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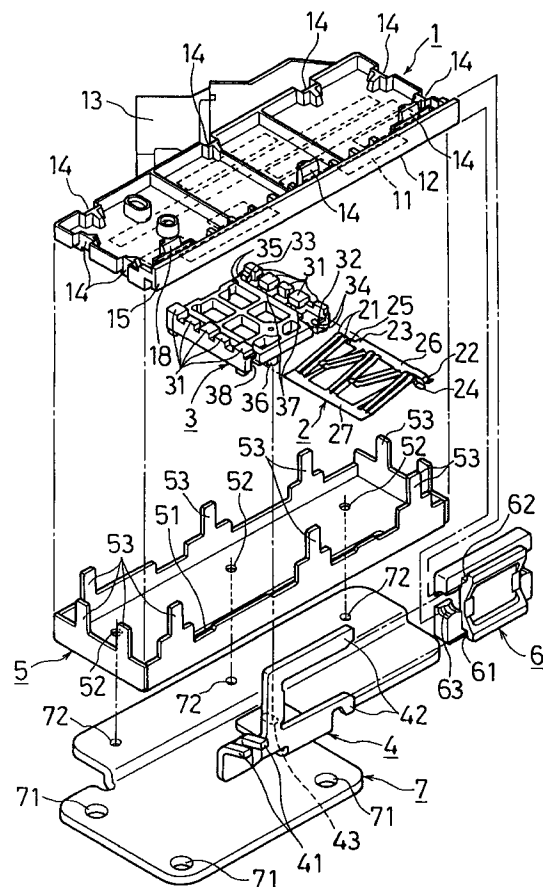
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(54) **Slide switch apparatus**

(57) Disclosed is a slide switch apparatus. The slide switch apparatus is prevented from chattering between a movable contact and a movable board where it is used by immersing in a high-temperature oil. The movable contact can be assembled onto the movable board in a one-touch manner. The movable board 3 has a gap 37, a step portion 32, 33 and an engaging portion 34, 35. The gap extends in a direction perpendicular to a direction of sliding of the movable board 3 so that the movable contact 2 can be inserted therinto in that perpendicular direction. The step portion 34, 35 is sectionally in valley form. The movable contact 2 has a leadframe 26 inserted in the gap 37 of the movable board 3, and a chatter preventive piece 22, 23, 24, 25 engaged with the step portion 32, 33 and the engaging portion 34, 35.

FIG. 1



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Description

BACKGROUND OF THE INVENTION

Technical field

[0001] This invention relates to an improvement on a slide switch apparatus having a movable contact held by a movable board arranged to be slidably contacted with a fixed contact so as to perform switch operation. More particularly, this invention relates to a slide switch apparatus improved for accurately detecting a shift position of an automatic transmission of automobile to prevent chatter from occurring between the movable contact and the movable board due to thermal expansion or change in tolerance, where used by immersing in a high-temperature oil as use of an in-oil inhibittance switch to be installed within an automatic transmission, while for being assembled onto a movable board in a one-touch manner.

Prior arts

[0002] The conventional slide switch apparatus in general is structured, for example as shown in Fig. 7, by a movable board a having an engaging portion d having in a movable contact attaching surface a support projection c for supporting a movable contact b, and an elastic rib f having an engaging projection e for engaging the movable contact b oppositely to the engaging portion d. Otherwise, the apparatus is structured, as shown in Fig. 8, by a movable board g having a projection h that is cold-crimped, and a movable contact i fixed to the movable board g through screw fastening or ultrasonic welding. Incidentally, the slide switch apparatuses shown in Fig. 7 and Fig. 8 are disclosed by Japanese Unexamined Utility Model Publication. No. S57-117523.

SUMMARY OF THE INVENTION

[0003] In the above-stated conventional art as shown in Fig. 7, however, there has been a problem that chattering occurs due to occurrence of a gap G between the movable board a and the movable contact b as shown in Fig. 7, resulting from change in tolerance introduced during forming the movable board g and the movable contact b or from thermal expansion caused when the apparatus is installed within an automatic transmission of an automobile to be used by immersion in a high-temperature oil. Furthermore, it is impossible in the conventional art as shown in Fig. 8 to assemble the movable contact onto the movable board g in a one-touch manner. Moreover, there has been a problem that chattering occurs in the movable contact b due to loosening of crimping in the projection h during service in an immersed state in a high-temperature oil over a long period of term.

[0004] The present invention has been made in order

to solve the above-stated problem. It is an object to, even where a slide switch apparatus is used in a state of being immersed in a high-temperature oil, prevent chatter from occurring between a movable contact and a movable board, with the movable contact assembled onto the movable board in a one-touch manner.

[0005] In order to solve the above problem, the invention of claim 1 provides, a slide switch apparatus having a movable contact, a movable board for supporting the movable contact, a fixed contact with which the movable contact is slidably contacted, a printed board for supporting the fixed contact, wherein the movable contact comprising: a gap in which the movable contact can be inserted in a direction perpendicular relative to a direction of sliding thereof; a step portion formed on an extension line of the gap and an engaging portion formed sectionally in valley form; and the movable contact comprising: a leadframe inserted in the gap; and a chatter preventive piece provided in the lead frame correspondingly to step portion and the engaging portion so as to be engaged with the step portion and the engaging portion.

[0006] The invention of claim 2 provides a slide switch apparatus wherein the movable board has the step portion and the engaging portion at opposite ends thereof.

[0007] The invention of claim 3 provides a slide switch apparatus wherein the chatter preventive piece is elastically fitted with the step portion of the movable board so as to prevent the movable contact from chattering in that rectangular direction.

[0008] The invention of claim 4 provides a slide switch apparatus wherein the chatter preventive piece is press-contacted with the engaging portion of the movable board so as to prevent the movable contact from chattering in that slide direction thereof.

[0009] The invention of claim 5 provides a slide switch apparatus wherein the movable board is coupled to a manual valve within an automatic transmission of an automotive vehicle.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

Fig. 1 is an exploded perspective view showing an embodiment of the present invention;

Fig. 2 is a perspective view showing the detail of a movable contact and movable board shown in Fig. 1;

Fig. 3 is a plan view showing a state that the movable contact shown in Fig. 1 is mounted on the movable board;

Fig. 4 is a sectional view taken on line B-B in Fig. 3;

Fig. 5 is a sectional view taken on line C-C in Fig. 3;

Fig. 6 is a perspective view of a slide switch apparatus that is assembled by one shown in Fig. 1;

Fig. 7 is a sectional view showing a conventional art; and

Fig. 8 is a sectional view showing another conventional art.

DETAILED DESCRIPTION OF THE INVENTION

[0011] The invention will be explained on an embodiment thereof with reference to Fig. 1 through Fig. 6. First, a printed board 1 is formed of a synthetic resin to have such resistance to heat and oil that can afford to withstand against use of being immersed in an high-temperature oil contained within an automatic transmission. The printed board 1 has five rows of fixed contacts 11 at a back surface 12 thereof. The fixed contacts 11 are portions over which a movable contact 2, hereinafter referred to, slides in contact therewith. A plurality of walls (not shown) are provided along the fixed contacts 11. These plural walls have dual functions to enhance insulation resistance between the fixed contacts 11 and to guide therealong a projection 31, hereinafter referred to, of the movable contact 3.

[0012] The printed board 1 has a connector 13 integrally formed therewith so that terminals (not shown) electrically connected to the fixed contacts 11 are projected to an inside of the connector 13. Further, the printed board 1 has several crimp portions 14 provided at locations in a periphery thereof. The crimp portions 14 are portions on which respective crimp pieces 53, hereinafter referred to, are to be crimped over.

[0013] Next, the movable contact 2 is a part that slides in contact over the fixed contact 11. The movable contact 2 has contact pieces 21 in number corresponding to the number of rows, i.e. five sets, of the fixed contacts alternately arranged. Each set of the contact pieces 21 is comprised by a pair. Also, the movable contact 2 has a chatter-preventive pieces 22, 23, 24, 25 and leadframes 26, 27.

[0014] The leadframe 26, 27 are portions to be inserted in gaps 37, to be stated in detail, and are formed by press-working a springy stainless steel sheet or the like into one body having the contact pieces 21. The chatter preventive pieces 22, 23, 24, 25 are provided in the leadframe 26 at locations corresponding to the step portions 32, 33 and the engaging portions 34, 35 of the movable board 3. By engaging the chatter preventive pieces 22, 23, 24, 25 with the step portions 32, 33 and the engaging portions 34, 35, the movable contact 2 is to be assembled on the movable board in a one-touch manner.

[0015] The movable board 3 is formed of a synthetic resin to have projections 31 for wiping over the surface of the fixed contact 11, gaps 37 extending in a direction perpendicular to a direction of sliding so as to receive therein the movable contact 2 in that perpendicular direction, step portions 32, 33 formed on an extension line of the gaps 37 and engaging portions 34, 35 formed sectionally in a valley-like form. Further, a metallic pin 36 engageable with an operating portion 4, hereinafter referred to, is insert-formed.

[0016] Here, explanation will be made on a procedure for assembling the movable contact 2 onto the movable board 3 in a one-touch manner. First, the leadframes 26, 27 of the movable contact 2 are inserted into the respective gaps 37, 38 of the movable board 3 in a direction of arrow A shown in Fig. 2. When the movable contact 2 is inserted by a certain amount, the second chatter preventive piece 23 is brought into abutment against the second step portion 33. As a result, the movable contact 2 cannot be inserted further.

[0017] At this time, the first chatter preventive piece 22 provided on the opposite side to the second chatter preventive piece 23 gets over the first step portion 32 to be elastically fitted with the movable board 3. In this manner, the movable contact 2 is prevented from chattering in the rectangular direction.

[0018] On the other hand, the third and fourth chatter preventive pieces 24, 25 are respectively become press-contacted with the first and second engaging portions 34, 35. To this end, the movable contact 2 is prevented from chattering in the slide direction.

[0019] Next, the operating portion 4 has a coupling portion 41 for being coupled to a manual valve (not shown) of an automatic transmission, an insertion portion for being fitted over by a guide block 6, hereinafter referred to, and an engaging hole 43 for being engaged with a pin 36 of the movable board 3. The engaging hole 43 is formed in an elongate hole that is long in a direction rectangular to the direction of movement of the movable board 3.

[0020] A frame member 5 is a part that is press-worked from a metallic plate. The frame member 5 is provided with an elongate hole 51 into which a pin 36 of the movable board 3 is inserted, a hole 52 provided corresponding to a hole 72 of a bracket 7, hereinafter referred to, and crimp pieces 53 for being crimped over respective crimp portions 14 of the printed board 1. The movable board 3 is accommodated in a space defined by the frame member 5 and the printed board 1. Incidentally, the width of the elongate hole 51 is set somewhat greater than the diameter of the pin 36.

[0021] The guide block 6 is a part interposed between the operating portion 4 and the printed board 1 so that the operating portion 4 is guided along a rail 15 provided in the printed board 1. The guide block 6 is provided with grooves 61, 62 into which respective insertion portions 42 of the operating portion 4 are inserted, and a recessed portion 63 into which the rail 15 of the printed board 1 is inserted.

[0022] The bracket 7 has holes 71 for attachment to a case of the automatic transmission, and holes 72 for attachment to the frame member 5. The bracket 7 and the frame member 5 are fixed by tightening nuts (not shown) through the holes 72 and the holes 52.

[0023] Then the operation of the above embodiment will be explained. The slide switch apparatus of this embodiment is installed, in a position of the direction of arrow UP shown in Fig. 6 taken upward, within the case

of the automatic transmission. The coupling portions 41 of the operating portion 4 are coupled with a manual valve and a detent lever (both not shown). Consequently, if a driver operates a shift lever (not shown) to actuate the detent lever, the manual valve and the operating portion 4 are responded to move to their corresponding shift positions. On this occasion, the movable board 3 coupled to the operating portion 4 through the pin 36 is moved together with the operating member 4 so that the movable contact 2 provided on the movable board 3 is switched over in contact position relative to the fixed contact 11. This enables the slide switch apparatus to operate switching in a manner corresponding to a shift position.

[0024] In this case, since the slide switch apparatus is installed, in the position directed upward of the arrow UP shown in Fig. 6 as stated before, within the automatic transmission case, the fixed contacts 11 of the printed board 1 is directed downward. As a consequence, foreign matters being adhered to the fixed contacts 11 fall due to the force of gravity, to be stripped off from the fixed contacts. To this end, the slide switch apparatus does not undergo poor insulation caused between the fixed contacts 11, even where it is used by immersion in an oil contaminated by mixed with conductive foreign matters within the automatic transmission.

[0025] The slide switch apparatus according to the invention provides a slide switch apparatus having a movable contact, a movable board for supporting the movable contact, a fixed contact with which the movable contact is slidably contacted, a printed board for supporting the fixed contact, wherein the movable contact comprising: a gap in which the movable contact can be inserted in a direction perpendicular relative to a direction of sliding thereof; a step portion formed on an extension line of the gap and an engaging portion formed sectionally in valley form; and the movable contact comprising: a leadframe inserted in the gap; and a chatter preventive piece provided in the lead frame correspondingly to step portion and the engaging portion so as to be engaged with the step portion and the engaging portion. Therefore, even where the slide switch apparatus is used in an ordinary manner or in a state of being immersed in a high-temperature oil, chattering can be prevented from occurring between the movable contact and the movable board. Furthermore, the movable board can be assembled onto the movable board in a one-touch manner.

[0026] Also, since the movable board has the step portion and the engaging portion at opposite ends thereof, an effect that the movable board is positively held at opposite end thereof is provided, in addition to the above effect.

[0027] Further, since the chatter preventive piece is elastically fitted with the step portion of the movable board, an effect that the movable contact is prevented from chattering in that rectangular direction is provided, in addition to the above effects.

[0028] Besides, since the chatter preventive piece is press-contacted with the engaging portion of the movable board, an effect is provided that the movable contact is prevented from chattering in that slide direction thereof is provided, in addition to the above effects.

[0029] In addition, since the movable board is coupled to a manual valve within an automatic transmission of an automotive vehicle, an effect that the shift position of the automatic transmission is detected with high accuracy, in addition to the above effects.

Claims

1. A slide switch apparatus having a movable contact (2), a movable board (3) for supporting said movable contact (2), a fixed contact (11) with which said movable contact (2) is slidably contacted, a printed board (1) for supporting said fixed contact (11), wherein

said movable contact (3) comprising:

a gap (37) in which said movable contact (2) can be inserted in a direction perpendicular relative to a direction of sliding thereof;

a step portion (32, 33) formed on an extension line of said gap (37) and an engaging portion formed sectionally in valley form; and

said movable contact (2) comprising:

a leadframe (26) inserted in said gap (37); and

a chatter preventive piece (22, 23, 24, 25) provided in said lead frame (26) correspondingly to step portion (32, 33) and said engaging portion (34, 35) so as to be engaged with said step portion (32, 33) and said engaging portion (34, 35).

2. A slide switch apparatus according to claim 1, wherein said movable board (3) has said step portion (32, 33) and said engaging portion (34, 35) at opposite ends thereof.
3. A slide switch apparatus according to claim 1 or 2, wherein said chatter preventive piece (22, 23) is elastically fitted with said step portion (32, 33) of said movable board (3) so as to prevent said movable contact (2) from chattering in that rectangular direction.
4. A slide switch apparatus according to claim 1, 2 or 3, wherein said chatter preventive piece (22, 23) is press-contacted with said engaging portion (34, 35) of said movable board (3) so as to prevent said

movable contact (2) from chattering in that slide direction thereof.

5. A slide switch apparatus according to claim 1, 2, 3 or 4, wherein said movable board (3) is coupled to a manual valve within an automatic transmission of an automotive vehicle.

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FIG. 1

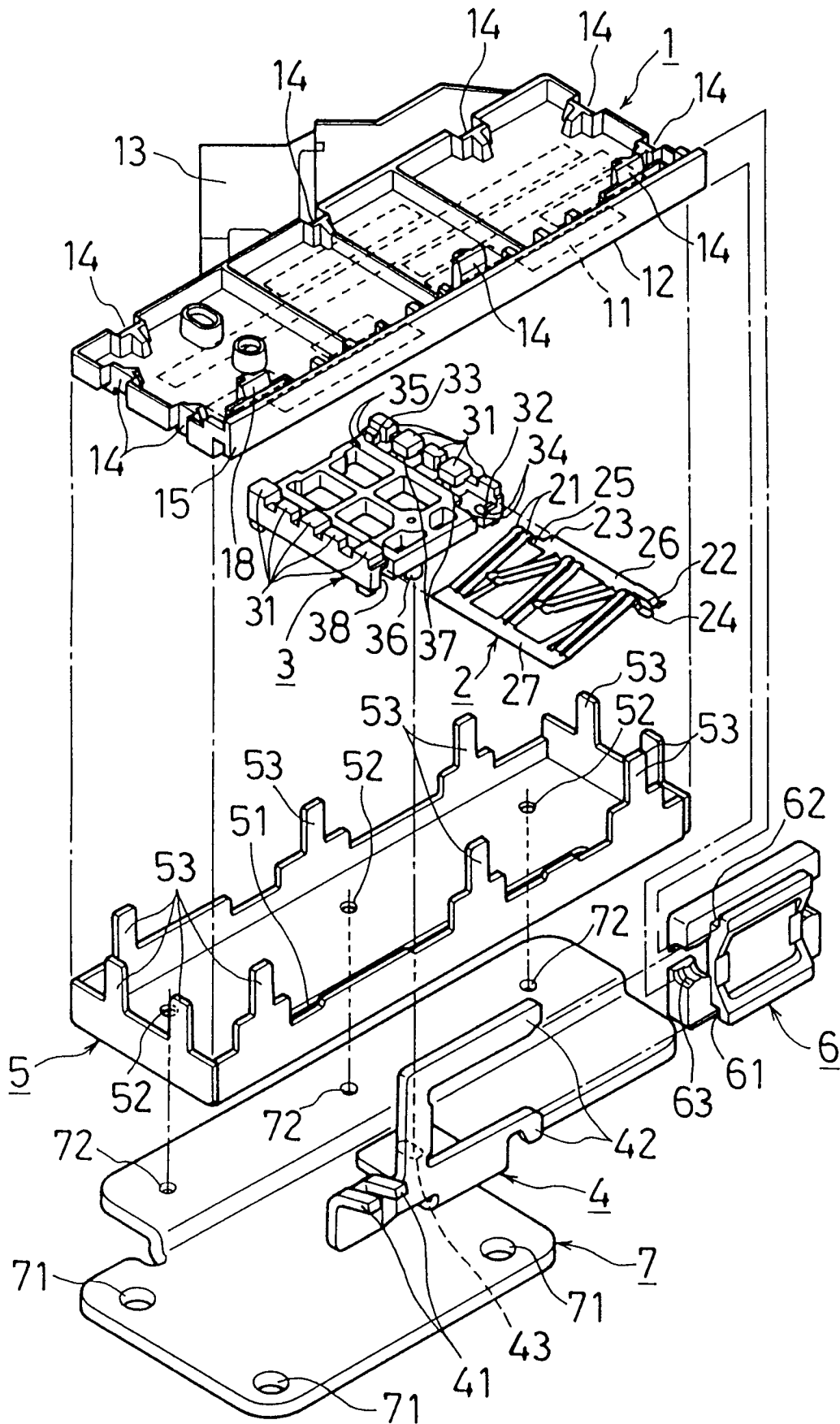


FIG. 2

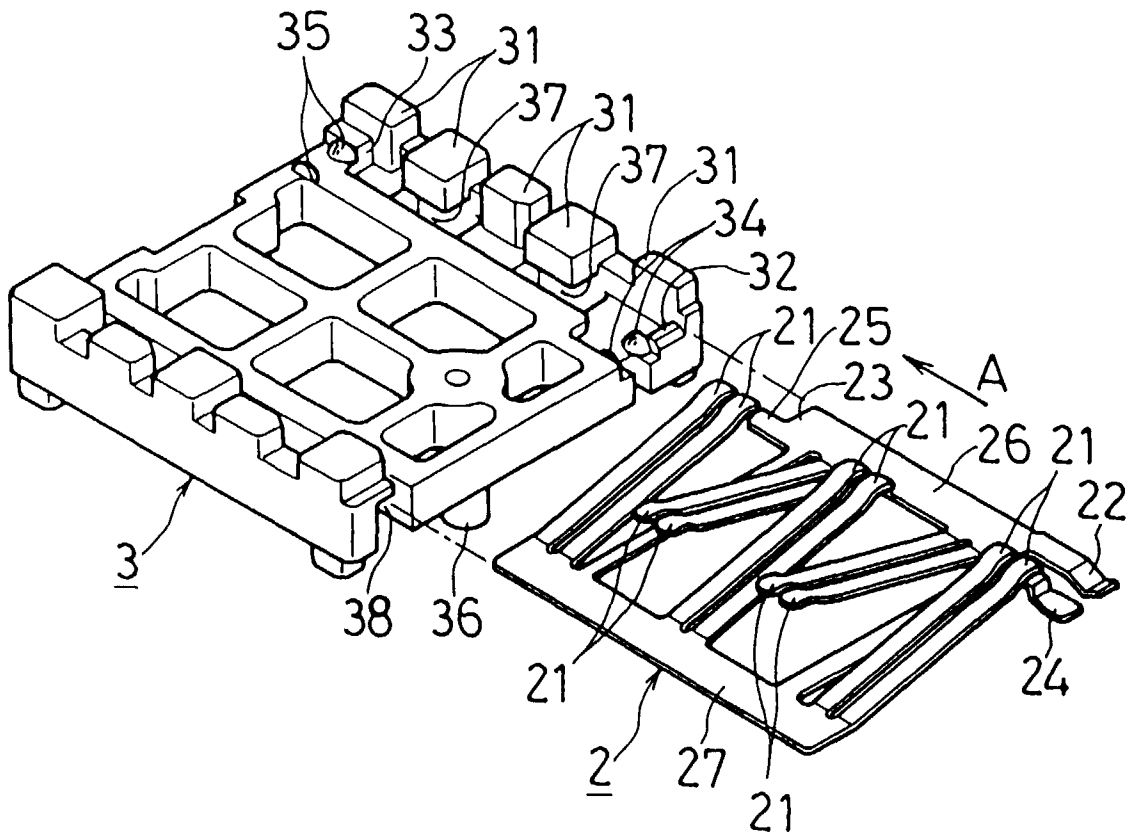


FIG. 3

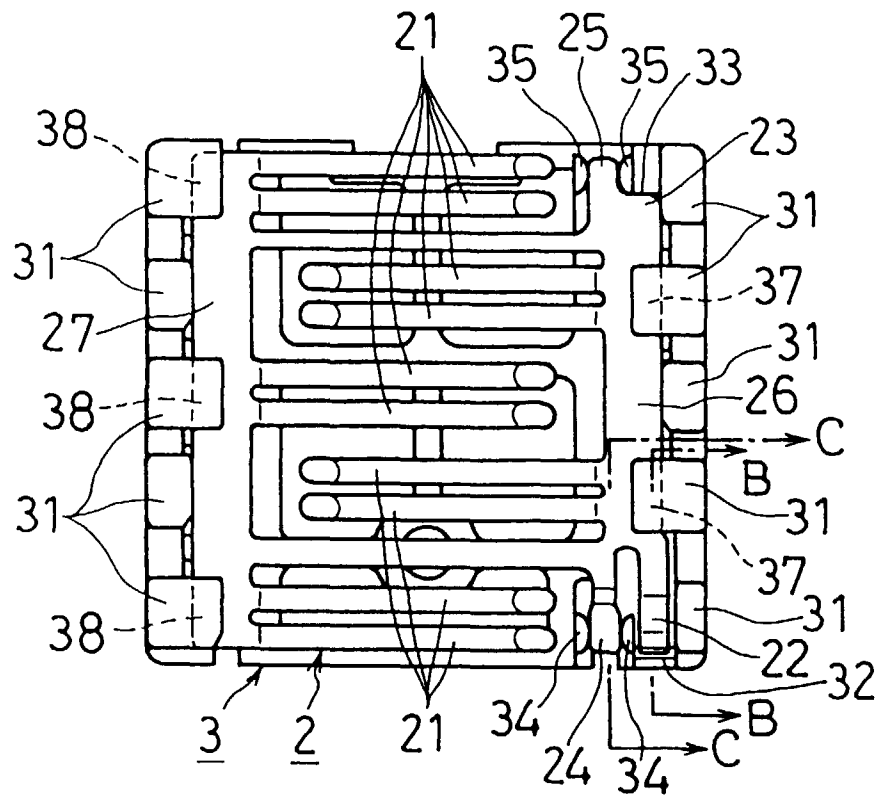


FIG. 4

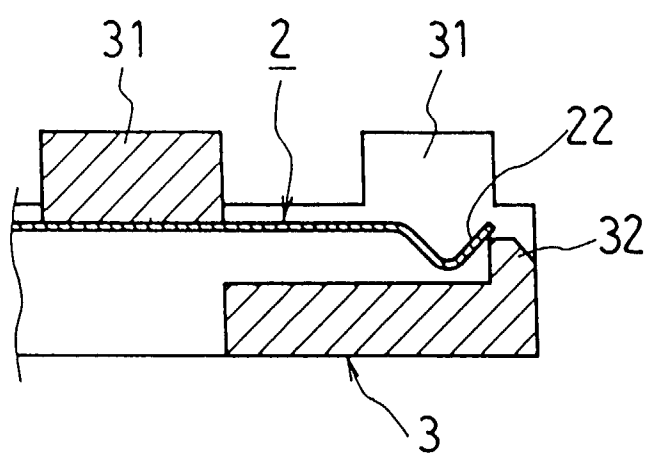


FIG. 5

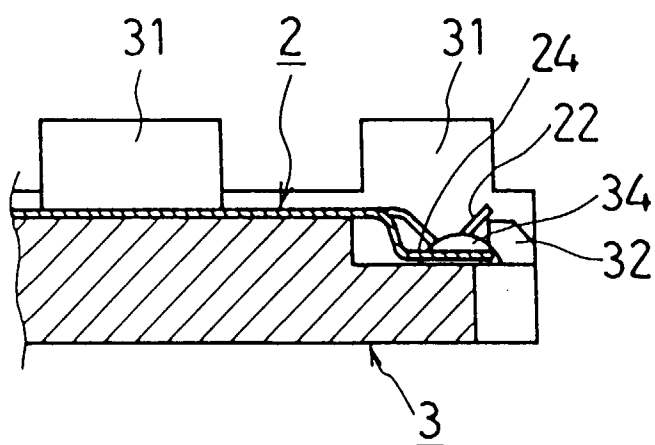


FIG. 6

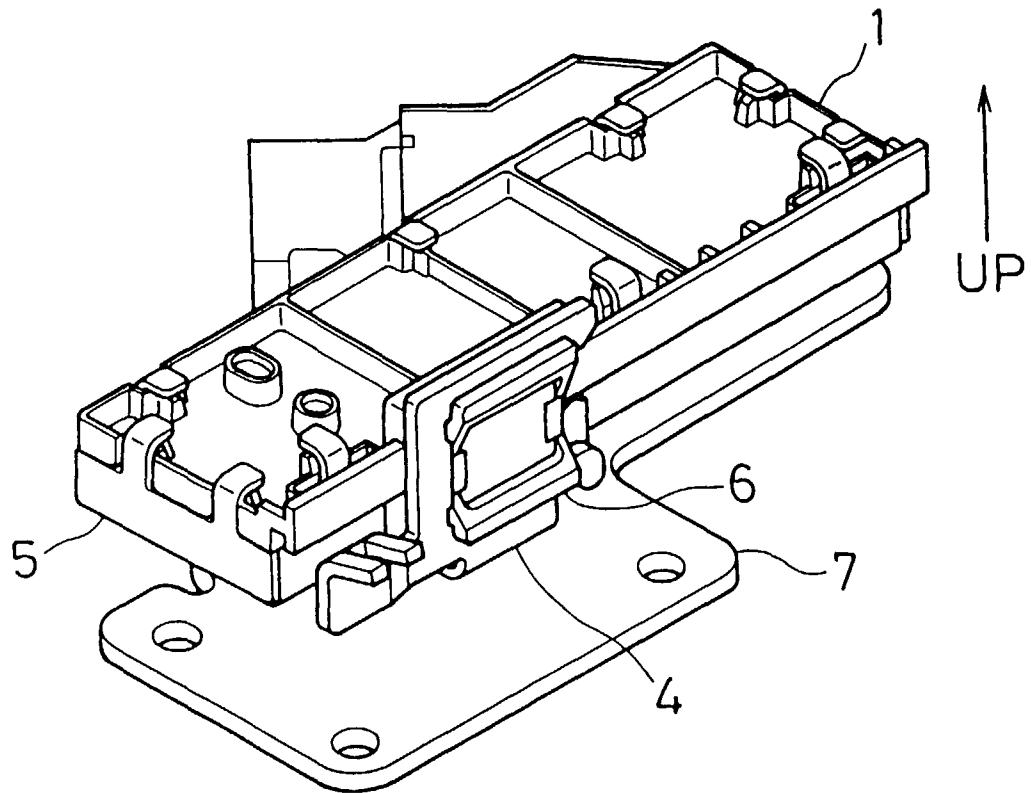


FIG. 7

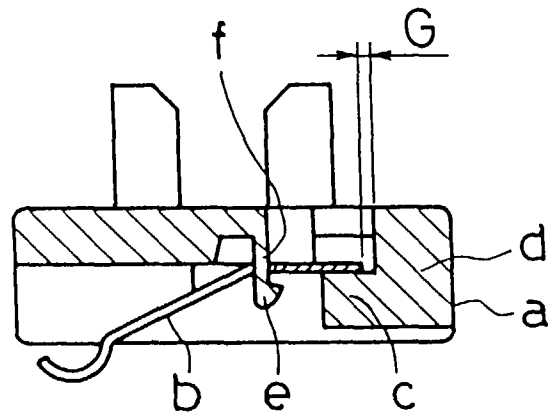
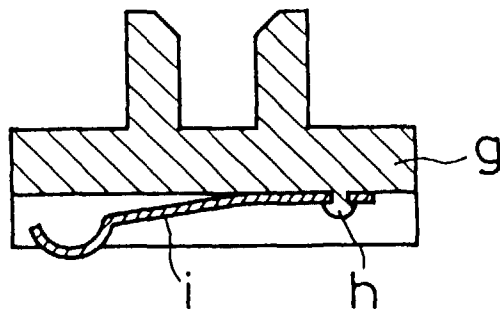


FIG. 8





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 98 10 2150

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	GB 2 276 271 A (TOYO DENSO KK) 21 September 1994 * page 23, paragraph 2 - page 26, paragraph 2; figures 9-13 *	1,2	H01H15/06 H01H11/06
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			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
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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 7 July 1998	Examiner Janssens De Vroom, P
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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 98 10 2150

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