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(54) Title: POKE-IN CONNECTOR WITH IMPROVED WIRE SEPARATION PERFORMANCE

(57) Abstract: A poke-in connector is configured so that a wire can be inserted into a terminal and then can be released. In an embodiment the wire can be released with a separate tool. In another embodiment a release tool can be built into a housing of the poke-in connector.

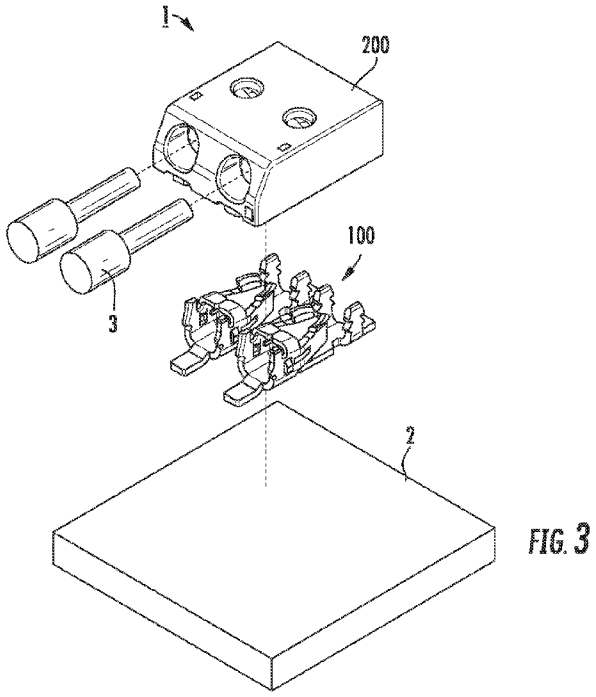


FIG. 3

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POKE-IN CONNECTOR WITH IMPROVED WIRE SEPARATION PERFORMANCE

RELATED APPLICATIONS

[0001] This application claims priority to Korean Application No. 10-2014-0118955, filed September 5, 2014.

TECHNICAL FIELD

[0002] This invention relates to field of poke-in connectors, more specifically to connectors that allow for removable wires.

BACKGROUND ART

[0003] Generally, electrical devices contain connectors having a form such that the terminal that is connected to a wire is soldered to the surface of a printed circuit board PCB and is surrounded by an insulative housing. These connectors include poke-in connectors, wherein the wire is locked to the terminal and contacted solely by the action of pushing the wire into the terminal.

[0004] An example of a poke-in connector of the prior art is disclosed in Republic of Korea Registered Patent No. 1050922 hereinafter "the Reference" as a "Low Profile Surface Mount Poke-In Connector."

[0005] In the connector according to the Reference, in order to detach the wire, a sharp tool such as a nail must first be placed in the hole formed on the top of the housing, and then the terminal holding the wire must be pressed to release the clamping force.

[0006] In order to be able to release the clamping force of the terminal that clamps the wire using a tool such as a nail, as in the Reference, it is crucial that the clamping force of the clamping part be readily released by having the end of the tool in secure contact with the clamping part. However, in the case of the Reference, because the end of the tool is not furnished with a separate guide structure to guide it toward the clamping part, the end of the tool cannot readily be contacted with the clamping part of the terminal; as a result, wire separation is not straightforward. Consequentially, certain individuals would appreciate further improvements to poke-in connectors.

SUMMARY OF THE INVENTION

[0007] A poke-in connector includes a covering part that extends upward from the soldering part that is soldered to the PCB so as to cover the wire; and a terminal having a locking contact part, configured to narrow toward the end while extending upward in the direction of the insertion of the wire on either side of said covering part, that is put into locking contact as the wire is interference-fit to the end; and a housing that covers the terminal. The poke-in connector further includes a locking release part having a guide surface on both facing sides, sloped in a curved shape, which guides the secure insertion of the locking release tool, extending from either locking contact part upward and with a gap that increases in the ascending direction so that the locking release tool is inserted therebetween.

[0008] In an embodiment the surface of the boundary area between the guide surface and the portion located therebelow is formed as a curve, so that after the locking release tool has been guided along the guide surface, it can be made to descend smoothly toward the lower portion and readily spread open the locking contact parts. The locking release tool can be a locking release lever on the top surface of the housing and can include a flexible extension part having a bending structure for elasticity, and extending toward the top surface of the housing. The locking release tool can be formed separately from the housing or formed as a single unit with the housing. The locking release tool can also include a compression part that extends from the end of the flexible extending part, and formed narrowly in the left-right direction compared to the left-right width of the end of the flexible extension part and can include a stopper part that extends from the end of the compression part and has a left-right width greater than that of the compression part so that, when pressed, additional displacement is limited by catching on the top end of the locking contact part of the terminal.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 is a perspective view of the insertion and fastening of a wire into a first embodiment of a poke-in connector with improved wire separation performance.

[0010] FIG. 2 is a perspective view of the removal of the wire from the poke-in connector.

[0011] FIG. 3 is an exploded perspective view of the poke-in connector with improved wire separation performance according to the embodiment depicted in FIG. 1.

[0012] FIG. 4 is a perspective view of the wire locked into the terminal.

[0013] FIG. 5 is a cross-section showing a wire having been pushed into an embodiment of a poke-in connector.

[0014] FIG. 6 is a cross-section of the housing.

[0015] FIG. 7 is a perspective view of a locking release tool depressing the terminal in order to release the wire lock.

[0016] FIG. 8 is a top view showing the spreading of the locking contact parts of the terminal caused by insertion of the locking release tool.

[0017] FIG. 9 is an exploded perspective view of a second embodiment of a poke-in connector with improved wire separation performance.

[0018] FIG. 10 is a top view of the poke-in connector depicted in FIG. 9.

[0019] FIG. 11 is an elevated front view of a cross section of the embodiment depicted in FIG. 9, showing the spreading of locking release parts to either side when the locking release lever is pressed.

[0020] FIG. 12 is a drawing showing the stopper part of the locking release lever catching on the stopper surface.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0021] Hereinbelow, preferred embodiments of the poke-in connector with improved wire separation performance of this invention will be described in detail with reference to the attached drawings. The purpose of this invention, which has been devised in order to resolve the above-described problems of the prior art, is to provide a poke-in connector having improved wire separation performance, wherein the end of the locking release tool which releases the locking state of the wire is kept in secure contact with the wire locking part of the terminal, so that the wire can readily be separated from the terminal.

[0022] As noted above, an embodiment of a poke-in connector includes a covering part that extends upward from the soldering part that is soldered to the PCB so as to cover the wire; and a terminal having a locking contact part, configured to narrow toward the end while extending upward in the direction of the insertion of the wire on either side of said covering part, that is put into locking contact as the wire is interference-fit to the end; and a housing

that covers the terminal. The poke-in connector further includes a locking release part having a guide surface on both facing sides, sloped in a curved shape, which guides the secure insertion of the locking release tool, extending from either locking contact part upward and with a gap that increases in the ascending direction so that the locking release tool is inserted therebetween. The locking release tool can include a compression part that extends from the end of the flexible extending part, and formed narrowly in the left-right direction compared to the left-right width of the end of the flexible extension part and can include a stopper part that extends from the end of the compression part and has a left-right width greater than that of the compression part so that, when pressed, additional displacement is limited by catching on the top end of the locking contact part of the terminal. Due to the left-right width difference, the end of the flexible extension part, the compression part, and the stopper part, viewed from above, are formed in an H shape, with a groove on either side of the compression part; as the compression part is inserted between the locking release parts, the locking release parts are relatively inserted into the groove so as to ascend along the side of the compression part; the bottom of the stopper part is configured so as to be located below the top end of the locking release parts when the stopper part is stopped due to catching on the top edge of the locking contact parts, so that a reduction in the size of the assembled article, including the housing, is made possible. In addition, the poke-in connector can provide improved wire separation performance with a wedge coupling part formed in a wedge shape that extends extending upward from either side of the front end of the soldering part so as to guide coupling with the housing front part while ensuring that the coupling is secure.

[0023] Potential benefits of the design include several things. First, by configuring the sloped guide surface in a curved shape that guides the secure insertion of the locking release tool on the facing sides of the locking release part, the release of the wire from the lock can be readily achieved because the locking release tool can be stably inserted into the guide surface. Second, the housing can be securely and firmly fastened to the terminal because of the wedge coupling part, bottom surface guide part, back end catch part, and side surface catch part, which are formed on the terminal. Third, if the locking release lever is formed as a single unit as a locking release tool on the top surface of the housing, due to the difference in left-right width, the end of the flexible extension part, the compression part, and the stopper part, viewed from above, are formed in an H shape with a groove on either side of the compression part; as the compression part is inserted between the locking release parts, the

locking release parts are relatively inserted into the groove so that they ascends along the side of the compression part; the bottom of the stopper part is configured so as to be located below the top end of the locking release parts when the stopper part is stopped due to catching on the top edge of the locking contact parts, so that a reduction in the size of the assembled article, including housing, is made possible.

[0024] As can be appreciated from FIGs 1-8, a poke-in connector 1 with a housing 200 (formed of an insulative material) that is mounted on the top surface of a PCB 2. The poke-in connector is configured to releasably connect to a wire 3 with a terminal 100 that is mounted inside the housing and is configured to be soldered to the PCB 2 so as to provide an electrical connection between the wire 3 and a PCB 2. As can be appreciate, the housing 200 isolates and protects the terminal 100 and includes a terminal receiving space that is formed opening downward in order to accommodate the terminal 100.

[0025] On a first surface of the housing 200 a wire insertion hole 210 is formed, into which a wire 3 can be inserted while on a top surface of the housing 200 a tool insertion hole 220 is formed. A locking release tool 4 can be inserted into the tool insertion hole 220 and allows the wire 3 to be released when desired.

[0026] As can be appreciated, the wire 3 is locked and connected to the terminal 100 by insertion of an end of the wire 3 (typically the wire 3 will have insulation over a conductor and the insulation is thus first removed) into the wire insertion hole 210. The wire 3 can be released from the poke-in connector 1 when the locking release tool 4 is inserted into the tool release hole 220.

[0027] On the inner top part of the wire insertion hole 210 a wire guide surface 211 is formed sloping downward in the direction of insertion of the wire 3. The wire guide surface guides the wire 3 being inserted into the housing 200 so that the wire can be inserted in downward angled diagonal direction. On the top surface of the housing 200 a sloped tool guide surface 221 is provided at the beginning of the tool release hole 220.

[0028] The wire 3 can be inserted until it presses against an inner surface of the housing 200. A fastening groove 230 is formed into the inner surface of the housing 200 and a wedge coupling part 160 of the terminal 100 is fitted into the fastening groove 230. On either bottom side of the housing 200, a side tab 240 is formed that catches on a side catch projection 190 of the terminal 100. A back end tab 250 is formed on the rear side of the bottom of the housing 200 and is configured to catch on a back end projection 180 of the terminal 100. In

addition, a guide part insertion groove 260 is formed on the top of the bottom surface on the inner side of the housing 200 and is configured to have an interference fit with a bottom surface guide part 170 of the terminal 100. The terminal 100 includes a soldering part 110, a covering part 120, locking contact part 130, and locking release part 140.

[0029] The housing 200 also includes a locking release part insertion groove 270 that the locking release part 140 is inserted into and a covering part insertion groove 280 that the top part of the covering part 120 is inserted into. The locking release part insertion groove 270 is formed on the lower side of the tool insertion hole 220.

[0030] The soldering part 110 is the part that is soldered to the top surface of the PCB 2, and can be formed entirely in a flat plate shape; the front end and back end can extend below other parts of the terminal 100 so as to facilitate soldering to the contact pads on the PCB 2. As can be appreciated, when the wire 3 is inserted the soldering part 110 and the end of the wire 3 are spaced apart from one another. Therefore, when the wire 3 is removed by pulling it upward, the end of the wire 3 does not contact the soldering part 110 and the wire 3 can be readily removed.

[0031] The covering parts 120 extend respectively upward from either side of the back end part of the soldering part 110 and are configured to cover the wire 3 when the wire 3 is inserted. These covering parts 120 comprise a vertical extension section 121 that extends vertically upward from the soldering part 110 and a horizontal extension section 122 that extends horizontally inward from the vertical extension section 121, each of the horizontal extension sections 122 facing the other horizontal extension 122. The horizontal extension section 122 is formed sloping downward in the direction of insertion of the wire 3. As the wire 3 can be inserted at a downward angle; correspondingly, the covering part insertion groove 280 formed on the inside of the housing 200 is formed with its top surface sloping downward in the direction of insertion of the wire 3.

[0032] The locking contact parts 130 extend in the direction of insertion of the wire 3, e.g. from the respective perpendicular extension part 121 of the covering part 120 toward the opposite end of the soldering part 110. In order to simultaneously contact and retain the wire 3 the locking contact parts 130 taper toward an end and the wire 3 has an interference-fit with and is secured by the ends. As can be appreciated, in a curved section formed in the connecting portion between the locking contact part 130 and perpendicular extension part 121 of the covering part 120, a bead 150 is formed on the inside to help increase the strength of

the curved section.

[0033] The locking release parts 140 extend respectively from the top end of the locking contact parts 130; the gap increases toward the end, and the locking release tool 4 is inserted therebetween, and on the facing sides, a sloped guide surface 141 is formed that is sloped in a curved shape so as to guide the secure insertion of the locking release tool 4. The end of the locking release tool 4 can have a circular cross-section. The guide surfaces 141 of the locking release parts 140, when viewed from above, form a curved surface that receives and also contacts on both left and right the end of the locking release tool 4, so that a sufficient contact area is established between the locking release tool 4 and the guide surfaces 141. Due to the curved structure of these sloped guide surfaces 141, the locking release tool 4 is inserted securely between the sloped guide surfaces 141, while pressing the sloped guide surfaces 141 so as to spread them out to either side. As the sloped guide surfaces 141 are spread open, the locking contact parts 130 also spread open at the same time, so that the wire 3 is released from the locked state. The sloped guide surfaces 141 and the boundary area with the part located therebelow form a curved surface, so that after the locking release tool 4 has been guided along the sloped guide surface 141, it descends evenly to the area therebelow, so as to readily spread open the locking contact parts 130.

[0034] At either side of the front end of the soldering part 110, respective wedge coupling parts 160 having a wedge shape extend so as to firmly couple with, and guide the coupling with, the front part of the housing 200. By interference-fitting into the respective wedge coupling part fastening grooves 230 formed on the inner side of the housing 200, the wedge coupling parts 160 firmly couple the front part of the housing 200 to the terminal 100.

[0035] On the respective back ends of the perpendicular extending parts 121 that are part of the covering part 120, bottom surface guide parts 170 are formed extending upward, which guide the coupling with the bottom surface part of the housing 200; on the back end of the bottom surface guide parts 170, rear coupling projections 180 are formed protruding backward, which lock onto the bottom surface part of the housing 200 by catching on the rear tab 250 formed on the inner side of the housing 200. On the sides of the perpendicular extension part 121, respective side catch projections 190 are formed protruding outward, and a side tab 240 is formed on the inside of the housing 200 and catches thereon so as to lock them onto the side part of the housing 200. These side catch projections 190 are formed by cutting and bending outward a portion of the perpendicular extension part 121.

[0036] When the locking release tool 4 is inserted perpendicularly via the tool insertion hole 220 of the housing 200 in order to separate the wire 3 from the poke-in connector 1, the end of the locking release tool 4 is inserted between the guide surfaces 141 of the two locking release parts 140, spreading the two locking release parts 140 to either side. As the locking release parts 140 are spread to either side, the wire 3 is automatically released from its locked state due to the spreading of the locking contact parts 130 at the same time; the wire 3 can then be removed from the poke-in connector 1 by pulling on the wire 3.

[0037] FIGs. 9-12 illustrate another embodiment of a poke-in connector with improved wire separation performance and include a terminal 300 and a housing 400 that has a locking release lever 410 that acts as the locking release tool.

[0038] The terminal 300 includes a soldering part 310, covering parts 320, locking contact parts 330, and locking release parts 340. The locking release parts 340 extend respectively upward from the top end of the locking contact parts 330 so that when the locking release lever 410 is pressed, part of the locking release lever 410 is inserted therebetween and causes them to spread outward. It should be noted that locking release parts 340 could also be formed similar to the locking release parts 140 but as depicted they are formed in a shape that is bent roundedly toward one another. The locking release parts 340 are formed in a location that is spaced apart from the end of the locking contact parts 330.

[0039] The housing 400 is covers and securely retains the terminal 300. As depicted, the locking release lever 410 on the top surface is formed as a single unit. On the top surface of the housing 400 a lever moving hole 420 is formed so that the locking release lever 410 can be moved up and down.

[0040] The locking release lever 410 includes a flexible extension part 411 extending upward from the top surface of the housing 400 and has a bending structure configured to provide sufficient elasticity. A compression part 412 extends from the end of the flexible extension part 411 and is formed with a narrower left-right width than the right width of the end of the flexible extension part 411. The compression part 412 can be inserted between the locking release parts 340 when pressed and acts to spread the locking release parts 340 to either side. A stopper part 413 extends from the end of the compression part 412 and is formed to have a greater left-right width than the compression part 412 so that, when pressed, it catches on the locking contact part 330 of the terminal 300 so as to limit translation.

[0041] Due to the left-right width difference, the end of the flexible extension part 411,

compression part 412, and stopper part 413, when viewed from above, form an H-shape with a groove on either side of the compression part 412. When the compression part 412 is pressed between the locking release parts 340 the locking release parts 340 extend up into the groove and, relatively speaking, slides along the side of the compression part 412. When the stopper part 413 presses on the top edge of the locking contact parts 330 the bottom of the stopper part 413 is configured so as to be located below the top end of the locking release parts 340. This allows for a reduction in the size of the assembled article, including the housing 400.

[0042] The locking release parts 340, which are part of the terminal 300, are formed with a rounded front surface and a gap is formed between the two locking release parts 340. Due to the fact that the two locking release parts 340 have rounded front surfaces, when the locking release lever 410 is pressed the compression part 412 may be readily inserted between the locking release parts 340.

[0043] The stopper part 413 limits translation of the compression part 412 by catching on the back side of the locking release part 340 at the top of the locking contact part 330. If the locking release lever 410 is pressed until the stopper part 413 catches on the top of the locking contact parts 330 then the locking release parts 340 are spread open by the compression part 412 and the wire 3 will cease to be retained by the terminal 300.

[0044] The disclosure provided herein describes features in terms of preferred and exemplary embodiments thereof. Numerous other embodiments, modifications and variations within the scope and spirit of the appended claims will occur to persons of ordinary skill in the art from a review of this disclosure.

CLAIMS

What is claimed is:

1. A poke-in connector, comprising:

a housing with a first surface and a top surface, the first surface including a wire insertion hole and the top surface including a tool insertion hole; and

a terminal with a positioned in the housing, the terminal including a soldering part, a covering part, a locking contact part, and a locking release part, wherein the connector is configured to receive an inserted wire in a first direction and the covering part extends upward from the soldering part so as to, in operation, cover the inserted wire; the locking contact parts extending upward in the first direction on either side of said covering part and configured to narrow toward the end, wherein the locking release parts have a guide surface sloped in a curved shape extending upward from both locking contact parts so that the guide surfaces are formed in a curved shape that covers the locking release tool on the left and right sides when viewed from above.

2. The poke-in connector of claim 1, wherein the surface of the boundary area between the guide surface and the portion located therebelow is formed as a curved surface, so that after the locking release tool has been guided along the guide surface, it can be made to descend smoothly toward the lower portion and readily spread open the locking contact parts.

3. The poke-in connector of claim 1, wherein the terminal further includes a wedge coupling part formed in a wedge shape, extending upward from either side of a front end of the soldering part and configured to securely couple the terminal with a front part of the housing, and the terminal further includes a bottom guide part that extends upward from a back end of the covering part so as to guide the coupling with the bottom part of the housing, and the terminal further includes a rear blocking part that is formed protruding backward on the back end of the bottom guide part so as to lock the bottom part of the housing and the terminal further includes a side blocking part that is formed protruding in a sideways direction on the side of the covering part so as to lock the side part of the housing.

4. A poke-in connector, comprising:

a housing with a first surface and a top surface, the first surface including a wire insertion hole and the top surface includes a locking release tool formed as a single unit with the housing; and

a terminal with a positioned in the housing, the terminal including a soldering part, a covering part, a locking contact part, and a locking release part, wherein the connector is configured to receive an inserted wire in a first direction and the covering part extends upward from the soldering part so as to, in operation, cover the inserted wire; the locking contact parts extending upward in the first direction on either side of said covering part and configured to narrow toward the end, wherein the locking release parts have a guide surface sloped in a curved shape extending upward from both locking contact parts so that the guide surfaces are formed in a curved shape that receives the locking release tool on the left and right sides when viewed from above.

5. The poke-in connector of claim 4, wherein the locking release lever comprises a flexible extension part, a compression part and a stopper part, the flexible extension part having a bending structure for elasticity and extending toward the top surface of the housing, the compression part extending from the end of the flexible extending part, and being formed with a narrower left-right width than the left-right width of the end of the flexible extension part and the stopper part extends from the end of the compression part and has a left-right width greater than that of the compression part, so that when pressed, additional translation of the locking release lever is prevented by catching on the top end of the locking contact parts of the terminal.

6. The poke-in connector of claim 5, wherein due to the left-right width difference, the end of the flexible compression part, the compression part, and the stopper part, viewed from above, are formed in an H shape with a groove on either side of the compression part.

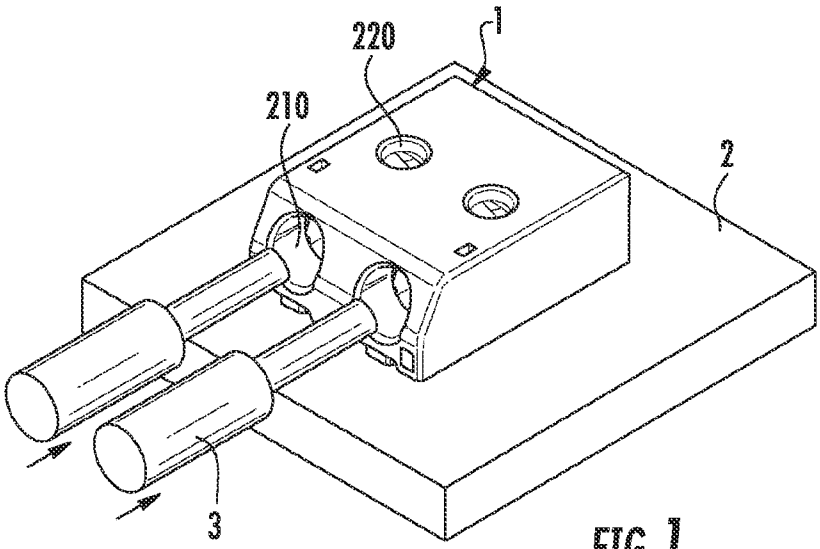


FIG. 1

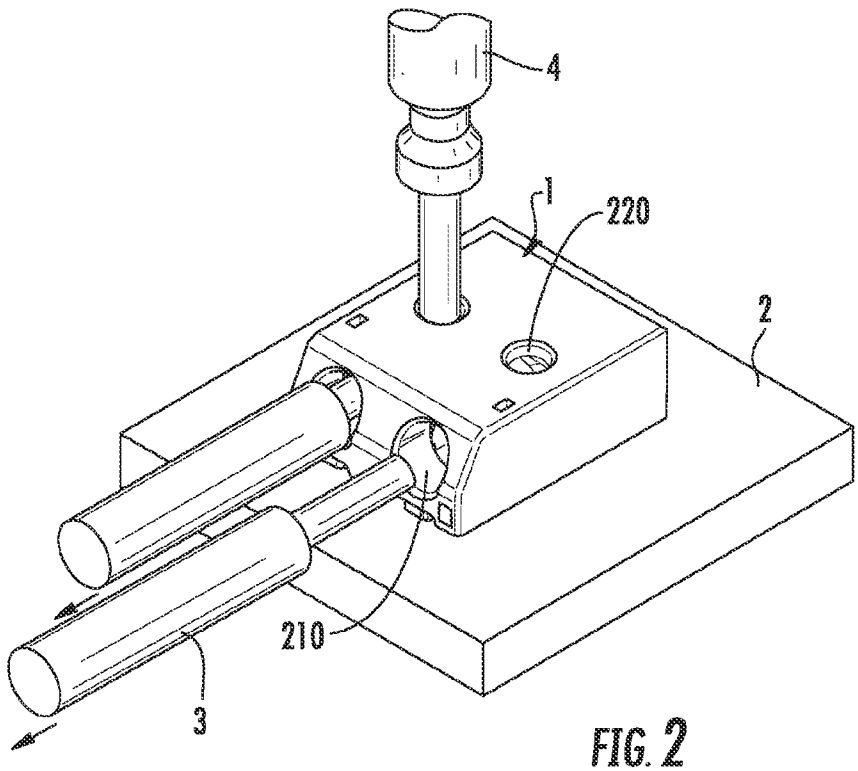


FIG. 2

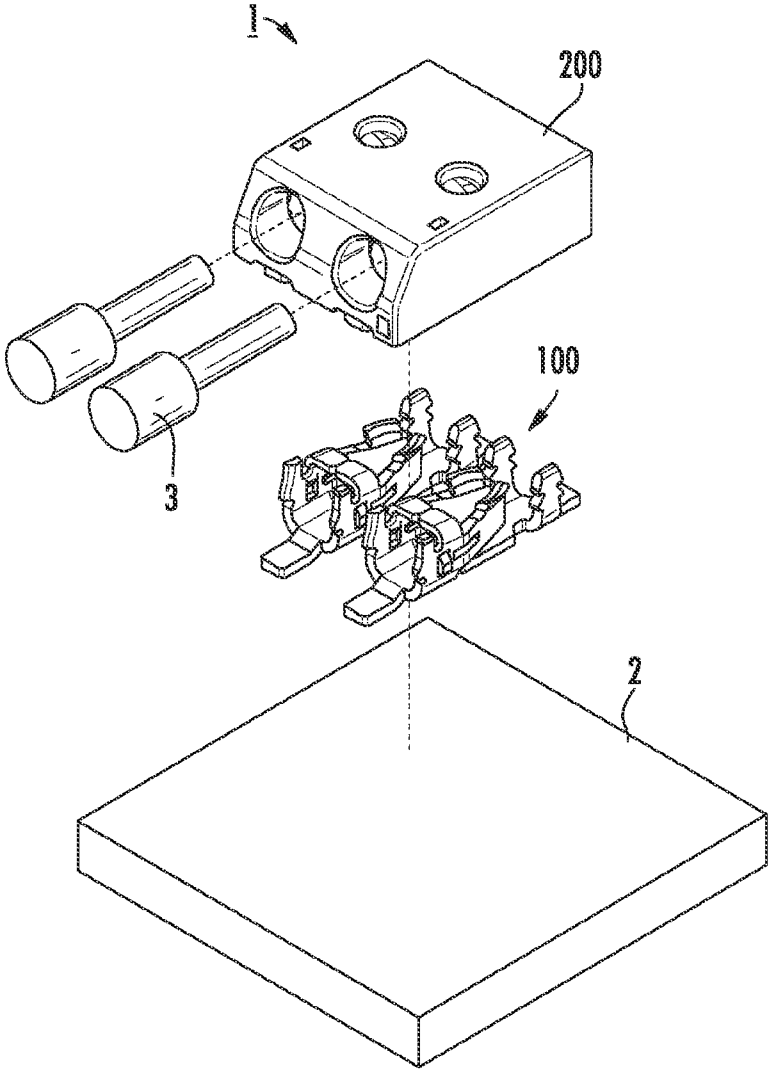


FIG. 3

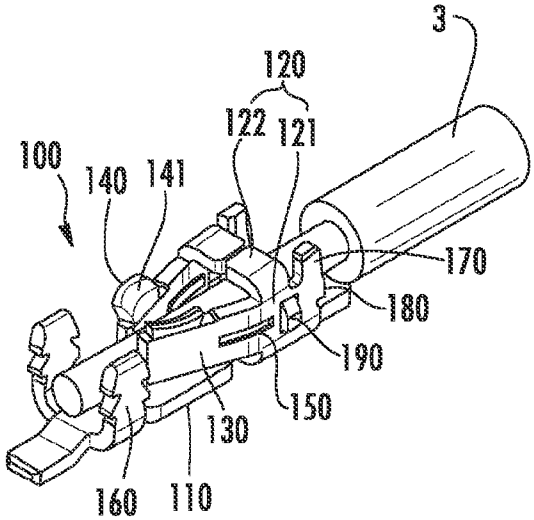


FIG. 4

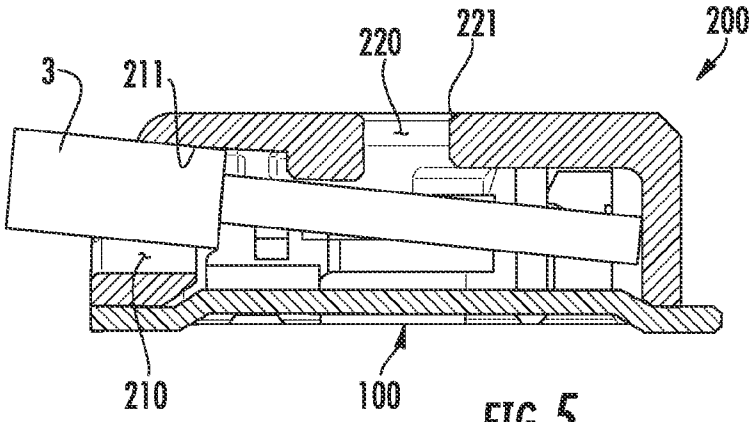


FIG. 5

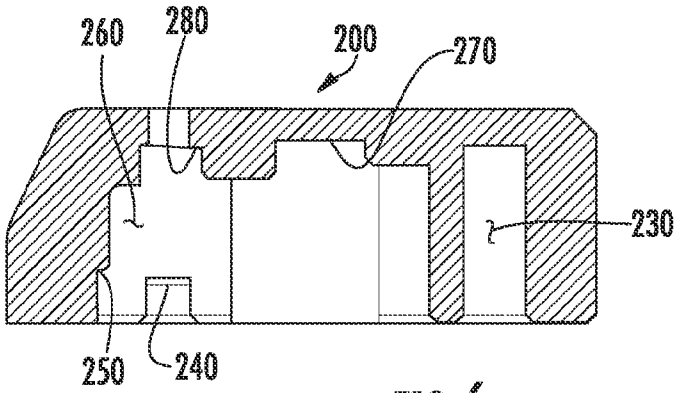


FIG. 6

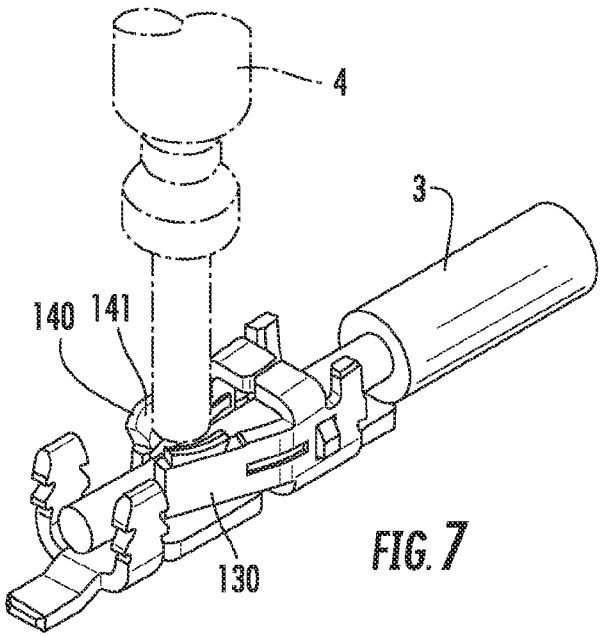


FIG. 7

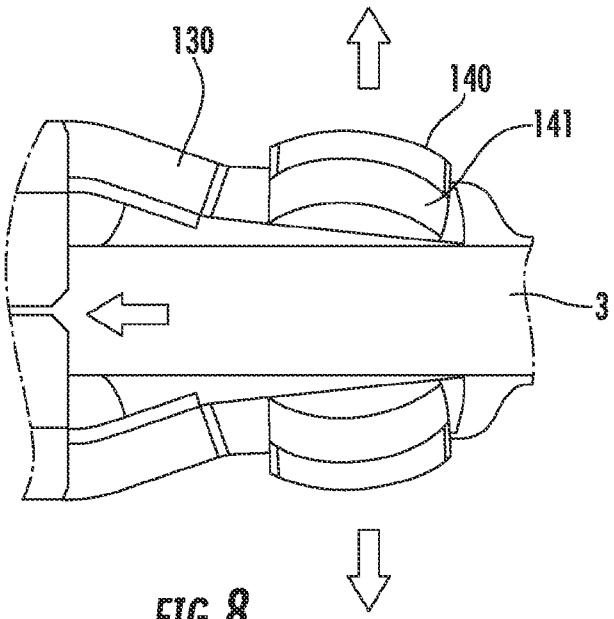


FIG. 8

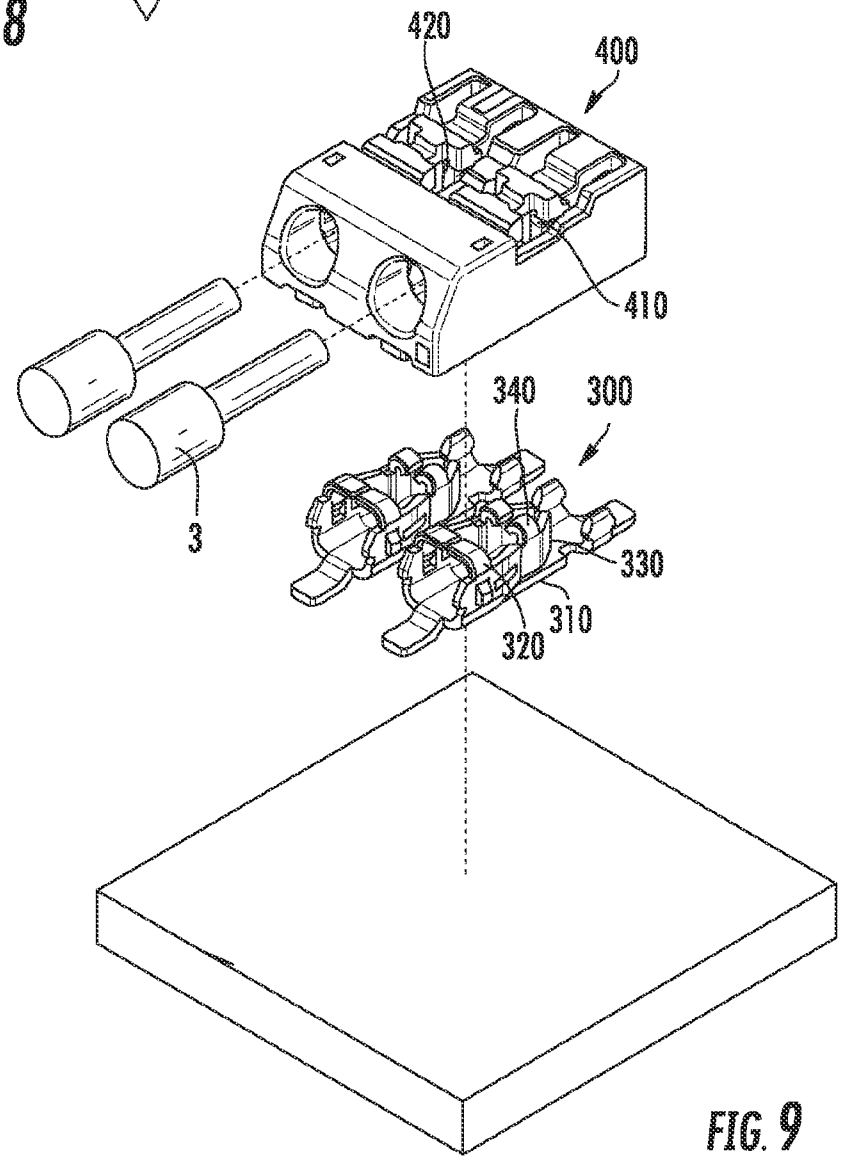


FIG. 9

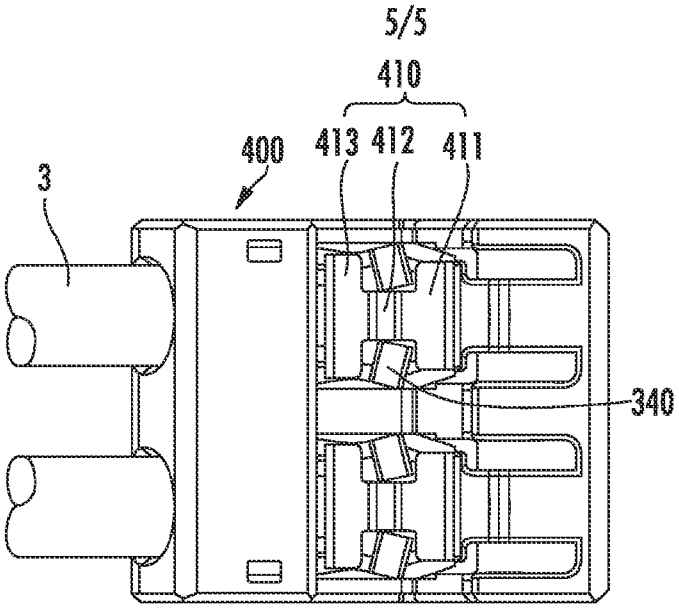


FIG. 10

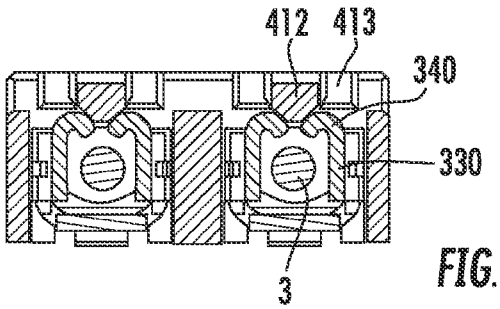


FIG. 11

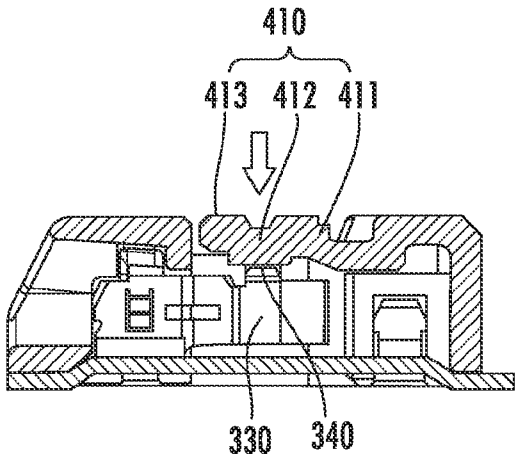


FIG. 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2015/048579

A. CLASSIFICATION OF SUBJECT MATTER

H01R 4/48(2006.01)i, H01R 12/57(2011.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H01R 4/48; H01R 9/03; H01R 13/50; H01R 13/62; H01R 12/72; H01R 43/18; H01R 12/57

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: poke-in connector, locking release part, sloped guide surface, locking release lever

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2011-0250775 A1 (HENRYK BIES et al.) 13 October 2011 See abstract, paragraphs [0023]-[0026], [0031]-[0032], claim 1 and figures 1-3, 6a.	1-2
Y		3-6
Y	KR 10-1390960 B1 (MOLEX, LLC.) 02 May 2014 See abstract, paragraphs [0032]-[0053] and figures 2-10.	3-6
A	US 2014-0242833 A1 (TYCO ELECTRONICS CORPORATION) 28 August 2014 See abstract, paragraphs [0021]-[0026], [0030]-[0034], [0049]-[0051], [0063] and figures 2-3, 6, 10-11.	1-6
A	US 6244904 B1 (DAVID JAMES FABIAN et al.) 12 June 2001 See abstract, column 4, line 43 - column 5, line 22 and figures 6, 9-11.	1-6
A	EP 1182750 A2 (ADELS-CONTACT ELEKTROTECHNISCHE FABRIK GMBH & CO. KG.) 27 February 2002 See abstract, claims 1-13 and figure 2.	1-6

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
09 December 2015 (09.12.2015)	**10 December 2015 (10.12.2015)**

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Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/US2015/048579

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