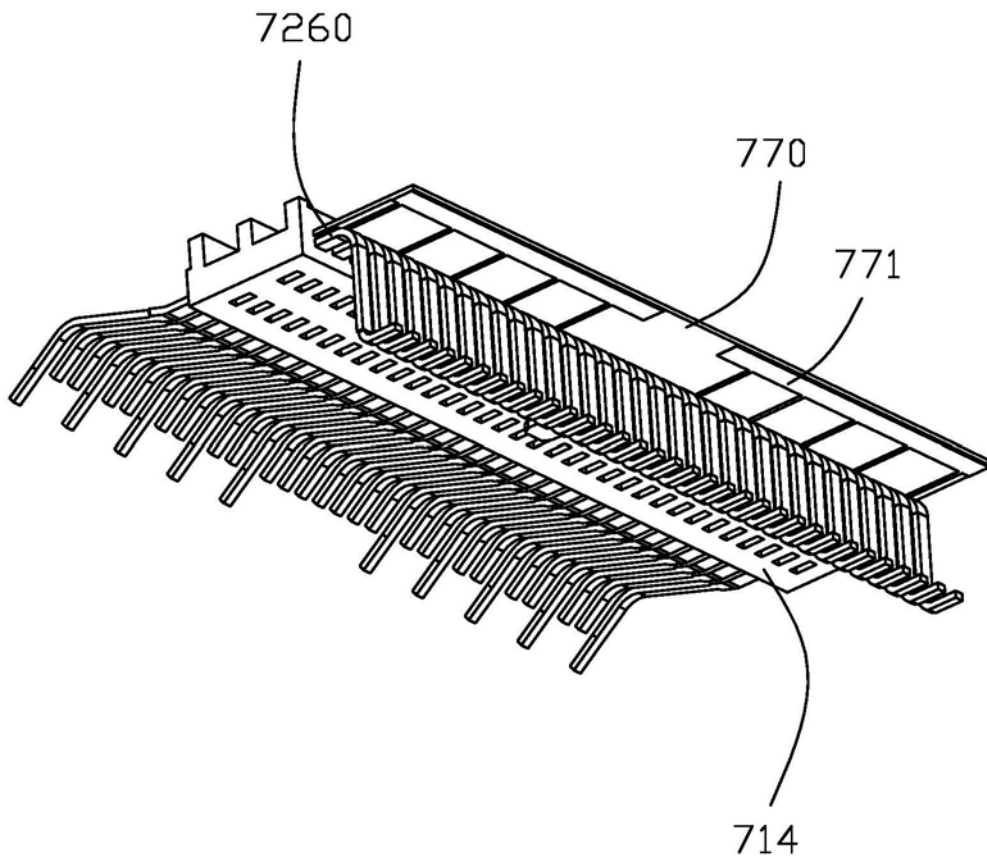


图35

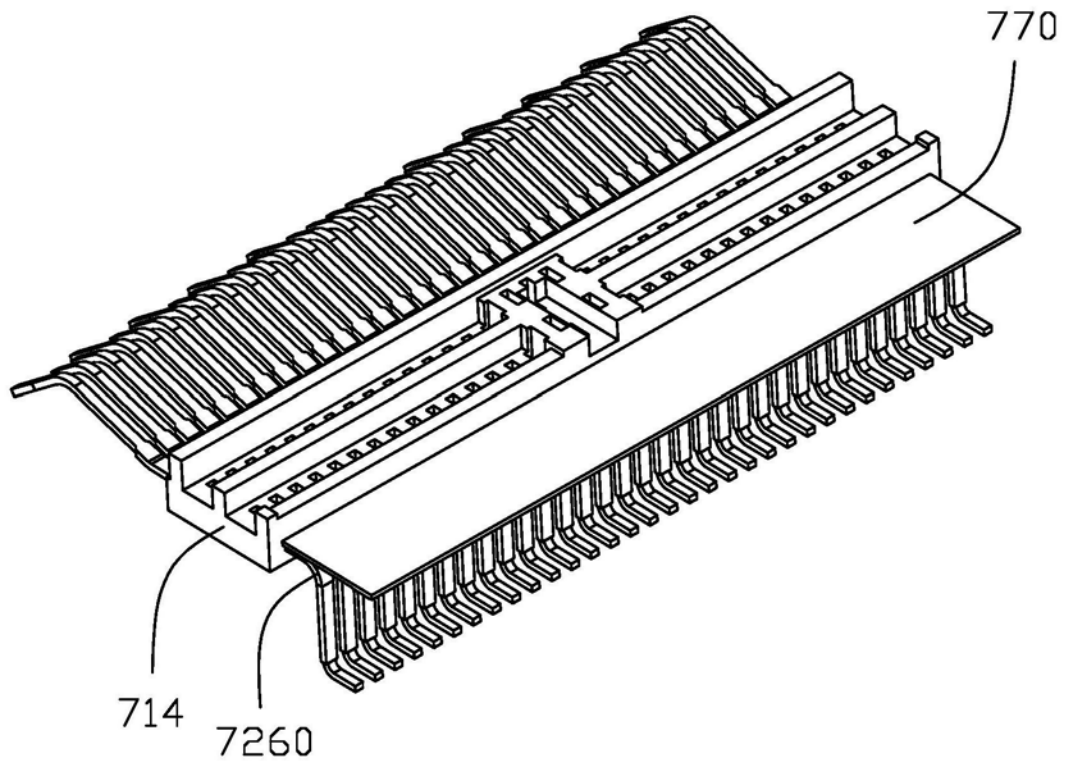


图36

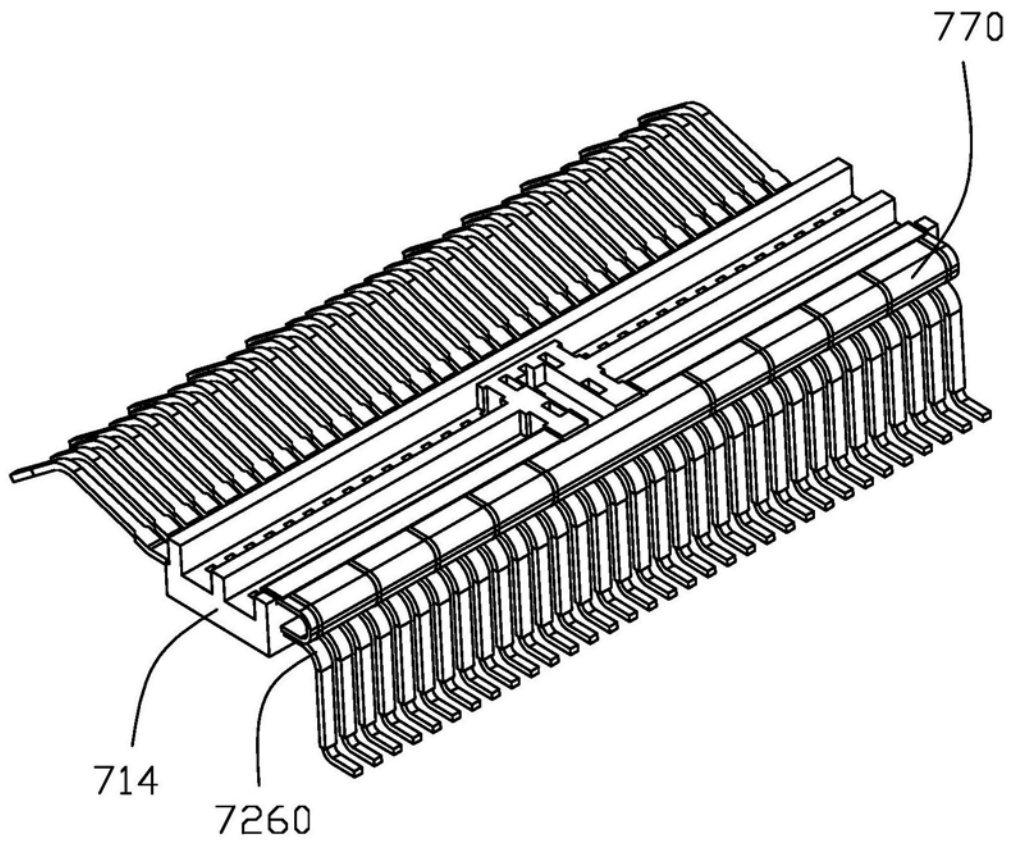


图37

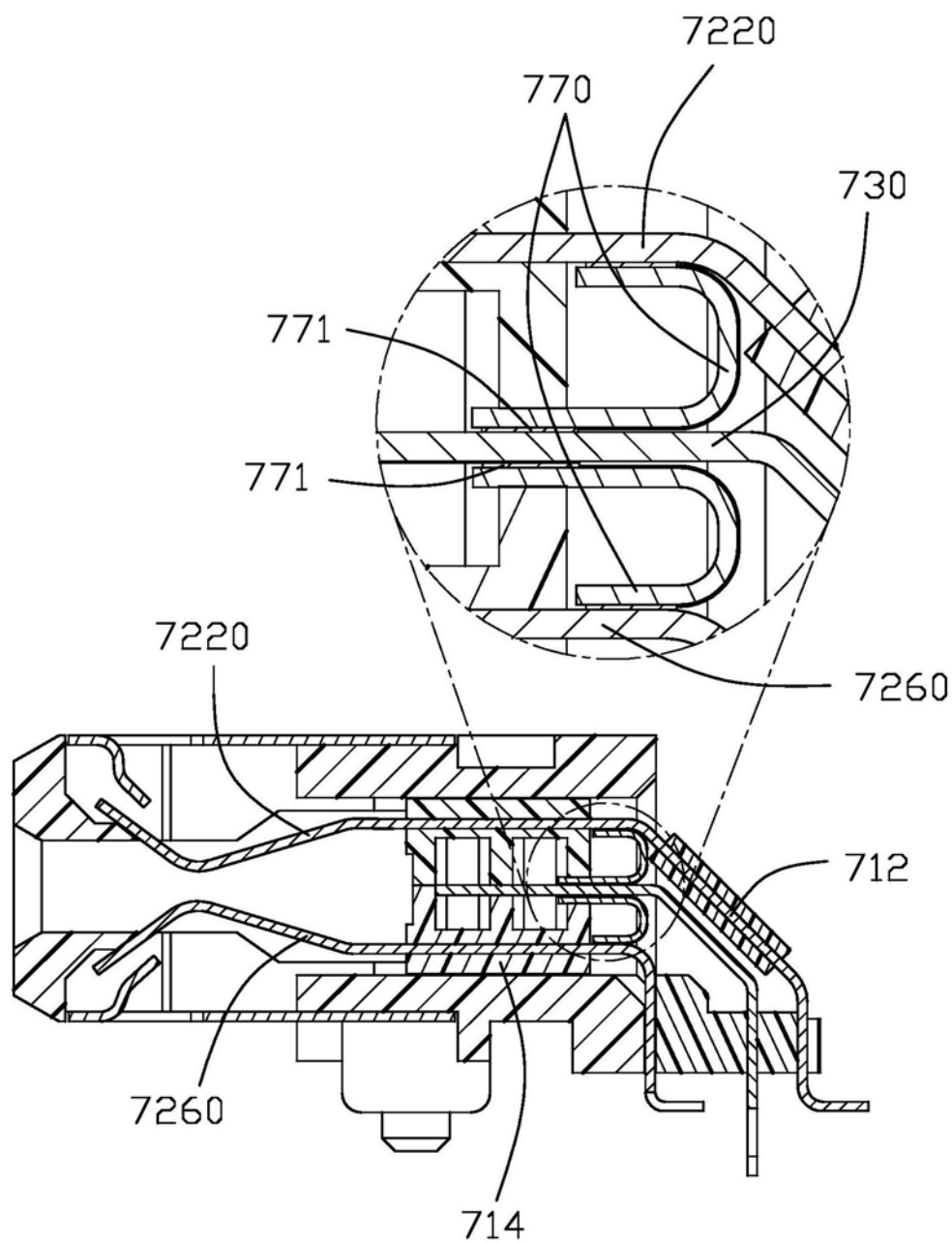


图38

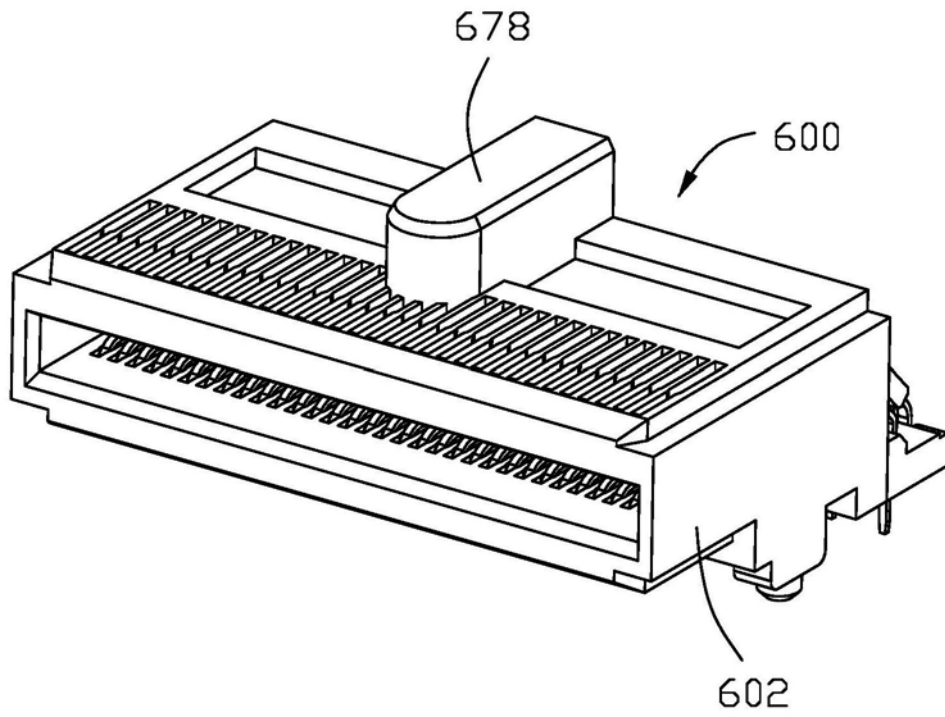


图39

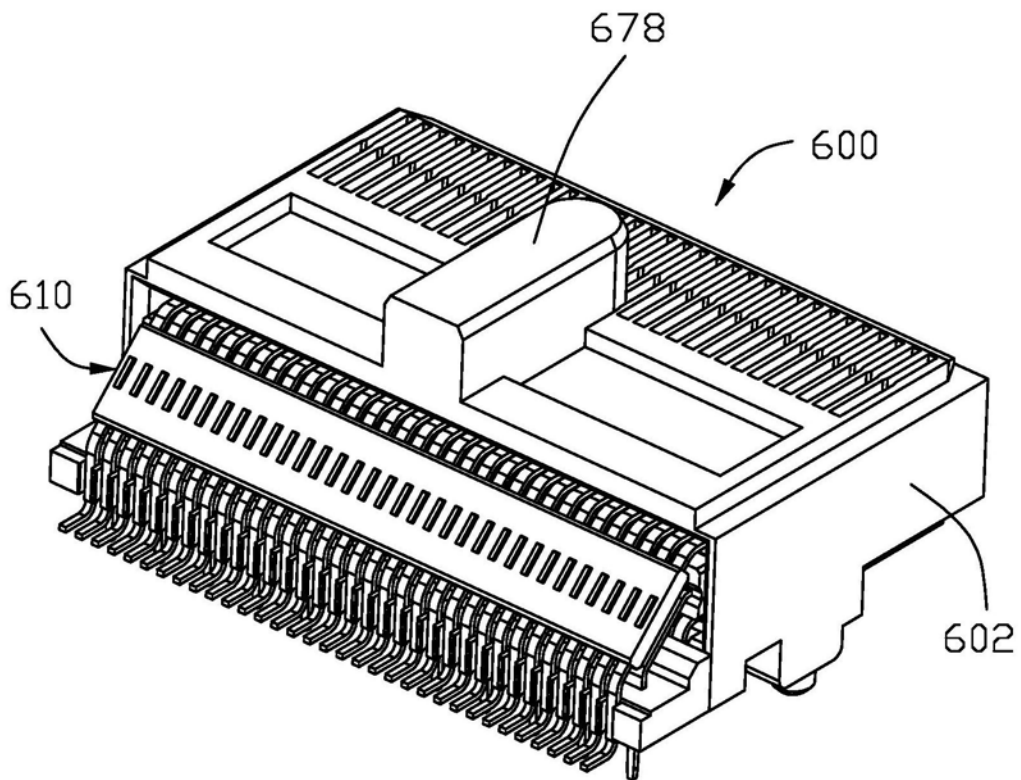


图40

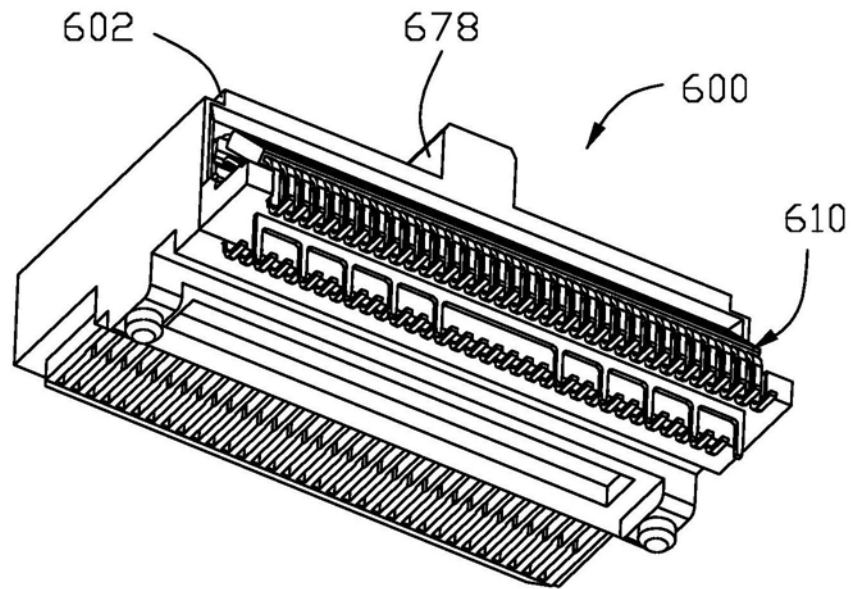


图41

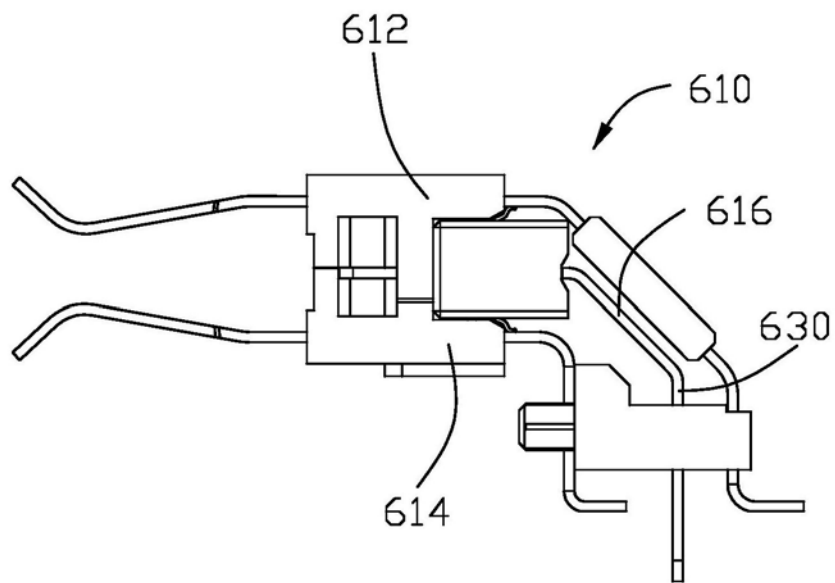


图42

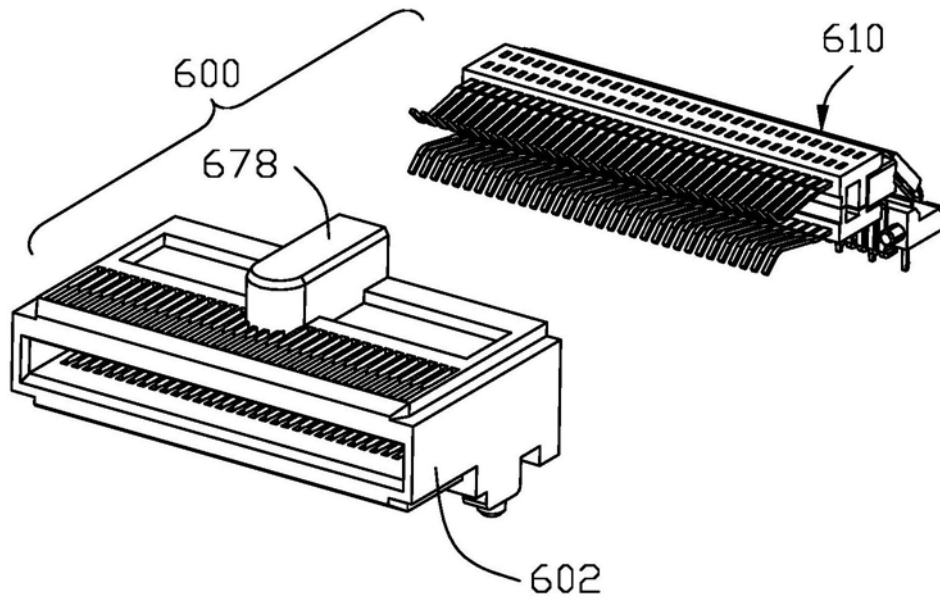


图43

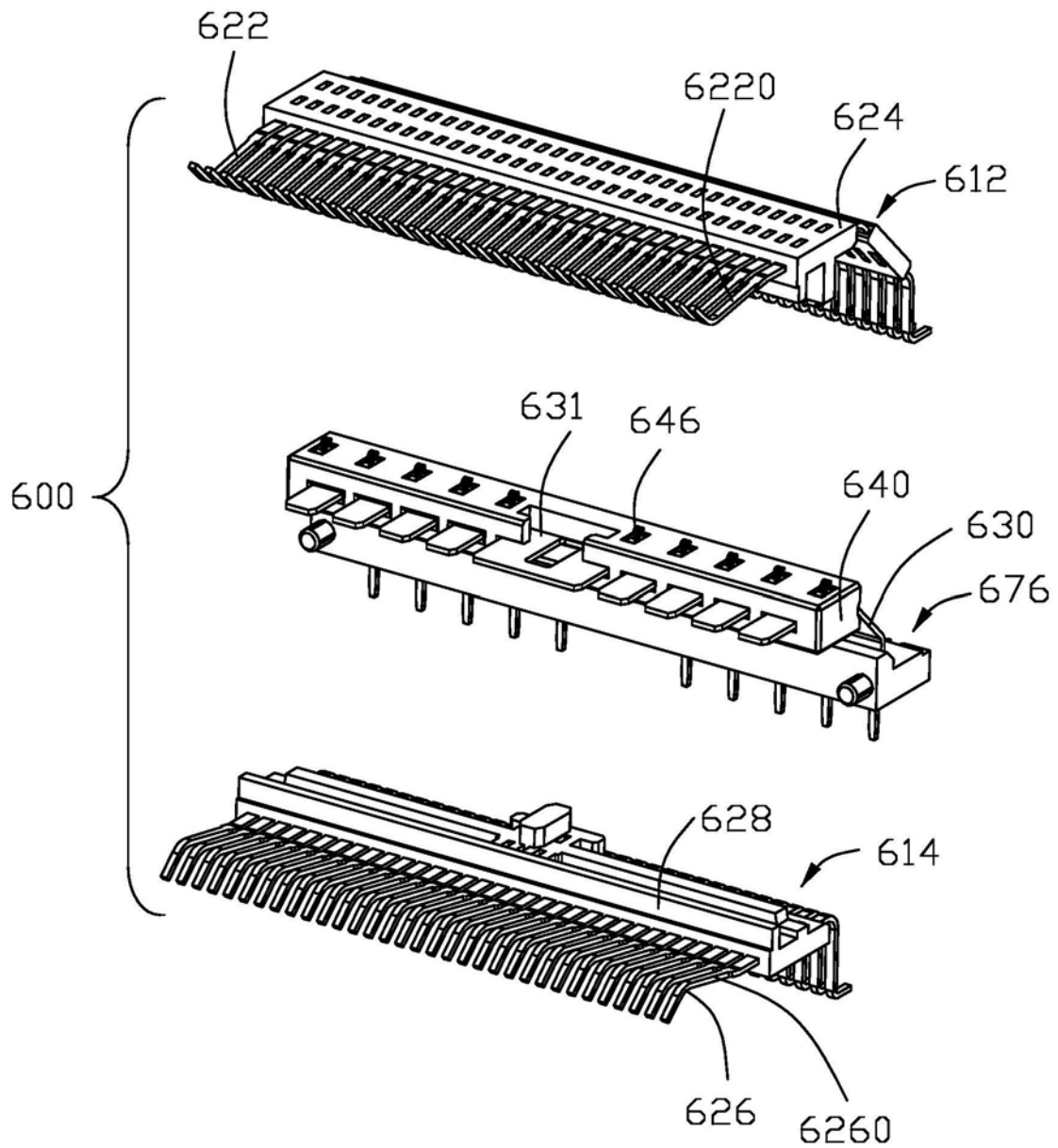


图44

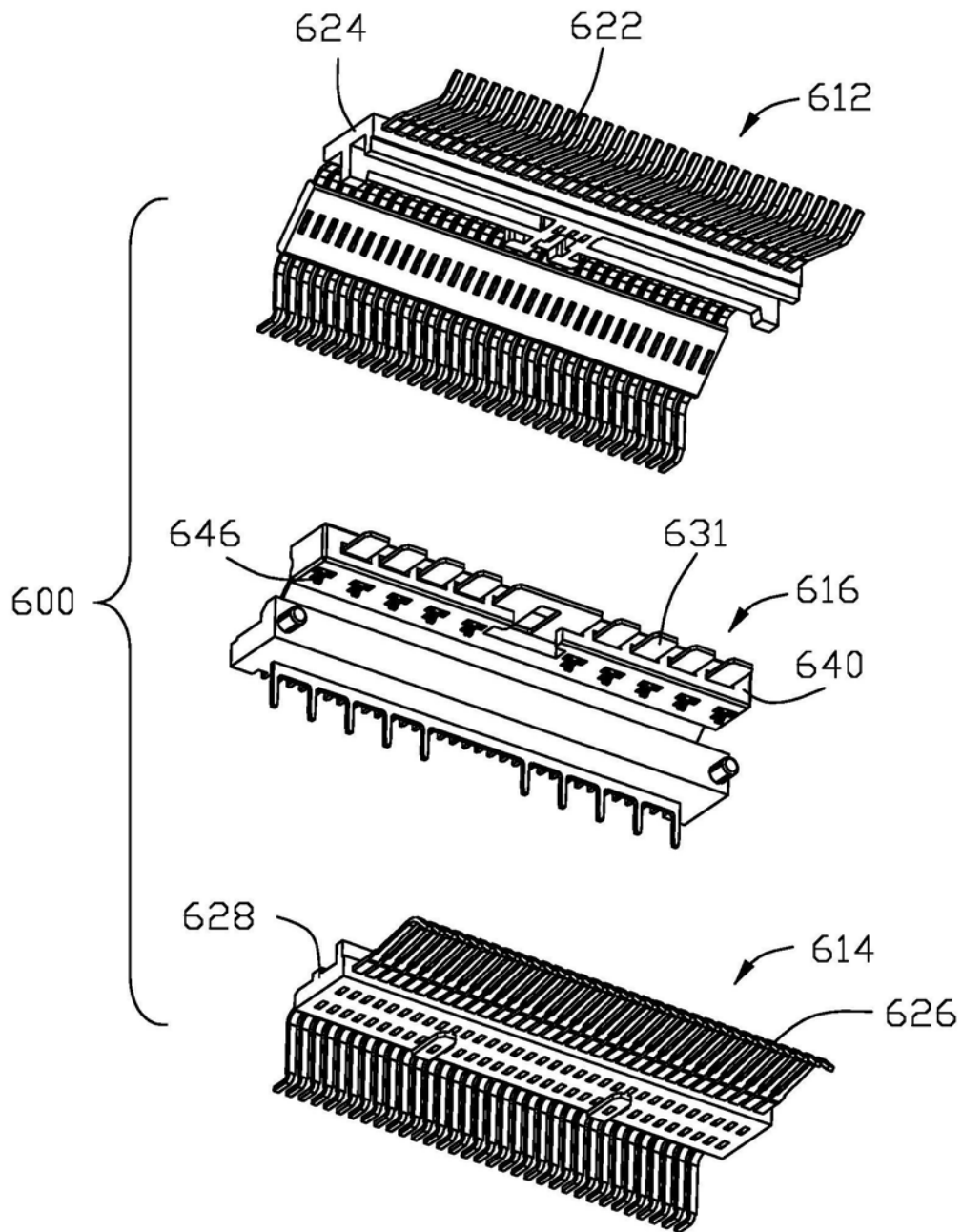


图45

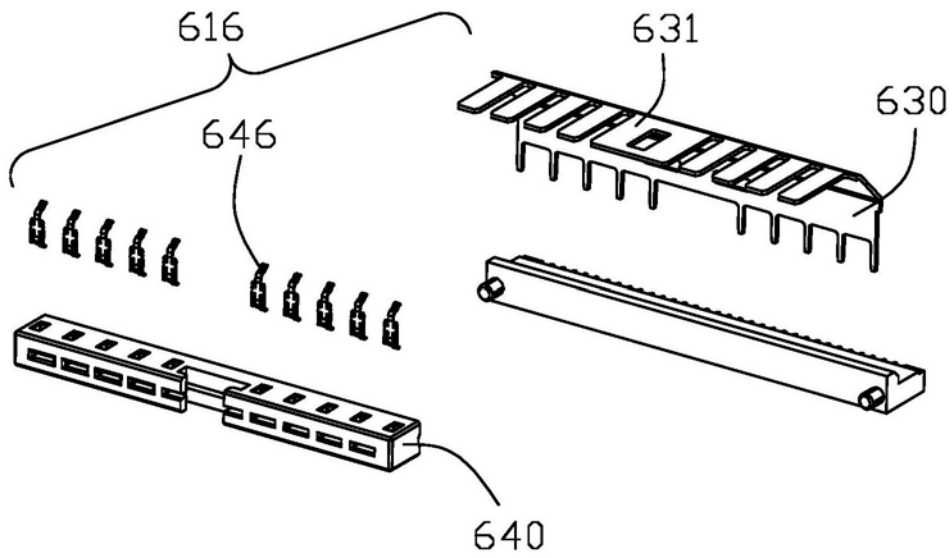


图46

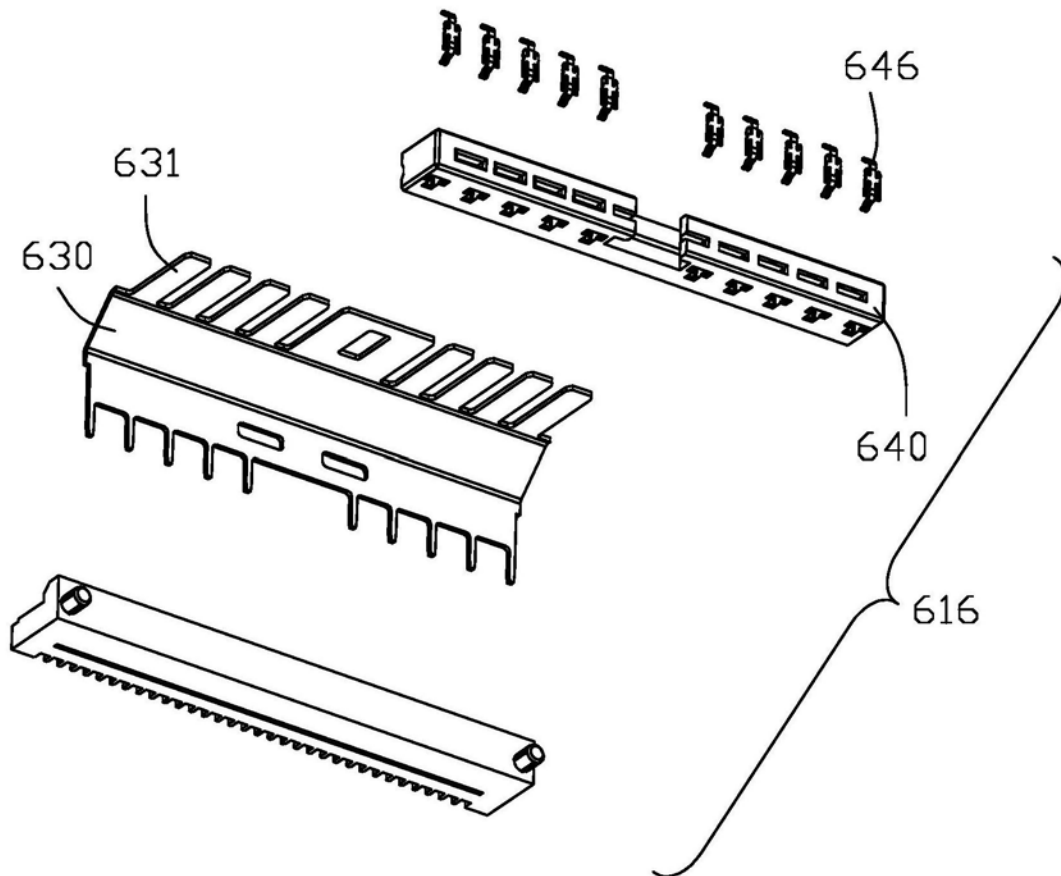


图47

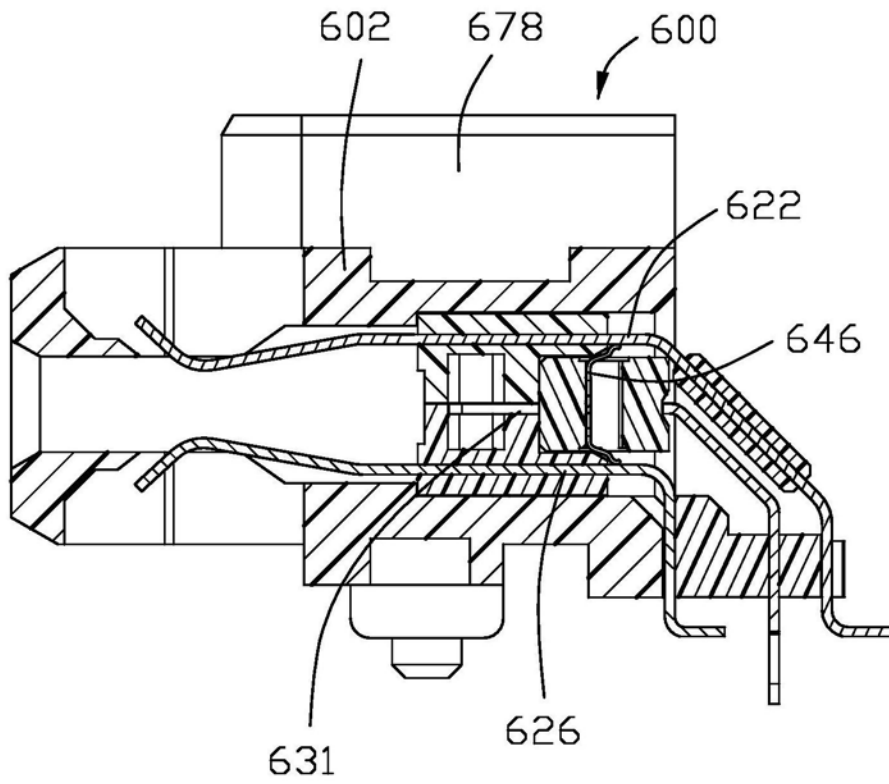


图48

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H01R 13/6597 (2011 .01)

H01R 12/71 (2011 .01)

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CN 204947245 U ,2016 .01 .06

62/399272 2016 .09 .23 US 62/412841

CN 204947245 U ,2016 .01 .06

2016 .10 .26 US

TW M521820 U ,2016 .05 .11 CN

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205452701 U ,2016 .08 .10 TW M521821

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105428860 A ,2016 .03 .23 CN 105356163

A ,2016 .02 .24

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(51)Int .Cl .

H01R 13/648 (2006 .01)

Claims (1 page), Description (4 pages), Drawings (42 pages)

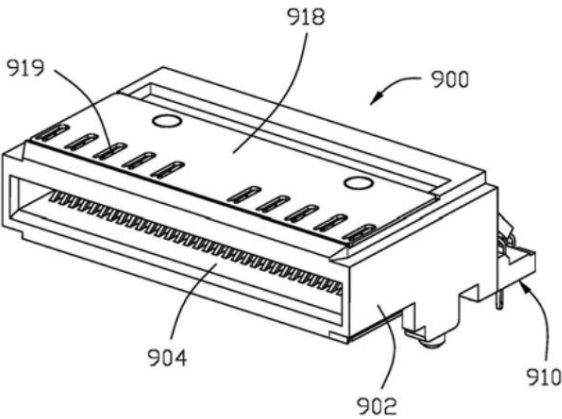
(54) Invention Title:

And electrical connection.

Electrical

Connector (57)

Abstract: This invention discloses an electrical connector, comprising an insulating body, a terminal module housed within the insulating body, and a grounding component. The insulating body includes a front cavity for housing a plug connector and a rear cavity opposite to the front cavity in a front-rear direction. The terminal module is assembled in the rear cavity. The terminal module includes an upper terminal module, a lower terminal module, and a shielding module sandwiched between the upper terminal module and the lower terminal module in a vertical direction perpendicular to the front-rear direction. The upper terminal module includes an upper insulator and a plurality of upper terminals integrally formed with the upper insulator. The upper terminals include a pair of upper ground terminals and a pair of upper differential signal terminals disposed between the pair of upper ground terminals. The lower terminal module includes a lower insulator and a plurality of lower terminals integrally formed with the lower insulator. The lower terminals include a pair of lower ground terminals and a pair of lower differential signal terminals disposed between the pair of lower ground terminals. The shielding module is provided with a shielding plate. The grounding component cooperates with the shielding module and mechanically connects the upper ground terminals and the lower ground terminals to at least one shielding plate.



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1. An electrical connector comprising an insulating body, a terminal module housed within the insulating body, and a grounding element, the insulating body comprising a front cavity for housing a plug connector and a rear cavity opposite to the front cavity in a front-rear direction, the terminal module being assembled in the rear cavity, the terminal module comprising an upper terminal module, a lower terminal module, and a shielding module sandwiched between the upper terminal module and the lower terminal module in a vertical direction perpendicular to the front-rear direction, the upper terminal module comprising an upper insulator and a plurality of upper terminals integrally formed with the upper insulator, the upper terminals comprising a pair of upper grounding terminals and a pair of upper differential terminals disposed between the pair of upper grounding terminals. The signal terminal module includes a lower insulator and a plurality of lower terminals integrally formed with the lower insulator. The lower terminals include a pair of lower ground terminals and a pair of lower differential signal terminals disposed between the pair of lower ground terminals. The shielding module is provided with a shielding sheet. The grounding component cooperates with the shielding module and mechanically and electrically connects the upper ground terminal and the lower ground terminal to at least one shielding sheet. The grounding component includes an insulator and a plurality of terminals housed within the insulator. The insulator includes a plurality of horizontal channels. The shielding sheet is provided with a plurality of tongue plates, which are housed within the horizontal channels to mechanically and electrically connect the terminals.

2. The electrical connector according to claim 1, characterized in that the grounding component cooperates with the shielding module and connects the upper...
The grounding terminal and the lower grounding terminal are mechanically and electrically connected to all the shielding plates.

3. The electrical connector according to claim 2, characterized in that the grounding member cooperates with the shielding module to mechanically and electrically connect the shielding sheet, the upper terminal module, and the lower terminal module. 4. The electrical connector according to claim 1, characterized in that each terminal includes an upper end and an opposite end.
At the lower end, both the upper and lower ends extend out insulators to mechanically and electrically connect the upper grounding terminal and the lower grounding terminal, respectively.

5. The electrical connector according to claim 1, wherein the insulating body includes a vertical channel for receiving terminals, the vertical channel and the horizontal channel being arranged alternately, and the tongue plate being received within the horizontal channel for transverse electrical connection to the terminals. 6. The electrical connector according to claim 4, wherein both the upper and lower
insulators are provided with a plurality of through holes for the upper and lower ends to extend out of the insulators and be mechanically and electrically connected to the upper grounding terminal and the lower grounding terminal, respectively. 7. The electrical connector according to claim 2, wherein the grounding element includes a pair of flexible circuit boards, one of which is mechanically and electrically connected to the upper grounding terminal and the shielding sheet, and the other is mechanically and electrically connected to the lower grounding terminal and the shielding sheet.

8. The electrical connector according to claim 2, wherein the electrical connector comprises components located on an insulating body.
The surface has an upper metal grounding plate, which includes a plurality of grounding feet extending into the front cavity of the insulating body.

9. The electrical connector according to claim 8, characterized in that the electrical connector includes components located under the insulating body.
The surface has a lower metal grounding plate, which includes a plurality of grounding feet extending into the front cavity of the insulating body.

Electrical connectors

yTechnical Fieldy

[0001] This invention relates to an electrical connector, and more particularly to an electrical connector suitable for transmitting high-speed signals.

[Background Art]

[0002] Currently, high-speed electrical connectors have several transmission channels, each with a transmission rate of 25 Gbit/s or 50 Gbit/s. On July 1, 2014, US Patent No. 62/399,272 disclosed an electrical connector with several terminals for transmission between electronic devices. The terminals include several ground terminals, and a ground coupling assembly is electrically connected to the ground terminals to adjust the performance of the electrical connector as needed.

[Summary of the

Invention] [0003] The main objective of this invention is to provide an electrical connector with a high-speed signal transmission device. [0004]

To solve the above technical problems, the present invention adopts the following technical solution: an electrical connector, comprising an insulating body, a terminal module housed within the insulating body, and a grounding component, wherein the insulating body comprises a front cavity for housing a plug connector and a rear cavity opposite to the front cavity in a front-rear direction, the terminal module is assembled in the rear cavity, the terminal module comprises an upper terminal module, a lower terminal module, and a shielding module sandwiched between the upper terminal module and the lower terminal module in a vertical direction perpendicular to the front-rear direction, the upper terminal module comprises an upper insulator and a plurality of upper terminals integrally formed with the upper insulator, the upper terminals comprising a pair of upper grounding terminals and a pair of upper differential signal terminals disposed between the pair of upper grounding terminals, the lower terminal module comprises a lower insulator and a plurality of lower terminals integrally formed with the lower insulator, the lower terminals comprising a pair of lower grounding terminals and a pair of lower differential signal terminals disposed between the pair of lower grounding terminals, the shielding module is provided with a shielding sheet, and the grounding component cooperates with the shielding module and mechanically and electrically connects the upper grounding terminals and the lower grounding terminals to at least one shielding sheet. [0005] In the

electrical connector of the present invention, the grounding component cooperates with the shielding module and mechanically and electrically connects the upper grounding terminal and the lower grounding terminal with the shielding sheet, thereby enhancing the transmission rate of the electrical connector.

[Figure Descriptions]

[0006] FIG1 is a perspective view of the front of a socket connector conforming to the first embodiment of the present invention, mating with a plug connector, facing downwards.

[0007]

FIG2 is a perspective view of the rear of the socket connector shown in FIG1, facing upwards. [0008] FIG3 is an exploded view of the front of the socket connector shown in FIG1, facing downwards. [0009] FIG4 is a perspective view of the rear of the socket connector shown in FIG3, facing upwards. [0010] FIG5 is a further exploded view of the front of the socket connector shown in FIG3, facing downwards. [0011] FIG6 is a further exploded view of the rear of the socket connector shown in FIG3, facing upwards. [0012] FIG7 is an exploded view of the front of the terminal module of the socket connector shown in FIG1, facing downwards. [0013] FIG8 is an exploded view of the rear of the terminal module shown in FIG7, facing upwards. [0014] FIG9 is a further exploded view of the front of the terminal module shown in FIG7, facing downwards. [0015] FIG10 is a further exploded view of the rear of the terminal module shown in FIG9, facing upwards.

[0016] FIG11 is a cross-sectional view of the socket connector shown in FIG1 without the plug connector inserted. [0017] FIG12 is a cross-sectional view of the socket connector shown in FIG1 with the plug connector inserted. [0018] FIG13 is a cross-sectional view of the socket connector shown in FIG1, wherein the socket connector is provided with a shield that is electrically connected to the grounding terminals of the upper terminal module and the lower terminal module. [0019] FIG14 is a rear-facing perspective view of the socket connector conforming to the second embodiment of the present invention and mating with the plug connector. [0020] FIG15 is a front-facing exploded view of the socket connector shown in FIG14. [0021] FIG16 is a rear-facing exploded view of the socket connector shown in FIG14. [0022] FIG17 is a front view of the grounding pins of the upper and lower metal grounding plates connected to the grounding terminals of the upper and lower terminal modules of the socket connector shown in FIG14, wherein the socket connector is provided with an insulating body, and the plug connector is removed in this figure for clarity. [0023] FIG18 is an exploded view of the front of the socket connector terminal module shown in FIG14, looking downwards. [0024] FIG19 is an exploded view of the rear of the terminal module shown in FIG18, looking upwards. [0025] FIG20 is an exploded view of the rear of the terminal module shown in FIG18, looking upwards, wherein the terminal module does not have a lower terminal module.

[0026] FIG21 is a perspective view of the terminal module shown in FIG20 with the rear facing upward. [0027] FIG22 is an exploded view of the terminal module shown in FIG15 with the rear facing upward. [0028] FIG23 is a perspective view of the terminal module shown in FIG22 with the rear facing upward. [0029] FIG24 is a perspective view of the common grounding terminal module of the terminal module shown in FIG18 . [0030] FIG25 is a cross-sectional view of the grounding terminal sub-module of the terminal module shown in FIG18 . [0031] FIG26 is a perspective view of the terminals in the grounding terminal sub-module of the terminal module shown in FIG18 . [0032] FIG27 is a cross-sectional view of the socket connector shown in FIG18. [0033] FIG28 is a cross-sectional view of the socket connector shown in FIG18 from another perspective. [0034] FIG29 is a perspective view of the socket connector conforming to the third embodiment of the present invention with the front facing downward. [0035] FIG30 is an exploded view of the socket connector shown in FIG29 with the front facing downward. [0036] FIG31 is an exploded view of the rear of the socket connector shown in FIG30, looking upwards. [0037] FIG32 is a perspective view of the terminal module of the socket connector shown in FIG30. [0038] FIG33 is an exploded view of the front of the terminal module of the socket connector shown in FIG29, looking downwards. [0039] FIG34 is an exploded view of the rear of the terminal module shown in FIG29, looking upwards. [0040] FIG35 is a perspective view of the rear of the lower terminal module of the terminal module shown in FIG34, looking upwards, wherein the flexible circuit board is not bent backwards. [0041] FIG36 is a perspective view of the rear of the lower terminal module shown in FIG35, looking downwards. [0042] FIG37 is a perspective view of the rear of the lower terminal module shown in FIG35, looking upwards, wherein the flexible circuit board has been bent backwards. [0043] FIG38 is a cross-sectional view of the socket connector shown in FIG29. [0044] FIG39 is a perspective view of the front of the socket connector according to the fourth embodiment of the present invention, looking downwards. [0045] Figure 40 is a perspective view of the rear of the socket connector shown in Figure 39, facing downwards. [0046] Figure 41 is a perspective view of the rear of the socket connector shown in Figure 39, facing upwards. [0047] Figure 42 is a side view of the terminal module of the socket connector shown in Figure 39.

[0048] FIG43 is an exploded view of the socket connector shown in FIG42. [0049]

FIG44 is an exploded view of the front end of the terminal module of the socket connector shown in FIG43.

[0050] FIG45 is an exploded view of the rear end of the terminal module of the socket connector shown in

FIG43. [0051] FIG46 is an exploded view of the front end of the grounding portion of the terminal module

shown in FIG44. [0052] FIG47 is an exploded view of the rear end of the grounding portion of the terminal

module shown in FIG45. [0053] FIG48 is a cross-sectional view of the socket connector shown in FIG39.

¶Detailed Embodiments¶

[0054] As shown in Figures 1-12, a socket connector 900 conforming to the first embodiment of the present invention includes an insulating body 902 having a front cavity 904 and a rear cavity 906 opposite to the front cavity 904 in the front-rear direction, a terminal module 910, an upper metal grounding plate 918, and a lower metal grounding plate 920 opposite to the upper metal grounding plate 918 in the vertical direction. The front cavity 904 is used to accommodate the mating tongue of a complementary plug connector, and the rear cavity 906 is used to accommodate the terminal module 910. The terminal module 910 includes an upper terminal module 912 and a lower terminal module 914, and a shielding module 916 disposed between the upper terminal module 912 and the lower terminal module 914 in the vertical direction. The upper metal grounding plate 918 is provided with a grounding foot 919, which is located on the upper surface of the insulating body 902 and extends into the front cavity 904 of the insulating body 902. The lower metal grounding plate 920 is provided with a grounding foot 921, which is located on the lower surface of the insulating body 902 and extends into the front cavity 904 of the insulating body 902. The insulating body 902 is provided with a plurality of grooves 903 extending through the upper and lower walls of the insulating body 902 for the grounding feet 919 and 921 to extend into the front cavity 904 of the

insulating body 902. [0055] The upper terminal module 912 includes an upper insulator 924 and a plurality of upper terminals 922 formed on the upper insulator 924 by injection molding. The upper terminal 922 includes a plurality of pairs of upper grounding terminals 9220 and a plurality of pairs of differential signal terminals 9221, each pair of differential signal terminals 9221 being disposed between a pair of upper grounding terminals 9220. The front end 9222 of each upper grounding terminal 9220 is longer than the front end 9223 of the differential signal terminal 9221. When the plug connector is inserted into the front cavity 904, the upper grounding terminal 9220 can be mechanically and electrically connected to the corresponding grounding pin 919 through contact/deflection. When the plug connector is not inserted into the front cavity 904, the upper grounding terminal 9220 cannot be mechanically and electrically connected to the corresponding grounding pin 919 through contact/deflection. Similarly, the lower terminal module 914 includes a lower insulator 924 and a plurality of lower terminals 922 formed under the lower insulator 924 by injection molding. The lower terminals 922 include a plurality of pairs of lower grounding terminals 9220 and a plurality of pairs of differential signal terminals 9221, with each pair of differential signal terminals 9221 disposed between a pair of lower grounding terminals 9220. The front end 9222 of each lower grounding terminal 9220 is longer than the front end 9223 of the differential signal terminal 9221. When the plug connector is inserted into the front cavity 904, the lower grounding terminal 9220 can be mechanically and electrically connected to the corresponding grounding pin 919 through contact/deflection. When the plug connector is not inserted into the front cavity 904, the lower grounding terminal 9220 cannot make mechanical and electrical connections with the corresponding grounding pin 919 through contact/deflection. The shielding module 916 includes a spacer 932 and a shielding sheet 930 connected to the spacer 932 by injection molding to separate the upper terminal module 912 and the lower terminal module 914. Each upper terminal 912 and lower terminal 914 has a tail 950 extending downward and disposed outside the bottom surface of the insulating body 902 for mounting on the circuit board. The shielding sheet 930 includes a plurality of shielding pins 960 extending downward and disposed outside the upper surface of the tail 950, and the shielding pins 960 are mounted on the circuit board by through-holes.

[0056] FIG13 is a cross-sectional view of the socket connector 900' shown in FIG1. The socket connector 900' includes a shield 930', which is mechanically and electrically connected to the grounding terminal 9220' of the upper terminal module 912' via an upper connecting portion 941' and mechanically and electrically connected to the grounding terminal 9220' of the upper terminal module 912' via a lower connecting portion 942'. [0057]

FIG14-28 show a socket connector 800 conforming to the second embodiment of the present invention. Compared with the first embodiment,

A common grounding terminal module 840 is added to the shielding sheet 830 to establish a mechanical and electrical connection between the shielding sheet 830, the upper grounding terminal 8820, and the lower grounding terminal 8860. The common grounding terminal module 840 includes an insulator 842 with a plurality of vertical channels 844 for accommodating a plurality of terminals 846. Each terminal 846 is essentially a bifurcated double-bundle structure, including an upper end 848 and a lower end 849 opposite to each other. Both the upper end 848 and the lower end 849 extend out of the insulator 842 and are mechanically and electrically connected to corresponding grounding terminals 8220 and 8260 of the upper and lower terminals, respectively. The upper insulator 824 includes a plurality of through holes 8120 for the upper end 848 to extend and be mechanically and electrically connected to the upper grounding terminal 8220. The lower insulator 828 includes a plurality of through holes 8140 for the lower end 848 to extend and be mechanically and electrically connected to the lower grounding terminal 8220. The insulator 842 further includes a plurality of horizontal channels 850 arranged alternately with the vertical channels 844.

The shield 830 includes a plurality of tongues 831 that receive the corresponding horizontal channels 850 and contact the corresponding terminals 846 on their lateral sides. In this embodiment, a grounding path is established between the grounding terminals of the upper terminal module 812 and the lower terminal module 814, the upper ends 848 and the lower ends 849 of the terminals 846, and the tongues 831 of the shield 830 to a circuit board (not shown), on which the socket connector 800 is disposed. As shown in FIG17, the grounding pins 819, 821 of the upper metal grounding plate 818 and the lower metal grounding plate 820 are connected to the grounding terminals 8220, 8260 in the upper terminal module 812 and the lower terminal module 814. For clarity, the plug connector has been removed from this figure. Therefore, the upper metal grounding piece 818, the lower metal grounding piece 820, the upper grounding terminal 8220, the lower grounding terminal 8260, the common grounding terminal module 840, and the shielding piece 830 are grounded together. [0058] As shown in Figures 29-38, this is an electrical connector 700 conforming to the third embodiment of the present invention. Compared with the electrical connector 800 of the second embodiment, the common grounding terminal module is replaced by a pair of flexible circuit boards 770 with corresponding grounding circuit paths. By welding or compression, the flexible circuit boards 770 mechanically and electrically connect the shielding piece 730 to the grounding terminals 7220 and 7260 in the upper terminal module 712 and the lower terminal module 714, respectively. [0059] As shown in Figures 29-38, this is an electrical connector 600 conforming

to the fourth embodiment of the present invention. The electrical connector 600 includes an insulating body 602 that houses the terminal module assembly 610. The terminal module assembly 610 includes an upper terminal module 612 with a plurality of upper terminals 622, a lower terminal module 614 with a plurality of lower terminals 626, and a grounding module 616 disposed between the upper terminal module 612 and the lower terminal module 614. The upper terminals 622 are formed within an upper insulator 624, and the lower terminals 626 are formed within a lower insulator 628. The grounding module 616 includes a metal shield 630 connected to a grounding terminal 646 of an intermediate insulator 640. In the

vertical direction, the grounding terminal 646 is further connected to a selected grounding terminal 6220 or 6260 of the upper terminals 622 and lower terminals 624 to short-circuit a selected grounding terminal 6220 or 6260 of the shield 630. The terminal module assembly 610 may relate to a second embodiment. The insulating body 602 further includes a protrusion that receives a mating connector recess to prevent mis-insertion.

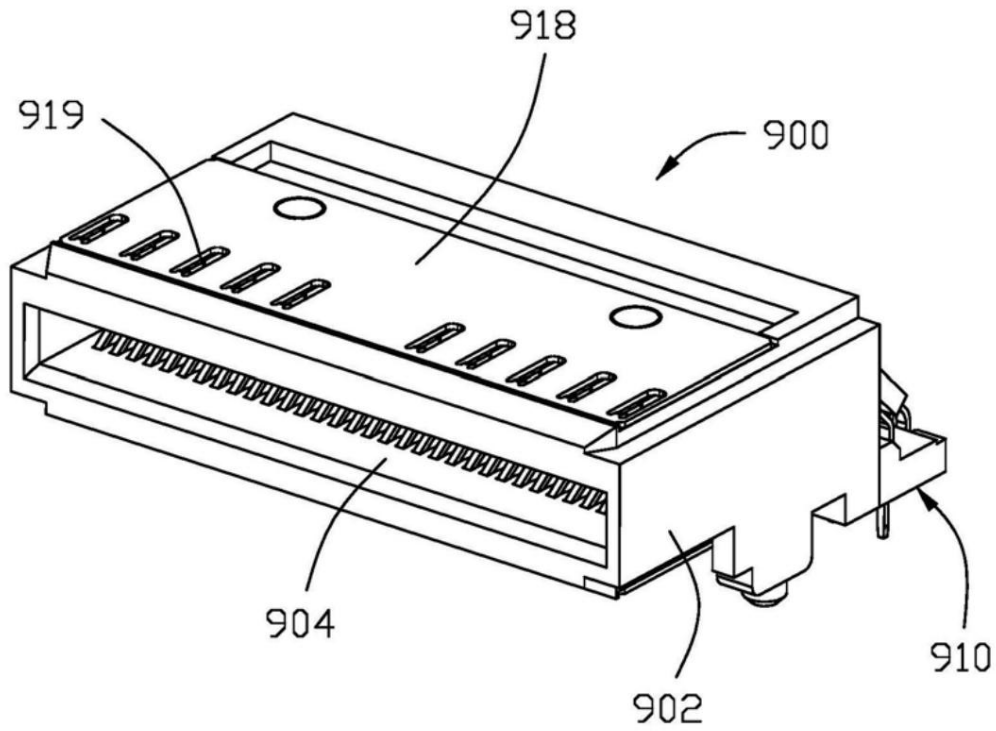


Figure 1

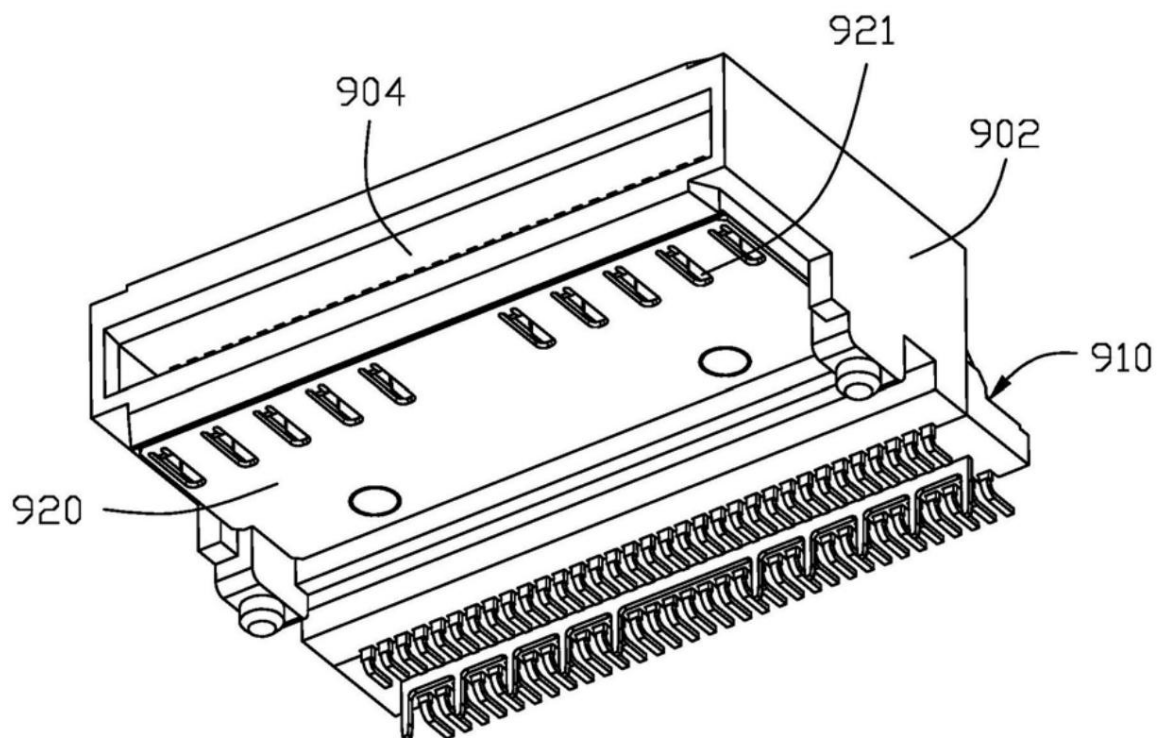


Figure 2

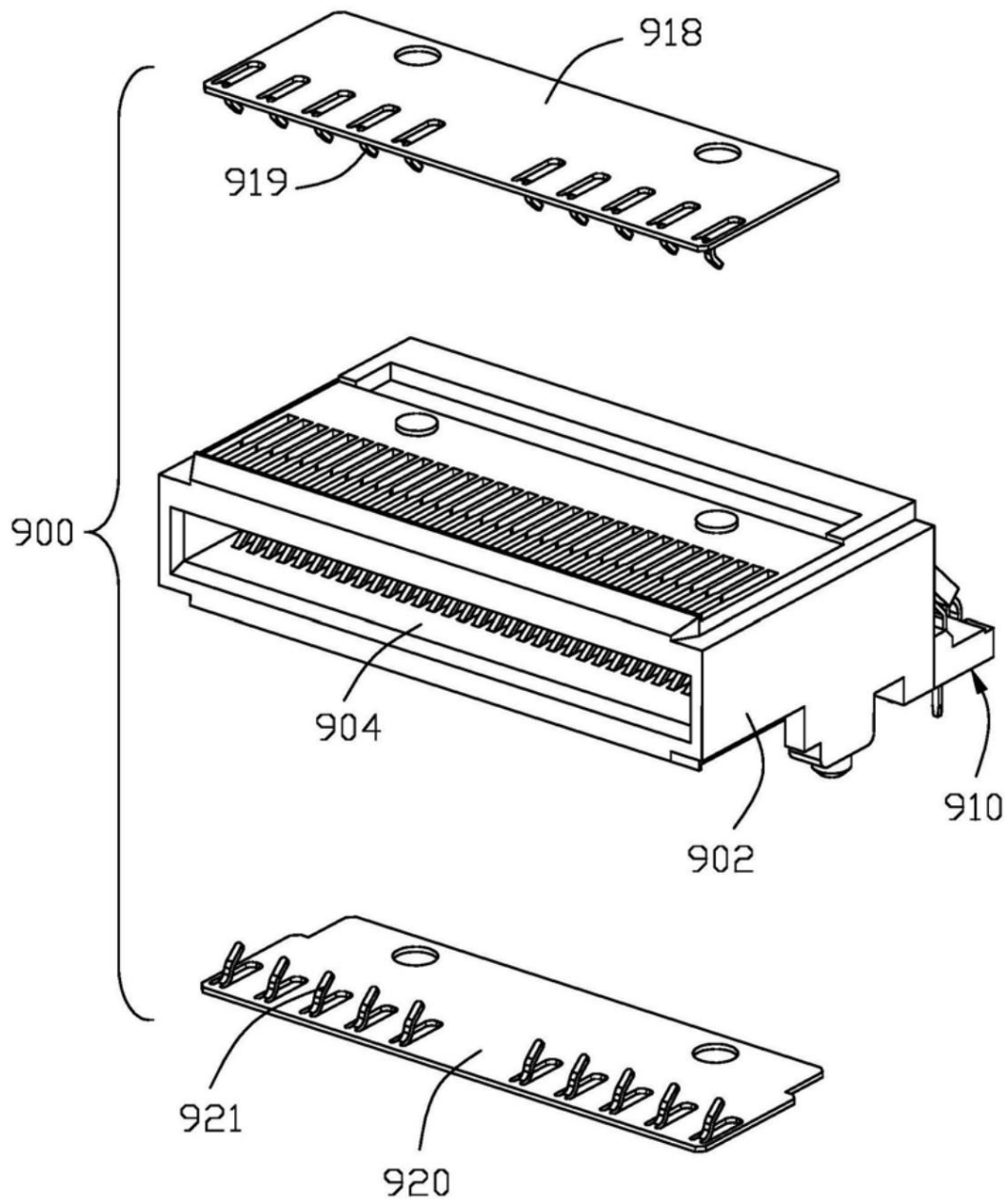


Figure 3

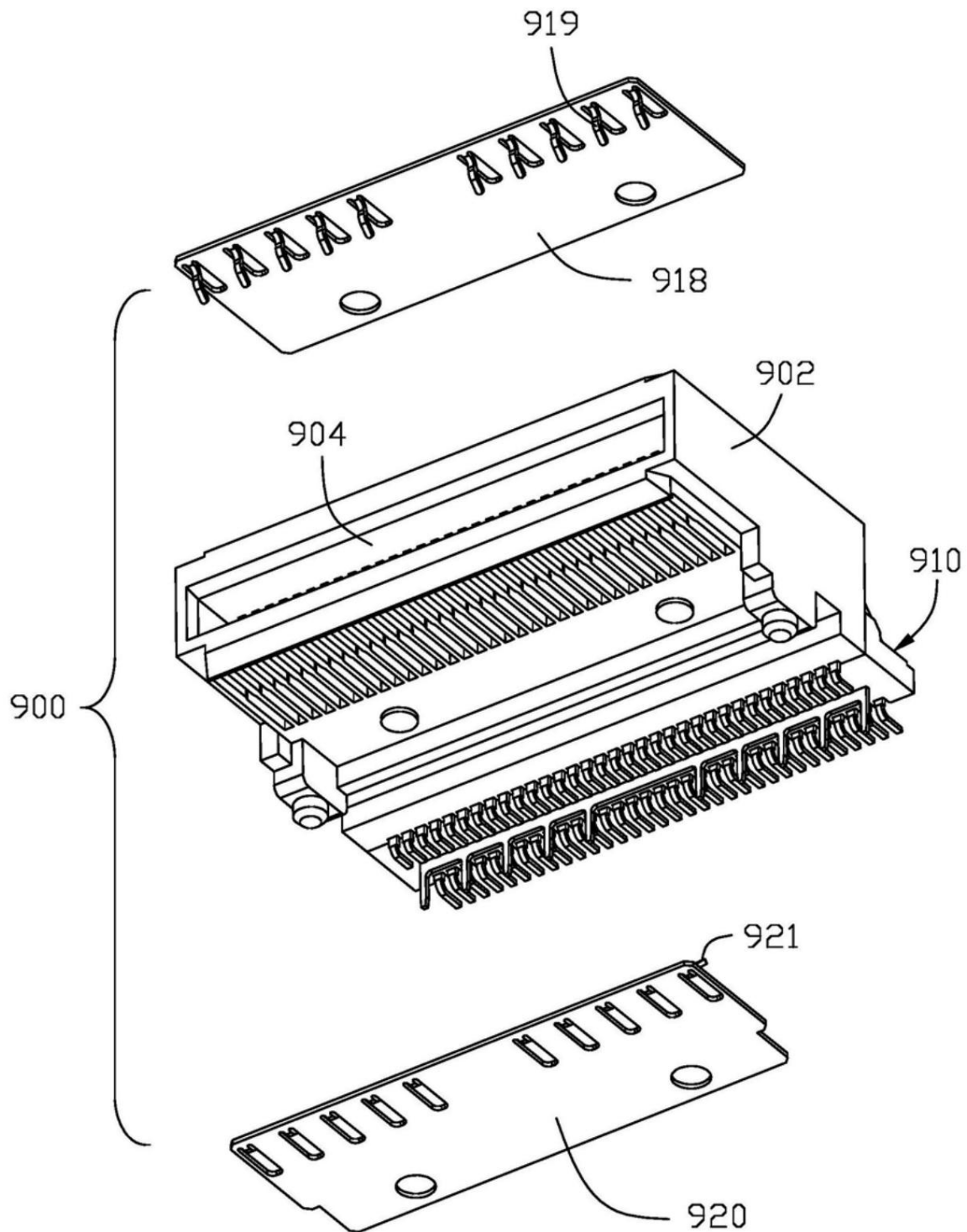


Figure 4

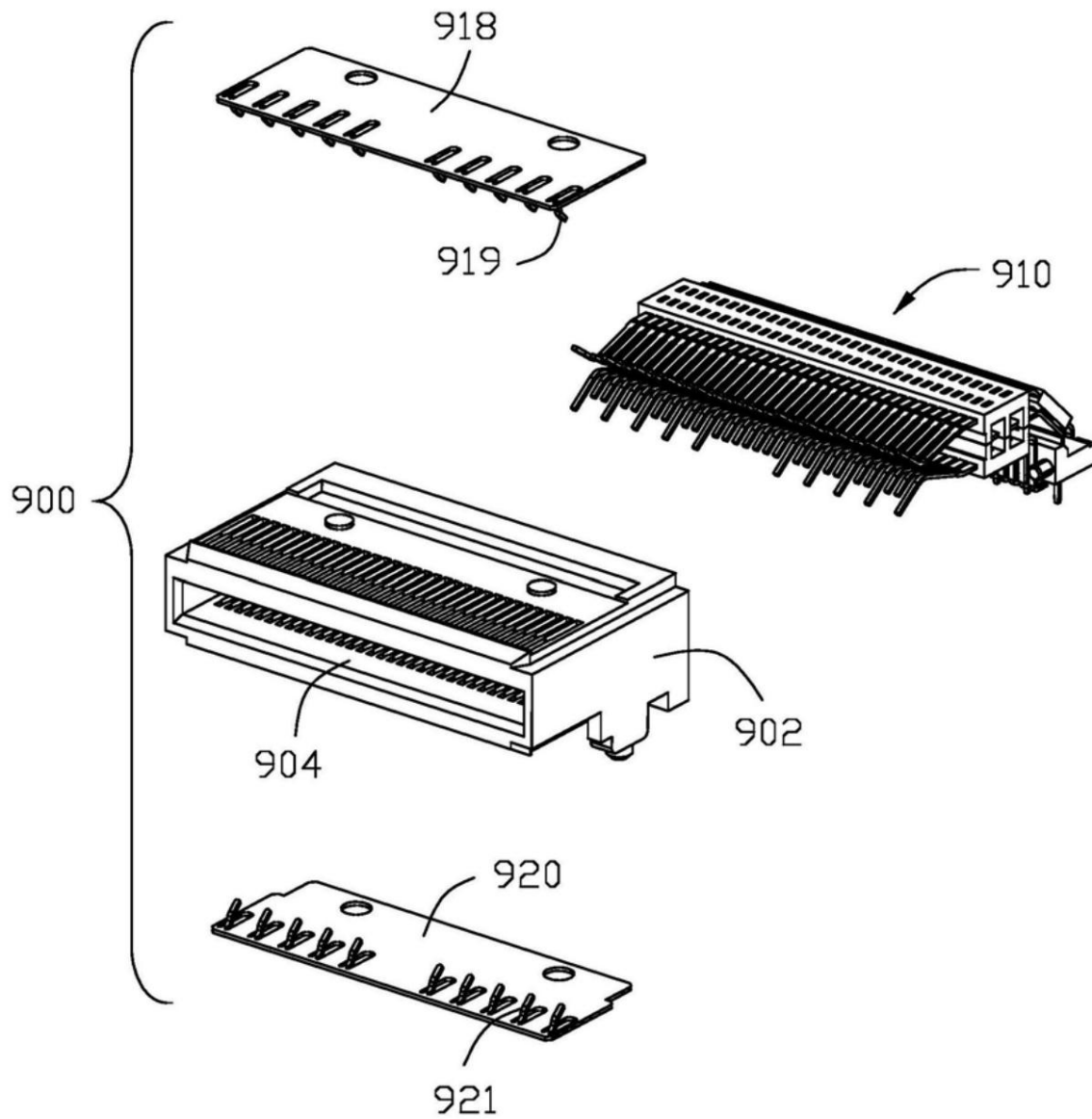


Figure 5

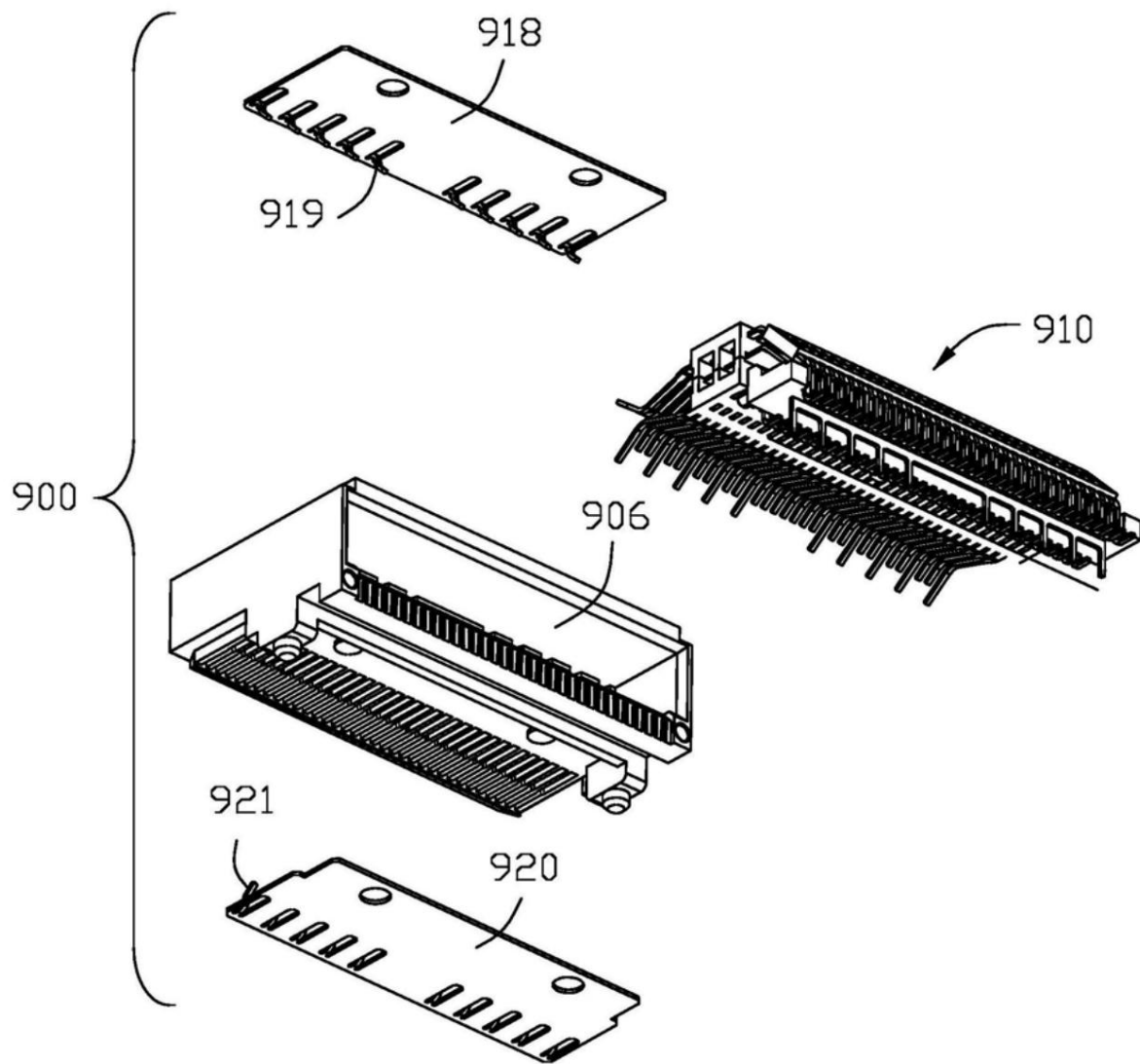


Figure 6

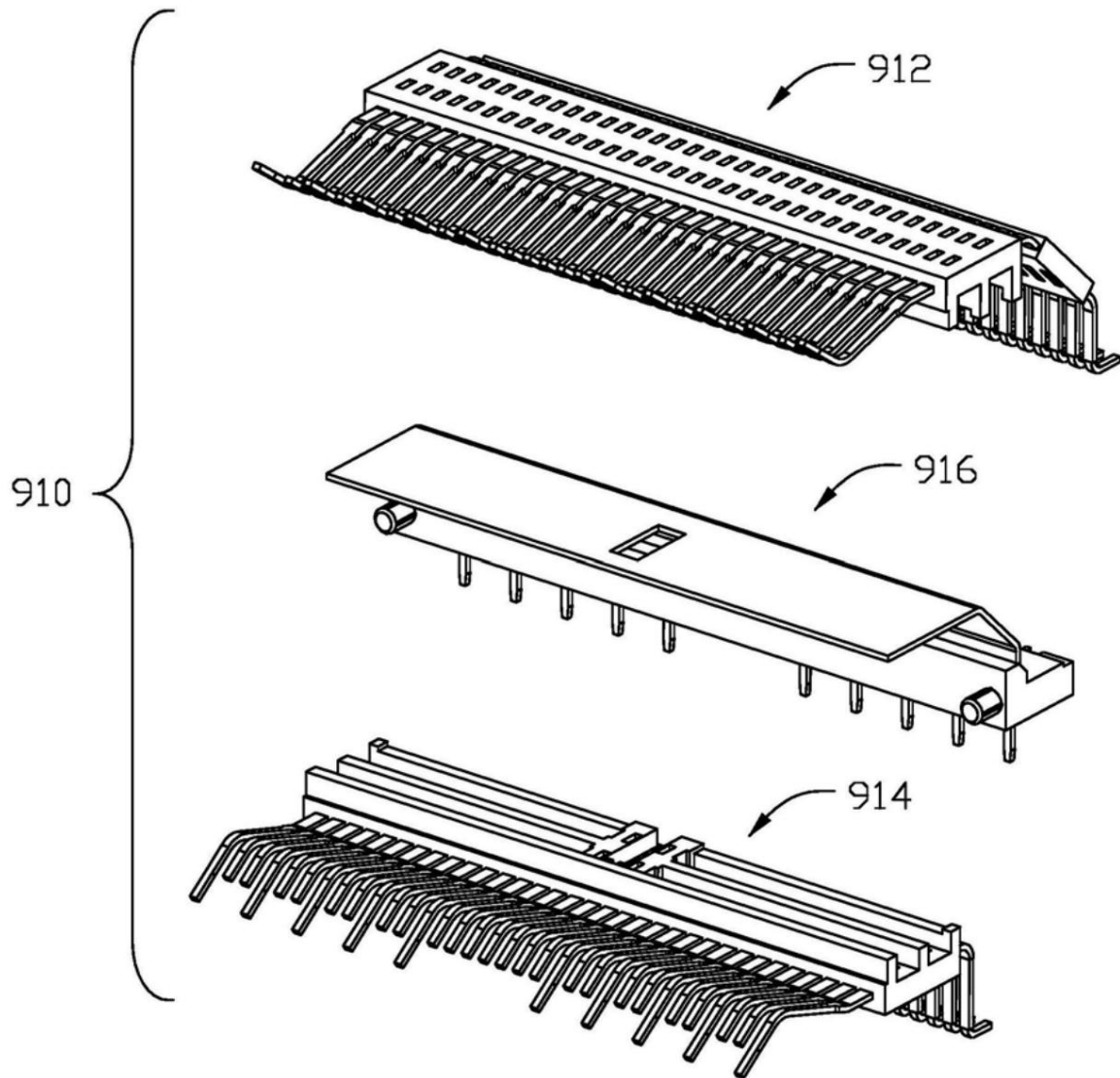


Figure 7

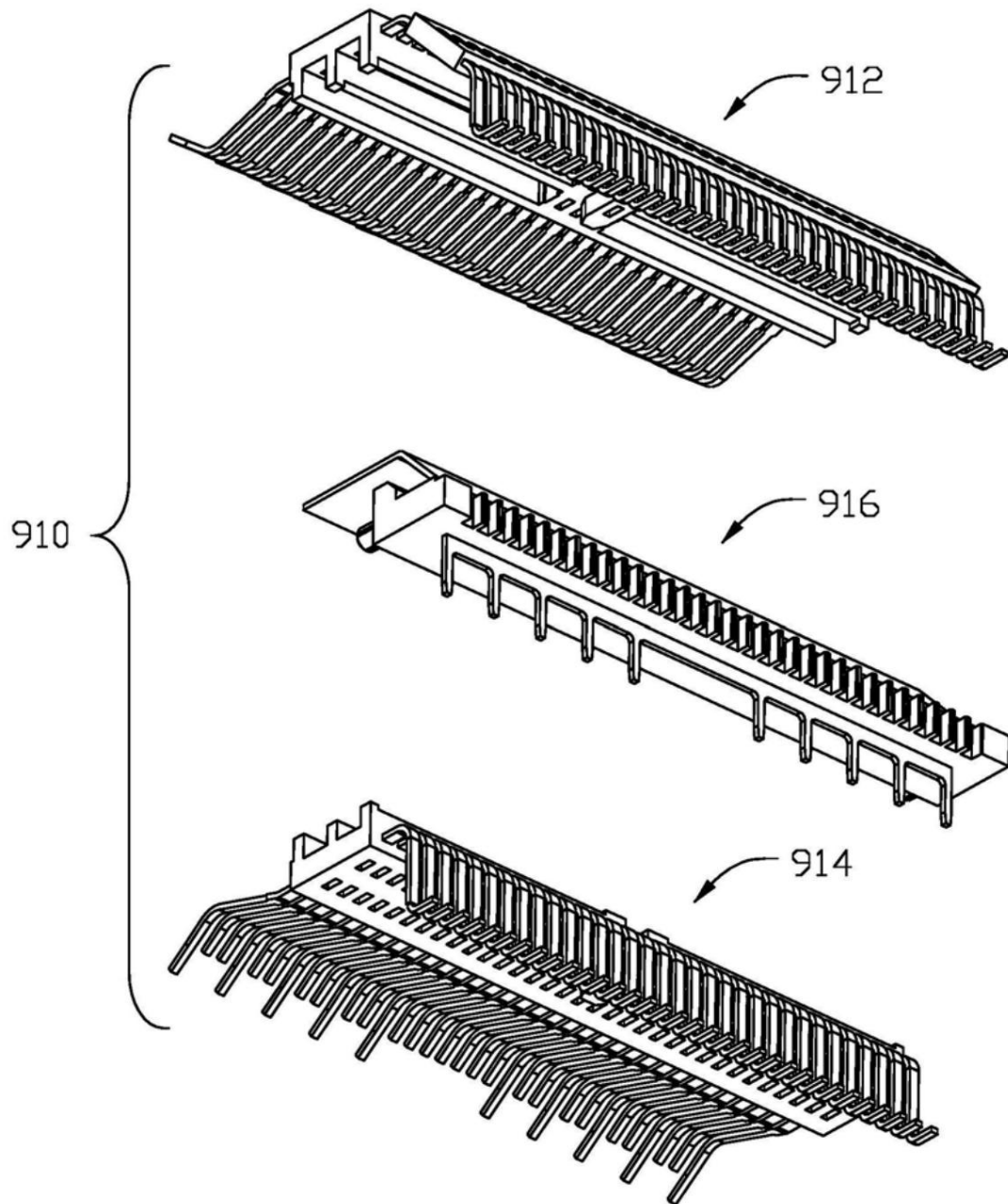


Figure 8

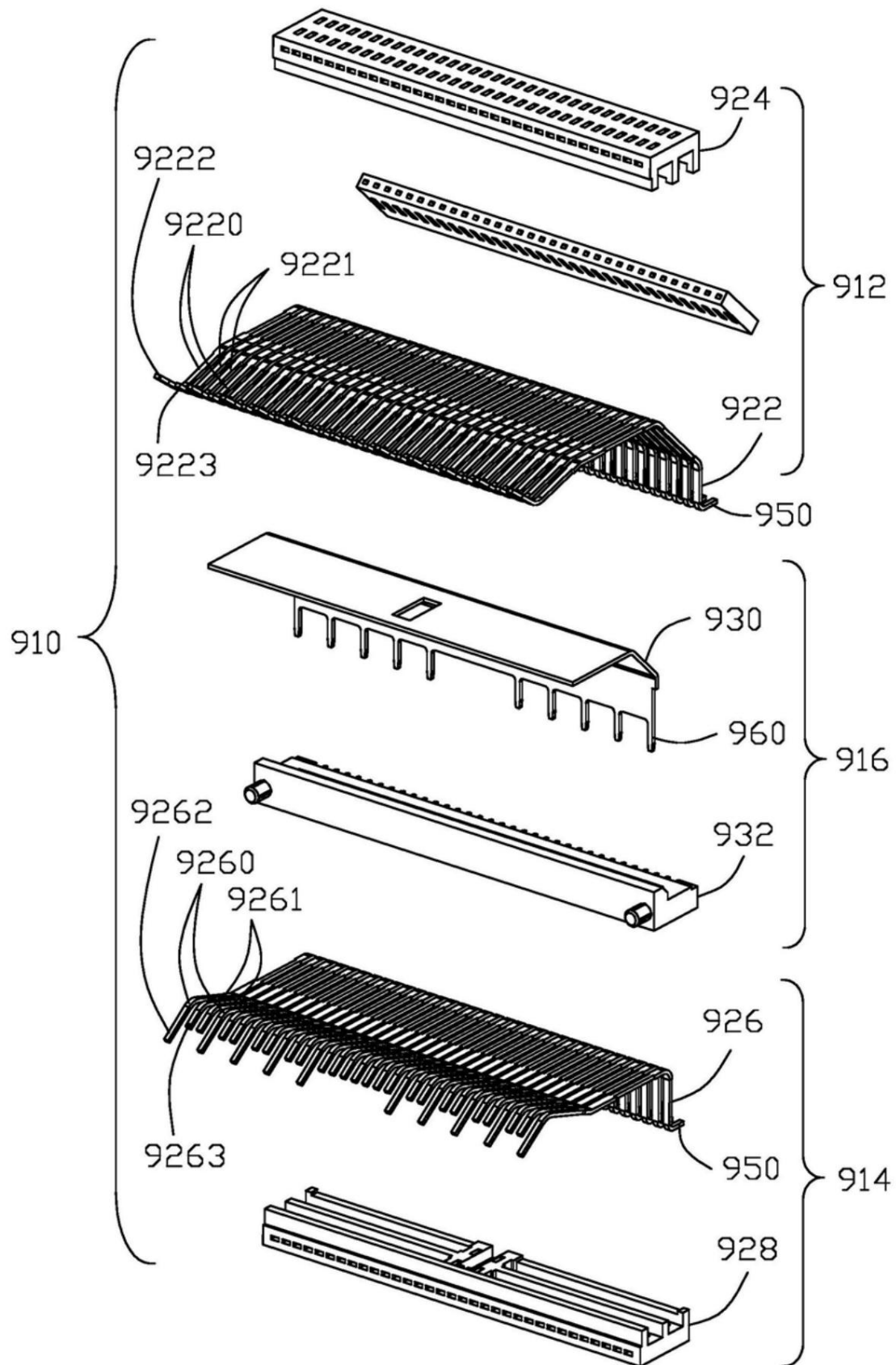


Figure 9

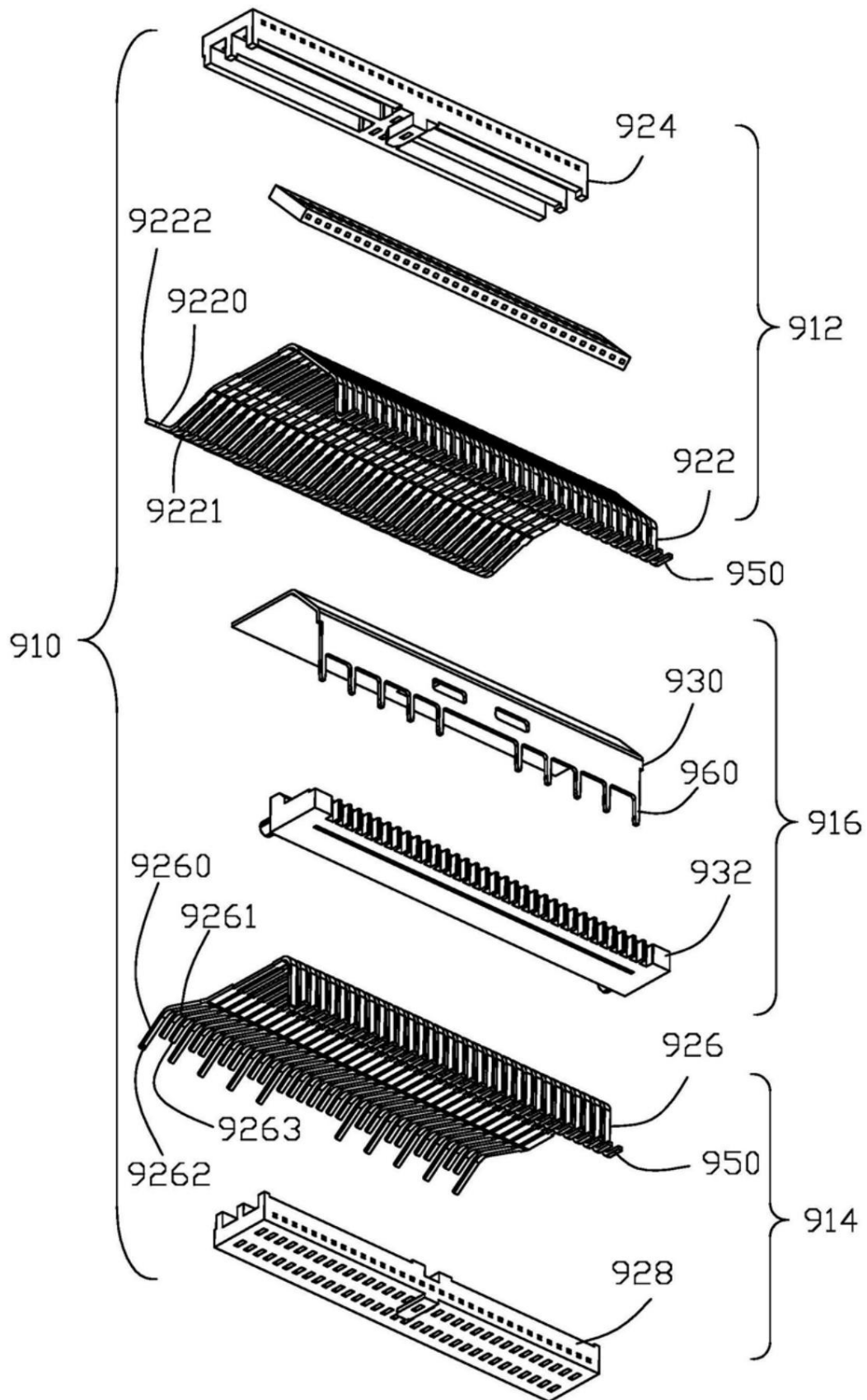


Figure 10

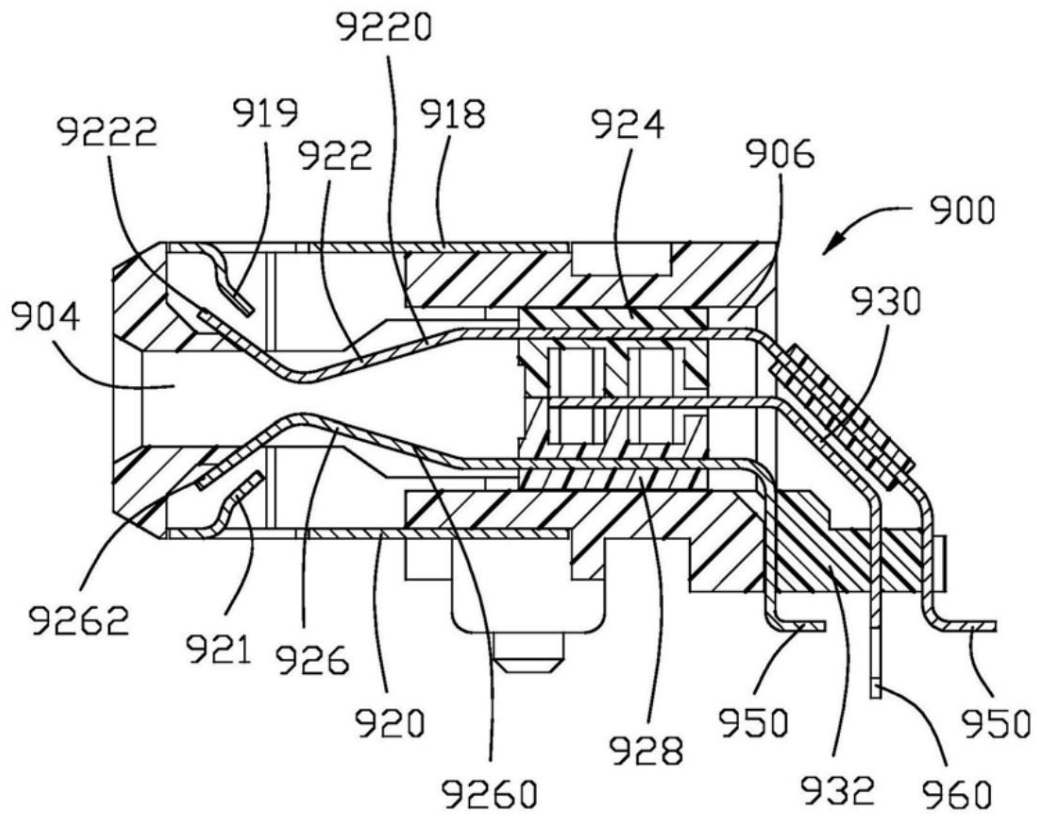


Figure 11

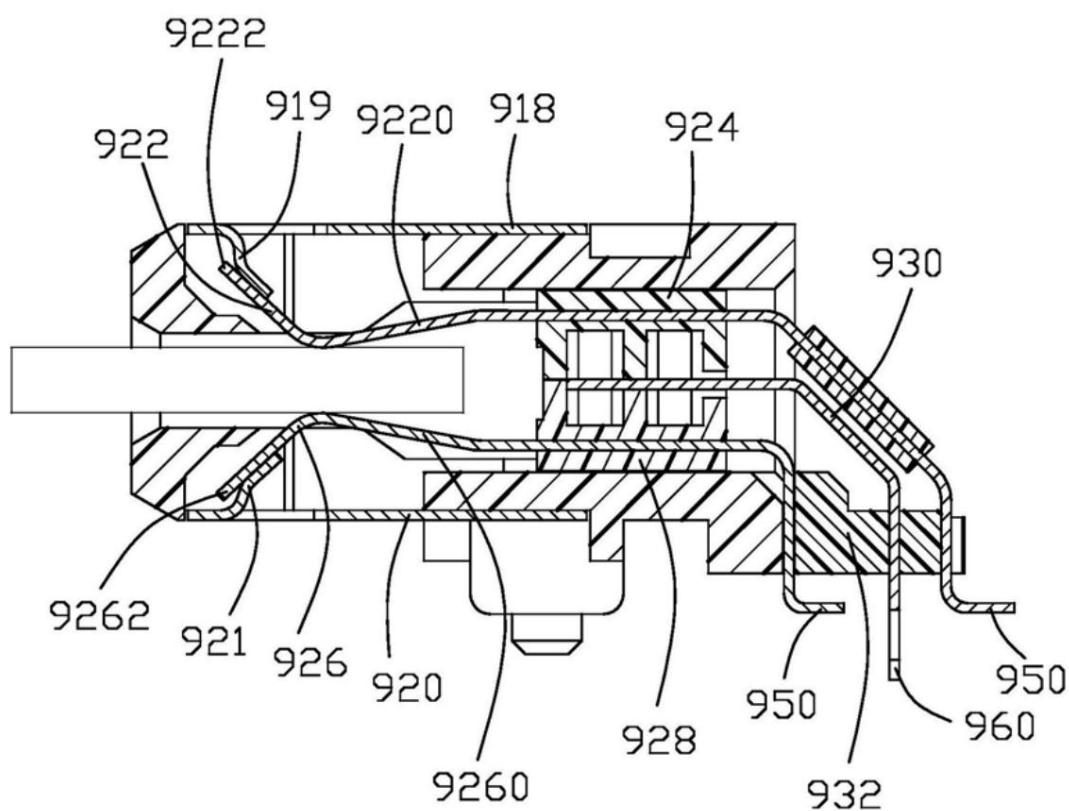


Figure 12

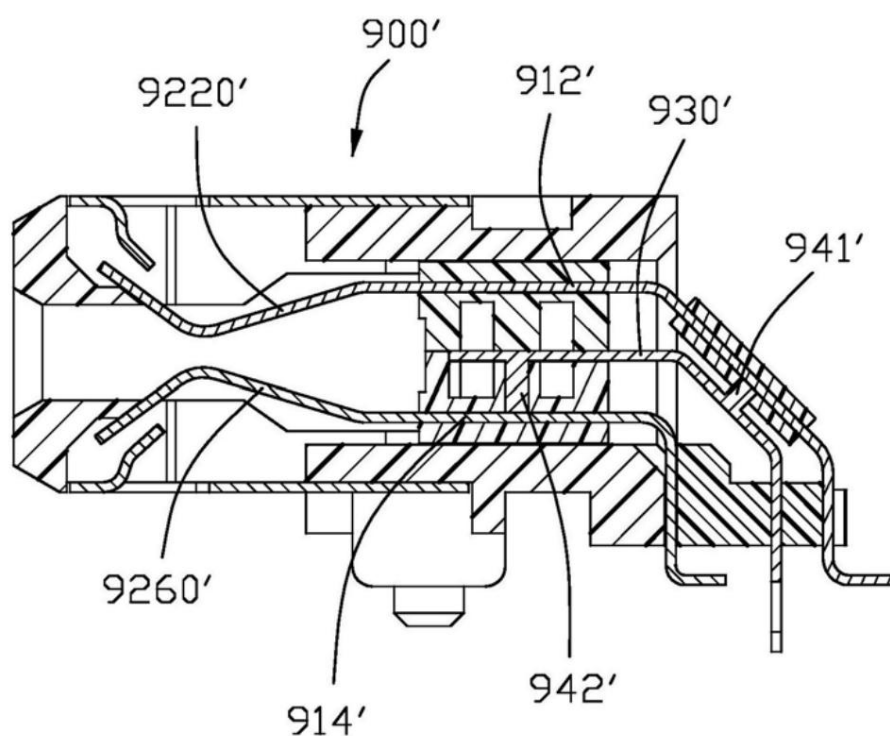


Figure 13

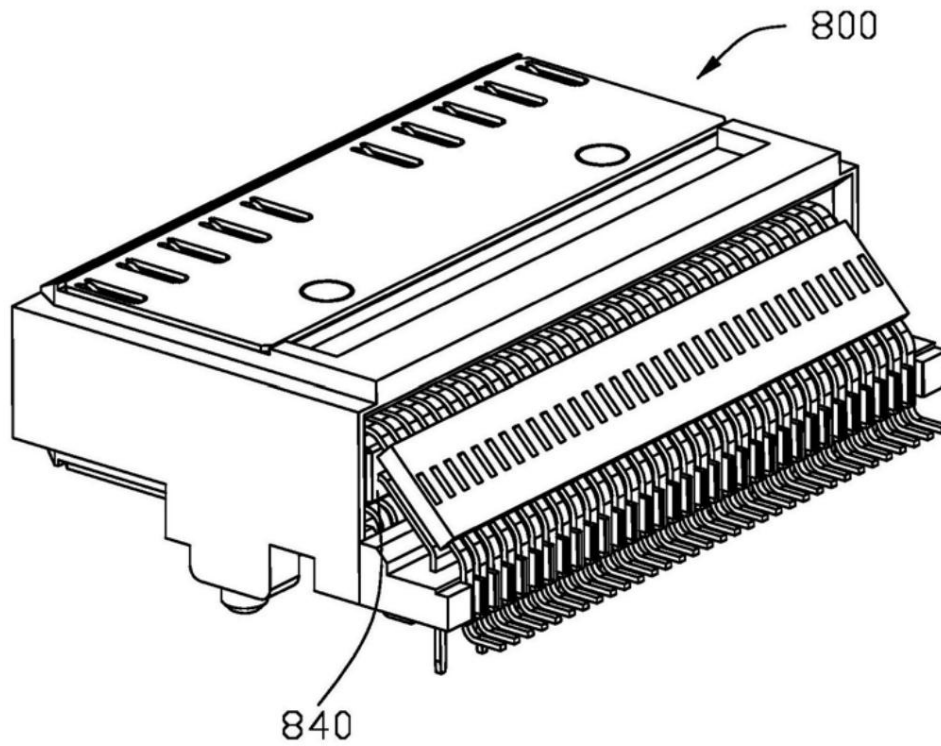


Figure 14

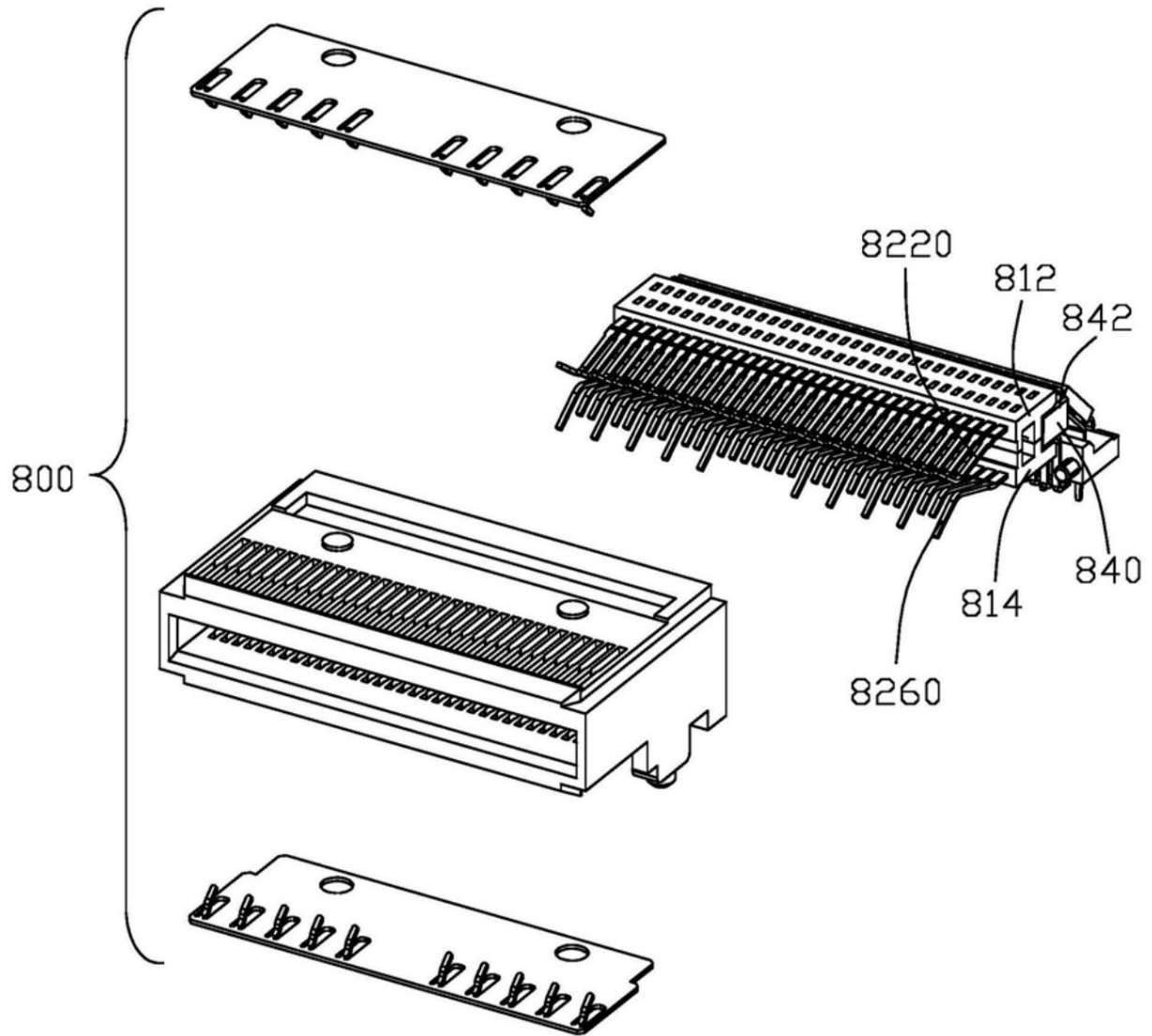


Figure 15

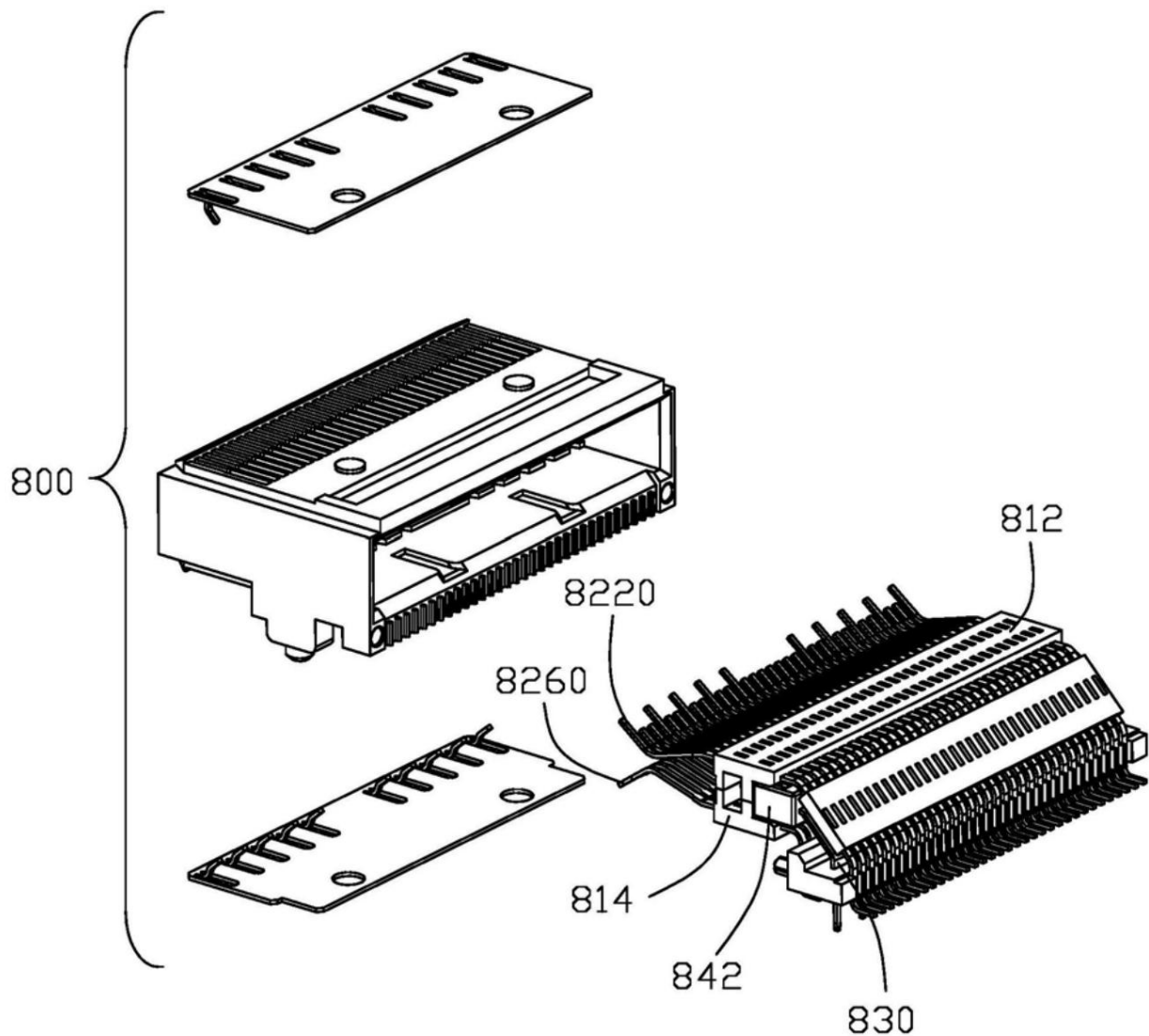


Figure 16

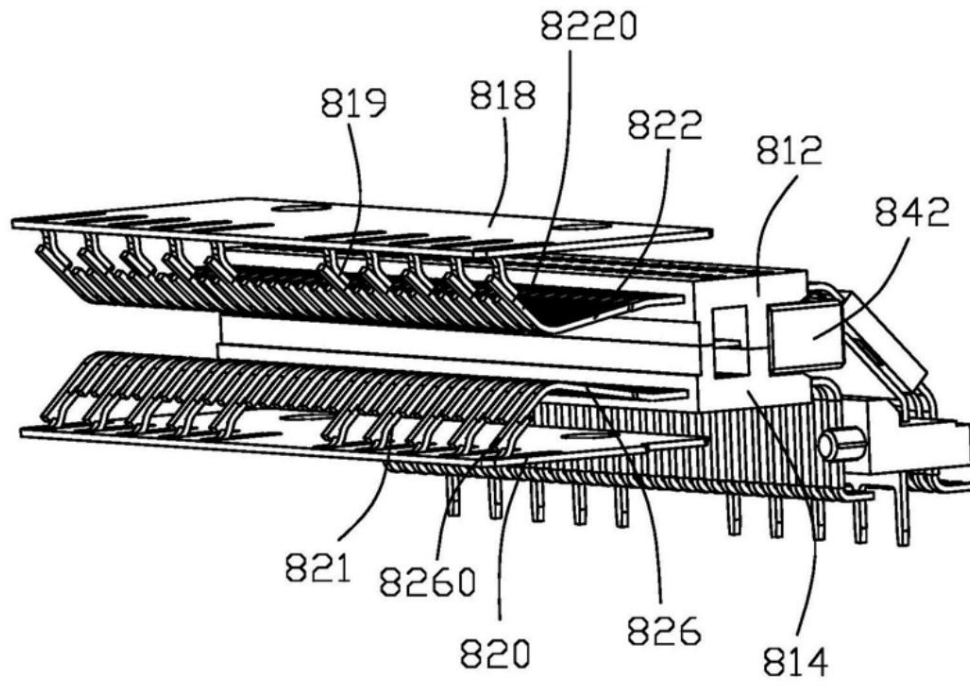


Figure 17

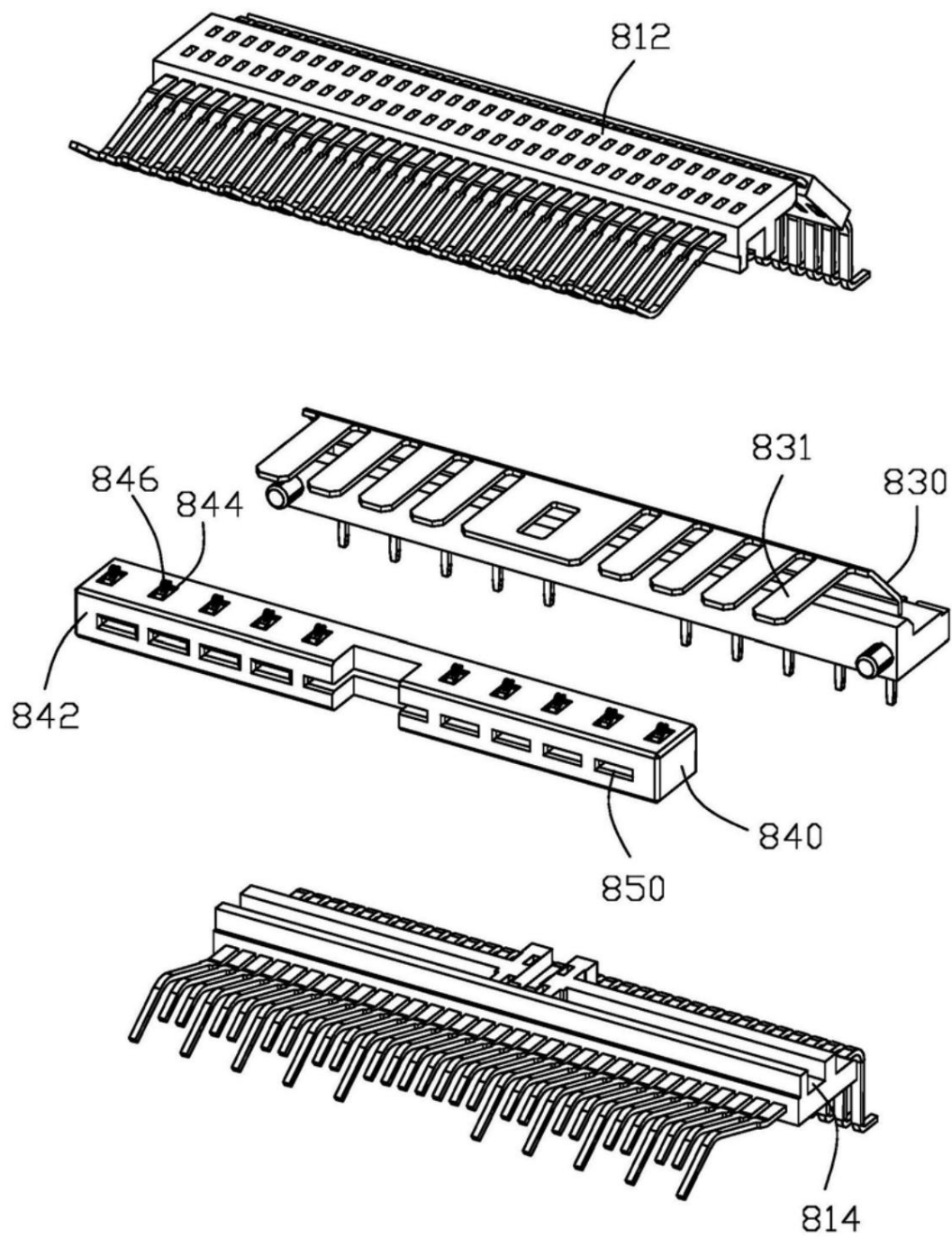


Figure 18

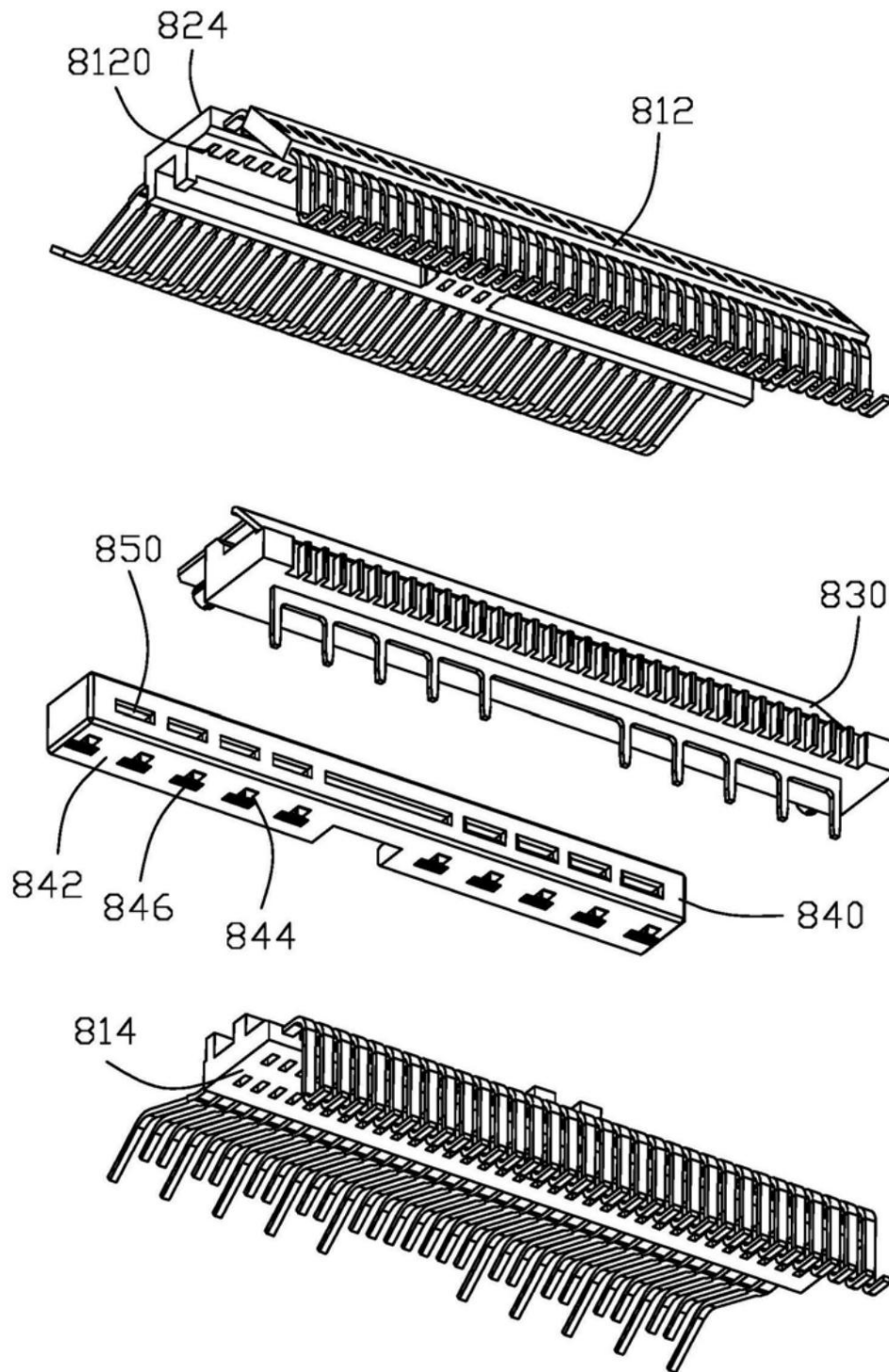


Figure 19

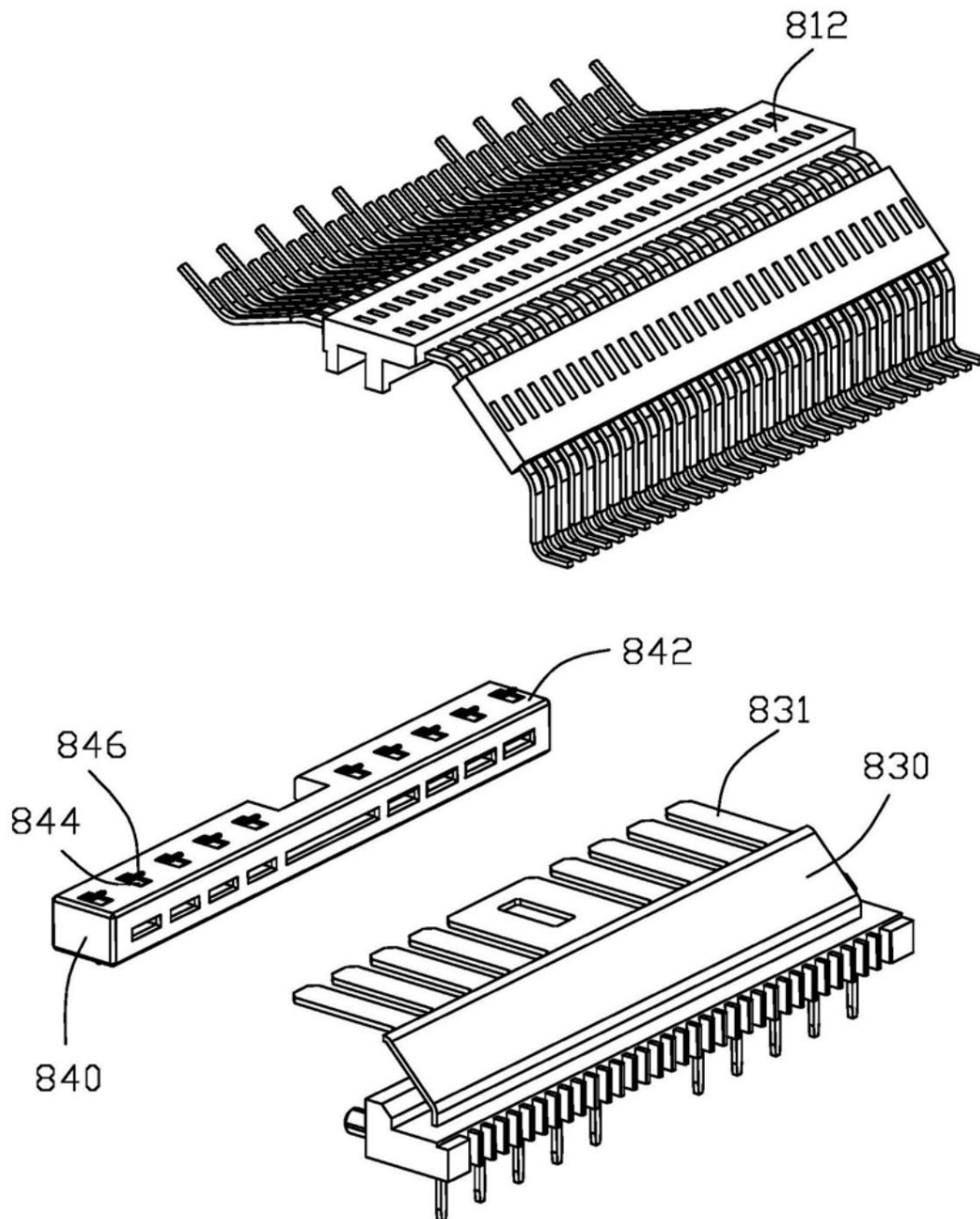


Figure 20

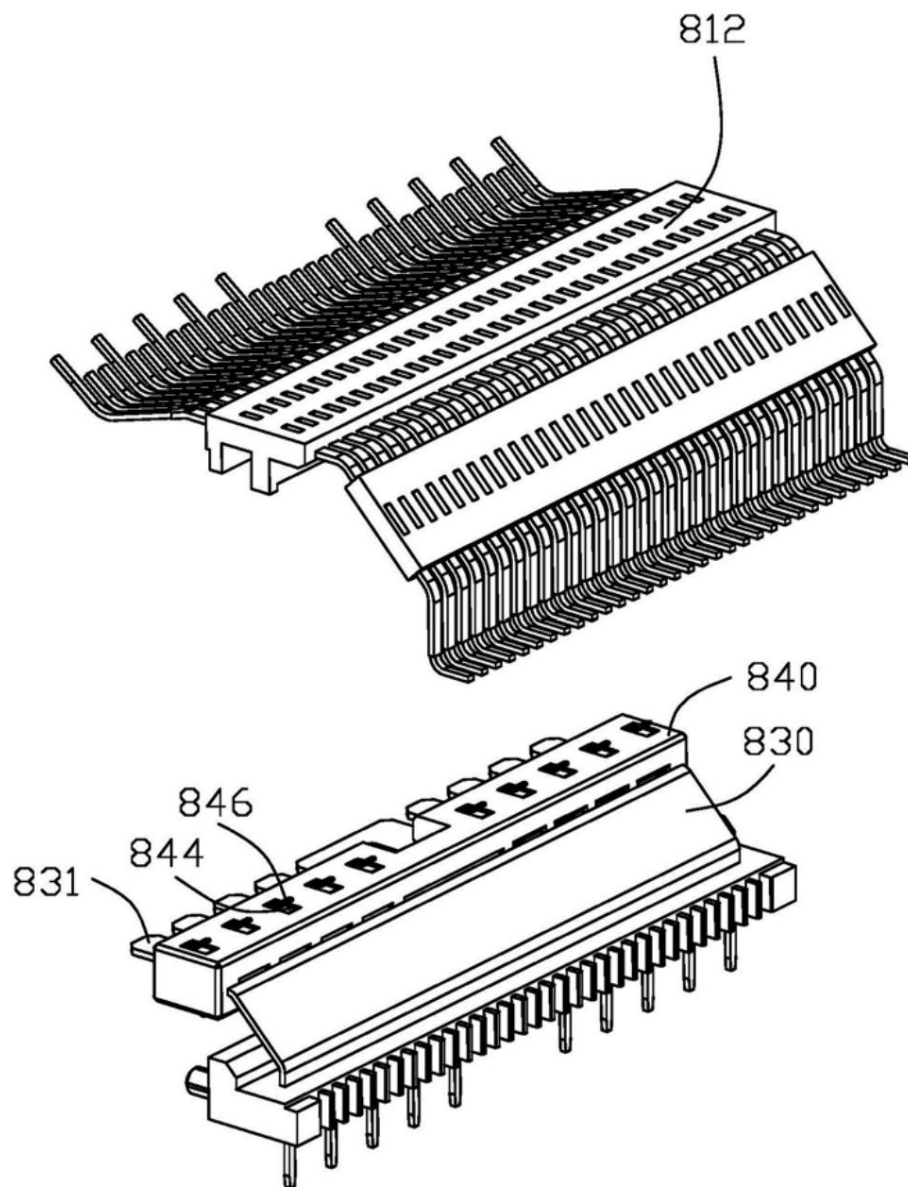


Figure 21

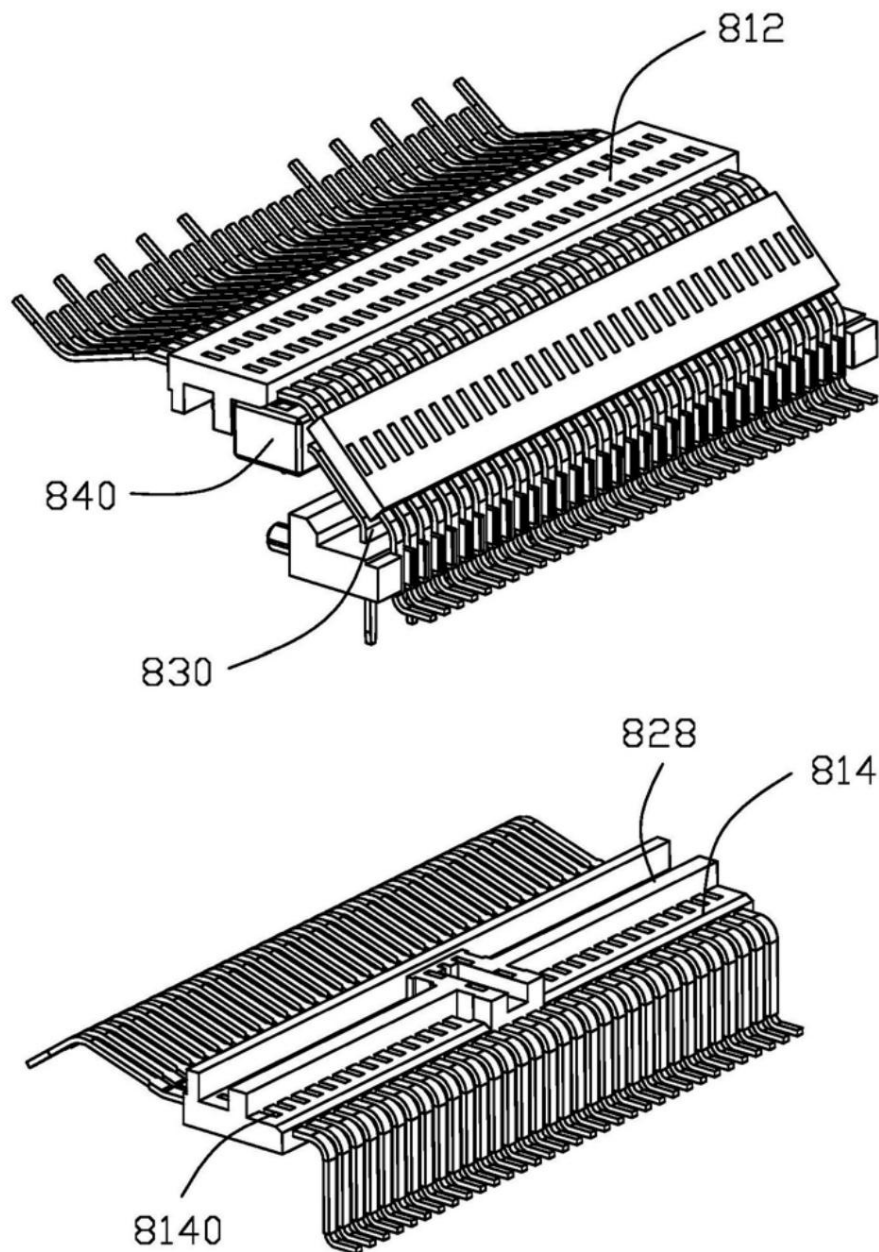


Figure 22

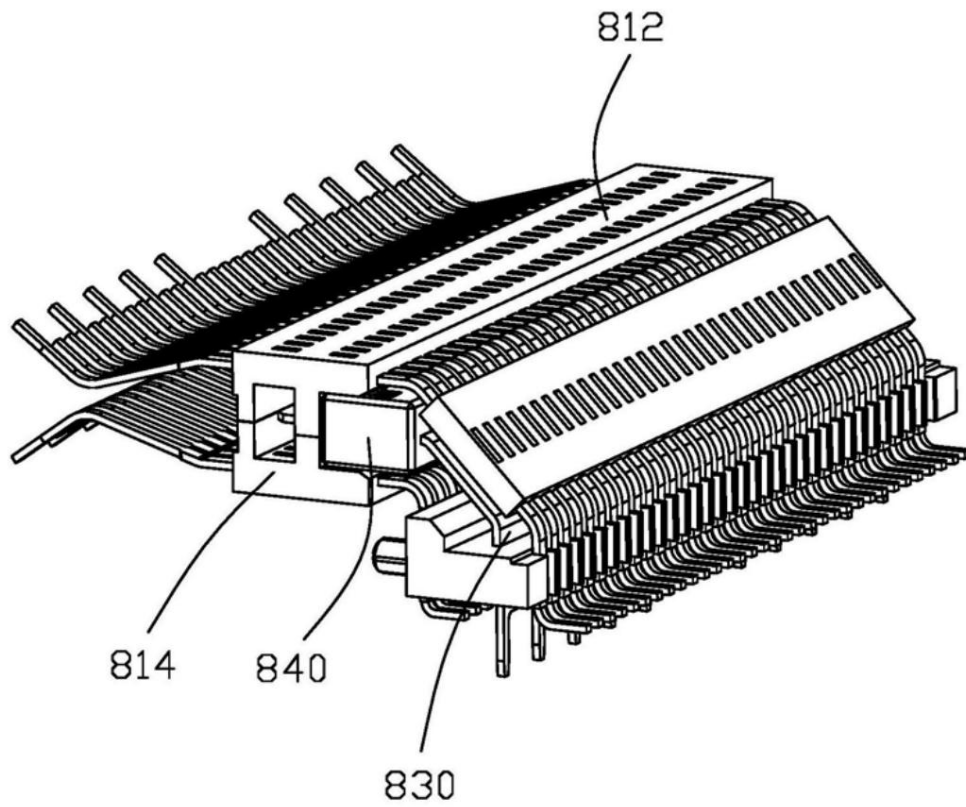


Figure 23

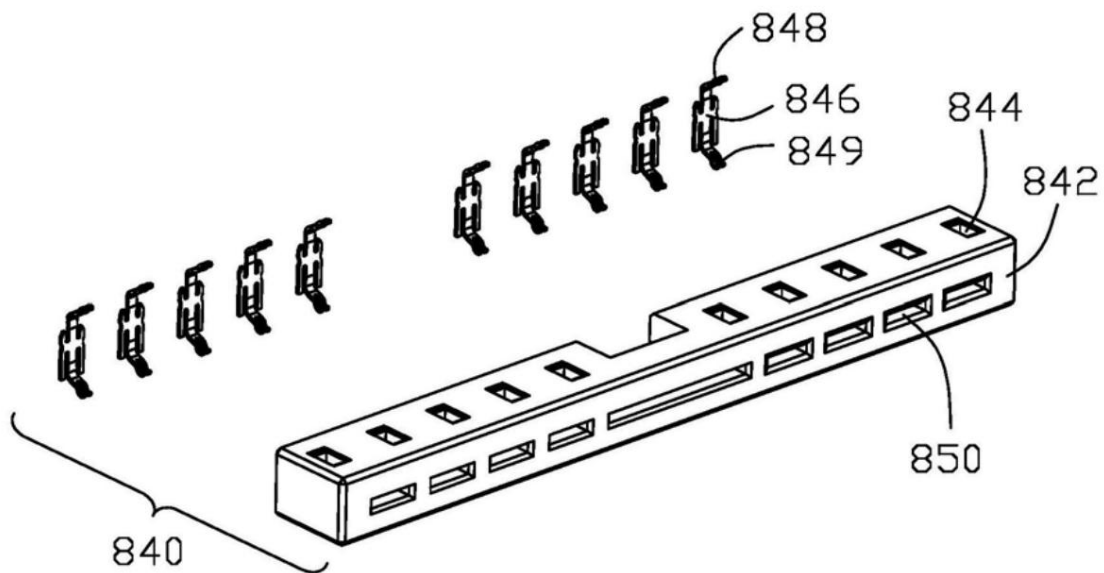


Figure 24

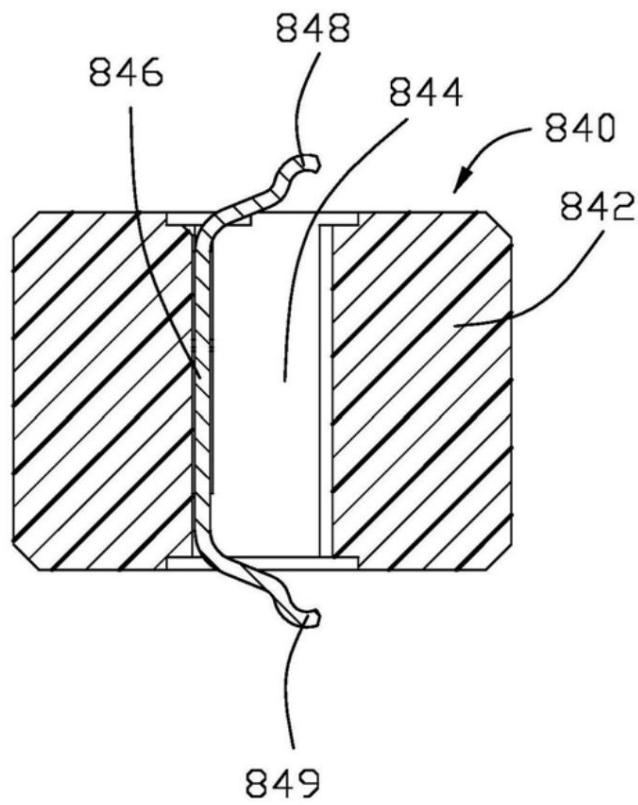


Figure 25

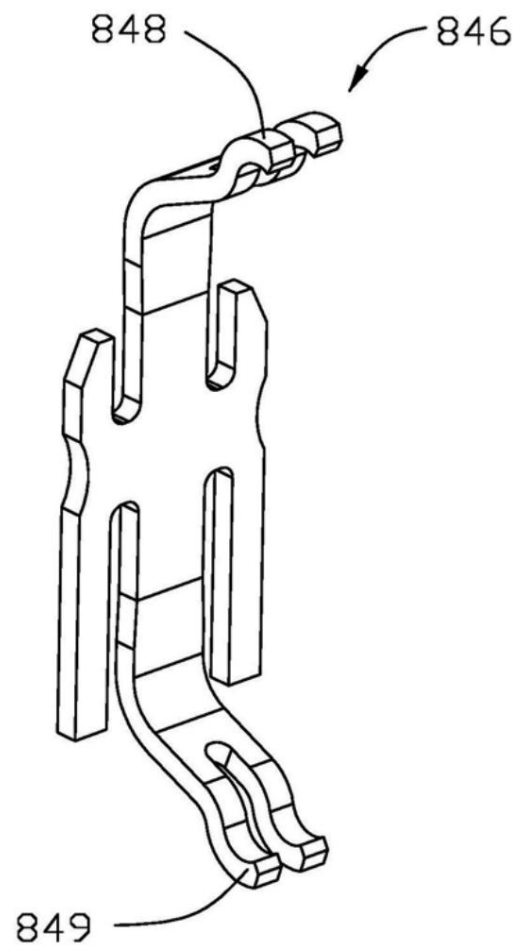


Figure 26

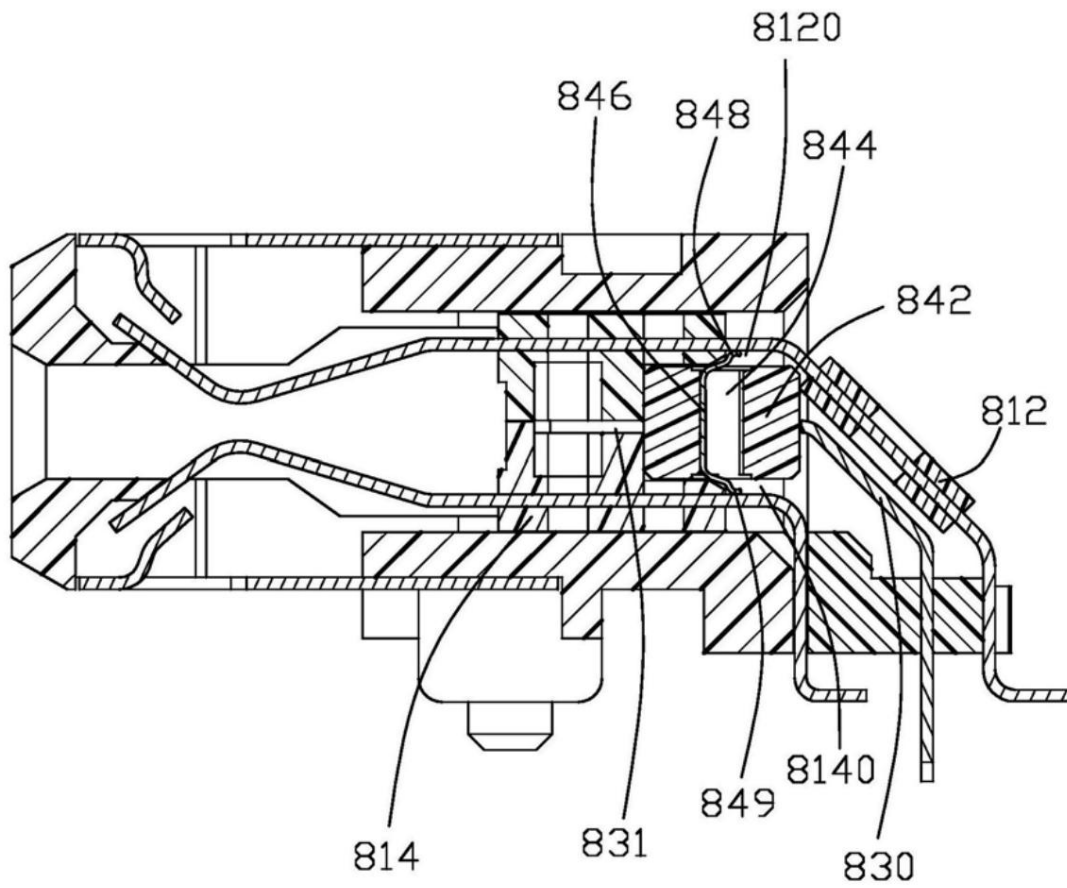


Figure 27

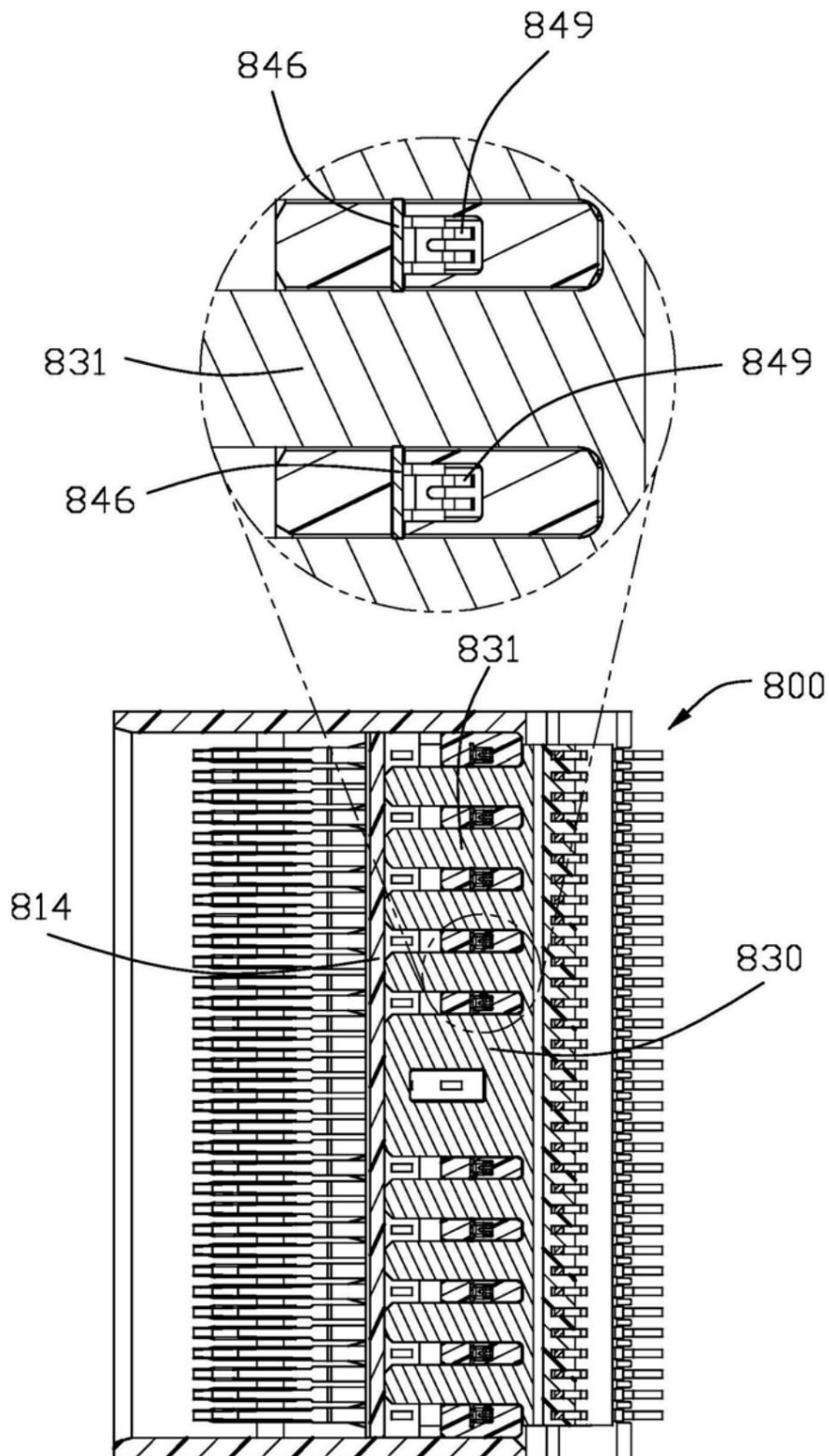


Figure 28

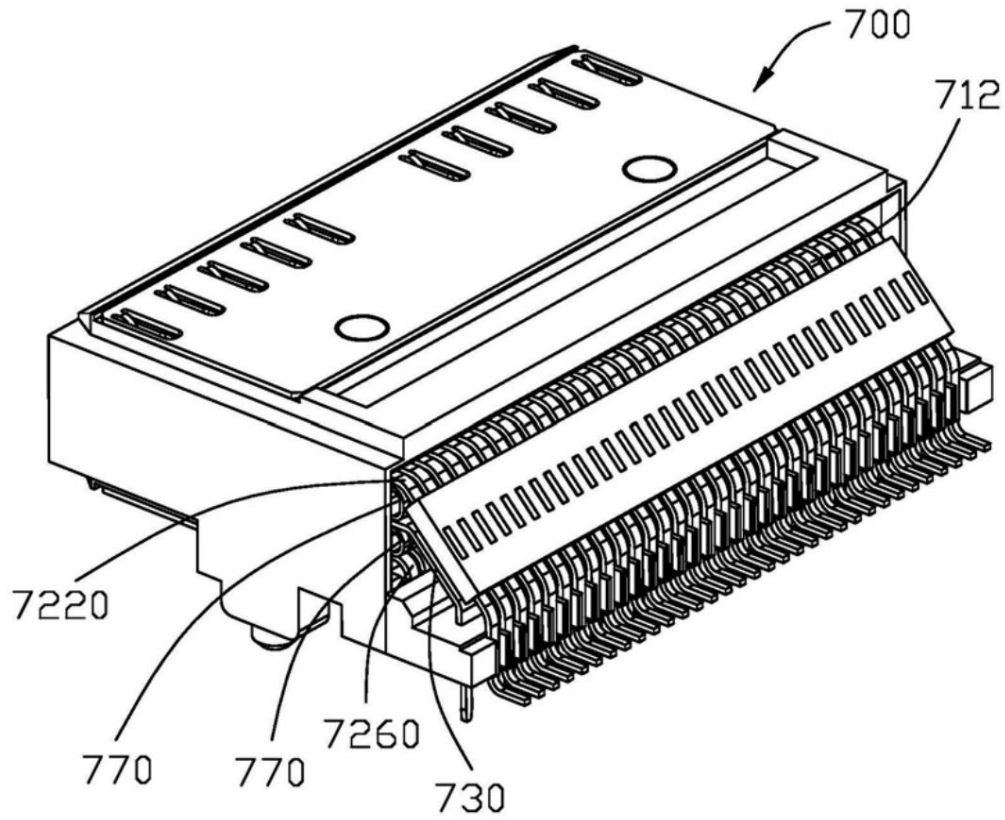


Figure 29

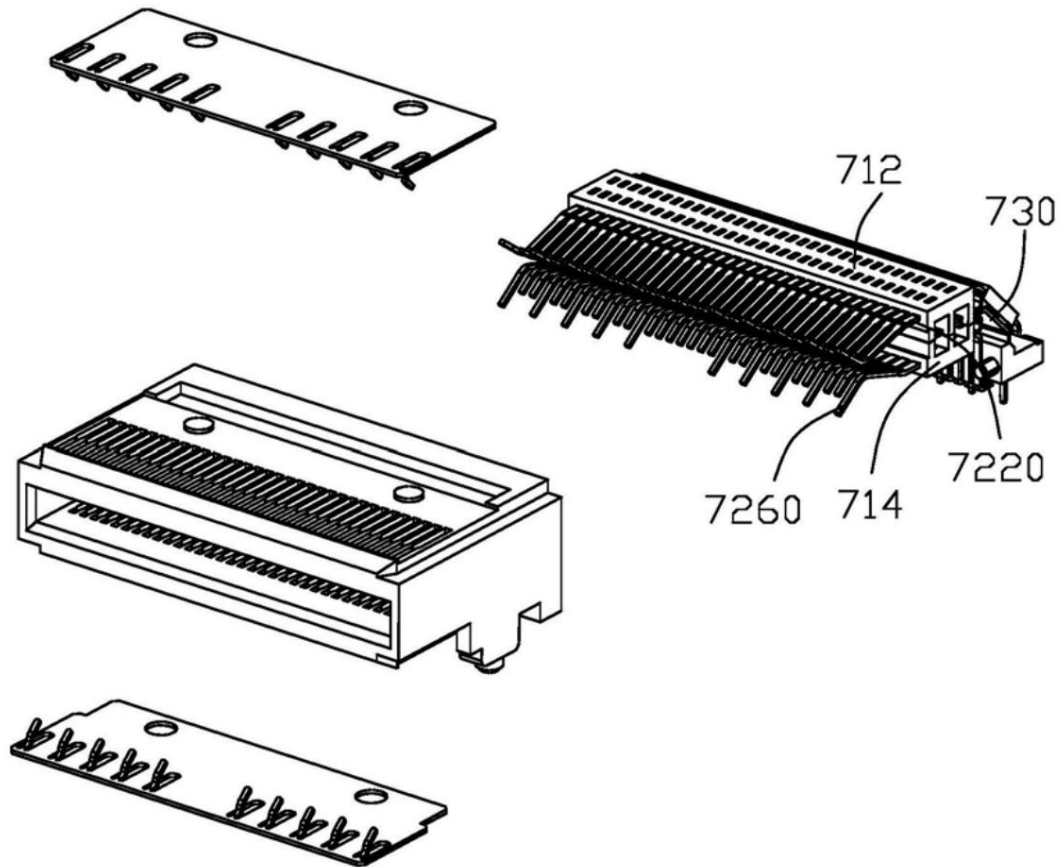


Figure 30

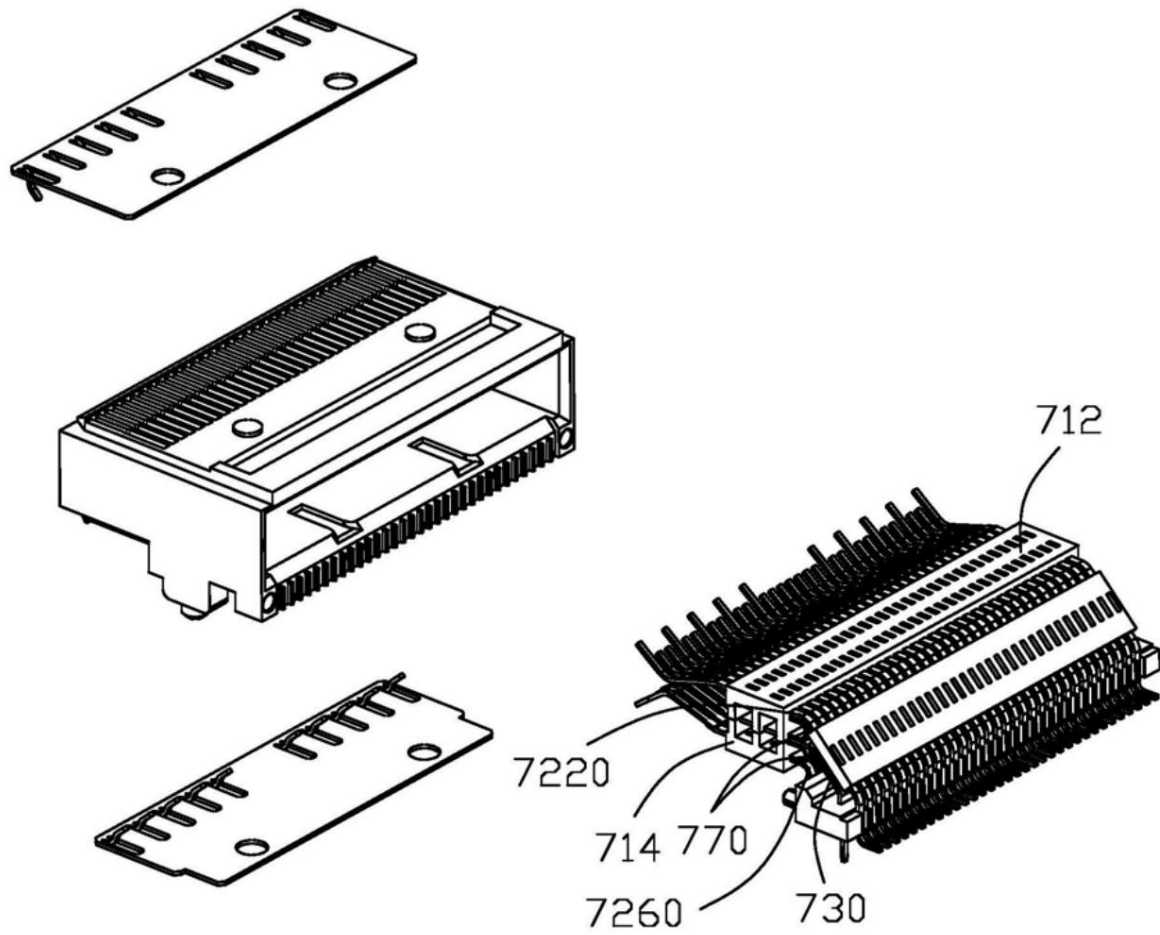


Figure 31

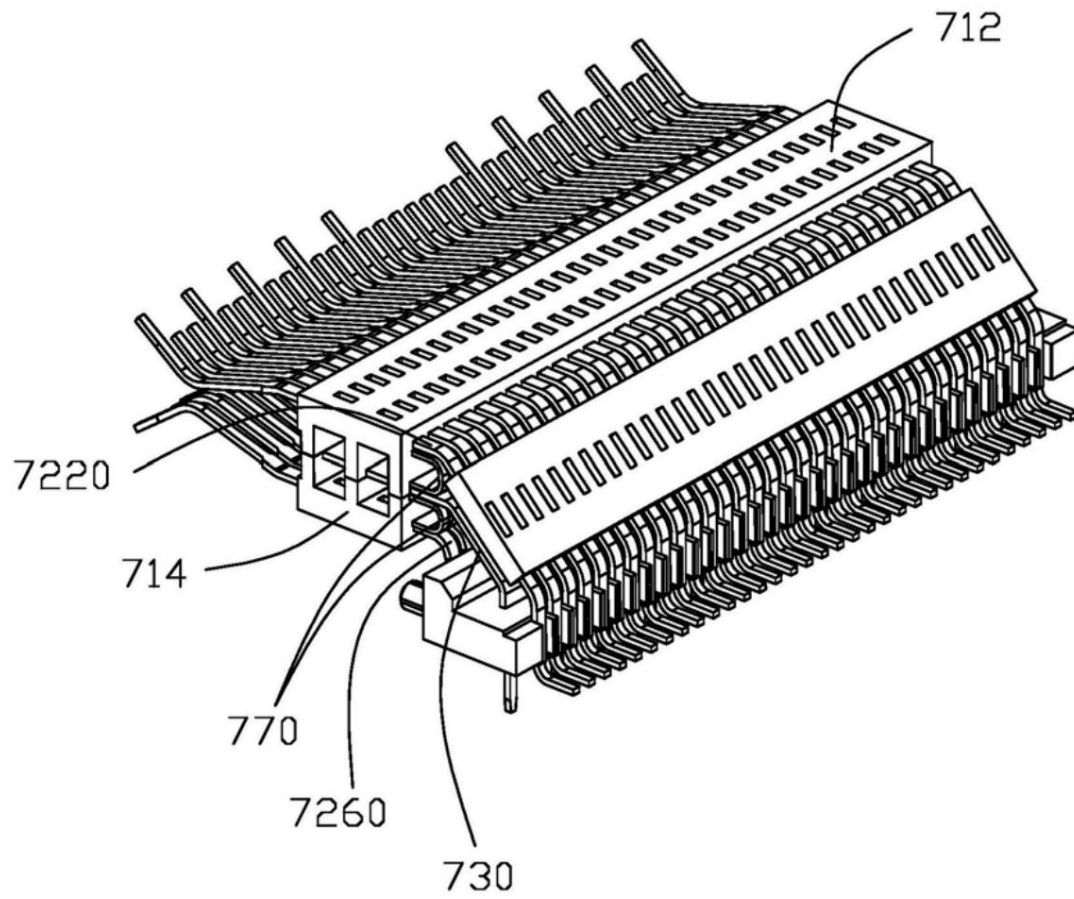


Figure 32

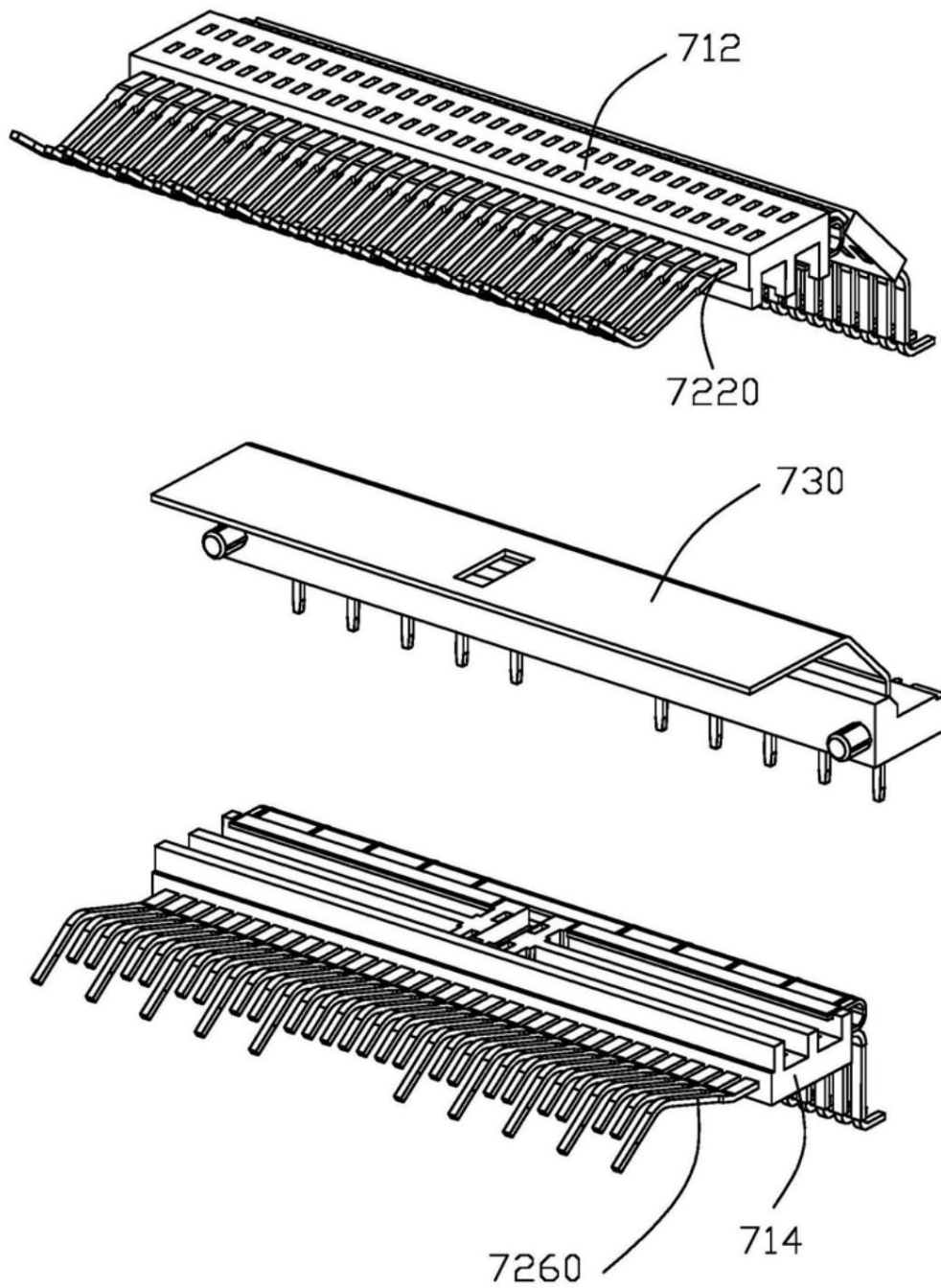


Figure 33

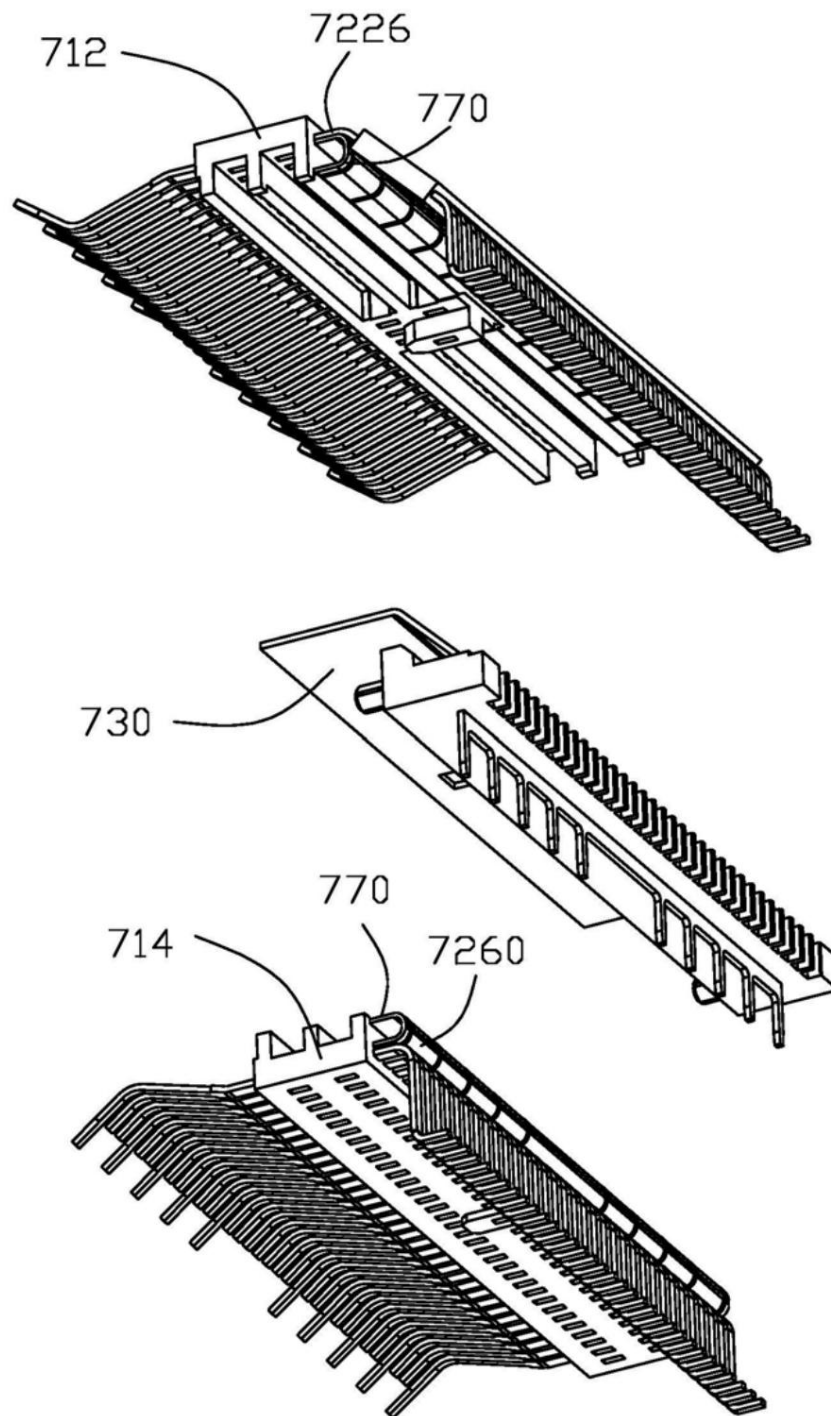


Figure 34

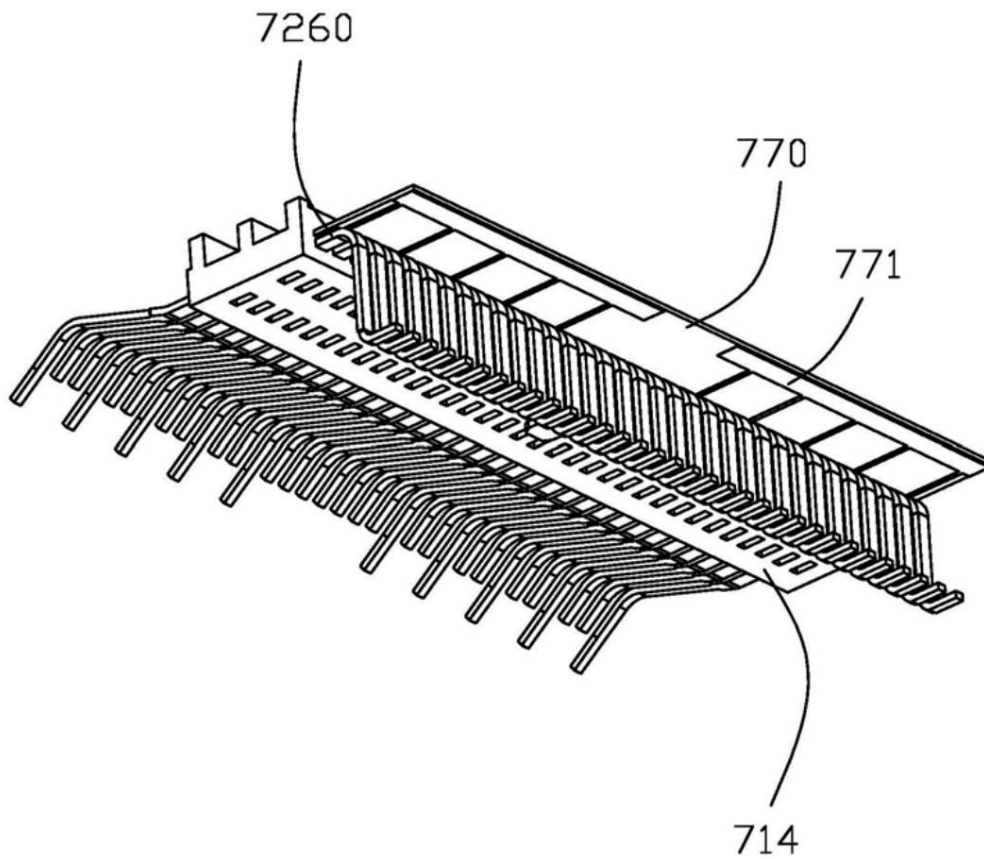


Figure 35

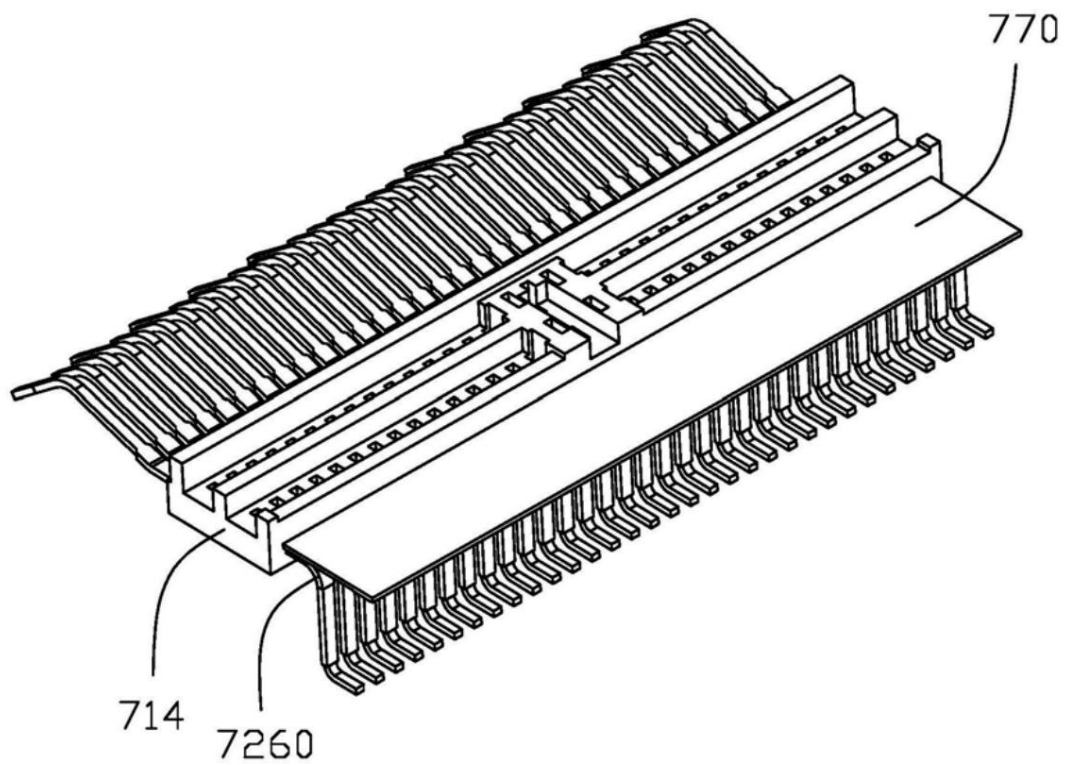


Figure 36

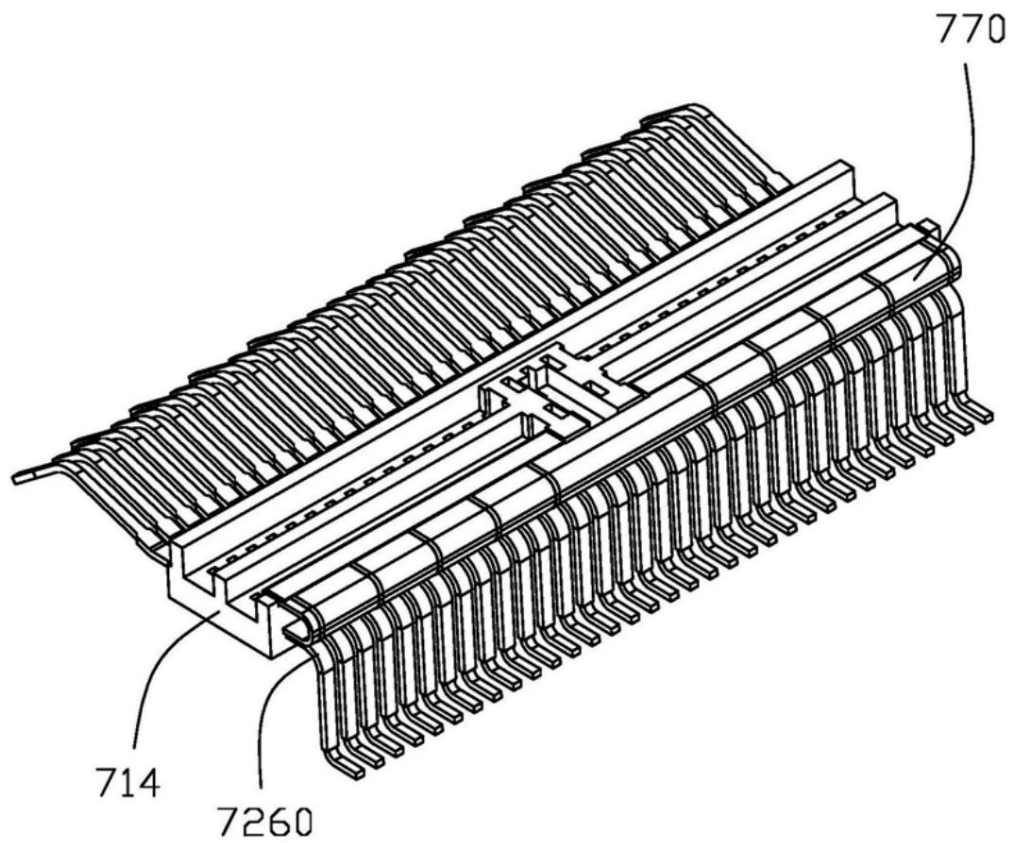


Figure 37

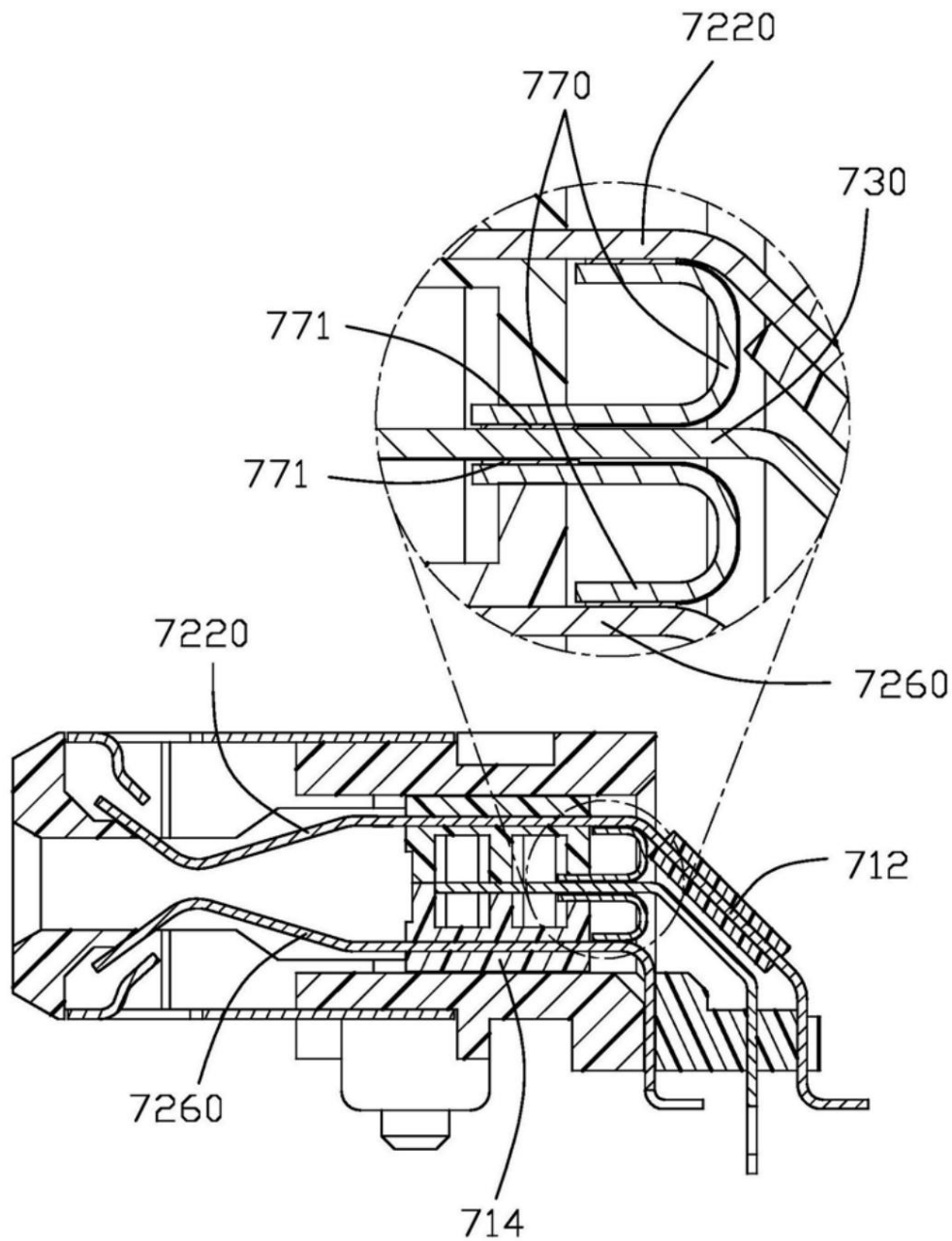


Figure 38

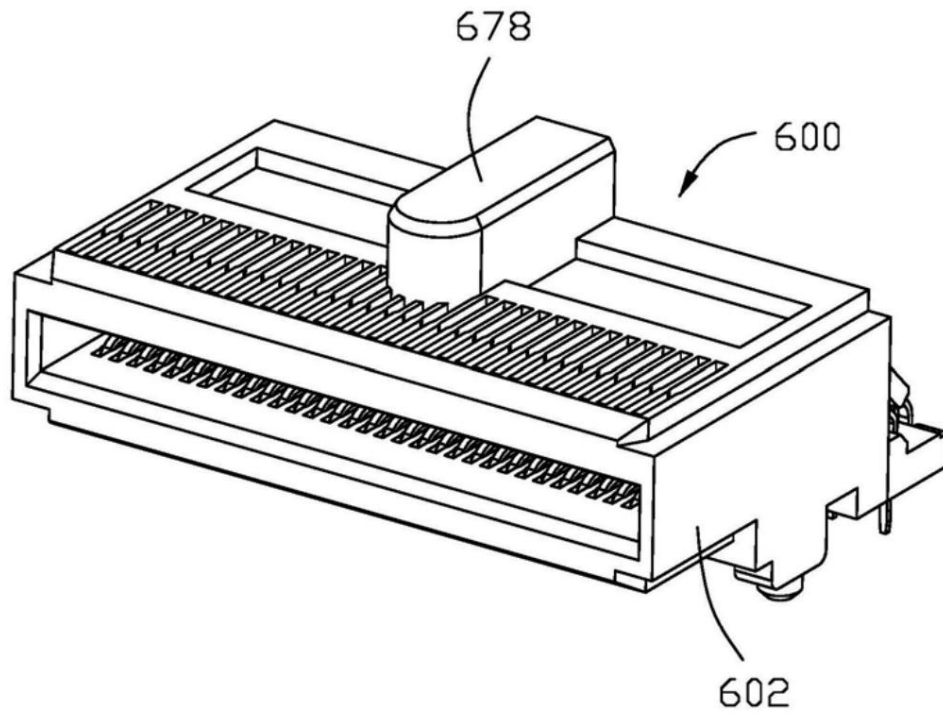


Figure 39

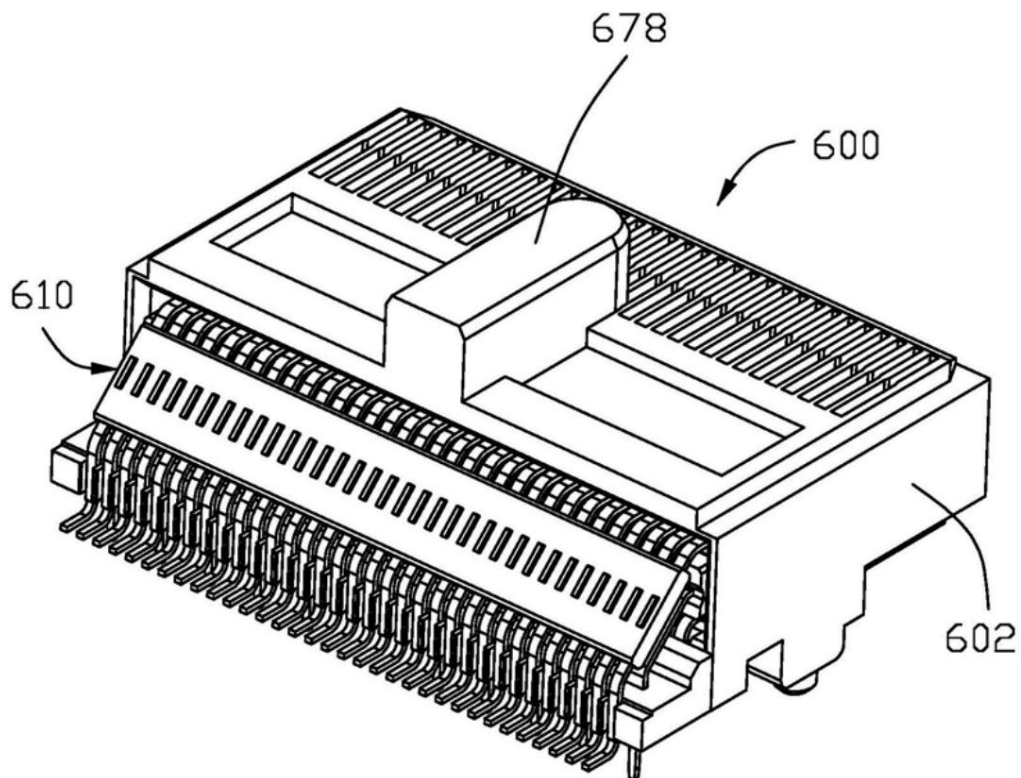


Figure 40

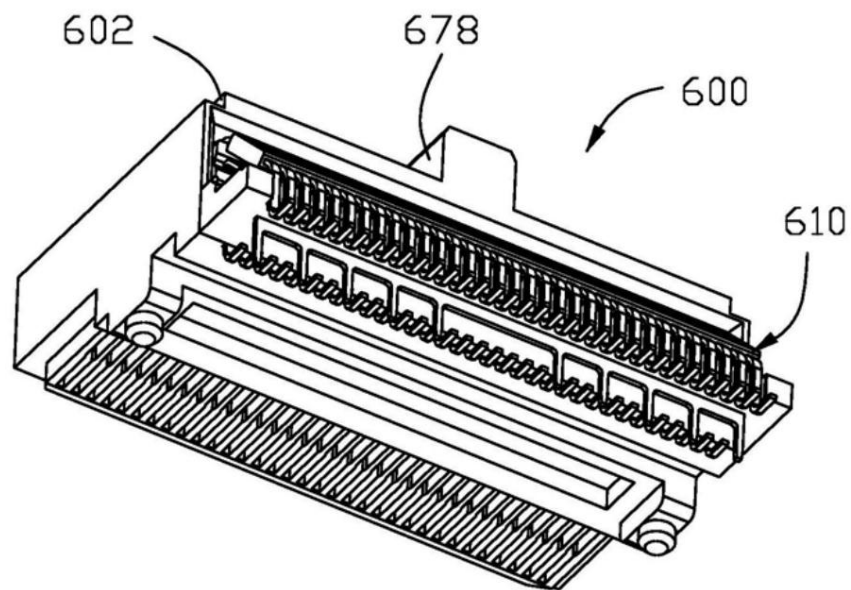


Figure 41

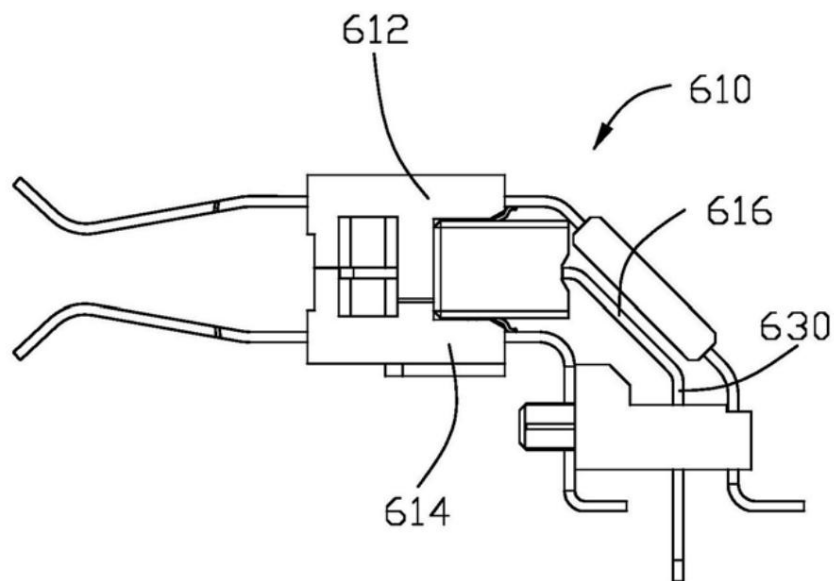


Figure 42

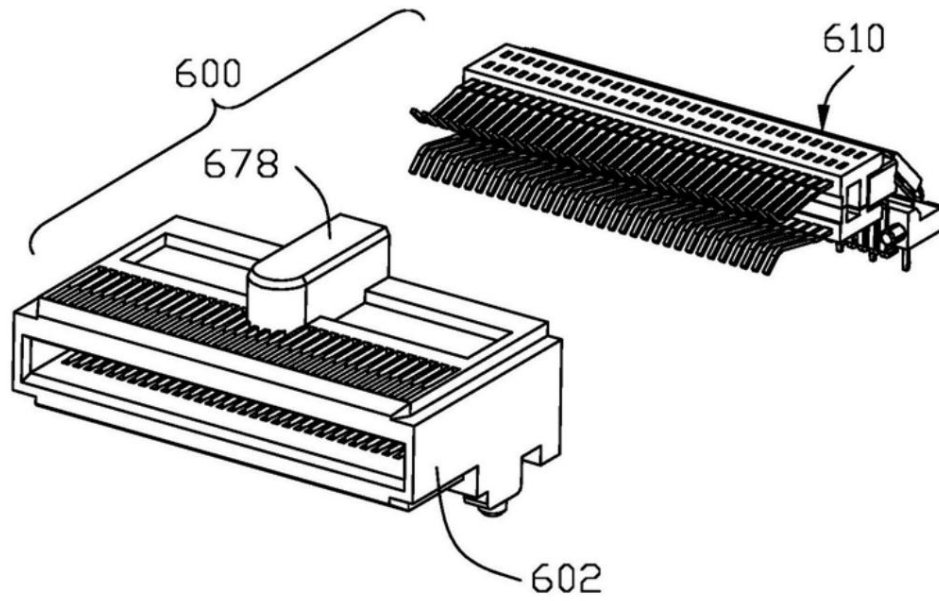


Figure 43

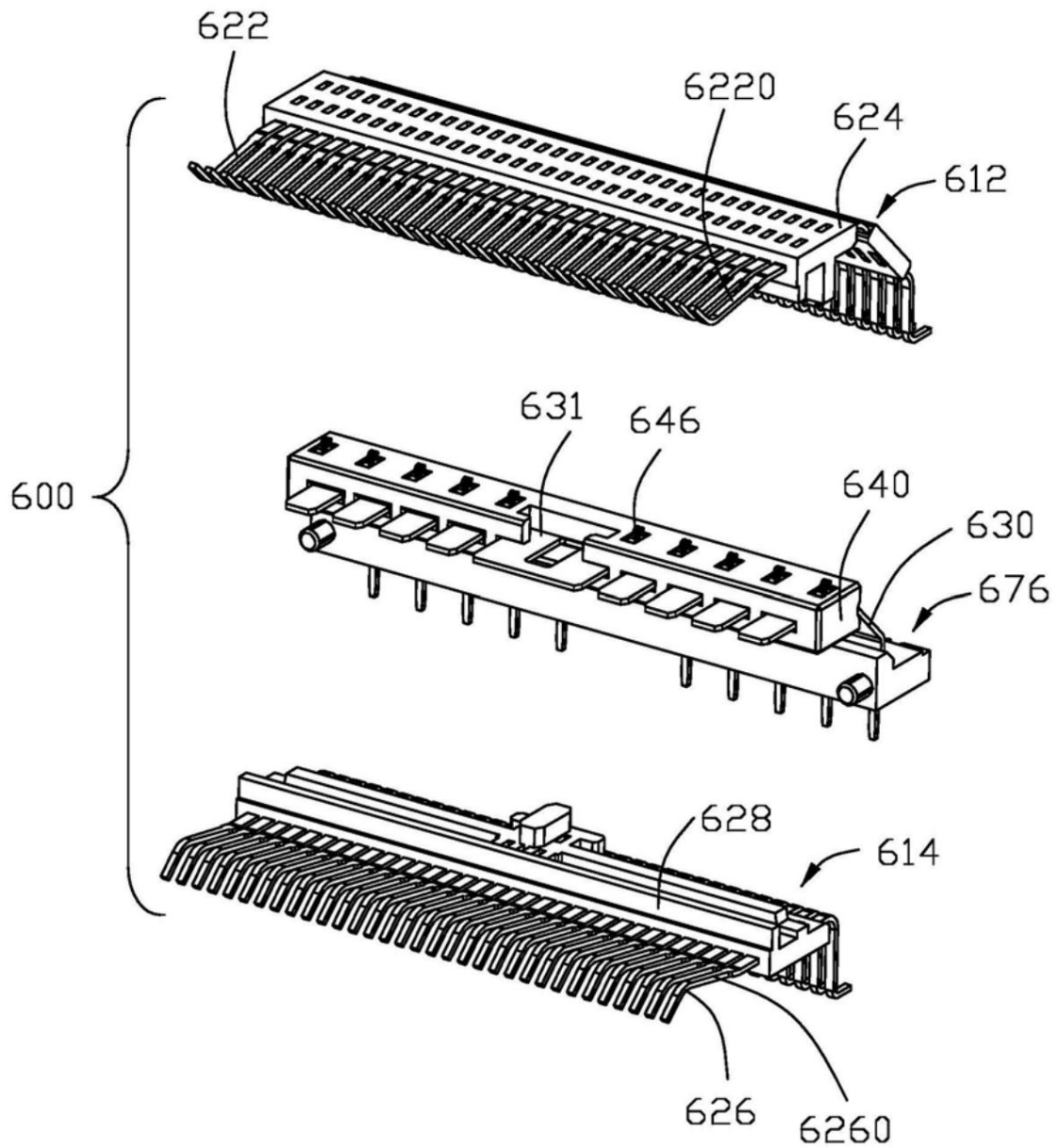


Figure 44

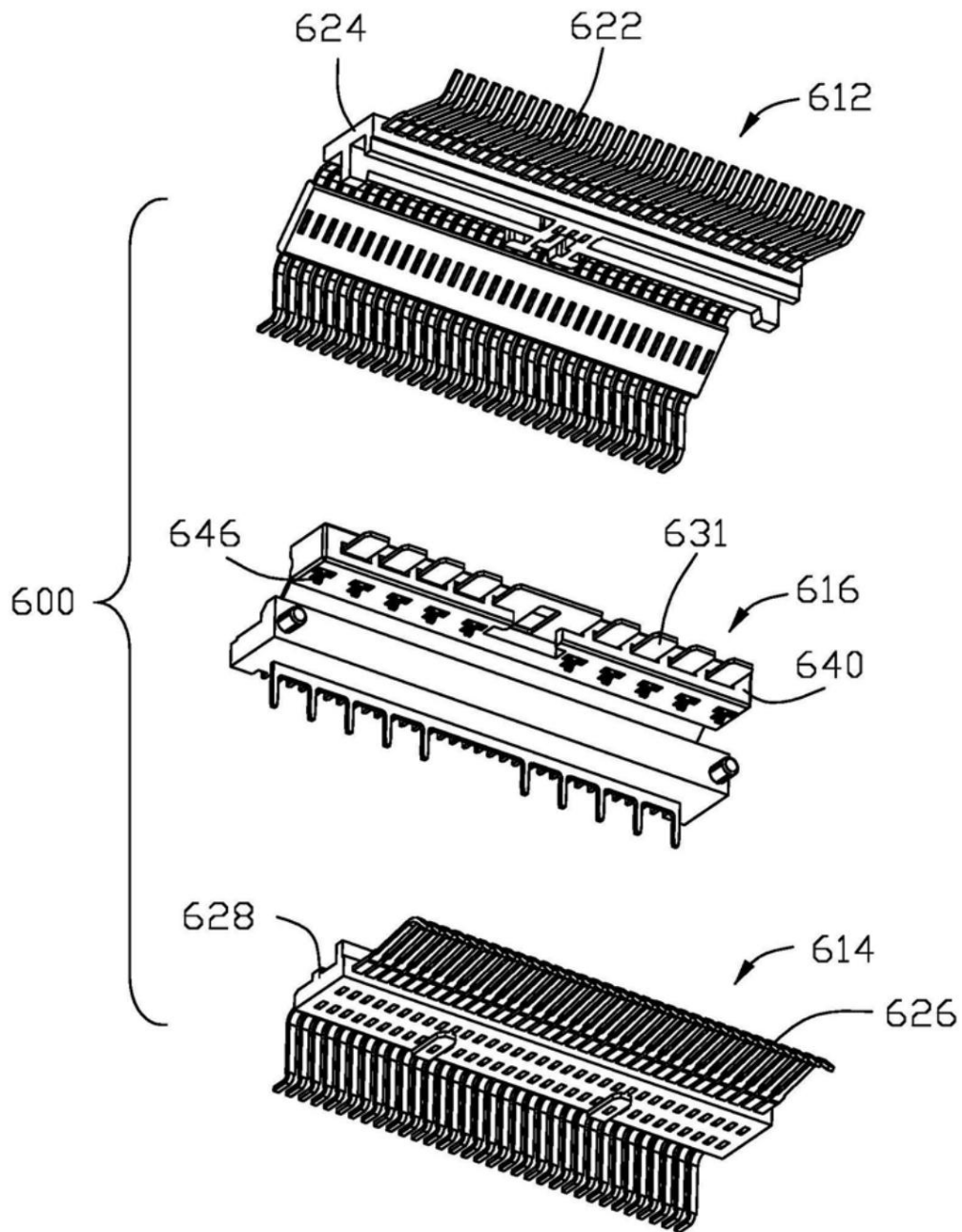


Figure 45

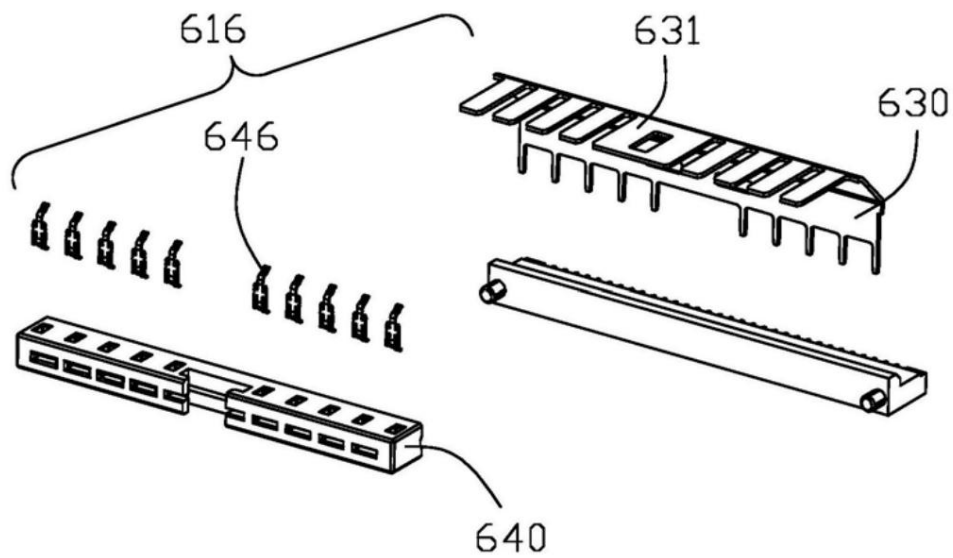


Figure 46

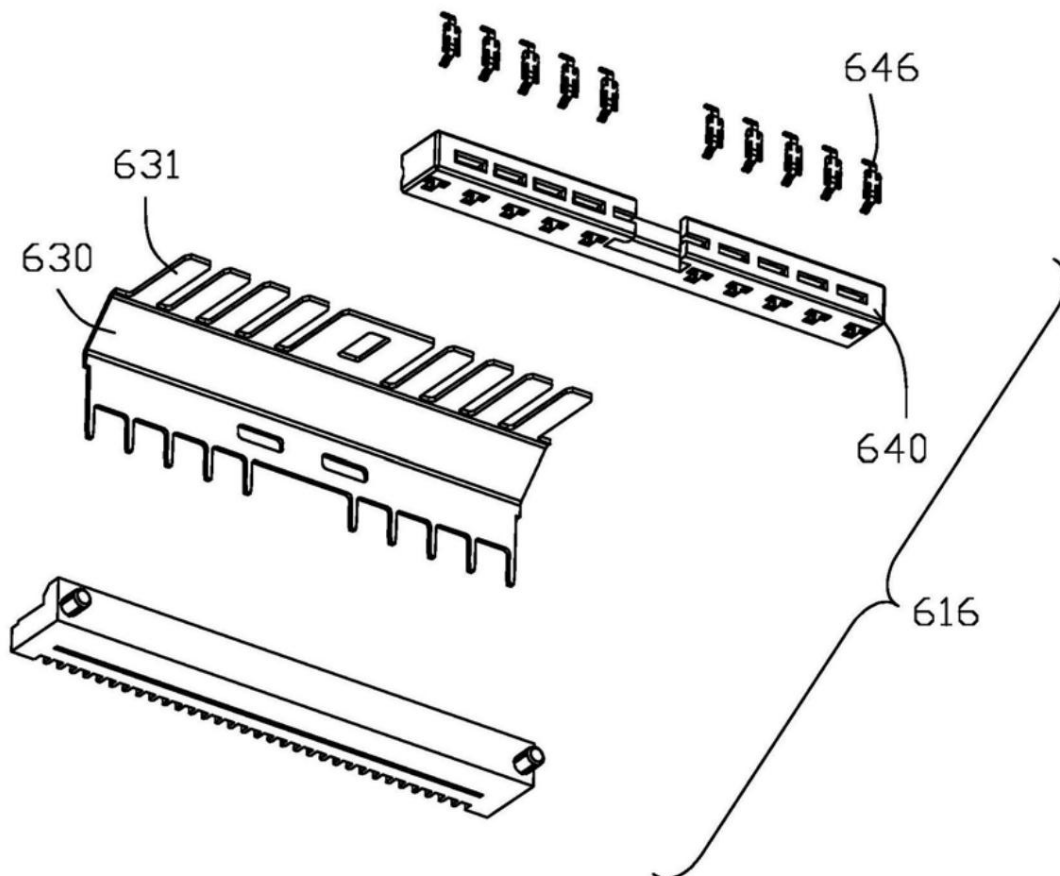


Figure 47

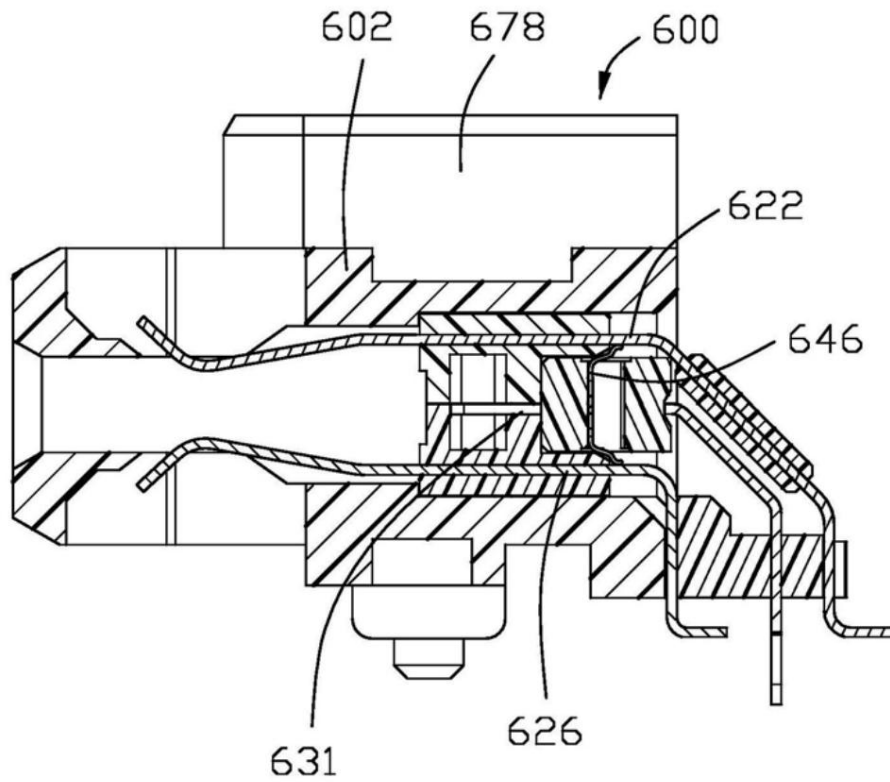


Figure 48