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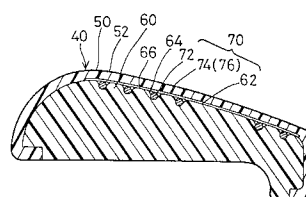
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London WC2B 6UZ (GB)(54) **TWO-LAYERED, FORMED TOILET SEAT AND METHOD OF MANUFACTURING SAME.**

(57) In manufacturing a heating toilet seat (40), a heater (72) is inserted into heater holding grooves (64) in a support base material (60), a heat-transfer sheet (74) is provided to cover the heater (72) and the support base material (60), and an adhesive sheet (76) is used to bond a heater unit (70) to the upper surface (62) of the support base material (60). Then a seat body (50) is laminatingly formed on the heat-transfer sheet (74) by injection molding. The heat-transfer sheet (74) covers irregularities of the heater (72) and is flush with the upper surface (62) of the support base material (60) to provide a smooth surface. Accordingly, a fused resin smoothly

flows at the time of injection molding of the heater toilet seat (40), and the heater (72) will not be displaced or moved to one side even under high injection pressure.

Fig. 4

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Field of the Invention

The present invention relates to a double layer molded toilet seat, where electric parts, such as a heater, are built-in by insertion forming and also relates to method of manufacturing the same.

Background Art

As shown on the plan in Figure 55 and on the section in Figure 56, which is a view on A-A in Figure 55, a conventional heated toilet seat 600 comprises a horseshoe shaped toilet seat main body 602, a heater 606 which is adhesively attached to an undersurface 604 of the forenamed toilet seat main body 602 with an adhesive sheet 609, and a bottom plate 608 which seals the bottom opening of the toilet seat main body 602. The toilet seat main body 602 is heated when electric power is supplied to the heater 606. Manufacturing of the forenamed heated toilet seat 600 is performed by sticking the heater 606 to the undersurface 604 of the toilet seat main body 602 with the adhesive sheet 609, or similar material, and then joining the bottom plate 608 to the bottom opening of the toilet seat main body 602 by induction fusion method or hot-plate fusion method.

Since a narrow space S is inevitably created between the bottom opening of the toilet seat main body 602 and the bottom plate 608 due to resin shrinkage and assembling efficiency, soiling will stick to the surfaces in the narrow space. Such soiling stuck to the surface around the narrow space cannot be easily removed by wiping with a damp cloth. Another problem is its shape. An ultrasonic horn and the bottom plate 608 are of a flat shape so as to transmit energy evenly. Such a flat shape, however, is not suitable from a design aspect and, moreover, the configuration affects the shape of the toilet seat main body 602 making it difficult to form it in a suitably round shape comfortable to sit on from a human engineering aspect.

As a resolution of such problems, insertion forming of a heater inside the toilet seat has been known as shown in the Japanese Utility Model Laying-open Gazette 61-13685 (1986). Such a heated toilet seat as shown in Figure 57 has grooves 624 on an upper surface 622 of a supporting base material 620 and each of the grooves 624 has a heater 626 inserted manually, which is then set on an injection molding die 630 to fill the cavity 632 with resin, and the toilet seat main body (not shown in the figure) is formed as a layer over the supporting base material 620 with the heater 626 inserted between the supporting base material 620 and the toilet seat main body. However, inserting the heater into the grooves 624 is a laborious operation. Another problem is that the heater 626

comes out of the grooves and onto the upper surface 622 because of the injection pressure so that some part of the toilet seat main body becomes thinner and consequently its strength is reduced.

Another conventional heated toilet seat is that disclosed in the Japanese Patent Laying-open Gazette 61-247426 (1986). The manufacturing method for this heated toilet seat is to set a perforated sheet type heater inside a die for injection molding to form a preformed body, where sheet type heater and PC board are made into a single body, and then to set the preformed body inside another die for injection molding to form the toilet seat main body layer over the sheet type heater. It is difficult, however, to manufacture an evenly heated toilet seat, which has a large area, utilizing such a thin sheet type heater. The surface of the heated toilet seat utilizing a sheet type heater cannot be heated evenly, and thus another problem is created.

When embedding other electric parts, such as thermistors and fuses, as well as heaters, inside the toilet seat, a problem of difficulty in inserting the various electric parts inside the toilet seat has been caused by the injection pressure of molten resin causing displacement of the electric parts from their set positions.

Disclosure of Invention

The purpose of the present invention is to solve problems in the prior art as described above and to present a double layer molded toilet seat made in a simple insertion forming process and having electric parts in prescribed positions without displacement, together with its manufacturing method.

The present invention of a double layer molded toilet seat with built-in electric parts is unique in that it comprises

a first layer molded with resin,

electric parts attached to the surface of this first layer,

a second layer formed by injection moulding, after the electric parts are attached, and

a flow controlling means which is positioned on an upper part of the first layer and in proximity to the forenamed electric parts and which is located at least on the side upstream of the molten resin injected to form the second layer so as to reduce the molten resin injection pressure on the electric parts.

The double layer molded toilet seat in the present invention has the electric parts attached to the surface of the first layer and the second layer is formed subsequently over the first layer so that the electric parts are inserted between the layers. The flow controlling means is located at least on

the side upstream of the molten resin flow which will form the second layer and also in proximity to the electric parts. The flow controlling means will prevent the electric parts from floating and deviating through reducing the molten resin injection pressure applied on the electric parts at the time of injecting the molten resin to form the second layer.

A slope formed on the upper surface of the first layer as its integral part can be utilized as a preferred configuration of the forenamed flow controlling means. Since the slope leads the molten resin flowing toward the electric parts over its smooth surface, so as to reach their upper parts, the injection pressure directly applied on the lateral sides of the electric parts is reduced. The structure and manufacturing of the slope which is formed as an integral part of the first layer is simple.

An alternative configuration of the forenamed flow controlling means is a recess which is formed so that the upper surface of the electric parts installed in it will be almost flush with the upper surface of the first layer; and when the electric parts are installed in this recess, the molten resin flows smoothly from the upper surface of the first layer onto the upper surface of the electric parts, without applying high injection pressure on the lateral side of the electric parts.

Another alternative configuration for the flow controlling means is the application of flexible sheet type material. Covering of the electric parts with such sheet type material will reduce injection pressure applied on the electric parts. Since the sheet type material is flexible, it can cover such electric parts whatever configuration they may have.

All kinds of electric parts can be utilized in so far as they are elements which effect electric function of the toilet seat. For example, limit switches, electrodes of capacitance type sensors, and piezo-electric sensors can be included. In the case of a heated toilet seat where a heater heats the toilet seat surface, thermal sensors to detect toilet seat surface temperatures, and thermal fuses as well as heaters, are included.

The double layer molded toilet seat is complete if it has a first layer and a second layer between which the electric parts are inserted. A preferred configuration, however, consists of a supporting base which is formed in a horseshoe shape and supported on an upper part of the toilet bowl as the first layer and the toilet seat main body which has a toilet seat surface, some part of which is thermally adhered to the top of the supporting base, as the second layer.

When the electric parts are inserted between the first layer and the second layer, joint strength tends to be reduced by the reduction in the fused area of the first and second layers caused by the

electric parts; but this reduction in the joint strength of the first and second layers is prevented by utilizing projections and recesses where the first and second layers are engaged and thermally adhered.

The electric parts need a connection terminal for power supply from an outside source and the connection terminal is suitably attached in the structure as follows. The connection terminal is fitted into and supported by a fitting hole formed in the first layer. The upper part of the connection terminal should be attached so as to protrude from the fitting hole. Since the second layer, injection molded over the first layer, secures the upper part of the connection terminal in the state of insertion, the connection terminal is attached at the same time as the second layer formation; and thus the structure and fitting operation is simplified.

The molten resin of the second layer tends to flow into the fitting hole if the inner diameter of the fitting hole is made much larger than the outer diameter of the connection terminal at the time of fitting and supporting of the connection terminal by the fitting hole. However, the molten resin flow into the space between the fitting hole and the connection terminal is prevented by sealing of the upper part of the connection terminal with a sheet type material and thus reducing the injection pressure applied to the space between the connection terminal and the fitting hole.

The present invention also comprises a manufacturing method for a double layer molded toilet seat with built-in electric parts; said method comprising:

a first step of forming a first layer,

a second step of forming a second layer by injecting molten resin so that said electric parts are inserted on said first layer, and

a third step of preparing a flow controlling means for reduction of molten resin injection pressure on said electric parts, said flow controlling means being positioned to a part on said first layer in a proximity of said electric parts and is located at least on a side upstream of said molten resin injected to form said second layer, before said second step.

The double layer molded toilet seat manufacturing method involves a process where the electric parts and the flow controlling means are mounted on the first layer before the second layer is formed in layers over the first layer by injection molding after the first layer is formed with resin. The flow controlling means, which is located at least on the side upstream of the molten resin flow injected for formation of the second layer so as to reduce the molten resin injection pressure, prevents positional deviation of the electric parts by such injection pressure and prevents generation of partially thin

parts in the second layer caused by deviation of the electric parts or similar parts.

In this case, since the flow controlling means is the highest in the vicinity of the gate for molten resin injection, it is desirable to locate it at a position close to the gate and on its upstream side.

The order of attaching the electric parts and the flow controlling means is not specified; a process to form a unit body where the electric parts and the flow controlling means are unified may be adopted or the flow controlling means may be attached after attaching the electric parts on the first layer.

Brief Description of Drawings

Figure 1 is an angled-view sketch of a western style toilet bowl mounted with a heated toilet seat according to an embodiment of the present invention.

Figure 2 is a plan of the heated toilet seat according to the embodiment.

Figure 3 is a plan of a supporting base inserted into the heated toilet seat.

Figure 4 is a sectional view along the line B-B in Figure 2.

Figure 5 is a magnified sectional view of a main part in Figure 4.

Figure 6 is an illustrative sketch showing a manufacturing method for a heater unit.

Figure 7 is an illustrative drawing showing a process for mounting the heater unit on the supporting base.

Figure 8 is a sectional view showing an injection molding process.

Figure 9 is an illustrative drawing of the injection molding process.

Figure 10 is a sectional view of a main part of a heated toilet seat according to an alternative embodiment.

Figure 11 is an illustrative sketch of a heater unit manufacturing process.

Figure 12 is an illustrative drawing showing a manufacturing process for the unit shown in Figure 10.

Figure 13 is an illustrative drawing of an injection molding process for the heated toilet seat.

Figure 14 is a sectional view of a heater unit according to another alternative embodiment.

Figure 15 is an illustrative drawing of a manufacturing process for a heated toilet seat according to the alternative embodiment.

Figure 16 is an illustrative drawing showing an example of deformation of the embodiment related to Figure 14.

Figure 17 is a sectional view of a heater unit according to an alternative embodiment.

Figure 18 is an illustrative drawing of a manufacturing process for a heated toilet seat according to the alternative embodiment.

Figure 19 is a sectional view of an example of alternative supporting base.

Figure 20 is a sectional view of an example of another alternative supporting base.

Figure 21 is a sectional view of an end of a heated toilet seat according to still another alternative embodiment.

Figure 22 is an illustrative drawing showing an alternative manufacturing method for the heated toilet seat.

Figure 23 is an illustrative drawing showing the alternative manufacturing method for the heated toilet seat.

Figure 24 is a plan of a heated toilet seat according to an alternative embodiment.

Figure 25 is a plan of a supporting base inserted into the heated toilet seat.

Figure 26 is a sectional view along the line C-C in Figure 24.

Figure 27 is a magnified sectional view of the main part in Figure 26.

Figure 28 is an illustrative drawing showing a heater covered with a heat transmitting sheet.

Figure 29 is a sectional view along the line D-D in Figure 24.

Figure 30 is a magnified sectional view of the main part in Figure 29.

Figure 31 is an illustrative sketch showing a heater unit manufacturing process.

Figure 32 is an illustrative drawing showing a process for mounting the heater unit on the supporting base.

Figure 33 is a sectional view showing the injection molding process in Figure 26.

Figure 34 is an illustrative drawing showing the injection molding process.

Figure 35 is an illustrative drawing showing the injection molding process as a top view of the heated toilet seat.

Figure 36 is an illustrative drawing showing the injection molding process related to an alternative embodiment as a top view of the heated toilet seat.

Figure 37 is an illustrative drawing showing a gate and its surroundings in the injection molding process for the alternative embodiment.

Figure 38 is an illustrative drawing showing a gate and its surroundings in the injection molding process for another alternative embodiment.

Figure 39 is an illustrative drawing showing a gate and its surroundings in the injection molding process for still another alternative embodiment.

Figure 40 is an angled-view sketch of a heated toilet seat and a toilet bowl main body.

Figure 41 is a sectional view of the surroundings of a cushion part of the heated toilet seat.

Figure 42 is a sectional view along the line E-E in Figure 41.

Figure 43 is an illustrative drawing showing an attachment process for a terminal part shown in Figure 41.

Figure 44 is an illustrative drawing showing the structure in the vicinity of the terminal part shown in Figure 41 and its attachment process for it.

Figure 45 is a sectional view of a connector in its disconnected state.

Figure 46 is a sectional view of the connector in its connected state.

Figure 47 is an illustrative drawing showing a manufacturing process for the cushion part and the part surrounding the connector.

Figure 48 is a sectional view of an alternative manufacturing method for the cushion part.

Figure 49 is a frontal view of a connector unit having a different structure and its surroundings.

Figure 50 is a sectional view of the connector unit and its surroundings.

Figure 51 is a sectional view along the line F-F in Figure 50.

Figure 52 is a sectional view of a connector with a different structure in a disconnected state.

Figure 53 is a sectional view of the connector of Fig. 52 in a connected state.

Figure 54 is a sectional view along the line G-G in Figure 53.

Figure 55 is a plan of a conventional heated toilet seat.

Figure 56 is a sectional view along the line A-A in Figure 55.

Figure 57 is an illustrative drawing showing a manufacturing process for a conventional heated toilet seat.

Figure 1 is an angled-view sketch showing a western style toilet bowl 20 mounted with a heated toilet seat according to an embodiment of the present invention. As shown in Figure 1, the western style toilet bowl is equipped with a toilet bowl main body 22, a heated toilet seat 40 with a toilet bowl lid 26 pivotably supported at an end of the toilet bowl main body 22, a sanitary washing unit 30, and a flush water tank 28.

The forenamed heated toilet seat 40 is equipped with a horseshoe shaped toilet seat main body 50, shown in Figure 2, and a supporting base 60, shown in Figure 3, which is insertion formed inside the toilet seat main body 50. Figure 2 is a plan of the toilet seat main body 50 and Figure 3 is a plan of the supporting base 60; Figure 4 is a sectional view along the line B-B shown in Figure 2. On the upper surface 62 of the supporting base 60, shown in Figure 3, a heater attachment groove 64 is formed in the configuration shown with the broken line. On the upper surface 62 between the heater attachment grooves 64 and on the surround-

ing parts, the adhesion attachment surface 66 is formed.

The forenamed toilet seat main body 50 is formed with ABS resin which has a melting point of 200 degrees Celsius or PP resin which has a melting point of 180 degrees Celsius, and the supporting base 60 is formed with the same resin. Therefore, when the molten resin for formation of the toilet seat main body 50 comes into contact with the supporting base, the surface of the supporting base 60 melts with the injected resin and is thoroughly adhered with the main body. Although the molten resin melts the surface of the supporting base 60 when it comes into contact with the supporting base 60, the temperature of the molten resin is reduced by contact and thus the body of the supporting base 60 will not melt. Utilization of ABS resin or PP resin realizes favorable appearance and low manufacturing costs.

As Figure 5 shows, a heater unit 70 is located between the upper surface 62 of the supporting base 60 and the toilet seat main body. The heater unit 70 is equipped with a heater 72 which is inserted into the heater attachment groove 64, a heat transmitting sheet 74 made of aluminum foil, and an adhesive sheet 76 made of double sided adhesive tape attached to the heat transmitting sheet 74; the heat transmitting sheet 74 and the adhesive sheet 76 cover almost the entire area of the upper surface 62 and thus retain the heater 72 inside the heater attachment groove 64.

The following description is of a manufacturing method for the heated toilet seat 40.

Firstly, the supporting base 60 shown in Figure 3 is manufactured by injection molding. As shown in Figure 6, the first adhesive face 77 which is one side of the adhesive sheet 76 is attached to the lower surface of the heat transmitting sheet 74 and then the second adhesive face 78, which is the other side, is attached to the heater 72. A supporting table 100 is utilized for the operation. A number of positioning pins 102 are mounted on the supporting table 100, and move up and down on springs. The positioning pins 102 are arranged so as to follow the shape of the heater attachment groove 64 on the supporting base 60. Next, the heater 72 is laid between the positioning pins 102 and then the adhesive sheet 76, which is attached to the heat transmitting sheet 74, is pressed onto the side of the heater 72 with a sheet pressing device (not shown in the figure). This operation presses the positioning pins 102 downward and thus the heater 72 is attached to the adhesive sheet 76. When the heat transmitting sheet 74 and the adhesive sheet 76 are lifted up, the heater 72 and the heat transmitting sheet 74 are stuck together by the adhesive sheet 76 making an integral unit. The upper end surface of each positioning pin

102 is coated with Teflon or similar material making it easy to remove from the second adhesive face 78 of the adhesive sheet 76.

In the next step, shown in Figure 7, the heater 72 of the heater unit 70 is inserted into the heater attachment groove 64 on the supporting base 60 and then the second adhesive face 78 of the adhesive sheet 76 is attached to the adhesion attachment surface 66 of the supporting base. After this, as shown in Figure 8, the supporting base 60, which the heater unit 70 or similar devices are mounted on, is placed between an upper mold 112 and a lower mold 114 which compose a metal mold 110 for an injection molding machine. At this time, a cavity 115 is formed between the heat transmitting sheet 74 and the wall of the upper mold 112. Following this, the molten resin R is filled inside the cavity 115 through a gate 116, as shown in Figure 9. Then, after cooling and solidification, the resin formed body is released from the mold, thus completing manufacture of the heated toilet seat 40.

In the forenamed embodiment, the heater 72 is inserted into the heater attachment groove 64 on the supporting base 60 and covered with the heat transmitting sheet 74. Thus the heat transmitting sheet 74 gives a smooth surface to the heater 72 and simultaneously firmly sticks it to the upper surface 62 of the supporting base 60 with the adhesive sheet 76 between them. Therefore, the heater 72 will not be displaced or pushed to one side by the injection pressure of the molten resin R at the time of injection molding. Consequently, there will be no partial thinning in the toilet seat main body 50 resulting from deviation of the heater 72 and thus there will be no reduction in strength resulting from the thinning.

Since the heat transmitting sheet 74 which retains the heater 72 is formed with aluminum foil, heat from the heater 72 is efficiently transmitted to the toilet seat surface 52 with insignificant heat loss.

Moreover, in the process of attaching the heat transmitting sheet 74 to the heater 72, the heater 72 is adhesively attached to the surface of the heat transmitting sheet 74 in the arrangement along the heater attachment groove 64 if the heat transmitting sheet 74 and the adhesive sheet 76 are pressed onto the heater 72 while the heater 72 is positioned between positioning pins 102 on the supporting table 100. Therefore, if the heater attachment groove 64 is formed in a little larger size, there will be no such difficulties as inserting the heater 72 into a narrow groove 64; thus the heater attachment operation will be a simple one. If, however, the heater attachment groove 64 is narrow, adhesive material with lower adhering strength may be utilized, and thus the operation of attaching the

heater unit 70 can still be done easily.

The toilet seat main body 50 and the supporting base 60 are made into an integral unit by insertion forming and thus it is easily cleaned with no space in the joint. The heated toilet seat 40 itself can take various configurations unrestricted by the configuration of the supporting base 60; therefore, the seat can be manufactured with a superbly comfortable configuration as well as an excellent design.

The next paragraphs describe alternative embodiments according to the present invention. Figure 10 is a sectional view of a magnified main part of a heated toilet seat 40A according to an alternative embodiment. As Figure 10 shows, a heater attachment groove 64A is formed in a supporting base 60A of the heated toilet seat 40A. Two heaters 72A of the heater unit 70 are inserted into the heater attachment groove 64A and the space between the two heaters 72 forms a heater-bound recess 70a. A projection on the toilet seat main body 50A engages with this heater-bound recess 70a.

To manufacture the forenamed heated toilet seat 40A, a heater unit 70A is manufactured first. As Figure 11 shows, positioning pins 102 are arranged in 2 rows on a supporting table 100A. The distance between the rows of these positioning pins is almost equal to that of the two heaters 72 to be attached inside the heater attachment grooves 64A. Next, the heat transmitting sheet 74 and attached adhesive sheet 76 are placed on the positioning pins 102 for the heaters 72, and then pressed onto the heaters 72 with a sheet pressing device 104. There is a forming groove 104a in the sheet pressing device 104. Thus, the heaters 72 are attached to the heat transmitting sheet 74 in Figure 12 by the adhesive sheet 76 simultaneously to form the heater unit 70A which has a heater-bound recess 70a in the shape of the forming groove 104a.

In the next step, the heaters 72 of the heater unit 70A are inserted into the heater attachment groove 64A in the supporting base 60A and attached to the wall of the heater attachment groove 64A by the adhesive sheet 76. The bottom part of the heater-bound recess 70a is adhesively attached to the bottom surface of the heater attachment groove 64A. Since the heater attachment groove 64A has a cross section area somewhat larger than that of the two heaters 72, inserting the heaters 72 is a simple operation.

The next step, shown in Figure 13, is injection molding with the supporting base 60A, attached with the heater unit 70A, set on the metal mold 110. At this time, the molten resin R fills a cavity 115A, flowing first through a flat part 115a of the heat transmitting sheet 74, and then gradually fills

the recess 115b formed by the heater-bound recess 70a. Therefore, the injection pressure is low when the molten resin R fills the recess 115b, and thus the heaters 72 will not be displaced from the heater attachment groove 64A and generation of a thin part in the toilet seat main body 50A is prevented.

The heater unit 70 or 70A in the embodiments, shown in Figures 1 through 13, has a structure where the adhesive sheet 76 is attached to one side of the heat transmitting sheet 74 and then the heater(s) 72 is attached to the adhesive sheet 76 but this is not the only possible structure. As shown in Figure 14, the heaters 72 may be placed between the heat transmitting sheet 74B and the adhesive sheet 76B. In this case, as shown in Figure 15, the second adhesive face 78B of the adhesive sheet 76B is attached also to the inner side of the heater attachment groove 64, so that the adhesion strength and the heat transmitting efficiency are increased with the heaters 72 in direct contact with the heat transmitting sheet 74B. As Figure 16 shows, the insertion operation is made easier if the adhesion attachment surface 66B between the heater attachment grooves 64B is made a littler lower than the upper surface 62.

As Figures 17 and 18 show, a heat insulation sheet 79 made of polyester or similar material may be placed between a heat transmitting sheet 74C and an adhesive sheet 76 C. This will prevent heat transmission to the side of the supporting base 60, and this effects a greater increase in the heat transmission efficiency from the heaters 72 to the toilet seat surface. In this case, a part of the heat insulation sheet may be cut away to attach the adhesive sheet 76C directly to the heat transmitting sheet 74 so as to reinforce the three layer structure.

In Figure 19, a supporting base 60E which is inserted into the toilet seat main body 50E has a hollow structure. In this embodiment, since the heated toilet seat 40E itself is made with less weight per unit volume and thus in a larger volume with the same amount of material, it gives an impression of higher quality by its sense of volume. If a cushion part 150 is located under the bottom part 69 of the supporting base 60E, the height of the toilet seat main body is made lower than when the cushion part 150 is directly formed under the top part 62E and cleaning the area around the joint of the cushion part 150 can be facilitated.

As Figure 20 shows, a toilet seat main body 50F may be formed around the entire circumference inclusive of the bottom part 69 of the supporting base 60F. This will increase much more the design quality of the product.

Figure 21 shows a sectional view of an end of an alternative heated toilet seat 40G. If a heat transmitting sheet 74G is placed between a supporting base 60G and a toilet seat main body 50G, joint strength tends to be decreased; to prevent this, the following variety of structures are adoptable:

1) A structure where windows 75 are formed by cutting away some parts of the heat transmitting sheet 74G, and the toilet seat main body 50G and the supporting base 60G are thermally adhered to form a single body through these windows 75.

2) Together with formation of windows 75 in the heat transmitting sheet 74G, a recess 63 is formed on the upper surface 62 of the supporting base 60G so as to match one of the windows 75. At the time of injection molding to form the toilet seat main body 50G, the molten resin flows into the recess 63 through the window 75 and forms a projection 53. This will increase the joint area of the toilet seat 50G and the supporting base 60G.

3) A recess 67 is formed in an end part of the supporting base 60G. At the time of injection molding to form the toilet seat main body, the molten resin flows into the recess 67 and forms a retaining part 58 as a part of the toilet seat main body 50G to retain the end of the supporting base 60G. This will increase the joint area of the toilet seat 50G and the supporting base 60G.

4) A sheet material made of aluminum and coated with resin on its both sides is utilized as the heat transmitting sheet 74, to make the toilet seat main body 50G adhere strongly to the adhesive sheet 76 through improvement of fusing efficiency of resin by the resin coating.

Figures 22 and 23 show a manufacturing method for the heated toilet seat where no extrusions are generated at the joint of the supporting base and the toilet seat main body. A metal mold 110H on the injection molding machine is equipped with an upper mold 112H, a lower mold 112 and a sliding mold 118; and the sliding mold 118 is located at a joint 60h of a supporting base 60H and the toilet seat main body and constructed so as to be slid up and down in the direction indicated by an arrow in the figure. At the time of injection molding, the molten resin R injected to fill a cavity 115H reaches the sliding mold 118 and a high resin pressure at the initial injection stage is applied to the sliding mold 118, and then the sliding mold is slid downward. The molten resin R fills the cavity 115H gradually after removal of the sliding mold 118. That is, when the molten resin R comes to the joint 60h of the supporting base 60H, the high resin pressure of the initial injection stage is applied first to the sliding mold 118 and, after

reduction of the resin pressure, the molten resin R directly comes to a direct contact with the joint 60h on removal of the sliding mold 118 and fills the cavity 115H. Therefore, the molten resin R does not have a high injection pressure at the joint 60h of the supporting base 60 and the toilet seat main body, and thus no extrusions are generated at the joint 60h of the supporting base 60H and the toilet seat main body.

Figures 24 through 35 show an alternative embodiment.

A heated toilet seat 40L is equipped with a horseshoe shaped toilet seat, shown in Figure 24, and a supporting base 60L insertion formed inside the toilet seat main body 50L, shown in Figure 25. Figure 24 is a plan of the heated toilet seat 50L; Figure 25 is a plan of the supporting base 60L; Figure 26 is a sectional view along the line C-C in Figure 24; Figure 29 is a sectional view along the line D-D line in Figure 24. A flat surface 62La for heater attachment is formed on the top surface 62L of the supporting base 60L shown in Figure 25. A hindering projection 62Lb is formed at an end of the supporting base 60L shown in Figure 29.

As shown in Figure 26 and its magnified drawing Figure 27, a heater unit 70L is installed between the upper surface 62L of the supporting base 60L and the toilet seat main body. The heater unit 70L is equipped with a heater placed on the heater attachment flat surface 62La of the supporting base 60L, a heat transmitting sheet 74L which is made of aluminum foil with slight suitable high rigidity and a double sided adhesive sheet 76L adhesively attached to this heat transmitting sheet 74L; the heat transmitting sheet 74L and the adhesive sheet 76L covers an upper surface of the heater 72L and also almost the entire surface of the upper surface 62L of the supporting base 60L. The heat transmitting sheet 74L, as Figure 27 shows, has a hill shape with gently inclined slopes 74La when it is covers the heater 72L. As Figure 28 shows, the vertex angle θ of the inclined surface ranges from 90 to 130 degrees. The heat transmitting sheet 74L covers the heater 72L almost entirely in a hill shape with gently inclined slopes except the heater lead end 72La which is covered together with a narrow hindering projection 62Lb, as in Figure 30, a magnified drawing of the main part of Figure 29. Some parts of the heat transmitting sheet 74L and the adhesive sheet 76L are cut away to form windows, not shown in the figure, to enhance unity of the supporting base 60L and the toilet seat main body 50L.

The following description is of a manufacturing method for the heated toilet seat 40L.

Firstly, the supporting base 60L shown in Figure 25 is manufactured by injection molding. In a separate manufacturing process, as shown in Fig-

ure 31, a first adhesive face 77L, which is one side of the adhesive sheet 76L, is attached to the lower surface of the heat transmitting sheet 74L and a second adhesive face 78L is attached to the heater 72L. The supporting table 100L is utilized for this operation. A number of positioning pins 102 are mounted on the supporting table 100L, and move up and down on springs. The positioning pins 102L are arranged so as to follow the arrangement of the heater 72L to be laid on the supporting base 60L. Next, the heater 72L is laid between the positioning pins 102L and then the adhesive sheet 76L, which is attached to the heat transmitting sheet 74L, is pressed onto the side of the heater 72L with a sheet pressing device (not shown in the figure). This operation presses the positioning pins 102L downward and thus the heater 72L is attached to the adhesive sheet 76L. In the next step, when the heat transmitting sheet 74L and the adhesive sheet 76L are lifted up, the heater 72L and the heat transmitting sheet 74L are attached together by the adhesive sheet 76L making an integral heater unit 70L. The upper end face of each positioning pin 102L is coated with Teflon or similar material making it easy to remove from the second adhesive face 78L of the adhesive sheet 76L.

In the next step, as shown in Figure 32, the heater 72L of the heater unit 70L is mounted on the supporting base 60L and then the second adhesive face 78L of the adhesive sheet 76L is attached to the adhesion attachment surface 62L of the supporting base. At this time, the heat transmitting sheet 74L is raised at the part of the heater 72L (Figure 28). However, sheet material with a comparatively high rigidity is utilized, creating gentle slopes 74La which are adhesively attached to the heater attachment flat surface 62La. The heat transmitting sheet 74L which covers a heater lead 72La of the heater 72L also covers the narrow hindering projection 62Lb of the supporting base 60L (see Figure 30).

After this, as shown in Figure 33, the supporting base 60L, which the heater unit 70L or similar devices are mounted on, is placed between an upper mold 112L and a lower mold 114L which compose a metal mold 110L for an injection molding machine. In this state, the position of a gate 116L of the metal mold 110L is positioned in a place opposing the narrow hindering projection on the supporting base 60L. When the supporting base is placed, a cavity 115L is formed between the heat transmitting sheet 74L and the wall of the upper mold 112L. Following this, the molten resin R is filled inside the cavity 115L through the gate 116L (Figure 34). The molten resin R flows from the gate 116L in the direction indicated by the arrows in Figure 35 and fills the cavity 115L. Then, after cooling and solidification, the resin formed

body is released from the mold. Finishing operations, such as connecting the fuses which are not shown in the figure, complete the manufacture of the heated toilet seat 40L.

In the forenamed embodiment, since the heat transmitting sheet 74L covers the heater 72L on the supporting base 60L in a hill shape with gentle slopes, the molten resin R injected through the gate 116L flows smoothly over the heat transmitting sheet 74L as shown in Figure 34. Therefore, the heater 72L will not be displaced or pushed to one side by high injection pressure of the molten resin R not being directly applied to the heater 72L, there will be no partial thinning in the toilet seat main body 50L resulting from deviation of the heater 72L and thus there will be no reduction in strength resulting from the thinning. Moreover, since the prescribed procedure requires formation of the heat transmitting sheet 74L with a sheet material of comparatively high rigidity for covering the heater 72L with the heat transmitting sheet 74L in wide and gentle slopes, the structure and manufacturing operations are simple.

Since the heat transmitting sheet 74L which retains the heater 72L is formed with aluminum foil, heat from the heater 72L is efficiently transmitted to the toilet seat surface 52L with insignificant heat loss.

Moreover, the injection pressure applied to the supporting base in the proximity of the gate 116L in the embodiment described above is high, but the narrow hindering projection 62Lb located in a position close to the gate 116L prevents application of a high injection pressure of the molten resin to the heater lead 72La of the heater 72 and thus prevents displacement of the heater lead 72La

In the forenamed embodiment, the gate 116L of the metal mold 110L is located on the outer rim of the supporting base 60L and the narrow hindering projection 62Lb is located at a part of the supporting base opposing this gate 116L. However, as shown in Figure 36, if a gate 116M is located on the inner wall, the molten resin R will flow in the direction indicated by arrows; therefore, a narrow hindering projection 62Mb needs to be located on the inner wall which opposes the gate 116M, as shown in Figure 37.

Figure 38 shows an injection molding process for manufacturing of a heated toilet seat in another alternative embodiment. On the surface of the supporting base 60 in proximity of a gate 116N, a heater attachment groove 63Nb is formed, and the heater lead 72La of the heater 72L is retained in such heater attachment groove 63Nb as this. Since the heater lead 72La is securely retained by the heater attachment groove 63Nb, it will not be displaced by high injection pressure of the molten resin R through the gate 116N. Insertion operation

of the heater lead 72La into the heater attachment groove 63Nb is required only in the proximity of the gate 116N, and is not required over the entire surface of the supporting base 60N, and it does not require much labor. Besides the single heater attachment groove 63Nb formed in the proximity of the gate 116N, a plurality of heater attachment grooves 63Pb may be formed as in Figure 39 so as to match the injection pressure and the resin flows to make such heater attachment grooves 63Pb retain the heater lead 72La.

A variety of ways of covering a heater with a heat transmitting sheet may be adopted, other than forming the heat transmitting sheet with aluminum foil with a high rigidity. Utilization of an adhesive sheet with rigidity or filling the joints of the heater and the supporting base with resin plaster or similar material and then covering them with a heat transmitting sheet are possibilities.

The following paragraphs describe the fuse attachment structure for the heater unit 70 to be attached to the heated toilet seat 40. As shown in Figure 40, four cushion parts 150 which come in contact with the toilet bowl main body are formed on the back of the heated toilet seat 40. Of these cushion parts, a cushion part 150A stores a fuse 180 as shown in sectional views in Figures 41 and 42. That is, the cushion part 150A is equipped with a projection 152, which has a storage space 154 that is created as an integral body having an oval sectional shape protruding from the lower part of the supporting base 60, and a cushion element 190 which is attached to the opening of the storage space 154 by a pressure-inserted stopper plug part 192.

Through attachment holes 156a and 156b are formed in the upper part of the cushion part 150A, and run through from the storage space 154 to the upper surface 62 of the supporting base 60, the lower part of which is a throttled part 162 (see Figure 43). Terminals 170a and 170b are pressure-inserted into the through attachment holes 156a and 156b. As shown in Figure 44, the terminals 170a and 170b is equipped with an upper terminal part 171 which is connected to the lead 72a (72b) of the heater 72, a swollen part 172 and a lower terminal part 173. The swollen part 172 pressure-contacts the forenamed throttled part 162 to seal the lower part of the through attachment holes 156a and 156b. Insulation tape is adhesively attached to prescribed positions of the upper surface 62 where the leads 72a and 72b and the terminals 170a and 170b are placed. The insulation tape is adhesively attached to the cutaway parts in the heat transmitting sheet 74 to prevent entry of the molten resin into the attachment holes 156a and 156b at the time of injection molding.

The fuse 180 for excess current prevention for the heater 72 is connected by the terminal part 182 to the lower terminal parts 173 of the forenamed terminals 170a and 170b. This fuse 180 is molded in resin filler 184 made of silicone rubber or similar material and insulated from moisture or other outside agent.

The structure of the cushion part 150A permits storage of the fuse 180, utilizing the storage space 154 in the cushion part 150A, and thus the attachment structure is simpler than that for the fuse 180 which is attached outside.

As shown in Figure 44, the end of the terminal 170a and 170b respectively forms a swollen part 172 and completely seals the through attachment holes 156a and 156b by tightly contacting the throttled part 162, and thus the molten resin cannot enter the storage space 154 at the time of injection molding.

A connector unit which can be detached from the heater 72 of the heated toilet seat is explained below and illustrated in Figures 45 and 46.

A connector unit is installed in an end part 40a of the heated toilet seat (see Figure 2) for connection of the heater to the external power source by a cable 220. Figure 45 shows the disconnected state of the connector unit 200 and Figure 46 shows the connected state. As shown in Figure 45, the connector unit 200 comprises a male connector 210 which is installed at the lower end of the supporting base 60 and a female connector 230 which can be detached from this male connector 210. The male connector 210 is equipped with a bushing 212 which is thrust into a supporting part 61 at an end of the supporting base. A stepped projection 215 and four through attachment holes 214a, 214b, 215a and 215b (see Figure 47) are formed in the bushing 212; male terminals 216a and 216b are pressure-inserted into the through attachment holes 214a and 214b, and male terminals 217a and 217b which are connected to a thermistor 310 are pressure-inserted. Two narrow retaining projections 218, each of which has an engagement part 218b at its end, protrude at the outer circumferential end of the bushing 212.

The female connector 230 is equipped with a case 240 and a plug 250 which is stored inside the case 240. The plug 250 is equipped with an immovable component 260, a movable component 270 and a stopper component 280. At the front end of the forenamed case 240, an engagement retainer 244, which is to engage with an engagement cavity 219 on the side of the male connector 210, is formed. At the rear end of the case 240, a through hole 242 which runs so that the cable 220 can be freely slid through are formed. The cable 220 is movable inside the through hole 242 together with the plug 250 but the movement is

limited by a stopper 222.

The cable 220, a connection cable 224 and female terminals 226 are contained in the forenamed immovable component 260 by resin molding, and a slide cavity 262 is formed on the side of the female terminals 226. The movable component 270 fits into the slide cavity 262 so as to slide freely, but the motion of the movable component 270 is limited by a stopper component 280 which is fixed on the outer circumference of the immovable component 260.

A guide groove 264 and a guide cavity 266 are formed at the bottom of the slide cavity 262 in the forenamed immovable component 260, and guide projections 272 and 274, which are formed on the movable component 270, fit into the guide groove 264 and the guide cavity 266 so as to slide freely. Springs 292 and 294 are located inside the guide groove 264 and the guide recess 266, and exercise spring force for sliding the movable component 270 against the immovable component 260. The slide of the movable component 270 is limited by the projection 282 on the stopper component 280. Relay terminals 300 each of which has a male terminal 302 and female terminal 304 are resin molded into the movable component 270. The forenamed male terminal 302 is made to be disconnectable from the female terminal 226 and the female terminal 304 is disconnectable from the male terminal 216a, 216b, etc.

The following paragraphs explain connecting operations of the forenamed connector unit 200.

In the disconnected state shown in Figure 45, the plug 250 moves to the left in the figure together with the cable 220 till it contacts the stopper 222, and the plug 250 is free inside the case 240. The movable component 270 is moved away from the immovable component 260 by the spring force of the springs 292 and 294, and the male terminals 302 and the female terminals 226 are in the disconnected state.

When bringing the connector unit 200 from a disconnected state to a connected state as in Figure 46, the female terminals 304 of the relay terminals 300 are pushed into the male terminals 216a and 216b while the plug 250 is held by hand. This means the movable component 270 is pressed by the projecting stepped part 215 against the springs 292 and 294, and thus the male terminals 302 are connected to the female terminals 226. At this time, the engagement parts 218a on the side of the male connector 210 become engaged with the engagement projections 268 in the immovable component 260 and the plug 250 is secured by the male connector 210. The male terminals, such as 216a and 216b, are thus connected to an external power source by the relay terminals 300, female terminals 226, connection cable 224 and the cable 220 while

they are sealed by the plug 250. After this, the case 240 is pushed by hand to the side of the male connector 210 to complete mounting of the case 240 on the male connector by engaging the engagement retainer 244 with the engagement cavity 219 on the side of the male connector 210.

Therefore, the forenamed connector unit 200 is excellently waterproofed since the male terminals, such as 216a and 216b, the relay terminals 300 and female terminals 226 are sealed by the plug 250.

When the female connector 230 is disconnected from the male connector 210, the movable component 270 inside the female connector 230 is isolated from the relay terminals 300 and the female terminals 226 by spring force of the springs 292 and 294. Therefore, the relay terminal 300s are completely resistant to any electric leakage since they are thus separated from external power source.

Moreover, since no external cable is attached to the heated toilet seat 40 when the female connector 230 is disconnected from the male connector 210, handling operations, such as cleaning, are facilitated without hindrance.

Besides these merits, the plug 250 is difficult to unplug from the male connector 210 with an external force because the engagement parts 218a are engaged with the engagement projections 268 and because elastic deformation of the narrow retaining projection 218 is limited from the outside by the case 240.

The following paragraphs describe the manufacturing process of the heated toilet seat 40 by insertion forming of the heater unit 70, where the fuse 180 and connector unit 200 are mounted simultaneously on the cushion part 150A.

In the first step, the bushing 212 is inserted and secured under high pressure into the supporting part of the supporting base 60 shown in Figure 47. The male terminals 216a, 216b, 217a and 217b are pressure-inserted and secured beforehand into the bushing 212. Then the lead 312 of the thermistor 310 is connected to the male terminals 217a and 217b, the thermistor 310 is temporarily secured on the upper surface of the supporting base 60 of the thermistor 310.

In the next step, the heater unit 70 is mounted on the supporting base 60. This operation is achieved by the adhesively attachment of the heat transmitting sheet 74 or similar parts on the supporting base 60 as illustrated in Figures 6 through 9. The thermistor 310 is also secured on the supporting base 60 with the heat transmitting sheet 74.

In the next step, one lead 72a of the heater 72 is connected to the male terminal 216a which is secured in the bushing 212. The terminal 170a is connected to the other lead 72b of the heater 72

and then the terminal 170a is pressure-inserted into the through attachment hole 156a in the upper part of the cushion part 150A. The terminal 170b is connected to one lead 320a of a relay cable 320, and then the terminal 170b is pressure-inserted into the through attachment hole 156b. The other lead 320b of the relay cable 320 is connected to the other male terminal secured in the bushing 212.

In the next step, the terminals 170a and 170b and some part of the relay cable 320 are wrapped with insulation tape 360, and the male terminals 216a, 216b, 217a and 217b in the upper surface of the bushing 212 are respectively wrapped with insulation tape 362. The insulation tapes 360 and 362 are made of a sheet material which has insulation properties where the terminals and other parts are covered. Then, the supporting base 60 mounted with heater unit 70 and other parts is placed inside the metal mold for the injection molding machine to form the toilet seat main body 50 by injection molding. After cooling, the formed body is released.

In the next step, as shown in Figure 41, the fuse is inserted into the storage space 154 in the cushion part 150A and the terminal part 182 of the fuse 180 is connected to the through attachment holes 156a and 156b. Next, resin filler 184 is filled inside the storage space 154 to mold the fuse 180 and other parts, and then the cushion element 190 is attached by pressure insertion of the stopper plug part 192 of the cushion element 190 into the storage space 154. This completes manufacturing of the heated toilet seat.

Therefore, if the heated toilet seat 40 is manufactured by the method described above, the fuse 180 in the cushion part 150A and the connector unit 200 require no laborious processes after injection molding of the toilet seat main body except a simple assembly process for the fuse 180 or other parts before injection molding.

Figure 48 shows an alternative manufacturing method where the fuse 180 is attached before injection molding.

In the first step, the terminals 170a and 170b are pressure-inserted into the attachment holes 156a and 156b in a supporting base 60I. Next, the fuse 180 is connected to the terminals 170a and 170b, and then a cushion element 68 which has a shape surrounding the fuse 180 is attached to the lower end surface of the supporting base 60I. Air holes 68a and 68b are formed in the lower part of the cushion element 68.

In the next step, the supporting base 60I and other parts are placed in the metal mold 110I in the injection molding machine. In this state, the toilet seat main body is formed by injection molding while the fuse 180 is cooled by flow of gas, such as nitrogen and atmospheric air running through

the air hole 68a, the storage space 154l and then the air hole 68b. Cushions (not shown in the figure) are attached after injection molding. For the purpose of enhancing the waterproofing efficiency, the fuse 180 may be molded with silicone resin or other material by filling through the air holes 68a and 68b. Compared with the embodiment shown in Figure 41, efficiency of assembly is improved in this embodiment, since the fuse 180 can be attached to the under surface of the supporting base 60l which is not surrounded by the projection 152 or other elements.

Figures 49 through 51 show the connector having an alternative structure and its related parts. The connector for the heater 72 is constructed with a supporting part 61J where a bushing 212J is pressure-inserted and secured, and, after the male terminal 216 is pressure-inserted and secured in the bushing 212J, a toilet seat main body 50J is formed by injection molding.

The following paragraphs describe the manufacturing method for the forenamed connector structure. In the first step, the bushing 212J is inserted and secured in the supporting part of the supporting base 60J under high pressure. The bushing 212J is inserted with four male terminals 216. Two of the four male terminals 216 are connected to a thermistor (not shown in the figure) or other parts; the heater unit 70 is attached to the upper surface 62 of the supporting base 60J and the male terminals 216 are then connected to the leads of the heater 72. After that, the male terminals 216 are covered on the top with the insulation tape 36 and then an insertion ring 380 is attached to the lower end opening of the supporting part 61J. The supporting base 60J, attached to other parts, is then placed inside the metal mold for the injection molding machine to form the toilet seat main body 50J by injection molding.

After injection molding, a female connector 400 which has female terminals 402 at its front end is connected to the male terminals 216 and other parts. An O ring 404, which seals against the tapered surface, is attached at the front end of the female connector 400. A hexagonal resin nut 410, into which the female connector is inserted, is attached by screw thread on the insertion ring 380. Thus the female terminals 402 are securely connected to the male terminals 216.

If a projection (not shown in the figure) is added to the screw threaded inside wall of the hexagonal nut 410, the projection will increase resistance to securely tighten the hexagonal nut 410 and effect assurance of fastening with a click sound, as well as prevention of loosening even without use of a fitting tool.

Figures 52 through 54 show a connector unit 450 with still another alternative structure; Figure

52 shows its disconnected state and Figure 53 shows its connected state; Figure 54 is a sectional view along the line G-G in Figure 53.

The connector unit 450 is equipped with a male connector 460, which is located in the supporting base 60K, and a female connector 470 which is detachably connected to this male connector 460. The male connector 460 is equipped with a bushing which is pressure-inserted into the supporting part 61K in an end part of the supporting base 60K. Four through attachment holes 214a and 214b (the figures show only two of them) are formed in the bushings 212K, and male terminals 216a and 216b are pressure-inserted into the through attachment holes 214a and 214b. A socket part 462 which is shaped so as to surround the male terminals 216a and 216b is formed in the bushing 212K, and narrow engagement projections 464 each of which has an engagement part 464a at its end and an engagement part 464c at its root are also formed there.

The female connector 470 is equipped with a plug 480 and a case 550 which covers the plug 480. The plug 480 is equipped with a sliding component 490, which is mounted in the case 550 with a guide 482 ensuring that it slides freely, and a connection component 500 which is mounted on the sliding component 490.

An end of the cable 220, a connection cable 224 and terminal base part 227 are formed with resin on the forenamed slide component 490. The forenamed connection component 500 is equipped with terminal contact parts 504, which are connected to the forenamed terminal base part 502, and narrow engagement projections 506, which these terminal contact parts are attached to and engage with the forenamed socket parts. An engagement recess 508 which engages the part 464a on the side of the male connector 460 are formed on the outside wall of the connection component 500.

A narrow engagement projection 552c, which engages an engagement part 464c on the side of the male connector 460, is formed at the front end of the forenamed case 550, and a through hole 554 through which the cable 220 slides freely is formed at the rear end of the case 550. The cable 220 and the plug 480 make a single body which can move inside the through hole 554.

The next paragraphs describe attachment and detachment operations of the female connector and the male connector. To bring the connectors from the disconnected state shown in Figure 52 to the connected state shown in Figure 53, the plug 480, held by its outer rim, is inserted into the side of the male connector 460 while the narrow engagement projection 506, which is guided by the socket part 462 and the terminal contact part 504, is inserted

into the male terminals 216a and 216b. The engagement part 464a on the side of the male connector 460 engages the engagement recess 508 in the plug 480 and the terminal contact parts 504 are connected to the male terminals 216a and 216b. Next, a holding part 556 of the case 550 is held and inserted into the side of the male connector 460. The case 550 is slid, while being guided by the plug 480 and the engagement projections 552c, to engage with the engagement parts 464c on the side of the male connector 460. Thus the female connector 470 is attached to the male connector 460.

The narrow engagement projections 464 on the side of the male connector 460, as shown in Figure 53, engage the engagement recess 508 in the plug 480 and the plug 480 cannot be pulled out separately because elastic deformation is limited while it is held under pressure by the narrow engagement projections 552 in the case 550. Therefore, to disconnect the male connector 460 from the female connector 470, firstly, the holding part 556 of the case 550 is held with the fingers and force is applied in the direction indicated by the arrow. The narrow engagement projection 552 is elastically deformed in the open direction to release, and the engagement parts 552c are disengaged from the engagement parts 464c. The case 550 slides in the direction indicated by the arrow, while it is guided by the guide 482 of the plug 480. Then, some force is applied in the direction indicated by the arrow while the plug 480 is held by fingers, the narrow engagement projection 464 is elastically deformed outward; the engagement parts 464c are disengaged from the engagement recess 508 and the female connector 470 is detached from the male connector 460.

In this embodiment, the plug 480 slides more freely against the case 550 but makes a more unified body, in comparison with the connector unit 200 in Figure 46, the insertion operation of the plug 480 and case 550 is much simpler.

Claims

1. A double layer molded toilet seat with built-in electric parts, said seat comprising:
 - a first layer molded with resin,
 - said electric parts attached to said surface of said first layer,
 - a second layer formed by injection molding, after said electric parts are attached and
 - a flow controlling means which is positioned on an upper part of said first layer in proximity to said electric parts and is located at least on a side upstream of molten resin injected to form said second layer so as to reduce said molten resin injection pressure on

said electric parts.

2. A double layer molded toilet seat in accordance with claim 1, wherein said flow controlling means is a slope integrally formed on said upper surface of said first layer for smooth leading of said molten resin toward said upper part of said electric parts.
3. A double layer molded toilet seat in accordance with claim 1, wherein said flow controlling means is a recess formed on said upper surface of said first layer for installation of said electric parts so that upper parts of said electric parts are almost flush with said upper surface of said first layer.
4. A double layer molded toilet seat in accordance with claim 1, wherein said flow controlling means is a flexible sheet to cover said electric parts.
5. A double layer molded toilet seat in accordance with claim 4, wherein said first layer is a supporting base which is formed in a horse-shoe shape and supported on an upper part of said toilet bowl and said second layer is a toilet seat main body having a toilet seat surface, some part of which is thermally adhered to said top of said supporting base.
6. A double layer molded toilet seat in accordance with claim 5, wherein said sheet is made of thin metal film and said electric part is a heater for heating said toilet seat surface.
7. A double layer molded toilet seat in accordance with claim 6, wherein a heater attachment groove is formed on said upper surface of said supporting base, a heater is retained in said heater attachment groove and said heater is covered with said flexible sheet so as to be almost flush with said supporting base.
8. A double layer molded toilet seat in accordance with claim 6, wherein said sheet is adhesively attached to said supporting base as a hill shape heater covering with a vertex angle of 90 degrees or more.
9. A double layer molded toilet seat in accordance with claim 1, wherein a projection and a recess are formed one on each of said first and second layers, where said first and second layers are engaged and thermally adhered.
10. A double layer molded toilet seat in accordance with claim 1, which further has a

connection terminal for electric power supply to said electric parts from outside, and said first layer has an attachment hole on a surface of said first layer, said connection terminal is inserted into and supported by said attachment hole, and an upper part of said connection terminal protrudes from said first layer surface and is inserted under said second layer.

11. A double layer molded toilet seat in accordance with claim 1, wherein said double layer molded toilet seat further has a connection terminal for electric power supply to said electric parts from outside, said first layer has an attachment hole on a surface of said first layer, said connection terminal is inserted into and supported by said attachment hole, and is covered by a flow controlling means formed of a flexible sheet.

12. A manufacturing method for a double layer molded toilet seat with built-in electric parts; said method comprising:

a first step of forming a first layer,

a second step of forming a second layer by injecting molten resin so that said electric parts are inserted on said first layer, and

a third step of preparing a flow controlling means for reduction of molten resin injection pressure on said electric parts, said flow controlling means being positioned to a part on said first layer in a proximity of said electric parts and is located at least on a side upstream of said molten resin injected to form said second layer, before said second step.

13. A manufacturing method for a double layer molded toilet seat in accordance claim 12, wherein said flow controlling means is a flexible sheet to cover said electric parts.

14. A manufacturing method for a double layer molded toilet seat in accordance with claim 13, wherein said first layer is a supporting base which is formed in a horseshoe shape and supported on an upper part of a toilet bowl and said second layer is a toilet seat main body which has a toilet seat surface, some part of which is thermally adhered to said supporting base.

15. A manufacturing method for a double layer molded toilet seat in accordance with claim 14, wherein said flexible sheet is made of thin metal film and said electric part is a heater for heating said toilet seat surface.

16. A manufacturing method for a double layer molded toilet seat in accordance with Claim 15, wherein a heater attachment groove is formed on said upper surface of said supporting base, a heater is retained in said heater attachment groove and covered with said flexible sheet so as to be almost flush with said supporting base.

17. A manufacturing method for a double layer molded toilet seat in accordance with claim 15, wherein said flexible sheet is adhesively attached to said supporting base as a hill shape heater covering with a vertex angle of 90 degrees or more.

18. A double layer molded toilet seat manufacturing method in accordance with claim 12, wherein said method further comprises:

a step of preparing a unit body including a flexible sheet and electric parts attached to said flexible sheet, and

a step of attaching said unit body to said first layer.

Fig. 1

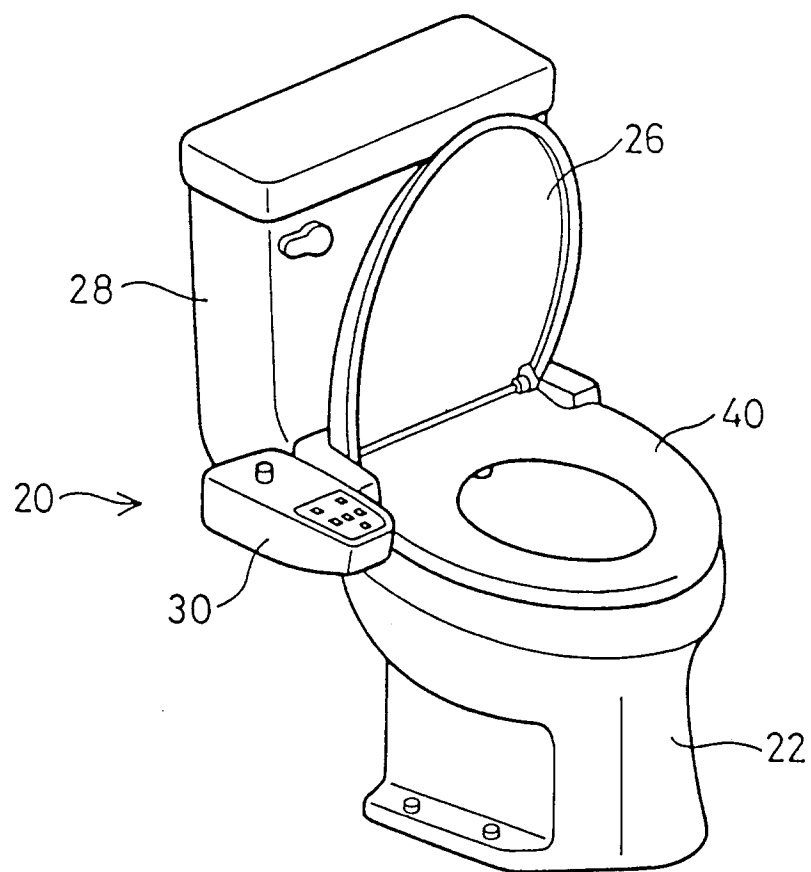


Fig. 2

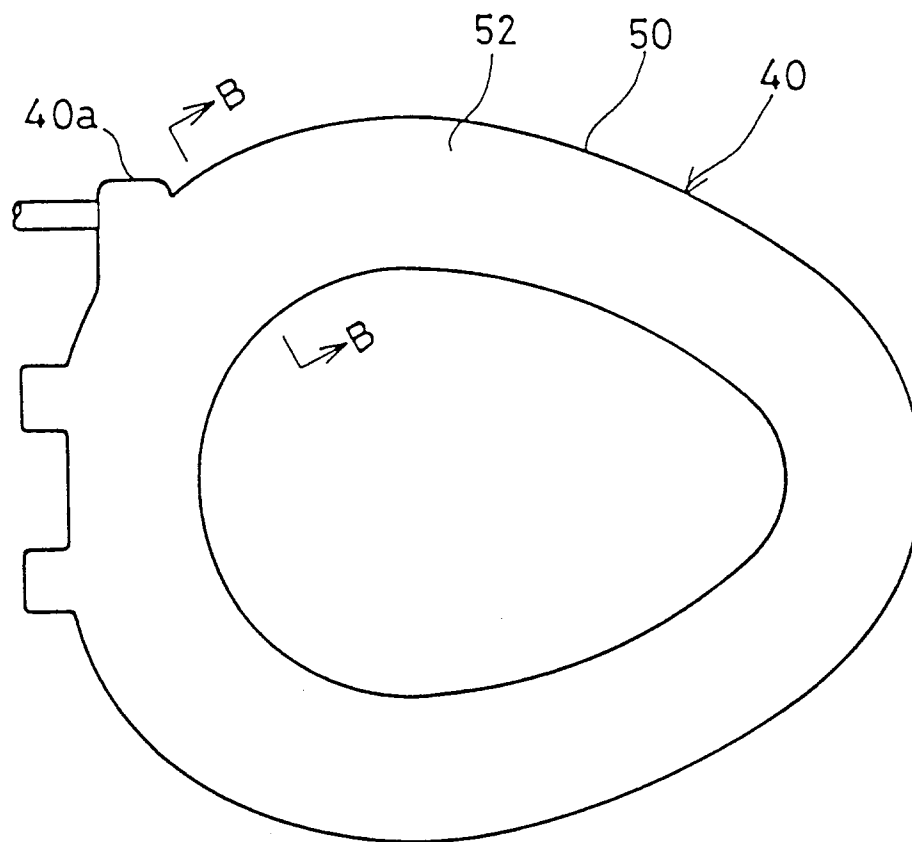


Fig. 3

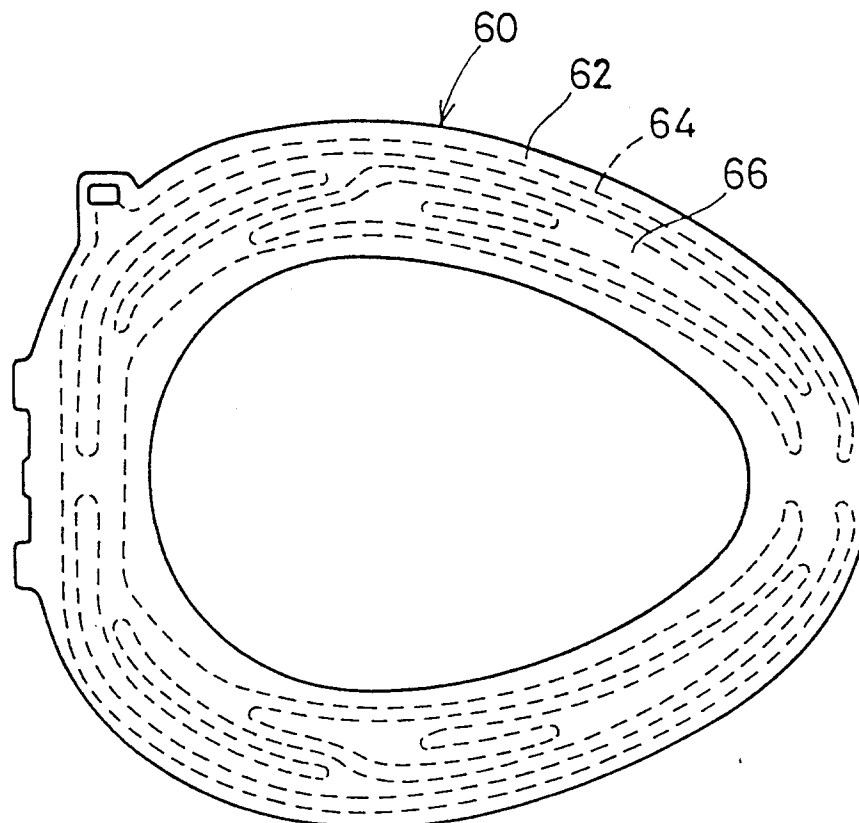


Fig. 4

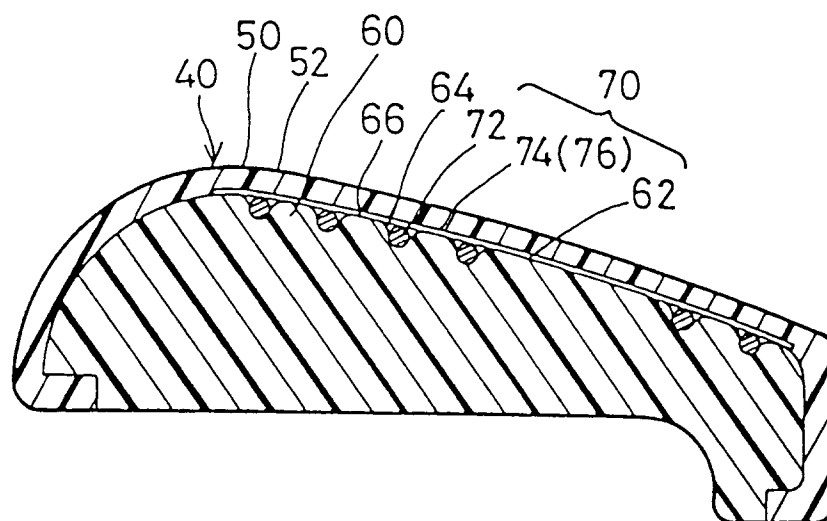


Fig. 5

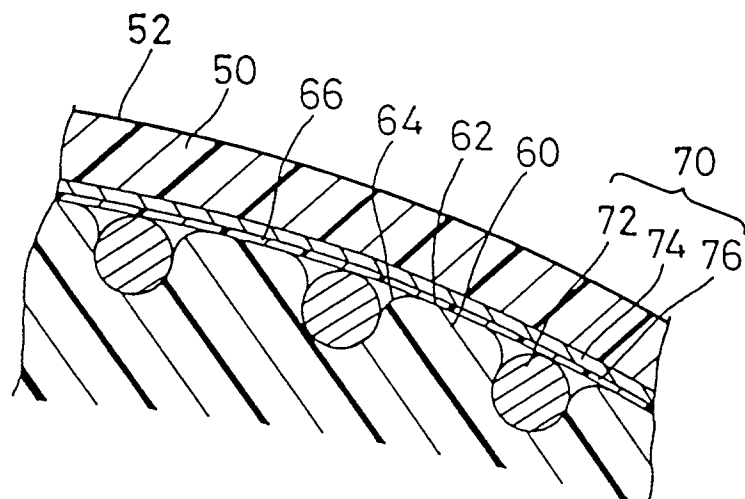


Fig. 6

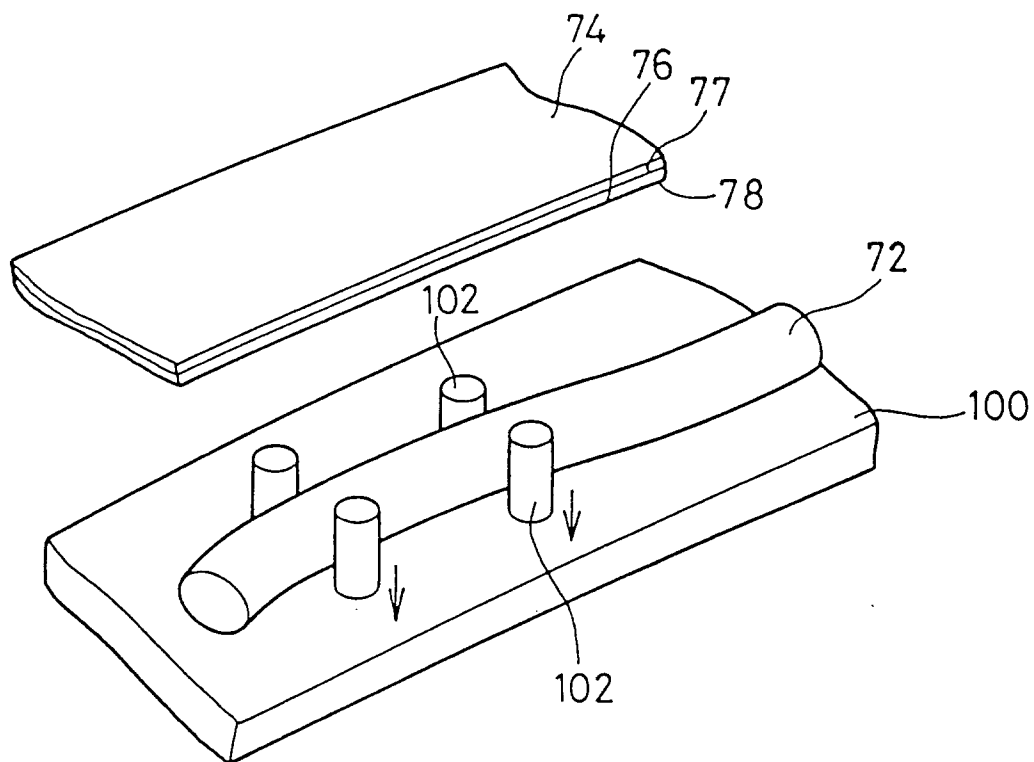


Fig. 7

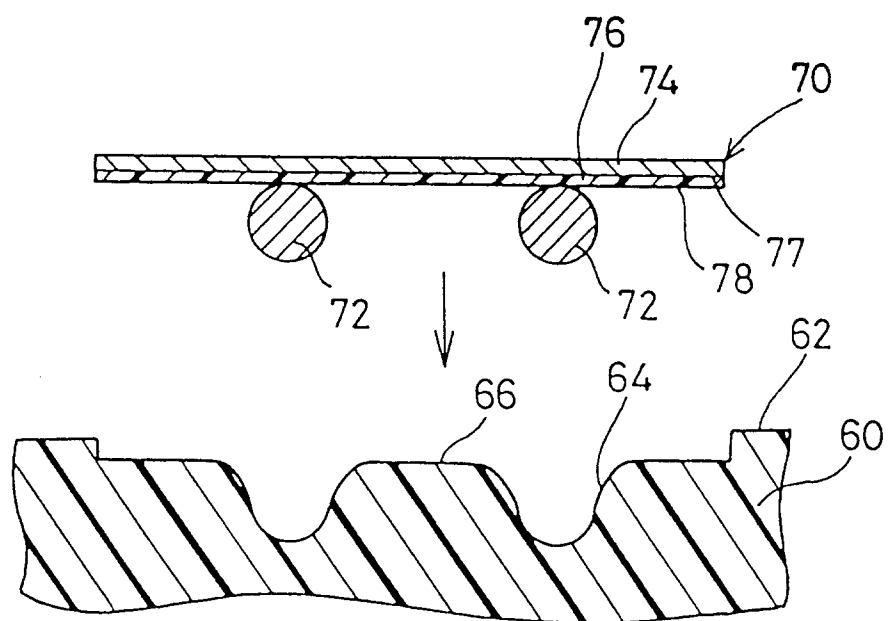


Fig. 8

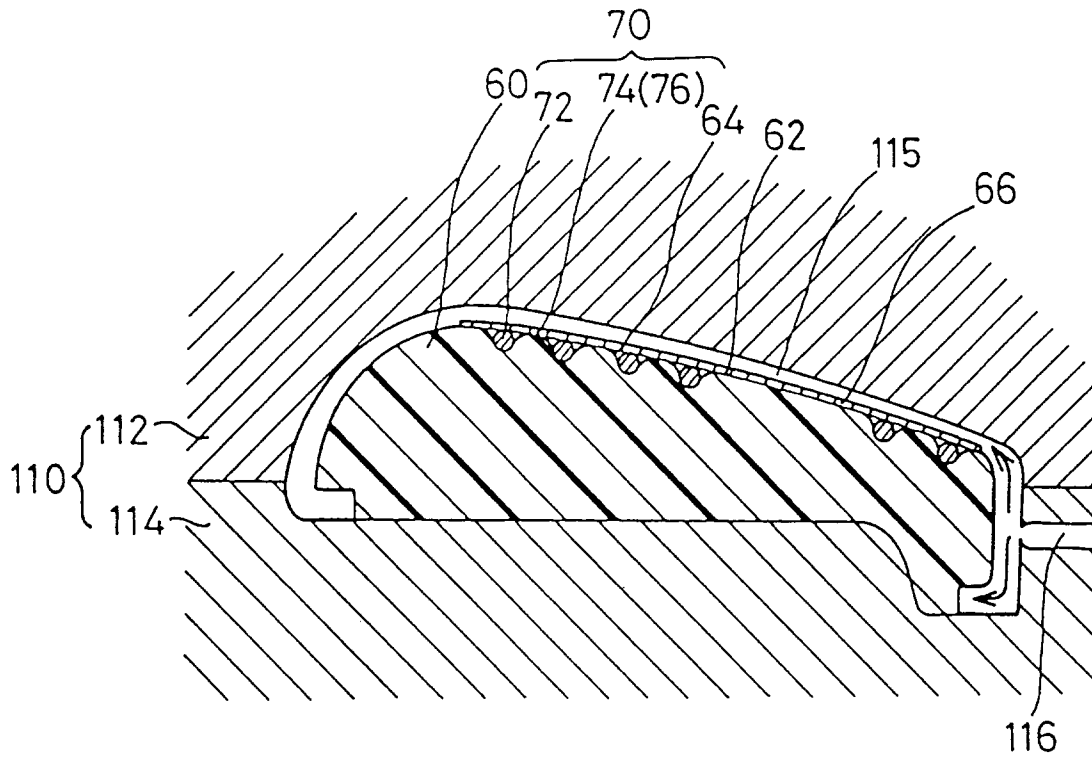


Fig. 9

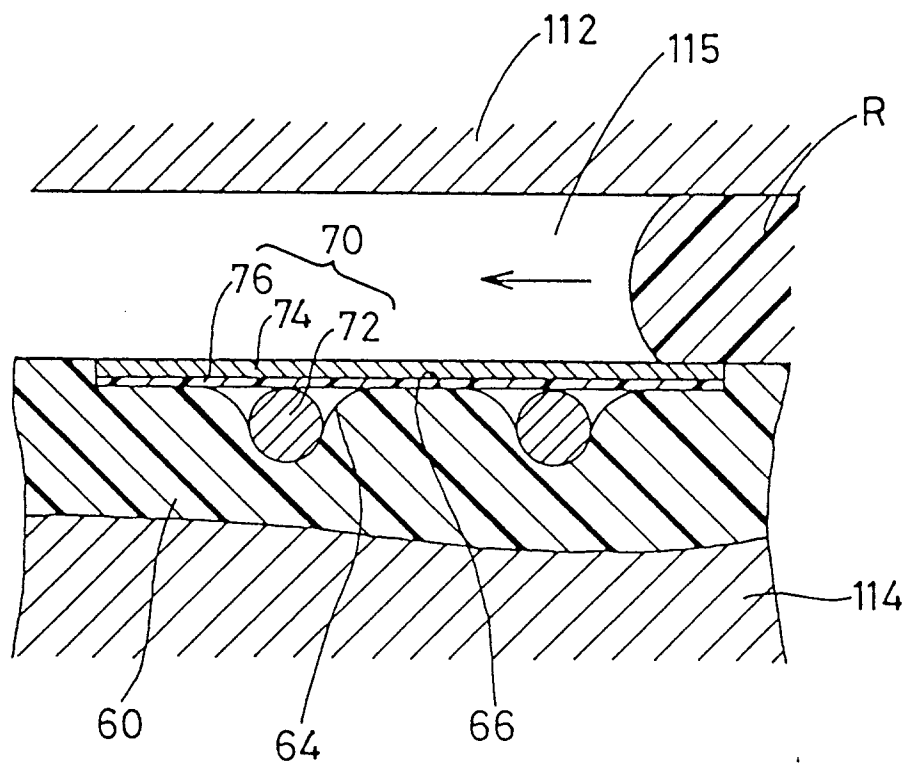


Fig. 10

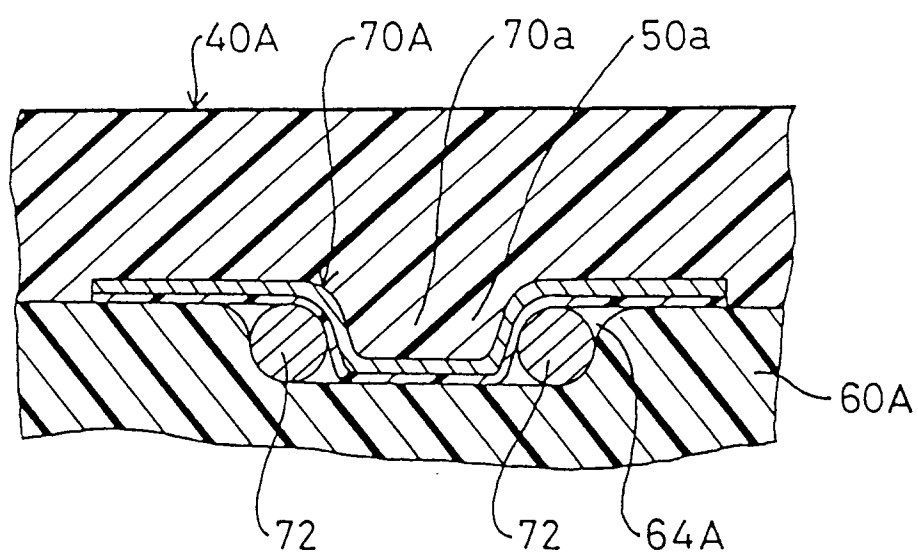


Fig. 12

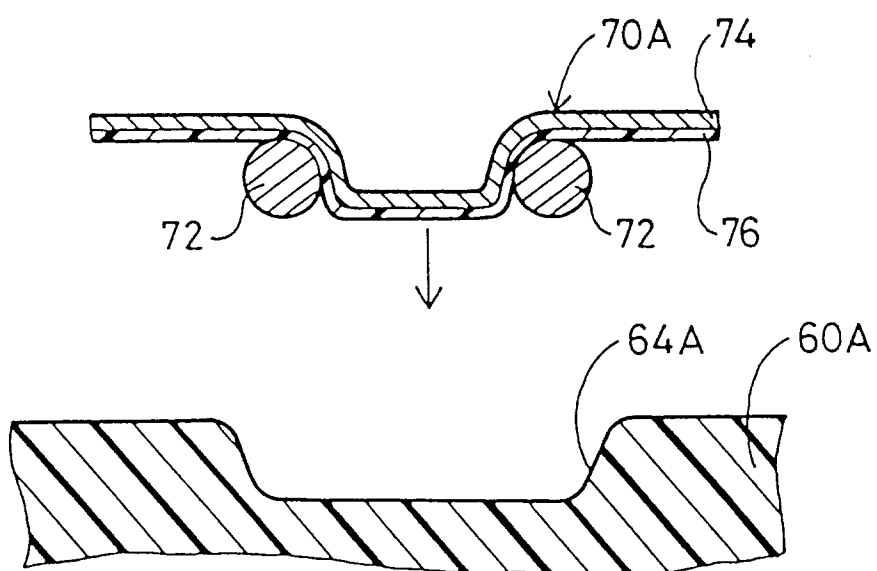


Fig. 11

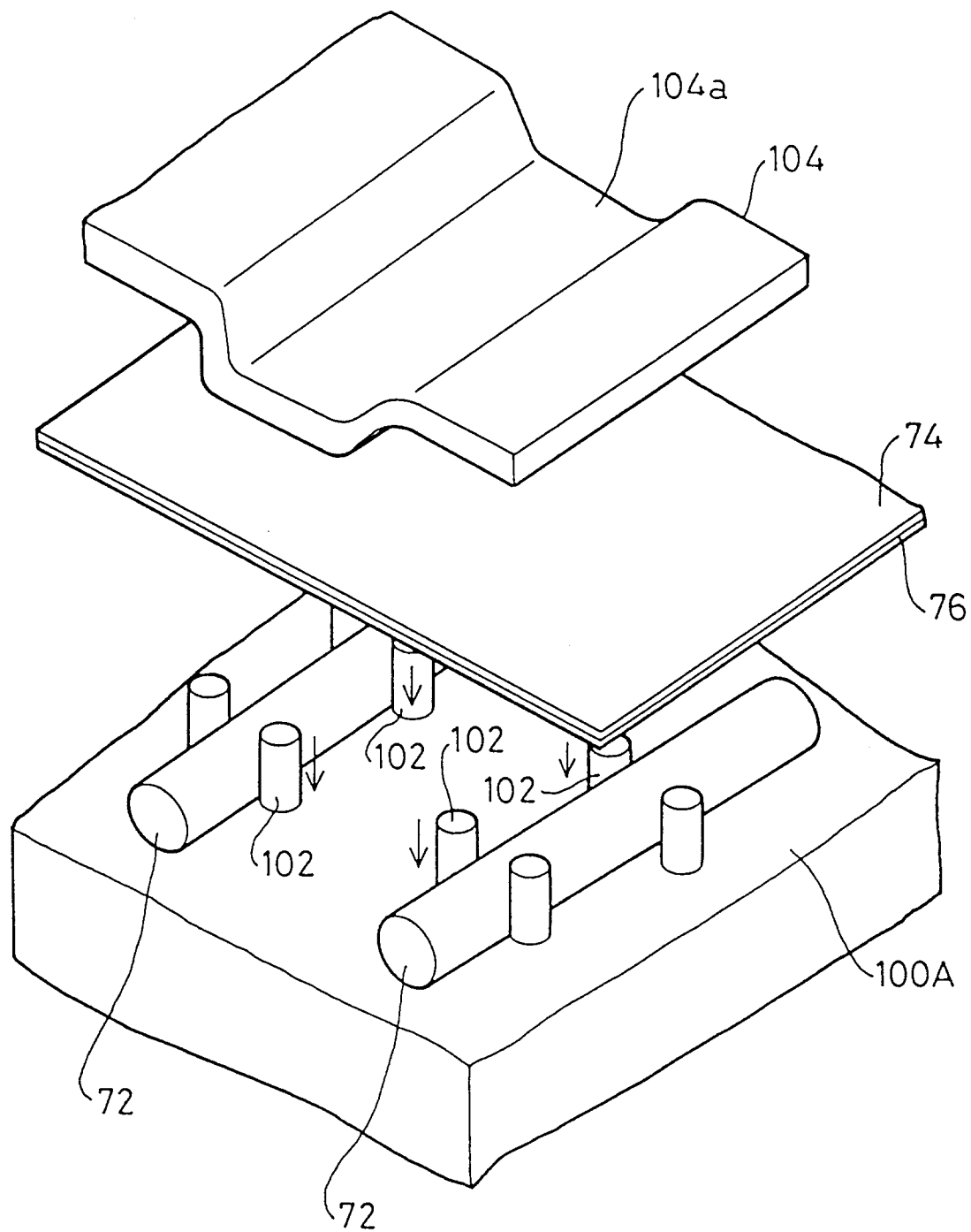


Fig. 13

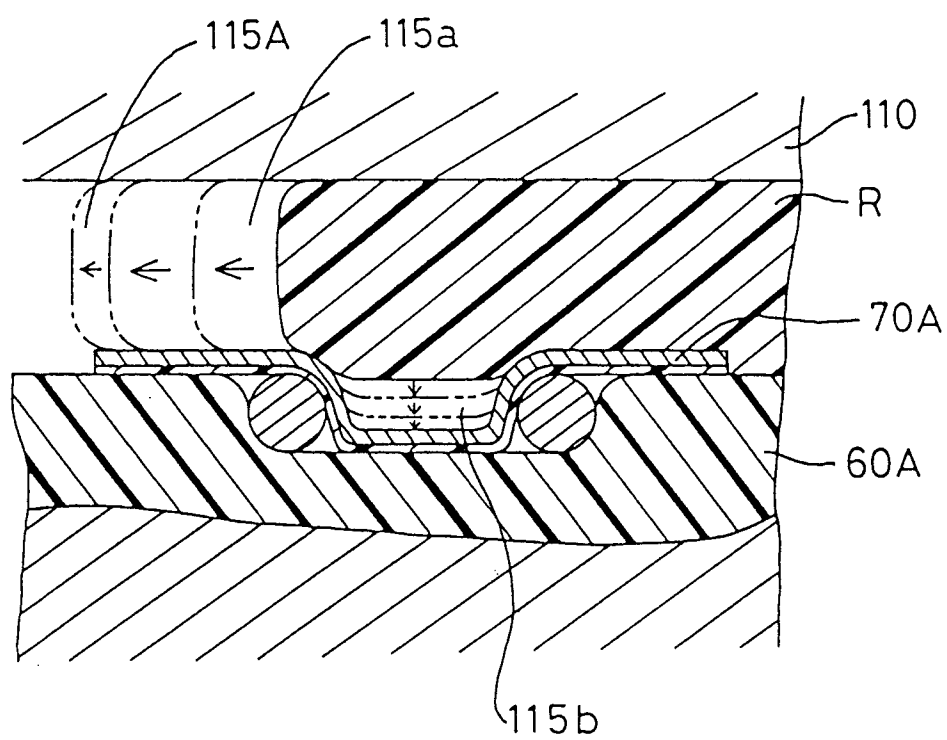


Fig. 14

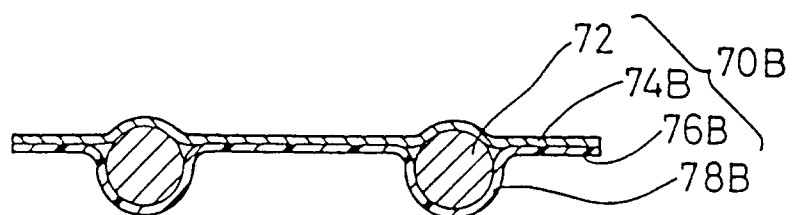


Fig. 15

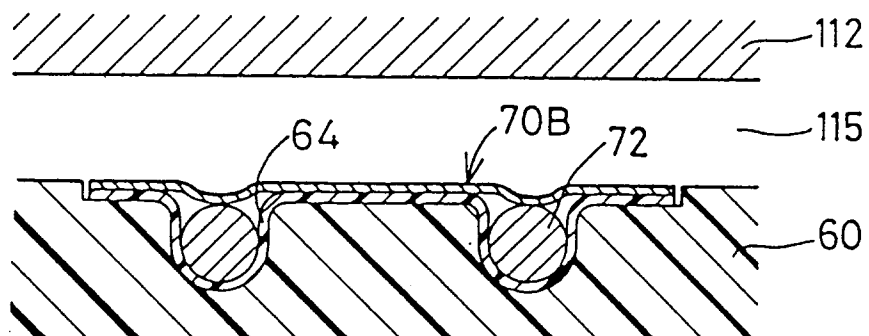


Fig. 16

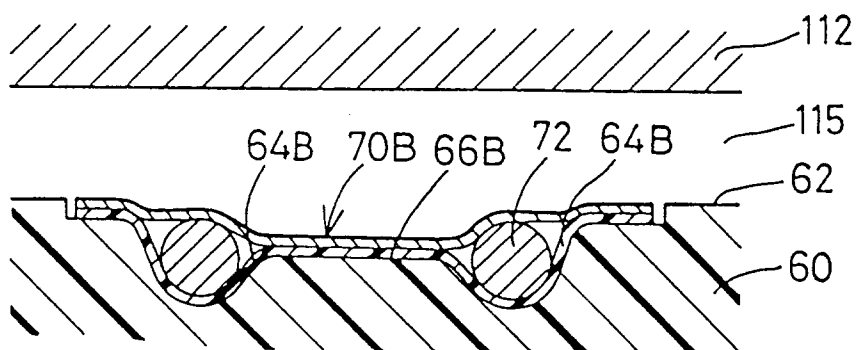


Fig. 17

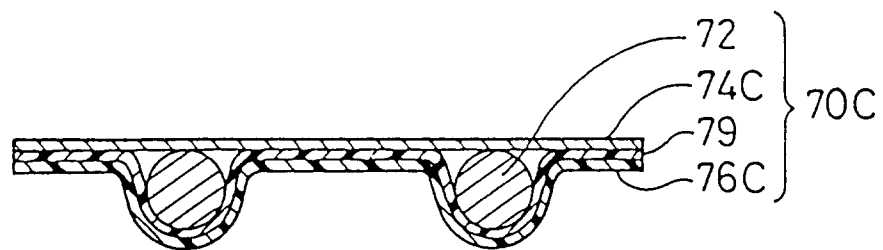


Fig. 18

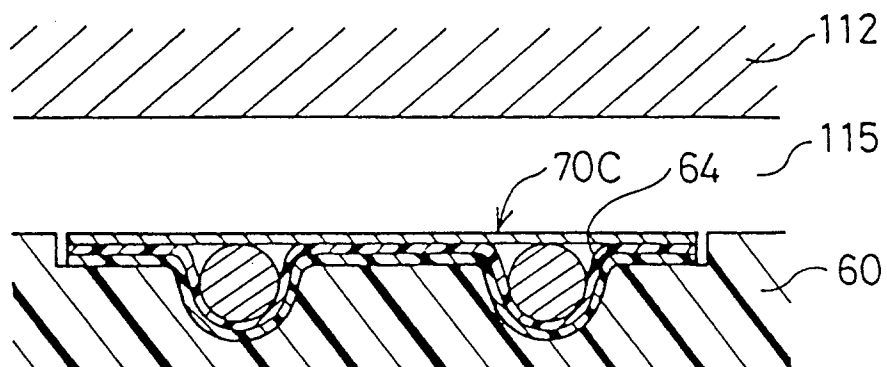


Fig. 19

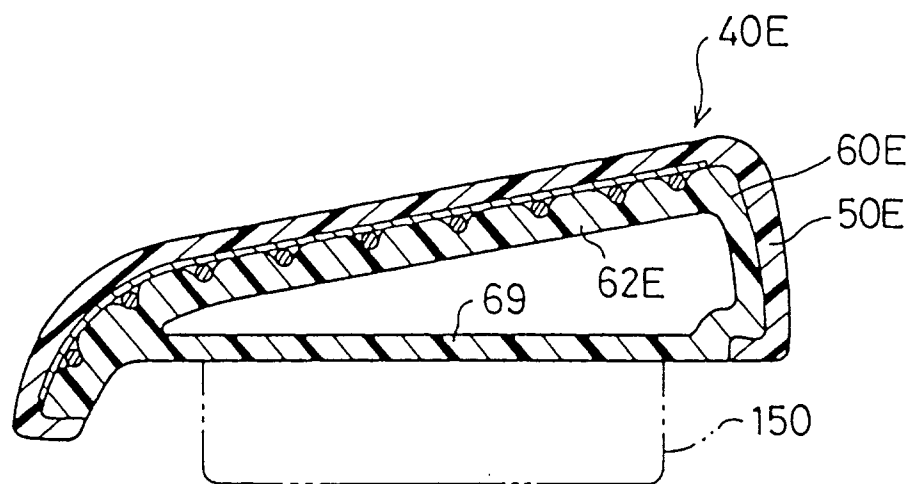


Fig. 20

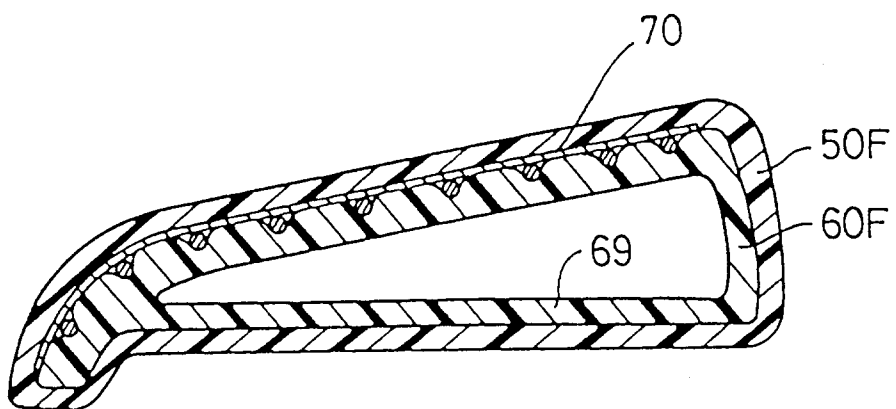


Fig. 21

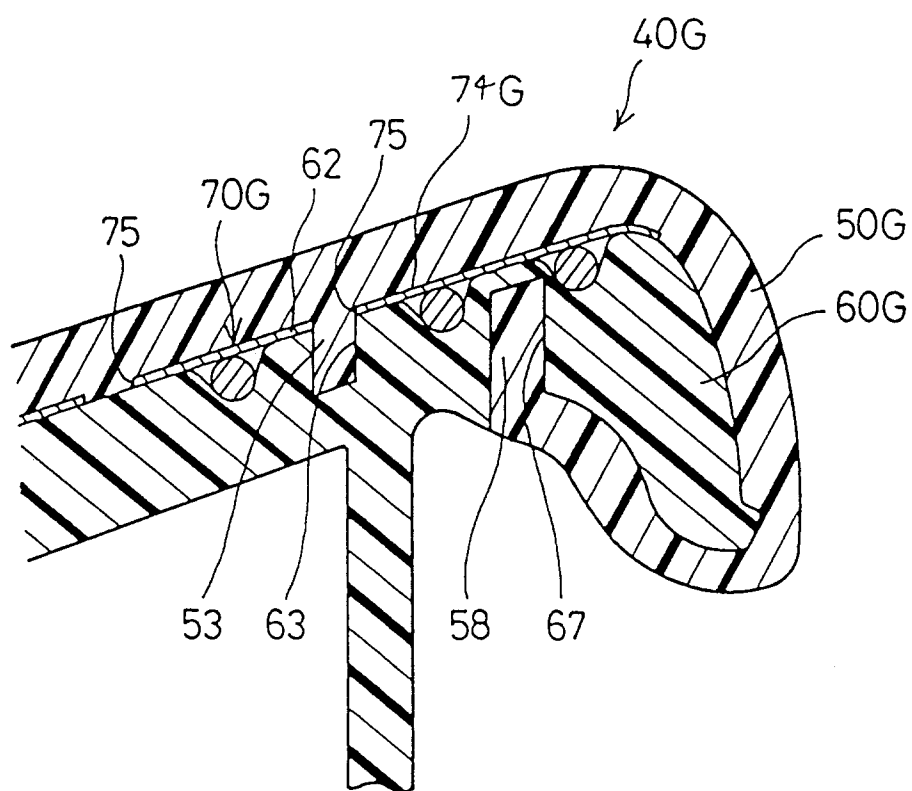


Fig. 22

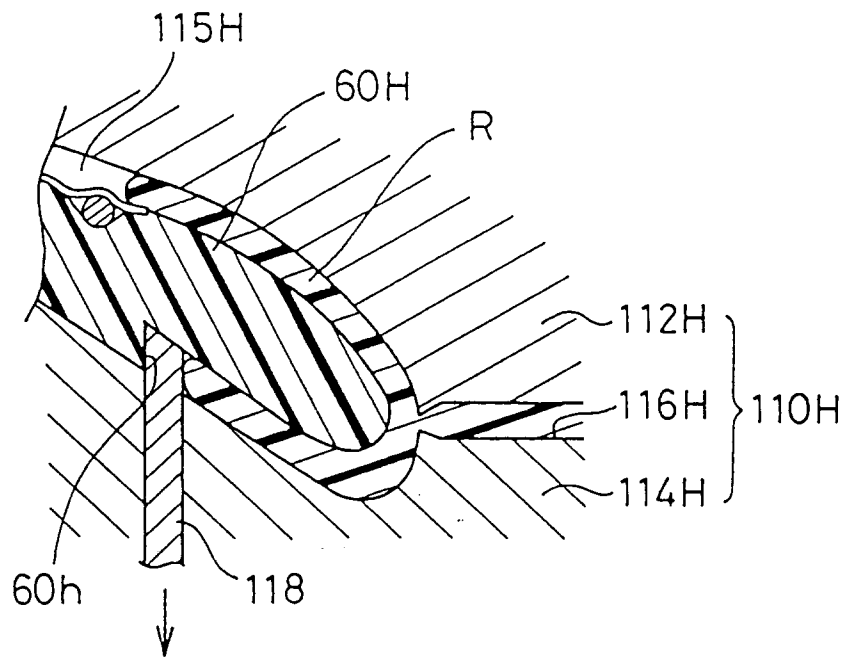


Fig. 23

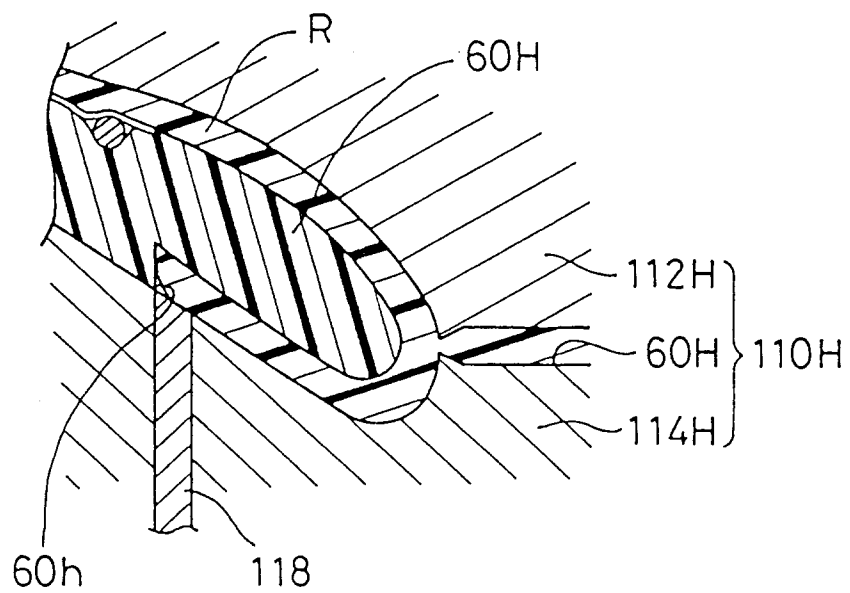


Fig. 24

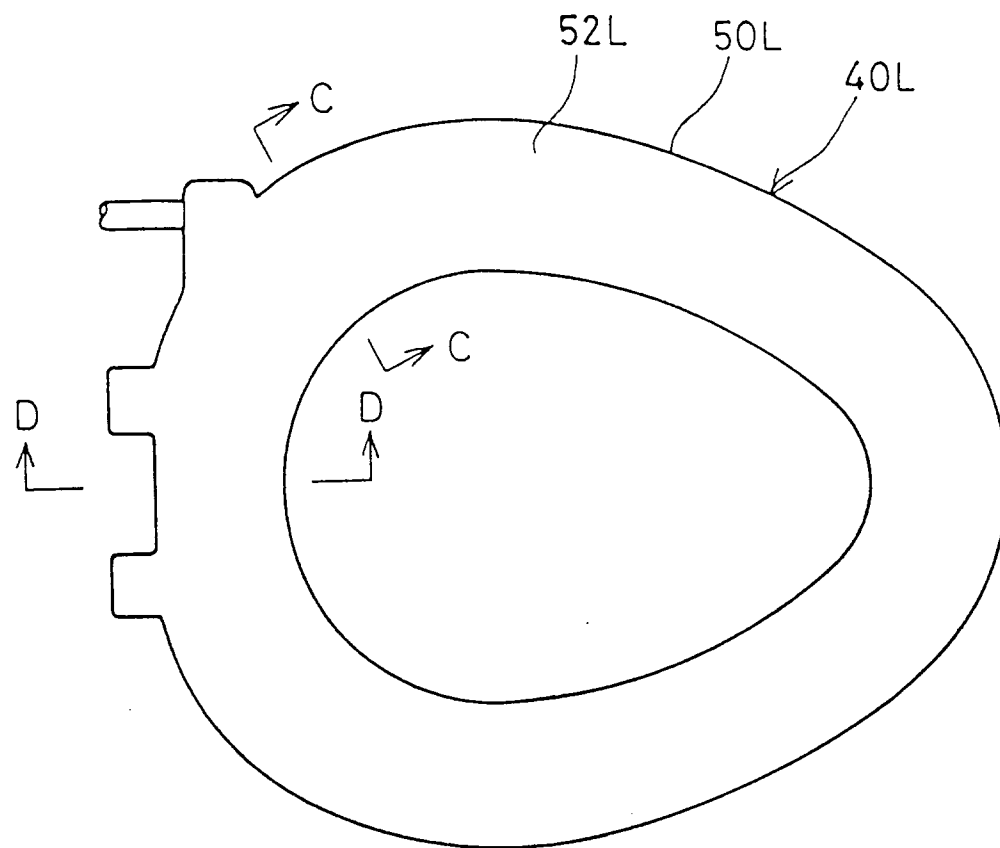


Fig. 25

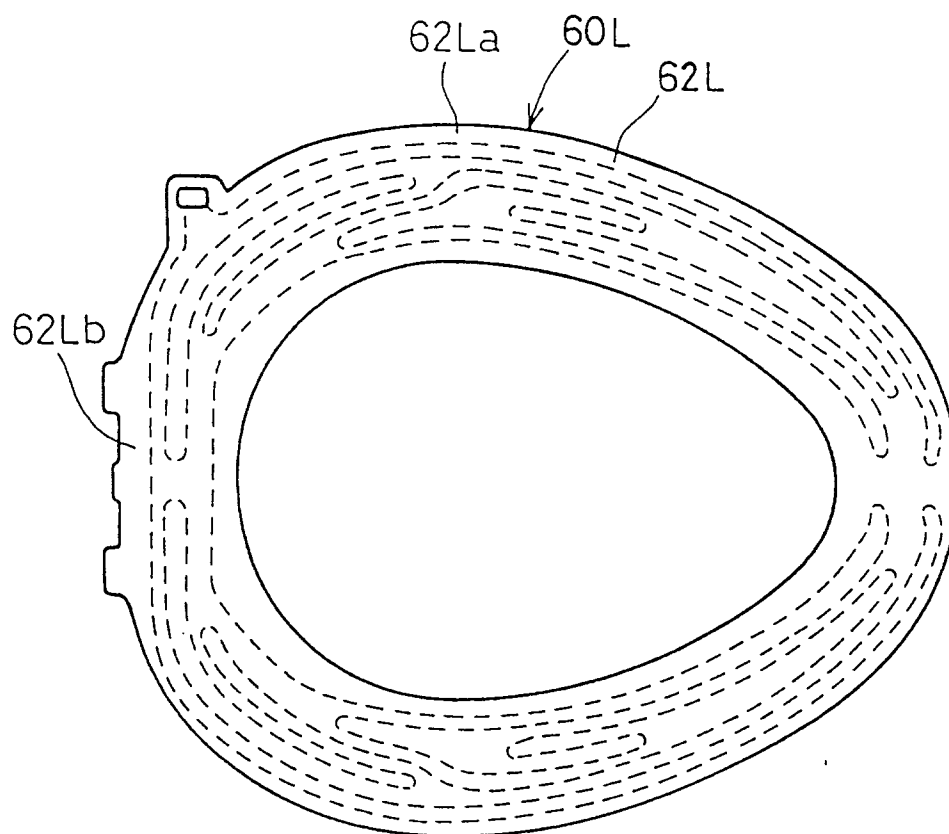


Fig. 26

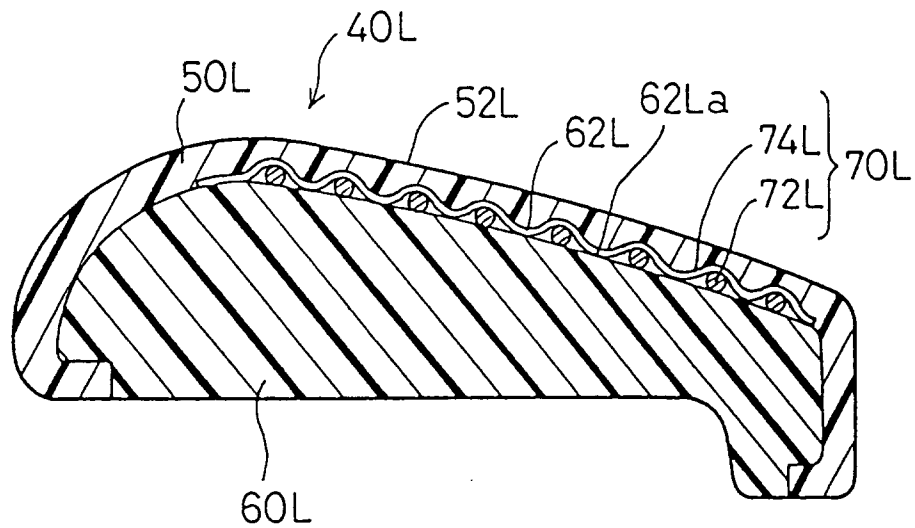


Fig. 27

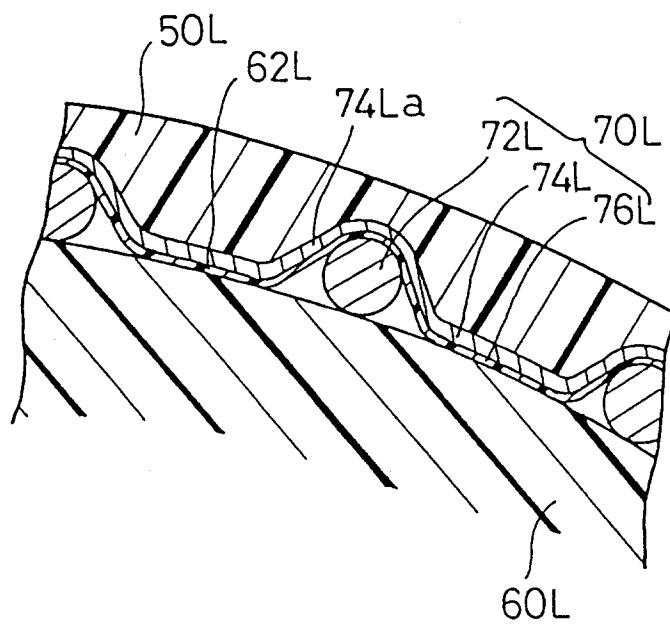


Fig. 28

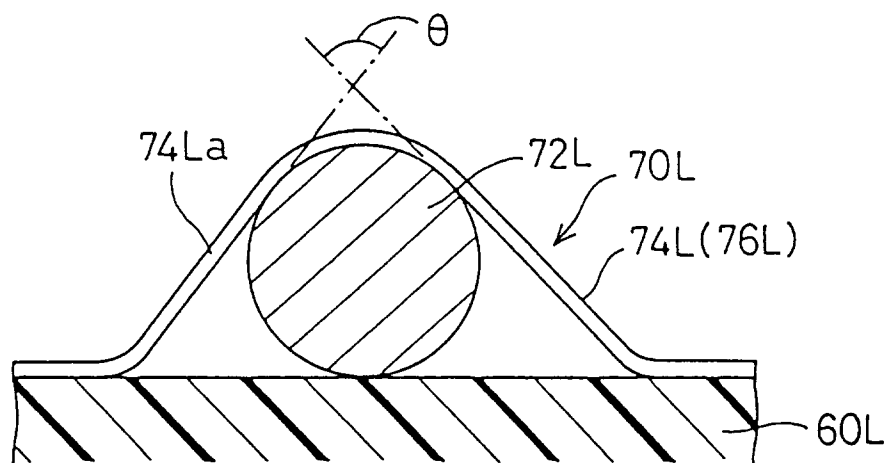


Fig. 29

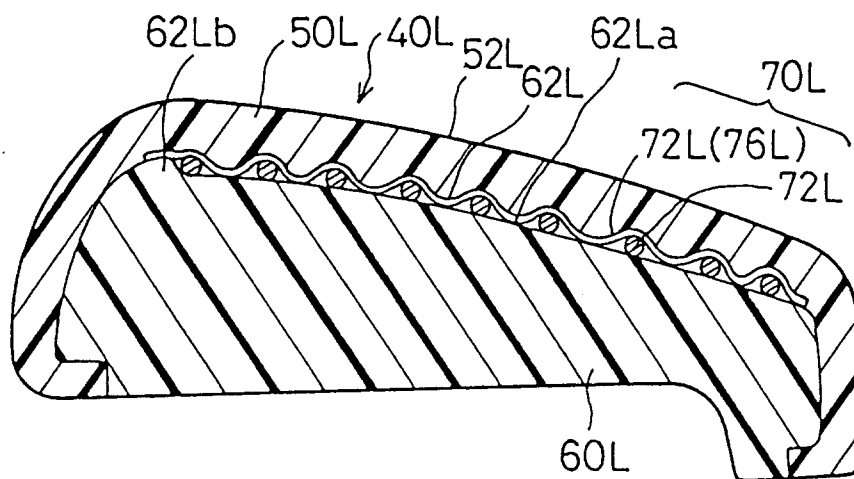


Fig. 30

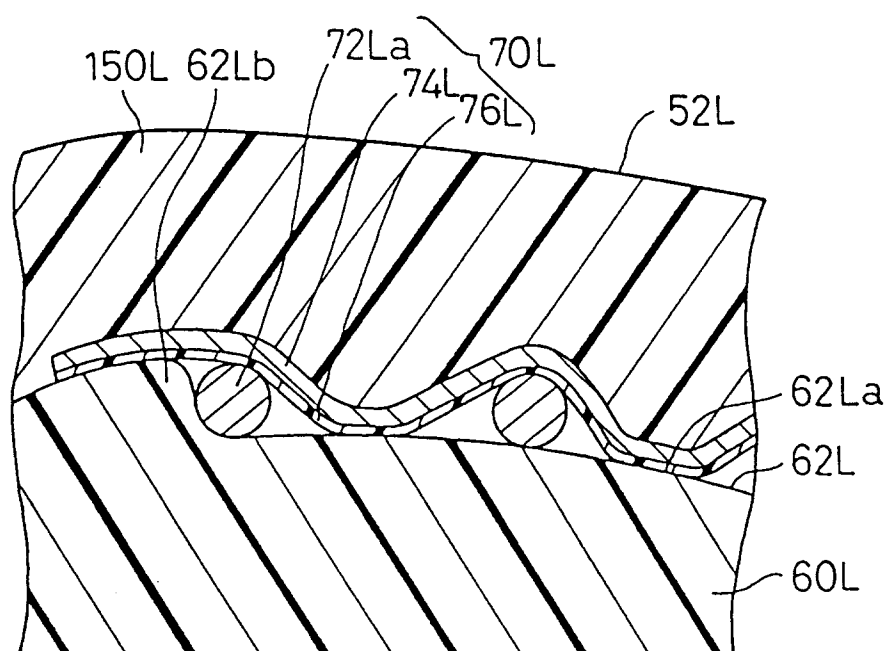


Fig. 31

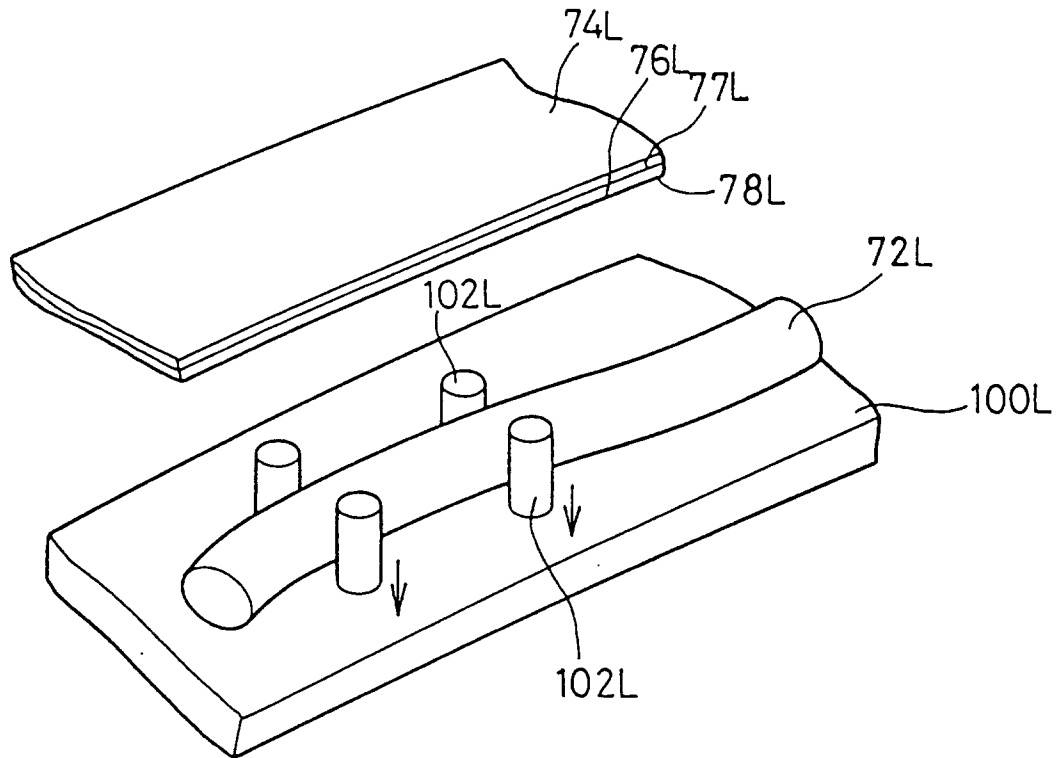


Fig. 32

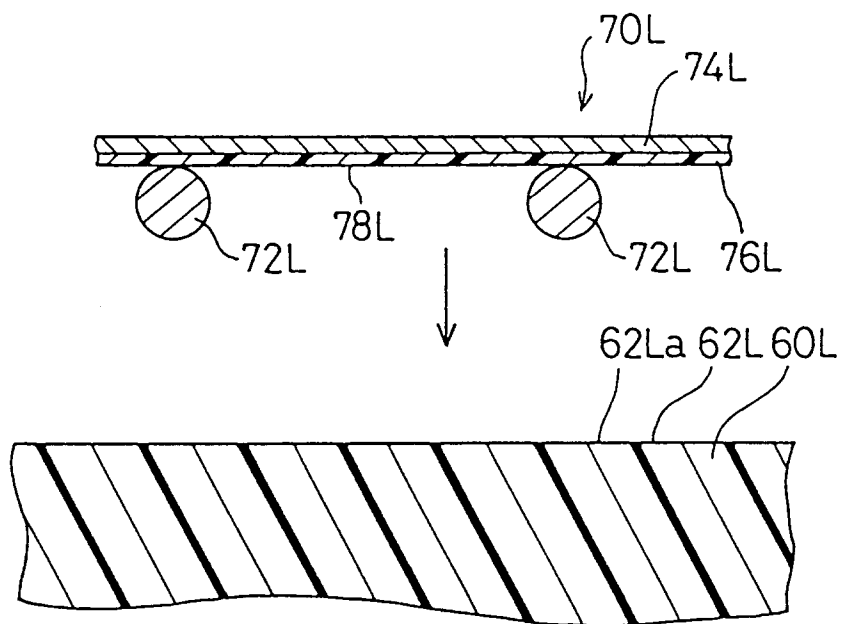


Fig. 33

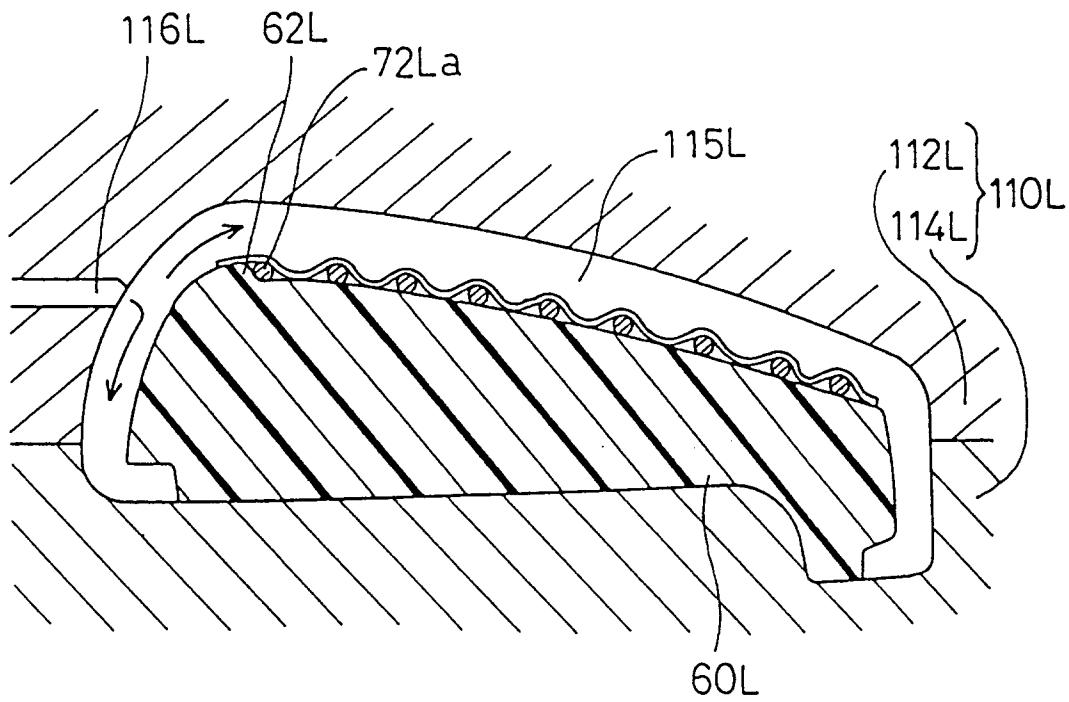


Fig. 34

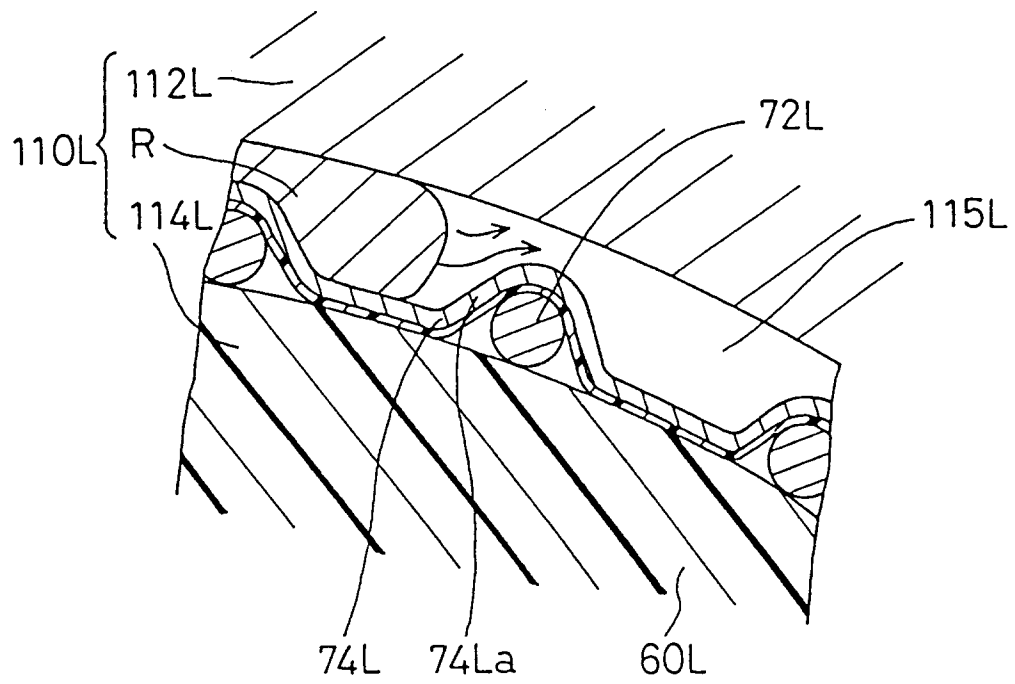


Fig. 35

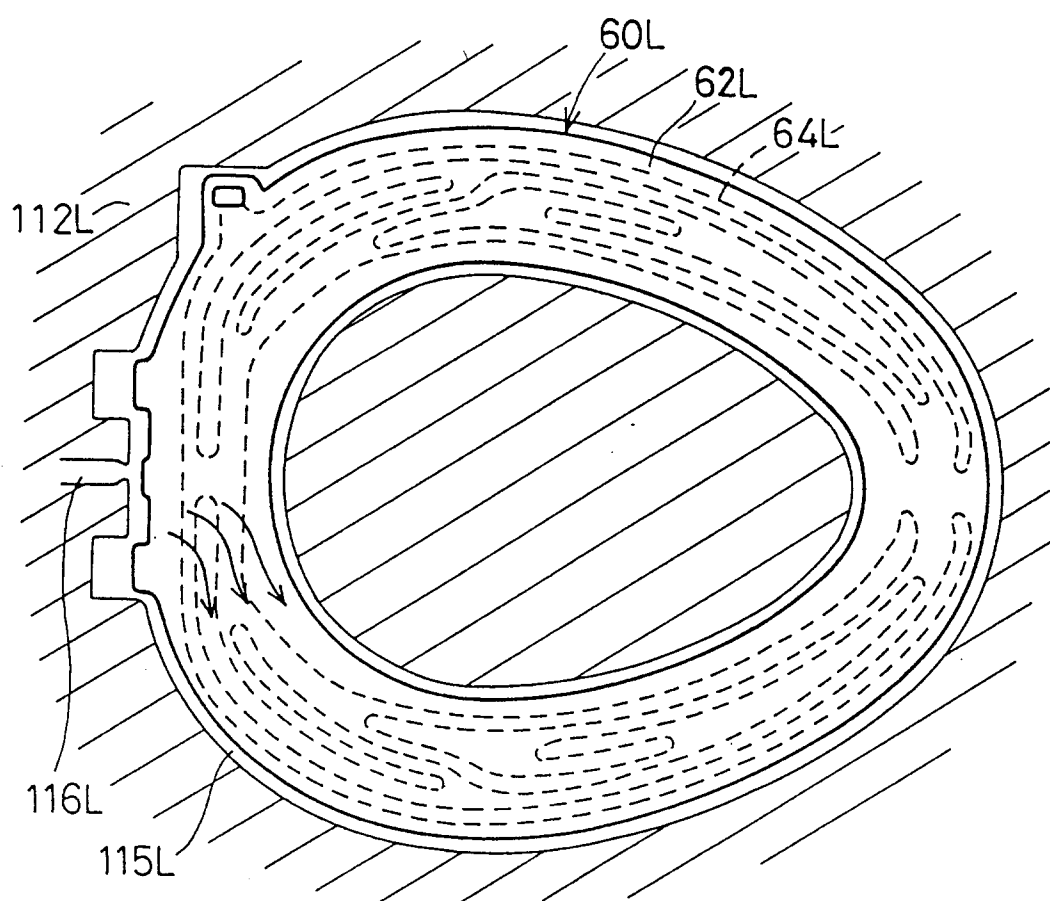


Fig. 36

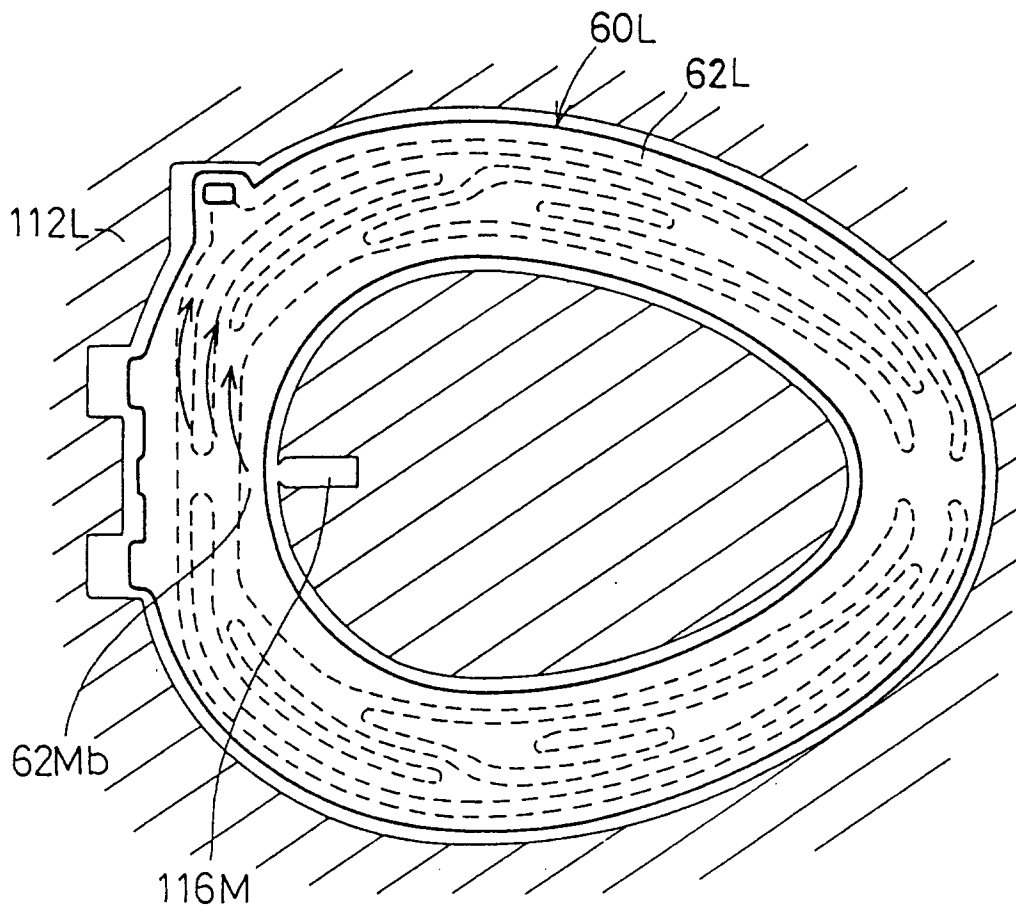


Fig. 37

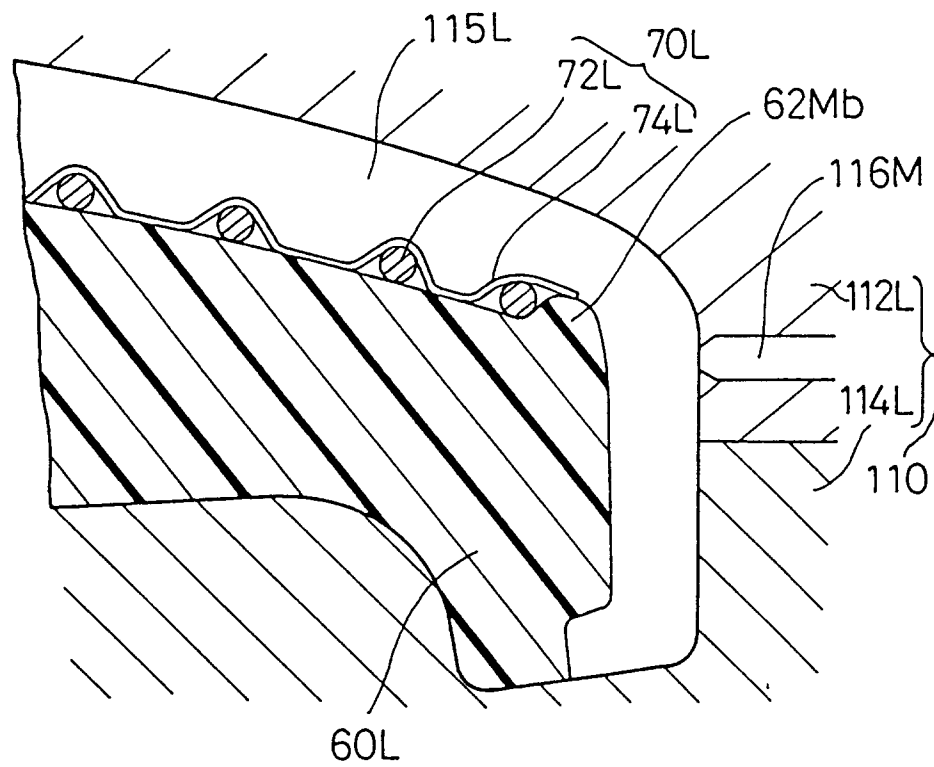


Fig. 38

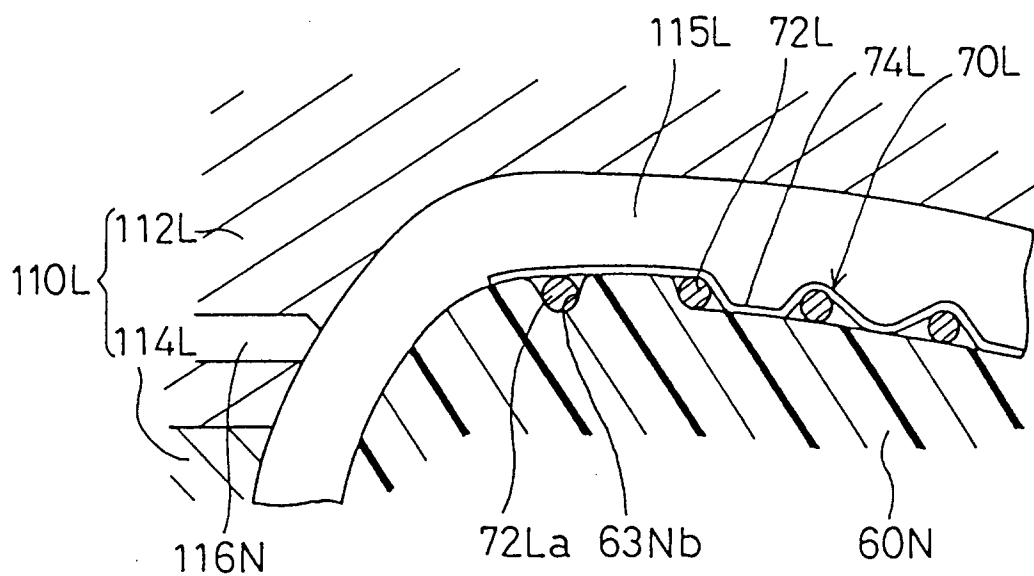


Fig. 39

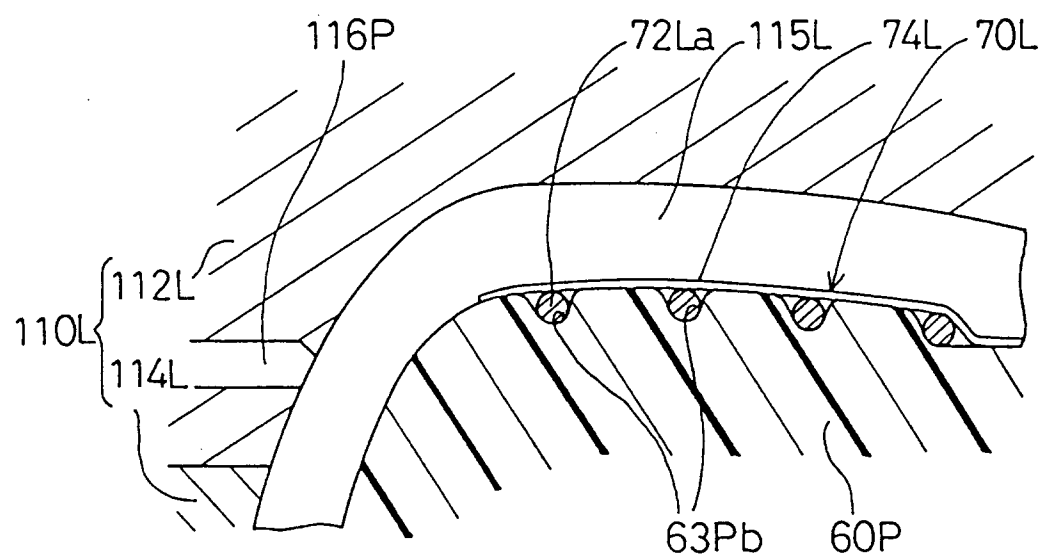


Fig. 40

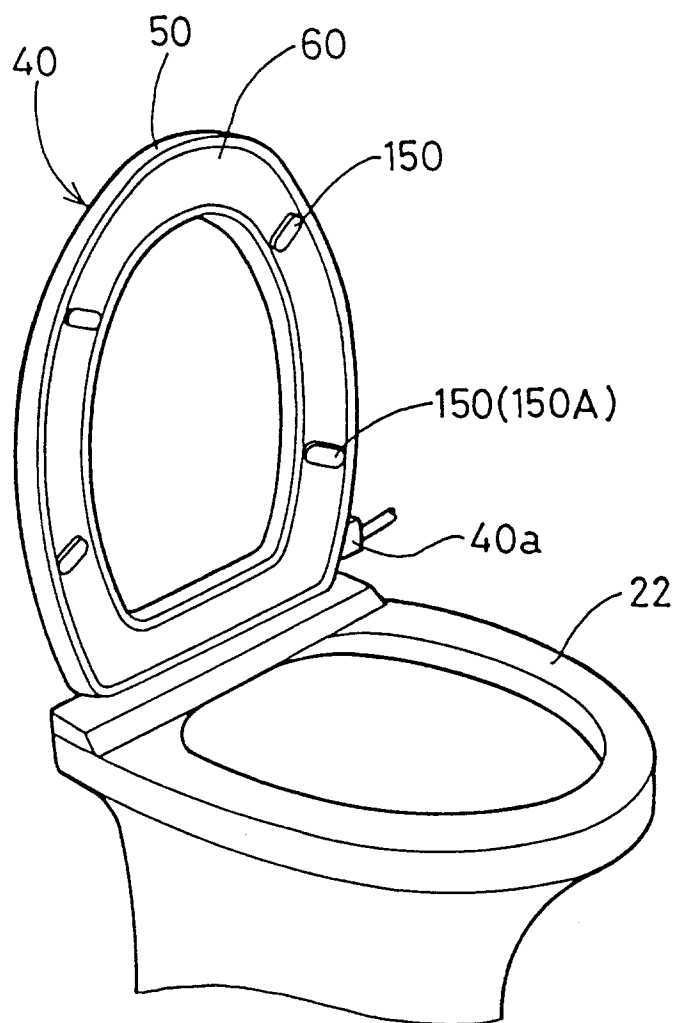


Fig. 41

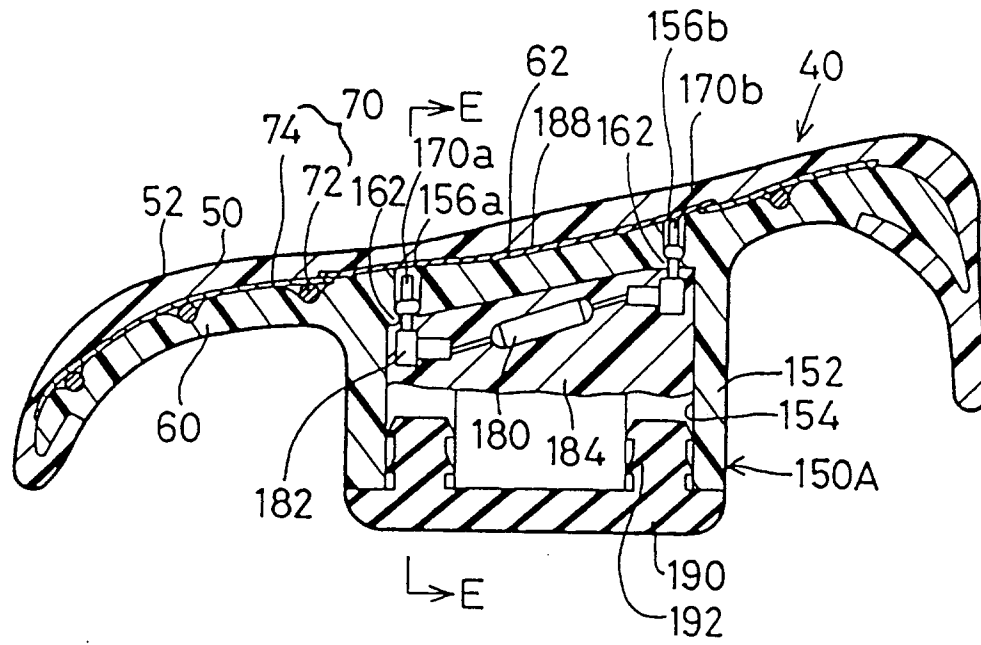


Fig. 42

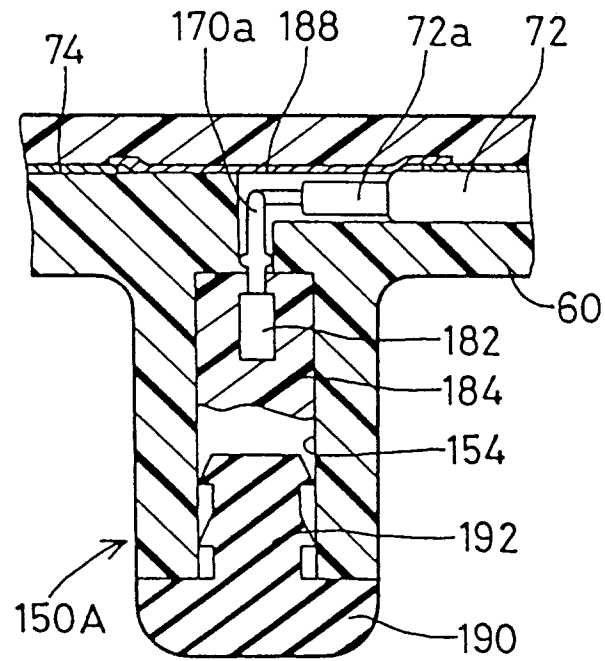


Fig. 43

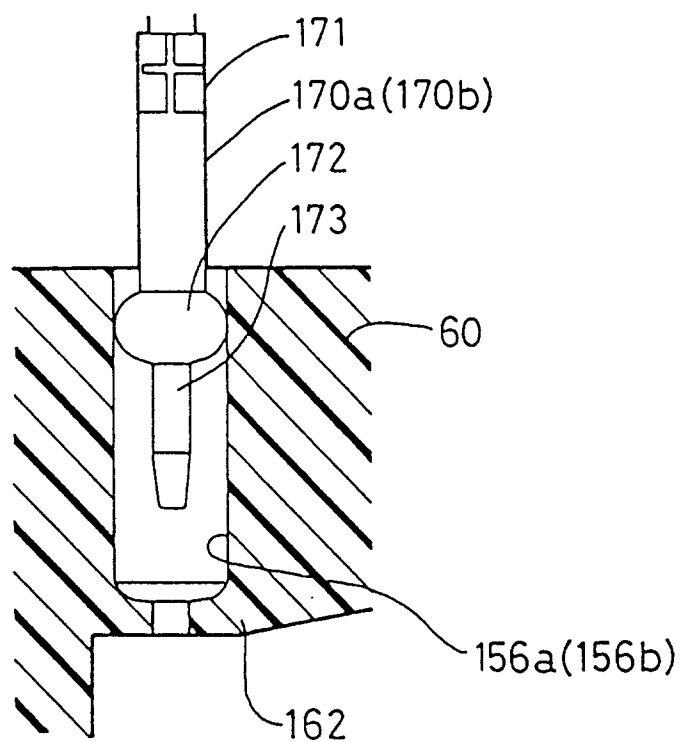


Fig. 44

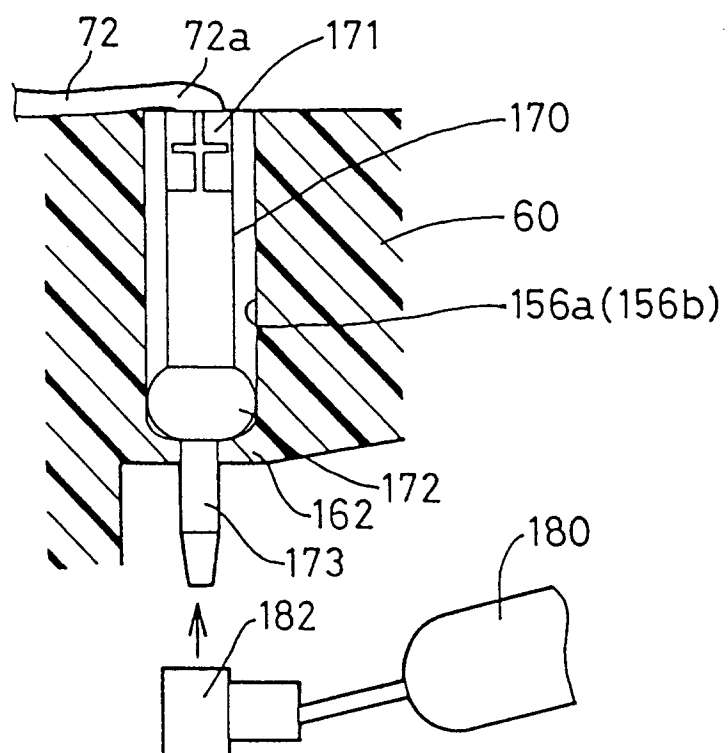


Fig. 45

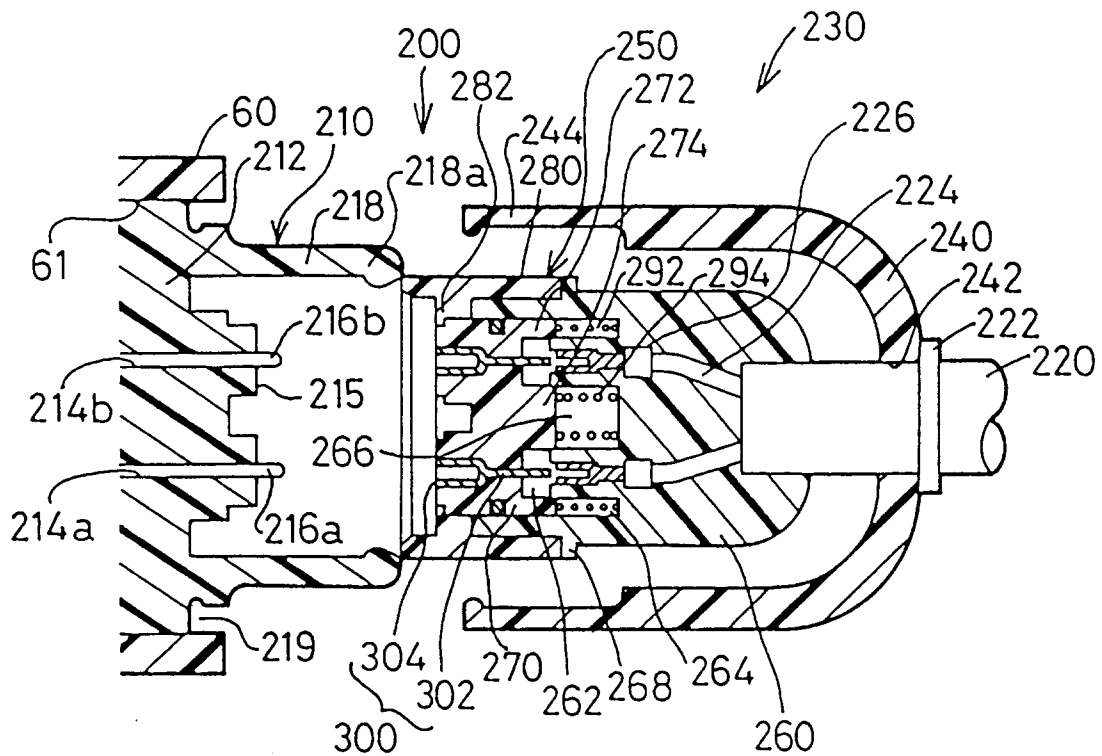


Fig. 46

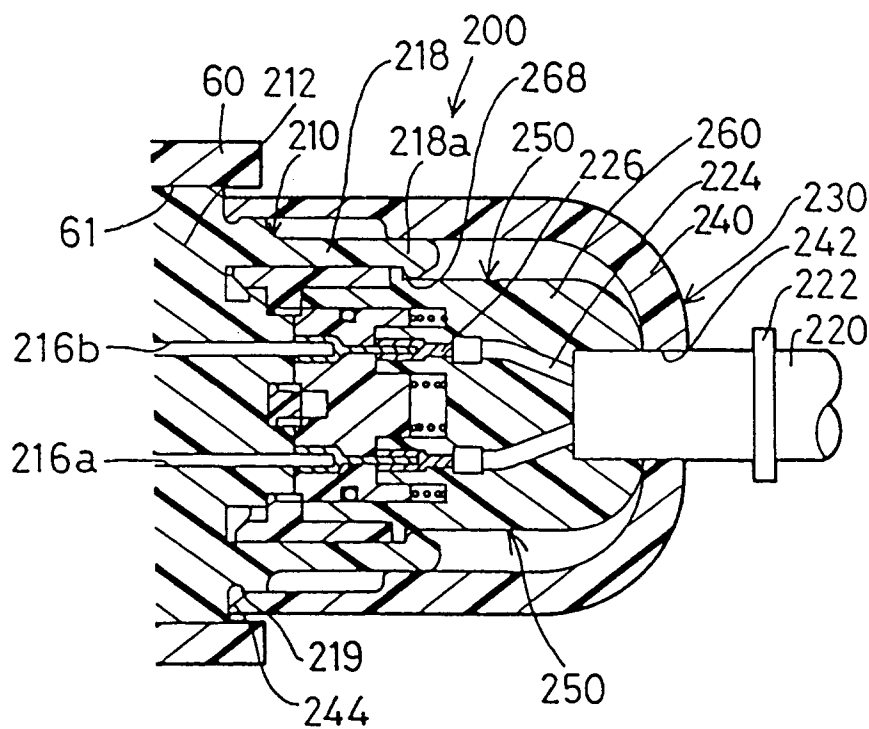


Fig. 47

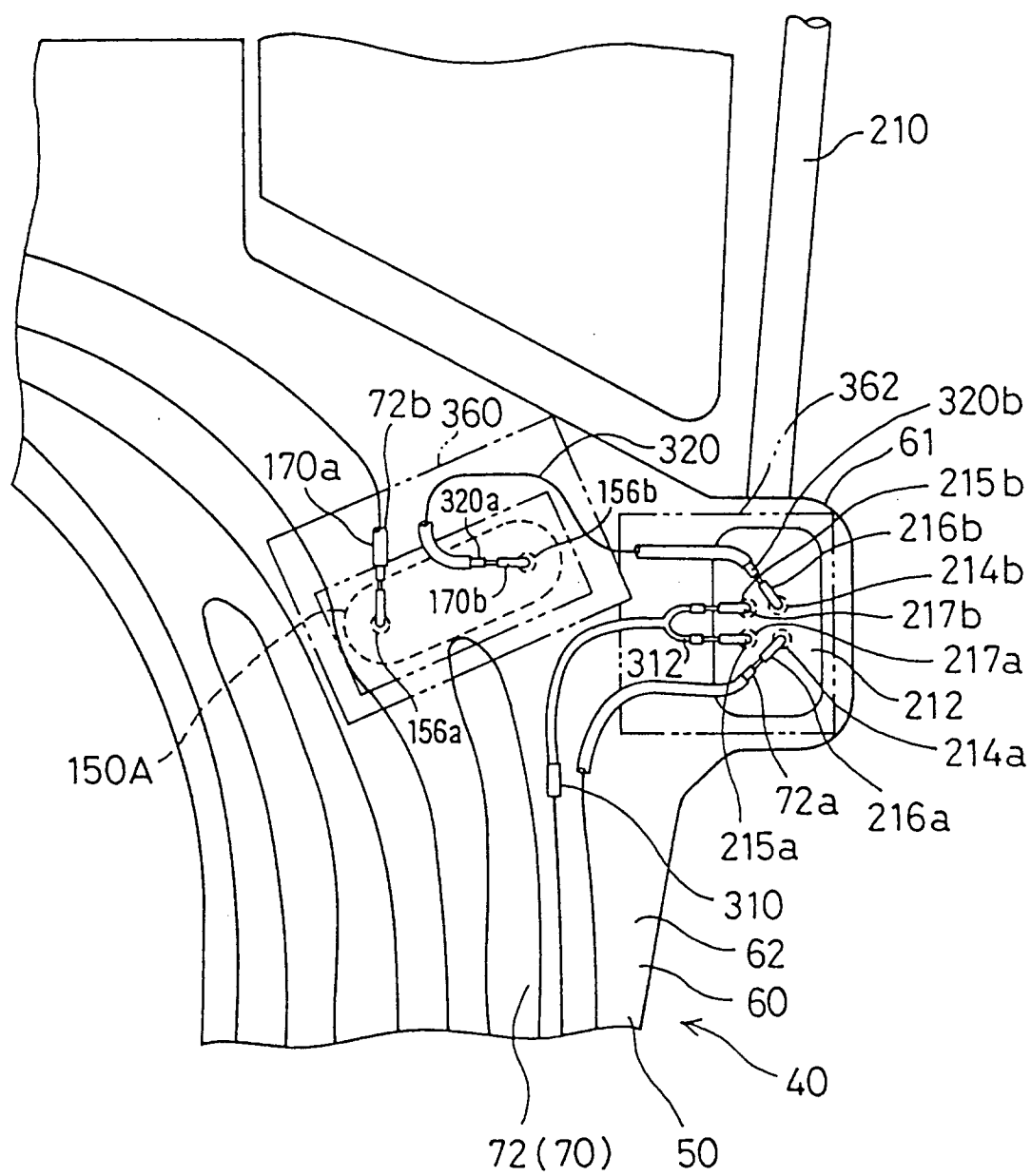


Fig. 48

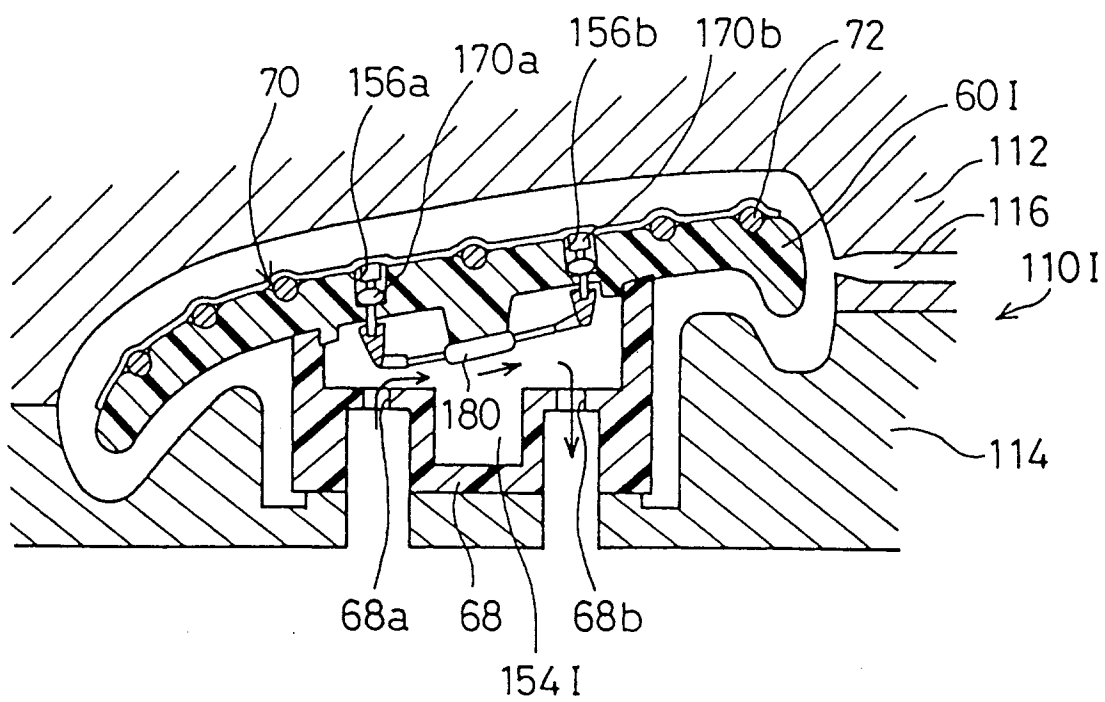


Fig. 49

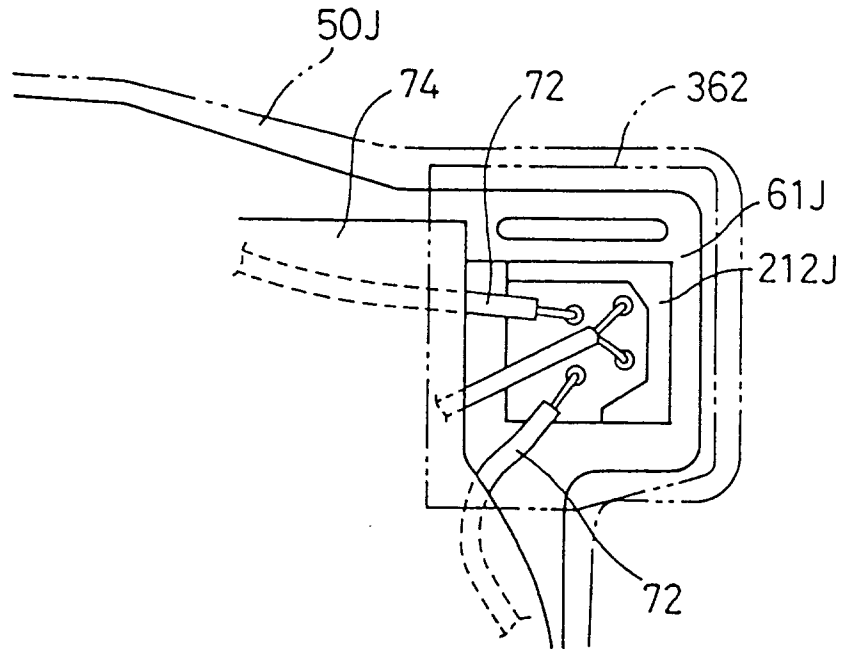


Fig. 50

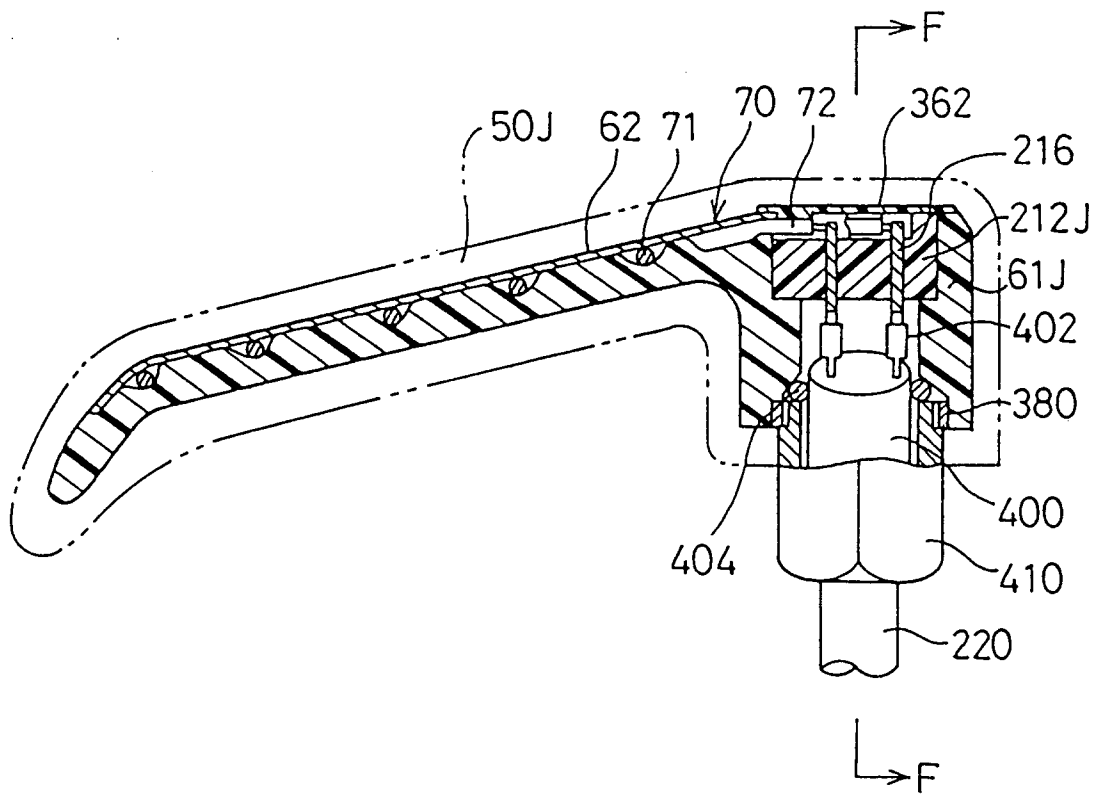


Fig. 51

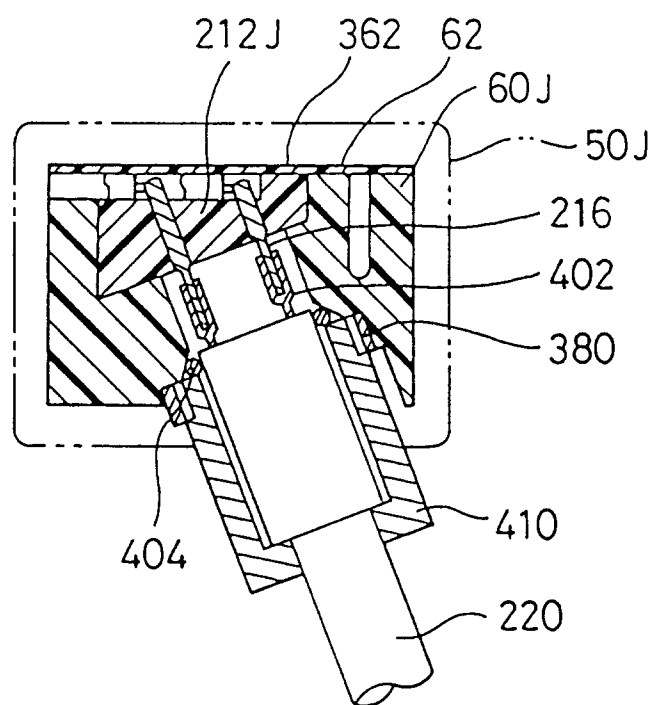


Fig. 52

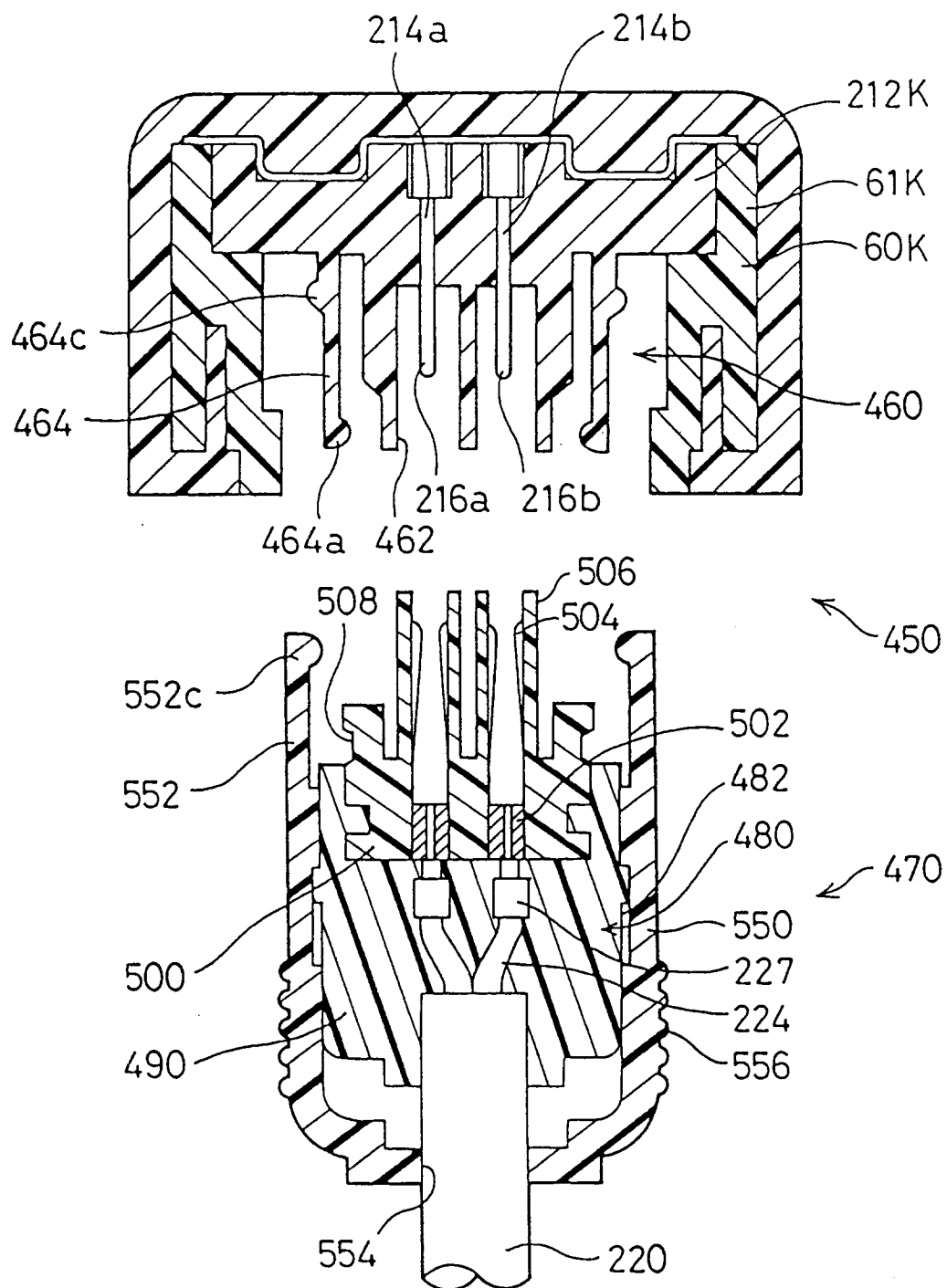


Fig. 53

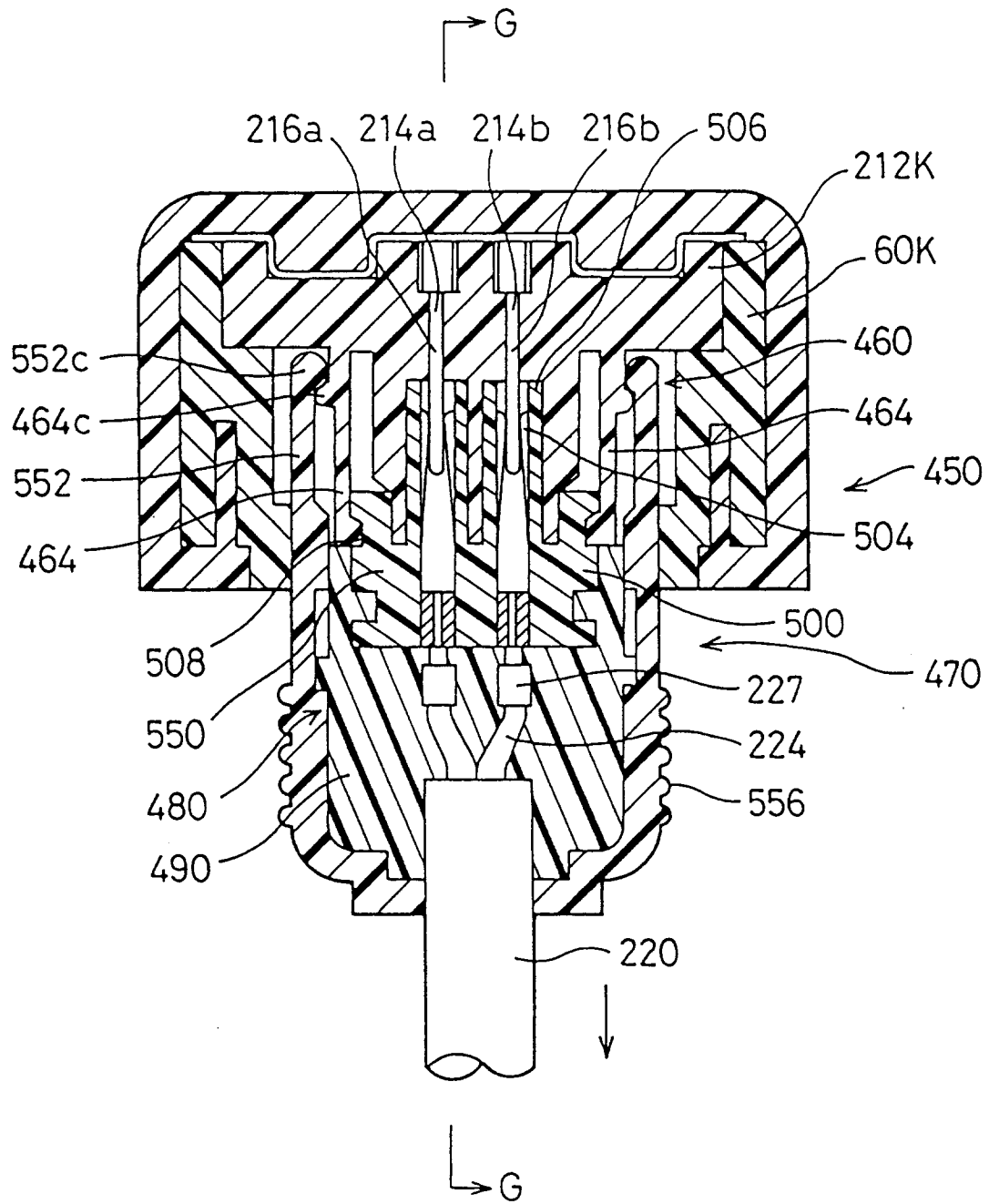


Fig. 54

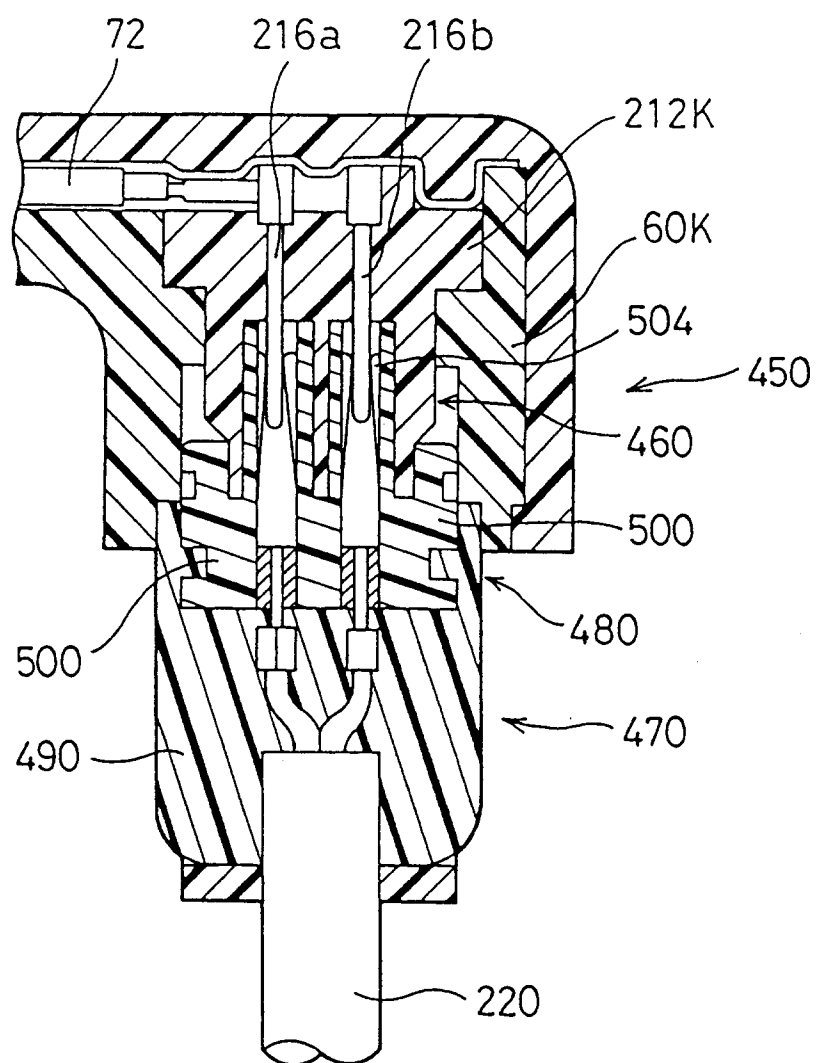


Fig. 55

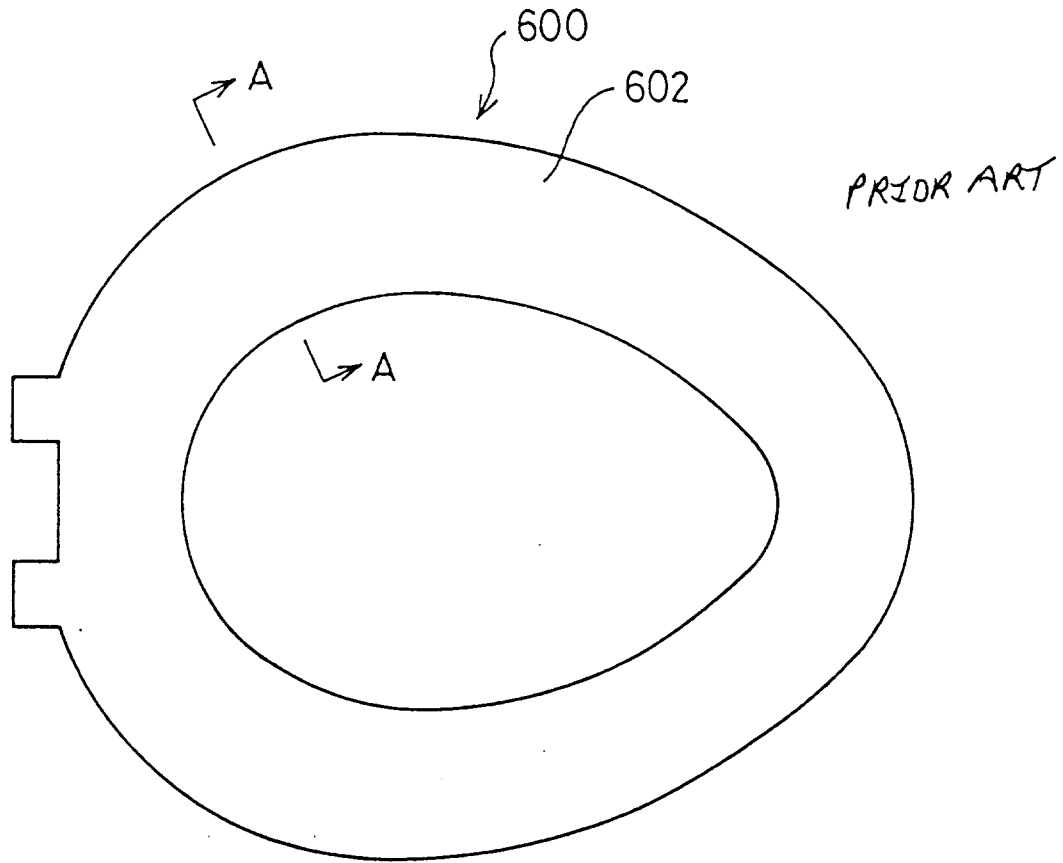


Fig. 56

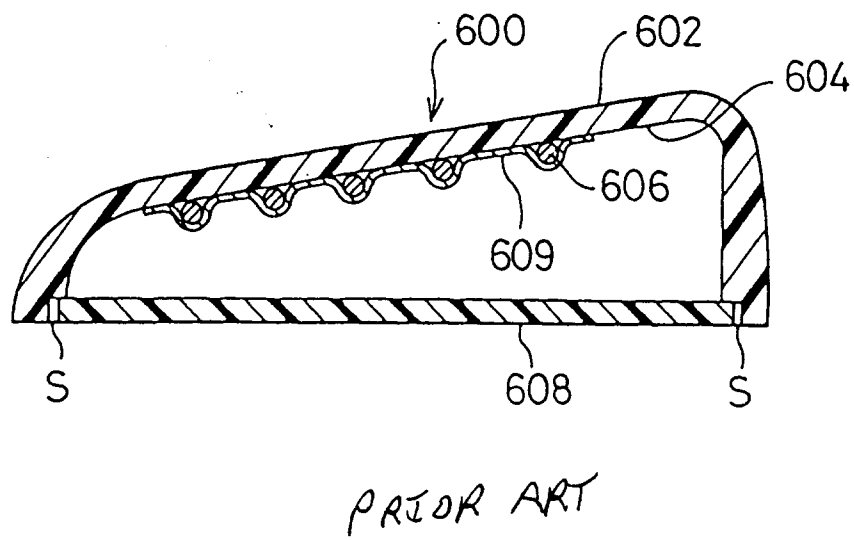
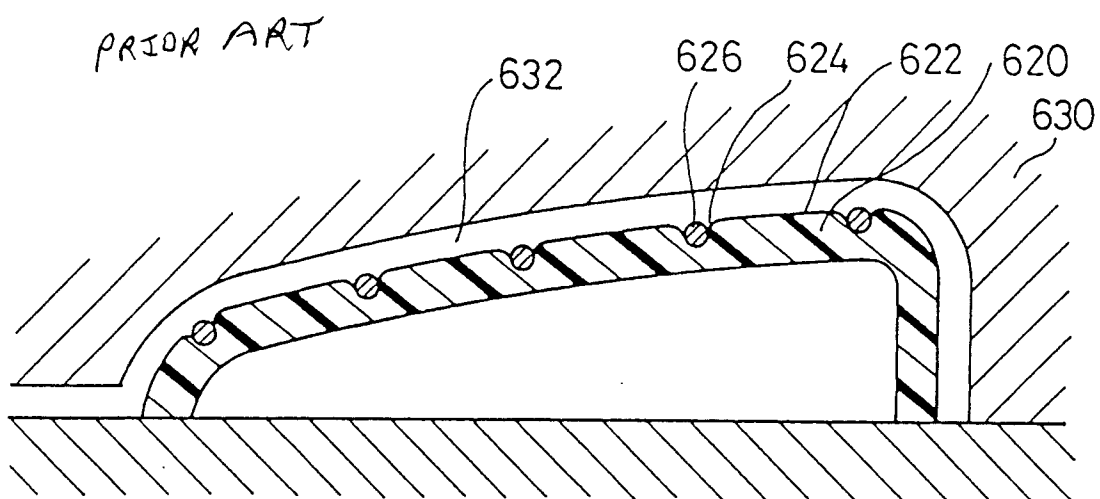


Fig. 57



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP94/01819

A. CLASSIFICATION OF SUBJECT MATTER		
Int. Cl ⁶ A47K13/30		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
Int. Cl ⁶ A47K13/30		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Jitsuyo Shinan Koho 1941 - 1994		
Kokai Jitsuyo Shinan Koho 1971 - 1994		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP, A, 1-124428 (Aishin Seiki Co., Ltd.), May 17, 1989 (17. 05. 89), (Family: none)	1-18
A	JP, A, 62-117516 (Aichi Denki K.K. and two others), May 29, 1987 (29. 05. 87), (Family: none)	1-18
A	JP, U, 61-13685 (Aichi Denki Kosakusho K.K., and another), January 27, 1986 (27. 01. 86), (Family: none)	1-18
☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search		Date of mailing of the international search report
December 28, 1994 (28. 12. 94)		January 31, 1995 (31. 01. 95)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.