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(54) **ASSEMBLY FOR A CONNECTOR, AND METHOD OF PRODUCING A CONNECTOR**

(57) The invention relates to assembly (20) for a connector (100), wherein at a contact face (51) of the connector (100) a pitch (83, 85) of contact elements (60) is greater than at an exit face (51) of the connector (100), wherein the assembly (20) comprises a housing part (30) forming the exit face (31), and a separate positioning part (50) forming the contact face (51), wherein the positioning part (50) is adapted to be attached to the housing part

(30). Further, the invention relates to a method of producing a connector (100), wherein a pitch (83, 85) of contact elements (60) is greater at a contact face (51) of the connector (100) than at an exit face (31) of the connector (100), wherein a positioning part (50) forming the contact face (51) is attached to a matching, separate housing part (30) forming the exit face (31).

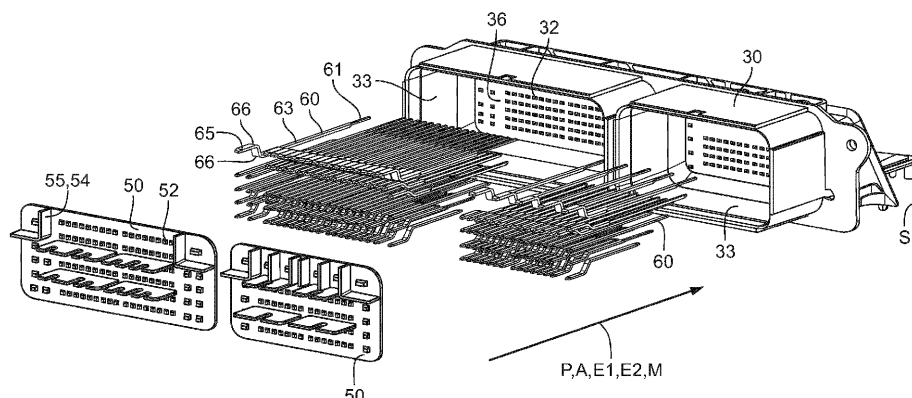


Fig. 2

Description

[0001] The invention relates to an assembly for a connector, and a method of producing a connector.

[0002] In some applications, the space available for a connector is restricted. In this case, connectors, wherein at a contact face of the connector a pitch of contact elements is greater than at an exit face of the connector, can be used.

[0003] However, such connectors are difficult to produce.

[0004] It is the object of the invention to make the production simpler.

[0005] According to the invention, this is achieved by an assembly for a connector, wherein at a contact face of the connector a pitch of contact elements is greater than at an exit face of the connector, wherein the assembly comprises a housing part forming the exit face, and a separate positioning part forming the contact face, wherein the positioning part is adapted to be attached to the housing part.

[0006] Further, the object is achieved by a method of producing a connector, wherein a pitch of contact elements is greater at a contact face of the connector than at an exit face of the connector, wherein a positioning part forming the contact face is attached to a matching, separate housing part forming the exit face.

[0007] Utilizing this assembly and this method, the production is simplified. Previously, the contact elements were inserted into an injection molded cavity and the housing part was created with injection molding, embedding the contact elements in the housing part. Such an inlay molding process is laborious and time consuming. With the solution according to the invention, the housing can be produced without having the contact elements in the cavity. Such a simple injection molding process allows a much faster throughput. The contact elements can be engaged with the housing part in a subsequent step. A pitch at the contact face is affixed by the positioning part, which can also be produced in a simple manner and be added at a later stage.

[0008] Preferably, the contact elements extend parallel to each other at the exit face and/or at the contact face. This can simplify the manufacturing process and/or the assembly. To increase this effect, the contact elements may be parallel to each other in adjacent areas, i.e., in areas next to the contact face and/or the exit face. In other words, sections of the contact elements located at the contact face and/or the exit face can be parallel to each other.

[0009] Further, for at least one, preferably more than one or all of the contact elements, the section located at the contact face can be parallel to the section located at the exit face. This can make the design compact.

[0010] At least one contact element can comprise transition sections on which the pitch changes. To keep the production simple, the transition section can be straight. The transition section can be limited by two

bends or curves. The angles at the bends or curves should sum up to 180° if a parallel offset is to be achieved. The bends or curves can be located between the transition section and the section or sections located at the exit face and/or the contact face. Preferably, no further section is arranged between the transition section and the section or sections located at the exit face and/or the contact face, respectively, apart from the bend or curve.

[0011] In the mounted state, the transition section can be located in a gap between the exit face and the contact face. The gap can be empty (or more precisely: filled with air or a protective gas) or be filled with an insulating material, for example a glue or sealing material. The material in the gap can help to keep the positioning part attached to the housing part, for example if it is a glue. The glue can be a curable glue, for example, a two-component glue like epoxy resin.

[0012] In an advantageous embodiment, the housing part is stiffened by the positioning part. For example, the stability or deformability of the housing part can be improved when the positioning part is attached versus when it is not attached. This can help to improve the mechanical stability of the connector. The housing part and the positioning part may not fulfill the requirements of mechanical stability alone. However, the combination of the two can provide the required stability for the connector.

[0013] In the attached state, i.e., when the positioning part is attached to the housing part, the positioning part and the housing part can be immobile relative to each other. Such an immobility may in particular be present for forces that occur during the normal or specified operation of the connector. When applying forces that are higher than such specified forces, the two can be detached from each other, either with or without destroying at least one of the parts.

[0014] According to one preferred embodiment, the housing part and the positioning part can be adapted for an attachment by a press fit. This can, for example, be achieved by designing and manufacturing corresponding sections of the parts so that a desired force is achieved when attached to each other. For example, the outer dimension of a first section that is inserted into a second section can be slightly bigger than the inner dimension of the second section.

[0015] As an alternative or an addition, the housing part and positioning part can be welded together. Welding refers to any process that creates a material bond between two components. Suitable welding techniques can, for example, include melting or ultrasonic welding for insulating materials like plastic.

[0016] As a further alternative or an addition, the housing part and/or the positioning part can comprise positive lock elements for blocking movement out of the attached state. The housing part and/or the positioning part can comprise positive lock elements for blocking movement along an attachment direction along which the positioning part is attached to the housing part. The positive lock elements can comprise at least one protrusion and/or at

least one recess. Parts of the positive lock elements can be elastically deflectable. A positive lock (or synonymously a positive fit or form fit) can be automatically achieved when the positioning part is attached to the housing part. The positive lock can in particular act counter to an attachment direction, along which the positioning part is attached to the housing part or counter to a mating direction along which the connector is connected to a mating connector. Further, the positive lock can act along the attachment direction and/or the mating direction.

[0017] In a space-saving configuration, the housing part may form a receptacle in which the positioning part is located at the attached state.

[0018] The receptacle can taper between the contact face and the exit face to keep the space requirements low.

[0019] The positioning part may rest against a flange part of the housing part, to achieve a precise relative position of the positioning part relative to the housing part.

[0020] According to an advantageous embodiment, the positioning part may comprise a plate from which ribs may protrude into the receptacle. This can keep the required amount of material to a minimum, thus reducing the weight.

[0021] The plate can comprise the contact face for simplification.

[0022] The positioning part may comprise at least one protrusion or recess adapted to interact with a mating connector in a mated state. The protrusion can protrude counter to a/the mating direction. It can for example be used to lock terminals in the mating connector or assure a correct mating of the connector and the mating connector.

[0023] The protrusion can be shaped as a pin or a board.

[0024] In a preferred embodiment, an attachment direction along which the positioning part is attached to the housing part is parallel to a mating direction along which the connector is mated with the mating connector. This can facilitate the assembling process.

[0025] The assembly can, in addition, comprise a securing part for positioning the contact elements at a location spaced from the housing part. The securing part can be similar in function and configuration to the positioning part, but be used at a distance from the contact face and the exit face. It can be used to position the contact elements at a distal end of the connector, the distal part being located opposite a proximal end at which the connector is mated with the mating connector. The exit face can be located between the securing part and the contact face.

[0026] The assembly may comprise contact elements. The contact elements can be adapted to extend through, in particular be pressed into the openings of the exit face and/or the contact face. The contact elements may extend from the contact face to the exit face, preferably continuously and/or monolithically.

[0027] The exit face can be located between a bend, for example a 90° bend, and the positioning part.

[0028] In a preferred embodiment, the method comprises the step of forming a transition section on the contact elements. This can be done by bending a straight section.

[0029] To achieve parallel sections, the contact element can be bent twice with two angles that sum up to 180°.

[0030] Preferably, the transition section is formed before the stitching or pressing step. This can allow for more precise forming.

[0031] The contact elements can be stitched or pressed through the exit face and/or through a wall of the housing part forming the exit face. This can be done one-by-one or in groups or rows of contact elements, if the resulting forces, in particular the friction forces, permit such a time-saving embodiment.

[0032] If the connector is connected to an external element like a PCB in a direction that does not coincide with the mating direction, the contact elements can be bent at a distance away from the housing part after the stitching or pressing step. Again, this can be done one-by-one or in groups or rows of contact elements.

[0033] According to one embodiment, the positioning part may be attached to the housing part after the stitching or pressing step. This can result in lower forces.

[0034] The solution can enable the engagement steps, in which the contact elements are engaged with the housing part and the positioning part, to take place after the production steps, in which the housing part and the positioning part are produced. The assembly process can then be very efficient.

[0035] In particular, the housing part and/or the positioning part can be produced by injection molding.

[0036] To allow for a simple assembly, the positioning part may be attached to the housing part with a linear movement. Linear movement, in this case, refers to a movement along a straight path.

[0037] Similarly, the contact elements may, in one embodiment, be engaged with the positioning part and/or the housing part with a linear movement.

[0038] In other configurations, the movement can be along a non-straight translational path or comprise rotational components, i.e., the positioning part is rotated relative to the housing part during the attachment or the contact elements are rotated relative to the housing part or the positioning part, respectively.

[0039] In one embodiment, a single linear movement (of the positioning part) can be used for engaging the contact elements and the positioning part and for attaching the positioning part to the housing part.

[0040] The invention also relates to a connector that has been produced by a method according to the invention or that comprises an assembly according to the invention.

[0041] The invention will now be described in detail and in an exemplary manner using advantageous embodi-

ments and with reference to the drawings. The described embodiments are possible configurations in which the individual features as described above can be provided independently of one another or can be omitted.

[0042] In the figures:

Fig. 1 shows a schematic, partially sectional, perspective view of a first embodiment of a connector;

Fig. 2 shows a schematic, perspective view of an assembly for the first embodiment shown in Fig. 1 during assembly; and

Fig. 3 shows a schematic, partially sectional, perspective view of a second embodiment of a connector.

[0043] In the figures, embodiments of assemblies 20 for connectors 100 are shown. In each connector, the pitch 83, 85 between contact elements 60 is different at different parts of the connector 100. At a contact face 51, the contact element 60 has a pitch 85 that is greater than the pitch 83 at an exit face 31. Such a design can be necessary if the connector 100 is used in a restricted space. The exit face 51 can be located where the contact elements 60 exit a space that is closed when the connector 100 is mated with a mating connector (not shown). The space can be defined by a receptacle 33 of a housing part 30 of the connector 100 and corresponding parts on the mating connector. The receptacle 33 is open towards a side at which the mating connector is to be inserted and closed at the other sides.

[0044] At the contact face 51, the connector is adapted for mating with the corresponding mating connector. The mating connector is inserted along a mating direction M into the receptacle 33 formed by the housing part 30 of the connector 100. Proximal sections 69 associated with a proximal end 99 of the connector 100 of the contact elements 60 then contact corresponding parts in the mating connector to achieve an electrical connection.

[0045] At a distal end 91 of the connector, distal sections 61 of the contact elements 60 can be connected to external elements (not shown), which can for example be located on a flat, support-like printed circuit board (PCB). In the depicted examples, the distal ends 61 are at an angle of 90° to the proximal ends 69.

[0046] At the exit face 31, the pitch 83 between the contact elements 60 is fixed by openings 32 in a wall 36 of the housing part 30 in which exit sections 63 of the contact elements 60 are located. For positioning the contact elements 60 at the larger pitch 85 of the contact face 51, a positioning element 50 is present. Similar to the openings 32 in the wall 36, openings 52 in the positioning part 50 define the pitch 85 between the contact elements 60. Again, the contact elements 60 extend through these openings 52 and are positioned at a contact section 65 by these openings 52.

[0047] In the depicted example, only the pitch in one direction (up-down in the figures) differs, while the pitch in the other direction (left-right) stays the same. In other embodiments, this second pitch could also be change between the exit face 31 and the contact face 51. Moreover, the example shows a case that the pitch 85 in the contact face 51 is greater than the pitch 83 in the exit face 31. However, the solution could, in a different example, also occur when the pitch 83 is greater than the pitch 85.

[0048] The configuration of the contact face 51 and/or the exit face 31, including the pitches 83, 85, can be defined in norms or standards, which can be set nationally, internationally, by a company or a consortium.

[0049] The positioning part 50 is configured to match the housing part 30. In particular, its shape and dimensions are such that the positioning part 50 can be attached to the housing part 30 in a manner that the resulting combination is stable enough to fulfil the specifications regarding a mechanical stability of the connector 100. In the depicted examples, the positioning part 50 can be held in the receptacle 33 by a press fit, for example by making the outer dimensions of the positioning part 50 perpendicular to the attachment direction and slightly bigger than the inner dimensions of the receptacle 33.

[0050] In order to allow for a good position of the positioning part 50 in the housing part 30, the housing part 30 can comprise flanges 34 that act as stop faces for the positioning part 50 during attachment.

[0051] Contact elements 60 that are outside the central row of contact elements 60 comprise transition sections 64 between the contact sections 65 and the exit sections 63. The depicted transition sections 64 are substantially straight and connected to the contact sections 65 and the exit sections 63 by curves or bends 66. A further bend 66 is located between the exit section 63 and the distal section 61. In the depicted examples, the transition sections 64 are located in an air-filled gap between the plate 53 of the positioning part 50 and the wall 36 of the housing part 30. At the transition sections 64, the receptacle 33 is funnel-shaped and tapers towards the outside.

[0052] The contact sections 51 extend parallel to each other and parallel to the exit sections 63, which in turn, are also parallel to each other.

[0053] The mechanical stability of the housing part 30 is increased by the presence of the positioning part 50. In other words, the housing part 30 is stiffened by the positioning part 50.

[0054] In the attached state 101, shown for example in Figs. 1 and 3, the housing part 30 and the positioning part 50 are immobile relative to each other, at least for the forces that act during the specified operation. During the attachment stage or when disassembling the connector 100, higher forces can be used and the frictional fit or press fit between the housing part 30 and the positioning part 50 can be overcome and the two can be moved relative to each other.

[0055] To improve the connection between the housing

part 30 and the positioning part 50, further connection techniques can be used. For example, glue can be applied or the two can be connected by welding, for example by ultrasound welding. During such a welding step, the positioning part 50 and/or the housing part 30 can melt at least partially at points or areas where they are in contact.

[0056] In other, non-depicted examples, positive fit elements could be used to secure the connection between the housing part 30 and the positioning part 50. For example, automatically latching elements can be used to create a positive fit when the positioning part 50 is attached correctly to the housing part 30.

[0057] As can, for example, be seen in Fig. 2, the positioning part 50 comprises the plate 53, from which protrusions 54 in the form of ribs 55 extend towards the mating connector. These ribs 55 can, for example, be used to increase the creep distance between the contact sections 65 of the contact elements 60 or to perform functions on the mating connector, for example the securing of corresponding counter contact elements in the mating connector.

[0058] The assembly process of the connector 100 can take place as follows:

[0059] In a first, non-depicted state, the contact elements 60, which can be cut from a wire or sheet metal, are bent twice to form the transition sections 64.

[0060] Then, the contact elements 60 are stitched into the housing part 30. During this step, the contact elements 60 are pressed along a pressing direction P through the openings 32 in the wall 36 of the housing part 30 and are fixed therein by a press fit between the contact elements 60 and the wall 36. The pressing direction P here relates to a first engagement direction E1 along which the contact elements 60 are engaged with the housing part 30. The contact elements 60 can be pressed into the housing part 30 individually or in groups of more than one contact element 60.

[0061] In a subsequent step, the positioning parts 50 are slid over the proximal ends 65 of the contact elements 60 and are then attached to the housing 30 by inserting them into the receptacles 33.

[0062] The attachment direction A, along which the positioning part 50 is attached to the housing part 30, is parallel to a second engagement direction E2, along which the positioning parts 50 are engaged with the contact elements 60. This allows for an easy assembly.

[0063] Further, the attachment direction A is parallel to the mating direction M.

[0064] In a further step, the contact elements 60 are bent row by row to form the bends 66 between the exit sections 63 and the distal sections 61.

[0065] The connector shown in Fig. 3 further comprises a securing part 70 for positioning the contact elements 60 at a location spaced from or outside the housing part 30, namely at the distal sections 61. This can be used for adjusting the relative positions of the contact elements for mounting to the external element, in particular when mounting along an external mounting direc-

tion S, which can differ from the mating direction M and can for example be perpendicular thereto.

[0066] The housing part 30 and/or the positioning parts 50 can be made from an insulating material, for example a material comprising plastic and/or can be produced by injection molding. The housing part 30 is a single monolithic piece, as is each of the positioning parts 50. The materials used for the different parts can be different and can be adapted to the function and desired application.

[0067] Advantageously, all of the movements that are necessary for assembling the connector 100 are linear and parallel to each other.

REFERENCE NUMERALS

[0068]

20	assembly
30	housing part
31	exit face
32	opening
33	receptacle
34	flange
36	wall
50	positioning part
51	contact face
52	opening
53	plate
54	protrusion
55	rib
60	contact element
61	distal section
63	exit section
64	transition section
65	contact section
66	bend
69	proximal section
70	securing part
72	opening
83	pitch at exit face
85	pitch at contact face
91	distal end
99	proximal end
100	connector
101	attached state
A	attachment direction
E1	first engagement section
E2	second engagement section
M	mating direction
P	pressing direction
S	external connection direction

Claims

1. Assembly (20) for a connector (100), wherein at a contact face (51) of the connector (100) a pitch (83, 85) of contact elements (60) is greater than at an exit

- face (51) of the connector (100), wherein the assembly (20) comprises a housing part (30) forming the exit face (31), and a separate positioning part (50) forming the contact face (51), wherein the positioning part (50) is adapted to be attached to the housing part (30).
2. Assembly (20) according to claim 1, wherein the housing part (30) and the positioning part (50) are adapted for an attachment by a press fit. 10
 3. Assembly (20) according to claim 1 or 2, wherein the housing part (30) and/or the positioning part (50) comprise positive lock elements for blocking a movement out of the attached state (101). 15
 4. Assembly (20) according to one of claims 1 to 3, wherein the housing part (30) forms a receptacle (33) in which the positioning part (50) is located in the attached state (101). 20
 5. Assembly (20) according to claim 4, wherein the positioning part (50) comprises a plate (53) from which ribs (55) may protrude into the receptacle (33). 25
 6. Assembly (20) according to one of claims 1 to 5, wherein the positioning part (50) comprises at least one protrusion (54) or recess adapted to interact with a mating connector in a mated state. 30
 7. Assembly (20) according to one of claims 1 to 6, wherein an attachment direction (A) along which the positioning part (50) is attached to the housing part (30) is parallel to a mating direction (M) along which the connector (100) is mated with the mating connector. 35
 8. Assembly (20) according to one of claims 1 to 7, wherein the assembly (20) comprises a securing part (70) for positioning the contact elements (60) at a location spaced from the housing part (30). 40
 9. Method of producing a connector (100), wherein a pitch (83, 85) of contact elements (60) is greater at a contact face (51) of the connector (100) than at an exit face (31) of the connector (100), wherein a positioning part (50) forming the contact face (51) is attached to a matching, separate housing part (30) forming the exit face (31). 45
 10. Method according to claim 9, wherein the contact elements (60) are stitched or pressed through the exit face (31) and/or through a wall (36) of the housing part (30) forming the exit face (31). 50
 11. Method according to claim 10, wherein the contact elements (60) are bent at a distance away from the housing part (30) after the stitching or pressing step. 55
 12. Method according to claim 10 or 11, wherein the positioning part (50) is attached to the housing part (30) after the stitching or pressing step.
 13. Method according to one of claims 9 to 12, wherein engagement steps in which the contact elements (60) are engaged with the housing part (30) and the positioning part (50) are taking place after production steps in which the housing part (30) and the positioning part (50) are produced.
 14. Method according to one of claims 9 to 13, wherein the contact elements (60) are engaged with the positioning part (50) and/or the housing part (30) by a linear movement.
 15. Connector (100) that has been produced by a method according to one of claims 9 to 14 or that comprises an assembly according to one of claims 1 to 8.

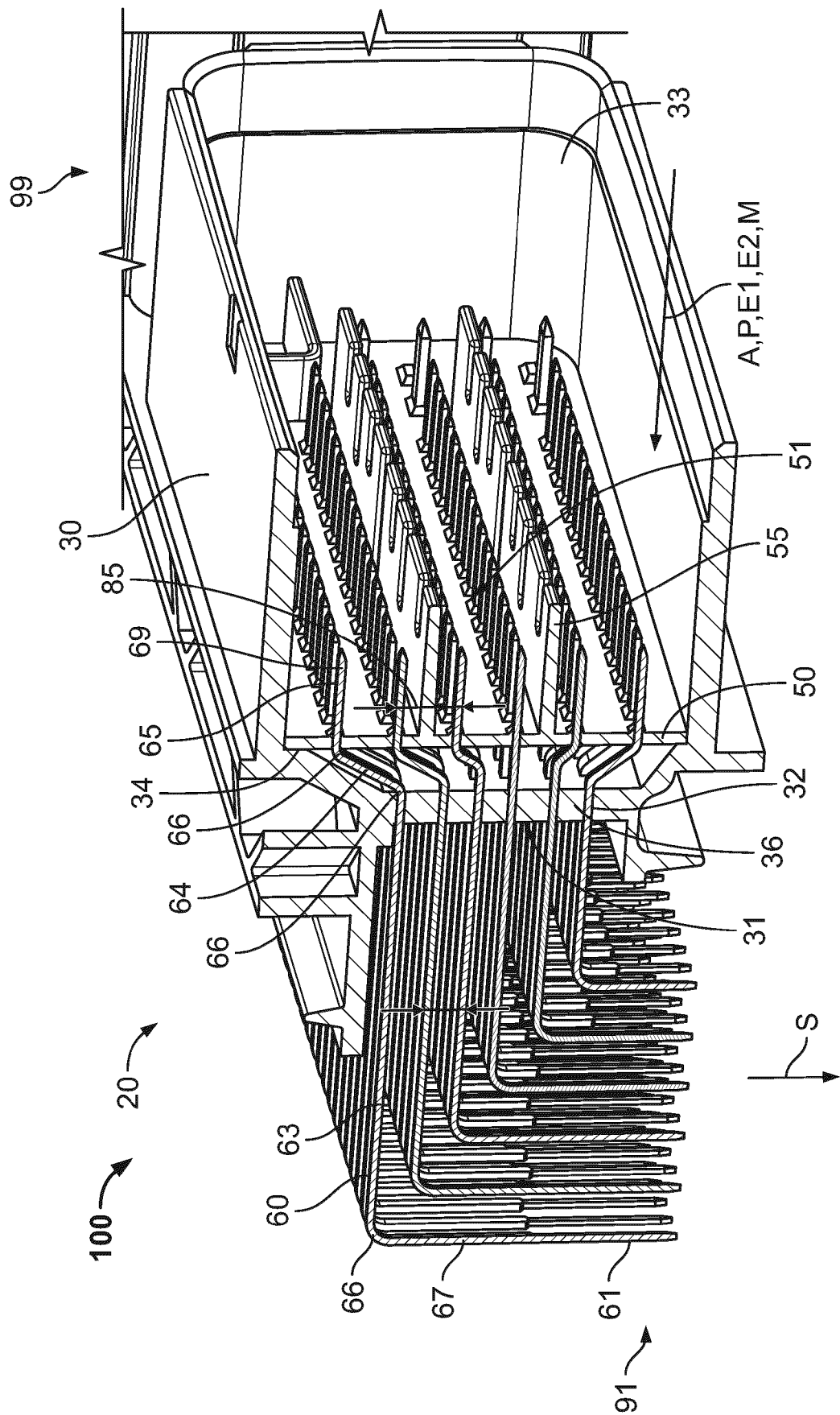


Fig. 1

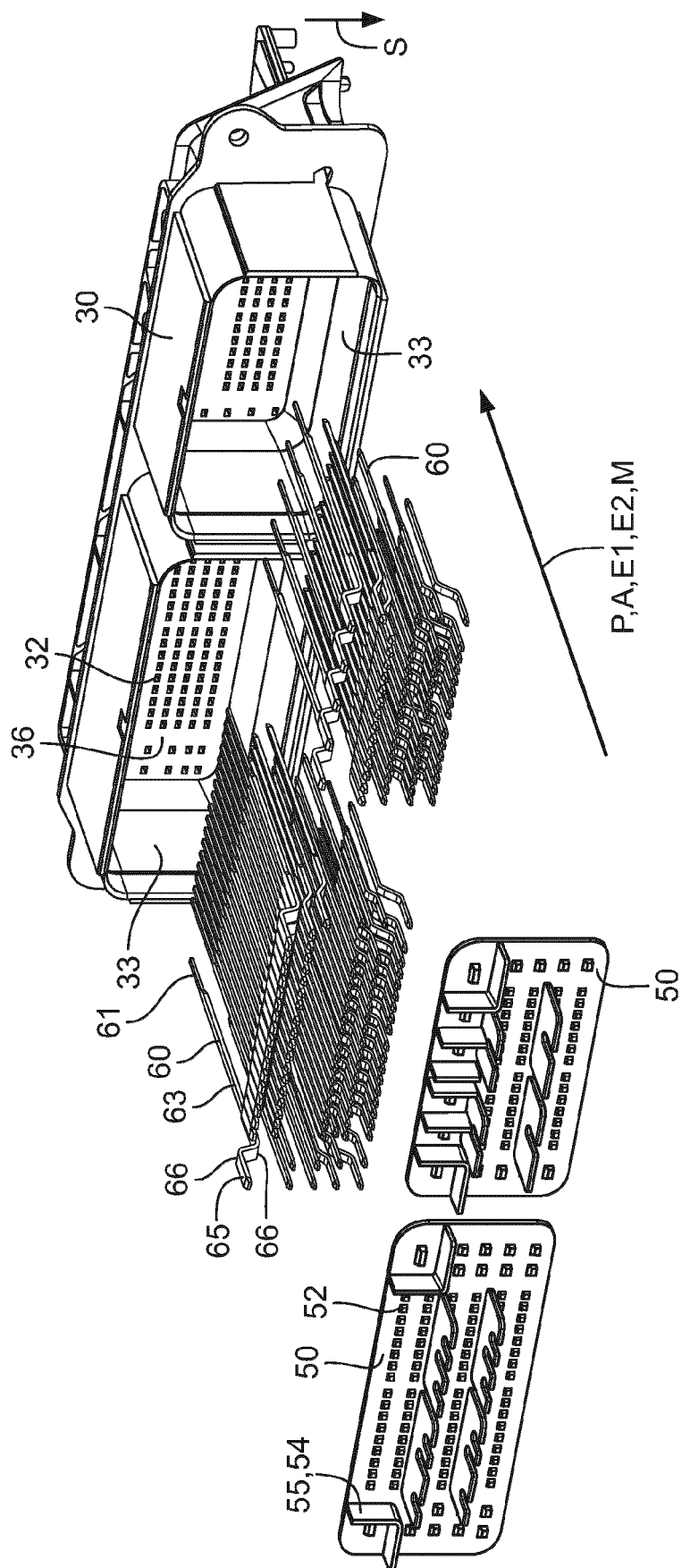
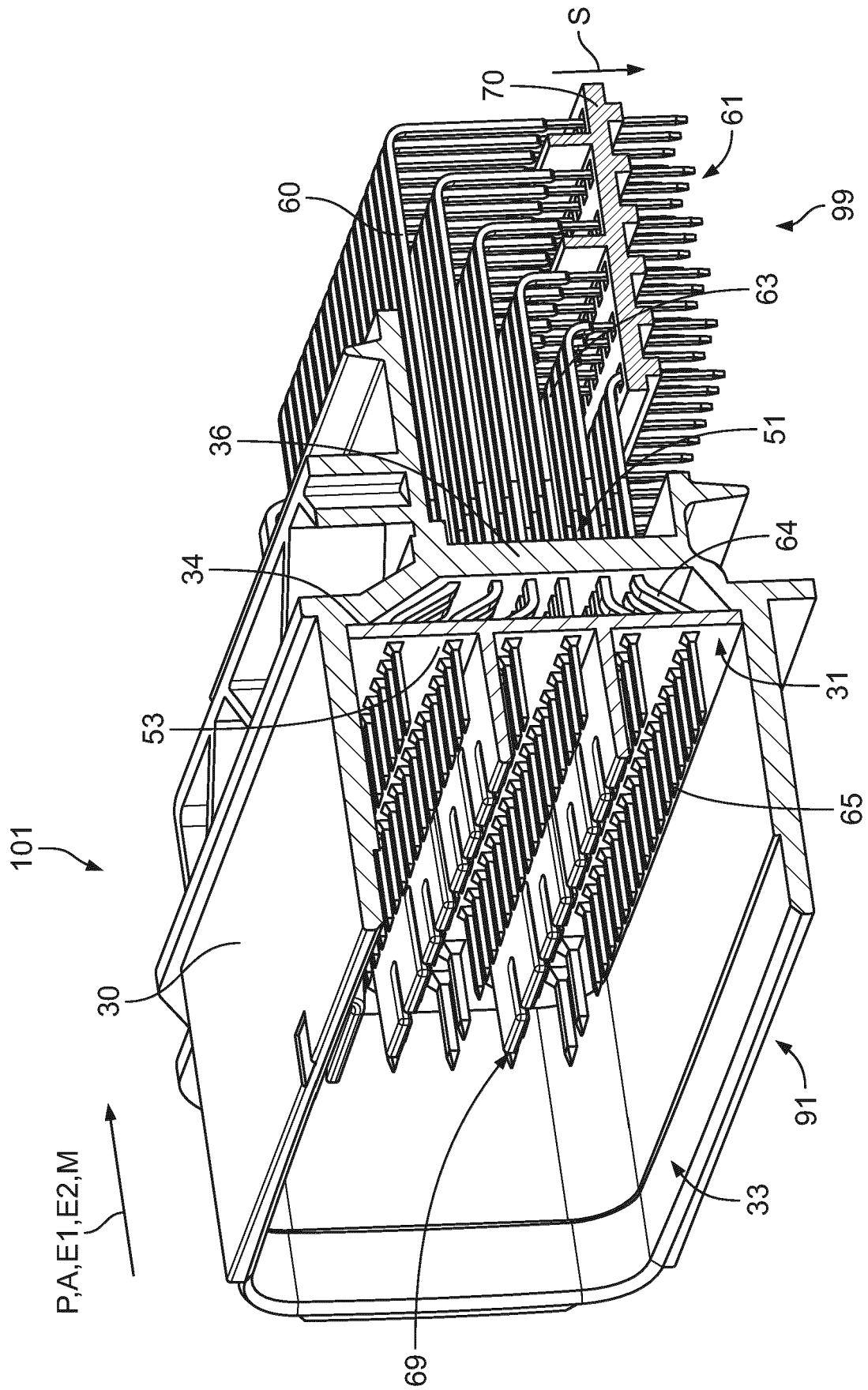


Fig. 2





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