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(54) **WATERPROOF BLADE TYPE CONNECTOR**

(57) A waterproof blade type connector composed of a first connecting member with first terminals and a second connecting member with second terminals is revealed, whereas the first and second terminals are electrically connected to each other. The second connecting member includes a base disposed on one end and a frame arranged at the base. A mounting space is enclosed by the frame while two locking grooves are arranged at two opposite sides of the frame symmetrically. A pin is extended from the second terminal toward the mounting space and a cover plate is mounted in the mounting space. A locking block corresponding to the locking groove is disposed on each of two ends of the cover plate. A first packing groove is formed on the periphery of the cover plate and filled with a hot melt adhesive layer while space around the pin is also sealed by the hot melt adhesive layer. Thus both easy assembly and effective waterproofing are achieved.

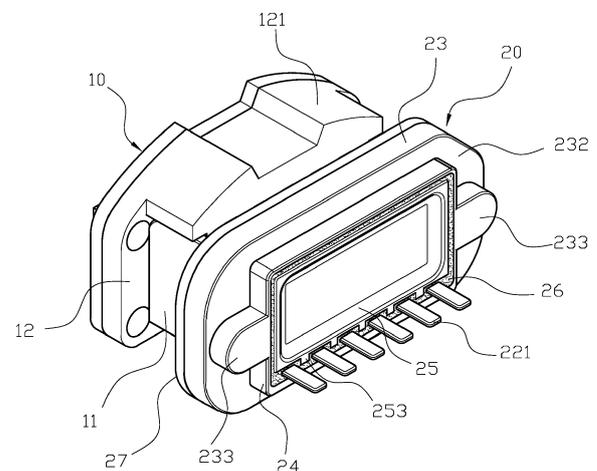


FIG. 1

Description

Field of the Invention

[0001] The present invention relates to a connector used for connection to a circuit, especially to a waterproof blade type connector with features of easy assembly and effective waterproofing.

Description of Related Art

[0002] In order to connect various electronics to a variety of circuits such as a power circuit, signal circuit, etc., a male connector and a female connector are fixed on the electronic device and the power source/or circuit respectively. The electrical connection is formed therebetween by the male connector being plugged into to the female connector. However, the connector is easy to get out of order once being exposed to water or moisture compared with other parts of the electronic device. A lot of electronic devices are used outdoors, in the environment with humidity and dramatic temperature fluctuations, or even in motion so that connectors with high waterproof performance are required. A stable electrical connection is also one of the main requirements. Thus waterproof connectors have been developed by vendors. Generally, a gasket or packing ring is arranged at the connection area between a housing and a cap of the waterproof connector. Thereby a gap formed on the connection area is sealed for preventing water/moisture outside from entering the connector. Yet the conventional structure mentioned above has certain shortcomings. The gasket or the packing ring is mounted into the connector firstly and then the cap is fastened onto the housing by screwing. Thus the gasket or the packing ring is held tightly by the cap in combination with the housing. However, during fastening of the cap, the gasket or the packing ring is not mounted and held in the connector evenly and smoothly owing to difference in the force applied between the application point and non-application points. A gap generated due to uneven distribution of the gasket/packing ring reduces water resistance of the connector. Moreover, even the connector meets the requirements for the waterproof property while being tested after the assembly process, elastic fatigue or shrinkage of the connector after long term use, thermal expansion or contraction may still result in loss of water resistance. At the same time, the assembly process of the connector with many steps is complicated. The position of the gasket/packing ring with respect to the connector is difficult to be fixed while being assembled so that the defective rate is increased and the water resistance is reduced. The conventional connectors have assembling difficulties and insufficient waterproofing for quite some time.

[0003] In order to overcome the shortcomings mentioned above, there is a room for improvement and there is a need to provide a novel waterproof connector.

SUMMARY OF THE INVENTION

[0004] Therefore it is a primary object of the present invention to provide a waterproof blade type connector in which a cover plate is mounted in a frame firmly while being assembled. Moreover, both easy sealing and effective waterproofing are achieved. The frame and the cover plate are fixed in place by locking blocks of the cover plate being locked into the locking grooves of the frame. A hot melt adhesive layer in liquid form is flowing along a path between the frame and the cover plate to fill up a first packing groove. A gap between the frame and the cover plate is further filled up with the hot melt adhesive layer while the space around pins is also filled with and sealed by the hot melt adhesive layer. The hot melt adhesive layer is processed only once so that the processing of the hot melt adhesive layer is simplified.

[0005] It is another object of the present invention to provide a waterproof blade type connector in which a projecting piece on a base is not only connected to a frame to reinforce the frame but also processed to form the locking groove. The formation of the locking groove is not limited by the thickness of the frame due to the projecting piece. Thus the locking groove formed does not penetrate the frame and waterproofing at the position of the locking groove is achieved without additional sealing. Moreover, the projecting piece is further used for mounting an internally-threaded insert so that the internally-threaded insert and the base are connected securely. The projecting piece can be used for forming the locking groove and mounting the internally-threaded insert. This is a substantial breakthrough in the structure design of the connector.

[0006] In order to achieve the above objects, a waterproof blade type connector according to the present invention includes a first connecting member and a second connecting member. A plurality of first terminals is disposed on the first connecting member and a connecting base is formed on one end of the second connecting member. A plurality of L-shaped slots is arranged at the connecting base and the second terminals are fixed in the L-shaped slots respectively. The first terminals and the second terminals are connected so that the first connecting member and the second connecting member are electrically connected. A base is disposed on the other end of the second connecting member, opposite to the end thereof with the connecting base. A joining surface is located on one side of the base facing the connecting base while an assembly surface is formed on the other side of the base opposite to the side with the joining surface. A frame is disposed on the assembly surface while a mounting space is enclosed by the frame and communicating with the L-shaped slot. Two locking grooves are symmetrically formed on two opposite sides of the frame respectively. A pin is extended from the second terminal toward the mounting space, abutting against the frame and projecting beyond the base. The second connecting member further includes a cover plate formed in the

mounting space. Two locking blocks are symmetrically arranged at two ends of the cover plate respectively. The pins are held tightly between the frame and the cover plate by the locking blocks locked into the locking grooves securely. A first packing groove is formed on the periphery of the cover plate and is filled with a hot melt adhesive layer. The space around the pins is also filled and sealed by the hot melt adhesive layer.

[0007] Preferably, a second packing groove is formed on an inner edge of the frame of the second connecting member. The pin is enclosed by the second packing groove together with the first packing groove. Thus the thickness of the hot melt adhesive layer applied around the pin is equal to the total groove depth of the first packing groove and the second packing groove.

[0008] Preferably, a limiting notch is formed between the two adjacent pins of the second connecting member while a plurality of pressing blocks is disposed on the edge of the cover plate and the first packing groove spanning the edge of the respective pressing block. The pressing blocks are engaged in the limiting notches respectively so as to hold the pin between the two adjacent pressing blocks. All the pins are inserted in the same surface of the cover plate being filled with the hot melt adhesive layer in the way that all the pins pass through the same surface.

[0009] Preferably, a partition is disposed between the two adjacent L-shaped slots of the connecting base and a bottom part is formed by extension of the partition into the mounting space. A mounting groove is formed on one side of the cover plate facing the mounting space and is extended to the pressing blocks. A waterproof gasket is arranged at the mounting groove. The waterproof gasket is brought to abut against the bottom parts of the partitions and the pin is enclosed by the waterproof gasket.

[0010] Preferably, two projecting pieces are arranged at the assembly surface of the base and are connected to the frame to reinforce the frame. The projecting piece can also be processed to form the locking groove so that the locking groove formed does not penetrate the frame.

[0011] Preferably, two internally-threaded inserts are mounted in the base. One end of the internally-threaded insert is open on the joining surface of the base while the other end thereof is extended into the projecting piece. Thus a secure connection between the internally-threaded insert and the base is achieved by the projecting piece.

[0012] Preferably, a sealing member is integrated into the first connecting member. A plurality of insertion holes is formed on the sealing member and a C-shaped lateral block is disposed on the sealing member. The first terminals are inserted in the insertion holes and pass through them respectively. In conjunction with the lateral block, the sealing member abuts against the L-shaped slots when the first terminals and the second terminals are connected with each other.

[0013] Preferably, a gasket is mounted on the connecting base of the second connecting member in the way that it abuts against the joining surface of the base. When

the base of the second connecting member is assembled with other components, the gasket is held tightly therebetween for waterproofing.

[0014] Preferably, an annular groove is formed on the joining surface of the base. A protruding ring is formed on an inner edge of one side of the gasket and mounted in the annular groove while an annular part is arranged at the other side of the gasket, opposite to the side with the protruding ring. While being assembled, the annular part is squeezed so that the protruding ring is expanded and pressed tightly against the annular groove.

[0015] The second terminal further includes a bracket and two clip branches. The bracket is bent inward and the clip branches are arranged at the bracket symmetrically. The second terminal is fixed in the L-shaped slot by the bracket. A fixed end of the clip branch is connected to the bracket and located close to the opening of the L-shaped slot while a free end thereof is located near the mounting space. Thereby a lower portion of the first terminal is held tightly by the two clip branches.

[0016] As to other functions and features of the present invention, please refer to the following embodiments with details and the related figures.

25 BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The structure and the technical means adopted by the present invention to achieve the above and other objects can be best understood by referring to the following detailed description of the preferred embodiments and the accompanying drawings, wherein:

Fig. 1 is a perspective view of an embodiment according to the present invention;

35 Fig. 2 is an explosive view of an embodiment according to the present invention;

Fig. 3 is another explosive view of an embodiment according to the present invention;

40 Fig. 4 is a perspective view of a section of a second connecting member in an embodiment according to the present invention;

Fig. 5 is a schematic drawing of an embodiment before filling of a hot melt adhesive layer according to the present invention;

45 Fig. 6 is a schematic drawing of an embodiment after a hot melt adhesive layer being applied according to the present invention;

Fig. 7 is a sectional view of an embodiment after filling of a hot melt adhesive layer according to the present invention;

50 Fig. 8 is a schematic drawing showing an embodiment in use according to the present invention;

Fig. 9 is another schematic drawing showing an embodiment in use according to the present invention;

55 Fig. 10 is an explosive view of another embodiment according to the present invention; and

Fig. 11 is a sectional view of another embodiment according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0018] Refer to Fig. 1, Fig. 2, Fig. 3 and Fig. 4, a waterproof blade type connector according to the present invention includes a first connecting member 10 and a second connecting member 20. The first connecting member 10 consists of a plurality of first terminals 11 and a sealing member 12. A plurality of insertion holes 121 is arranged at the sealing member 12 and a C-shaped lateral block 122 is formed on the sealing member 12. The first terminals 11 are inserted in the insertion holes 121 the pass through them respectively. The second connecting member 20 is composed of a connecting base 21 on one end thereof, a plurality of second terminals 22, a base 23, a frame 24, a cover plate 25, and a hot melt adhesive layer 26. A plurality of L-shaped slots 211 is arranged at the connecting base 21 and the second terminals 22 are fixed in the L-shaped slots 211 respectively. The first terminals 11 and the second terminals 22 are connected with each other so as to form electrical connection between the first connecting member 10 and the second connecting member 20. The sealing member 12 together with the lateral block 122 abuts against the L-shaped slots 211 when the first terminals 11 and the second terminals 22 are connected with each other. The base 23 is formed on the other end of the second connecting member 20, opposite to the end thereof with the connecting base 21. A joining surface 231 is located on one side of the base 23 facing the connecting base 21 while an assembly surface 232 is arranged at the other side of the base 23 opposite to the side with the joining surface 231. The frame 24 is disposed on the assembly surface 232 of the second connecting member 20. The frame 24 includes a mounting space 241 communicating with the L-shaped slots 211, two locking grooves 242 symmetrically arranged at two opposite sides thereof respectively and a second packing groove 243 disposed on an inner edge thereof. The mounting space 241 is enclosed by the frame 24. Two projecting pieces 233 are arranged at the assembly surface 232 of the base 23 and connected to the frame 24 to reinforce the frame 24. The projecting piece 233 can also be processed to form the locking groove 242. Thus the locking groove 242 with sufficient strength does not penetrate the frame 24 and waterproofing at the position of the locking groove 242 is further provided. Two internally-threaded inserts 234 are mounted in the base 23. One end of the internally-threaded insert 234 is open on the joining surface 231 of the base 23 while the other end thereof is extended into the projecting piece 233. Thus the internally-threaded insert 234 and the base 23 are connected securely by the projecting piece 233. The projecting piece 233 is not only processed to form the locking groove 242 but also used for mounting the internally-threaded insert 234. A pin 221 is extended from the second terminal 22 toward the mounting space 241, abutting against the frame 24 and projecting beyond the base 23. The cover plate 25

is mounted in the mounting space 241 of the second connecting member 20 and is composed of two locking blocks 251 disposed on two ends thereof respectively, and a first packing groove 252. The locking blocks 251 are locked into the locking grooves 242 respectively so as to hold the pins 221 between the frame 24 and the cover plate 25. The first packing groove 252 is formed on the periphery of the cover plate 25 while the hot melt adhesive layer 26 is used to fill the first packing groove 252. The space around the pin 221 is also filled with and sealed by the hot melt adhesive layer 26. The second packing groove 243 is arranged at the inner edge of the frame 24 of the second connecting member 20 while the pin 221 is enclosed by the second packing groove 243 in combination with the first packing groove 252, as shown in Fig. 4 and Fig. 5. Thus the thickness of the hot melt adhesive layer 26 filled in the space around the pin 221 is equal to the total groove depth of the first packing groove 252 and the second packing groove 243. The second terminal 22 further includes a bracket 222 and two clip branches 223. The bracket 222 is bent inward and the clip branches 223 are arranged at the bracket 222 symmetrically. The second terminal 22 is fixed in the L-shaped slot 211 by the bracket 222. The clip branch 223 consists of a fixed end and a free end thereof. The fixed end of the clip branch 223 is connected to the bracket 222 and located close to the opening of the L-shaped slot 211 while the free end thereof is located near the mounting space 241. Thereby a lower portion of the first terminal 11 is held tightly by the two clip branches 223. Thus the first terminal 11 and the second terminal 22 will not get loose easily.

[0019] While being assembled, refer from Fig. 2 to Fig. 7, the second terminal 22 is mounted into the second connecting member 20 through the end of the second connecting member 20 with the mounting space 241 and then is fixed in the L-shaped slot 211 by the bracket 222. The pin 221 of the second terminal 22 is extending along the frame 24 and protruding out of the frame 24. Then the cover plate 25 is mounted in the mounting space 241 and the locking block 251 of the cover plate 25 is locked into the locking groove 242 of the frame 24 so that the mounting space 241 is covered by the cover plate 25. The position of the frame 24 relative to the cover plate 25 is fixed securely by the locking blocks 251 being locked in locking grooves 242. Thereby the cover plate 25 is mounted in the frame 24 firmly while being assembled. The hot melt adhesive layer 26 in liquid form is flowing along a path between the frame 24 and the cover plate 25 to fill up the first packing groove 252 and the second packing groove 243 while a gap between the frame 24 and the cover plate 25 is further filled up with the hot melt adhesive layer 26. A space around the respective pin 221 is also filled up with the hot melt adhesive layer 26. It should be noted that the area around the pin 221 is depressed due to the first packing groove 252 and the second packing groove 243. Thus the hot melt adhesive layer 26 can flow automatically to fill up the gaps

and the grooves, without being applied circularly around the pin 21. Thereby the thickness of the hot melt adhesive layer 26 filled in the space around the pin 221 is equal to the total groove depth of the first packing groove 252 and the second packing groove 243. The hot melt adhesive layer 26 is applied to fill and seal only a single surface. Thus not only the processing of the hot melt adhesive layer 26 is simplified, easy sealing and effective waterproofing are also achieved. Moreover, the projecting piece 233 on the base 23 is connected to the frame 24 to reinforce the frame 24. The projecting piece 233 is also used for the processing of the locking groove 242. The formation of the locking groove 242 is performed independent of the thickness of the frame 24 due to the projecting piece 233 and the locking groove 242 formed does not penetrate the frame 24. Thus no additional sealing is required and waterproofing at the position of the locking groove 242 is achieved. The projecting piece 233 is further used for mounting the internally-threaded insert 234 to achieve a stable connection between the internally-threaded insert 234 and the base 23. Thereby, the screwable length of the internally-threaded insert 234 is also significantly increased. The internally-threaded insert 234 can be made from metals. The screwing strength of the second connecting member 20 can be dramatically increased by the internally-threaded insert 234 in combination with the projecting piece 233 while the second connecting member 20 is connected to other components. To sum up, the projecting piece 233 can be used not only for the formation of the locking groove 242 but also for the assembly of the internally-threaded insert 234. The second connecting member 20 further includes a gasket 27 mounted on the connecting base 21 thereof. The gasket 27 is abutting against the joining surface 231 of the base 23. When the base 23 of the second connecting member 20 is assembled with other components, the gasket 27 is held tightly therebetween for preventing water from entering therein. An annular groove 235 is formed on the joining surface 231 of the base 23. A protruding ring 271 is disposed on an inner edge of one side of the gasket 27 and mounted in the annular groove 235 while an annular part 272 is arranged at the other side of the gasket 27, opposite to the side with the protruding ring 271.

[0020] While in use, refer to Fig. 8 and Fig. 9, the first connecting member 10 is screwed on a first component 30 while the first terminals 11 and the lateral block 122 are arranged at one end of the first component 30. The second connecting member 20 is screwed on a second component 40 by means of the internally-threaded inserts 234 from inside out so that the connecting base 21 is exposed at one end of the second component 40. While the second connecting member 20 is assembled with the second component 40, the annular part 272 is squeezed so that the protruding ring 271 is expanded and pressed against the annular groove 235. The waterproofing between the second component 40 and the second connecting member 20 is further enhanced. Then the first

terminals 11 of the first connecting member 10 are inserted into the L-shaped slots 211 of the second connecting member 20 respectively so that the first terminal 11 is held tightly by the two clip branches 223 of the second terminal 22. Thus, the first connecting member 10 and the second connecting member 20 are electrically connected with each other. The sealing member 12 together with the lateral block 122 is abutting against the L-shaped slot 211 to achieve waterproofing at the connection between the first component 30 and the second component 40. Furthermore, the fixed end of the clip branch 223 connected to the bracket 222 is located close to the opening of the L-shaped slot 211. That means the two clip branches 223 provides the maximum holding force at the position close to the L-shaped slot 211. Thus the second terminal 22 holds the lower portion of the first terminal 11 tightly. Therefore both the first terminal 11 and the second terminal 22 will not get loose easily.

[0021] Refer to Fig. 10 and Fig. 11, another embodiment is revealed. A limiting notch 236 is located between the two adjacent pins 221 of the second connecting member 20 while a plurality of pressing blocks 253 is formed on the edge of the cover plate 25 and the first packing groove 252 is spanning the edge of each pressing blocks 253. The pressing blocks 253 are engaged in the limiting notches 236 respectively so that the pin 221 is held between the two adjacent pressing blocks 253. That means all the pins 221 pass through the same surface of the cover plate 25 filled with the hot melt adhesive layer 26. Thereby both easy assembly and effective waterproofing are provided. A partition 212 is arranged between the two adjacent L-shaped slots 211 of the connecting base 21 and is extended into the mounting space 241 to form a bottom part 213. A mounting groove 254 is formed on one side of the cover plate 25 facing the mounting space 241 and is extended to the pressing blocks 253. A waterproof gasket 28 is disposed on the mounting groove 254. While being assembled, the waterproof gasket 28 is brought to directly abut against the bottom parts 213 of the partitions 212 and the pin 221 is enclosed by the waterproof gasket 28. Thereby the water resistance at the position of the pins 221 is enhanced by both the waterproof gasket 28 and the hot melt adhesive layer 26.

[0022] Additional advantages and modifications will readily occur to those skilled in the art. Therefore, the invention in its broader aspects is not limited to the specific details, and representative devices shown and described herein. Accordingly, various modifications may be made without departing from the spirit or scope of the general inventive concept as defined by the appended claims and their equivalent.

Claims

1. A waterproof blade type connector comprising:
 - a first connecting member that is provided with

a plurality of first terminals; and
a second connecting member that includes

a connecting base formed on one end of the second connecting member and having a plurality of L-shaped slots arranged thereat; a plurality of second terminals that are fixed in the L-shaped slots respectively and are connected to the first terminals respectively to form electrical connection between the first connecting member and the second connecting member;
a base disposed on the other end of the second connecting member, opposite to the end of the second connecting member with the connecting base, and composed of a joining surface located on one side thereof facing the connecting base, and an assembly surface formed on the other side thereof opposite to the side with the joining surface;
a frame that is disposed on the assembly surface and having a mounting space enclosed thereby and communicating with the L-shaped slots, and two locking grooves symmetrically arranged at two opposite sides thereof respectively; a pin being extended from the second terminal toward the mounting space, abutting against the frame and projecting beyond the base;
a cover plate that is set in the mounting space of the frame and is composed of a locking block arranged at each of two ends thereof and locked into the locking groove for holding the pin between the frame and the cover plate, and a first packing groove located on the periphery thereof; and
a hot melt adhesive layer that is used to fill and seal the first packing groove and a space around the pin.

- 2. The connector as claimed in claim 1, wherein a second packing groove is arranged at an inner edge of the frame of the second connecting member; the pin is enclosed by the second packing groove in conjunction with the first packing groove so that a thickness of the hot melt adhesive layer filled in the space around the pin is equal to the total groove depth of the first packing groove and the second packing groove.
- 3. The connector as claimed in claim 1 or claim 2, wherein a limiting notch is formed between the two adjacent pins of the second connecting member while a plurality of pressing blocks is disposed on an edge of the cover plate and the first packing groove is spanning the edge of the respective pressing block; the pressing blocks are engaged in the limiting notches respectively to hold the pin between the two

adjacent pressing blocks; the pins are inserted in the same surface of the cover plate being filled with the hot melt adhesive layer in the way that the pins pass through the same surface.

- 4. The connector as claimed in claim 3, wherein a partition is disposed between the two adjacent L-shaped slots of the connecting base and is extended into the mounting space to form a bottom part; a mounting groove is formed on one side of the cover plate facing the mounting space and is extended to the pressing blocks; a waterproof gasket is mounted at the mounting groove and is abutting against the bottom parts of the partitions while the pin is enclosed by the waterproof gasket.
- 5. The connector as claimed in claim 1, wherein two projecting pieces are arranged at the assembly surface of the base and are connected to the frame to reinforce the frame; the projecting piece is processed to form the locking groove so that the locking groove does not penetrate the frame.
- 6. The connector as claimed in claim 5, wherein two internally-threaded inserts are mounted in the base; one end of the internally-threaded insert is open on the joining surface of the base while the other end thereof is extended into the projecting piece so that a secure connection between the internally-threaded insert and the base is achieved by the projecting piece.
- 7. The connector as claimed in claim 1, wherein a sealing member is integrated in the first connecting member; a plurality of insertion holes is disposed on the sealing member and a C-shaped lateral block is formed at the sealing member; the first terminals are inserted in the insertion holes and pass through them respectively while the sealing member in conjunction with the lateral block abuts against the L-shaped slots when the first terminals and the second terminals are connected with each other.
- 8. The connector as claimed in claim 1, wherein a gasket is mounted on the connecting base of the second connecting member and is abutting against the joining surface of the base; the gasket is firmly held for waterproofing while the base of the second connecting member is assembled.
- 9. The connector as claimed in claim 8, wherein an annular groove is arranged at the joining surface of the base; a protruding ring is formed on an inner edge of one side of the gasket and is mounted in the annular groove while an annular part is arranged at the other side of the gasket, opposite to the side with the protruding ring; while being assembled, the annular part is squeezed so that the protruding ring is ex-

panded and pressed against the annular groove during assembly.

10. The connector as claimed in claim 1, wherein the second terminal further includes a bracket bent inward and two clip branches disposed on the bracket symmetrically; the second terminal is fixed in the L-shaped slot by the bracket; a fixed end of the clip branch connected to the bracket is located close to an opening of the L-shaped slot while a free end thereof is located near the mounting space; thereby a lower portion of the first terminal is held tightly by the two clip branches.

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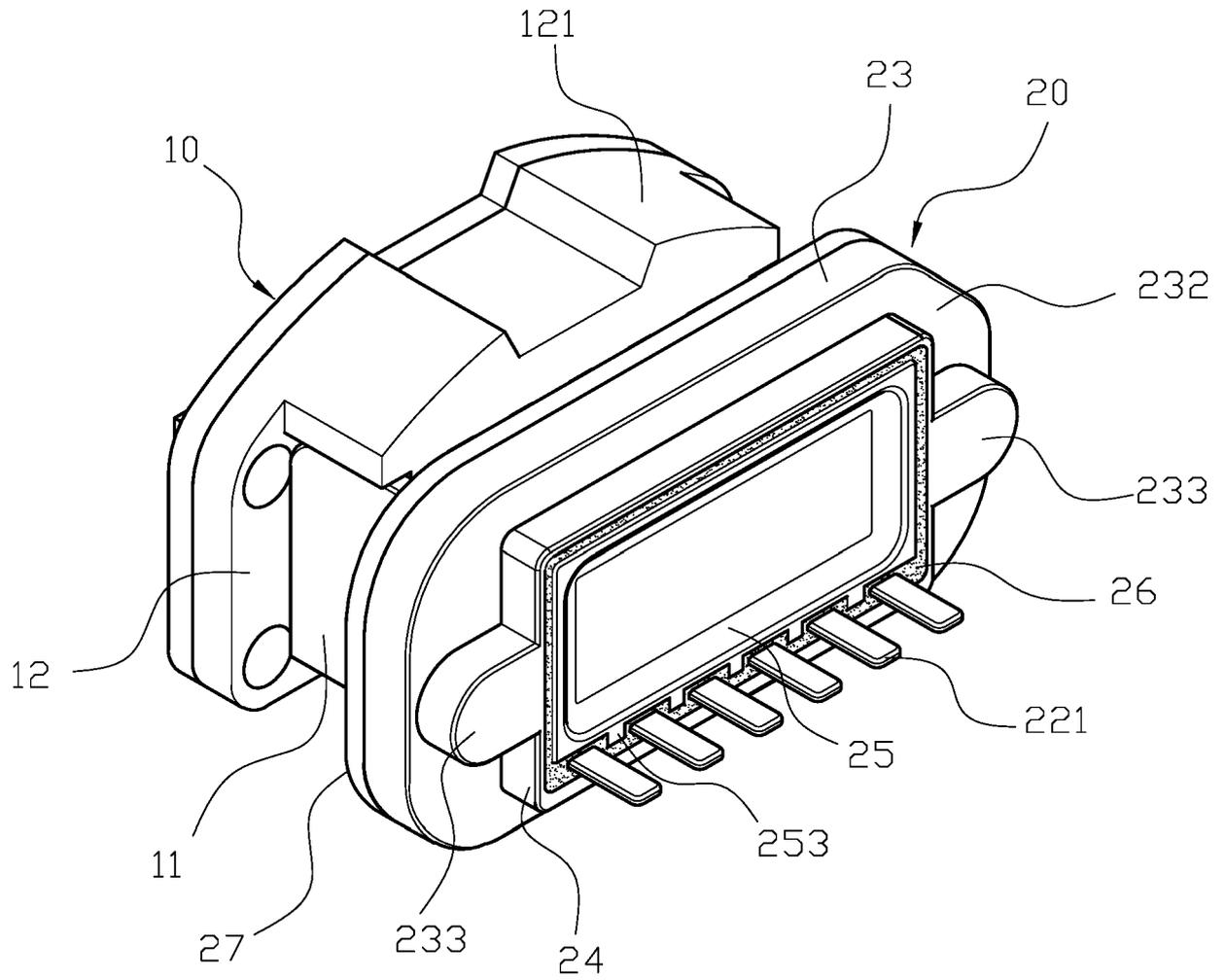


FIG. 1

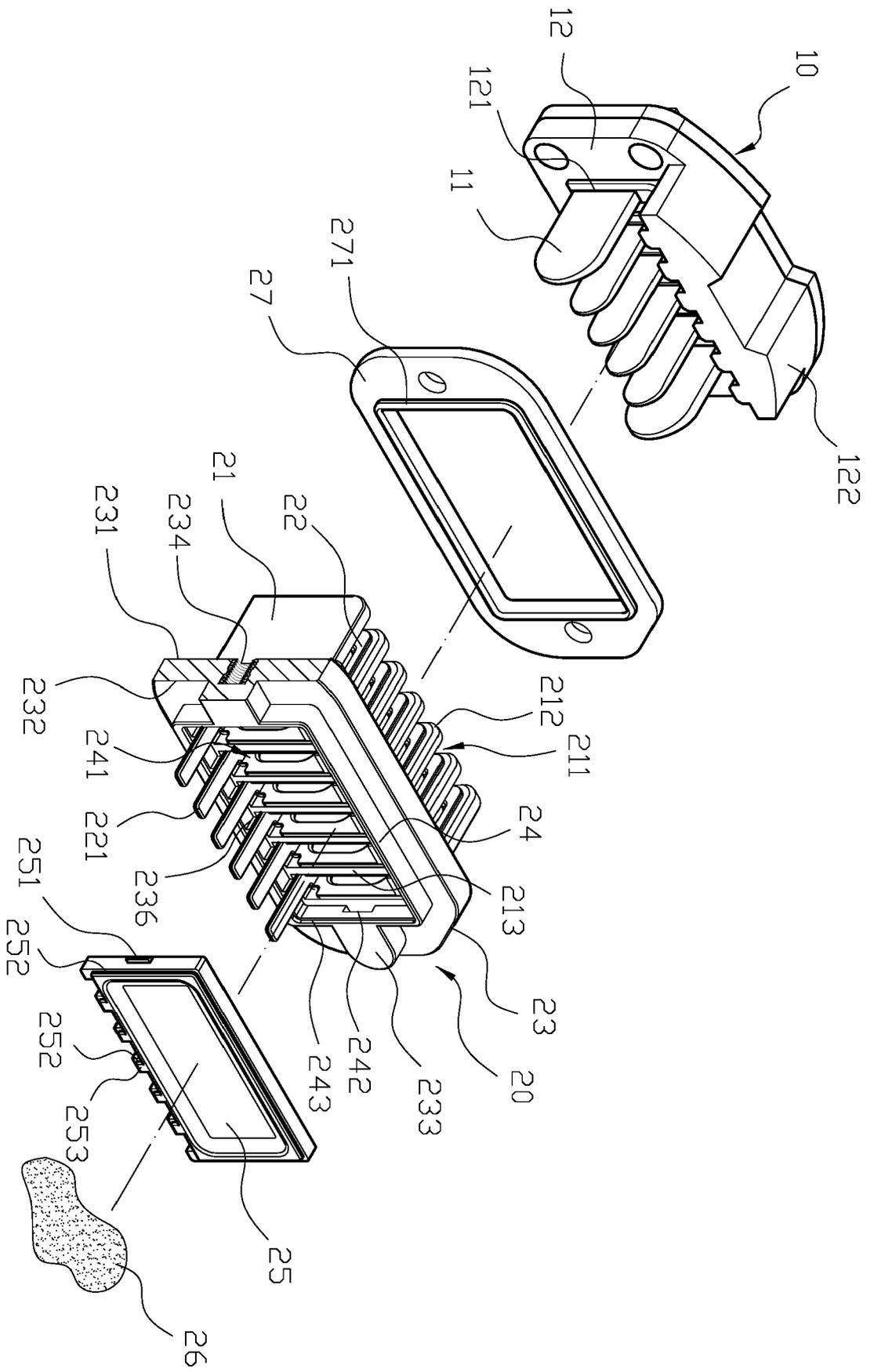


FIG. 2

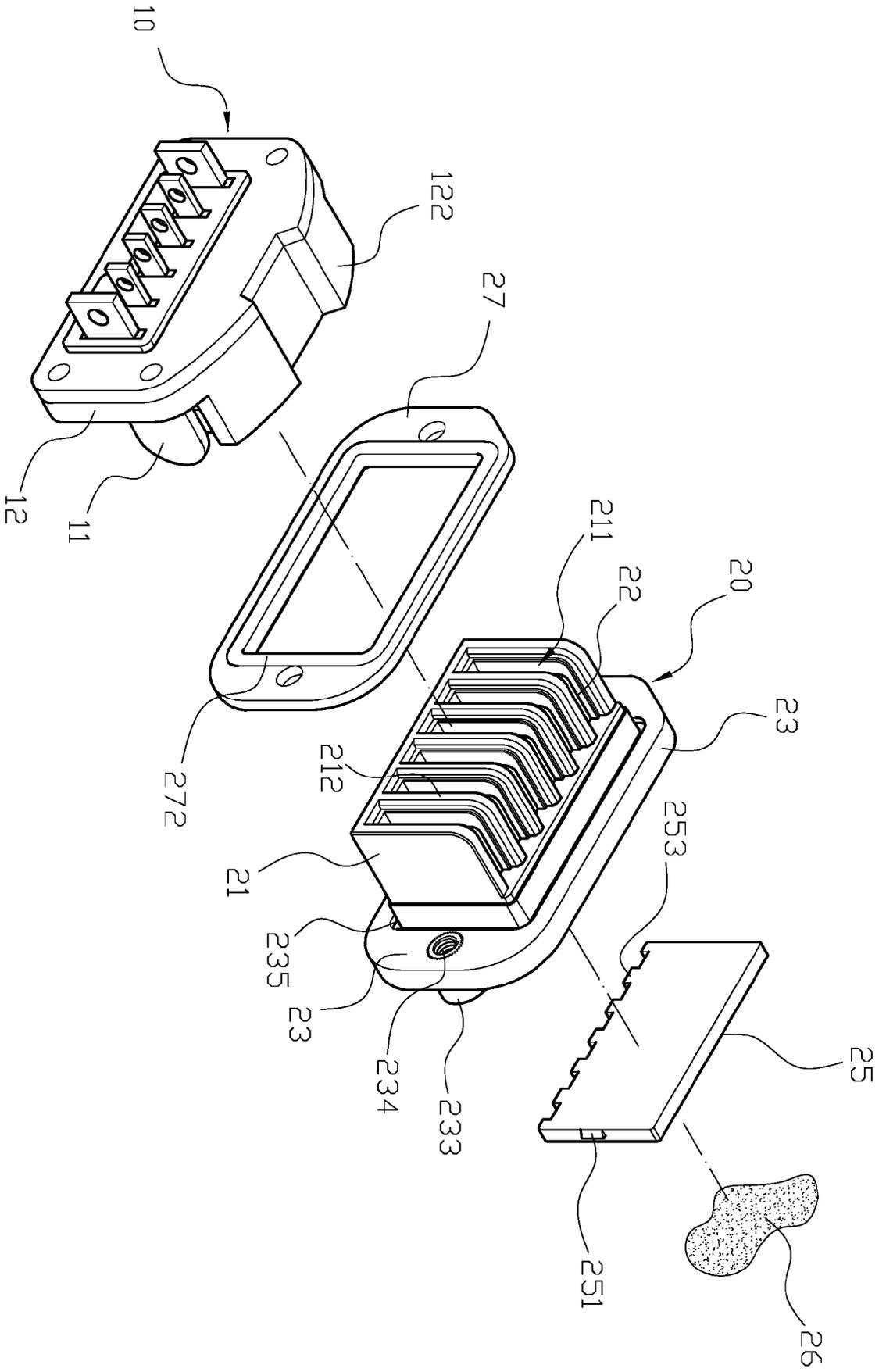


FIG. 3

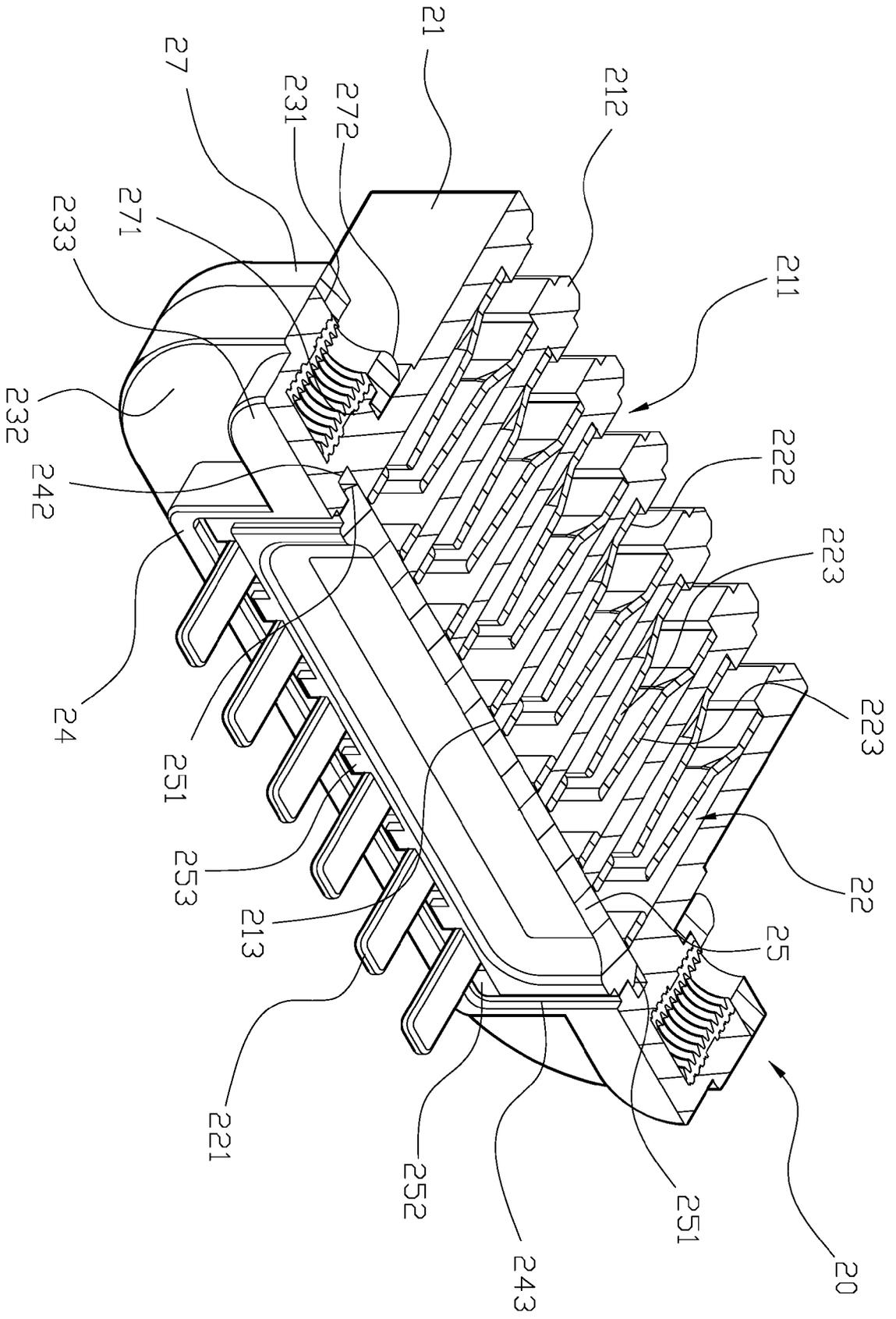


FIG. 4

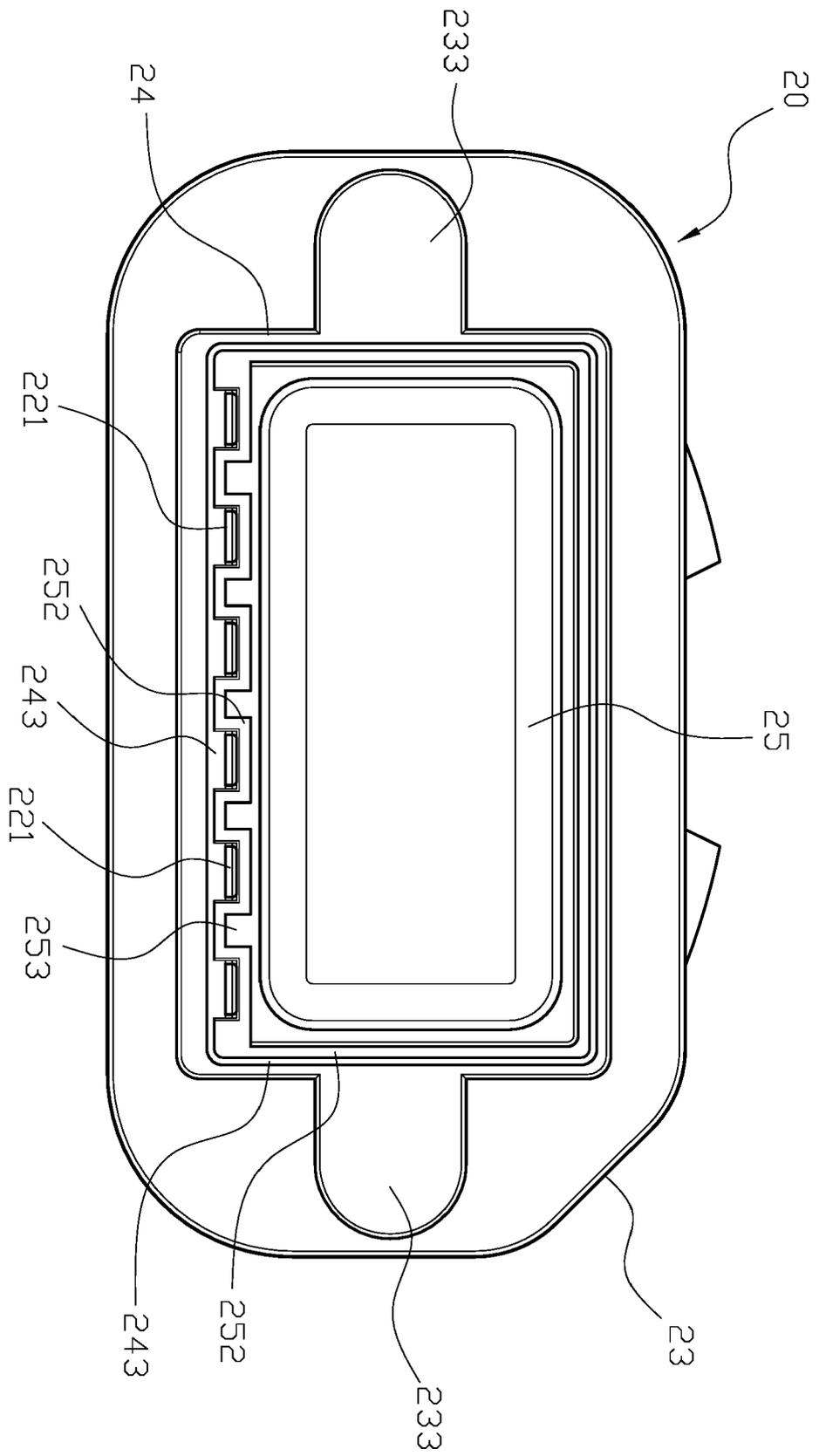


FIG. 5

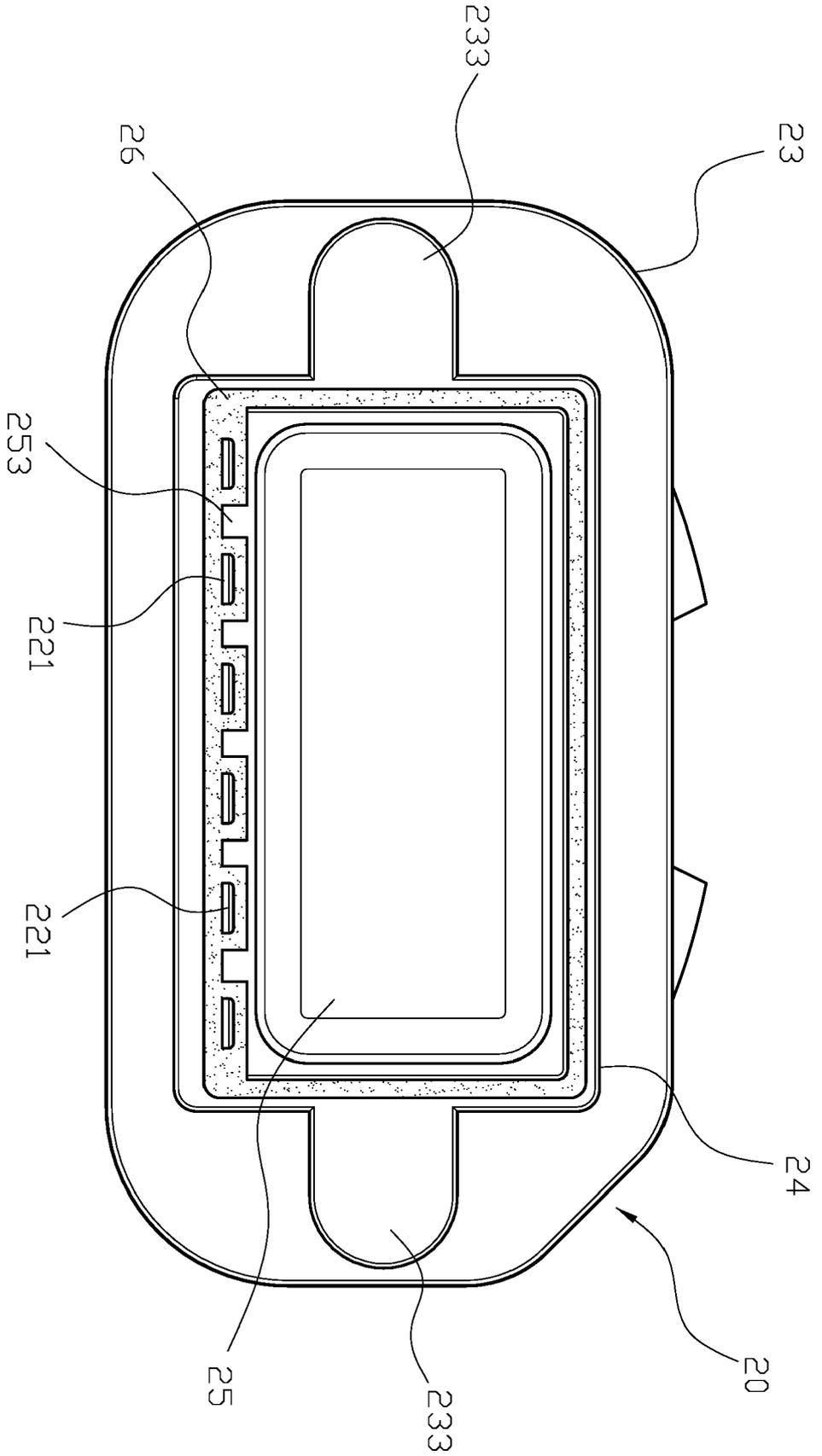


FIG. 6

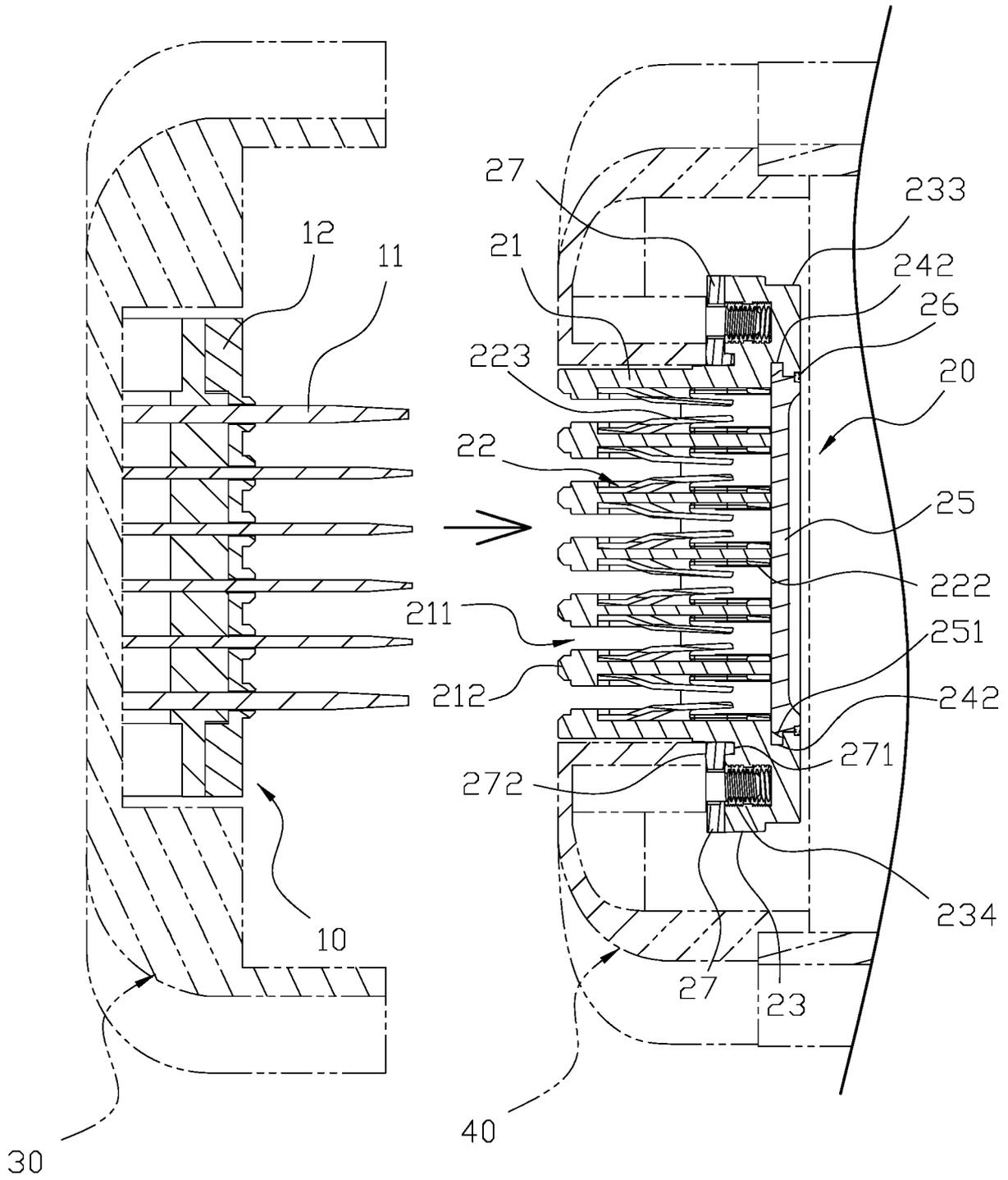


FIG. 8

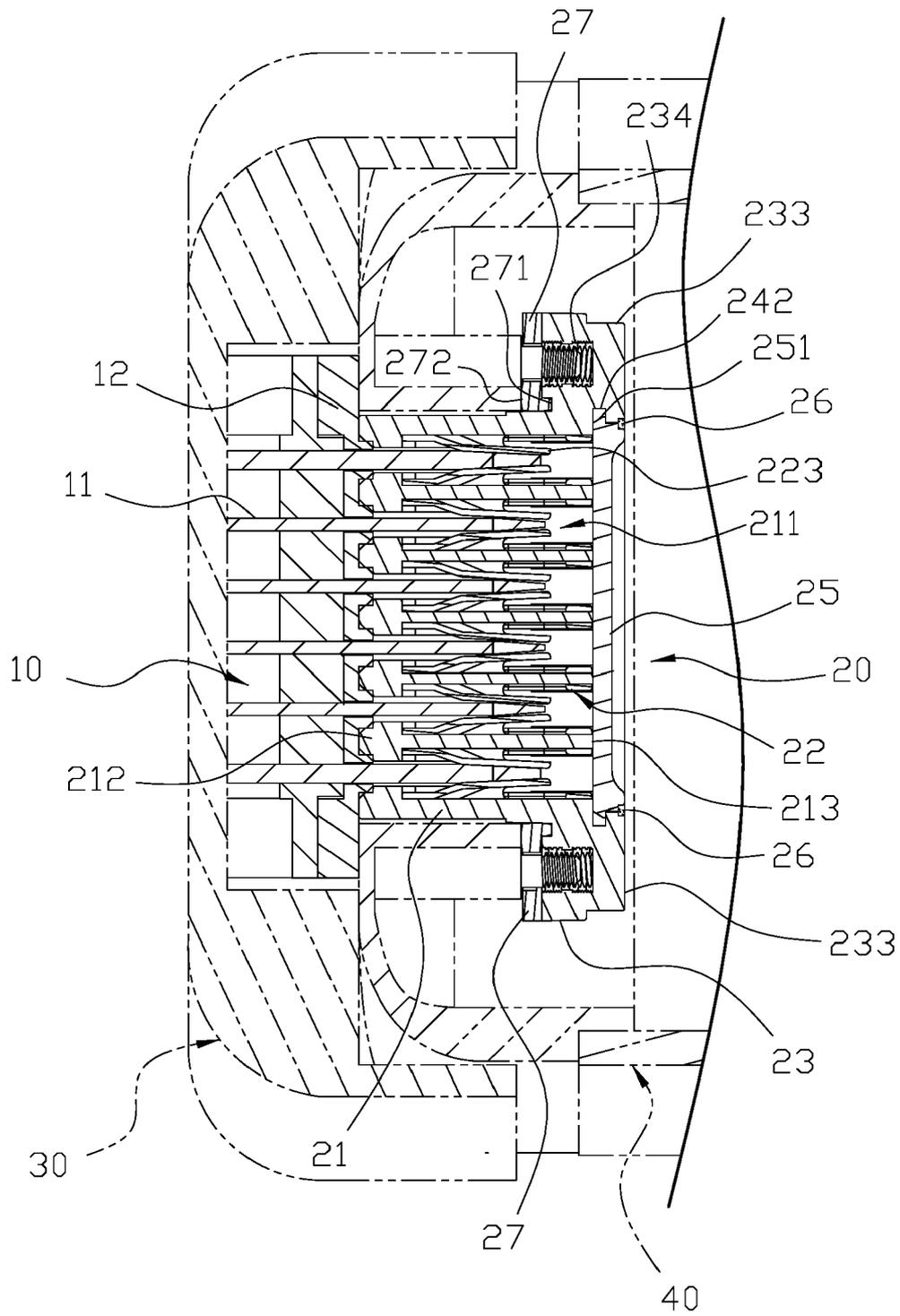


FIG. 9

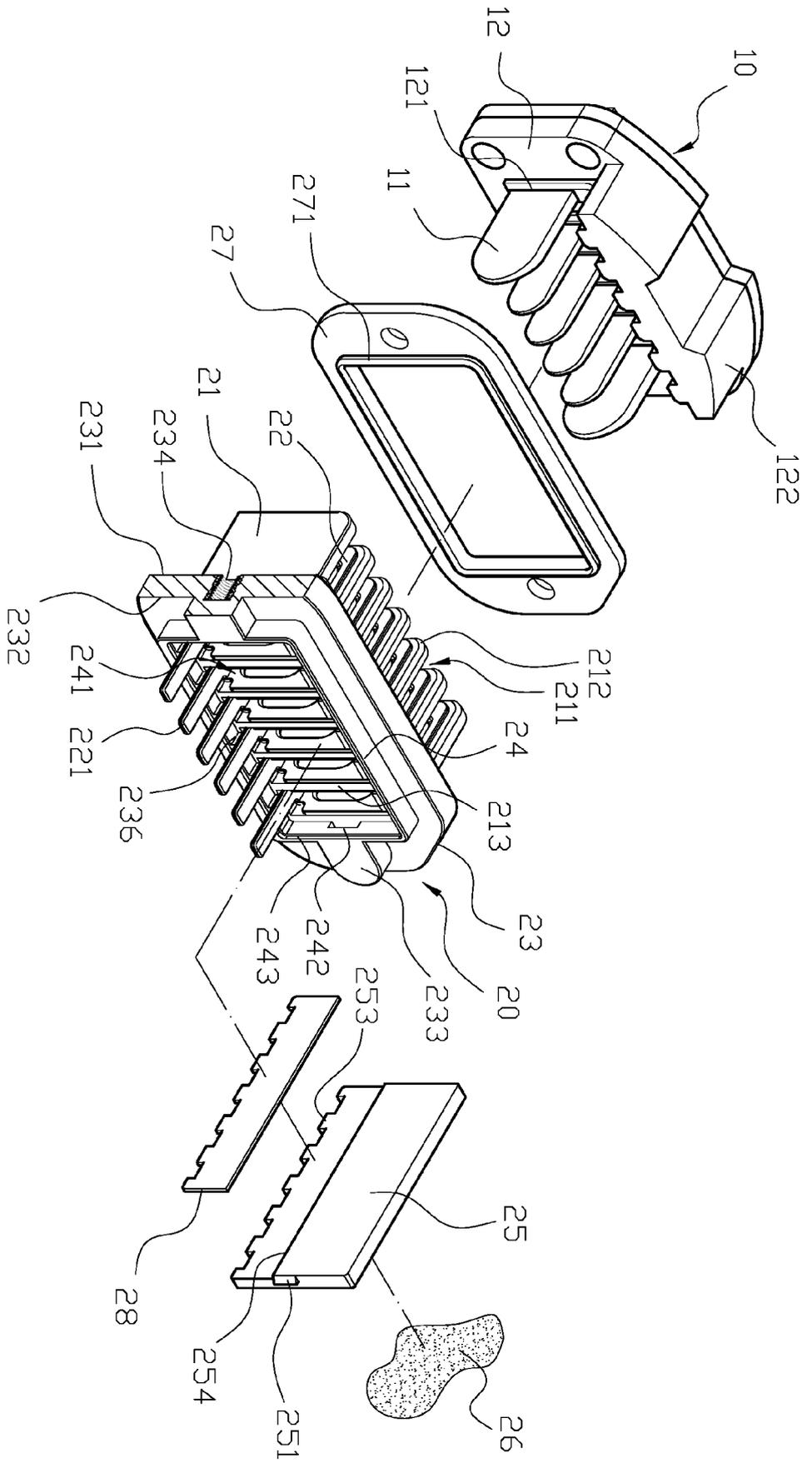


FIG. 10

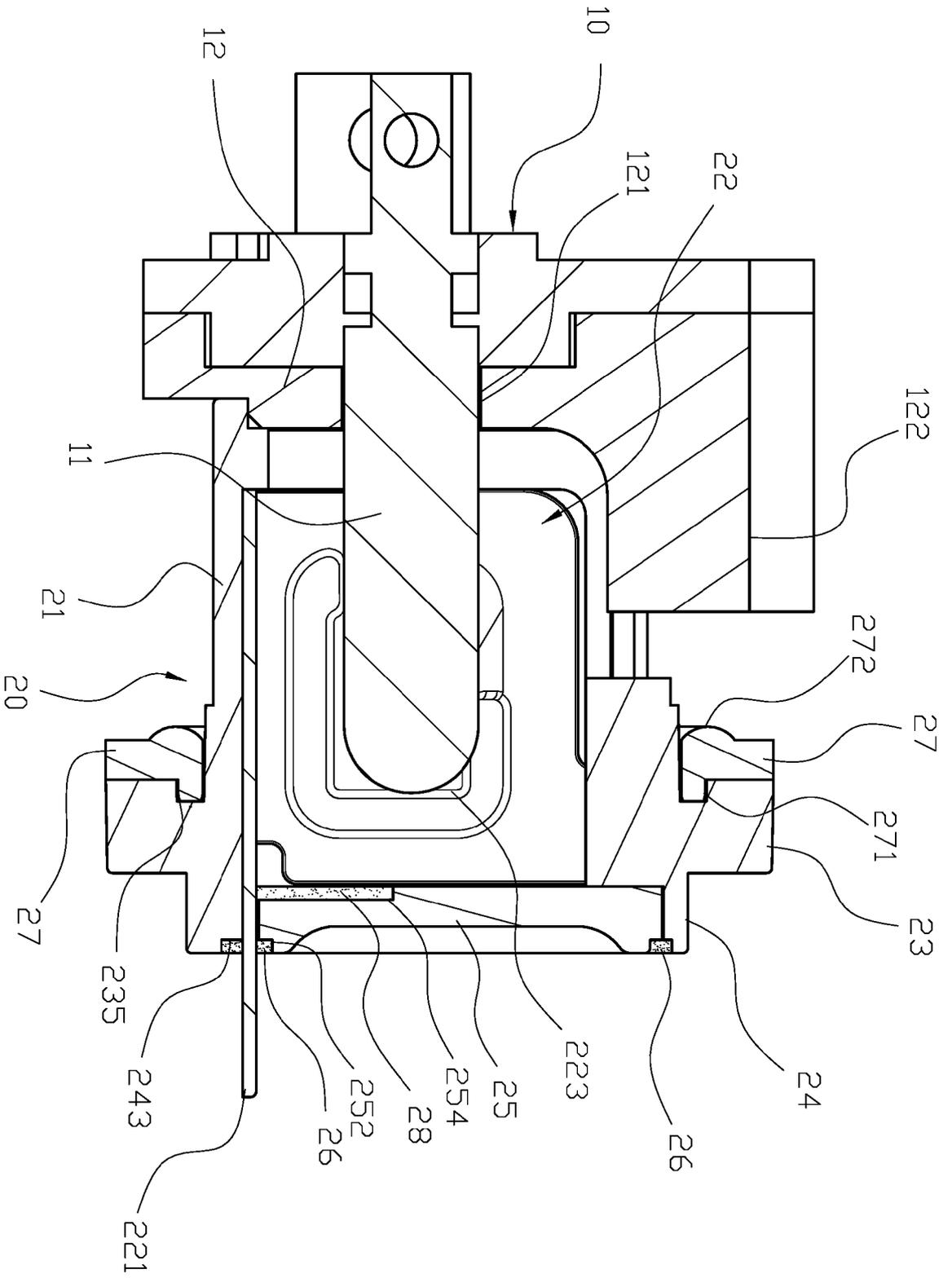


FIG. 11



EUROPEAN SEARCH REPORT

Application Number
EP 18 19 1603

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DOCUMENTS CONSIDERED TO BE RELEVANT			
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 5 March 2019	Examiner López García, Raquel
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	

EPO FORM 1503 03/02 (P04C01)

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

EP 18 19 1603

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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