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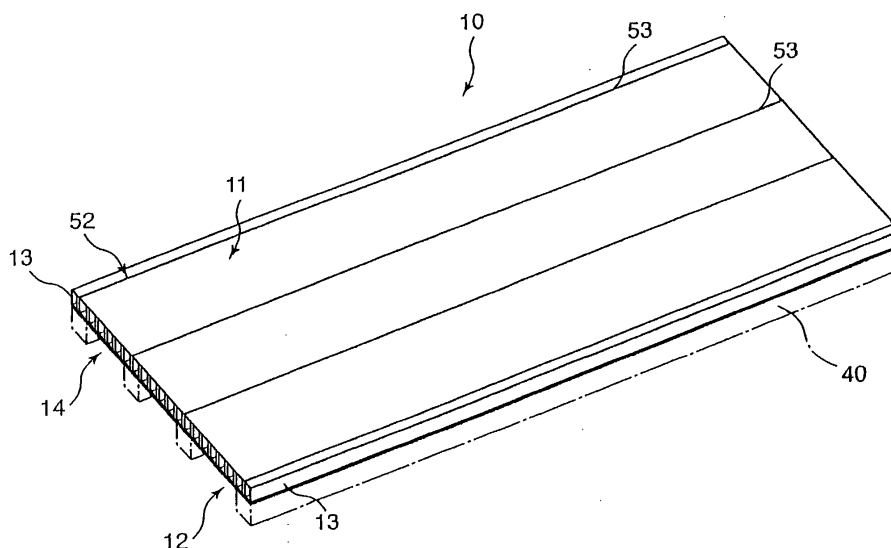
(54) **MOLDING FLASK MADE OF THERMOPLASTIC RESIN**

(57) A form 10 for constructing a concrete structure is formed of a thermoplastic resin containing an inorganic material, and includes a first main plate 11 facing a poured concrete, a second main plate 12 opposing this first main plate, and partition plates 15, 16 extending between these first and second main plates.

The partition plates 15 construct a plurality of first reinforcement parts 30 having at least one kind of cross

sectional shape selected from an approximately rectangular shape and an approximately truss shape in a width direction from right to left. And the partition plates 16 construct a second reinforcement part 31 having an approximately rectangular cross sectional shape of a width capable of supporting an outer edge of a head part 51 of a nail 50 at a portion 52 where a columnar reinforcement body 40 for supporting a form is to be nailed.

FIG. 1



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Description

TECHNICAL FIELD

[0001] The present invention relates to a thermoplastic resin form, that can be used as a permanent form disposed at a predetermined interval to construct a concrete structure, concrete being poured into that interval and hardened and the permanent form being left with that concrete structure as it is, or that can be used as a form removable after the concrete structure is completed and reusable repeatedly.

BACKGROUND ART

[0002] In the reusable form of the latter case, conventionally, a wooden form made of plywood has been used. However, it is thrown away after used repeatedly about 10 times, and is thus disadvantageous from viewpoint of cost. In recent years, a plastic form capable of being used about 30 times has been developed.

[0003] A plastic form having plural openings of a rectangular or truss-like cross sectional shape, arranged in line along a width direction from right to left has been proposed (see, for example, FIG. 1 of JP-A 6-66021 (1994), FIG. 1 of JP-A 8-207190 (1996), FIG. 1 of JP-A 9-151602 (1997), FIG. 1 of JP-A 11-182029 (1999) and FIG. 1 of JP-A 2003-161037).

[0004] Preferably, the plastic form is nailed on a columnar reinforcement body such as frame wood for use.

[0005] The present invention has been made in view of the above circumstances, and an object of the present invention is to provide a thermoplastic resin form having a sufficient strength to a pressure of poured concrete, capable of protecting its nail driving surface from being dented when a nail is driven into a columnar reinforcement body, and improving a finish appearance of concrete which makes contact with the form, while achieving reduction in its weight.

DISCLOSURE OF THE INVENTION

[0006] The present invention provides a form, which is made of a thermoplastic resin containing an inorganic material, for constructing a concrete structure comprising: a first main plate facing a poured concrete; a second main plate opposing the first main plate; and partition plates connecting the first and second main plates, wherein the partition plates construct (1) a plurality of first reinforcement parts having at least one kind of cross sectional shape selected from an approximately rectangular shape and an approximately truss shape in a width direction from right to left, and (2) a second reinforcement part having an approximately rectangular cross sectional shape of a width capable of supporting an outer edge of a head part of a nail at a portion where a columnar reinforcement body for supporting a form is to be nailed.

[0007] By using a thermoplastic resin containing an

inorganic material, the hardness and softness of the form can be optimized and, further, heat resistance and impact resistance can be increased tremendously. Additionally, elongation and contraction due to changes in temperature can be reduced, and the shape can be stabilized. By forming an approximately rectangular reinforcement part narrower than the head part of a nail at the portion where the columnar reinforcement body is to be nailed, the nail driving surface of the form can be prevented from being dented when the form is nailed on such a columnar reinforcement body as a vertical frame, and the finish performance of concrete making contact with the form can be improved. Additionally, when not only an approximately rectangular reinforcement part but also an approximately truss shaped reinforcement part are combined, the deformation resistance to the pressure of concrete can be intensified while maintaining light weight of the form.

[0008] If a reinforcement part adjacent to the second reinforcement part is called a third reinforcement part, at least one sectional shape of two third reinforcement parts is rectangular in many cases. In this approximately rectangular third reinforcement part, it is desirable to form an oblique rib which serves as a diagonal line of this approximately rectangular shape, and the oblique rib (the diagonal line) expands from a forward side in the nail driving direction to a faraway side or an approximately X-shaped rib which serves as two diagonal lines of this approximately rectangular shape. Forming this rib enables to prevent the form from being dented by driving nails more highly.

[0009] It is recommended to form an indicated part on the first main plate in order to clarify a nail driving portion. This indicated part is capable of securely preventing the form from being dented by driving nails.

[0010] Further, it is desirable to form a surface layer made of a soft or semi-hard resin similar to the main plate at least on the surface of the first main plate facing poured concrete. This surface layer can protect the form from an impact of driving nails. Further, the release performance between the form and poured concrete can be improved.

[0011] Hollow parts (openings) between the partition plates may be filled with expanded resin bodies. Consequently, the strength and impact resistance of the form can be intensified while suppressing increase in weight of the form. Further, it is possible to eliminate the necessity of a cap for sealing the top and bottom opening of the form.

[0012] In this specification, the direction of the opening in the internally hollow reinforcement part is called a vertical direction. Additionally, the arrangement direction of the reinforcement parts is called a lateral direction (right and left direction).

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

FIG. 1 is a schematic perspective view showing an example of a thermoplastic resin form of the present invention.

FIG. 2 is a partially enlarged schematic perspective view showing part of the form shown in FIG. 1.

FIG. 3 is a partially enlarged and local sectional schematic perspective view showing a state where a columnar reinforcement body is attached to the form shown in FIG. 1.

FIG. 4 is a partially enlarged schematic perspective view showing another example of the thermoplastic resin form of the present invention.

FIG. 5 is a partially enlarged schematic perspective view showing still another example of the thermoplastic resin form of the present invention.

FIG. 6 is a schematic perspective view showing yet another example of the thermoplastic resin form of the present invention.

FIG. 7 is a schematic perspective view showing yet another example of the thermoplastic resin form of the present invention.

FIG. 8 is a partially enlarged schematic perspective view showing yet another example of the thermoplastic resin form of the present invention.

FIG. 9 is a partially enlarged schematic perspective view showing yet another example of the thermoplastic resin form of the present invention.

FIG. 10 is a partially enlarged schematic sectional view showing yet another example of the thermoplastic resin form of the present invention.

FIG. 11 is a partially enlarged schematic sectional view showing yet another example of the thermoplastic resin form of the present invention.

FIG. 12 is a partially enlarged schematic sectional view showing yet another example of the thermoplastic resin form of the present invention.

FIG. 13 is a schematic perspective view showing an example of a panel body obtained by attaching the columnar reinforcement body to the form of the present invention.

FIG. 14 is a schematic sectional view of the panel body shown in FIG. 13.

FIG. 15 is a schematic sectional view for describing an example (typical example) of use method of the form of the present invention.

FIG. 16 is a partially enlarged schematic sectional view for describing an example of manufacturing method of the form of the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

[0014] Hereinafter, the present invention will be described further in detail with reference to the accompanying drawings. Same reference numerals are attached to the same components so as to avoid duplicated description.

[0015] FIGS. 1, 2 show an example of the thermoplastic resin form of the present invention, used for concrete

structure construction. FIG. 1 is a schematic perspective view of the thermoplastic resin form and FIG. 2 is a partially enlarged schematic perspective view of the form in FIG. 1. FIG. 3 is a partially broken enlarged schematic perspective view showing the use condition of the thermoplastic resin form of the present invention.

[0016] A form 10 made of thermoplastic resin shown in FIGS. 1, 2 includes a first main plate 11 whose plan view shape is approximately rectangular and which makes contact with poured concrete and a second main plate 12 having an approximately same plan view shape as this first main plate 11 and opposing the first main plate 11 with a predetermined distance to the first main plate 11. In this indicated example, the right and left ends of the first and second main plates 11, 12 are connected with end plates 13, 13. A circum-part 14 having a rectangular section formed by the main plates 11, 12 and the end plates 13, 13 is partitioned by partition plates 15 for connecting these main plates 11, 12 in the thickness direction, therefore a plurality of internally hollow reinforcement parts 30 exist in the width direction from the right to the left. Hereinafter, the internally hollow reinforcement parts shaped from the main plates 11, 12 and the partition plates 15 are referred to as first hollow reinforcement parts. The hollow reinforcement part, in this indicated example, has an approximately rectangular section. By forming the plural hollow reinforcement parts 30, the form 10 can be reduced in weight while maintaining the strength of the form 10.

[0017] Upon use of the form 10, usually, plural (four in this indicated example) columnar reinforcement bodies 40 (vertical frame wood having a square section in the indicated example) are attached thereto by driving nails 50. Speaking further in detail, as shown in FIGS. 1 to 3, the plural columnar reinforcement bodies 40 are disposed with an appropriate interval in parallel to the length direction of the hollow reinforcement part 30 on the back side of the poured concrete face (that is, the second main plate 12 side) and the columnar reinforcement bodies 40 are fixed onto the form 10 by driving the nails 50 from the side of poured concrete face (that is, from the side of the first main plate 11).

[0018] In the form 10 of the present invention, the sectional shape of the hollow reinforcement part 31 formed at a portion 52 where the columnar reinforcement body is to be nailed is formed into an approximately rectangular shape. Hereinafter, the hollow reinforcement part 31 formed at the portion 52 where the columnar reinforcement body is referred to as second hollow reinforcement part. Further, the width of this second hollow reinforcement part 31 is designed to be as narrow as capable of supporting the outer edge of a head part 51 of the nail 50. That is, the partition plates 16, 16 for forming the second hollow reinforcement part 31 are approximately perpendicular to the main plates 11, 12 and a distance between these partition plates 16 and 16 is smaller than the width of the head part 51 of the nail 50. Thus, the head part 51 of each nail 50 can be received by the par-

tion plates 16, 16, so that the nail driving face can be prevented considerably highly from being dented. As a result, the finish appearance of concrete making contact with the form can be improved remarkably. Further, the head part 51 of the nail 50 can be prevented from penetrating through the first main plate 11 located at a side in which the nail 50 is driven when the nail 50 is driven, thereby making it possible to securely prevent the installation strength of the columnar reinforcement body 40 from being reduced.

[0019] Further in the form 10, surface layers (resin layer) 20, 21 made of a soft or semi-hard resin similar to the main plates 11, 12 (preferably, common to the main plates in a monomer component; hereinafter, the same) are formed on the surfaces of the main plates 11, 12. The surface layers 20, 21 can highly avoid a dent (deformation) and crack due to driving of the nails and further intensify release performance to poured concrete.

[0020] A linear mark (indicated part) 53 is drawn along the second hollow reinforcement part 31 on the first main plate 11 of the form 10 in order to indicate a nail driving portion 52. By forming this mark 53, the nails 50 can be driven into the second hollow reinforcement part 31 and received securely. Therefore, the speed and accuracy of the installation work of the columnar reinforcement body 40 can be improved. In the meantime, the marks in the indicated example are formed by applying colored resin in a color different from the other portions to part of resin which constitutes the surface layer 20.

[0021] The indicating method is not restricted to any particular one, but it is permissible to apply various kinds of well known methods. For example, as shown in FIG. 4, it is permissible to form the mark (indicated part) 53 by printing. Further, it is permissible to form the mark 53 on the surface of the main plate 11 by printing or the like and cover this main plate 11 together with the mark 53 with transparent or semi-transparent surface layer 20, so that that mark 53 can be seen through the surface layer 20.

[0022] The pattern of the indicated part is not restricted to any particular one and various kinds of patterns can be applied. For example, it is permissible to adopt a grid-like indicated part 53 as shown in FIG. 6. Further, the indicated part 53 may be a spot for indicating a nail driving portion 52 as shown in FIG. 7.

[0023] Additionally, the indicated part is not restricted to any one formed with a different color from surrounding colors but may be formed of an uneven configuration (particularly concave part). Further, the present invention does not always need the indicated part.

[0024] The indicated part 53 may be formed on not only the first main plate 11, but also the second main plate 12. Positioning of the columnar reinforcement body 40 is facilitated.

[0025] When hollow reinforcement parts on both sides of the second hollow reinforcement part 31 (hollow reinforcement part formed at the nail driving portion 52) in the form 10 of the present invention are called third hollow

reinforcement parts 32, 32, one or both of the third hollow reinforcement parts 32, 32 are often formed so as to have an approximately rectangular cross sectional shape. Then, it is permissible to form an oblique rib or X-shaped rib into this approximately rectangular third hollow reinforcement part 32. The oblique rib or the X-shaped rib prevents the nail driving face from being dented further highly.

[0026] FIGS. 8, 9 are partially enlarged schematic perspective views showing an example of form in which the oblique rib 22 or the X-shaped rib 23 is formed. The oblique rib 22 shown in FIG. 8 is formed on a diagonal line of the rectangular shape of the third hollow reinforcement part 32. In the indicated example, the oblique ribs 22 are formed diagonally such that they expand from a forward side in the nail driving direction to a faraway side. Such an oblique rib 22 is capable of increasing deformation resistance to nail driving pressure as compared to an oblique rib in an opposite direction. As shown in FIG. 9, usually, the X-shaped rib 23 is formed on two diagonal lines of the rectangular shape.

[0027] Although the deformation resistance to a nail driving pressure can be made larger when the oblique rib 22 and/or the X-shaped rib 23 is formed in both the third hollow reinforcement parts 32, 32, it may be formed in a single third hollow reinforcement part 32. Further, it is permissible to form the oblique rib 22 in one hollow reinforcement part 32 and the X-shaped rib 23 in the other third hollow reinforcement part 32.

[0028] Further, the oblique rib 22 and/or the X-shaped rib 23 may be formed in the first hollow reinforcement part 30 or the X-shaped rib 23 may be formed in the second hollow reinforcement part 31.

[0029] In the form 10 of the present invention, hollow reinforcement parts other than the second hollow reinforcement part 31 (hollow reinforcement part formed at the nail driving portion 52) may be formed in a similar width to the second hollow reinforcement part 31. Hereinafter the hollow reinforcement parts other than the second hollow reinforcement part 31, i.e. first hollow reinforcement part 30 and the third hollow reinforcement part 32, are referred to as "other hollow reinforcement part" in a lump. However, as long as the strength of the form is maintained, part or all of other hollow reinforcement parts is recommended to be formed wider than the second hollow reinforcement part 31. In the examples of FIGS. 1 to 9, the third hollow reinforcement part 32 is formed in an approximately rectangular shape having a large width, part of the first hollow reinforcement part 30 is formed in an approximately rectangular shape having a large width and the remainder is formed in an approximately rectangular shape having a similar width to the second hollow reinforcement part 31. By increasing the ratio of the wide hollow reinforcement parts in the other hollow reinforcement parts, the weight of the form can be decreased.

[0030] Part or all of the other hollow reinforcement parts may be formed in other shape than the approxi-

mately rectangular shape (for example, approximately truss shape such as triangular, trapezoidal). The approximately truss reinforcement part is effective for increasing the shape holding strength of the form 10 and effective for suppressing deformation of the form 10 due to a concrete pressure upon pouring concrete.

[0031] FIGS. 10 to 12 are partially enlarged schematic sectional views showing an example of the form in which part of the other hollow reinforcement part is formed in an approximately truss shape. More specifically, in the form 10 shown in FIG. 10, the first hollow reinforcement part 30 is approximately trapezoidal and in the form 10 in FIG. 11, the first hollow reinforcement part 30 is approximately triangular and in the form 10 in FIG. 12, the first hollow reinforcement part is formed in an approximately waveform shape by continuing triangles. Although in the form 10 in FIGS. 10 to 12, the third hollow reinforcement part 32 is approximately rectangular, the third hollow reinforcement part 32 also may be formed in an approximately truss shape as described above.

[0032] The plan shape of the form 10 (the plan shape of main plates 11, 12) is not restricted to any particular one as long as there is no inconvenience in pouring concrete, it may be rectangular or square. Further, it may be deformed appropriately depending on the configuration of a construction work site. Further, it is permissible to form a cutout portion appropriately in order to combine forms.

[0033] The surface layers 20, 21 are not always necessary but may be formed on a single side of the main plates 11, 12 even if the surface layer is formed. When forming on a single side, it is recommended to form the surface layer 20 on the first main plate 11 which makes contact with poured concrete. The surface layer 20 of this first main plate 11 can intensify a capacity of suppressing a dent (deformation) or crack by nail driving and further enhance the release performance to the poured concrete.

[0034] In the form 10 of the present invention, the opening ends (top and bottom ends of the form) of the internally hollow reinforcement parts 30, 31, 32 may be sealed suitably. By sealing, concrete can be prevented from invading into the form from the opening ends. As sealing means, it is permissible to adopt a resin plate formed integrally with the form 10 or fit a cap (for example, resin made or rubber made cap) formed separately from the form to the opening end detachably or bond that cap to the opening end. The detachable sealing means is further advantageous in following points. That is, the form 10 is cut out to a predetermined vertical length depending on the situation of concrete pouring site. In this case, if the detachable sealing means is adopted, the opening part can be sealed even after cutting. Further, the cap can be replaced when the cap is damaged.

[0035] According to the form 10 of the present invention, the hollow parts 30, 31, 32 formed with the partition plates 15, 16 may be filled with an expanded resin body. By filling with the expanded resin body, the strength and

impact resistance of the form can be intensified while suppressing the weight. Further, it can achieve the role for the above-described sealing.

[0036] The form 10 of the present invention is made of a thermoplastic resin containing an inorganic material. Using an inorganic material enables the hardness and softness of the form to be optimum and heat resistance and impact resistance to be increased tremendously. Further, elongation and contraction due to changes in temperature can be reduced thereby stabilizing the shape.

[0037] Examples of the inorganic material may include calcium carbonate, mica, talc, glass, carbon and the like.

[0038] As described above, the form 10 of the present invention may be filled with an expanded resin body. As this expanded resin body, it is permissible to use various kinds of expanded resins, and examples thereof may include polypropylene foam, polystyrene foam, polyethylene foam, hard polyurethane foam, soft polyurethane foam, hard vinyl chloride foam, urea foam, phenol foam, acrylic foam, cellulose acetate foam and the like.

[0039] Further, as described above, the surface layers 20, 21 may be formed on the form 10 of the present invention and the surface layer is made of a soft or semi-hard resin similar to the main plates 11, 12. Although it is preferable that this surface layer contains no inorganic material, the inorganic material may be contained as long as it is softer than the main plates 11, 12.

[0040] As long as the columnar reinforcement bodies 40 used for supporting the form 10 of the present invention are installed in plural quantities along the direction of an opening (length direction of the hollow reinforcement parts 30, 31, 32), the quantity thereof is not restricted to any particular one and other columnar reinforcement bodies 41 may be installed perpendicularly to the direction of the opening depending on the necessity (for example, on both ends in the direction of the opening). Particularly, the columnar reinforcement bodies 40, 41 are often installed along the outer periphery of the form. FIG. 13 is a schematic perspective view showing a situation in which some columnar reinforcement bodies 40 are installed along the direction of the opening while other columnar reinforcement bodies 41 are installed in perpendicular direction, on the form 10 of the present invention. FIG. 14 is a schematic sectional view showing the same situation as FIG. 13. According to the examples shown in FIGS. 13, 14, four columnar reinforcement bodies 40 are installed along the direction of the opening while two columnar reinforcement bodies 41 are installed in the perpendicular direction.

[0041] The cross sectional shape of the columnar reinforcement body 40, 41 is not restricted to any particular one as long as it is capable of supporting the form and it is usually rectangular.

[0042] Further, the material of the columnar reinforcement body 40, 41 is not restricted to any particular one as long as it can be nailed on the form and usually it is wooden.

[0043] The form 10 having the above-described columnar reinforcement body 40 can be used to construct a concrete structure. Although the use method is the same as an ordinary method and not restricted to any particular one, a typical example will be described below. FIG. 15 is a schematic sectional view for describing an example (typical example) of the use method of the form 10 of the present invention.

[0044] If a concrete structure is formed as shown in FIG. 15, first, a panel body 60 including the columnar reinforcement body 40 and the form 10 is often disposed both inside and outside of a portion where the concrete structure is to be formed. After plural angular steel pipes 61 are attached to the installation side of the columnar reinforcement body 40, these panel bodies 60 may be fixed with a supporting tool including a form tie 62 or the like, which is a mold tightening metal tool. Next, concrete is poured between the panel bodies 60 and after it is cured and hardened, the supporting tools and the panel bodies 60 are removed so as to obtain a concrete structure 70. If such an engineering method is adopted, the form of the present invention can be used for at least one (usually both) of the panel bodies 60.

[0045] A through hole drilled in the panel body 60 by removing the form tie 62 is often filled with a plug made of a rubber or a thermoplastic resin.

[0046] A manufacturing method of the form 10 of the present invention is not restricted to any particular one but various well known methods can be adopted. It can be manufactured by forming according to such a well known forming method as extrusion or injection after inorganic material and thermoplastic resin are mixed appropriately (by agitation), for example. Particularly, the extrusion is effective in that the form can be formed continuously and the vertical dimension of the form can be set up freely.

[0047] When the form is produced (particularly by extrusion), both ends in the width direction from the right to the left of the form can contract in the thickness direction of the form. In this case, it is recommendable to cut out a contracted portion. An example thereof is shown in FIG. 16. According to this indicated example, an unnecessary contracted end part 24 is cut out along an appropriate position (dotted line 25). If the contracted portion 24 is cut out, a corner part at the end can be formed securely.

[0048] The method for forming the surface layers 20, 21 on the form is not restricted to any particular one, but it is permissible to adopt various well known methods. For example, a main-form-body composed of the main plates 11, 12, the end plate 13 and the partition plates 15, 16 and the surface layers 20, 21 may be formed integrally by simultaneous extrusion or it is permissible to form the main-form-body and the surface layers separately and bond them together.

[0049] Further, a charging method of the resin expanded body is not restricted to any particular one. For example, after one end of both ends in the vertical direction (both ends in the direction of the opening) of the form is

closed appropriately, the resin expanded body can be charged from another end. Further, expansion of the resin may be performed after charging, for example, the expandable resin may be expanded after it is charged from the other end. Further, it is permissible to close both ends in the vertical direction of the form, drill an appropriate hole at an appropriate position (for example, near the center) in the vertical direction of the form and charge expanded resin body or expandable resin through this hole.

[0050] The form 10 of the present invention is made of a thermoplastic resin containing an inorganic material and approximately rectangular and/or approximately truss shaped hollow reinforcement parts (first hollow reinforcement part) 30 are formed appropriately and further, an approximately rectangular hollow reinforcement part (second hollow reinforcement part) 31 having a smaller width than the head part 51 of the nail 50 is formed at the portion 52 where the columnar reinforcement body 40 is nailed. Consequently, the weight can be reduced and it has a sufficient strength to the pressure of poured concrete. Additionally, it can prevent the form from being deformed when the columnar reinforcement body is nailed, so that the finish performance of concrete which keeps contact with the form can be improved.

INDUSTRIAL APPLICABILITY

[0051] The form of the present invention is applicable as a form for constructing a concrete structure.

Claims

1. A form, which is made of a thermoplastic resin containing an inorganic material, for constructing a concrete structure comprising:

a first main plate facing a poured concrete; a second main plate opposing the first main plate; and partition plates connecting the first and second main plates, wherein the partition plates construct (1) a plurality of first reinforcement parts having at least one kind of cross sectional shape selected from an approximately rectangular shape and an approximately truss shape in a width direction from right to left, and (2) a second reinforcement part having an approximately rectangular cross sectional shape of a width capable of supporting an outer edge of a head part of a nail at a portion where a columnar reinforcement body for supporting a form is to be nailed.

2. The form according to claim 1, wherein at least one of two reinforcement parts adjacent to said second reinforcement part serves as a third reinforcement part having an approximately rectangular cross sec-

tional shape.

3. The form according to claim 2, wherein said third reinforcement part has an oblique rib which is a diagonal line of the approximately rectangular shape of the third reinforcement part, expanding from a forward side in the nail driving direction to a faraway side of two diagonal lines or an approximately X-shaped rib which is two diagonal lines of the approximately rectangular shape of the third reinforcement part.
4. The form according to claim 1, wherein an indicated part for indicating a nail driving portion is formed in said first main plate.
5. The form according to claim 1, wherein a surface layer made of a soft or semi-hard resin similar to this main plate is provided at least on the surface of the first main plate facing poured concrete of said form.
6. The form according to claim 1, wherein a hollow part between said partition walls is filled with an expanded resin body.

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FIG. 1

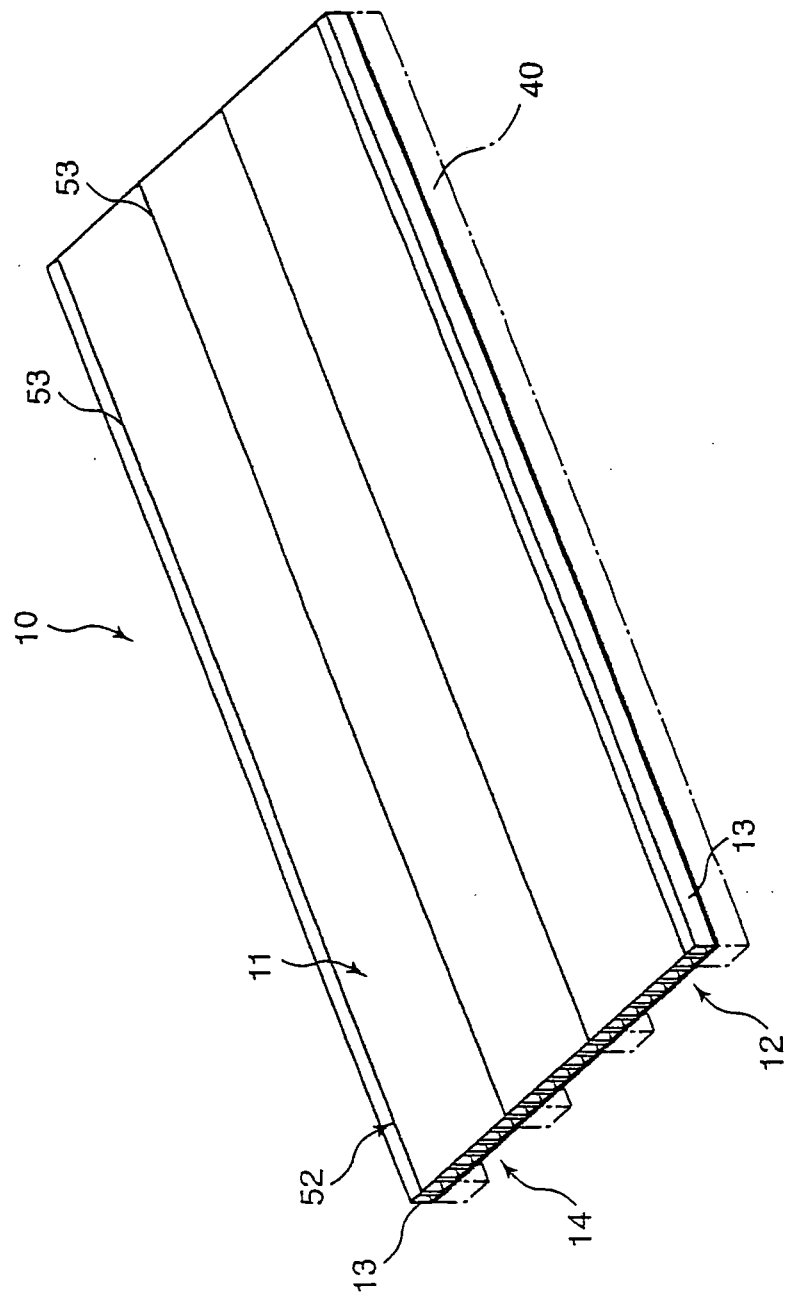


FIG.2

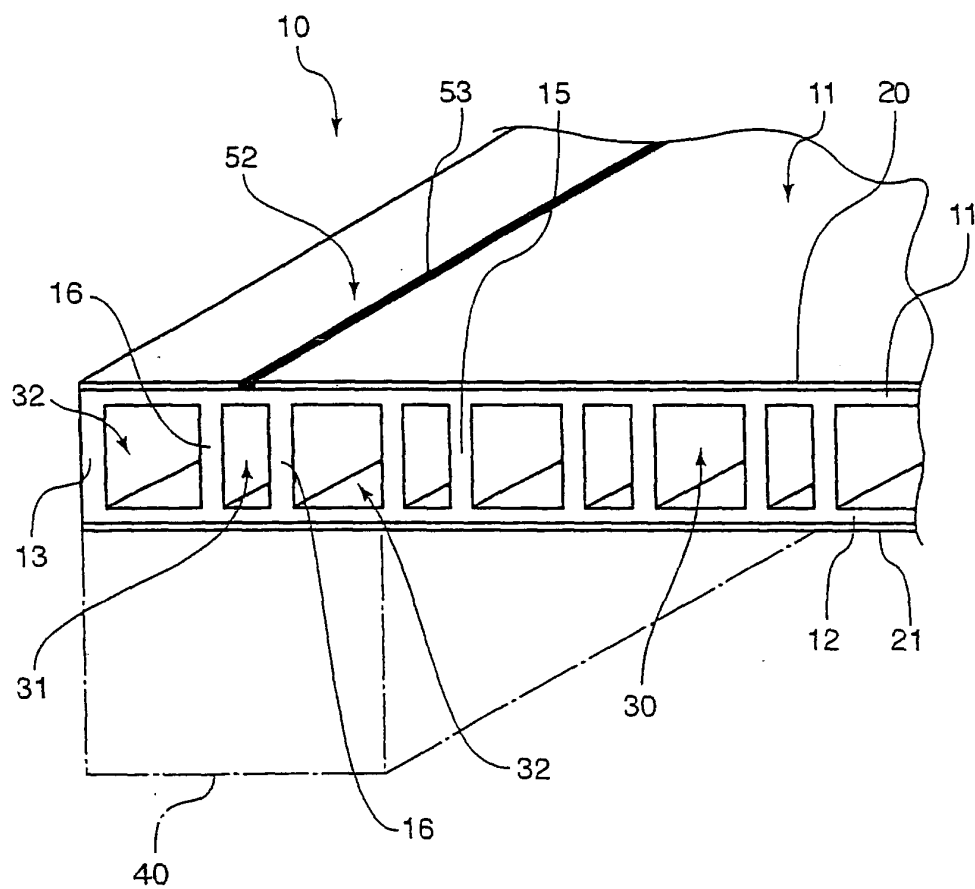


FIG.3

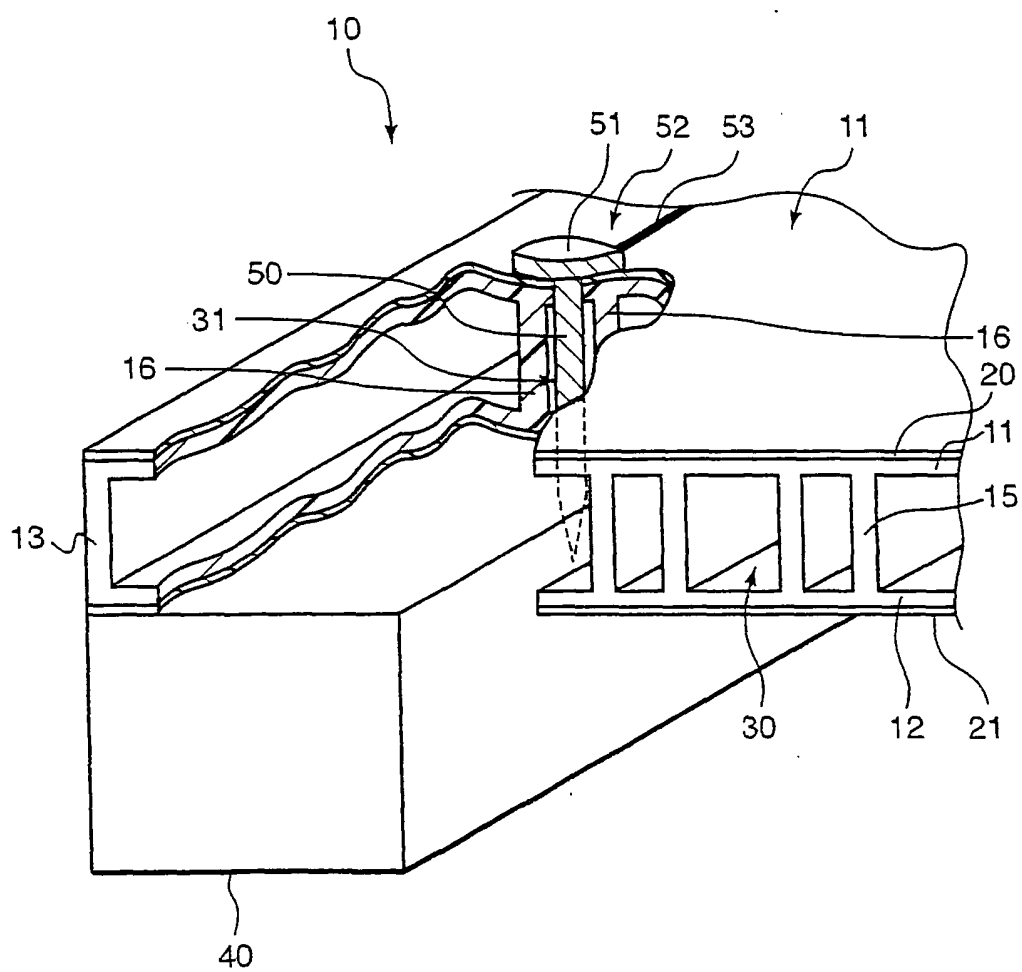


FIG.4

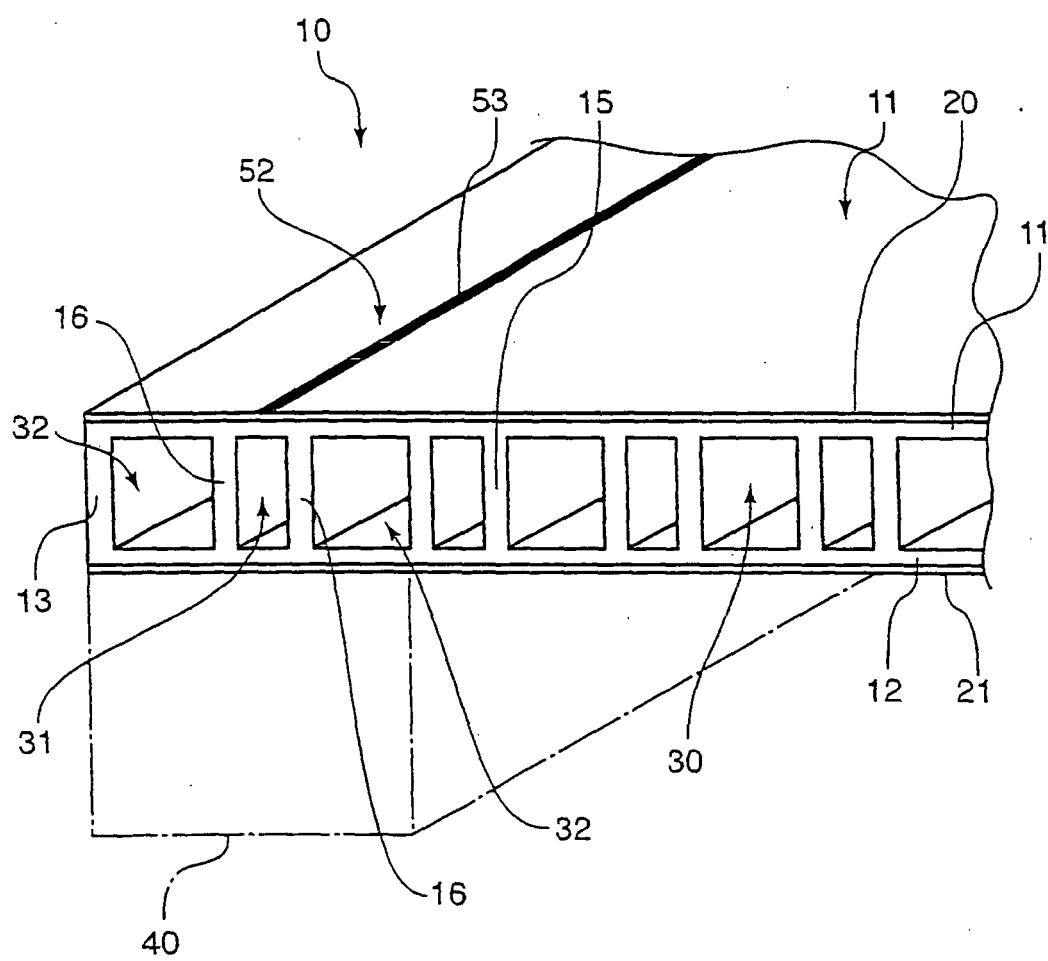


FIG.5

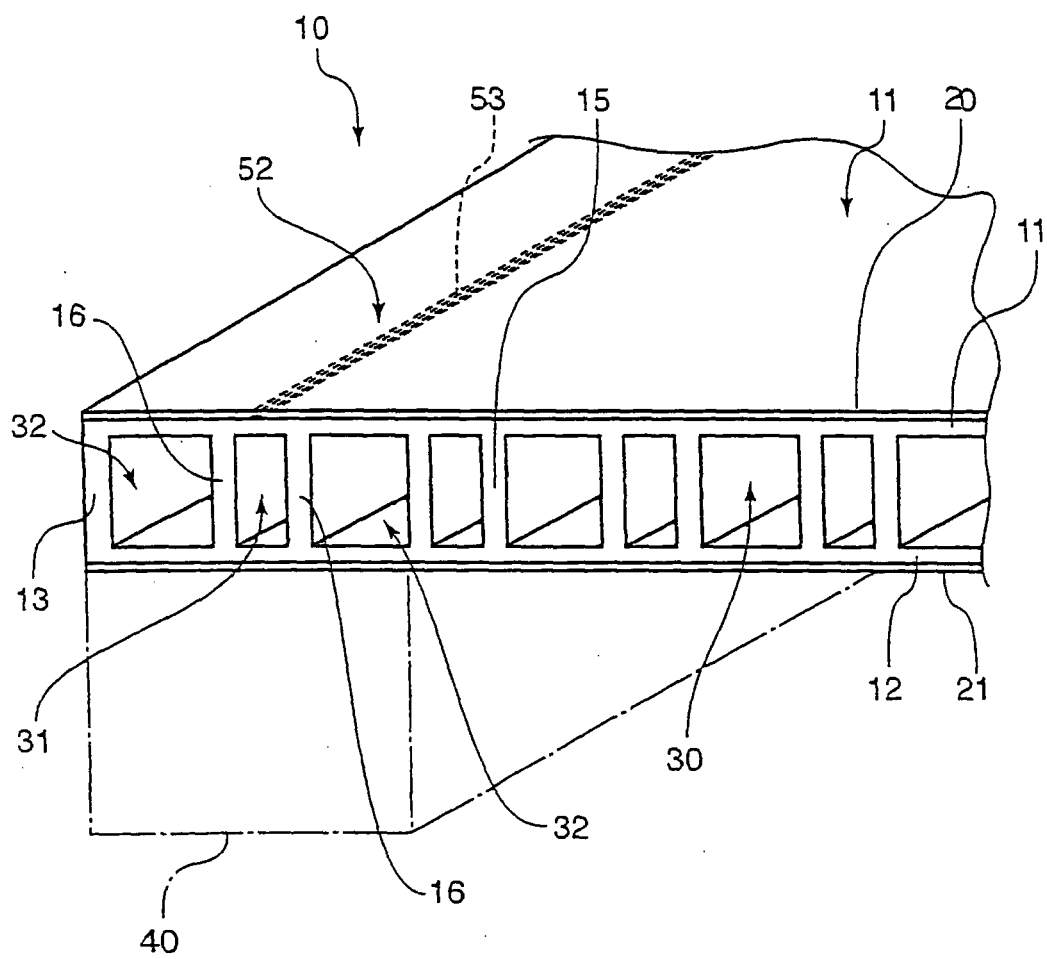


FIG. 6

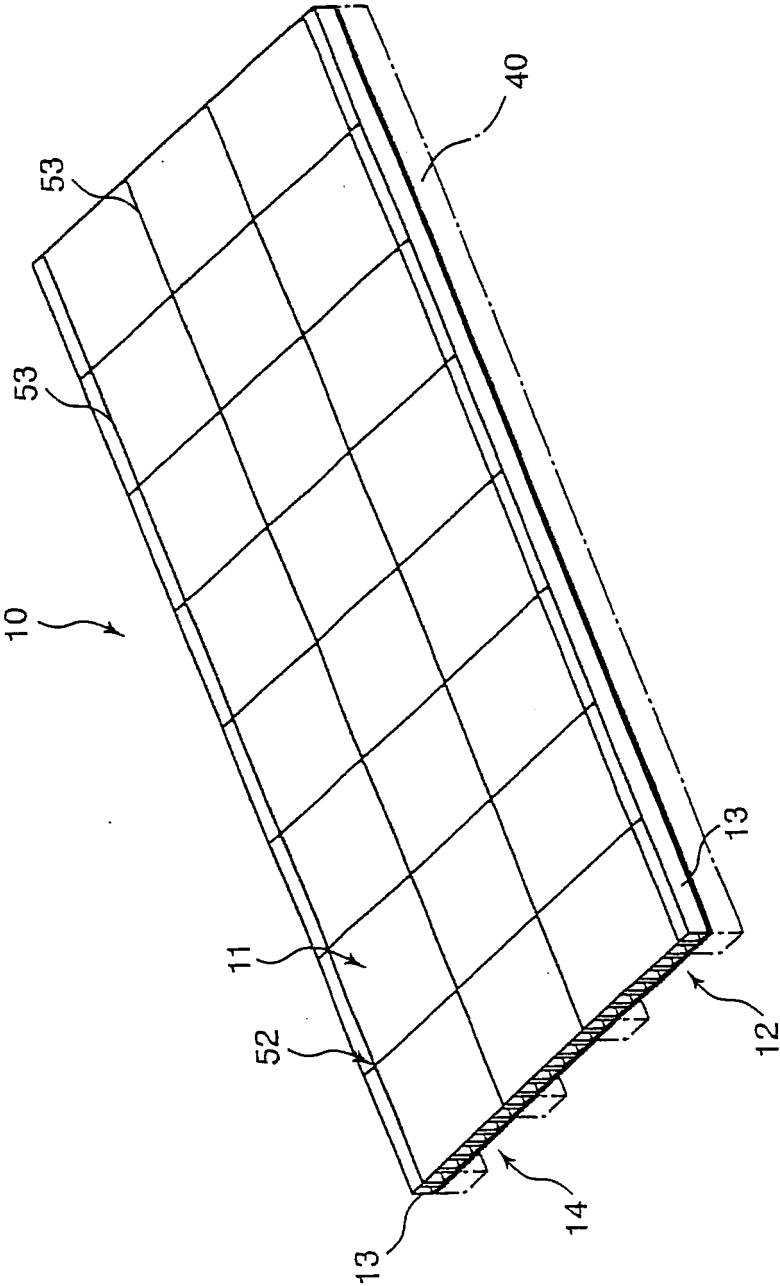


FIG. 7

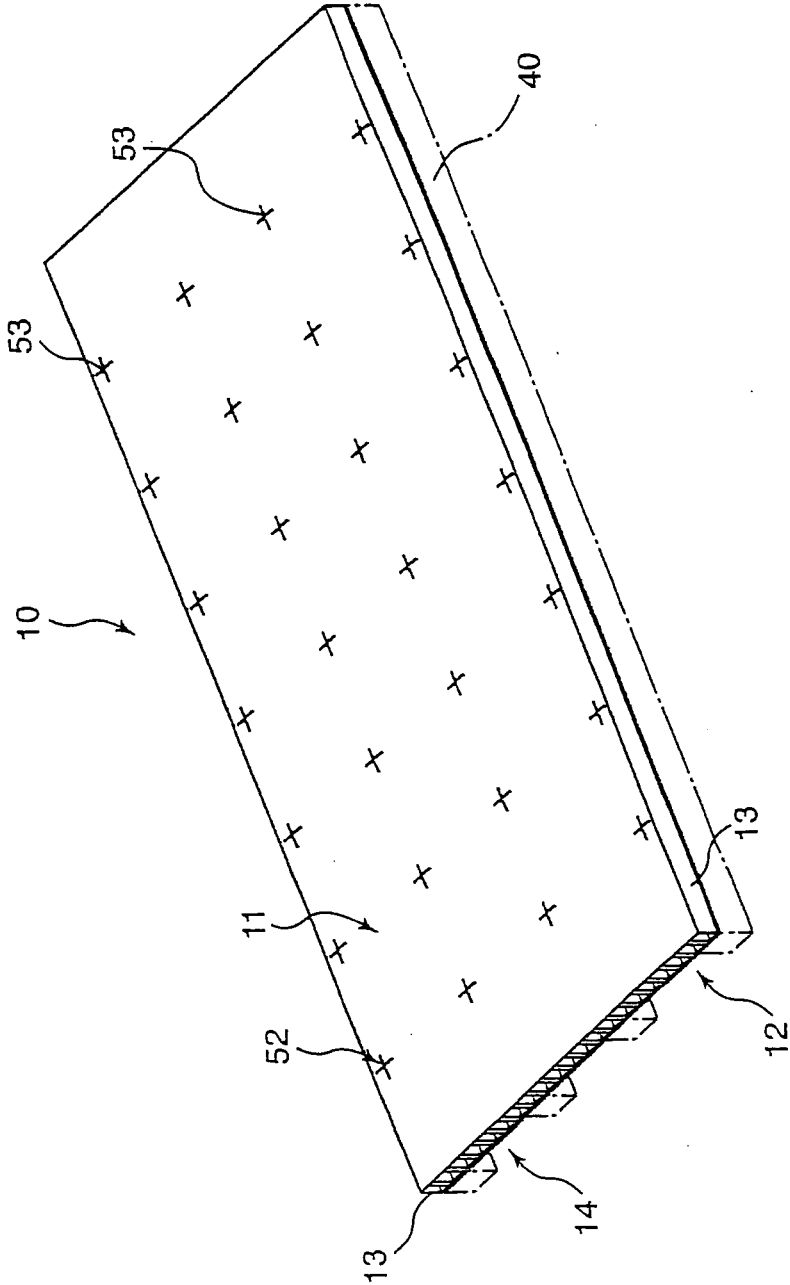


FIG.8

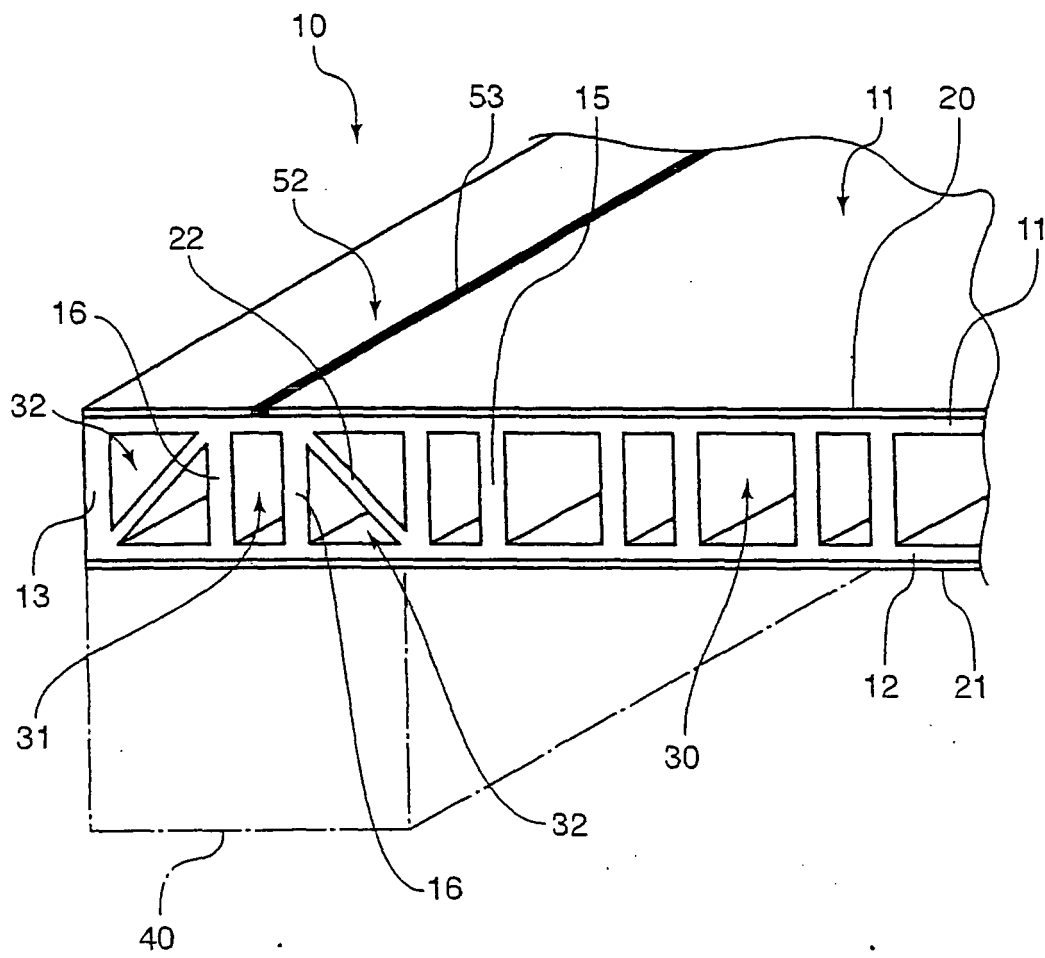


FIG.9

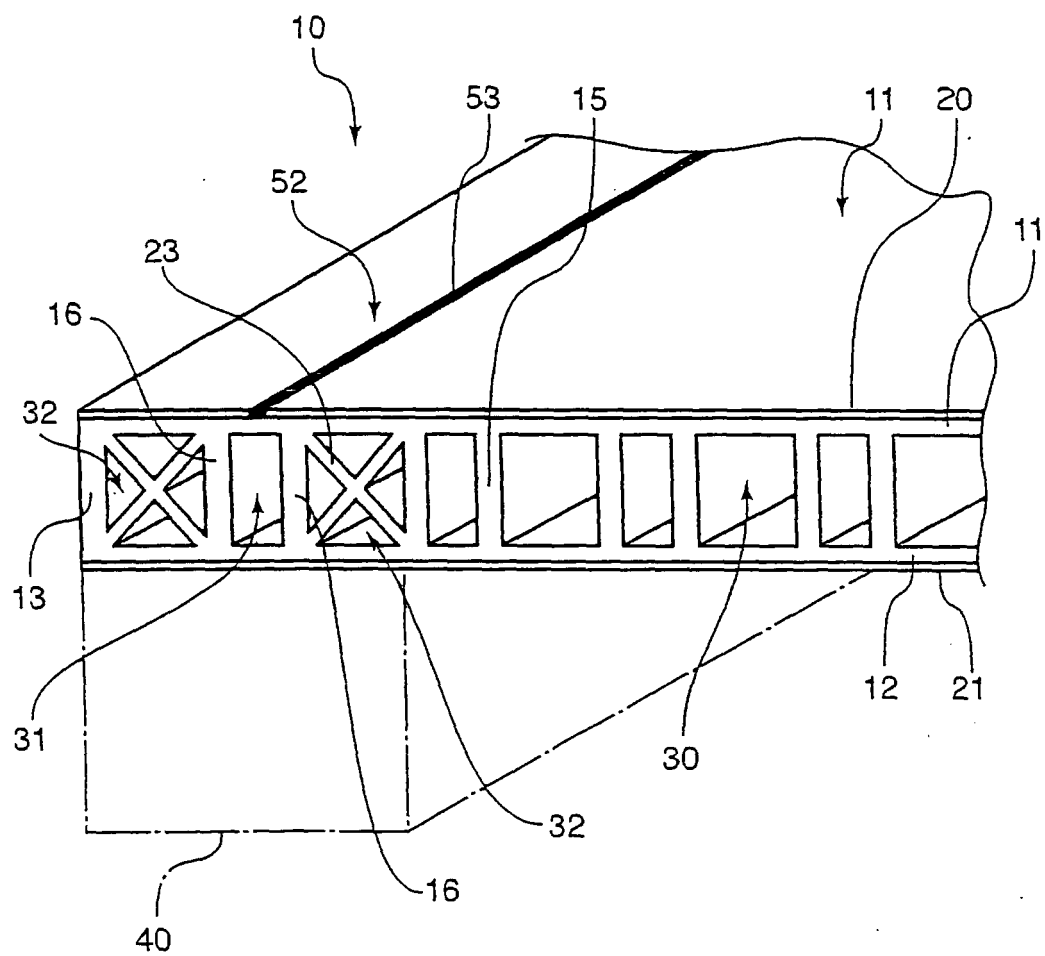


FIG.10

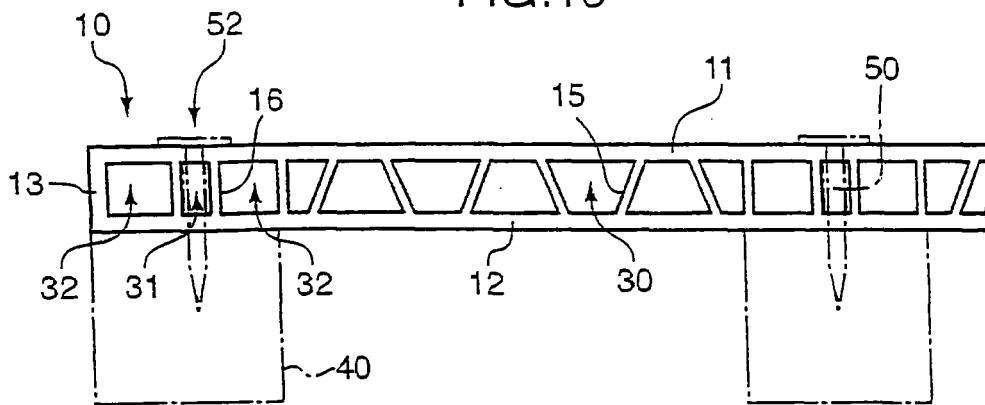


FIG.11

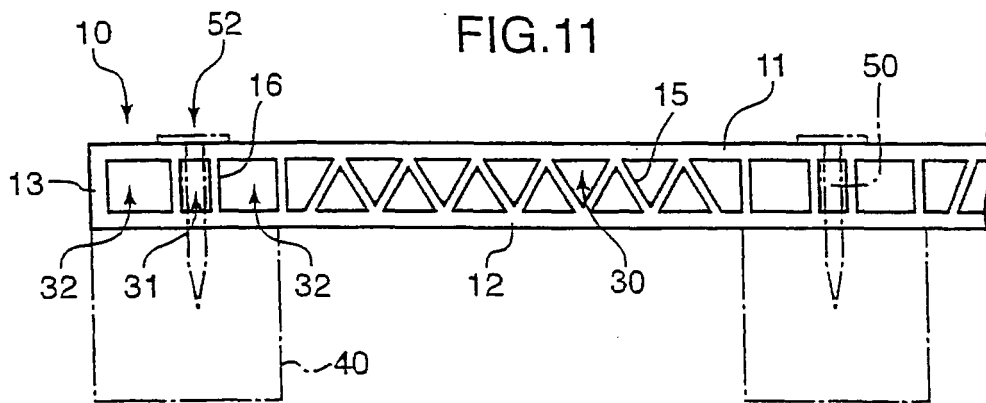
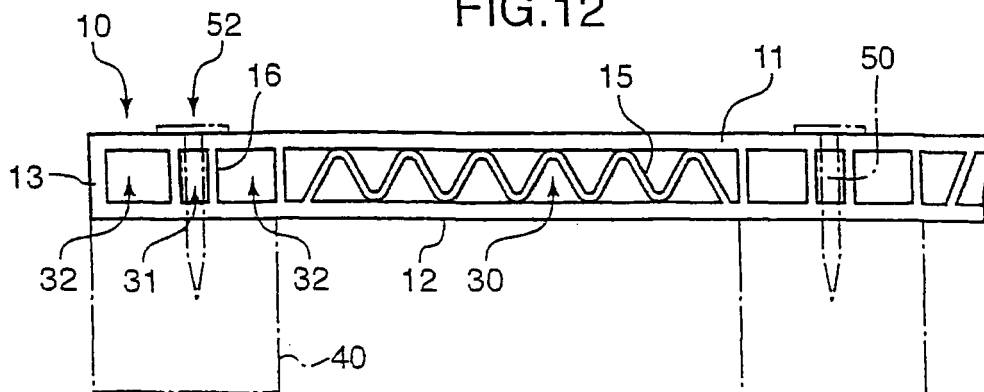


FIG.12



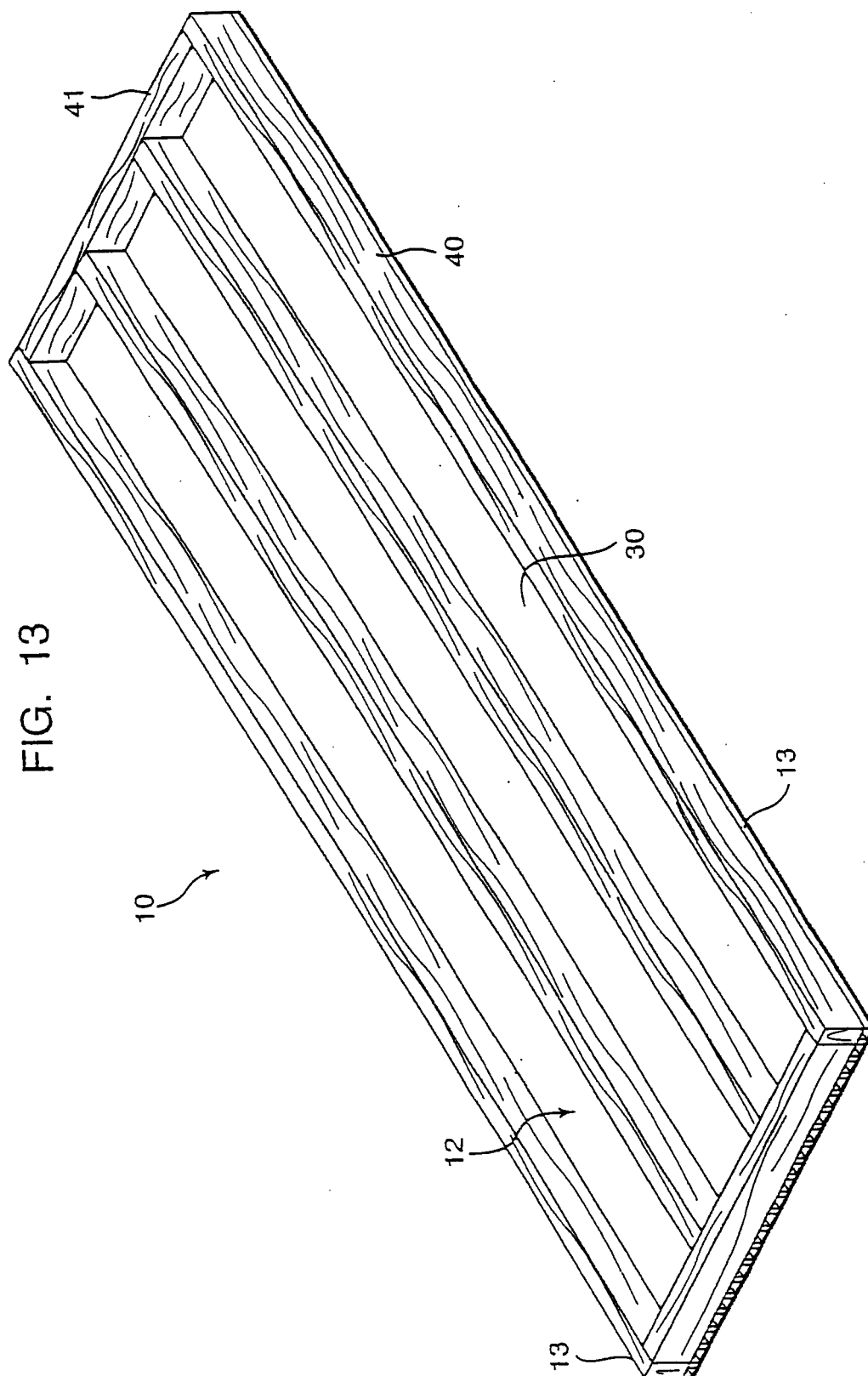


FIG. 14

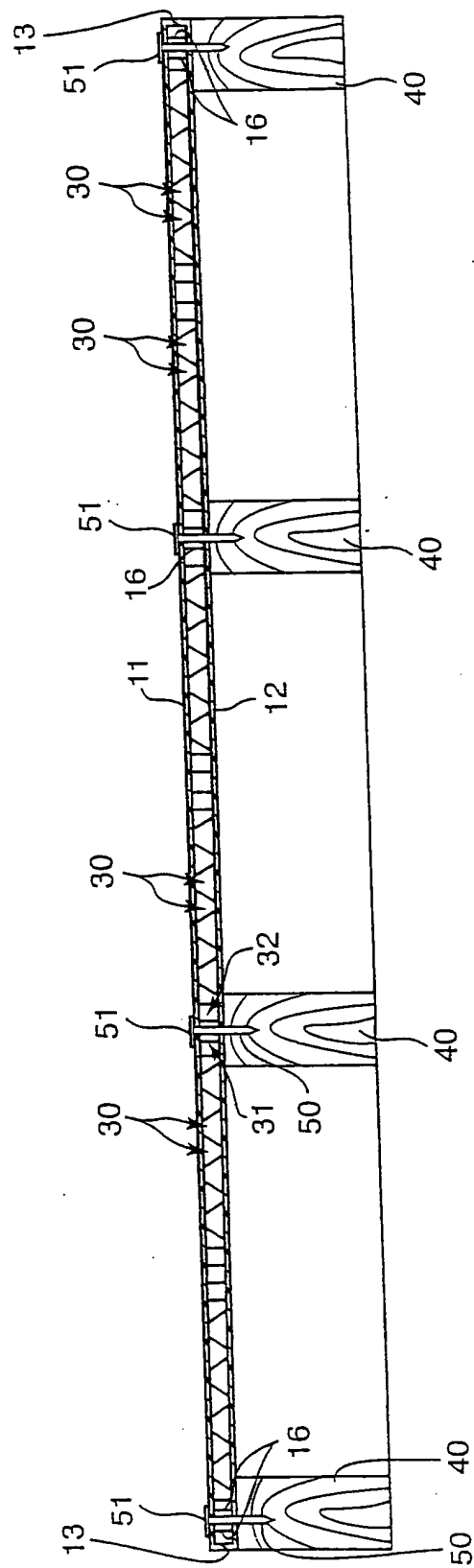


FIG.15

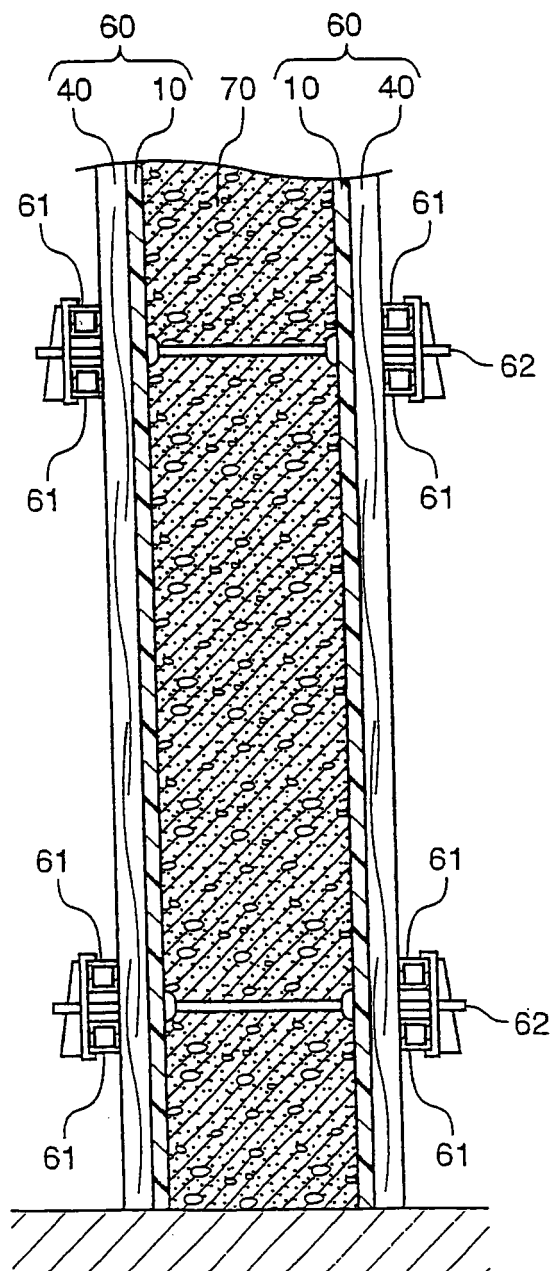
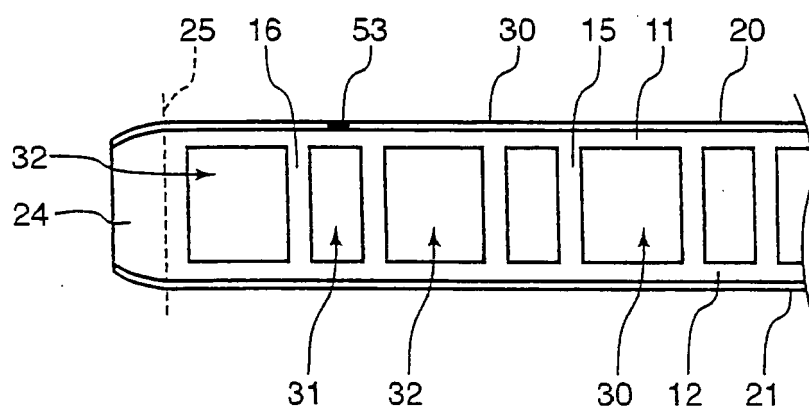


FIG.16



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2004/016906

A. CLASSIFICATION OF SUBJECT MATTER Int.Cl ⁷ E04G9/05, 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 E04G9/05, E04B2/86, E04C2/00-2/42		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2005 Kokai Jitsuyo Shinan Koho 1971-2005 Toroku Jitsuyo Shinan Koho 1994-2005		
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.
Y	JP 7-108582 A (Japan Synthetic Rubber Co., Ltd.), 25 April, 1995 (25.04.95), Par. Nos. [0005], [0017]; Fig. 1 (Family: none)	1-6
Y	JP 3-19564 Y2 (Daiken Trade & Industry Co., Ltd.), 25 April, 1991 (25.04.91), Column 4, line 22 to column 5, line 24; Fig. 2 (Family: none)	1-6
Y	JP 11-182029 A (Taisei Corp.), 06 July, 1999 (06.07.99), Par. No. [0007]; Fig. 4 (Family: none)	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 application or patent 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 27 January, 2005 (27.01.05)		Date of mailing of the international search report 15 February, 2005 (15.02.05)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 6-129094 A (Sumitomo Chemical Co., Ltd.), 10 May, 1994 (10.05.94), Par. No. [0012] & EP 625620 A1 page 5, line 56 to page 6, line 1 & CA 2125153 A & SG 45368 A & JP 6-146576 A & WO 1994/9227 A1	5
Y	JP 8-207190 A (Mitsubishi Plastics, Inc.), 13 August, 1996 (13.08.96), Par. No. [0010]; Fig. 1 (Family: none)	6

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 6066021 A [0003]
- JP 8207190 A [0003]
- JP 9151602 A [0003]
- JP 11182029 A [0003]
- JP 2003161037 A [0003]