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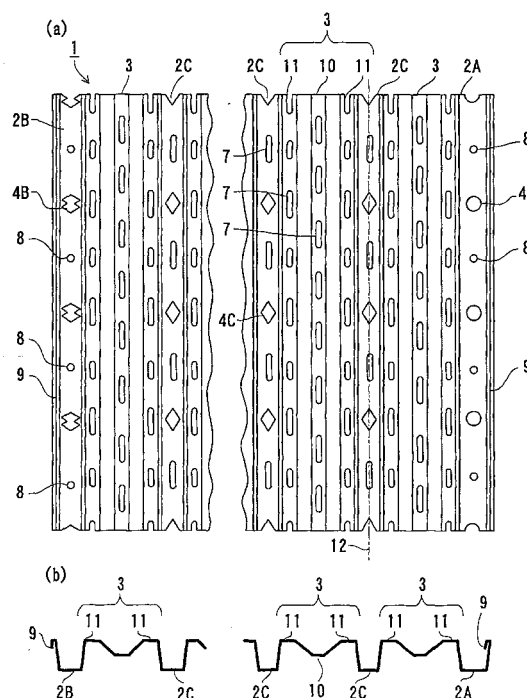
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(54) FORM PANEL AND PANEL HOLDING MEMBER

(57) It is an object of the present invention to enhance the efficiency of a concrete form construction work.

A form panel 1 to be used includes a plurality of expandable parts 3, wherein the expandable parts 3 include a plurality of projectedly bent rows 10 bent so as to be protruded toward a concrete depositing surface and a plurality of recessedly bent rows 11 which are bent so as to be recessed toward the concrete depositing surface, the projectedly bent rows 10 and the recessedly bent rows 11 are in parallel to each other, each of the projectedly bent rows 10 and the recessedly bent rows 11 is provided with a plurality of longitudinal slits 7 at appropriate intervals from one another in a straight line.

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Description

TECHNICAL FIELD

[0001] This invention relates to a metal form panel used as a sheathing board of a concrete form in civil engineering works, and to a panel holding member for holding the form panel on a basic surface.

BACKGROUND ART

[0002] Conventionally, a form panel made of plywood is mainly used as a sheathing board of a concrete form. However, a metal form panel which can be embedded as it is without being disassembled even after a skeleton concrete is cured or hardened has been developed in view of forest protection or because of troublesome of disassembling operation and disposition problem after use. This kind of metal form panel is formed by subjecting a thin steel plate to sheet-metal working, and the form panels are formed with ribs in place in a vertical direction for reinforcing the panels. When the form is assembled, the form panels are assembled along a panel holding member disposed on an oversite concrete and then, the ribs of the form panels are connected to each other through a separator so that the form panel can endure a pressure of the concrete which is poured. The metal form panel has a constant width (e.g., effective width is 600 mm), and a plurality of form panels are connected to one another to form a sheathing board having a necessary width. When an end portion having a width narrower than that of the form panel is generated, its size is adjusted using a cut piece of the form panel or another metal panel. At that time, since the panel is cut or a hole for inserting the separator is formed on the ground, there is a problem that the operability is inferior, and precision and strength are deteriorated in some cases.

[0003] The separator is a rod member formed at its opposite ends with male threads. When the separator is connected to the form panel, as shown in Fig. 14, opposite male thread portions 31a of the separator 31 are allowed to project outward from a separator inserting hole 4 formed in a rib portion of the form panel 1, and metal fittings 32 called as wall spacers are threadedly mounted to the male thread portions 31a. A lateral reinforcing steel pipe 33 is placed on the wall spacer 32, the fastening metal fitting 34 is fitted to the steel pipe 33 and then, a wedge 35 is inserted into a groove hole 32a of the wall spacer to fix the steel pipe 33 on an outer surface of the form panel 1.

[0004] The separator 31 and the wall spacer 32 are formed based on assumption that they are used for a form panel made of plywood. Therefore, when they are used for a metal form panel, it is necessary to use a washer 37 to prevent the separator from rotating together with the wall spacer when the wall spacer or a spacer 36 for adjusting a thickness are threadedly mounted.

Since the number of members to be used is large, it takes time to construct the form and it is troublesome to manage the materials.

[0005] Separator inserting holes are previously formed in the form panel at predetermined intervals from one another so that it is possible to handle a case in which the form panel is bent at a corner portion of the form and a case in which the form panel is cut into an appropriate width as described above. However, there is a defect that poured concrete leaks from the separator inserting hole.

[0006] Further, a separator which is formed based on the assumption that it is used for a form panel made of plywood is formed with projecting portions 31b. The projecting portions 31b bite into the form made of plywood to prevent the separator from rotating.

[0007] Therefore, the separator inserting hole of the conventional metal form panel is formed into a circular shape (see Fig. 15) having a diameter greater than an outer size of the projecting portion 31b of the separator 31, or into a square shape (see Fig. 16) whose diagonal line is longer than the outer size of the projecting portion 31b.

[0008] If the separator inserting hole is circular or square in shape like the conventional metal form panel, however, since play between an inner peripheral surface of the separator inserting hole and an outer peripheral surface of the separator is large, the separator 31 is deviated and an inner end surface of the wall spacer 32 adversely comes out from a peripheral portion of the rib portion 2 of the form panel 1 as shown in Fig. 17 in some cases due to impact caused when the concrete is poured or vibration of a vibrator. If such a matter is caused, the fastening metal fitting 34 may be loosened and comes out, the form itself may be deformed or damaged and poured concrete may flow out.

[0009] The panel holding member has a horseshoe-shaped cross section comprising a bottom surface and a pair of rising portions rising upward from opposite ends of the bottom surface. A lower end of the form panel is fitted to and held in the panel holding member. The panel holding member is fixed to the oversite concrete by concrete nail. However, since the panel holding member has the horseshoe-shaped cross section as described above, it is difficult to strike the concrete nail into the bottom surface thereof, and if a portion which is separate from a body portion having the horseshoe-shaped cross section is provided for striking the concrete nail, there is another problem that the shape becomes complicated, and the structure becomes bulky for transportation and storage.

[0010] Further, there are problems of handling a case in which a reference surface of the oversite concrete is uneven, and a commonality of upper caps mounted to upper ends of the form panel and the like, which the conventional panel holding member can not overcome.

[0011] This invention has been accomplished in view of the above circumstances, and it is an object of the

invention to provide a metal form panel in which concrete form construction work can easily and efficiently be carried out on the ground and which can be assembled strongly, and to provide a panel holding member which is suitably used in combination with the metal form panel.

Disclosure of the Invention

[0012] To solve the above problems, the present invention is constructed as follows:

[0013] First, a first aspect of the present invention provides a form panel includes a plurality of expandable parts, wherein the expandable parts include a plurality of projectedly bent rows bent so as to be protruded toward a concrete depositing surface side and a plurality of recessedly bent rows which are bent so as to be recessed toward the concrete depositing surface, the projectedly bent rows and the recessedly bent rows are in parallel to each other, each of the projectedly bent rows and the recessedly bent rows is provided with a plurality of longitudinal slits at appropriate intervals from one another in a straight line.

[0014] By changing the bending angles of the projectedly bent row and recessedly bent row, it is possible to expand the expandable parts in a direction intersecting with the longitudinal direction of the projectedly bent row and recessedly bent row. Since the projectedly bent row and the recessedly bent row are formed with the plurality of longitudinal slits at appropriate intervals from one another in the straight line, it is easy to change the bending angles of the projectedly bent row and recessedly bent row. Therefore, it is possible to easily change the effective width of the form panel on the ground, it is unnecessary to cut the form panel or prepare another metal panel for adjusting the size of the form, and the operating efficiency of the form construction is enhanced, and the precision and strength of the form are enhanced. Further, since no discarded material is produced on the ground, post-processing is unnecessary, which improves environmental protection.

[0015] If the form panel is previously formed with the plurality of separator inserting holes at predetermined intervals from one another, it is convenient to connect the separator to the form panel. In this case, if the separator inserting hole located at a central portion in a direction intersecting with a direction of the projectedly bent row and recessedly bent row has pointed ends in the direction of the projectedly bent row and recessedly bent row, it becomes easy to bend the form panel along a row of the separator inserting holes.

[0016] Further, if most of an outline of a separator inserting hole located at a central portion in a direction intersecting with a direction of the projectedly bent row and recessedly bent row is cut, and an inner side portion and an outer side portion of the outline are connected to each other through a non-cut portion of the remaining outline, it is possible to prevent the poured concrete from

leaking out in the normal state, and if the non-cut portion is cut or bent if necessary, it is possible to remove the inner side portion of the outline so that the separator can be inserted.

[0017] Further, at least the separator inserting hole located at one end in a direction intersecting with a direction of the projectedly bent row and recessedly bent row has a portion of its outer peripheral line projecting toward a center of the hole, the projecting portion is bent in a direction intersecting with a panel surface by a separator in a state in which the separator is inserted, this bent projecting portion is engaged with a shaft of the separator to restrain the separator from rotating around its axis. With this structure, a detent washer for the separator which is used in a conventional metal form panel is unnecessary.

[0018] According to a second aspect of the invention, a rib portion which is dented from an outer surface side in a form assembled state is formed with a separator inserting hole, the separator is inserted through the separator inserting hole from its inner surface side to its outer surface side, a wall spacer is mounted to a portion of the separator projecting toward the outer surface side, the form panel is assembled into a state in which the wall spacer abuts against the peripheral portion of the rib portion from the outer surface side, wherein diameters of the separator inserting holes in two directions intersecting with each other have different shapes.

[0019] More specifically, it is preferable that among the diameters of the separator inserting holes in two directions intersecting with each other, one of the diameter is larger than an outer size of the projecting portion of the separator, and the other diameter is smaller than the outer size of the projecting portion and larger than a diameter of the separator. With this structure, the projecting portion of the separator can be inserted, but only a small play exists between the inserted separator and the separator inserting hole and thus, it is possible to prevent the separator from being deviated in position when the concrete is poured.

[0020] A panel holding member for holding a form panel on a basic surface of the present invention is characterized in that the panel holding member is long in one direction and has a horseshoe-shaped cross section comprising a bottom surface and a pair of rising portions rising upward from both ends of the bottom surface, at least one of the rising portions is provided with an opening through which a head of a nail striking tool can pass.

[0021] By providing the opening, it is possible to easily strike a concrete nail to the bottom surface of the panel holding member, and it is unnecessary to provide a portion for striking the concrete nail separately from the body portion having the horseshoe-shaped cross section unlike the conventional technique.

[0022] Further, at least one of the rising portions is provided with a holding-height adjusting piece which can be bent inward and which can support a lower end of the form panel from below in its bent state. With this

structure, when the reference surface of the oversite concrete is uneven, it is possible to adjust the holding height of the form panel such that the form panel stays horizontally.

[0023] Further, if an end of the bottom surface in a direction intersecting with the cross section is formed with an incision in the direction, since the end of the panel holding member can be bent such that a interval between the pair of rising portions is narrowed, it is possible to fit the ends of the panel holding members to each other and to additionally connect the plurality of panel holding members to each other.

Brief Description of the Drawings.

[0024] Fig. 1(a) is a front view and Fig. 1(b) is a plan view of a form panel 1, Fig. 2(a) is a front view and Fig. 2(b) is a plan view of a second separator inserting hole. Fig. 3(a) is a front view and Fig. 3(b) is a plan view of a third separator inserting hole. Figs. 4(a), 4(b) and 4(c) are plan views of a normal state, an extended state and a contracted state of an expandable parts 3, respectively. Fig. 5 is a plan view (part 1) of the deformed form panel 1. Fig. 6 is a plan view (part 2) of the deformed form panel 1. Fig. 7 is a plan view (part 3) of the deformed form panel 1. Fig. 8(a) is a front view, Fig. 8(b) is a plan view and Fig. 8(b) is a side view of a panel holding member. Fig. 9 is a side view showing a state in which the form panel is held by the panel holding member. Fig. 10 is a perspective view of a form. Fig. 11 is a sectional view of an essential portion of the form. Fig. 12 is a view showing a different shape of the third separator inserting hole. Fig. 13 is a view showing another different shape of the third separator inserting hole. Fig. 14 is a sectional view showing an assembling state of a conventional form panel. Fig. 15 is a view (part 1) showing a shape of the conventional separator inserting hole. Fig. 16 is a view (part 2) showing a shape of the conventional separator inserting hole. Fig. 17 is a sectional view showing a state in which a separator is inserted through the conventional separator inserting hole.

BEST MODE FOR CARRYING OUT THE INVENTION

[0025] A preferred embodiment of the present invention will be explained below based on the drawings.

[0026] Figs. 1 to 7 show a form panel. This form panel 1 is formed by subjecting a thin steel plate (thickness is about 0.35 mm) to sheet-metal working, and the form panel 1 is plated with zinc. The form panel 1 is of a rectangular shape having a size of width of 600 mm (effective width) $\times$ length of 1800 mm. A necessary number of form panels are connected to one another in a lateral direction to form a sheathing board having a necessary width.

[0027] The form panel 1 comprises rib portions 2 and expandable parts 3 both directing in a vertical direction.

The rib portions 2 and the expandable parts 3 are alternately arranged in the lateral direction. Each the rib portion 2 is formed with separator inserting holes 4 arranged at predetermined intervals from one another in the vertical direction. A rib portion 2A is located at laterally one end, and the rib portion 2A is formed with circular separator inserting holes (first separator inserting holes) 4A. A rib portion 2B is located at laterally the other end, and the rib portion 2B is formed with separator inserting holes (second separator inserting holes) 4B. As shown in Figs. 2, each of the second separator inserting holes 4B comprises two rhombuses which are vertically arranged such that portions of the rhombuses are overlapped with each other, and vertically central side portions of an outer peripheral line of the second separator inserting hole 4B project toward a center of the hole. Since a thickness of the steel plate constituting the form panel 1 is thin, if an external force in a direction intersecting a surface of the panel is applied to projecting portions 5 formed on the outer peripheral portion of the second separator inserting hole, the projecting portions 5 are bent relatively easily.

[0028] Rib portions 2C are formed at laterally central portion of the form panel 1. Each of the rib portions 2C is formed with separator inserting holes (third separator inserting holes) 4C. As shown in Figs. 3, the third separator inserting hole 4C is shaped into a rhombus having a longer vertical diagonal line and a shorter lateral diagonal line. This third separator inserting hole 4C has a structure in which most portion of its outline is cut, and an inner portion and an outer portion of the outline are connected to each other through a partially remained non-cut portion 6. In an initial stage, the hole is closed, but if the non-cut portion 6 is cut or bent to remove the inner portion of the outline if necessary, the above-described square hole is formed.

[0029] As shown with chain double-dashed lines in Figs. 3, the third separator inserting hole 4C has such a size that a vertical size L1 is larger than an outer size of a projecting portion 31b of the separator 31, and a lateral size L2 is smaller than the outer size of the projecting portion 31b and larger than a diameter of the separator 31. If these conditions are satisfied, the third separator inserting hole 4C may have a shape other than the rhombus. For example, the third separator inserting hole 4C may be of rectangular shape as shown in Fig. 12, of ellipse as shown in Fig. 13, or other shape.

[0030] A portion between the third separator inserting hole 4C and the third separator inserting hole 4C is formed with vertical slits 7. For this reason, also because vertical ends of the third separator inserting hole 4C are pointed, the rib portion 2C can easily be bent along a vertical bending line 12.

[0031] Reference numbers 8 represents screw holes which are formed between the first separator inserting hole 4A and the first separator inserting hole 4A with the same pitch as that of the first separator inserting hole 4A. Lateral outer end lines 9 and 9 are bent inward to

ensure the reinforcement and handling safety.

[0032] The expandable parts 3 comprises a projectedly bent row 10 which is bent so as to be protruded toward a concrete depositing surface side, and a pair of recessedly bent rows 11 and 11 which are bent so as to be recessed toward the concrete depositing surface side located on both sides of the projectedly bent row 10. The projectedly bent row 10 and the recessedly bent rows 11 and 11 are in parallel to each other. The projectedly bent row 10 and the recessedly bent rows 11 and 11 are provided with a plurality of longitudinal slits 7 in straight lines at appropriate intervals from one another.

[0033] Therefore, the bending angles of the projectedly bent row 10 and the recessedly bent rows 11 and 11 can relatively easily be changed only manually. A normal state of the expandable parts 3 is as shown in Fig. 4(a), and if the bending angles are increased, a lateral width of the expandable parts 3 is increased as shown in Fig. 4(b), and if the bending angles are reduced, the lateral width is reduced as shown in Fig. 4(c). Therefore, it is possible to easily change the effective width of the form panel on the ground, and it is unnecessary to cut the form panel or prepare another metal panel. Thus, the operability of the form construction is enhanced, and the precision and strength of the form are enhanced. Further, since no discarded material is produced on the ground, post-processing is unnecessary, which improves environmental protection.

[0034] If the angles of the projectedly bent row 10 and the recessedly bent rows 11 and 11 of each the expandable parts 3 are adjusted and the rib portion 2C is bent along the vertical bending line, it is possible to deform the form panel 1 to a desired shape as shown in Figs. 5 to 7.

[0035] Figs. 8 and 9 show a panel holding member. This panel holding member 20 is long in one direction, and has a horseshoe-shaped cross section comprising a bottom surface 21 and a pair of rising portions 22 and 23 rising upward from both ends of the bottom surface and having different lengths. A tip end 22a of the shorter rising portion 22 is bent diagonally outward so that an end of the form panel 1 can smoothly be guided inside of the panel holding member 20. The shorter rising portion 22 is formed with openings 24 at predetermined intervals from one another so that when a concrete nail for fixing the panel holding member on the oversite concrete is struck to the bottom surface, a nail striking device or a hammer can be operated.

[0036] Holding-height adjusting pieces 25 surrounded by horseshoe-shaped lines of cutting plane are provided two each at vertically opposite sides of the opening 24. The holding-height adjusting piece 25 can be bent inward, and in its bent state, the holding-height adjusting piece 25 supports a lower end of the form panel 1 from below. A height of each holding-height adjusting piece 25 is different so that the holding-height of the form panel 1 including a case in which no holding-height ad-

justing pieces 25 are bent can be adjusted in four levels. Further, the opening 24 is formed at its opposite sides with screw holes 26 and 26 in the vicinity of the opposite sides.

[0037] The bottom surface 21 of the panel holding member 20 is formed at its one end with a longitudinal incision 27. A terminal portion 27a of the incision 27 is circular in shape having a diameter larger than a width of the incision 27 so that stress is not concentrated. By providing the incision 27, the end of the panel holding member 20 can be bent such that a interval between the pair of rising portions 21 and 22 is narrowed. Therefore, it is possible to fit an end of a panel holding member 20 whose interval between the rising portions is narrowed into an end of another panel holding member 20, and to connect a plurality of panel holding members 20 with one another.

[0038] Next, a constructing method of the form using the form panel 1 and the panel holding member 20 will be explained (see Figs. 10 and 11).

[0039] First, the panel holding member 20 is fixed by a concrete nail on a necessary position on the oversite concrete 30. If a concrete nail is struck at a position of the bottom plate 21 facing the opening 24, it is easy to operate the nail striking device or the hammer.

[0040] Next, in a state in which a lower end of the form panel 1 is fitted into the panel holding member 20, the form panel 1 is assembled. If an upper surface of the oversite concrete 30 is uneven and the panel holding member 20 is not horizontal, the lower end of the form panel 1 is adjusted by the holding-height adjusting piece 25 such that the lower end is directed horizontally. The form panels 1 are arranged in the lateral direction, and laterally outermost rib portions 2A and 2B of the adjacent pair of form panels 1 are temporarily connected to each other through a screw. At that time, the rib portion 2A having the first separator inserting hole is set outer side, and the screw is threadedly engaged using a screw hole 8.

[0041] Thereafter, opposed form panels 1 and 1 are connected to each other using the separator 31 and the wall spacer 32. When the form panels 1 and 1 are arranged using all of the effective width, the end of the separator passes through the first separator inserting holes 2A and the second separator inserting holes 2B of the pair of form panels 1 and 1 from the inner side toward the outer side. At the same time, as shown with the chain lines in Figs. 2, projecting portions 5 and 5 of the second separator inserting hole 2B pass through the first separator inserting hole 2A and bent outward. Then, the wall spacer 32 is threadedly engaged with the male thread portion 31a of the separator 31, but since the projecting portions 5 and 5 engage with projecting portions 31b and 31b formed on a shaft portion of the separator to restrain the separator 31 from rotating, the wall spacer 32 can reliably be threadedly engaged. An inner end surface of the wall spacer 32 is received by an outer surface of the rib portion 2A. With this structure of the

separator connecting portion, a space for adjusting the thickness and a separator-detent washer which are used in a conventional metal form panel are unnecessary.

[0042] When a form panel 1 having a width narrower than a standard lateral width (e.g., 600 mm) or a form panel 1 having a width wider than the standard lateral width is required, it is possible to satisfy this requirement by expanding or contracting the expandable parts 3. Further, as shown in Figs. 5 to 7, the form panel 1 can be deformed into a desired shape and used at a corner portion of the form. Since the rib portions 2 and the expandable parts 3 are arranged at relatively narrow intervals, a smooth surface closer to a curved surface can be obtained.

[0043] When the separator 31 is inserted through the third separator inserting hole 4C and the form panels 1 and 1 are connected to each other, the inner side portion of the outline of the third separator inserting hole 4C is removed to form a predetermined rhombus hole, and the separator 31 is inserted through this hole. As shown in Figs. 3, the separator 31 can be inserted through the third separator inserting hole 4C coinciding a direction (longitudinal direction) in which the diameter of the third separator inserting hole 4C is larger and a direction of the projecting portion 31b of the separator 31 with each other. In a state in which the separator 31 is inserted through the third separator inserting hole 4C, there is almost no play between the inner peripheral surface of the third separator inserting hole 4C and the outer peripheral surface of the separator 31. Therefore, even if an impact at the time of striking of the concrete nail or vibration of a vibrator is applied, the separator 31 is not deviated.

[0044] After the form panel 1 is assembled in this manner, the lateral reinforcing steel pipe 33 is fastened and fixed to the outside of the form panel 1. Since the form panel 1 is provided with a large number of vertical rib portions 2 and the expandable parts 3, the form panel 1 has high strength against the bending force in the vertical direction irrespective of the fact that the form panel 1 is formed of super-thin plate. Therefore, it is possible to obtain a form having sufficient strength only by providing the reinforcing steel pipe 33 in the lateral direction.

[0045] Lastly, the panel holding member 20 is mounted to the upper end of the form panel 1 as an upper end cap of the form panel 1. The panel holding member 20 has a simple structure comprising only a body portion having the horseshoe-shaped cross section and the panel holding members 20 can easily be connected to each other in the longitudinal direction utilizing the incision 27 formed on the one end. Therefore, the panel holding member 20 can also be used for the upper end cap.

[0046] Then, concrete is provided in the form. Excessive water of the concrete is appropriately discharged out from the slits 7 formed in the rib portions 2 and the

expandable parts 3, and the concrete is cured in an ideal state. Since the third separator inserting hole 4C is closed in the normal state, concrete does not leak from the third separator inserting hole 4C. After the concrete is cured, the reinforcing steel pipe 33 is disassembled, and the wall spacer 32 is removed from the separator 31. The form panel 1 and the separator 31 are left in their embedded states.

10 Industrial Applicability

[0047] As apparent from the above explanation, the lateral width of the form panel of the present invention can be adjusted, and the form panel can be bent along the vertical bending line. Therefore, it is possible to easily construct a sheathing board having desired size and shape. Since the separator inserting hole is variously worked, it is easy to install the separator, and the number of members required to install the separator can be reduced.

[0048] Further, according to the form panel of the present invention, since diameters of the separator inserting holes intersecting with each other are different, a projecting portion of the separator can be inserted through the separator inserting hole, but there is almost no play between the separator and the inner peripheral surface of the separator inserting hole, and the separator is not deviated in position. Therefore, if the form panel of the present invention is used, it is possible to prevent the form from being deformed and damaged which may be caused due to an impact at the time of striking of the concrete nail or vibration of a vibrator, and it is possible to prevent the concrete from flowing out.

[0049] Furthermore, the panel holding member of the present invention can easily be fixed to the oversite concrete by a concrete nail using a nail striking tool, and the holding-height of the form panel can be adjusted with respect to an uneven surface of the reference surface of the oversite concrete. Further, the panel holding member of the invention can also be used as an upper cap which is put on the upper end of the form panel.

[0050] Therefore, if a concrete form is constructed using the form panels and the panel holding members of the present invention, it is possible to obtain various merits that the operability is enhanced, precision and strength of the constructed concrete form are excellent, the number of attachment members can be reduced and the like.

Claims

1. A form panel comprising an expandable parts, wherein said expandable parts comprises a plurality of projectedly bent rows bent so as to be protruded toward a concrete depositing surface side, and a plurality of recessedly bent rows which are bent so as to be recessed toward the concrete depositing

surface side, said projectedly bent rows and said recessedly bent rows are in parallel to each other, each of said projectedly bent rows and said recessedly bent rows is provided with a plurality of longitudinal slits at appropriate intervals from one another in a straight line.

2. A form panel according to claim 1, further comprising a plurality of separator inserting holes arranged at predetermined intervals from one another, wherein the separator inserting hole located at a central portion in a direction intersecting with a direction of said projectedly bent row and recessedly bent row has pointed ends in the direction of said projectedly bent row and recessedly bent row. 15

3. A form panel according to claim 2, wherein most of an outline of a separator inserting hole located at a central portion in a direction intersecting with a direction of said projectedly bent row and recessedly bent row is cut, and an inner side portion and an outer side portion of the outline are connected to each other through a non-cut portion of the remaining outline. 20

4. A form panel according to any one of claims 1 to 3, further comprising a plurality of separator inserting holes arranged at predetermined intervals, wherein at least the separator inserting hole located at one end in a direction intersecting with a direction of said projectedly bent row and recessedly bent row has a portion of its outer peripheral line projecting toward a center of the hole, said projecting portion is bent in a direction intersecting with a panel surface by a separator in a state in which the separator is inserted, this bent projecting portion is engaged with a shaft of the separator to restrain the separator from rotating around its axis. 25

5. A form panel in which a rib portion which is dented from an outer surface side in a form assembled state is formed with a separator inserting hole, the separator is inserted through said separator inserting hole from its inner surface side to its outer surface side, a wall spacer is mounted to a portion of the separator projecting toward the outer surface side, said form panel is assembled into a state in which the wall spacer abuts against the peripheral portion of said rib portion from the outer surface side, wherein diameters of the separator inserting holes in two directions intersecting with each other have different shapes. 30

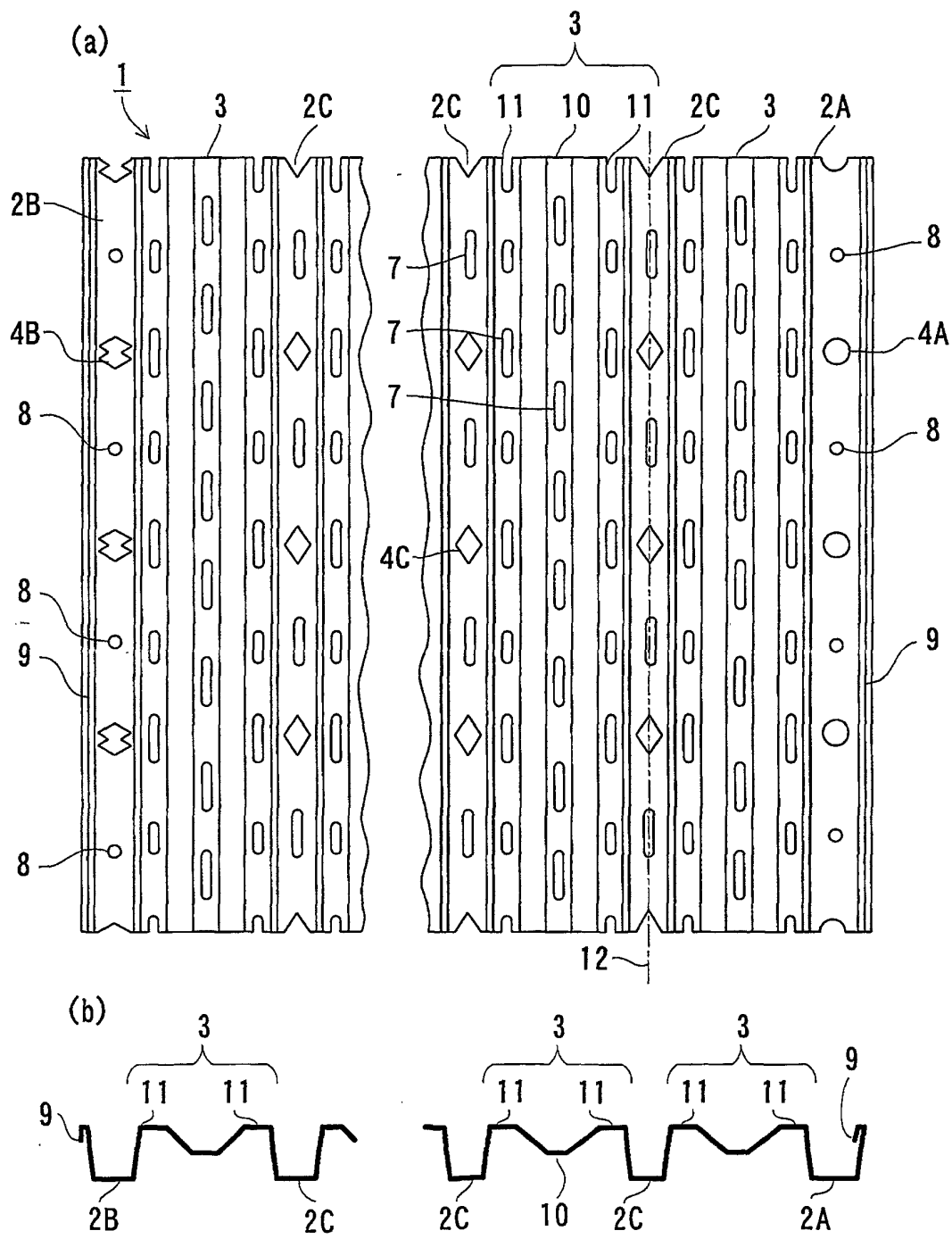
6. A panel holding member for holding a form panel on a basic surface, wherein said panel holding member is long in one direction and has a horse-shoe-shaped cross section comprising a bottom surface and a pair of rising portions rising upward 35

from both ends of the bottom surface, at least one of the rising portions is provided with an opening through which a head of a nail striking tool can pass.

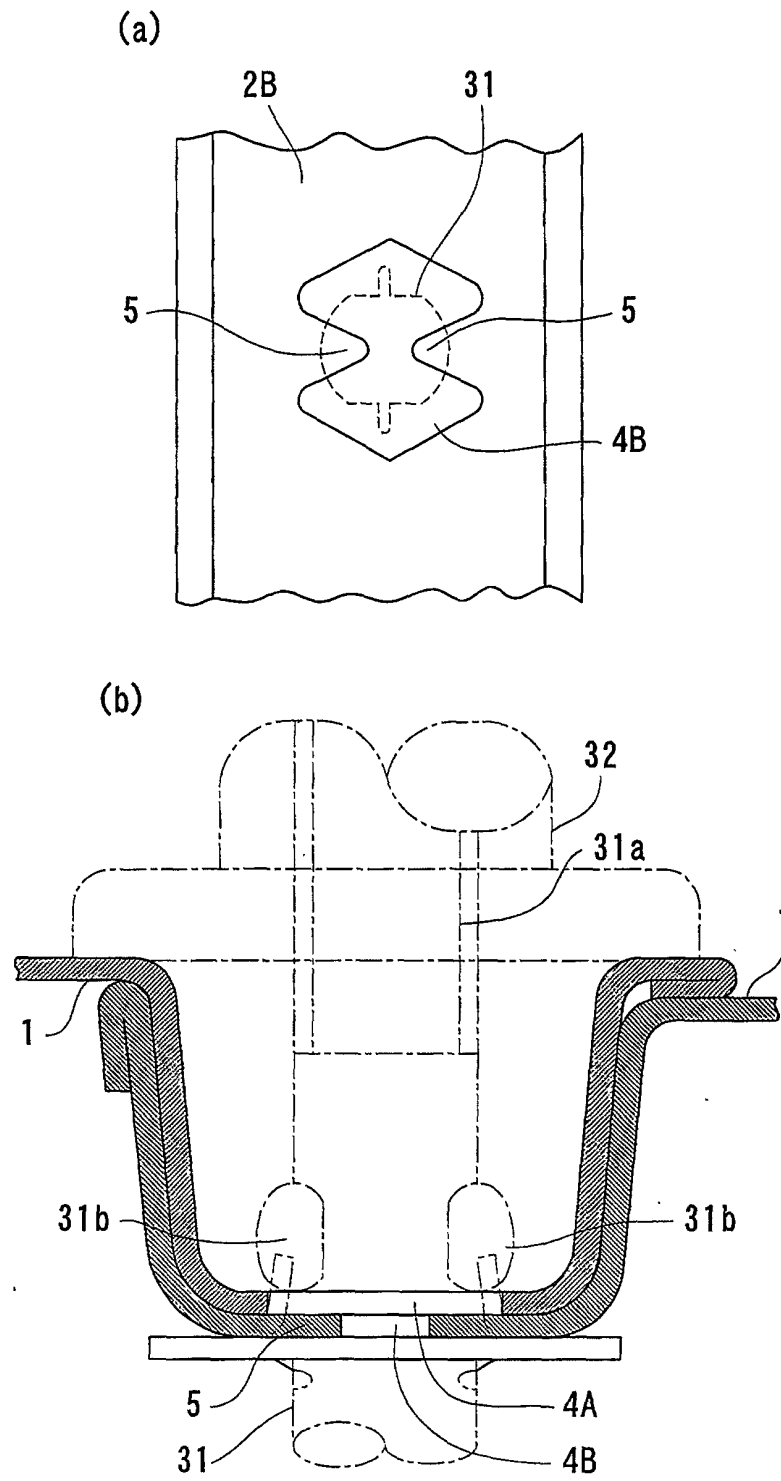
7. A panel holding member according to claim 6, wherein at least one of the rising portions is provided with a holding-height adjusting piece which can be bent inward and which can support a lower end of the form panel from below in its bent state. 40

8. A panel holding member according to claim 6 or 7, wherein an end of the bottom surface in a direction intersecting with said cross section is formed with an incision in said direction. 45

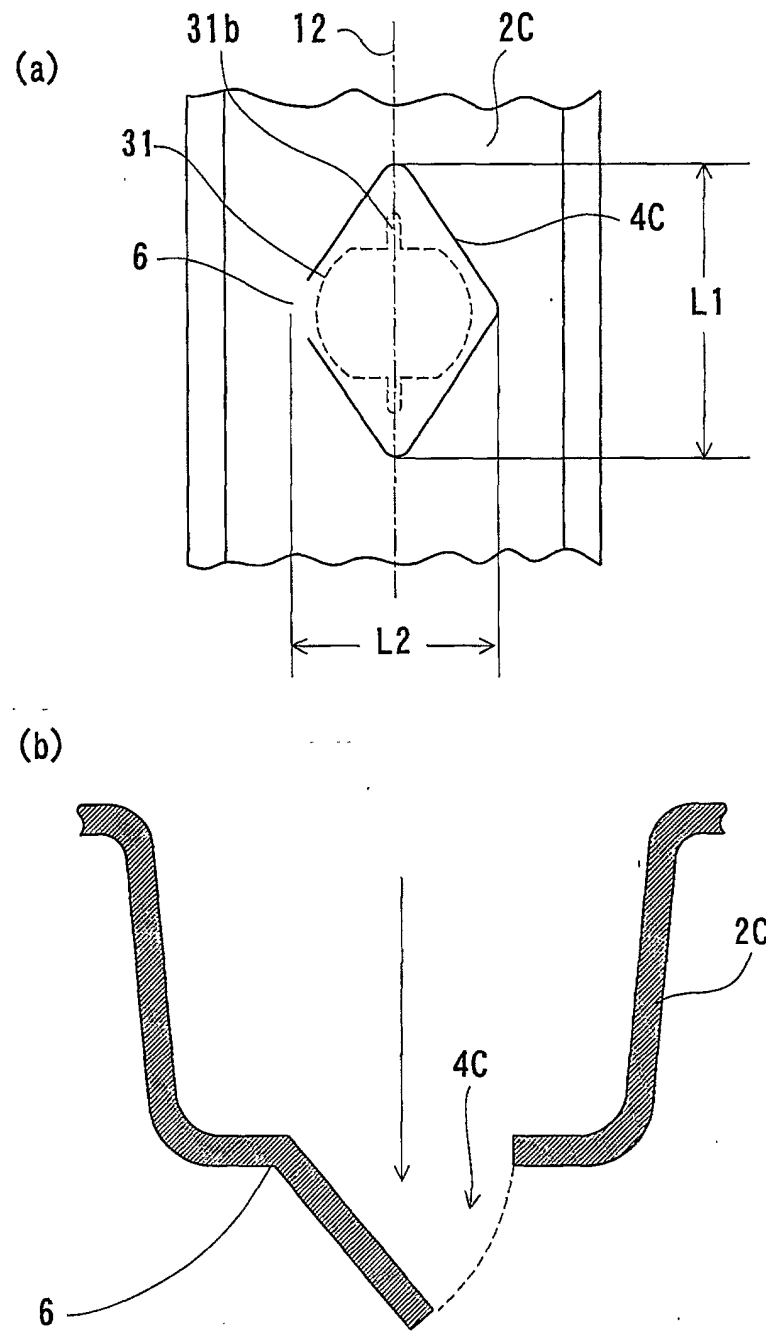
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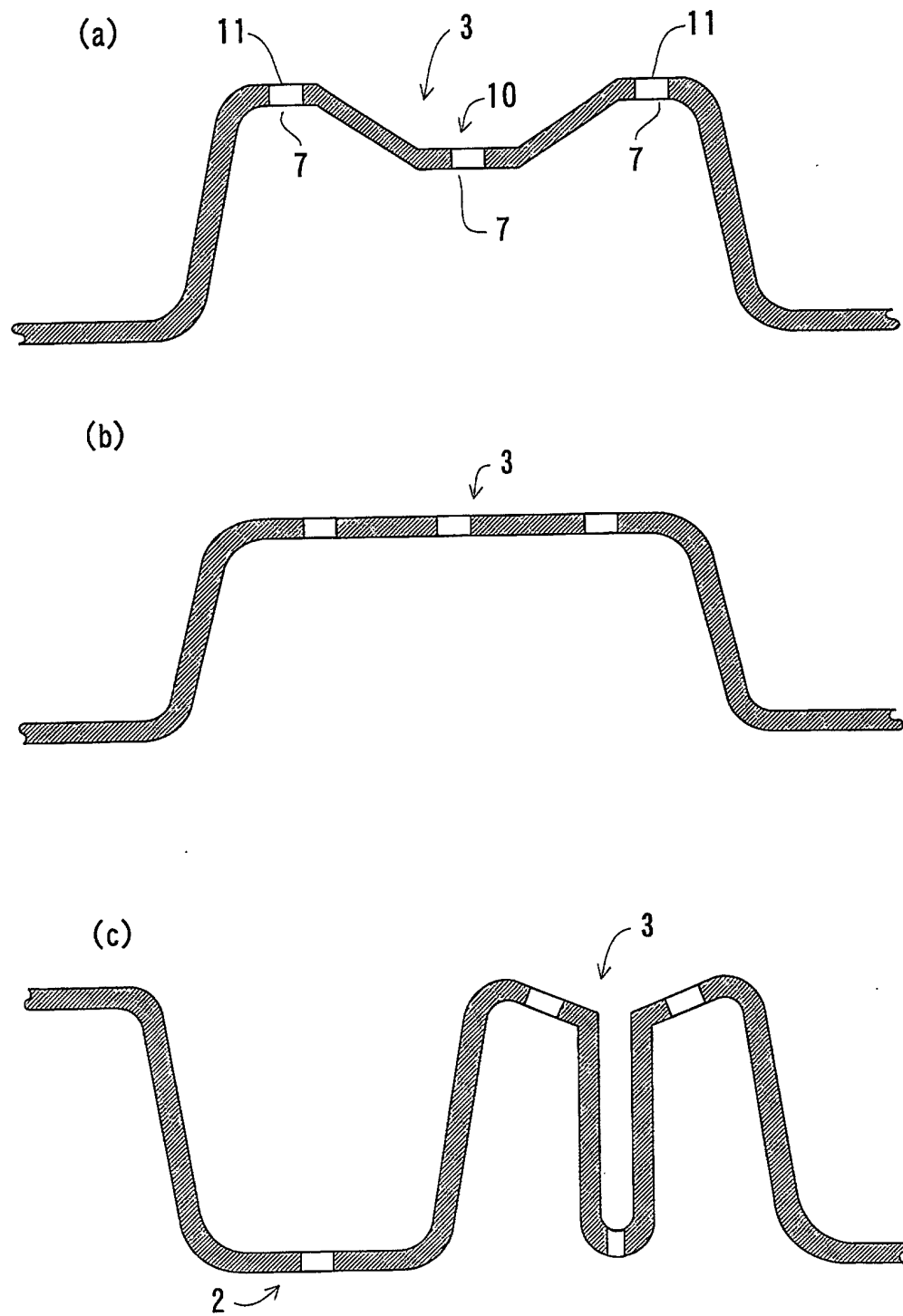
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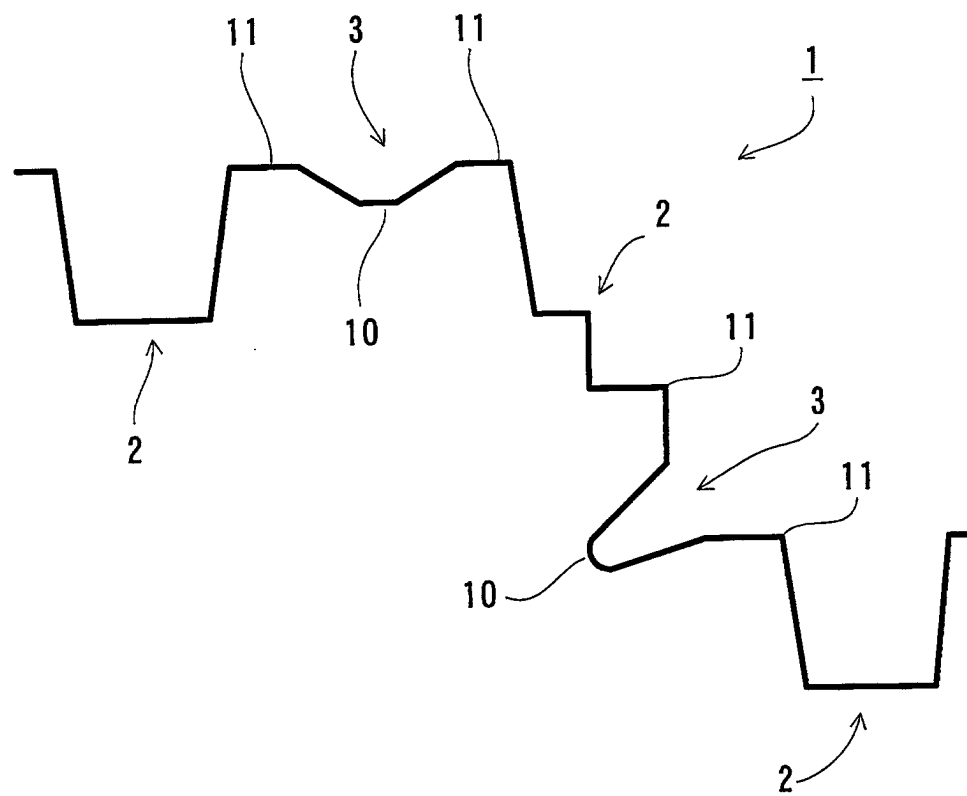
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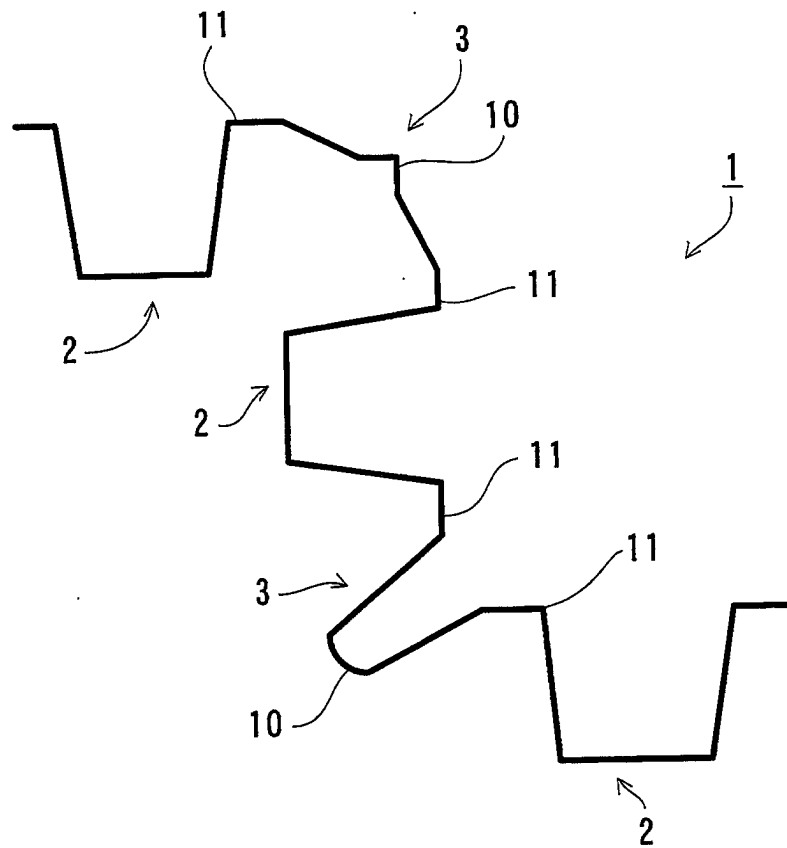
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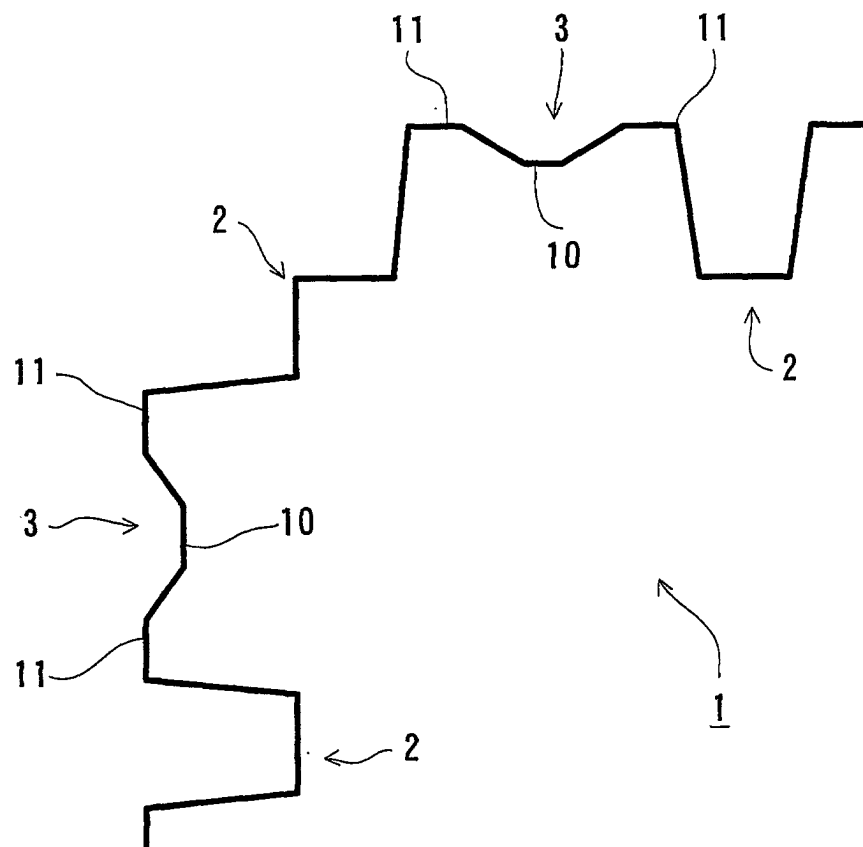
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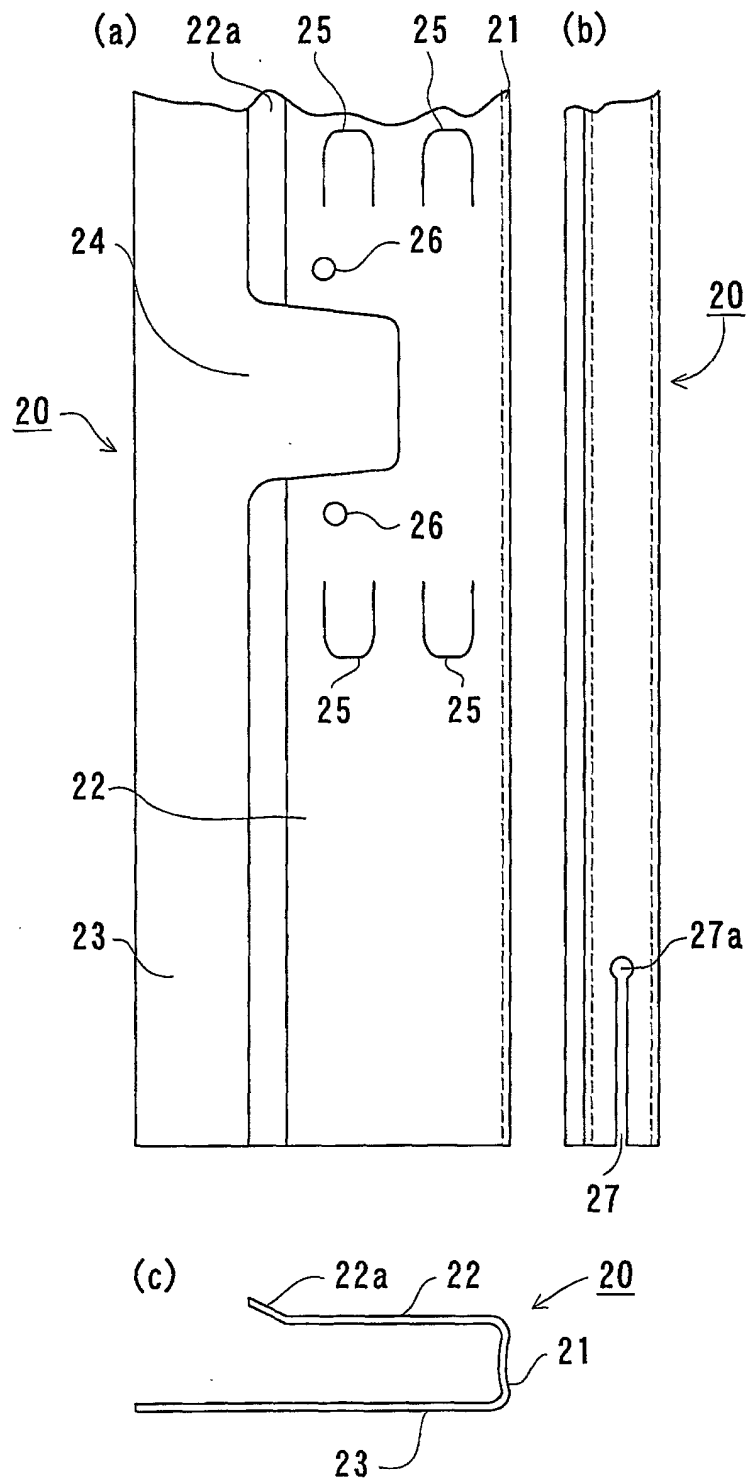
第6図



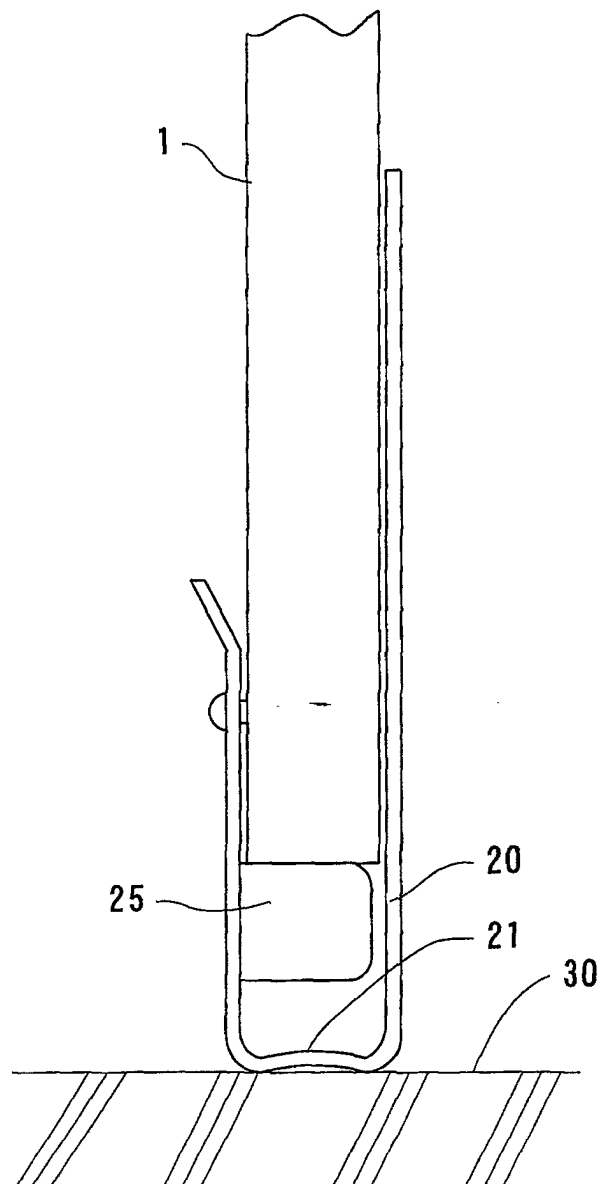
第7図



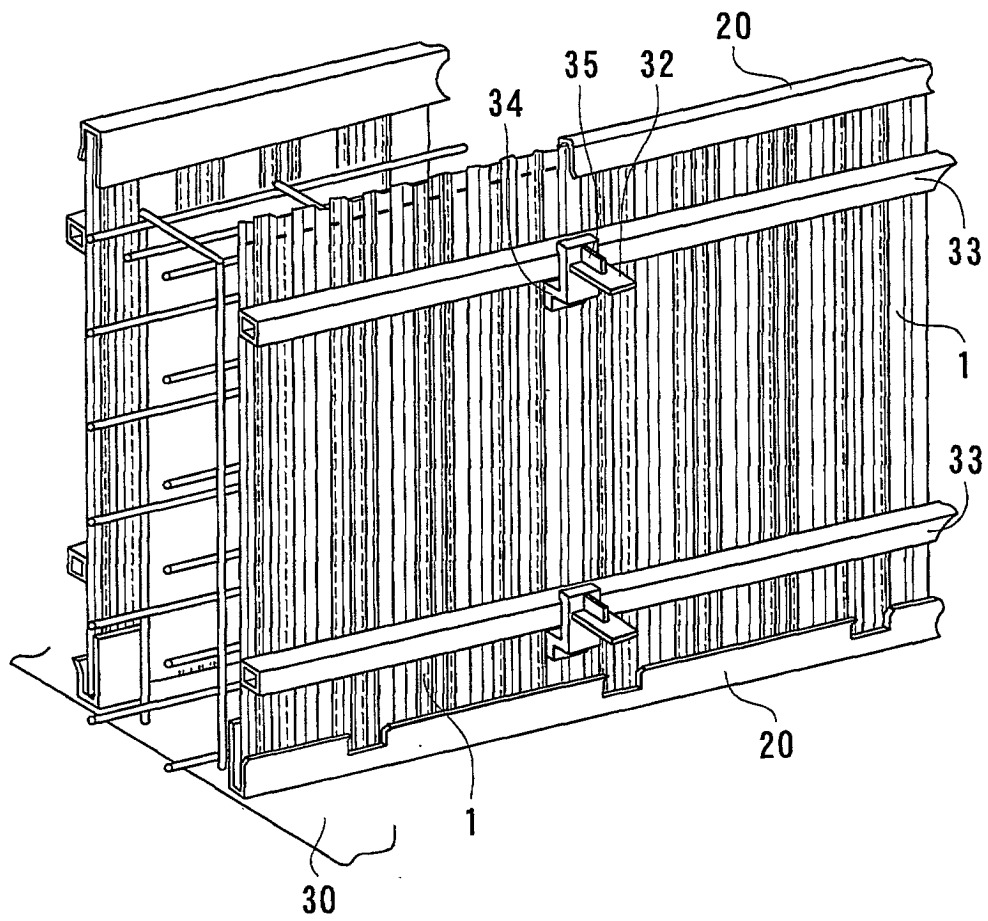
第 8 図



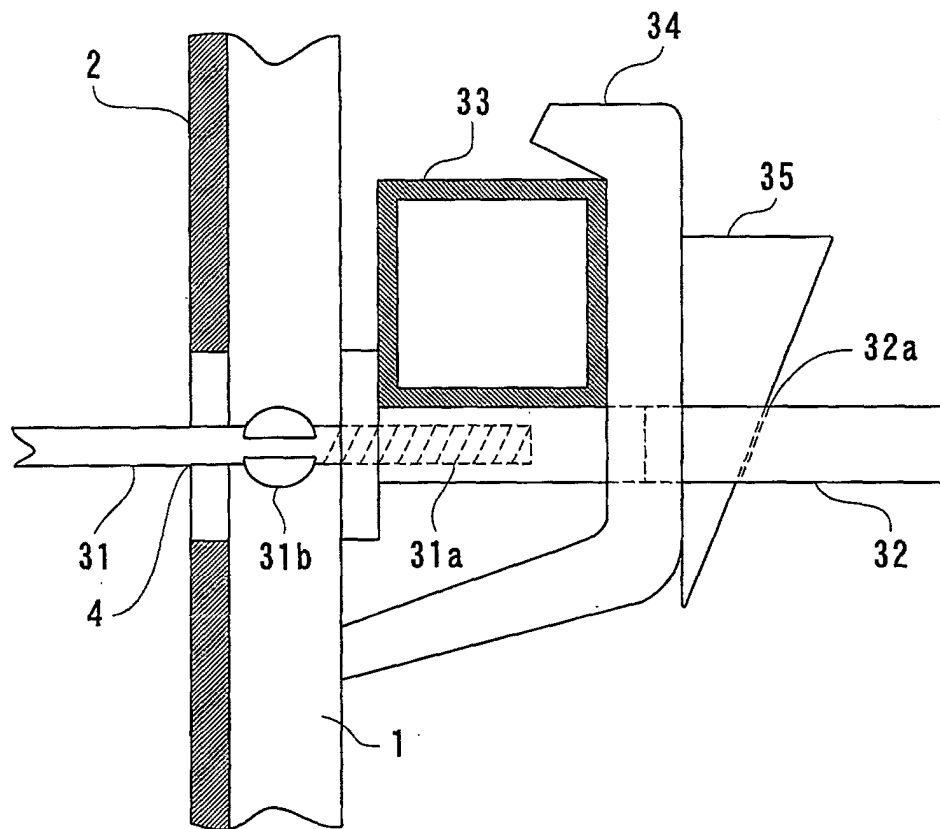
第9図



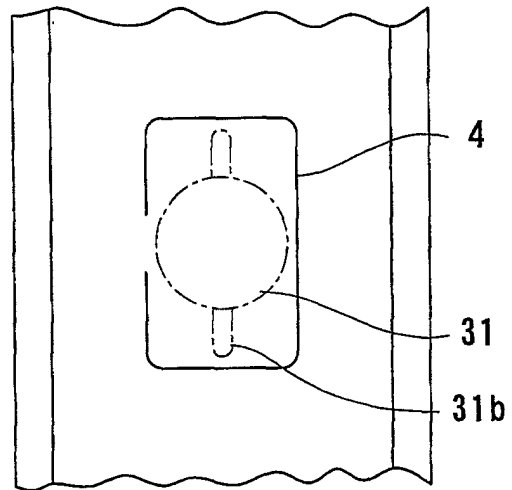
第10図



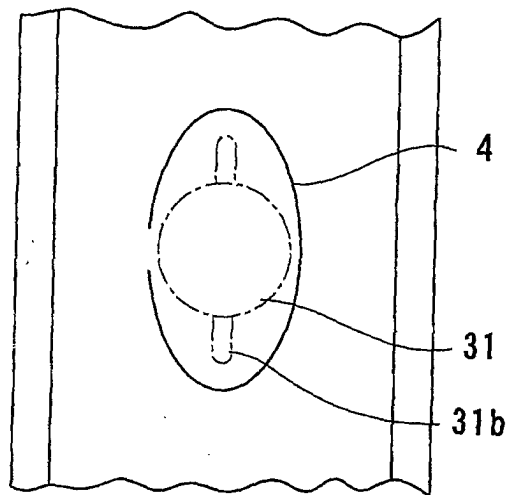
第 11 図



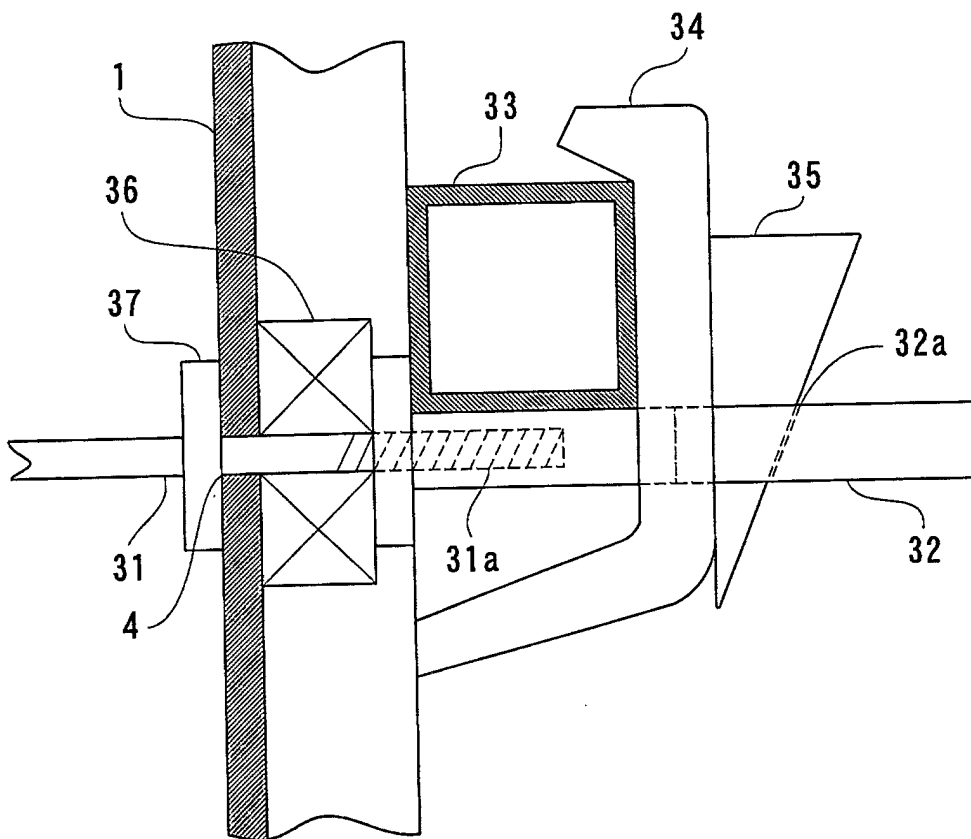
第12図



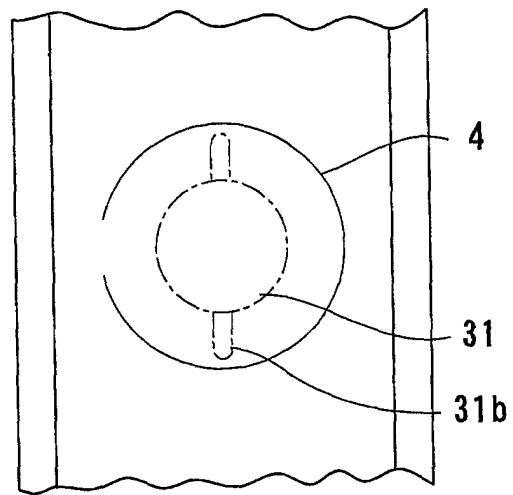
第13図



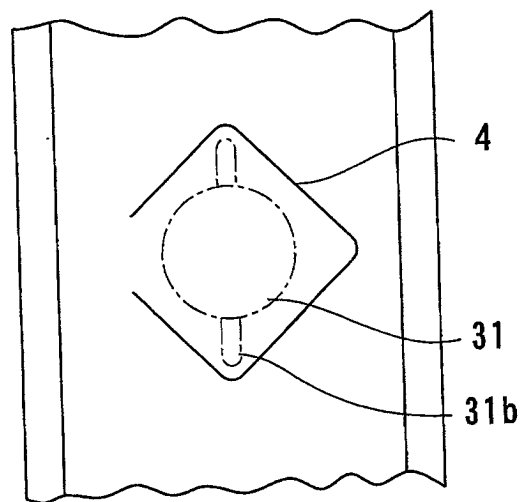
第14図



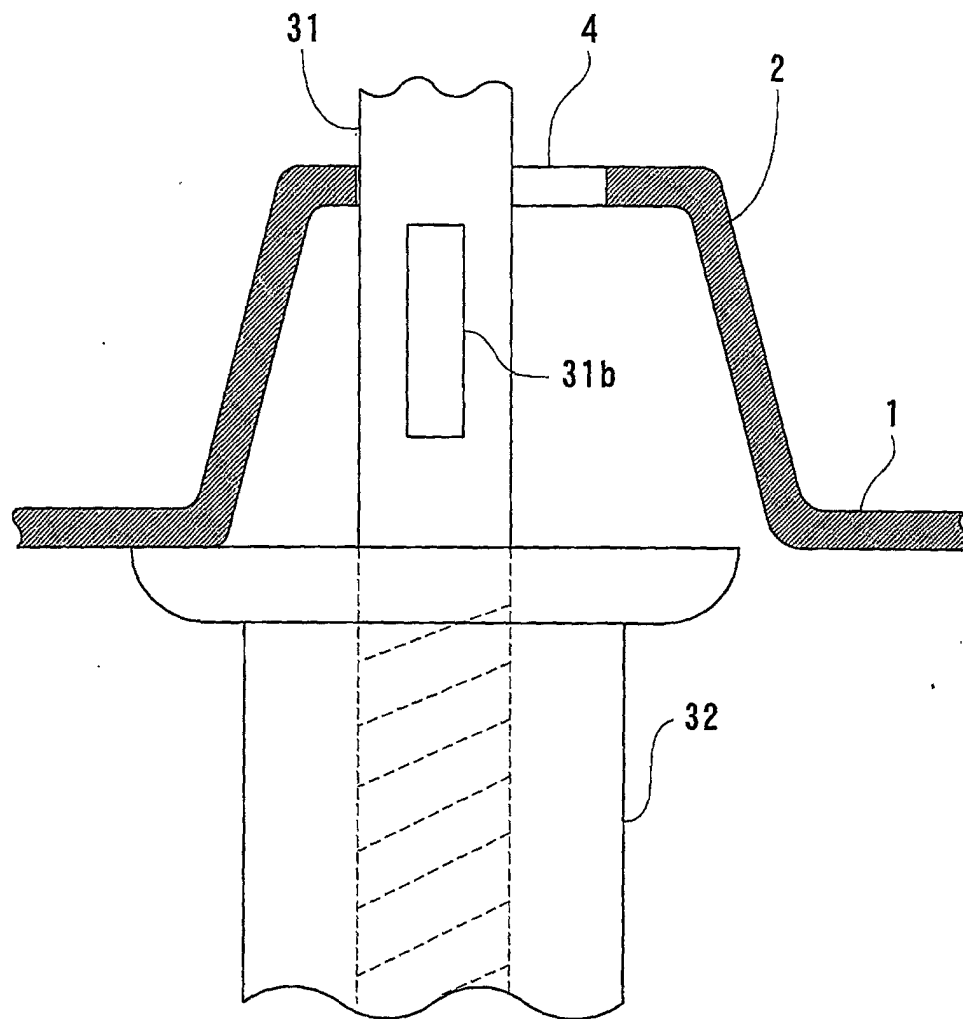
第15図



第16図



第 1 7 図



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP01/03428

A. CLASSIFICATION OF SUBJECT MATTER Int.Cl. ⁷ E04B2/86		
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. ⁷ E04B2/86, E04G9/00, 17/00-17/18		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1926-1996 Toroku Jitsuyo Shinan Koho 1994-2001 Kokai Jitsuyo Shinan Koho 1971-2001 Jitsuyo Shinan Toroku Koho 1996-2001		
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.
X	JP 9-60165 A (Takeo OKADA),	6
Y	04 March, 1997 (04.03.97),	1
A	Full text; Figs. 1, 7, 9, 13 (Family: none)	2-4, 7, 8
Y	JP 10-110491 A (Oyo Kikaku K.K.), 28 April, 1998 (28.04.98), Par. No. [0015], lines 1 to 3 (Family: none)	1
X	JP 10-88715 A (Takeo OKADA),	5
A	07 April, 1998 (07.04.98), Claim 1; Figs. 1, 7, 13 (Family: none)	2, 3
☐ 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 14 August, 2001 (14.08.01)		Date of mailing of the international search report 28 August, 2001 (28.08.01)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP01/03428

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

The common matter pertaining to Claims 1, 5, and 6 is a form panel only, and the form panel is obvious to a person skilled in the art.

In Claims 1, 5, and 6, there is no technical relationship, among the inventions, beyond the obvious matter to the person skilled in the art.

Therefore, the groups of these three inventions I to III are not considered to be a group of inventions so linked as to form a single general inventive concept.

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest ☐ The additional search fees were accompanied by the applicant's protest.
☒ No protest accompanied the payment of additional search fees.