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(54) **Heat exchanger tank**

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates in general to heat exchangers of motor vehicles, and more particularly to a tank of the heat exchangers, which generally comprises a tank body of clad metal, a pipe member of clad metal, a header plate member of clad metal and end plates of clad metal which are all hermetically secured to one another by means of brazing.

2. Description of the Prior art

[0002] In order to clarify the task of the present invention, some conventional tanks of heat exchangers will be described with reference to the drawings.

[0003] Referring to Fig. 41, there is shown a conventional tank of heat exchanger, which is disclosed in Japanese Utility Model First Provisional Publication 60-2195. The conventional tank comprises a tank body 1 which has a pipe inserting opening 1a provided by means of a burring reamer. A pipe member 2 is inserted into the pipe inserting opening 1a having its leading end abutting on an inner surface of the tank body 1 through a seating plate 3. However, usage of the seating plate 3 brings about a troublesome and time consuming work for producing the tank. Furthermore, due the nature of the burring reamer, the tank needs a height "H" much greater than the diameter "D" of the pipe member 2, which causes a bulky construction of the tank.

[0004] Referring to Fig. 42, there is shown another conventional tank of heat exchanger. The conventional tank comprises a tank body 1 produced by using a deep drawing technique, and a header plate member 4 brazed to the tank body 1. For facilitating the assembly, the header plate member 4 is partially fixed or welded to the tank body 1 before carrying out the brazing. However, in this conventional tank, different types of dies are needed depending on sizes and types of the tank produced by the deep drawing technique, and thus cost of the tank increases inevitably. If the tank is designed for radiators, the tank is obliged to have a larger height and longer structure making the deep drawing much difficult. Furthermore, the longer structure of the tank makes the brazing between the tank body 1 and the header plate member 4 much difficult. Furthermore, for the partial attaching between the tank body 1 and the header plate member 4, the parts 1 and 4 have to have complicated engaging and engaged portions 1a and 4a which are to be mutually engaged, which also brings about increase in production cost of the tank.

[0005] Referring to Fig. 43, there is shown still another conventional tank of heat exchanger, which is of a seam welded pipe type made of aluminum. The tank shown in Fig. 42 has a rectangular cross section. However, in this

conventional tank, due to the tubular shape, formation of the opening in the tank for receiving and holding the pipe member needs a troublesome and consuming manual work.

5 **[0006]** Referring to Figs. 44 and 45, there is shown a further conventional tank of heat exchanger, which is made of aluminum. The tank shown in the drawings comprises an aluminum tank body 1 having a generally C-shaped cross section and an aluminum header plate member 5 fitted to an open portion of the tank body 1. To both sides of a unit consisting the tank body 1 and the header plate member 5, there are fixed aluminum end plates 6 (only one is shown) respectively. As is seen from the drawings, each end plate 6 is formed with a rectangular recess 6a into which the corresponding end of the unit is press-fitted. The recess 6a of the end plate 6 and the end of the unit are brazed at "R" in a furnace. However, as is seen from Fig. 45, if the press-fitting of the unit to the end plate 6 is too hard due to a possible dimensional error therebetween or the like, the tank body 1 becomes deformed as is shown by phantom lines. Of course, in this case, brazing of such deformed portion and the end plate is not adequately carried out.

10 **[0007]** Referring to Fig. 46, there is shown a conventional structure for holding a radiator 7 to a motor vehicle (not shown) through lower and upper mount rubbers 12 and 15. The radiator 7 comprises upper and lower tanks 8 and 9 of plastics and a core structure 10 interposed between the upper and lower tanks 8 and 9. The lower tank 9 has at its lower surface mounting pins 11 by which the lower mount rubber 12 is held. The lower mount rubber 12 is held by a lower bracket 13 extending from the vehicle body. The upper tank 8 has at its upper surface mounting pins 14 by which the upper mount rubber 15 is held. The upper mount rubber 15 is held by an upper bracket 16 extending from the vehicle body. Due to provision of the upper and lower mount rubbers 15 and 12, undesired transmission of vibration of the vehicle body to the radiator 7 is lowered or at least minimized. Fig. 47 shows a conventional technique for fixing each mounting pin 14 or 11 to the upper or lower tank 8 or 9. For this fixing, the tank 8 or 9 is formed with an opening 8a, and each mounting pin 14 or 11 is formed with a forked projected portion 14a. The forked projected portion 14a is put in the opening 8a and then brazing is practically applied to mating portions therebetween. However, this pin fixing work is troublesome. Furthermore, satisfied brazing is not obtained by the pin due to a non-negligible difference in heat capacity between the mounting pin 14 or 11 and the tank 8 or 9. Of course, the unsatisfied brazing tends to induce leakage of cooling water from the tank.

15 **[0008]** EP 0 821 213 A2 discloses securing inlet and outlet connectors to a header each of which is constituted of a generally rectangular-parallelepiped block. The inlet and outlet connectors are provisionally fixed to the respective headers through argon arc spot welding and thereafter a tight assembling of the heat exchanger is

achieved through brazing in a furnace.

SUMMARY OF THE INVENTION

[0009] It is therefore a main object of the present invention to provide a tank of heat exchanger, which is free of the above-mentioned drawbacks.

[0010] It is an object of the present invention to provide a tank of heat exchanger, wherein a pipe member is readily and assuredly connected to a tank body.

[0011] It is another object of the present invention to provide a tank of heat exchanger, which is easily manufactured at a reduced cost.

[0012] It is still another object of the present invention to provide a tank of heat exchanger, wherein end plates are assuredly brazed to ends of a unit including a tank body and a header plate member.

[0013] It is a further object of the present invention to provide a tank of heat exchanger, wherein mounting pins are readily and assuredly fixed to the tank.

[0014] These objects are solved by the features of claim 1.

[0015] Further embodiments are claimed in sub-claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] Other objects and advantages of the present invention will become apparent from the following description when taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a sectional view of a tank of heat exchanger, which is a first embodiment of the present invention; Fig. 2 is a front view of the tank of the first embodiment, that is a view taken from a direction of the arrow "II" of Fig. 1;

Fig. 3 is a plan view of the tank of the first embodiment;

Figs. 4A to 4D are illustrations explaining first half steps of a method of producing a pipe member used in the first embodiment;

Figs. 5A to 5E are views explaining last half steps of the method of producing the pipe member used in the first embodiment;

Fig. 6 is a sectional view of a tank of heat exchanger, which is a second embodiment of the present invention;

Fig. 7 is a front view of the tank of the second embodiment, that is taken from a direction of the arrow "VII" of Fig. 6;

Fig. 8 is a plan view of the tank of the second embodiment;

Fig. 9 is a sectional view of a tank of heat exchanger, which is a third embodiment of the present invention;

Fig. 10 is a side view of the tank of the third embodiment;

Fig. 11 is a sectional view of the tank of the third embodiment, showing a header plate member fitted in a longitudinally extending opening of a tank body; Fig. 12 is a front view of the tank of the third embodiment, showing an end plate fixed to a longitudinal end of the tank body;

Fig. 13 is a sectional view of the tank of the third embodiment, showing the header plate member and a pipe member which are fixed to the tank body; Fig. 14 is a sectional view of the tank of the third embodiment, showing a portion where a filler-neck is arranged;

Figs. 15A, 15B and 15C are views showing steps for producing the tank body used in the third embodiment;

Figs. 16A, 16B and 16C are views showing steps for producing the header plate member used in the third embodiment;

Fig. 17 is a sectional view of the tank of the third embodiment, showing a method for partially welding the header plate member to the tank body;

Fig. 18 is an exploded perspective view of a tank of heat exchanger, which is a fourth embodiment of the present invention;

Fig. 19 is a side view of the tank of the fourth embodiment;

Fig. 20 is an illustration showing a method for partially welding an end plate to a longitudinal end of a unit including a tank body and a header plate member;

Fig. 21 is a sectional view taken along the line XXI-XXI of Fig. 19;

Fig. 22 is a sectional view taken along the line XXII-XXII of Fig. 19;

Fig. 23 is a sectional view taken along the line XXIII-XXIII of Fig. 19;

Fig. 24 is a view showing a first modification of the fourth embodiment;

Fig. 25 is a view showing a second modification of the fourth embodiment;

Fig. 26 is a view showing a third modification of the fourth embodiment;

Fig. 27 is a view showing a fourth modification of the fourth embodiment;

Fig. 28 is an illustration showing a method for partially welding two end plates to longitudinal both ends of a unit including a tank body and a header plate member;

Fig. 29 is an exploded perspective view of a tank of heat exchanger, which is a fifth embodiment of the present invention;

Fig. 30 is a side view of the tank of the fifth embodiment;

Fig. 31 is a partial sectional view of a tank of heat exchanger, which is a sixth embodiment of the present invention;

Fig. 32 is a partially cut perspective view of the tank of the sixth embodiment;

Figs. 33A to 33E are illustrations explaining a method of producing a mounting pin used in the sixth embodiment;

Fig. 34 is a sectional view of the tank of the sixth embodiment, showing a portion where brazing is practically applied;

Fig. 35 is a sectional view of the tank of the sixth embodiment, showing a mount rubber mounted on the tank body through the mounting pin;

Fig. 36 is a view similar to Fig. 31, but showing a first modification of the sixth embodiment;

Fig. 37 is a view similar to Fig. 31, but showing a second modification of the sixth embodiment;

Fig. 38 is a view similar to Fig. 31, but showing a third modification of the sixth embodiment;

Fig. 39 is an illustration of a radiator having respective tanks at right and left sides;

Fig. 40 is a schematic illustration of an automotive radiator to which tanks of the present invention are practically mounted;

Fig. 41 is a sectional view of a first conventional tank of heat exchanger;

Fig. 42 is a sectional view of a second conventional tank of heat exchanger;

Fig. 43 is a sectional view of a third conventional tank of heat exchanger;

Fig. 44 is a sectional view of a fourth conventional tank of heat exchanger;

Fig. 45 is a side view of the fourth conventional tank of heat exchanger, showing a condition wherein a tank body is deformed;

Fig. 46 is a sectional view of a radiator mounted to a motor vehicle through a conventional holding structure; and

Fig. 47 is a view showing a conventional manner for partially welding a mounting pin to a tank body.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0017] In the following, embodiments of the present invention will be described with reference to the accompanying drawings.

[0018] For ease of understanding, various directional terms, such as, upper, lower, right, left, upward, downward and the like are used in the following description. However, it is to be noted that such terms are to be understood with respect to the drawings on which corresponding parts and structures are illustrated.

[0019] Referring to Figs. 1 to Fig. 5E, particularly Figs. 1 to 3 of the drawings, there is shown a tank 100 of heat exchanger, which is a first embodiment of the present invention. The heat exchanger to which the tank 100 is practically applied is a radiator which is usually mounted in a front part of an engine room for cooling an engine cooling water.

[0020] The tank 100 of this first embodiment comprises a tank body 102 which is made of a clad metal, such as a clad aluminum plate or the like. The tank body 102

is shaped like a channel member including opposed side walls 102a and 102b and an upper wall (or base wall) 102c. The tank body 102 has a lower portion fully opened, as shown. An inner surface of the tank body 102 is coated with a corrosion resisting material or self-sacrificing corrosion material, and an outer surface of the tank body 102 is lined with a brazing metal. The side wall 102b is formed with a circular opening 104. As is seen from Fig. 1, the circular opening 104 has an uppermost end that terminates at an inner surface of the upper wall 102c.

[0021] A pipe member 106 is connected to the circular opening 104 of the tank body 102. That is, in operation, coolant is forced to flow in the pipe member 106 and the tank body 102. The pipe member 106 is made of a clad metal, such as a clad aluminum plate or the like. Inner and outer surfaces of the pipe member 106 are coated with a corrosion resisting material or self-sacrificing corrosion material. The pipe member 106 is formed at one end with an annular ridge 108 which functions to make a tight fitting of a hose (not shown) thereto when the hose is connected to the pipe member 106.

[0022] The other end of the pipe member 106 is formed with a generally circular flange 110. The flange 110 comprises a generally circular major part which is brazed to a peripheral portion of the circular opening 104 of the side wall 102b and a generally arcuate upper part 110a which is bent at generally right angles and brazed to the upper wall 102c.

[0023] The pipe member 106 is produced by taking the following steps.

[0024] First, as is seen from Fig. 4A, a clad aluminum plate 112 is prepared. The plate 112 is then subjected to a deep drawing process as is depicted by Figs. 4B, 4C and 4D to produce a cup-shaped member 114 with a roughly shaped flange 110. Preferably, the deep drawing process is carried out through three drawing steps. Then, as is seen from Fig. 5A, the cup-shaped member 114 is subjected to a piercing process to provide at a bottom thereof with an opening 114a. Then, as is seen from Figs. 5A and 5B, a peripheral portion of the opening 114a is bent or expanded outward as is indicated by short arrows in Fig. 5B to form a cylindrical leading end 114b that is concentric with a major cylindrical portion of the member 114. Then, as is seen from Fig. 5C, the member 114 is subjected to a trimming process to remove an unnecessary part 110b. With this process, the flange 110 becomes shaped circular. Then, as is seen from Fig. 5D, one part 110a of the circular flange 110 is bent at right angles. Then, as is seen from Fig. 5E, the member 114 is subjected to an expansion process to provide the leading end thereof with an annular ridge 108. With this, the pipe member 106 is produced.

[0025] For assembling the tank 100, the following steps are taken.

[0026] First, the pipe member 106 is partially fixed or welded to the tank body 102, as is understood from Fig. 1. For this Incomplete fixing, spot welding is applied to

three portions P1, P2 and P3 of the unit of the tank body 102 and the pipe member 106, as is seen from Figs. 2 and 3. If desired, for such incomplete fixing, other technique, such as caulking, laser beam welding or the like may be used. Then, this semi-finished tank 100 is incompletely mounted to a core structure to provide a so-called semi-finished radiator (not shown), and then the semi-finished radiator is applied with a non-corrosive flux and heated in a furnace. With this, production of the radiator is finished completing brazing of various parts thereof. The flange 110 is brazed to the tank body 102 in such a manner as has been described hereinabove.

[0027] In the above-mentioned first embodiment, the bent shape of the flange 110 of the pipe member 106 facilitates positioning and holding of the pipe member 106 to the tank body 102. That is, the right-angled arcuate part 110a of the flange 110 can be used as a suspending means for suspending the pipe member 106 on the tank body 102, as will be seen from Fig. 1. Since the uppermost end of the circular opening 104 of the side wall 102b is mated with the inner surface of the upper wall 102c of the tank body 102, the height needed by the tank body 102 for connecting with the pipe member 106 is reduced, which brings about a compact construction of the tank 100 and the associated radiator.

[0028] Referring to Figs. 6 to 8, there is shown a tank 200 of heat exchanger, which is a second embodiment of the present invention.

[0029] Since the tank 200 of this embodiment is similar to that 100 of the above-mentioned first embodiment, only parts and structures which are different from those of the first embodiment 100 will be described in the following.

[0030] In this second embodiment 200, the circular opening 104 extends to the upper wall 102c of the tank body 102. That is, the opening 104 comprises a generally circular major part formed in the side wall 102b and an arcuate part 104b formed in the upper wall 102c. For surrounding both the generally circular major part and the arcuate part 104b of the opening 104, the flange 110 of the pipe member 106 comprises a generally circular major part which is brazed to a peripheral portion of the generally circular opening part of the side wall 102b and a generally rectangular part 110b (see Fig. 8) which is brazed to a peripheral portion of the arcuate opening part 104a of the upper wall 102c. As is seen from Fig. 6, for assuring a fluid communication between the arcuate opening part 104a and the interior of the pipe member 106, the rectangular part 110b of the flange 110 is somewhat raised from the upper wall 102c of the tank body 102. In the illustrated embodiment, the rectangular part 110b is swelled and sloped relative to the upper wall 102c.

[0031] In addition to the advantages possessed by the above-mentioned first embodiment 100, the second embodiment 200 has such an advantaged that the height needed by the tank body 102 for connecting with the pipe member 106 is much reduced, which brings about

much compact construction of the tank 200.

[0032] Referring to Figs. 9 to 17, particularly Figs. 9 and 10, there is shown a tank 300 of heat exchanger, which is a third embodiment of the present invention.

[0033] The tank 300 of this third embodiment comprises a tank body 102 made of a clad metal, such as a clad aluminum plate or the like. The tank body 102 is shaped like a channel member including opposed side walls 102a and 102b and an upper wall 102c. The tank body 102 has a lower portion 102d fully opened as shown in Fig. 1. An inner surface of the tank body 102 is coated with a corrosion resisting material or self-sacrificing corrosion material, and an outer surface of the tank body 102 is lined with a brazing metal.

[0034] An elongate header plate member 116 is fitted in the lower portion 102d of the tank body 102. The header plate member 116 is formed along side edges thereof with respective flanges 116a which are brazed to lower ends of the respective side walls 102a and 102b of the tank body 102. An inner surface of the header plate member 116 is coated with a corrosion resisting material or self-sacrificing corrosion material, and an outer surface of the header plate member 116 is lined with a brazing metal.

[0035] As is understood from Fig. 11, the elongate header plate member 116 is formed with a plurality of slits 118 which are arranged at equally spaced intervals along the length thereof. The slits 118 receive therein one ends of flat tubes 120 which constitute a core structure of the radiator (not shown). As is seen from Fig. 12, end plates 122 are fixed via brazing to longitudinal ends of the tank body 102. Furthermore, as is seen from Fig. 13, a pipe member 106 is connected to the tank body 102 in a manner to establish a fluid communication with the tank body 102 through an opening 104 formed in the side wall 102b of the tank body 102.

[0036] As is seen from Fig. 14, a filler neck member 124 is connected to the upper wall 102c of the tank body 102 in a manner to provide a fluid communication with the tank body 102 through an opening 102e formed in the upper wall 102c.

[0037] For producing the tank body 102, as is seen from Fig. 15A, a rectangular plate 126 is cut out from a coiled plate block 128. Then, as is seen from Fig. 15B, an opening 102e for the filler neck 124 and an opening 104 for the pipe member 106 are formed in the plate 126. Then, as is seen from Fig. 15C, the plate 126 is pressed to have a substantially channel structure. With this, the tank body 102 is produced.

[0038] For producing the header plate member 116, as is seen from Fig. 16A, an elongate plate 130 is cut out from a coiled plate block 132. Then, as is seen from Fig. 16B, the plate 130 is pressed to have two flanges 116a along both sides thereof. Then, as is seen from Fig. 16C, the plate 130 is subjected to a punching process to have a plurality of slits 118, and then subjected to a finishing process. With this, the header plate member 116 is produced.

[0039] For assembling the tank 300, the following steps are taken.

[0040] First, the pipe member 106 and the filler neck 124 are partially welded to the tank body 102. Two header plate members 116 are arranged keeping a given space therebetween. A plurality of flat tubes 120 and a plurality of corrugated fins (not shown) are put between the two header plate members 116. In this case, opposed ends of each flat tube 120 are snugly inserted in respective slits 118 of the header plate members 116. Then, to each header plate member 116, there is partially or incompletely connected a corresponding tank body 102 in such a manner as is understood from Fig. 17. For this incomplete coupling, as is seen from this drawings, spot welding is employed, contacting the tapered electrodes 134A and 134B onto the left (or lower) ends of the side walls 102a and 102b. With this, each flange 116a of the header plate member 116 and the corresponding end of the side wall 102a or 102b are incompletely fixed. Of course, the tank body 102 is connected to one terminal of the spot welding device. Since the electric resistance of the tank body 102 is sufficiently high than that of the header plate member 116, such spot welding can be made without using an inner electrode. Preferably, the spot welding is carried out under a condition wherein the pressing force applied by the electrodes 134A and 134B is about 10 to 30 Kgf and the current applied to the electrodes is about 7,000 to 10,000 A. Then, the end plates 122 are partially or incompletely fixed to the ends of the tank body 102. With this, a so-called semi-finished radiator is provided. Then, the semi-finished radiator is applied with a non-corrosive flux and heated in a furnace. With this, production of the radiator is finished completing brazing of various parts thereof. That is, with this brazing process, the incompletely fixed portions of the radiator are completely fixed or brazed to each other.

[0041] In the above-mentioned third embodiment 300, usage of the spot welding for the partial or incomplete fixing between the header plate member 116 and the tank body 102 facilitates positioning and holding of the header plate member 116 to the tank body 102. Thus, a subsequent brazing process is smoothly and readily carried out, which brings about a cost reduction of the tank 300 and the associated radiator. In fact, the tank body 102 in this third embodiment 300 can be produced at a reduced cost as compared with the tank body 102 of the first embodiment 100. In the first embodiment 100, somewhat expensive deep drawing technique is used.

[0042] Referring to Figs. 18 to 28, particularly Figs. 18 and 19, there is shown a tank 400 of heat exchanger, which is a fourth embodiment of the present invention.

[0043] Since the tank 400 of this fourth embodiment is similar in construction to the tank 300 of the above-mentioned third embodiment, only portions and parts which are different from those of the third embodiment 300 will be described in detail in the following.

[0044] As is seen from Fig. 18, the tank 400 of this fourth embodiment comprises a tank body 102, a header plate member 116 and two end plates 122 (only one is shown), which are assembled in substantially the same manner as in the case of the third embodiment 300. That is, the header plate member 116 carrying the flat tubes 120 and the corrugated fins 136 is brazed to the open portion 102d of the tank body 102, and the two end plates 122 are brazed to the longitudinal ends of the tank body 102.

[0045] In the fourth embodiment 400, there is further employed the following measures.

[0046] That is, as is seen from Fig. 18, each end plate 122 is formed at an inner surface thereof with two ridges 122a and 122b which extend in parallel. These two ridges 122a and 122b are formed by subjecting the end plate 122 a press working. These ridges 122a and 122b are used for partially or incompletely fixing the end plate 122 to the tank body 102 before effecting the brazing process, as will become apparent as the description proceeds. That is, for carrying out a so-called projection welding, such ridges 122a and 122b are used.

[0047] As is seen from Fig. 19, upon a semi-finished assembly provided by the projection welding, the ridge 122a extends between ends of the side walls 102a and 102b of the tank body 102, and the other ridge 122b extends between the ends of the flanges 116a of the header plate member 116 as well as between the ends of the side walls 102a and 102b of the tank body 102. The end plate 122 is then brazed to the ends of the tank body 102 and the header plate member 116.

[0048] For assembling the tank 400, the following steps are taken.

[0049] As is seen from Fig. 20, the header plate member 116 carrying the flat tubes 120 (see Fig. 18) and corrugated fins 136 is put into a given position of the tank body 102. Then, each end plate 122 is partially or incompletely fixed to the corresponding ends of the tank body 102 and the header plate member 116 through the projection welding. For this projection welding, two first flat electrodes 138 are attached to the respective side walls 102a and 102b of the tank body 102, and a second flat electrode 140 is handled to press the end plate 122 by a certain force "F" against the ends of the tank body 102 and the header plate member 116, and a certain voltage is applied between the first and second electrodes 138 and 140. With this, the ridges 122a and 122b are welded to the ends of the tank body 102 and the header plate member 116. That is, as is seen from Figs. 21 and 22, longitudinal ends of each ridge 122a or 122b are well welded at positions "W" to the corresponding ends of the tank body 102 and the header plate member 116. With this welding, each end plate 122 is partially or incompletely fixed to the ends having other portions intimately contacting with the same. With this, a so-called semi-finished radiator is provided. Then, the semi-finished radiator is applied with a non-corrosive flux and put into a furnace to be subjected to a brazing process.

With this, production of the radiator is finished completing brazing of various parts thereof. That is, as is seen from Fig. 23, with this brazing process, the incompletely fixed portions of the radiator become completely fixed or brazed to each other. That is, by the heat generated in the furnace, the brazing metal "R" lined on the inner surface of the end plate 122, the header plate member 116 and the tank body 102 is fused for carrying out brazing therebetween. During this, the flat tubes 120 (see Fig. 18), the corrugated fins 136 and the corresponding header plate member 116 achieve the mutual brazing therebetween.

[0050] In the above-mentioned fourth embodiment 400, usage of the projection welding for the partial or incomplete fixing between the end plate 122, the tank body 102 and the header plate member 116 facilitates the mutual positioning therebetween and thus facilitates and assures the subsequent brazing process applied thereto. That is, in this fourth embodiment, brazing failure such as one depicted by Fig. 44 is assuredly suppressed. Since the ridges 122a and 122b formed on each end plate 122 need only a low dimensional precision, the end plates 122 can be produced at a lower cost.

[0051] Figs. 24, 25, 26 and 27 show first, second, third and fourth modifications 400A, 400B, 400C and 400D of the tank 400 of the fourth embodiment. In the first modification 400A of Fig. 24, the end plate 122A is so oriented that each of ridges 122c and 122d extends between the end of the upper wall 102a of the tank body 102 and the end of the header plate member 116. In the second modification 400B of Fig. 25, the two ridges 122e and 122f on the end plate 122B are arranged to cross, and the end plate 122B is so oriented that the ridge 122e extends between the ends of the side walls 102a and 102b of the tank body 102 and the other ridge 122f extends between the end of the upper wall 102c of the tank body 102 and the end of the header plate member 116, as shown. In the third modification 400C of Fig. 26, T-shaped ridge including a first part 122g and a second part 122h is formed on the end plate 122C, and the end plate C 122 is so oriented that the first part 122g extends between the ends of the side walls 102a and 102b of the tank body 102 and the second part 122h extends from the first part 122g to the end of the header plate member 116. In the fourth embodiment 400D of Fig. 27, three separate ridges 122i, 122j and 122k are formed on the end plate 122D, and the end plate 122D is so oriented that the ridge 122i extends to the end of the upper wall 102c of the tank body 102, the ridges 122j and 122k extend to the end of the header plate member 116, as shown.

[0052] For assembling the tanks 400 and 400A to 400D, the following steps may be also taken.

[0053] That is, as is seen from Fig. 28, two flat electrodes 140A and 140B are used, which are handled to press the corresponding end plates 122 by a certain force "F" against the ends of the tank body 102 and the header plate member 116, and a certain voltage is ap-

plied between the two flat electrodes 140A and 140B.

[0054] Referring to Figs. 29 and 30, there is shown a tank 500 of heat exchanger, which is a fifth embodiment of the present invention.

[0055] As is seen from Fig. 29, in the tank 500 of this fifth embodiment, the flat tubes 120 and the corrugated fins 136 are connected to a tank body 102'. For covering the open portion of the tank body 102', an elongate cover plate 116' is employed. End plates 122 with ridges 122a and 122b are partially or incompletely fixed to ends of the tank body 102' and the cover plate 116' through projection welding and then tightly secured to the same through brazing, like in the case of the above-mentioned fourth embodiment 400. As shown in Fig. 30, in the fifth embodiment 500, one ridge 122a of the end plate 122 extends between the ends of the flanges 116'a of the cover plate 116' as well as between the ends of the side walls 102'a and 102'b of the tank body 102', and the other ridge 122b of the end plate 122 extends between the ends of the side walls 102'a and 102'b of the tank body 102', as shown.

[0056] Referring to Figs. 31 to 35, particularly Figs. 31 and 32, there is shown a tank 600 of heat exchanger, which is a sixth embodiment of the present invention.

[0057] The tank 600 of this sixth embodiment comprises a tank body 102 made of a clad metal, such as a clad aluminum plate or the like. The tank body 102 is shaped like a channel member including opposed side walls 102a and 102b and an upper wall 102c. As shown in Fig. 32, the tank body 102 has a lower portion 102d fully opened. An inner surface of the tank body 102 is coated with a corrosion resisting material of self-sacrificing corrosion material, and an outer surface of the tank body 102 is lined with a brazing metal.

[0058] On the upper wall 102c of the tank body 102, there are mounted mounting pins 142 (only one is shown). These pins 142 are used for stably mounting a mount rubber 15 (see Fig. 35) on the tank body 102. Each pin 142 is a cylindrical hollow member made of a clad metal, such as a clad aluminum plate or the like. An outer surface of the pin 142 is coated with a corrosion resisting material or self-sacrificing corrosion material. The pin 142 comprises a cylindrical middle part 142a, a head part 142b and a circular flange part 142c, as shown. The flange part 142c is brazed to the upper wall 102c of the tank body 102.

[0059] For producing the pins 142, as is seen from Figs. 33A to 33E, a flat plate 144 is subjected to a deep drawing process. Preferably, the deep drawing process is carried out through three drawing steps which are respectively shown in Figs. 33B, 33C and 33D. At a final step of Fig. 33E, the flange part 142c is trimmed.

[0060] For assembling the tank 600, the following steps are taken.

[0061] First, the pin 142 is put on the upper wall 102c of the tank body 102, as is seen from Fig. 31. Then, spot welding is applied to two portions "P1" and "P2" of the flange 142c, as is shown in Fig. 32. With this, the pin

142 is partially or incompletely fixed to the upper wall 102c of the tank body 102. Then, this semi-finished tank 600 is partially or incompletely mounted to a core structure to provide a so-called semi-finished radiator (not shown), and then, the semi-finished radiator is applied with a non-corrosive flux and heated in a furnace. With this, production of the radiator is finished completing brazing of various parts thereof. The flange 142c is brazed to the upper wall 102c of the tank body 102 in such a manner as has been described hereinabove.

[0062] Because the pin 142 is of a tubular structure, it has only a small heat capacity, which facilitates brazing of the pin 142 to the tank body 102. As is seen from Fig. 35, when a mount rubber 15 is operatively held by the pin 142, the flange 142c of the pin 142 can serve as a seat member.

[0063] Figs. 36, 37 and 38 show first, second and third modifications 600A, 600B and 600C of the tank 600 of the fifth embodiment. In the first modification 600A of Fig. 36, an opening 144 is formed in the head part 142b of the pin 142. Formation of such opening 144 facilitates the deep drawing process and washing of the pin 142. In the second modification 600B of Fig. 37, a projection 146 is formed on the upper wall 102c of the tank body 102 to facilitate positioning of the pin 142 relative to the tank body 102. In the third modification 600C of Fig. 38, a recess 148 is formed on the upper surface 102c of the tank body 102 to receive therein the flange 142c of the pin 142. With this, positioning and brazing of the pin 142 relative to the tank body 102 are facilitated.

[0064] Fig. 39 shows a radiator 1000 to which two tanks 600 of the fifth embodiment are practically applied. The radiator 100 comprises a core structure 1002 and the two tanks 600 which are mounted to opposed ends of the core structure 1002. As has been mentioned hereinabove, the core structure 1002 comprises a plurality of parallel flat tubes and a plurality of corrugated fins, which extend between the two tanks 600. Each tank 600 is provided at its upper and lower ends with pins 142.

Claims

1. A tank of heat exchanger comprising:

a tank body (102) made of a metal, said tank body (102) being shaped like a channel member including a base wall (102c) and opposed side walls (102a, 102b) between which said base wall (102c) extends;

an opening (104) formed in one of said opposed side walls (102a; 102b) of said tank body (102), said opening (104) having a peripheral end that terminates at an inner surface of said base wall (102c) of the tank body (102); and

a pipe member (106) made of a metal and hav-

ing a flange (110), said pipe member (106) being hermetically and securely connected to said one of said opposed side walls (102a; 102b) in a manner to provide a fluid communication between the interior of said tank body (102) and the interior of said pipe member (106) through said opening (104), the secured connection of said pipe member (106) to the side wall (102a; 102b) being achieved by partially welding said flange (110) of the pipe member (106) to the side of the tank body (102) and then brazing said flange (110) to the side wall (102a; 102b) of the tank body.

2. A tank as claimed in claim 1, in which said flange (110) is circular in shape and a part (110a) of the circular flange (110) is bent and secured to said base wall (102c) of the tank body (102).

3. A tank as claimed in claim 2, in which said opening (104) extends to a given portion of said base wall (102c) of said tank body (102), and in which said part (110b) of the circular flange (110) is raised and swelled to provide a fluid communication between the interior of said tank body (102) and the interior of said pipe member (106) through said open given portion.

4. A tank as claimed in one of claims 1 to 3, further comprising a header plate member (116) to which a core structure of the heat exchanger is fixed, said header plate member (116) being formed along side edges thereof respective flanges (116a) which are in contact with inner surfaces of leading ends of the respective side walls (102a, 102b) of said tank body (102), said respective flanges (116a) being secured to said leading ends of said respective side walls (102a, 102b) by partially welding said respective flanges (116a) to said leading ends and then brazing said respective flanges (116a) to said leading ends.

5. A tank as claimed in claim 4, in which the incomplete fixing of the respective flanges (116a) of said header plate member (116) is carried out by a spot welding.

6. A tank as claimed in claim 5, in which said spot welding is achieved by contacting electrodes (134A, 134B) onto outer surfaces of the leading ends of the respective side walls (102a, 102b) of said tank body (102).

7. A tank as claimed in one of claims 1 to 6, further comprising an end plate (122) that is hermetically secured to a longitudinal end of said tank body (102) by incompletely fixing said end plate (122) to said longitudinal end and then brazing said end plate

- (122) to said longitudinal end, the incomplete fixing of the end plate (122) to said longitudinal end being carried out by providing the end plate (122) with ridges (122a-122k), pressing the ridges (122a-122k) of said end plate (122) against said longitudinal end and applying a given voltage between said end plate (122) and said tank body (102) to fuse the ridges (122a - 122k).
8. A tank as claimed in claim 7, in which said ridges (122a, 122b) extend in parallel with each other, so that when said end plate (122) is attached to said longitudinal end of said tank body (102) each ridge (122a; 122b) extends between the ends of the opposed side wall (102a, 102b) of said tank body (102).
9. A tank as claimed in claim 7, in which said ridges (122a, 122b) of said end plate (122) extend in parallel with each other, so that when said end plate (122) is attached to said longitudinal end of said tank body (102) one ridge (122a) extends between the ends of the opposed side walls (102a, 102) of said tank body (102) and the other ridge (122b) extends between the ends of said flanges (116a) of said header plate member (116) as well as the ends of the opposed side walls (102a, 102b) of said tank body (102).
10. A tank as claimed in claim 7, in which said ridges (122c, 122d) of said end plate (122) extend in parallel with each other, so that when said end plate (122) is attached to said longitudinal end of said tank body (102), each of said ridges (122c; 122d) extends between the end of said base wall (102c) of said tank body (102) and the end of said header plate member (116).
11. A tank as claimed in claim 7, in which said ridges (122e, 122f) of said end plate (122) are arranged to cross, so that when said end plate (122) is attached to said longitudinal end of said tank body (102), one straight ridge (122e) extends between the ends of the side walls (102a, 102b) of said tank body (102) and the other straight ridge (122f) extends between the end of said base wall (102c) of said tank body (102) and the end of said header plate member (116).
12. A tank as claimed in claim 7, in which said ridges of said end plate (122) are arranged to constitute a generally T-shaped ridge which includes a first ridge part (122g) and a second ridge part (122h), so that when the end plate (122) is attached to said longitudinal end of said tank body (102), said first ridge part (122g) extends between the ends of the side walls (102, 102b) of said tank body (102) and said second ridge part (122h) extends between said first ridge part (122g) and the end of said header plate member (116).
13. A tank as claimed in claim 7, in which said ridges (122j, 122k) of said end plate (122) are separated from one another, so that when said end plate (122) is attached to said longitudinal end of said tank body (102), one of said ridges (122j, 122k) extends to the end of the base wall (102c) of said tank body (102) and the other two ridges (122j, 122k) extend to the end of said head plate member (116).
14. A tank as claimed in claim 7, further comprising a core structure which is connected to said tank body (102') and an elongate cover plate (116') which has flanges (116'a) and covers a longitudinally extending open portion of said tank body (102'), said core structure and said elongate cover plate (116') being hermetically secured to said tank body (102') by being partially welded to given portions of said tank body (102') and then brazed to said given portions.
15. A tank as claimed in claim 7, in which when said end plate (122) is hermetically attached to said longitudinal end of said tank body (102'), one ridge (122a) extends between ends of said flanges (116'a) as well as the ends of the opposed side walls (102'a, 102'b) of said tank body (102') and the other ridge (122b) extends between the ends of the side walls (102'a, 102'b) of said tank body (102').
16. A tank as claimed in one of claims 1 to 15, further comprising a cylindrical hollow pin (142) that is hermetically secured to the base wall (102c) of said tank body (102) by partially welding said pin (142) to said base wall (102c) and then brazing said pin (142) to said base wall (102c), the partial welding of the pin (142) to said base plate being carried out by means of spot welding.
17. A tank as claimed in claim 16, in which said cylindrical hollow pin (142) comprises a cylindrical middle part (142a), a head part (142b) and a circular flange part (142c), said flange part (142c) being hermetically secured to said base wall (102c) of said tank body (102) by means of spot welding and brazing.
18. A tank as claimed in claim 17, in which said head part (142b) of said cylindrical hollow pin (142) is formed with an opening (144).
19. A tank as claimed in one of claims 16 to 18, in which said circular flange part (142c) of said pin (142) is arranged to surround a projection (146) formed on said base wall (102c) of the tank body (102).
20. A tank as claimed in one of claims 16 to 18, in which

said circular flange part (142c) of said pin (142) is neatly received in a recess (148) formed on said base wall (102c) of the tank body (102).

Patentansprüche

1. Tank eines Wärmetauschers mit:

- einem Tankkörper (102), hergestellt aus Metall, wobei der Tankkörper (102) wie ein Kanalteil geformt ist, mit einer Grundwand (102c) und gegenüberliegenden Seitenwänden (102a, 102b), zwischen denen sich die Grundwand (102c) erstreckt;
- einer Öffnung (104), ausgebildet in einer der gegenüberliegenden Seitenwänden (102a; 102b) des Tankkörpers (102), wobei die Öffnung (104) ein Umfangsende hat, das an einer Innenfläche der Grundwand (102c) des Tanks (102) endet, und
- ein Rohrteil (106), hergestellt aus einem Metall, und mit einem Flansch (110), wobei das Rohrteil (106) hermetisch und fest mit einer der gegenüberliegenden Seitenwände (102a; 102b) in einer Weise verbunden ist, um eine Fluidverbindung zwischen dem Inneren des Tankkörpers (102) und dem Inneren des Rohrteils (106) durch die Öffnung (104) zu schaffen, wobei die feste Verbindung des Rohrteils (106) mit der Seitenwand (102a; 102b) durch teilweises Verschweißen des Flansches (110) des Rohrteils (106) mit der Seite des Tankkörpers (102) und anschließendes Hartverlöten des Flansches (110) mit der Seitenwand (102a; 102b) des Tankkörpers erreicht wird.

2. Tank nach Anspruch 1, bei dem der Flansch (110) in seiner Gestalt kreisförmig ist und ein Teil (110a) des kreisförmigen Flansches (110) gebogen und mit der Grundwand (102c) des Tankkörpers (102) fest verbunden ist.

3. Tank nach Anspruch 2, bei dem die Öffnung (104) sich zu einem bestimmten Abschnitt der Basiswand (102c) des Tankkörpers (102) erstreckt und bei dem dieser Teil (110b) des kreisförmigen Flansches (110) angehoben und ausgebaucht ist, um eine Fluidverbindung zwischen dem Inneren des Tankkörpers (102) und dem Inneren des Rohrteils (106) durch den offenen, bestimmten Abschnitt zu schaffen.

4. Tank nach einem der Ansprüche 1 bis 3, mit außerdem einem Verteilerplattenteil (116), mit dem eine Kernstruktur des Wärmetauschers fest verbunden

ist, wobei das Verteilerplattenteil (116) entlang seiner Seitenkanten mit jeweiligen Flanschen (116a) versehen ist, die in Kontakt mit Innenflächen der vorauslaufenden Enden der jeweiligen Seitenwände (102a; 102b) des Tankkörpers (102) sind, wobei die jeweiligen Flansche (116a) an den vorderen Enden der jeweiligen Seitenwände (102a, 102b) durch teilweises Verschweißen der jeweiligen Flansche (116a) mit den vorderen Enden und anschließendes Hartverlöten der jeweiligen Flansche (116a) mit den vorderen Enden befestigt sind.

5. Tank nach Anspruch 4, bei dem das unvollständige Befestigen der jeweiligen Flansche (116a) des Verteilerplattenteils (116) durch ein Punktschweißen ausgeführt wird.

6. Tank nach Anspruch 5, bei dem das Punktschweißen durch das Kontaktieren von Elektroden (134A, 134B) mit den Außenoberflächen der vorderen Enden der jeweiligen Seitenwände (102a, 102b) des Tankkörpers (102) erreicht wird.

7. Tank nach einem der Ansprüche 1 bis 6, mit außerdem einer Endplatte (122), die hermetisch an einem Längsende des Tankkörpers (102) durch unvollständiges Fixieren der Endplatte (122) mit dem Längsende und anschließendem Hartverlöten der Endplatte (122) an dem Längsende befestigt ist, wobei das unvollständige Fixieren der Endplatte (122) an dem Längsende ausgeführt wird, indem die Endplatte (122) mit Kanten (122a - 122k) versehen wird, Pressen der Kanten (122a-122k) der Endplatten (122) gegen das Längsende und Anlegen einer bestimmten Spannung zwischen der Endplatte (122) und dem Tankkörper (102), um die Kanten (122a - 122k) zu verschmelzen.

8. Tank nach Anspruch 7, bei dem die Kanten (122a, 122b) sich parallel zueinander erstrecken, so dass dann, wenn die Endplatten (122) mit dem Längsende des Tankkörpers (102) verbunden wird, jede Kante (122a; 122b) sich zwischen den Enden der gegenüberliegenden Seitenwände (102a, 102b) des Tankkörpers (102) erstreckt.

9. Tank nach Anspruch 7, bei dem die Kanten (122a, 122b) der Endplatte (122) sich parallel zueinander erstrecken, so dass, wenn die Endplatten (122) mit dem Längsende des Tankkörpers (102) verbunden wird, eine Kante (122a) sich zwischen den Enden der gegenüberliegenden Seitenwände (102a, 102b) des Tankkörpers (102) und die andere Kante (122b) sich zwischen den Enden der Flansche (116a) des Verteilerplattenteils (116) sowie den Enden der gegenüberliegenden Seitenwände (102a, 102b) des Tankkörpers (102) erstreckt.

10. Tank nach Anspruch 7, bei dem die Kanten (122c, 122d) der Endplatte (122) sich parallel zueinander erstrecken, so dass, wenn die Endplatte (122) mit dem Längsende des Tankkörpers (102) verbunden wird, jede der Kanten (122c; 122d) sich zwischen dem Ende der Grundwand (102c) des Tankkörpers (102) und dem Ende des Verteilerplattenteils (116) erstreckt. 5
11. Tank nach Anspruch 7, bei dem die Kanten (122e, 122f) der Endplatte (122) angeordnet sind, dass sie sich einander kreuzen, so dass dann, wenn die Endplatte (122) mit dem Längsende des Tankkörpers (102) verbunden ist, eine gerade Kante (122e) sich zwischen den Enden der Seitenwände (102a, 102b) des Tankkörpers (102) und die andere gerade Kante (122f) sich zwischen dem Ende der Grundwand (102c) des Tankkörpers (102) und dem Ende des Verteilerplattenteils (116) erstreckt. 10
12. Tank nach Anspruch 7, bei dem die Kanten der Endplatte (122) so angeordnet sind, dass sie eine im Wesentlichen T-förmige Kante bilden, die einen ersten Kantenabschnitt (122g) und einen zweiten Kantenabschnitt (122h) bildet, so dass dann, wenn die Endplatte (122) mit dem Längsende des Tankkörpers (102) verbunden ist, der erste Kantenteil (122g) sich zwischen den Enden der Seitenwände (102, 102b) des Tankkörpers (102) und der zweite Kantenteil (122h) sich zwischen dem ersten Kantenteil (122g) und dem Ende des Verteilerplattenteils (116) erstreckt. 15
13. Tank nach Anspruch 7, bei dem die Kanten (122j, 122k) der Endplatte (122) voneinander getrennt sind, so dass dann, wenn die Endplatte (122) mit dem Längsende des Tankkörpers (102) verbunden ist, eine der Kanten (122j, 122k) sich zu dem Ende der Grundwand (102c) des Tankkörpers (102) und die anderen zwei Kanten (122j, 122k) sich zu dem Ende des Verteilerplattenteils (116) erstrecken. 20
14. Tank nach Anspruch 7, mit außerdem einer Kemstruktur, die mit dem Tankkörper (102') verbunden ist, und einem langgestreckten Deckelteil (116') das Flansche (116'a) aufweist und einen sich in Längsrichtung erstreckenden, offenen Abschnitt des Tankkörpers (102') abdeckt, wobei die Kemstruktur und das langgestreckte Abdeckteil (116') hermetisch an dem Tankkörper (102') durch teilweises Verschweißen mit bestimmten Abschnitten des Tankkörpers (102') und anschließendes Hartverlöten an den bestimmten Abschnitten verbunden ist. 25
15. Tank nach Anspruch 7, bei dem dann, wenn die Endplatte (122) hermetisch an dem Längsende des Tankkörpers (102') befestigt ist, eine Kante (122a) sich zwischen den Enden der Flansche (116'a), ebenso wie zwischen den Enden der gegenüberliegenden Seitenwände (102'a, 102'b) des Tankkörpers (102') und die andere Kante (122b) sich zwischen den Enden der Seitenwände (102'a, 102'b) des Tankkörpers (102') erstreckt. 30
16. Tank nach einem der Ansprüche 1 bis 15, mit außerdem einem zylindrischen Hohlstift (142), der hermetisch an der Grundwand (102c) des Tankkörpers (102) durch teilweises Verschweißen des Stiftes (122) mit der Grundwand (102') und anschließendes Hartverlöten des Stiftes (142) mit der Grundwand (102c) hermetisch fest verbunden ist, wobei das teilweise Verschweißen des Stiftes (142) mit der Grundplatte durch Punktschweißen ausgeführt wird. 35
17. Tank nach Anspruch 16, bei dem der zylindrische Hohlstift (142) einen zylindrischen Mittelteil (142a), einen Kopfteil (142b) und einen kreisförmigen Flanschteil (142c) aufweist, wobei der Flanschteil (142c) hermetisch an der Grundwand (102c) des Tankkörpers (102) durch Punktschweißen und Hartverlöten befestigt ist. 40
18. Tank nach Anspruch 17, bei dem der Kopfteil (142b) des zylindrischen Hohlstiftes (142) mit einer Öffnung (144) versehen ist. 45
19. Tank nach einem der Ansprüche 16 bis 18, bei dem der kreisförmige Flanschteil (142c) des Stiftes (142) angeordnet ist, um einen Vorsprung (146) zu umgeben, der an der Grundwand (102c) des Tankkörpers (102) ausgebildet ist. 50
20. Tank nach einem der Ansprüche 1 bis 16, bei dem der kreisförmige Flanschteil (142c) des Stiftes (142) eng passend in einer Ausnehmung (148), ausgebildet an der Grundwand (102c) des Tankkörpers (102), aufgenommen ist. 55

Revendications

1. Une boîte collectrice d'échangeur de chaleur comprenant :

un corps de boîte collectrice (102) en métal, ledit corps de boîte collectrice (102) étant conforme en organe de canalisation incluant une paroi de base (102c) et des parois latérales (102a, 102b) opposées entre lesquelles s'étend ladite paroi de base (102c) ;
une ouverture (104) formée dans l'une desdites parois latérales (102a; 102b) opposées dudit corps de boîte collectrice (102), ladite ouverture (104) ayant une extrémité périphérique s'achevant en une surface intérieure de ladite

paroi de base (102) dudit corps de boîte collectrice (102) ; et

un organe formant tuyau (106) en métal et ayant une bride (110), ledit organe en tuyauterie (106) étant connecté de façon hermétique et sûre à ladite une desdites parois latérales (102a; 102b) opposées de manière à fournir une communication fluïdique entre l'intérieur dudit corps de boîte collectrice (102) et l'intérieur dudit organe formant tuyau (106) par ladite ouverture (104), la connexion sûre dudit organe formant tuyau (106) à la paroi latérale (102a; 102b) étant obtenue par un soudage partiel de ladite bride (110) de l'organe formant tuyau (106) sur le côté du corps de boîte collectrice (102), puis brasage de ladite bride (110) sur la paroi latérale (102a; 102b) du corps de boîte collectrice.

2. Une boîte collectrice selon la revendication 1, dans laquelle ladite bride (110) est de forme circulaire et une partie (110a) de la bride circulaire (110) est cou-dée et fixée à ladite paroi de base (102c) du corps de boîte collectrice (102).
3. Une boîte collectrice selon la revendication 2, dans laquelle ladite ouverture (104) s'étend à une partie donnée de ladite paroi de base (102c) dudit corps de boîte collectrice (102), et dans laquelle ladite partie (110b) de la bride circulaire (110) est levée et gonflée, pour fournir une communication fluïdique entre l'intérieur dudit corps de boîte collectrice (102) et l'intérieur dudit organe formant tuyau (106) par ladite partie donnée ouverte.
4. Une boîte collectrice selon l'une des revendications 1 à 3, comprenant en outre un organe de plaque de collecteur (116) auquel une structure de noyau de l'échangeur de chaleur est fixée, ledit organe de plaque de collecteur (116) étant formé, le long de bords latéraux de celui-ci, de brides (116a) respectives en contact avec des surfaces intérieures des extrémités avant des parois latérales (102a, 102b) respectives dudit corps de boîte collectrice (102), lesdites brides (116a) respectives étant fixées auxdites extrémités avant desdites parois latérales (102a, 102b) respectives, par un soudage partiel desdites brides (116a) respectives auxdites extrémités avant, puis brasage desdites brides (116a) respectives auxdites extrémités avant.
5. Une boîte collectrice selon la revendication 4, dans laquelle la fixation incomplète des brides (116a) respectives dudit organe de plaque de collecteur (116) est effectuée par un soudage par points.
6. Une boîte collectrice selon la revendication 5, dans laquelle ledit soudage par points est obtenu par mise en contact d'électrodes (134A, 134B) sur des surfaces extérieures des extrémités avant des parois latérales (102A, 102B) respectives dudit corps de boîte collectrice (102).
7. Une boîte collectrice selon l'une des revendications 1 à 6, comprenant en outre une plaque d'extrémité (122) fixée hermétiquement à une extrémité longitudinale dudit corps de boîte collectrice (102) par fixation incomplète de ladite plaque d'extrémité (122) sur ladite extrémité longitudinale, puis brasage de ladite plaque d'extrémité (122) à ladite extrémité longitudinale, la fixation incomplète de la plaque d'extrémité (122) à l'extrémité longitudinale étant effectuée en munissant la plaque d'extrémité (122) de nervures (122a à 122k), pressage des nervures (112a à 122k) de chaque plaque d'extrémité (122) contre ladite extrémité longitudinale, et application d'une tension électrique donnée entre ladite plaque d'extrémité (122) et ledit corps de boîte collectrice (102) pour mettre en fusion les nervures (112a à 112k).
8. Une boîte collectrice selon la revendication 7, dans laquelle lesdites nervures (122a, 122b) s'étendent parallèlement les unes les autres de manière que lorsque ladite plaque d'extrémité (122) est fixée à ladite extrémité longitudinale dudit corps de boîte collectrice (102), chaque nervure (122a; 122b) s'étend entre les extrémités de paroi latérale (102a, 102b) opposées dudit corps de boîte collectrice (102).
9. Une boîte collectrice selon la revendication 7, dans laquelle lesdites nervures (122a, 122b) de ladite plaque d'extrémité (122) s'étendent parallèlement les unes aux autres, de manière que, lorsque ladite plaque d'extrémité (122a) est fixée à ladite extrémité longitudinale dudit corps de boîte collectrice (102), une nervure (122a) s'étend entre les extrémités desdites parois latérales (102a, 102b) opposées dudit corps de boîte collectrice (102), et l'autre nervure (122b) s'étend entre les extrémités desdites brides (116a) dudit organe formant plaque de collecteur (116), ainsi que les extrémités des parois latérales (102a, 102b) opposées dudit corps de boîte collectrice (102).
10. Une boîte collectrice selon la revendication 7, dans laquelle lesdites nervures (122c, 122d) situées sur ladite plaque d'extrémité (122) s'étendent parallèlement les unes aux autres, de manière que, lorsque ladite plaque d'extrémité (122) est fixée à ladite extrémité longitudinale dudit corps de boîte collectrice (102), chacune desdites nervures (122c; 122d) s'étend entre l'extrémité de ladite paroi de base (102c) dudit corps de boîte collectrice (102) et l'extrémité dudit organe formant plaque de collecteur

(116).

11. Une boîte collectrice selon la revendication 7, dans laquelle lesdites nervures (122e, 122f) de ladite plaque d'extrémité (122) sont agencées pour se croiser, de sorte que, lorsque ladite plaque d'extrémité (122) est fixée à ladite extrémité longitudinale dudit corps de boîte collectrice (102), une nervure rectiligne (122e) s'étend entre les extrémités des parois latérales (102a, 102d) dudit corps de boîte collectrice (102) et l'autre nervure rectiligne (122f) s'étend entre l'extrémité de ladite paroi de base (102c) dudit corps de boîte collectrice (102) et l'extrémité dudit organe formant plaque de collecteur (116).
12. Une boîte collectrice selon la revendication 7, dans laquelle lesdites nervures de ladite plaque d'extrémité (122) sont agencées pour fixer une nervure globalement en fore de T qui comprend une première partie (112g) et une deuxième partie (112f), de sorte que, lorsque la plaque d'extrémité (122) est fixée sur ladite extrémité longitudinale dudit corps de boîte collectrice (102), ladite première partie de nervure (122g) s'étend entre les extrémités des parois latérales (102, 102b) dudit corps de boîte collectrice (102) et ladite deuxième partie de nervure (122h) s'étend entre ladite partie de nervure (122g) et l'extrémité dudit organe formant plaque de collecteur (116).
13. Une boîte collectrice selon la revendication 7, dans laquelle lesdites nervures (122j, 122k) de ladite plaque d'extrémité (122) sont séparées les unes des autres, de sorte que, lorsque ladite plaque d'extrémité (122k) est fixée sur ladite extrémité longitudinale dudit corps de boîte collectrice (102), l'une desdites nervures (122j, 122k) s'étend vers l'extrémité de la paroi de base (102c) dudit corps de boîte collectrice (102) et les deux autres nervures (122j, 122k) s'étendent vers l'extrémité dudit organe formant plaque de collecteur (116).
14. Une boîte collectrice selon la revendication 7, comprenant en outre une structure de noyau reliée audit corps de boîte collectrice (102') et une plaque de couverture (116') allongée ayant des brides (116'a) et couvre une partie ouverte, s'étendant dans la direction longitudinale dudit corps de boîte collectrice (102'), ladite structure de noyau et ladite plaque de couverture allongée (116') étant fixée hermétiquement audit corps de boîte collectrice (102'), par le fait d'être partiellement soudée à des parties données dudit corps de boîte collectrice (102') puis brasé auxdites parties données.
15. Une boîte collectrice selon la revendication 7, dans lequel, lorsque ladite plaque d'extrémité (122) est fixée hermétiquement à ladite extrémité longitudinale dudit corps de boîte collectrice (102'), une nervure (122a) s'étend entre des extrémités desdites brides (116'a) ainsi que des extrémités des parois latérales (102'a, 102'b) opposées dudit corps de boîte collectrice (102') et l'autre nervure (122b) s'étend entre les extrémités des parois latérales (102'a, 102b) dudit corps de boîte collectrice (102').
16. Une boîte collectrice selon l'une des revendications 1 à 15, comprenant en outre une tige (142) creuse cylindrique fixée hermétiquement à la paroi de base (102c) dudit corps de boîte collectrice (102), par soudage partiel de ladite tige (142) sur ladite paroi de base (102c) puis brasage de ladite tige (142) sur ladite paroi de base (102c), le soudage partiel de la tige (142) à ladite plaque de base étant effectué par soudage par points.
17. Une boîte collectrice selon la revendication 16, dans laquelle ladite tige (142) creuse cylindrique comprend une partie médiane (142a) cylindrique, une partie tête (142b) et une partie bride (142c) circulaire, ladite partie bride (142c) étant fixée hermétiquement à ladite paroi de base (102c) dudit corps de boîte collectrice (102), par soudage par points et brasage.
18. Une boîte collectrice selon la revendication 17, dans laquelle ladite partie de tête (142b) de ladite tige (142) creuse cylindrique comporte une ouverture (144).
19. Une boîte collectrice selon l'une des revendications 16 à 18, dans laquelle ladite partie de bride circulaire (142c) de ladite tige (142) est agencée pour entourer une saillie (146) formée sur ladite paroi de base (102c) du corps de boîte collectrice (102).
20. Une boîte collectrice selon l'une des revendications 16 à 18, dans laquelle ladite partie de bride circulaire (142c) de ladite tige (142) est logée parfaitement dans une cavité (148), formée sur ladite paroi de base (102c) du corps de boîte collectrice (102).

FIG.1

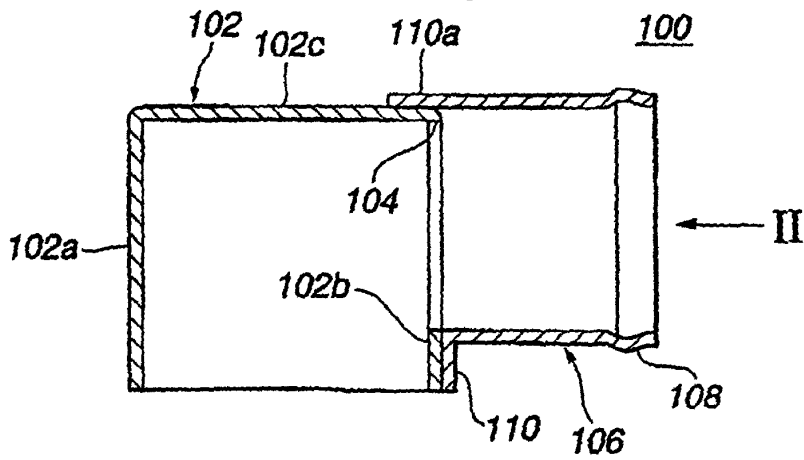


FIG.2

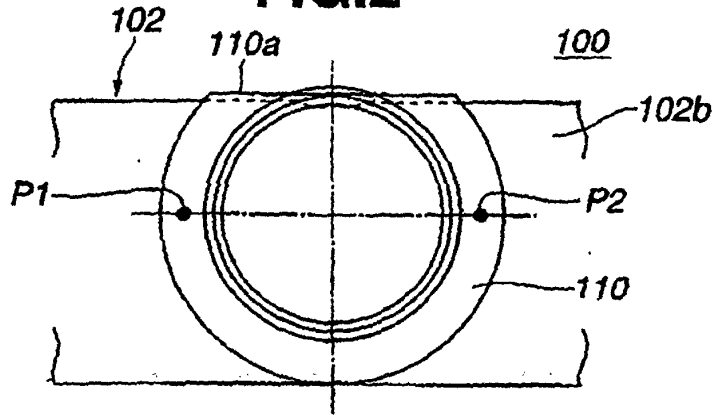


FIG.3

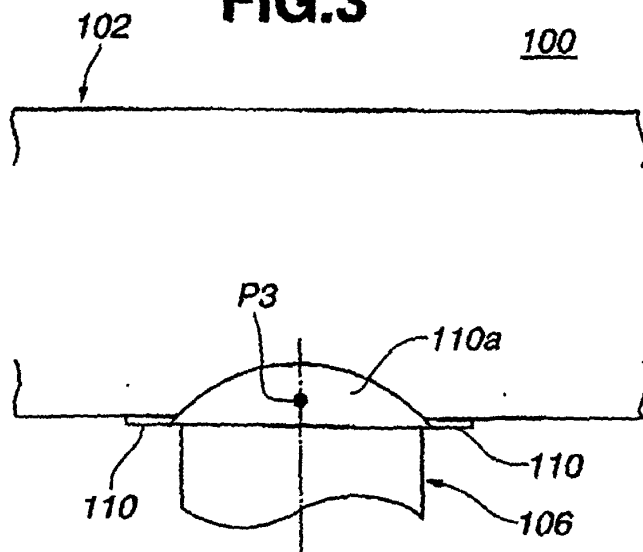


FIG.4A



FIG.4B

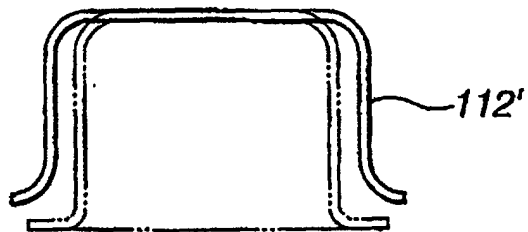


FIG.4C

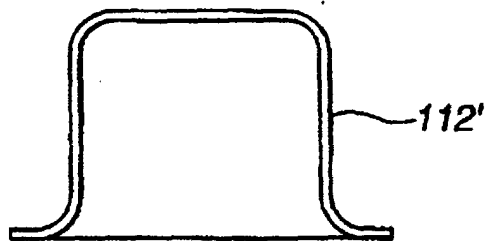


FIG.4D

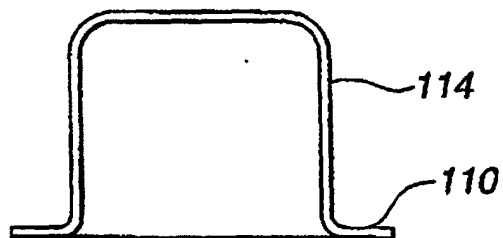


FIG.5A

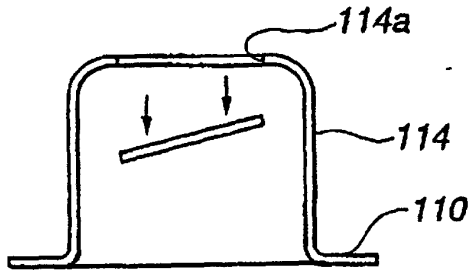


FIG.5B

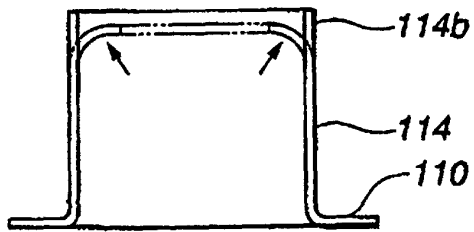


FIG.5C

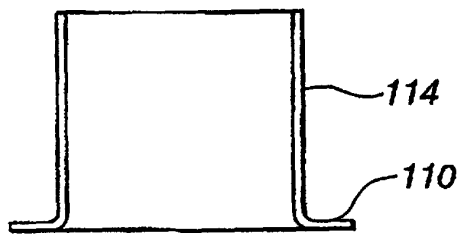


FIG.5D

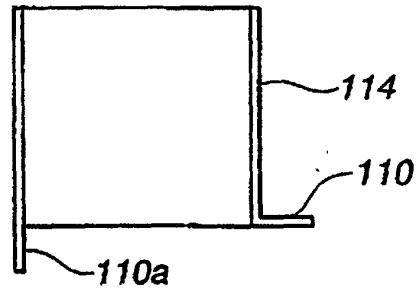


FIG.5E

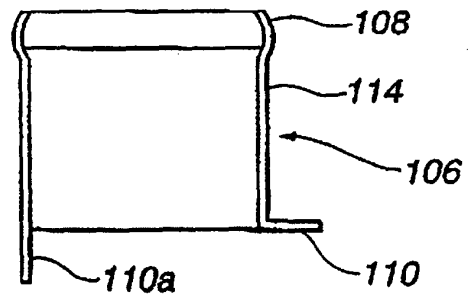


FIG.6

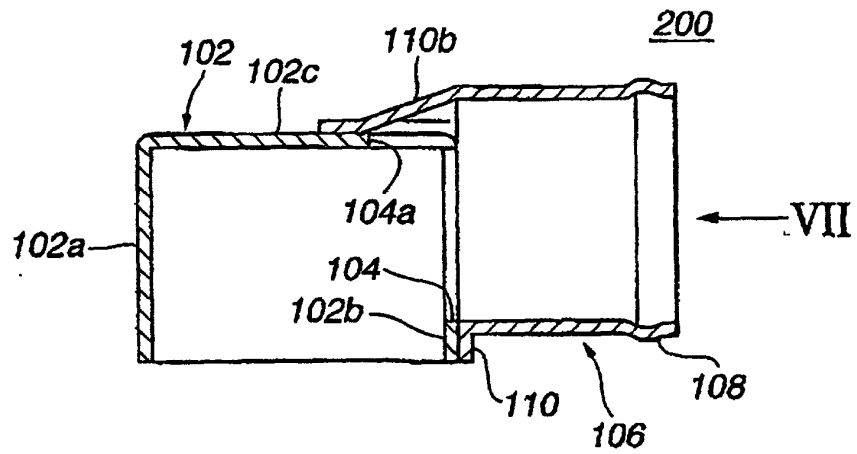


FIG.7

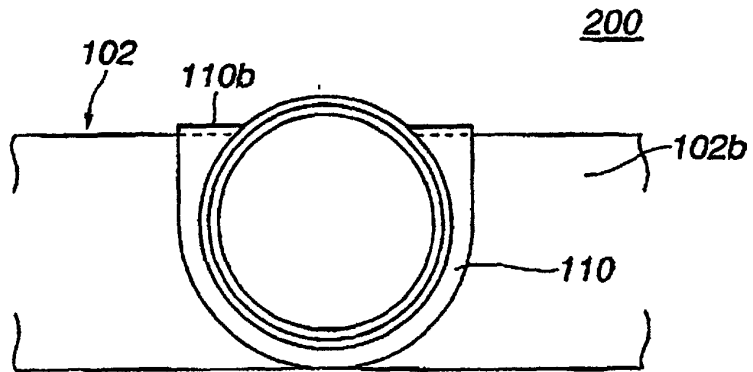


FIG.8

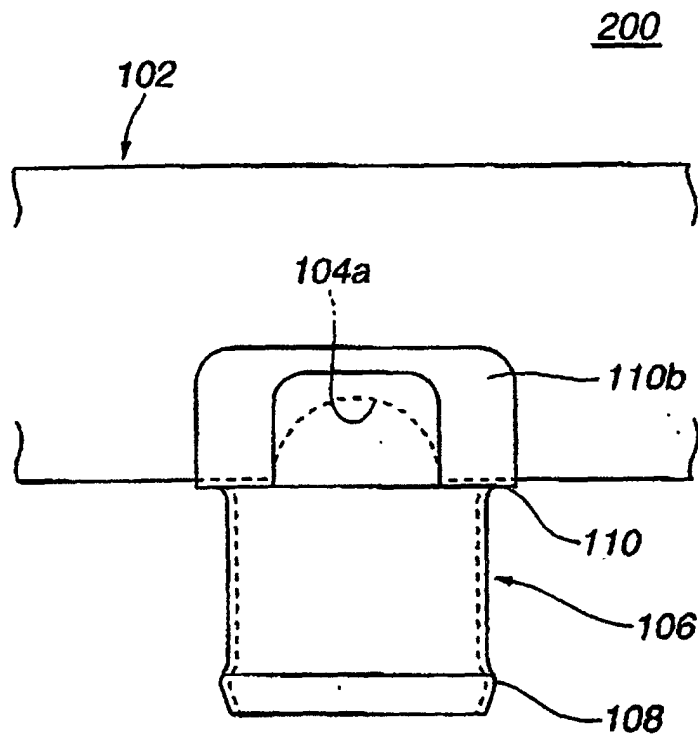


FIG.9

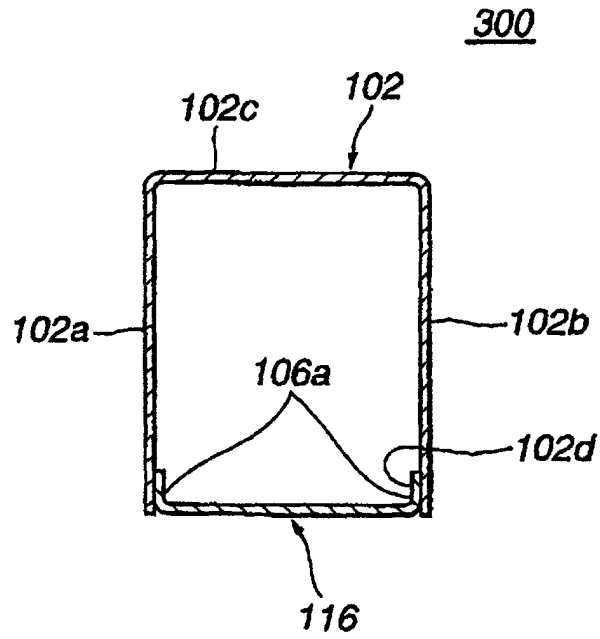


FIG.10

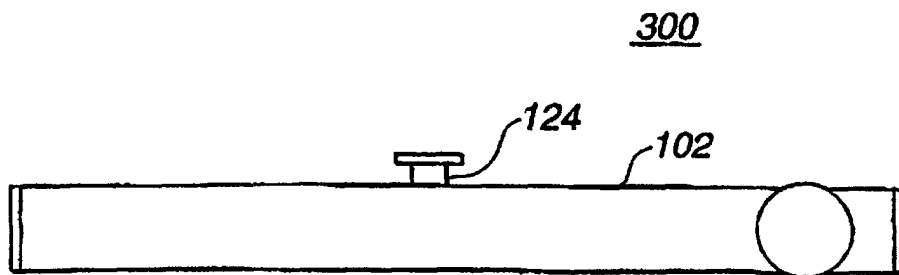


FIG.11

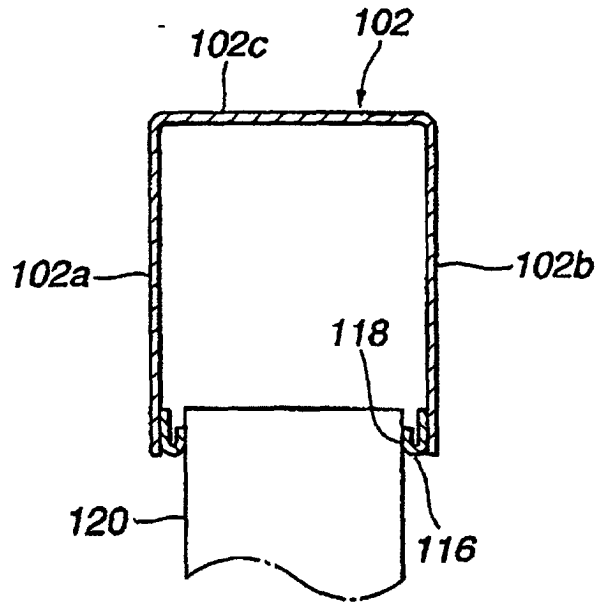


FIG.12

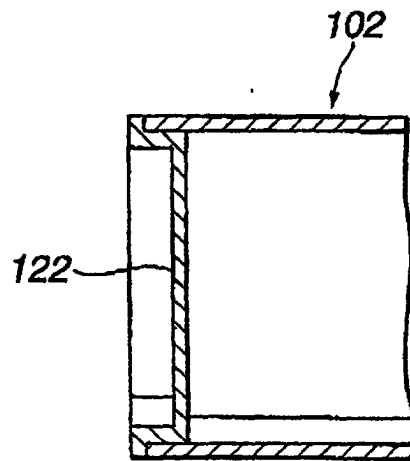


FIG.13

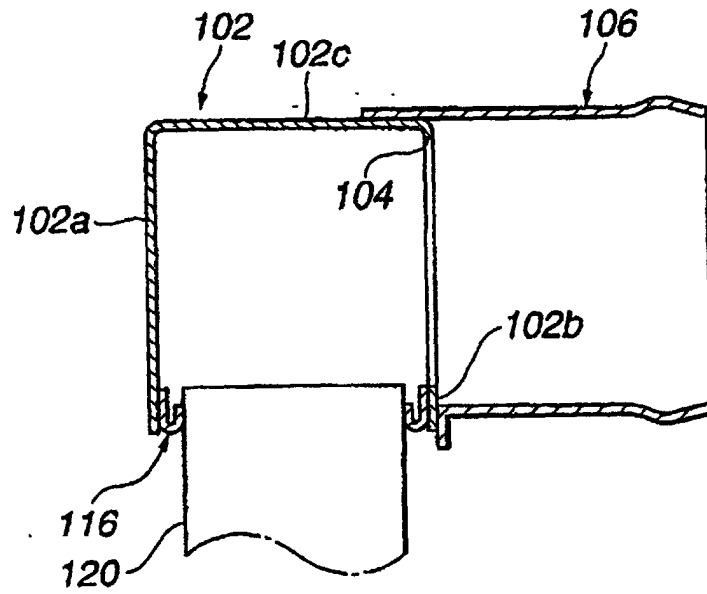


FIG.14

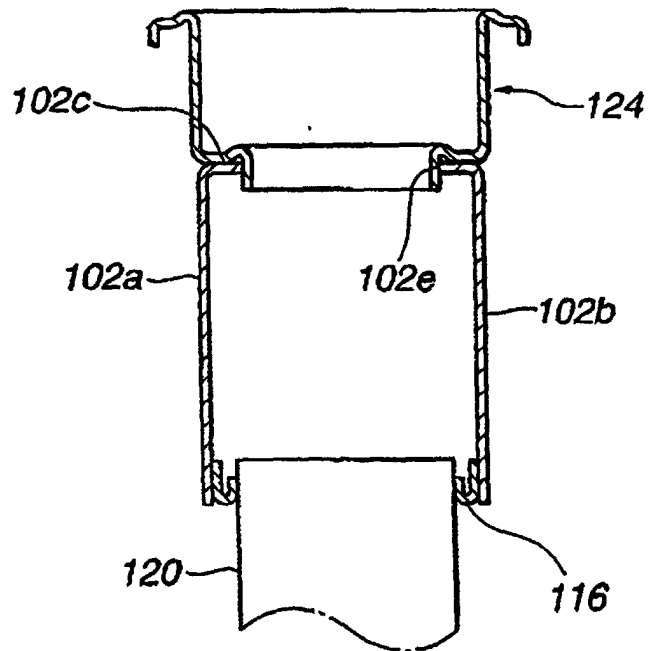


FIG.15A

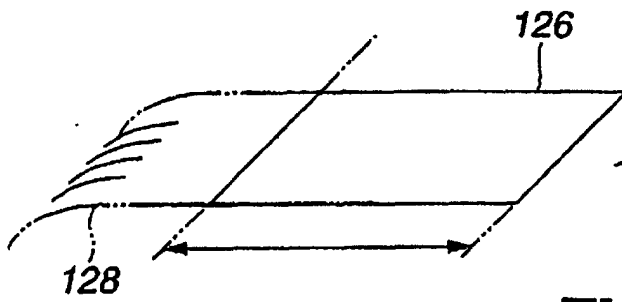


FIG.15B

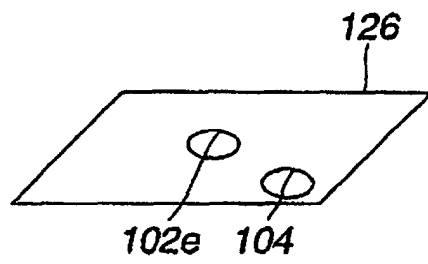


FIG.15C

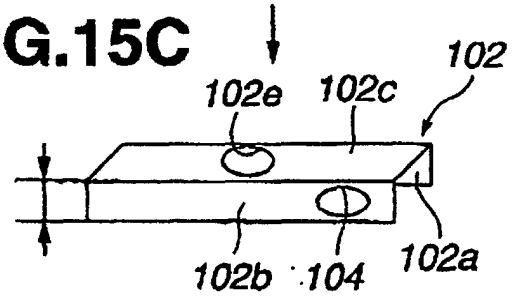


FIG.16A

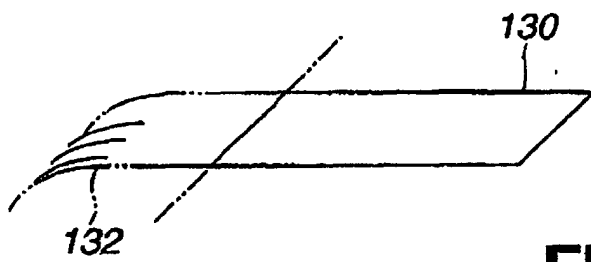


FIG.16B

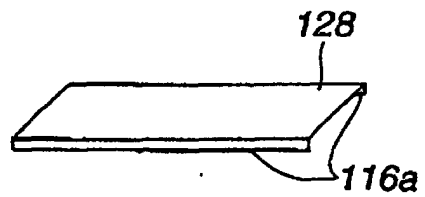


FIG.16C

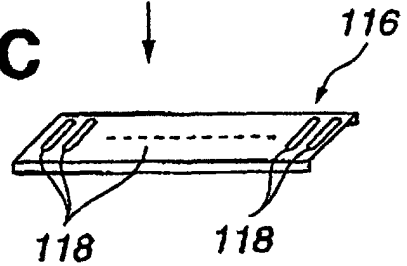


FIG.17

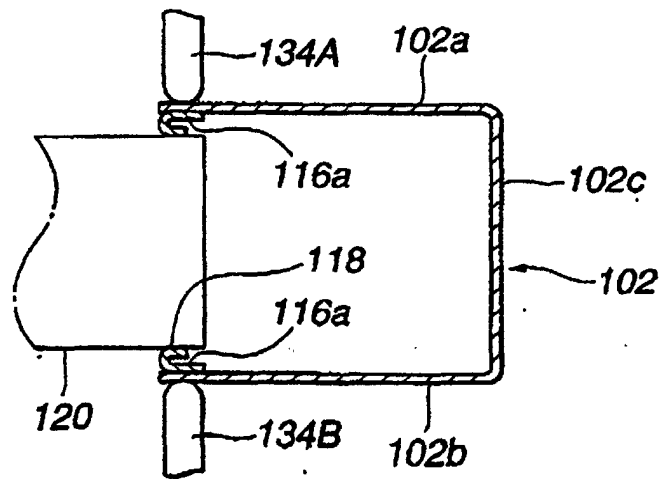


FIG.18

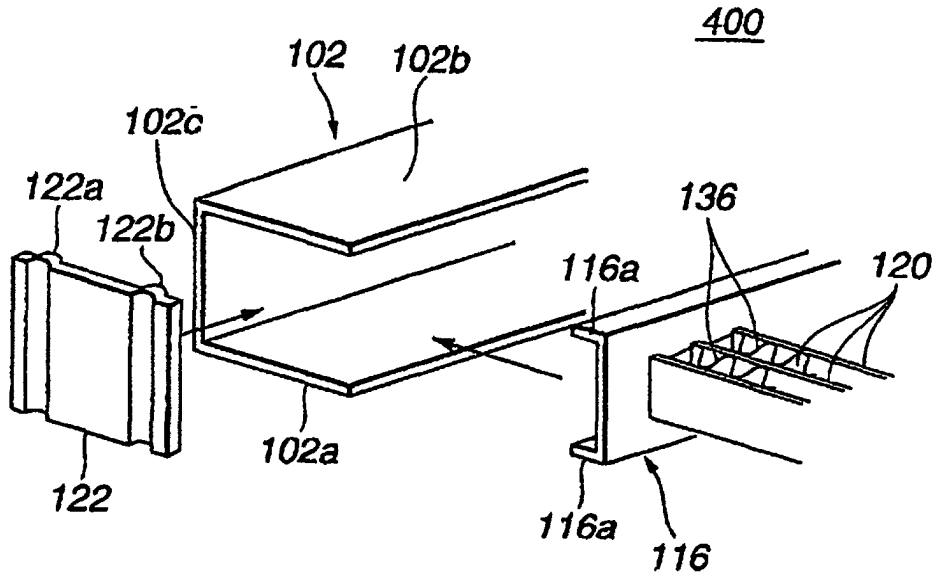


FIG.19

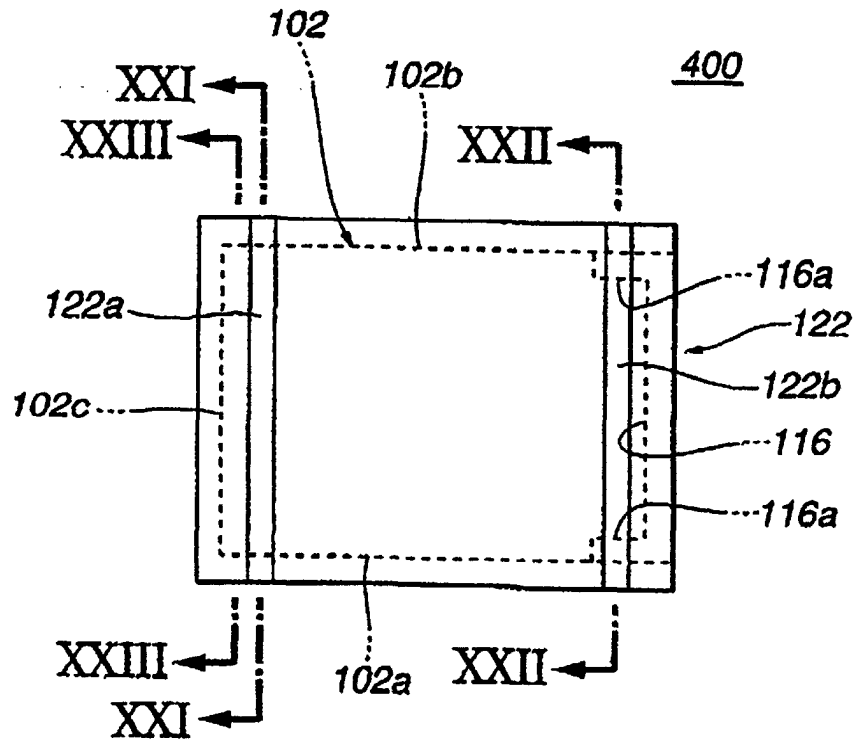


FIG.20

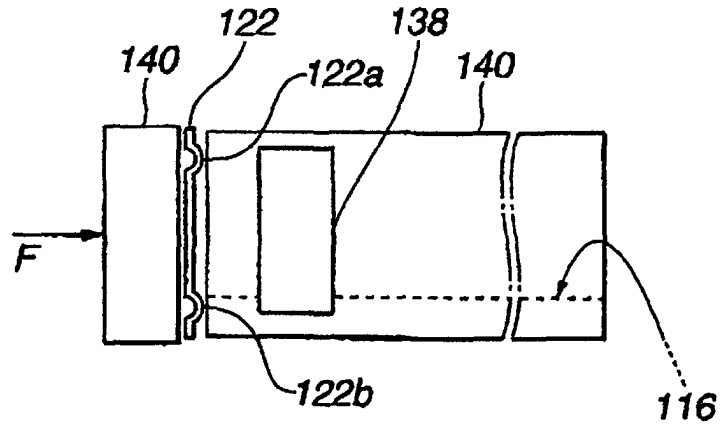


FIG.21

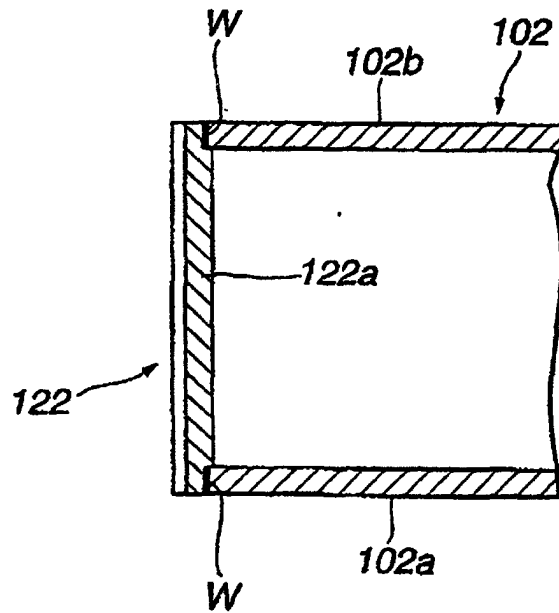


FIG.24

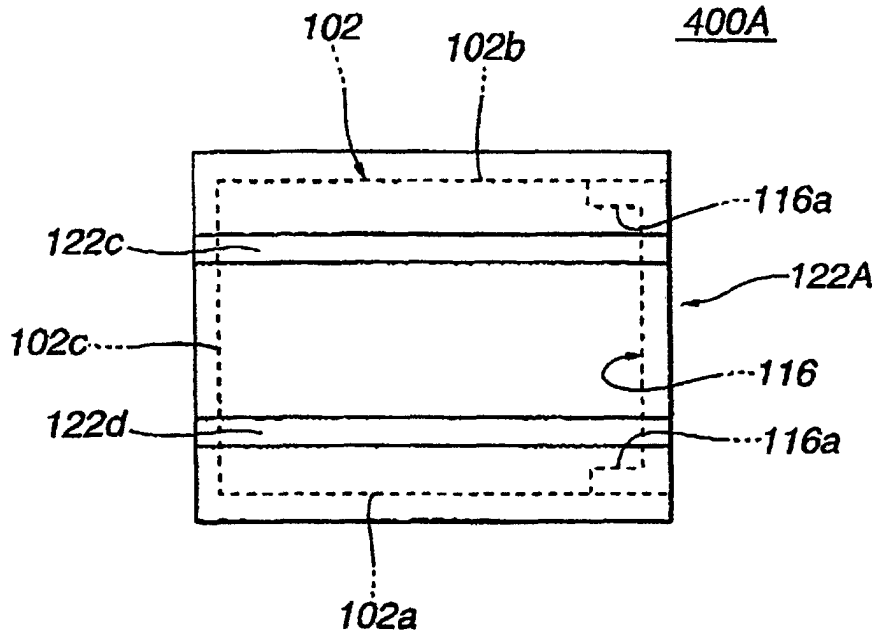


FIG.25

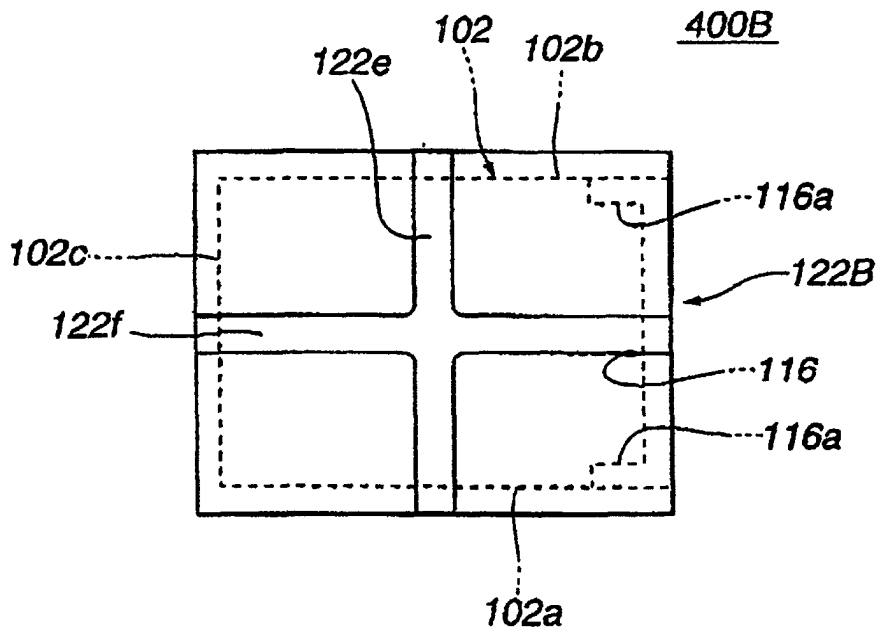


FIG.26

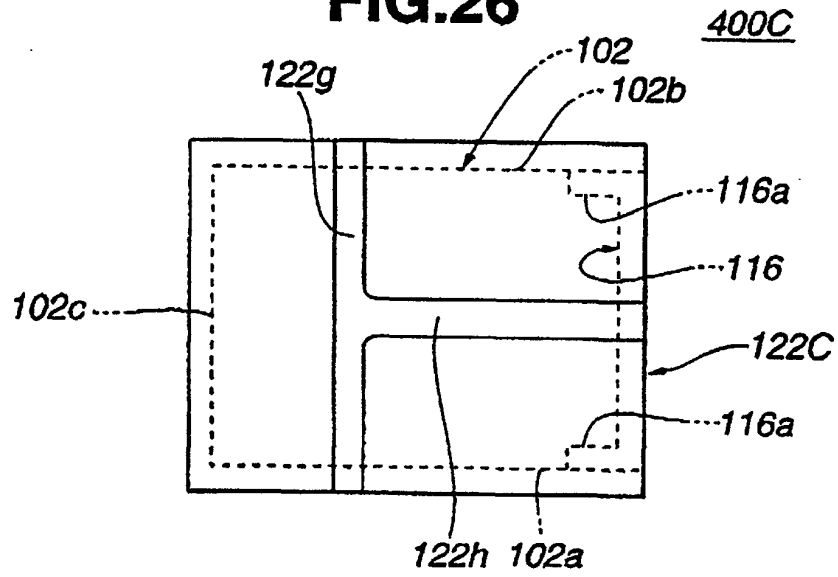


FIG.27

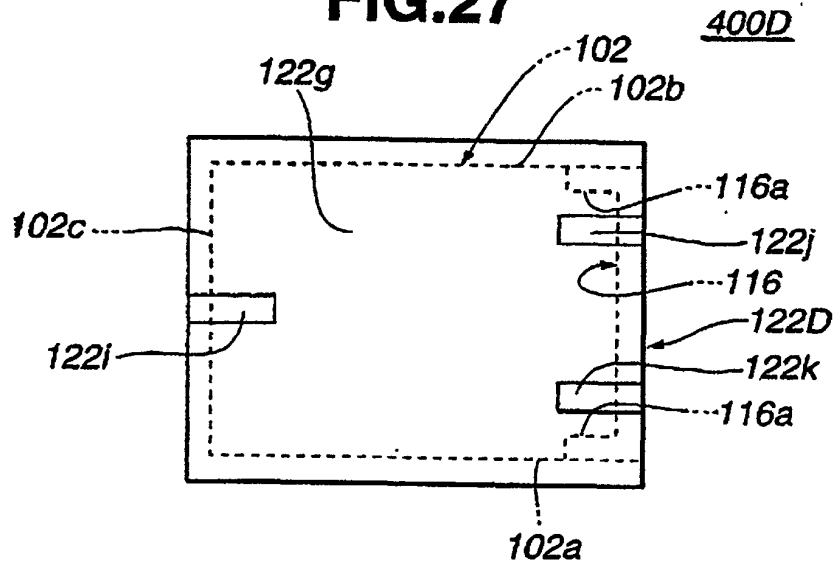


FIG.28

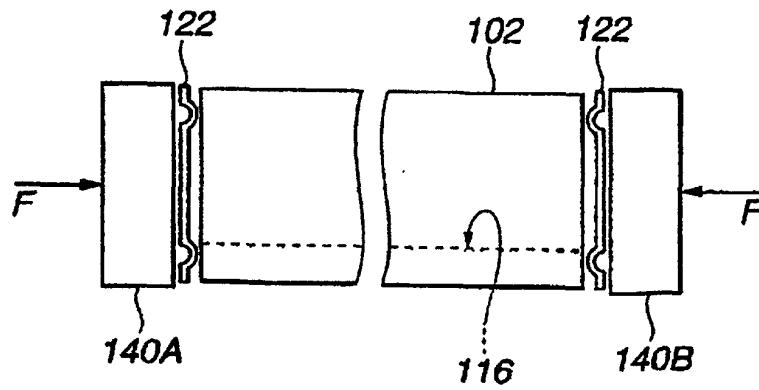


FIG.29

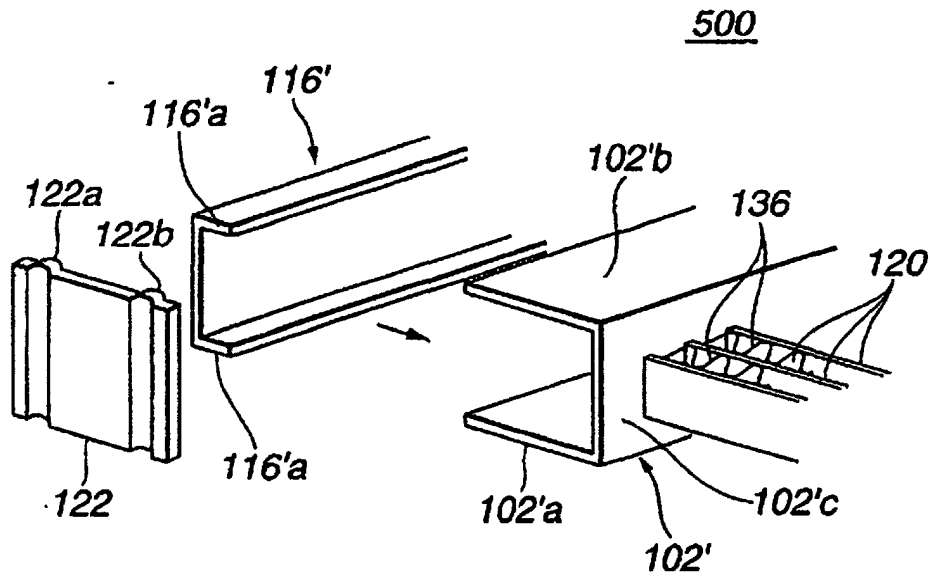


FIG.30

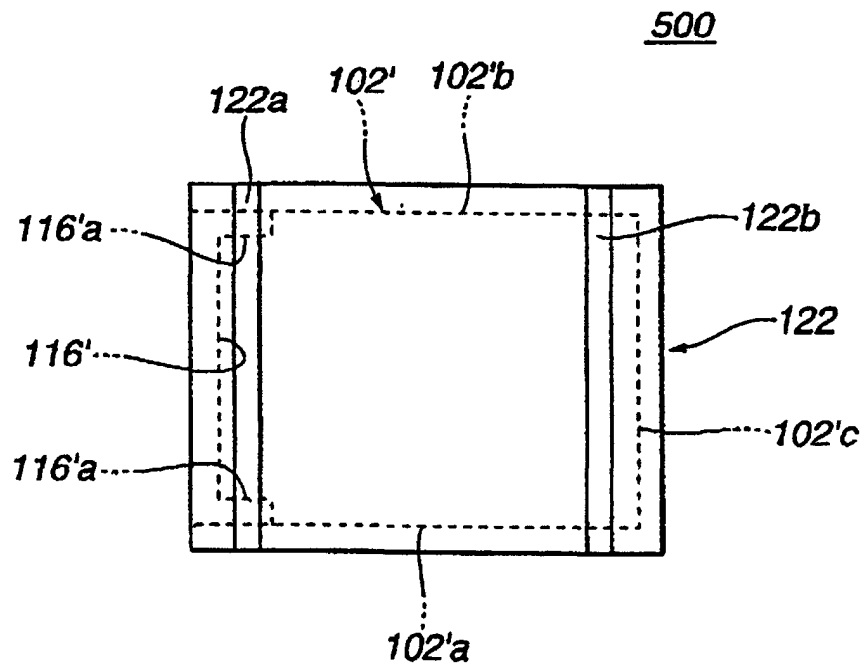


FIG.31

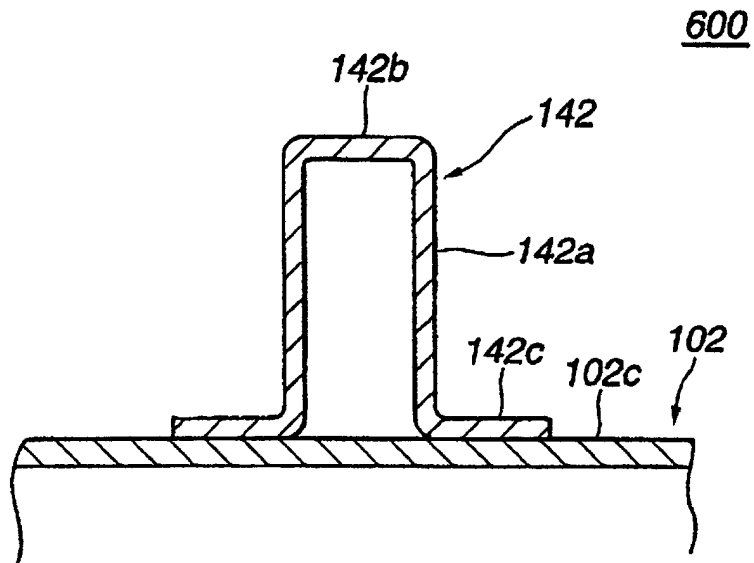
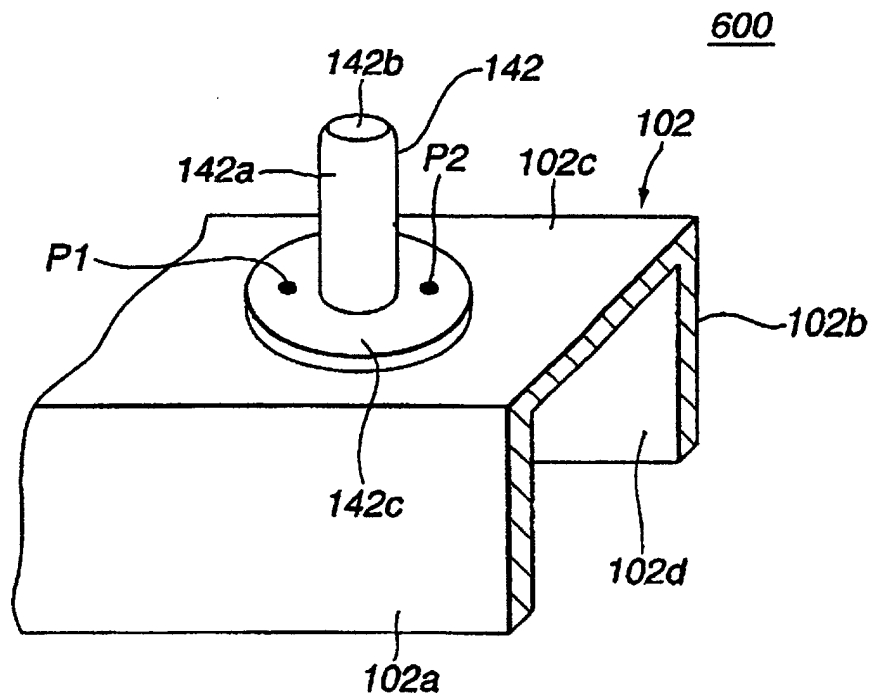


FIG.32



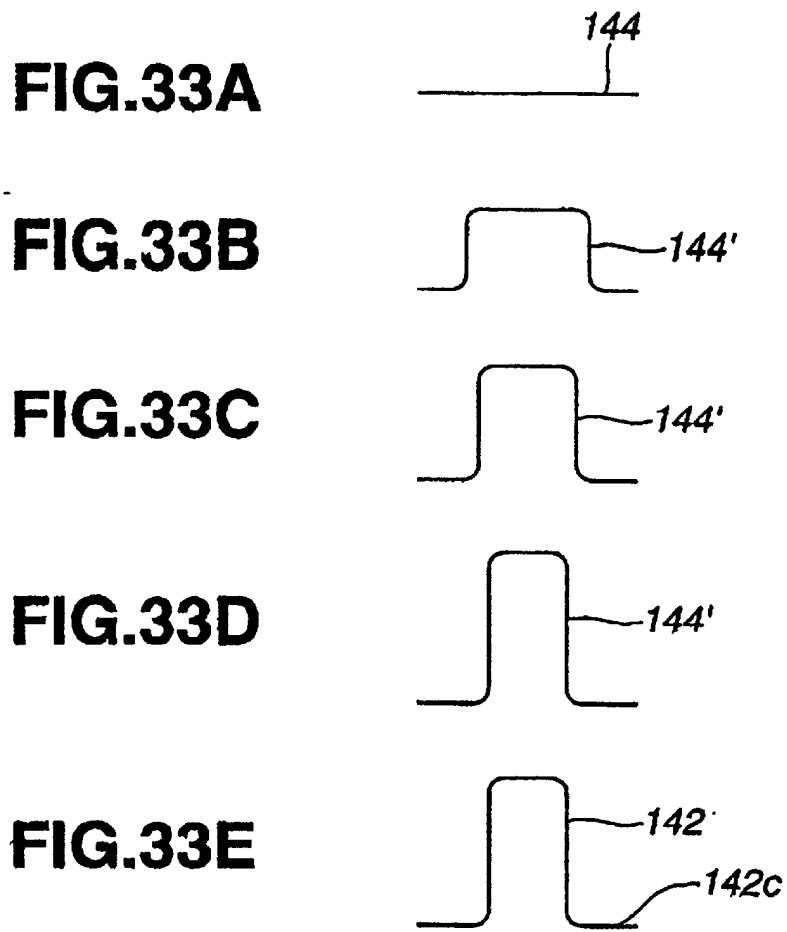


FIG.34

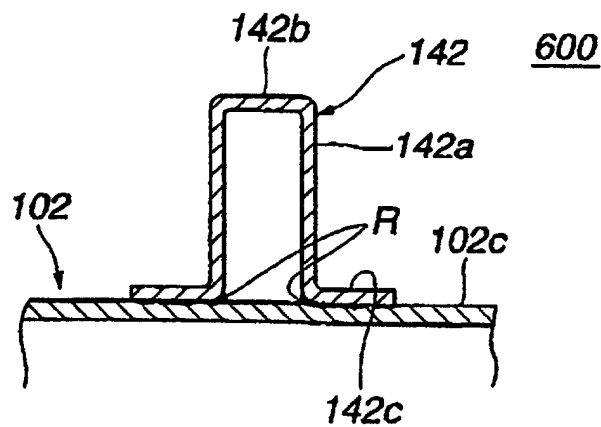


FIG.35

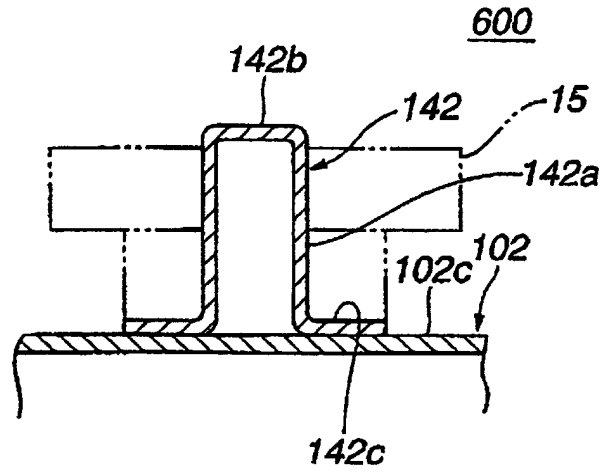


FIG.36

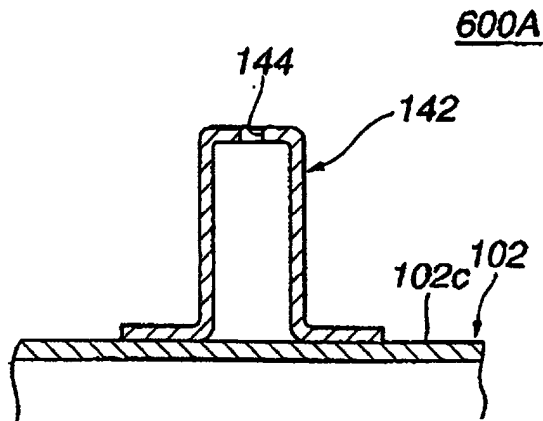


FIG.37

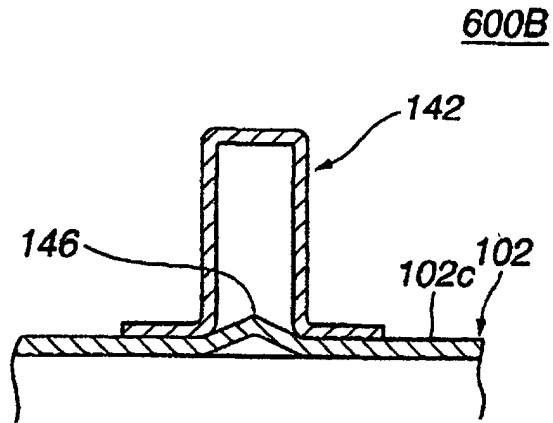


FIG.38

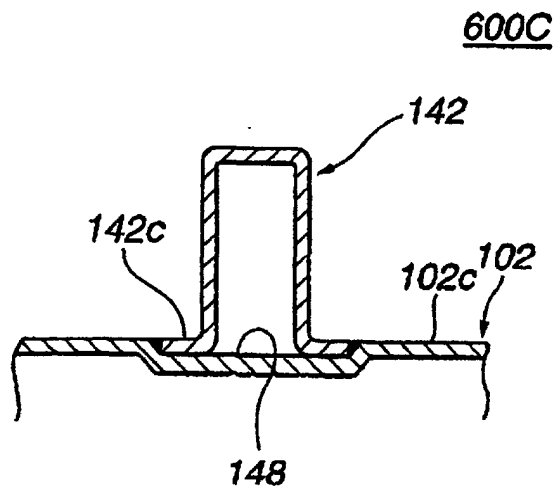


FIG.39

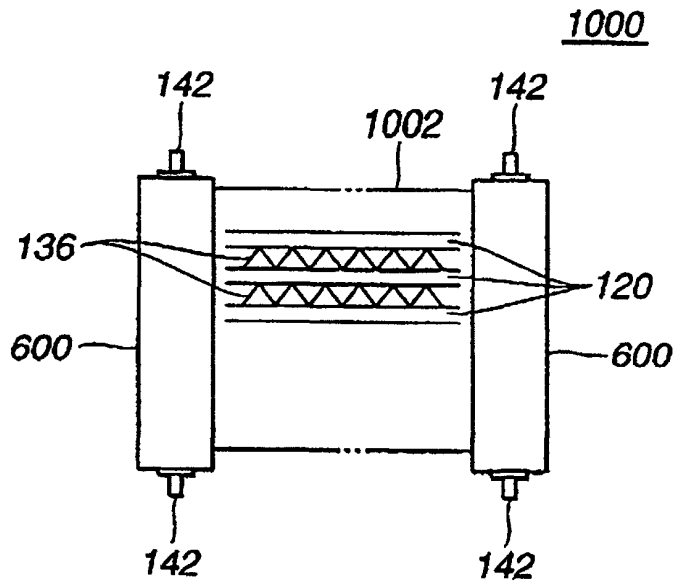


FIG.40

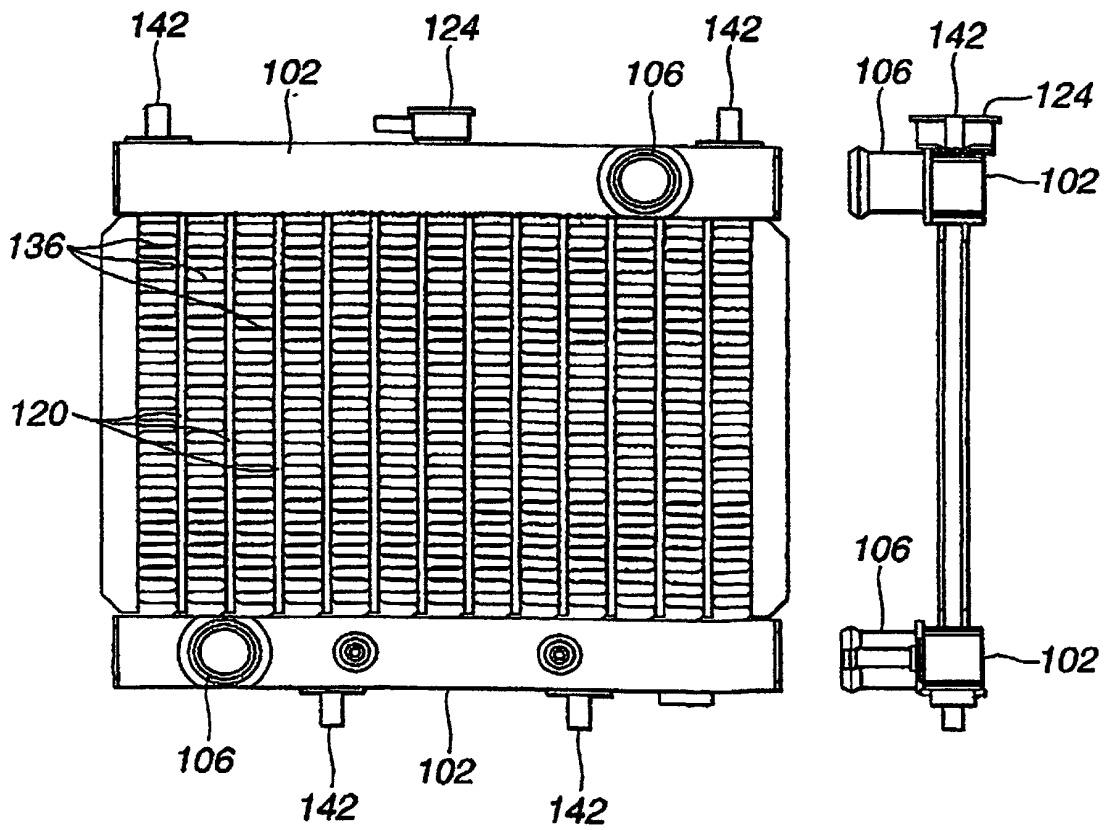


FIG.41
(PRIOR ART)

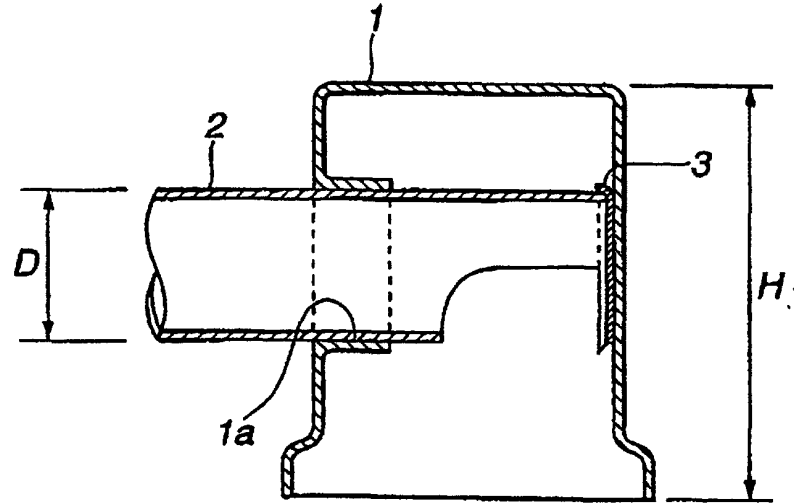


FIG.42
(PRIOR ART)

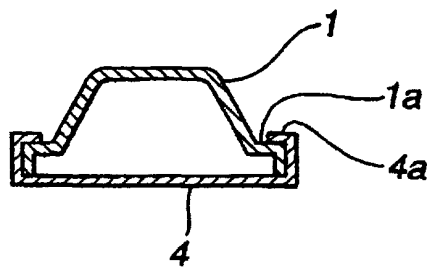


FIG.43
(PRIOR ART)

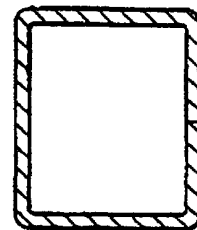


FIG.44
(PRIOR ART)

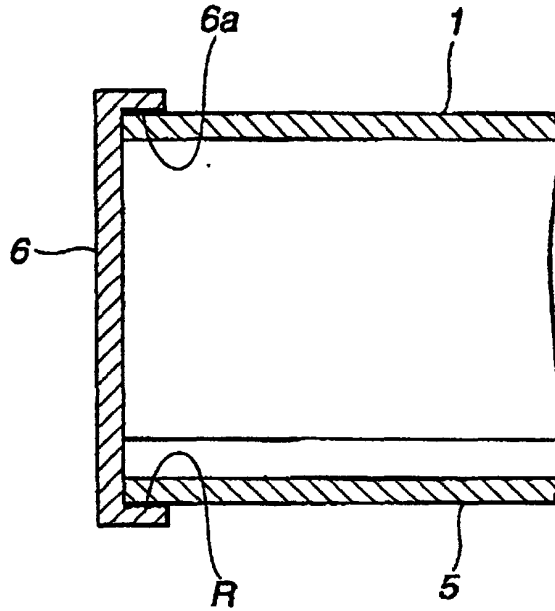


FIG.45
(PRIOR ART)

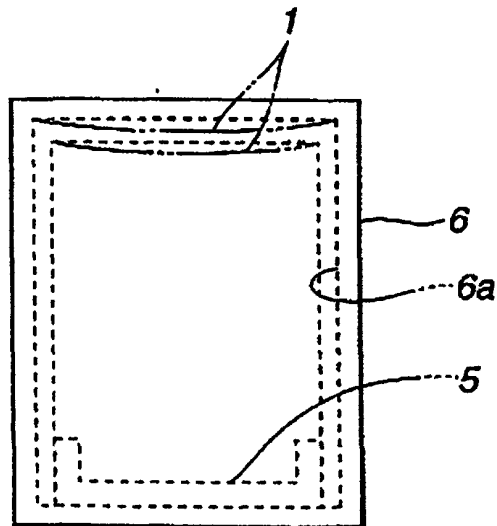


FIG.46
(PRIOR ART)

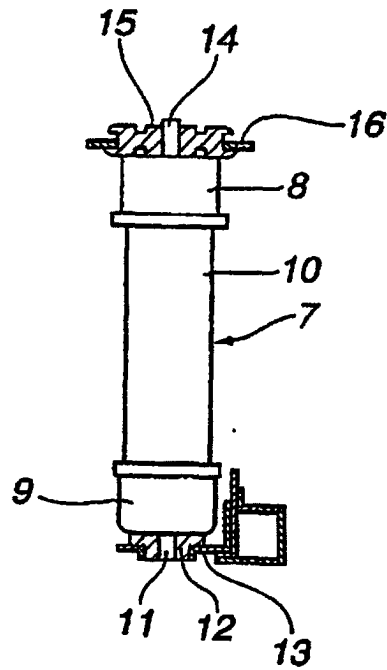


FIG.47
(PRIOR ART)

