



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
24.03.2021 Bulletin 2021/12

(21) Application number: **20195226.4**

(22) Date of filing: **09.09.2020**

(51) Int Cl.:
H01R 13/627 (2006.01) **H01R 13/74** (2006.01)
H01R 13/631 (2006.01) **H01R 13/64** (2006.01)
H01R 13/436 (2006.01) **H01R 13/52** (2006.01)
H01R 31/06 (2006.01) **H01R 13/506** (2006.01)
H01R 24/20 (2011.01) **H01R 107/00** (2006.01)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

- **WANG, Haibin**
Beijing, Beijing (CN)
- **JIN, Haitao**
Beijing, Beijing (CN)
- **ZHOU, Dongsheng**
Beijing, Beijing (CN)
- **WANG, Mengqi**
Beijing, Beijing (CN)

(30) Priority: **20.09.2019 CN 201921578452 U**

(71) Applicant: **Jing-Jin Electric Technologies Co., Ltd.**
Beijing (CN)

(74) Representative: **AOMB Polska Sp. z o.o.**
Ul. Emilii Plater 53
21st Floor
00-113 Warsaw (PL)

(72) Inventors:
• **XU, Bo**
Beijing, Beijing (CN)

(54) **LOW-VOLTAGE CONNECTOR**

(57) The present disclosure discloses a low-voltage connector, which solves the technical problem in the prior art that low-voltage connectors may be easily disconnected due to vibration. The low-voltage connector includes an adaptor (1) and a connector main body (2), the adaptor (1) is provided with a first connector head (1-1) and a second connector head (1-8) respectively at a front end and a rear end, the connector main body (2) is plug-connected to the second connector head (1-8), and a rear end of the connector main body (2) is connected to one or more signal lines; the second connector head (1-8) is provided with first clipping slots (1-9) on a left side and a right side, and the connector main body (2) is provided with elastic arms (2-5) on a left side and a right side that are snap-fitted to the first clipping slots (1-9), to prevent the connector main body (2) from disengaging from the second connector head (1-8); and the second connector head (1-8) is provided with second clipping slots (1-10) on an upper side and a lower side, and the connector main body (2) is provided with longitudinal convex strips (2-3) on an upper side and a lower side that are snap-fitted to the second clipping slots (1-10), to prevent the connector main body (2) from shaking in a left-and-right direction in the second connector head (1-8).

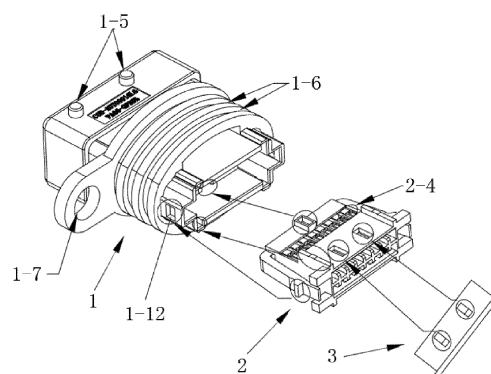


FIG.1

Description

TECHNICAL FIELD

[0001] The present disclosure relates to an electric-circuit connector, and particularly relates to a low-voltage connector.

BACKGROUND

[0002] Low-voltage connectors are frequently utilized in vehicles; for example, the signal line for connecting an electric-motor controller to a vehicle computer is required to use a low-voltage connector. Because of the vibration generated during the travelling of vehicles, the connector heads tend to separate at the position of low-voltage connectors, resulting in that the signal line would be disconnected, and thus the vehicle computer would lose control on the electric motor, which would cause a serious potential safety hazard.

SUMMARY

[0003] Aiming at the above problem in the prior art, the present disclosure provides a low-voltage connector, which, by providing snap-fitting structures having different functions, realizes a good anti-vibration capacity and a reliable connection structure.

[0004] To achieve the above objective, the technical solutions of the present disclosure are realized as follows:

The present disclosure provides a low-voltage connector, wherein the low-voltage connector comprises an adaptor and a connector main body, the adaptor is provided with a first connector head and a second connector head respectively at a front end and a rear end, the connector main body is plug-connected to the second connector head, and a rear end of the connector main body is connected to one or more signal lines;

the second connector head is provided with first clipping slots on a left side and a right side, and the connector main body is provided with elastic arms on a left side and a right side that are snap-fitted to the first clipping slots, to prevent the connector main body from disengaging from the second connector head; and

the second connector head is provided with second clipping slots on an upper side and a lower side, and the connector main body is provided with longitudinal convex strips on an upper side and a lower side that are snap-fitted to the second clipping slots, to prevent the connector main body from shaking in a left-and-right direction in the second connector head.

[0005] Optionally, the second connector head is provided with one slot on an inner wall on one side in a length

direction, the connector main body is correspondingly provided with one projection on an outer wall in a length direction, the projection and the slot form a fool proofing structure, and after the projection and the slot are matched the connector main body is capable of being plug-connected to the second connector head.

[0006] Optionally, the adaptor is provided with an engaging lug that protrudes outwardly on a left side or a right side, the engaging lug is provided with a connecting hole, and the adaptor is fixed to a housing of another component via the engaging lug.

[0007] Optionally, the first connector head is provided with a plurality of matching poles on an outer wall in a length direction; and steps are provided inside the first connector head to gradually reduce internal dimensions.

[0008] Optionally, several circumferential positioning grooves are provided on a periphery of the second connector head, and sealing rings are provided in the positioning grooves.

[0009] Optionally, the elastic arms are provided with clipping blocks that protrude laterally, the second connector head is correspondingly provided with clipping holes on sidewalls in a width direction, and after the connector main body has been plug-connected to the second connector head, the clipping blocks are snap-fitted to the clipping holes.

[0010] Optionally, the connector main body is provided with stopping parts at the rear end for limiting an insertion depth of the connector main body into the second connector head, and the stopping parts are provided with clearances for the elastic arms.

[0011] Optionally, a partition plate is provided between the first connector head and the second connector head, the partition plate is provided with a pin array that extend in a front-and-rear direction, a plurality of plug holes are provided inside the connector main body, and after the connector main body has been plug-connected to the second connector head, front ends of the plug holes are connected to the pin array, and rear ends of the plug holes are connected to terminals of the signal lines, to realize electrical connection inside the plug holes between the pin array and the signal lines.

[0012] Optionally, the connector main body is provided with pressing blocks on an outer wall in a length direction that correspond to the plug holes, and the pressing blocks press the terminals of the signal lines inside the plug holes.

[0013] Optionally, the low-voltage connector further comprises a depressor, and the depressor is inserted into the rear end of the connector main body, to depress and lock the signal lines into rear ends of the plug holes.

[0014] Optionally, the depressor comprises a sheet body, the sheet body is provided with a clipping block on one side, the connector main body is correspondingly provided with a clipping hole on an outer wall in the length direction, and when the depressor is inserted into the rear end of the connector main body, and the clipping block is snap-fitted to the clipping hole on the connector

main body.

[0015] Optionally, the sheet body is provided with a stopping part at a rear end for limiting an insertion depth of the depressor into the connector main body.

[0016] The low-voltage connector, by employing the above technical solutions, has the following advantages: The low-voltage connector according to the present disclosure, by providing the snap-fitting structures having the different functions, has a good anti-vibration capacity and a reliable structure, and significantly improves the functions of preventing the low-voltage connector from falling due to vibration and preventing disconnection of the signal lines.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

Fig. 1 is an exploded view of the low-voltage connector according to an embodiment of the present disclosure;

Fig. 2 is a perspective view of the adaptor according to an embodiment of the present disclosure;

Fig. 3 is a perspective view of the adaptor according to an embodiment of the present disclosure;

Fig. 4 is a front view of the adaptor according to an embodiment of the present disclosure;

Fig. 5 is a rear view of the adaptor according to an embodiment of the present disclosure;

Fig. 6 is a perspective view of the connector main body according to an embodiment of the present disclosure; and

Fig. 7 is a perspective view of the depressor according to an embodiment of the present disclosure.

[0018] In the drawings: 1. adaptor; 1-1. first connector head; 1-2. steps; 1-3. partition plate; 1-4. pin array; 1-5. matching poles; 1-6. positioning grooves; 1-7. engaging lug; 1-8. second connector head; 1-9. first clipping slots; 1-10. second clipping slots; 1-11. slot; 1-12. clipping hole; 2. connector main body; 2-1. connecting seat; 2-2. clipping holes; 2-3. longitudinal convex strips; 2-4. pressing blocks; 2-5. elastic arms; 2-6. clipping blocks; 2-7. plug holes; 2-8. projection; 2-9. stopping parts; 3. depressor; 3-1. sheet body; 3-2. clipping blocks; and 3-3. stopping part.

DETAILED DESCRIPTION

[0019] In order to make the objects, the technical solutions and the advantages of the present disclosure clearer, the embodiments of the present disclosure will be described below in further detail in conjunction with the drawings.

The first embodiment

[0020] Figs. 1, 2, 3 and 6 show the first embodiment

of the present disclosure. In the present embodiment, a low-voltage connector comprises an adaptor 1 and a connector main body 2, the adaptor 1 is provided with a first connector head 1-1 and a second connector head 1-8 respectively at the front end and the rear end, the connector main body 2 is plug-connected to the second connector head 1-8, and the rear end of the connector main body 2 is connected to one or more signal lines. The signal lines may be connected to an electric-motor controller.

[0021] The first connector head 1-1 may be a female connector head, which is connected to a male connector head, and the male connector head is in turn connected to a vehicle computer via the signal lines.

[0022] As shown in Figs. 3 and 5, the second connector head 1-8 is provided with first clipping slots 1-9 on the left side and the right side, and the connector main body 2 is provided with elastic arms 2-5 on the left side and the right side that are snap-fitted to the first clipping slots 1-9, to prevent the connector main body 2 from disengaging from the second connector head 1-8.

[0023] The second connector head 1-8 is provided with second clipping slots 1-10 on the upper side and the lower side, and the connector main body 2 is provided with longitudinal convex strips 2-3 on the upper side and the lower side that are snap-fitted to the second clipping slots 1-10, to prevent the connector main body 2 from shaking in the left-and-right direction in the second connector head 1-8.

[0024] Four second clipping slots 1-10 are provided, and correspondingly four longitudinal convex strips 2-3 are provided.

[0025] By providing the above snap-fitting structures having different functions, the connector main body 2, when it is in the second connector head 1-8, does not easily disengage, and does not easily loosen, which obviously enhances the anti-vibration capacity.

[0026] In order to realize blind insertion, and prevent erroneous connection between the connector main body 2 and the adaptor 1, the second connector head 1-8 is provided with one slot 1-11 on the inner wall on one side in the length direction, and the connector main body 2 is correspondingly provided with one projection 2-8 on the outer wall in the length direction. The projection 2-8 and the slot 1-11 form a fool proofing structure, and after the projection 2-8 and the slot 1-11 have been matched the connector main body 2 is capable of being plug-connected to the second connector head 1-8.

[0027] If the orientation of the connector main body 2 is reversed, the connector main body 2 cannot be inserted into the second connector head 1-8, which prevents the possibility of wiring errors.

[0028] In order to realize the fixing of the adaptor 1, the adaptor 1 is provided with an engaging lug 1-7 that protrudes outwardly on the left side or the right side, the engaging lug 1-7 is provided with a connecting hole, and the adaptor 1 is fixed to the housing of another component via the engaging lug 1-7. For example, it may be

fixed to the housing of an electric-motor controller, or fixed to the housing of a vehicle computer. Such fixing of the adaptor 1 further improves the stability of the circuit. The one-sided providing of the engaging lug 1-7 is also in order to prevent the reverse connection between the first connector head 1-1 and another connector head (for example, the male connector head), and is also a fool proofing structure.

[0029] As shown in Figs. 1 and 4, the first connector head 1-1 is provided with a plurality of matching poles 1-5 on the outer wall in the length direction. The matching poles 1-5 are for realizing matching when being plug-connected to another connector head (for example, the male connector head), and may further prevent loosening and disengaging. Preferably, the first connector head 1-1 is provided with four matching poles 1-5 on the outer wall.

[0030] The four matching poles 1-5 are not centering on the outer wall of the first connector head 1-1, but are proximal to the side where the engaging lug 1-7 is located. Such a structure can prevent reverse connection between the first connector head 1-1 and another connector head (for example, the male connector head), and is also a fool proofing structure.

[0031] As shown in Figs. 2 and 4, steps 1-2 are provided inside the first connector head 1-1 to gradually reduce internal dimensions. The steps 1-2 can realize guiding for plug connection, to facilitate the plug connection between the first connector head 1-1 and another connector head (for example, the male connector head).

[0032] As shown in Figs. 1 and 3, a plurality of circumferential positioning grooves 1-6 are provided on a periphery of the second connector head 1-8, and sealing rings are provided in the positioning grooves 1-6. The sealing rings can serve to seal and resist moisture. When the housing of an electric-motor controller is provided with a wiring hole, the second connector head 1-8 may block the wiring hole, in which case the sealing rings serve to seal the gap between the second connector head 1-8 and the wiring hole.

[0033] As shown in Figs. 1 and 6, the elastic arms 2-5 of the connector main body 2 are provided with clipping blocks 2-6 that protrude laterally, the second connector head 1-8 is correspondingly provided with clipping holes 1-12 on the sidewalls in the width direction, and after the connector main body 2 has been plug-connected to the second connector head 1-8, the clipping blocks 2-6 are snap-fitted to the clipping holes 1-12. Such a snap-fitting structure can further prevent the connector main body 2 from disengaging from the second connector head 1-8.

[0034] The connector main body 2 is provided with stopping parts 2-9 at the rear end for limiting the insertion depth of the connector main body 2 into the second connector head 1-8, and the stopping parts 2-9 are provided with clearances for the elastic arms 2-5.

[0035] As shown in Figs. 2 and 6, a partition plate 1-3 is provided between the first connector head 1-1 and the second connector head 1-8, the partition plate 1-3 is provided with a pin array 1-4 that extend in a front-and-rear

direction, a plurality of plug holes 2-7 are provided inside the connector main body 2, and after the connector main body 2 has been plug-connected to the second connector head 1-8, the front ends of the plug holes 2-7 are connected to the pin array 1-4, and the rear ends of the plug holes 2-7 are connected to the terminals of the signal lines, to realize the electrical connection inside the plug holes 2-7 between the pin array 1-4 and the signal lines.

[0036] The connector main body 2 has totally two lines of the plug holes 2-7, which are arranged vertically, and can be used for the access of a plurality of leads.

[0037] In order to fix the terminals of the signal lines in the plug holes 2-7, as shown in Figs. 1 and 6, the connector main body 2 is provided with pressing blocks 2-4 on the outer wall in the length direction that correspond to the plug holes 2-7, and the pressing blocks 2-4 press the terminals of the signal lines inside the plug holes 2-7.

[0038] The low-voltage connector according to the present embodiment, by providing the snap-fitting structures having the different functions, has a good anti-vibration capacity and a reliable structure, and significantly improves the functions of preventing the low-voltage connector from falling due to vibration and preventing disconnection of the signal lines.

The second embodiment

[0039] The present embodiment differs from the first embodiment in that, as shown in Figs. 1 and 7, the low-voltage connector further comprises a depressor 3, and the depressor 3 is inserted into the rear end of the connector main body 2, to depress and lock the signal lines into the rear ends of the plug holes 2-7.

[0040] The depressor 3 comprises a sheet body 3-1, the sheet body is provided with clipping blocks 3-2 on one side, the connector main body 2 is correspondingly provided with clipping holes 2-2 on the outer wall in the length direction, and when the depressor 3 is inserted into the rear end of the connector main body 2, the clipping blocks 3-2 are snap-fitted to the clipping holes 2-2 on the connector main body 2.

[0041] The sheet body 3-1 is provided with a stopping part 3-3 at the rear end for limiting the insertion depth of the depressor 3 into the connector main body 2.

[0042] The depressor 3 can further prevent the terminals of the signal lines from disengaging from the connector main body 2.

[0043] The other structures of the low-voltage connector of the present embodiment are the same as those of the first embodiment, and are not described repeatedly here.

[0044] The above descriptions are merely preferable embodiments of the present disclosure, and are not limiting the protection scope of the present disclosure. Any modifications, equivalent substitutions and improvements that are made within the spirit and principle of the present disclosure should fall within the protection scope of the present disclosure.

Claims

1. A low-voltage connector, **characterized in that:** the low-voltage connector comprises an adaptor (1) and a connector main body (2), the adaptor (1) is provided with a first connector head (1-1) and a second connector head (1-8) respectively at a front end and a rear end, the connector main body (2) is plug-connected to the second connector head (1-8), and a rear end of the connector main body (2) is connected to one or more signal lines;
the second connector head (1-8) is provided with first clipping slots (1-9) on a left side and a right side, and the connector main body (2) is provided with elastic arms (2-5) on a left side and a right side that are snap-fitted to the first clipping slots (1-9), to prevent the connector main body (2) from disengaging from the second connector head (1-8); and
the second connector head (1-8) is provided with second clipping slots (1-10) on an upper side and a lower side, and the connector main body (2) is provided with longitudinal convex strips (2-3) on an upper side and a lower side that are snap-fitted to the second clipping slots (1-10), to prevent the connector main body (2) from shaking in a left-and-right direction in the second connector head (1-8).
2. The low-voltage connector according to claim 1, **characterized in that:** the second connector head (1-8) is provided with one slot on an inner wall on one side in a length direction, the connector main body (2) is correspondingly provided with one projection (2-8) on an outer wall in a length direction, the projection (2-8) and the slot form a fool proofing structure, and after the projection (2-8) and the slot have been matched the connector main body (2) is capable of being plug-connected to the second connector head (1-8).
3. The low-voltage connector according to claim 1, **characterized in that:** the adaptor (1) is provided with an engaging lug that protrudes outwardly on a left side or a right side, the engaging lug is provided with a connecting hole, and the adaptor (1) is fixed to a housing of another component via the engaging lug.
4. The low-voltage connector according to claim 1, **characterized in that:** the first connector head (1-1) is provided with a plurality of matching poles (1-5) on an outer wall in a length direction; and steps are provided inside the first connector head (1-1) to gradually reduce internal dimensions.
5. The low-voltage connector according to claim 1, **characterized in that:** a plurality of circumferential positioning grooves (1-6) are provided on a periphery of the second connector head (1-8), and sealing rings are provided in the positioning grooves (1-6).
6. The low-voltage connector according to claim 1, **characterized in that:** the elastic arms (2-5) are provided with clipping blocks (2-6) that protrude laterally, the second connector head (1-8) is correspondingly provided with clipping holes (1-12) on sidewalls in a width direction, and after the connector main body (2) has been plug-connected to the second connector head (1-8), the clipping blocks (2-6) are snap-fitted to the clipping holes (1-12); and the connector main body (2) is provided with stopping parts (2-9) at the rear end for limiting an insertion depth of the connector main body (2) into the second connector head (1-8), and the stopping parts (2-9) are provided with clearances for the elastic arms (2-5).
7. The low-voltage connector according to claim 1, **characterized in that:** a partition plate (1-3) is provided between the first connector head (1-1) and the second connector head (1-8), the partition plate (1-3) is provided with a pin array (1-4) that extend in a front-and-rear direction, a plurality of plug holes (2-7) are provided inside the connector main body (2), and after the connector main body (2) has been plug-connected to the second connector head (1-8), front ends of the plug holes (2-7) are connected to the pin array (1-4), and rear ends of the plug holes (2-7) are connected to terminals of the signal lines, to realize electrical connection inside the plug holes (2-7) between the pin array (1-4) and the signal lines.
8. The low-voltage connector according to claim 1, **characterized in that:** the connector main body (2) is provided with pressing blocks (2-4) on an outer wall in a length direction that correspond to the plug holes (2-7), and the pressing blocks (2-4) press the terminals of the signal lines inside the plug holes (2-7).
9. The low-voltage connector according to claim 8, **characterized in that:** the low-voltage connector further comprises a depressor (3), and the depressor (3) is inserted into the rear end of the connector main body (2), to depress and lock the signal lines into rear ends of the plug holes (2-7).
10. The low-voltage connector according to claim 9, **characterized in that:** the depressor (3) comprises a sheet body (3-1), the sheet body (3-1) is provided with a clipping block (2-6) on one side, the connector main body (2) is correspondingly provided with a clipping hole (2-2) on an outer wall in the length direction, and when the depressor (3) is inserted into the rear end of the connector main body (2), the clipping block is snap-fitted to the clipping hole (2-2) on the connector main body (2); and

the sheet body (3-1) is provided with a stopping part (2-9) at a rear end for limiting an insertion depth of the depressor (3) into the connector main body (2).

5

10

15

20

25

30

35

40

45

50

55

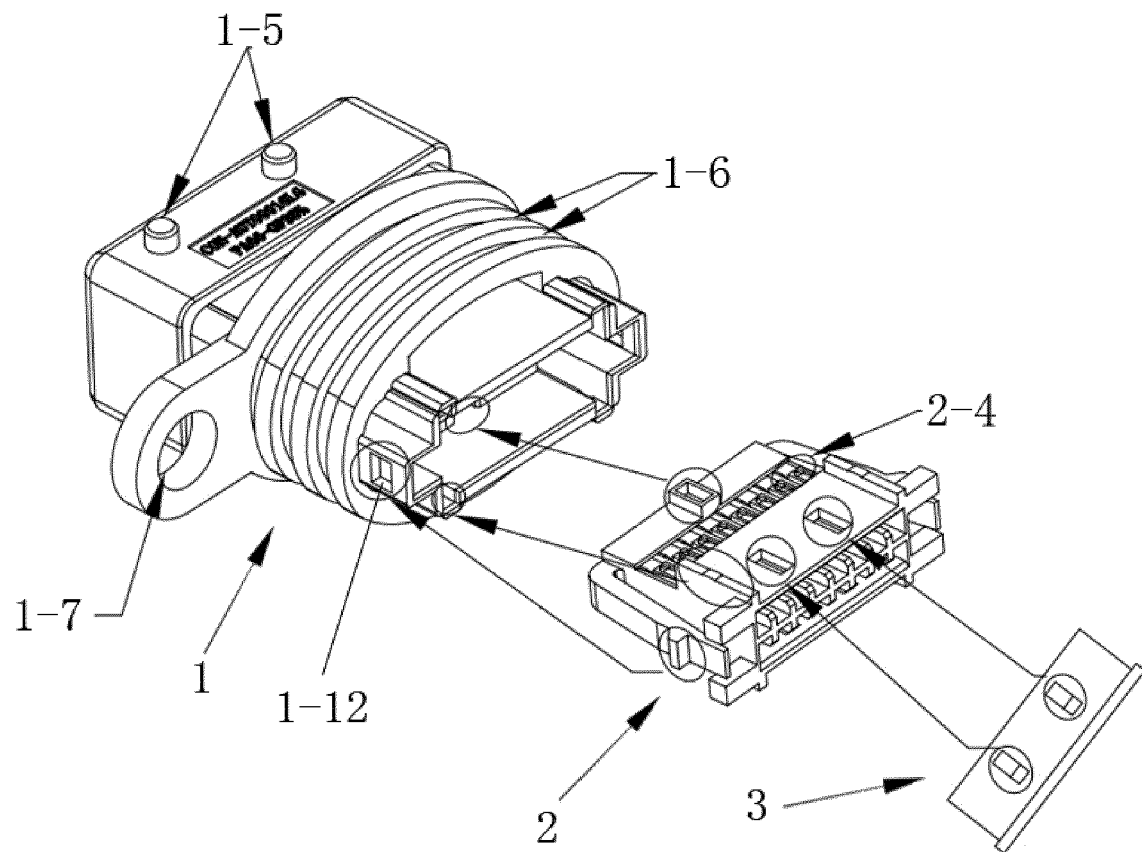


FIG.1

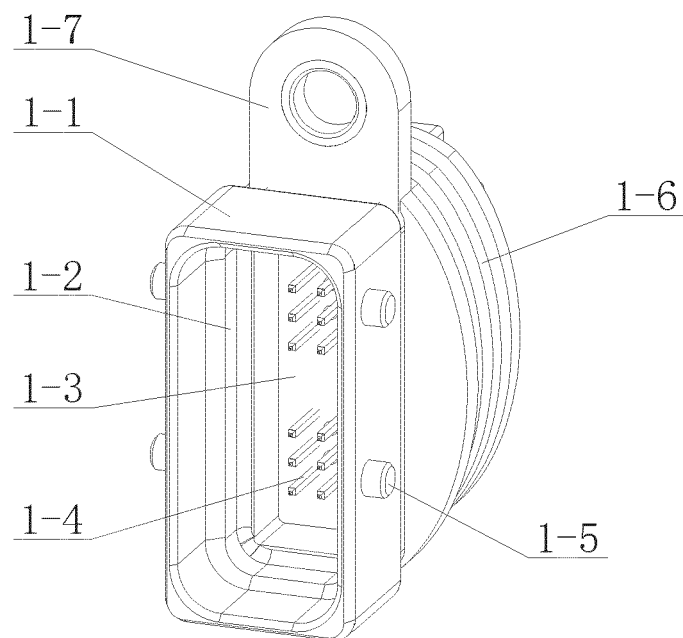


FIG.2

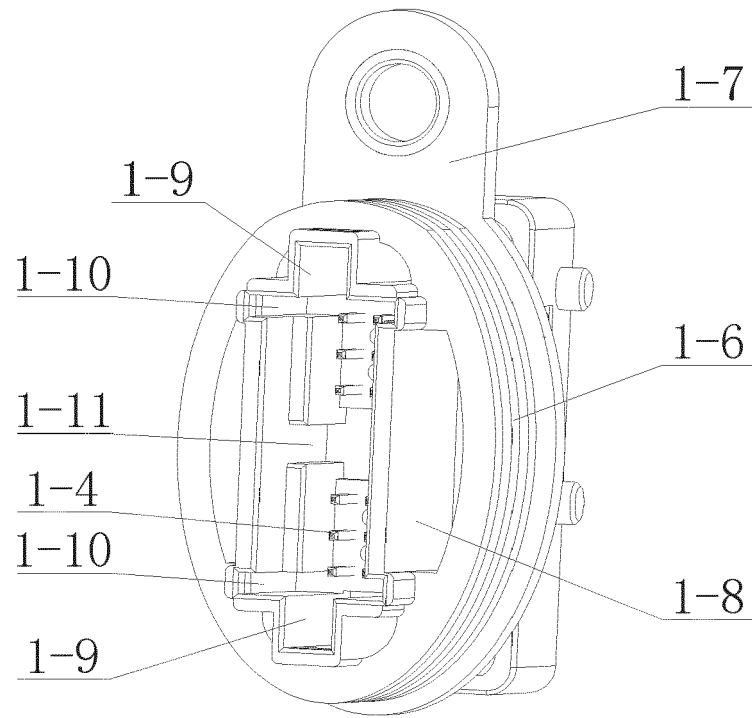


FIG.3

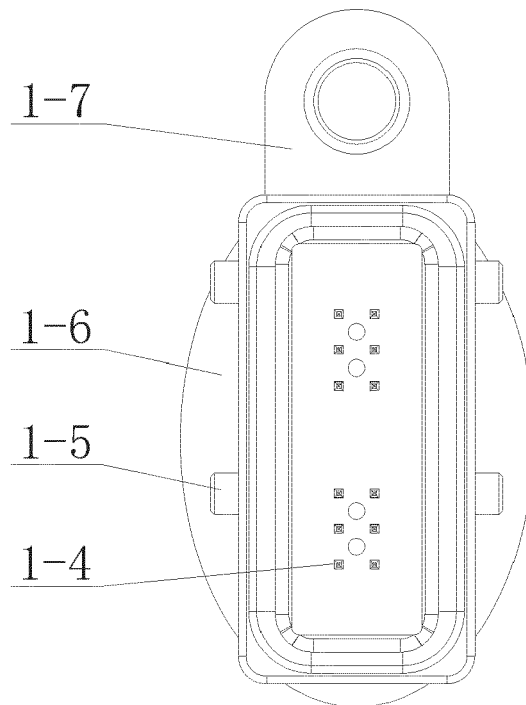


FIG.4

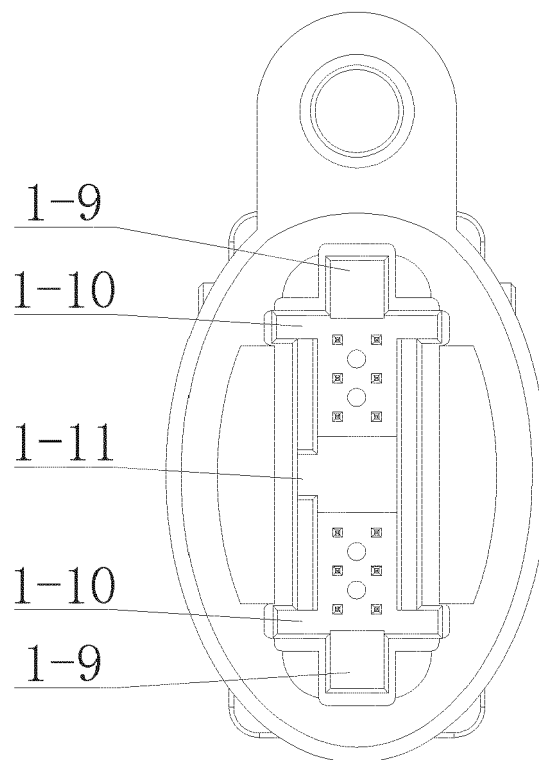


FIG.5

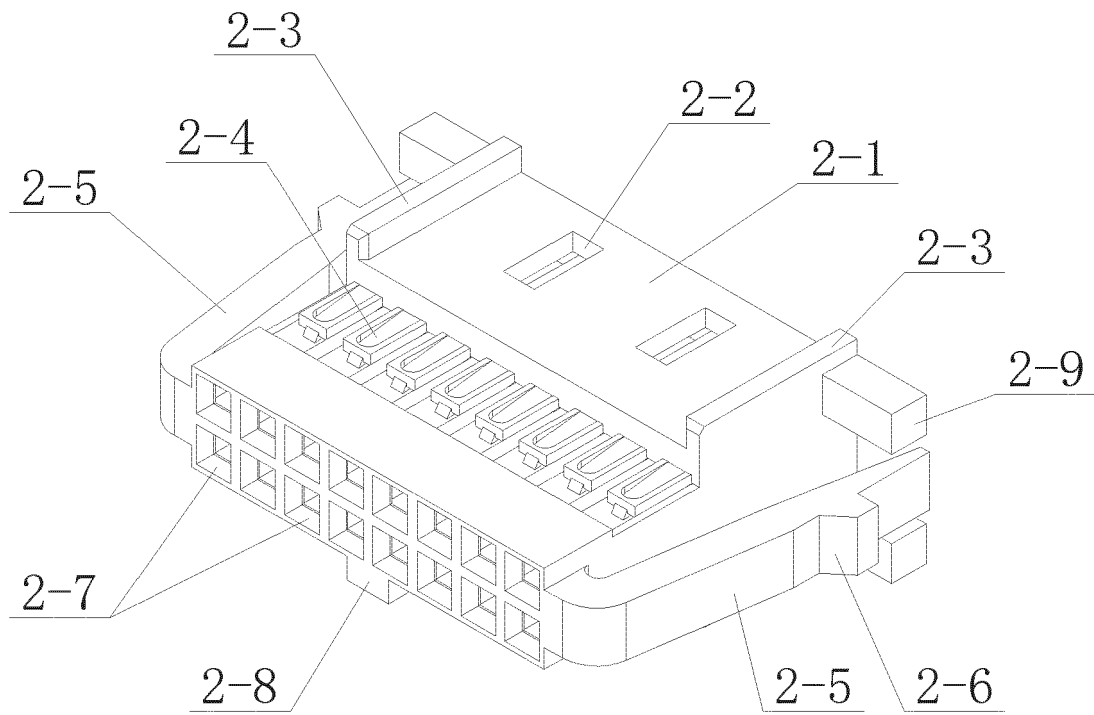


FIG.6

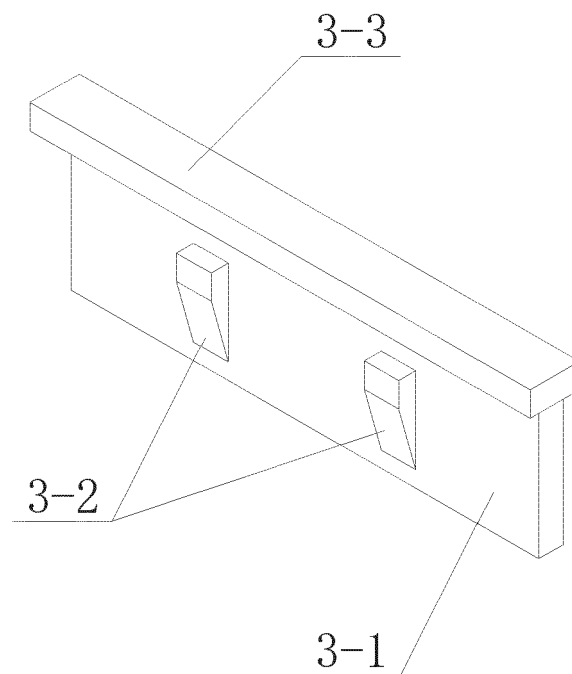


FIG.7



EUROPEAN SEARCH REPORT

 Application Number
 EP 20 19 5226

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	US 10 153 587 B1 (YUNG LI CO LTD [TW]) 11 December 2018 (2018-12-11) * figures 1-6 *	1-7	INV. H01R13/627
Y	JP 2008 166046 A (SUMITOMO WIRING SYSTEMS) 17 July 2008 (2008-07-17) * figures 4-5 *	1-7	ADD. H01R13/74 H01R13/631 H01R13/64 H01R13/436 H01R13/52 H01R31/06 H01R13/506 H01R24/20 H01R107/00
Y	US 2004/166744 A1 (INABA SHIGEMITSU [JP] ET AL) 26 August 2004 (2004-08-26) * figure 1 *	4	
Y	US 5 588 858 A (LESTER LESTER J [US] ET AL) 31 December 1996 (1996-12-31) * figure 3 *	5	
Y	JP S49 102290 U (JP APPLICANT) 3 September 1974 (1974-09-03) * figure 3 *	6	
Y	KR 200 467 383 Y1 (KR APPLICANT) 12 June 2013 (2013-06-12) * figure 7 *	7	TECHNICAL FIELDS SEARCHED (IPC)
A	DE 11 2013 003359 T5 (YAZAKI CORP [JP]) 19 March 2015 (2015-03-19) * figures 2-3 *	8	H01R
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 5 February 2021	Examiner Esmiol, Marc-Olivier
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

 1
 EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 20 19 5226

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

05-02-2021

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 10153587 B1	11-12-2018	CN 109004473 A	14-12-2018
		CN 206908040 U	19-01-2018
		TW 201904140 A	16-01-2019
		US 10153587 B1	11-12-2018

JP 2008166046 A	17-07-2008	JP 4748054 B2	17-08-2011
		JP 2008166046 A	17-07-2008

US 2004166744 A1	26-08-2004	JP 2004253163 A	09-09-2004
		US 2004166744 A1	26-08-2004

US 5588858 A	31-12-1996	NONE	

JP S49102290 U	03-09-1974	JP S5312458 Y2	04-04-1978
		JP S49102290 U	03-09-1974

KR 200467383 Y1	12-06-2013	NONE	

DE 112013003359 T5	19-03-2015	CN 104396096 A	04-03-2015
		DE 112013003359 T5	19-03-2015
		KR 20150027231 A	11-03-2015
		US 2015104981 A1	16-04-2015
		WO 2014007051 A1	09-01-2014
