

**FLOOR PANEL****BACKGROUND OF THE INVENTION****FIELD OF THE INVENTION**

This invention is categorized in floor panel for raised access floors which is constructed by attaching the edges of top plate and bottom pan.

DESCRIPTION OF THE RELATED ART

The article: sanctioned release #6-113433 may be cited as an example of patented floor panel, which enables cables pass through to the floor void between top and bottom panels.

Following is the description of the above example. Outlets are already formed on floor panel, and cable screening cover, built in to the wiring outlet, is installed in two ways: on the level when no electrical connection is required or with an inclination for connection to the building ground so that cables can pass downward along with the inclined surface on the cable screening cover through to the floor void.

The above mentioned article offers two options for installation of cable screening cover: on the level or with an inclination, and the installation structure is complicated because there are individual parts used for each method. This incurs extra cost. As cable screening cover is built in to all wiring outlets even when no electrical connection is required, the intensity of this part tends to be fragile. In addition, there are several potential troubles considered: necessary installation of cable screening cover may be

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missed; cable screening cover may come off floor panel during construction, etc. Furthermore, wrong installation of cable screening cover onto floor panel could occur as there are two kinds of installation methods provided.

As in former manner, Floor Panel 3 is constructed of Top Plate 1 and Bottom Pan 2 of which the rims are attached together, and is encased with Mortar 40a. When encased with Mortar 40a as Core 40, Bottom Pan 2 is held the bottom side up as shown in Fig. 30. This causes an incomplete filing of Mortar 40a, and an unnecessary space S will be created between Mortar 40a and the base of Bottom Pan 2. If concentrated loads are applied over, cracks will be generated, especially in the center unsatisfactorily encased with Mortar 40a, due to the space S.

As in former manner, the corners of Floor Panel 3 as the back bottom of Bottom Pan 2 are placed on Head 22 of the upper Pedestal 20 as shown in Fig. 23(b). If the head width W is constant and the length from Pedestal 20 to the surface of Head 22 is L_1 longer, the moment of force against Head 22 increases, then the intensity of Head 22 is spoiled.

Total formation of the former Floor Panel 3, constructed of Top Plate 1 and Bottom Pan 2 of which the rims are attached together, is affected by metallic Bottom Pan 2.

The invented article answers the above mentioned problems. Achieving no extra installation of cable screening cover when no electrical connection is required or simple wiring construction only with cutoff for connection to the building ground, the structure and the installation method are simplified. Cutting Sections are treated effortlessly and accurately. Since



the width necessary for wiring can be minimized, the intensity of floor panel is kept for electrical connection, therefore, this invention may be used as floor panel to support weighty loads. Its reasonable structure realizes better intensity of floor panel itself. Even when mortar is encased incompletely, the center of floor panel generates no space between mortar and the base of Bottom Pan so that no cracks will be made when concentrated loads are applied over the center. Floor Panel is placed securely on Head 22, which is the top of pedestal. Cutting Sections may be treated in advance when needed so that electrical connection can be completed without cutoff process at job site. Overall, it is the assignment of the invention to provide prevention of deformation on bottom pan and reinforcement of intensity in floor panel.

SUMMARY OF THE INVENTION

The invented floor panel is constructed of Top Plate 1 and Bottom Pan 2 of which the rims are attached together. Connective Piece 5 is attached to project out of the level from the upper brim of Body 4, thin-box figured in plain view with an opening on the top. Sunken Part 7 for wires is formed by denting the surface inward from the upper end to the bottom of each Wall Piece 6 of Body 4. The opening of Bottom Pan 2 is closed with Top Plate 1, and Conjugation Piece 8, provided to the outer edge of Top Plate 1, and Connective Piece 5, provided to the top outer edge of Bottom Pan 2, are attached together so that the top of Sunken part 7 is closed. The closed top of Sunken Part 7, as stretches upward, is reserved as Cutting Section 9 for formation of wiring outlets to pass cables through to the floor void. When no electrical connection is required, Cutting Section 9 is not treated, and general method is applied to floor-panel construction. On the other hand, when connection to the building ground is needed, Cutting



Section 9 is trimmed to open the upper end of Sunken Part 7 to make an wiring outlet through which cables pass to the floor void.

It is preferable to provide dotted lines or fine grooves as Cutoff Guidance 9a onto both or either Conjugation Piece 8 and/or Connective Piece 5, which are closing the upper rim of upward stretching Sunken Part 7. This is because the upper rim of Sunken Part 7 can be opened, without mistake, by treating Cutting Section 9 along with dotted lines or fine grooves as Cutoff Guidance 9a.

It is preferable that Cutting Section 9 is provided in all sides of Floor Panel 3 so that Cutting Section 9s faces each other when Floor Panel 3 is arranged side by side. The length of Cutting Section 9, measured in the same direction as Sunken Part 7, becomes around $\frac{1}{2}$ diameter of standard Flexible Cable Tube 13. This is because the wiring outlet between adjoined Floor Panel 3 can be equal to standard Flexible Cable Tube 13 in diameter. The length of Cutting Section 9, measured in the same direction as Sunken Part 7, may be minimized so that the intensity of Floor Panel 3 is not spoiled.

It is preferable to provide several Projection 14 upward on the base of thin-box figured Body 4 as Bottom Pan 2; joint Top Plate 1 and the tips of the Projection 14, and to provide several Joint 15 in a radial pattern from center on the surface of Top Plate 1 so that the number of Joint 15, which is located on diagonal linking the corners of Top Plate 1, is counted more than on other diagonals. Therefore, Top Plate 1 and Bottom Pan 2 are jointed more securely by longest diagonal, in plain view, on Floor Panel 3.

It is preferable to provide Central Anti-space Projection 50, an upward dent in the center of Bottom Pan 2, for Motor 40a to set firmly in the center



after encased. This is because even when Bottom Pan 2 is held the bottom side up while Mortar 40a is encased and an incomplete filling of Mortar 40a generates an unnecessary space S between Mortar 40a and the base of Bottom Pan 2, Mortar 40a contact Central Anti-space Projection 50 on the base of Bottom Pan 2 so that the inner part of Floor Panel 3, which has been unsatisfactorily encased with mortar 40a, will be supported by Central Anti-space Projection 50 and will not generate cracks.

It is preferable to provide Corner Inflated Part 51, that is the four corners of Body 4, thin-box figured in plain view with an opening on the top, inflated over the level of lines which create a square. This is because, if the width W of Head 22 is constant and the length from pedestal 20 to the surface of Head 22 is L_2 shorter, as Corner Inflated part 51 of Bottom Pan 2 are placed on Head 22 of the upper Pedestal 20, the moment of force against Head 22 decreases as well as the intensity of Head 22 is not spoiled.

It is preferable to trim some, not all, Cutting Sections 9 avoiding Cap Support 52 to create wiring outlets to pass cables through to the floor void, and to cover the wiring outlets with Cap 53. This is for the convenience of wiring construction. Cutting Sections 9 may be prepared before installation so that no cutting task is needed at job site. When extra electrical connection is assigned, untreated Cutting Sections 9 can be trimmed to create wiring outlets.

It is preferable to provide Bottom Pan 2 with Support 54 figured in slender sunken and projecting parts parallel to the four sides of the base. This is because the deformation on Bottom Pan 2 is prevented by Supports 54 described as the above, and the intensity of Floor Panel 3 is reinforced.



BRIEF DESCRIPTION ON THE DRAWINGS

Fig. 1 is a sidelong view to show mainly sunken part of floor panel as the invented article.

Fig. 2 is a sectioned drawing to show mainly sunken part of floor panel as the invented article.

Fig. 3 is a sidelong view to show mainly wiring outlet after trimming cutting section on floor panel as the invented article.

Fig. 4 is a sectioned drawing to show mainly wiring outlet after trimming cutting section on floor panel as the invented article.

Fig. 5 is a sidelong view to show a construction of floor panel as the invented article.

Fig. 6 is a bottom pan used for the invented article. (a) is shown in bottom view, (b) in front view, (c) in side view, and (d) in view of (a) sectioned with X to X line.

Fig. 7 is a top plate used for the invented article. (a) is shown in bottom view, (b) in front view, (c) in side view, and (d) in view of (a) sectioned with Y to Y line.





Fig. 8 (a) and (b) are description drawings to show the examples of the joint of connective element and connective receiver element used for the invented article.

Fig. 9 (a) and (b) are description drawings to show the examples of the joint of connective element and connective receiver element used for the invented article.

Fig. 10 (a) is a sectioned drawing of piling inlaying and piling inlaid parts, which are formed the upper surface and the back of floor panel. (b) is a sectioned drawing of bent projection part of floor panel. (c) is a sectioned drawing of the joint part of connective element and connective receiver element.

Fig. 11 is a drawing to show floor panel as the invented article when placed on pedestal. (a) is shown in sidelong view, (b) in plain view, (c) in section, and (d) in sectioned view of adjoined floor panels away from pedestal.

Fig. 12 is a sidelong view of floor panel as the invented article before cable screening cover is installed (a) and after the installation of cable screening cover and wiring (b).

Fig. 13 (a), (b) and (c) are description drawings to indicate the order of a process from trimming of cutting section on the invented article to create wiring outlet to installation of pushing to wiring outlet.

Fig. 14 is a sidelong view of wiring with pushing installed, as the invented article.



Fig. 15 is an example of providing cutoff guidance on the invented article. (a) is shown in bottom view, and (b) in plain view.

Fig. 16 is other example of providing cutoff guidance on the invented article. (a) is shown in bottom view, and (b) in plain view.

Fig. 17 is a plain view of flexible cable tube to pass through wiring outlet which is created on cutting section of the invented article.

Fig. 18 is other drawings of the actual practice of the invented article. (a) is shown in base view, (b) in front view, and (c) in side view.

Fig. 19 is a bottom view of wiring outlet which is created by trimming some, not all, cutting section avoiding cap support area. The wiring outlet is closed with a cap.

Fig. 20 is a sectioned view of the invented article before encased with mortar.

Fig. 21 (a) is an outline drawing when a space is generated between mortar and the base of bottom plate after mortar is encased. (b) is a sample description when concentrated loads are applied over the center of floor panel.

Fig. 22 is a bottom view of corner inflated parts of the invented article.

Fig. 23 (a) is an outline drawing when corner inflated parts are placed on the base of pedestal, and (b) is when corners without inflating process are placed on the base of pedestal.



Fig. 24 is a sidelong view of wiring outlet, which is created by trimming cutting section, and of a cap, which covers the wiring outlet.

Fig. 25 is a sidelong view of wiring outlet, as the invented article, which is covered with a cap.

Fig. 26. is a drawing of wiring outlet which is trimmed avoiding cap support area. (a) is shown in plain view, (b) in bottom view, and (c) in side view.

Fig. 27 is an example front view of sunken part which is created on surface in order to create a projection part on the upper surface of floor panel, as the invented article.

Fig. 28 is an outline drawing of floor panel, as the invented article, when piled up and below for processing of mortar.

Fig. 29 is other sectioned view of piling inlaying and piling inlayed parts which are formed in both the upper surface and the back of floor panel as the invented article.

Fig. 30 is an outline drawing when a small space is generated between mortar and the base of bottom plate after mortar is encased in the method formerly known.

Description of Numbered Items

1. Top Plate



2. Bottom pan
3. Floor Panel
4. Body
5. Connective part
6. Wall Piece
7. Sunken Part
8. Conjugation part
9. Cutting Section
- 9a. Cutoff Guidance
10. Wiring Outlet
13. Flexible Cable Tube
14. Projection
15. Joint
20. Pedestal
22. Head
- 40a Mortar
50. Central Anti-Space Projection
51. Corner Inflated Part
52. Cap Support
53. Cap
54. Support

DETAILED DESCRIPTION OF THE INVENTION

The following description is based on the actual practice of this invention along with the attached drawings. Floor Panel 3 is made of Top Plate 1 and Bottom Pan 2, both materials are metallic like iron, and the insides of both plates are encased with lightweight mortar, expanded synthetic resins, etc. as Core 40.



Bottom Pan 2, as shown in Fig. 6, is a substance with flange attached outward to the upper brim of Body 4, thin-box figured in plain view with an opening on the top. The above mentioned flange is called as Connective Piece 5. Sunken part 7 for wires, which stretches upward and is formed by denting the surface inward from the upper end to the bottom of each Wall Piece 6, a side of thin-box figured Body 4. The upper rim of Sunken Part 7 is covered with Connective Piece 5, the above mentioned flange. Sunken Part 7 is provided in one or more of Wall Piece 6, a side of thin-box figured Body 4. There are Projection 14, formed upward to Head 16 of Bottom Pan 2, and Connected Element 15a, provided on the upper surface of Projection 14. Connected Element 15a is provided in several places from the center of Bottom Pan 2 diagonally, as shown in Fig. 6(a), so that the number of Connected Element 15a located on diagonal on Bottom Pan 2 is counted more than on other diagonals. The upper surface of Projection 14 and the top of Body 4 are kept in the same level although Hollow Part 17, which is shorter than projection 14, is attached upward on the base of Bottom Pan 2. As the above mentioned structure, the intensity of thin-box figured Body 4 is reinforced by Projection 14 and Hollow Part 17. Additionally, Piling Inlayed Part 45, which is projected upward or downward, and Mortar Filler Opening 47 are provided in the base of Bottom Pan 2.

Top Plate 1, as shown in Fig. 7, is a square plate in plain view, and its edges are Connective Piece 5. There are several Connecting Element 15b provided on Top Plate 1. Connecting Element 15b are provided from the center of Top Plate 1 diagonally in plain view, as shown in Fig. 7(a), so that the number of Connecting Element 15b, located on diagonal on Top Plate 1, is counted more than on other diagonals. Additionally, Piling Inlaying



Part 46, which is projected upward or downward, is provided on Top Plate 1.

Top Plate 1 covers the upper opening of thin-box figured Body 4 as Bottom Pan 2. Then, Conjugation Piece 8 as the rim of Top Plate 1 is attached to Connective Piece 5 as the rim of Bottom Pan 2. Conjugation Piece 8 and Connective Piece 5 are securely adhered by inserting the edge of Conjugation Piece 8 to the back of Connective Piece 5 (cf. Fig. 1, 2). Connecting Element 15b of Top Plate 1 and Connected Element 15a of Bottom Pan 2 are also joined. As shown in Fig. 8 (a), Connecting Element 15b of Top Plate 1 and Connected Element 15a of Bottom Pan 2 may be formed in cylindrical figure with base of no holes to fit into and attach each other in caulking. On the other hand, Connecting Element 15b of Top Plate 1 may be formed in cylindrical figure with base of no holes, and Connected Element 15a of Bottom Pan 2 may be formed in peg. Then, Connecting Element 15b as cylinder figure with base of no holes is to fit into and attach each other in caulking as shown in Fig. 9 (c).

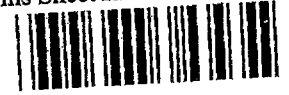
Joint 15, which is a joint of Connecting Element 15b and Connected Element 15a, is provided in several places diagonally from the center of Top Plate 1 in plain view, so that the number of Connecting Element 15b located on diagonal on Top Plate 1 is counted more than on other diagonals. Since Floor Panel 3 is constructed to figure in square in plain view, the diagonals, linking the corners, are longest in plain view. By keeping a number of Joint 15 on longest line, Top Plate 1 and Bottom Pan 2 are attached firmly on longest diagonal, in plain view. This is because the number of Connecting Element 15b, located on diagonal on Top Plate 1 is counted more than on other diagonals.



The construction of Floor Panel 3 is mentioned so far. Conjugation Piece 8 as the rim of Top Plate 1 is attached to Connective Piece 5 as the rim of Bottom Pan 2, and Conjugation Piece 8 and Connective Piece 5 are securely adhered by inserting the edge of conjugation Piece 8 to the back of Connective Piece 5. Sunken Part 7 for wires, which stretches upward and is formed by denting the surface inward from the upper end to the bottom of each Wall Piece 6, a side of thin-box figured Body 4, is closed by the layer of Connective Piece 5 and Conjugation Piece 8 as shown in Fig. 1, 2. The upper closing of upward stretching Sunken Part 7 is Cutting Section 9 to create a wiring outlet by cutoff.

The layer of Connective Piece 5 and Conjugation Piece 8, located in the corners of Floor Panel 3, is trimmed off as shown in Fig. 11, and the part is indicated as Trimmed Part 18.

Floor Panel 3, with the above mentioned structure, can be piled for storage or conveyed without misalignment by fitting Piling Inlaying Part 46 into Piling Inlayed Part 45 which are formed onto the upper surface and back bottom of Floor Panel 3. Fig. 5 and 11 show the construction of Floor Panel 3 at work site. Floor Panel 3 is placed on the head of Pedestal 20, which is provided on Floor foundation 19 like mortar slab, to construct Floor 21 over Space 20 on the upper surface of Floor foundation 19. There is Head 22 provided on the top of Pedestal 20, and the center of the upper surface of Head 22 has cross-figured Base 23. On Base 23 is Spacer Projection 24 provided. The corners of four Floor Panels 3 are jointed on the head of Pedestal 20. As shown in Fig. 11, when the back bottom of Bottom Pan 2, where there are the corners of Floor Panel 3, is jointed onto Head 22, and the layer of Connective Piece 5 and Conjugation Part 8 located in the corners of Floor Panel 3 is fit into Base 23. At this time,



Trimmed Part 18 is inserted into Spacer Projection 24 to be fixed in position so that there will be Space 25, measured in 1mm maximum, created between adjoined Floor Panels 3. Space 25, provided by positioning Spacer Projection 24, prevents Floor Panel 3 from its misalignment and sticking too hard to be removed during work.

When Floor Panel 3 is installed where no electrical connection is required, there is no need of treating Cutting Section 9, which covers the top of Sunken Part 7, while the top of Sunken Part 7 is closed with the layer of Connective Piece 5 and Conjugation Piece 8, as shown in Fig. 1, 2. For connection to the building ground, Cutting Section 9, which covers the top of Sunken Part 7, is trimmed to create Wiring Outlet 10 so that the top of Sunken Part 7 opens upward, as shown in Fig. 3 and Fig. 4. Then, Cable 26, connected over Floor foundation 19, is led to Sunken Part 7, which is formed on the side of Floor Panel 3, and comes out upward from Wiring Outlet 10, formed in the top of Sunken Part 7.

Fig. 5 shows the example of that Main Cable 26' is connected through Terminal Joint 27a to the inside of Cable Tray 27, placed onto Floor foundation 19, and Cable 26, wired through Terminal Joint 27a is connected through Sunken Part 7, which is formed on the side of Floor Panel 3, and is led out of upper Wiring Outlet 10, formed in the top of Sunken Part 7. As Plug 28 is attached to the tip of Cable 26, standard Flexible Cable Tube 13 which is located on Floor foundation 9, may be led out of upper Wiring Outlet 10, formed in the top of Sunken Part 7. Fig. 27b shows the cover to close the opening of Cable Tray 27.

As for the method of trimming Cutting Section 9, which covers the top of Sunken Part 7, to create Wiring Outlet 10, Cutting Section 9 may be cut in



U shape with cutoff jig to create Wiring Outlet 10 as shown in Fig. 12 (a), or the both ends of Cutting Section 9 may be cut off, as shown in Fig. 13 (a) → (b), and be bent downward in the arrow direction as shown in Fig. 13(b) along with the line which is led to the end of cutoff guidance to create Wiring Outlet 10.

With U-shaped dotted lines or fine grooves, as shown in Fig. 16, provided as Cutoff guidance 9a along with the upper sides and the inner part of Sunken Part 7 or, as shown in Fig. 15, along with the both upper sides of Sunken Part 7, Cutting Section 9 is treated in U shape accurately following the dotted lines or fine grooves as Cutoff guidance 9a to create Wiring Outlet 10 which is located in the opposite of Sunken Part 7, or both ends of Cutting Section 9 may be treated to face the both ends of Sunken Part 7 so that Cutting Section 9 is bent downward along with the end of cutoff guidance to create Wiring Outlet 10.

Cutoff Guidance 9a, which is dotted line, fine groove, or etc. on Cutting Section 9, may be provided on both or either Connective Piece 5 and/or Conjugation Piece 8. Cutoff process is simple in either way. Additionally, when provided on either of Connective Piece 5 or Conjugation Piece 8, cutoff process is done only to sides, not whole, and the intensity of Cutting Section 9, if untrimmed, is maintained.

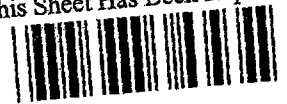
When Wiring Outlet 10 is created by trimming Cutting Section 9, Cable Screening Cover 12 may be installed as shown in Fig. 12. There are two U-shaped, in plain view, Knockouts 11 provided on Cable Screening Cover 12 and a grooved Fixing Part 12a provided in the edge of Cable Screening Cover 12. Fixing Part 12a of Cable Screening Cover 12 is inserted to the edge of Wiring Outlet 10, and any one of two Knockouts 11 is cut off with



Jig 30 like a pair of pliers as shown in Fig. 12 (a) to create Cutoff part 31 so that Cable 26, passing through Sunken Part 7 as shown in Fig. 12 (b), is led out of the upper Cutoff Part 31. Each of two Knockouts 11 is knocked in for individual purpose: one for electrical cable and the other for communication line. If Cable 26 is electric, Knockout 11 for electrical cable is knocked in, and if Cable 26 is for communication use, Knockout 11 for communication line is knocked in. Cable Screening Cover 12 prevents damage to the edge of Wiring Outlet 10 which is created by trimming Cutting Section 9, caused by knocking of Cable 26, etc.

U-shaped Pushing 32, made from pliable materials such as rubber, pliable synthetic resins, etc., may be inserted to the edge of Wiring Outlet 10 which is created by trimming Cutting Section 9 as shown in Fig. 13 (a) → (b) so that Cable 26 is connected through Wiring Outlet 10 as shown in Fig. 13 (c). By inserting Pushing 32, of which a grooved Fixing part 32a is formed in the end, to the edge (section) of Wiring Outlet 10 which is created by trimming Cutting Section 9, damage is prevented to the edge (section) of Wiring Outlet 10, caused by knocking of Cable 26, etc.

Cutting Section 9, as a part of this invention, is provided in all sides of Floor Panel 3 so that Cutting Section 9 faces each other when Floor Panel 3 is arranged side by side. Therefore, when Cutting Section 9 on an adjoined side of Floor Panel 3 is trimmed, removed, or bent to create Wiring Outlet 10, the pair of U-shaped Wiring Outlet 10 is connected each other to create Opening 33, shaped in square in plain view. Since the length of Cutting Section 9, measured in the same direction as Sunken Part 7, becomes around $\frac{1}{2}$ diameter of standard Flexible Cable Tube 13, the width of Opening 33, created by the pair of Openings 10, in U shape in plain view is enough for standard Flexible Cable Tube 13 to pass through.



Since the length of Cutting Section 9, measure in the same direction as Sunken Part 7, is kept around $\frac{1}{2}$ diameter of standard Flexible Cable Tube 13, the length can be minimized when standard Flexible Cable Tube 13 passes through. Therefore, the intensity of Floor Panel 3 is not spoiled. The actual practice in the attached figure shows that the length along with the upper rim of Floor Panel 3 on Cutting Section 9 (that is, the length along with the sides of Top Plate 1) is around 2 times longer than the diameter of standard Flexible Cable Tube 13 so that two of standard Flexible Cable Tubes 13 can pass through: one for electrical cable, and the other for communication lines. The actual practice in Fig. 17 shows that since the edge of Wiring Outlet 10 is reserved by inserting pushing 32 onto Wiring Outlet 10, the length of Cutting Section 9, measure in the same direction as Sunken Part 7, is some wider than $\frac{1}{2}$ diameter of standard Flexible Cable Tube 13, and the length along with the upper rim of Floor Panel 3 on Cutting Section 9 is 2 times wider than the diameter of standard Flexible Cable Tube 13. As the diameter of standard Flexible Cable Tube 13 is 25m, the length of Cutting Section 9, measures in the same direction as Sunken Part 7, is 15 mm, and the length along with the upper rim of Floor Panel 3 on Cutting Section 9 is 60 mm. It is not necessary to follow the measurement in this actual practice.

Fig. 18 to Fig. 29 show the other actual practices of this invention. As the basic structure of these states in the same as the above mentioned, the duplicated descriptions will be omitted from now on. In this actual practice, the center of Bottom Pan 2 is dented inward to form Central Anti-Space Projection 50. While Floor Panel 3, which is constructed of Top Plate 1 and Bottom Pan 2, is encased with Mortar 40a as Core 40 internally from Mortar Filler Opening 47, Bottom Pan 2 is held the bottom



side up as shown in Fig. 21 (a). It may happen that Space S is generated between Mortar 40a and the base of Bottom Pan due to incomplete encasing of Mortar 40a. In the actual practice of this invention, however, Mortar 40a contact and is supported by Central Anti-Space Projection 50 in the central base of Bottom Pan 2, and no cracks will be generated even when concentrated loads are applied over surface, as shown in Fig. 21 (b). The depth of the dent on Central Anti-Space Projection 50 is around 3mm.

Fig. 18 shows that Mortar Filler Opening 47 is provided to one of four corners of the base of Bottom Pan 2. There is Air Release Hole 55 provided to other corner diagonal to the corner with Mortar Filler Opening 47 to release air during mortar filling. Mortar Filler Opening 47 and Air Release Hole 47 are provided in the corners on diagonal line. It is advisable not to provide them directly on diagonal line for fear of deterioration of intensity. Since Mortar Filler Opening 47 is provided in the base of Bottom Pan 2, the diameter of opening may be measured up to 50mm. This saves time for mortar filling as well as reduces the chance of blockage when in filling. (The diameter of opening, however, may not exceed 20mm if Mortar Filler Opening 47 is provided in the side of Bottom Pan 2). The diameter of Air Release Hole 55 should be the same as that of Mortar Filler Opening 47 or less. Placed in the base of Bottom Pan 2, Air Release Hole 55 discharges Mortar 40a encased from Mortar Filler Opening 47. This gives workers the indication that Mortar 40a is encased sufficiently.

In this actual practice, Corner Inflated Part 51, that is the four corners of Body 4, thin-box figured in plain view with an opening on the top, inflated over the level of lines which create a square, is formed (cf. Fig. 18, Fig. 22). Corner Inflated Part 51 of Bottom Pan 2, which is located in the corner of Floor Panel 3, is placed on Head 22 of the upper Pedestal 20 as shown in



Fig. 23 (a), or the layer of connective and conjugation pieces in the corner of Floor Panel 3 is placed on Base 22 of the Pedestal 20. Therefore, by placing Corner Inflated Part 51 provided in the corner of Bottom Pan 2 onto Head 22 of Pedestal 20, if the width W of Head 22 is constant, the length from Pedestal 20 to the edge of Head 22 may be L_2 shorter: that is, shorter than the length L_1 , which is from Pedestal 20 to the surface of Head 22, compared with former article as shown in fig. 23 (b). As the result, the moment of force against Head 22 decreases, and the intensity of Head 22 is not spoiled.

Fig. 18 shows that several Cutting Sections 9 are provided to create Wiring Outlet 10. Some, not all, cutting Section 9 is trimmed avoiding Cap Supports 52 area, to create Wiring Outlet 10 in advance. Wiring Outlet 10 may be covered with Cap 53 so that Cap Support 52 can uphold Cap 53. Although Fig. 18 shows four Cutting Section 9, two Cutting Section 9: one each in left and right, may be treated, as shown in Fig. 19, in advance at factory to create Wiring Outlet 10, which will be covered with Cap 53, while the other cutting Section 9 are left untouched at this time.

When Cutting Section 9 is prepared by pressing process at factory, Cap Support 52, which is formed of inward projection from the center of the edges of Wiring Outlet 10, should be left as shown in Fig. 26. Cap 53 is placed onto Cap Support 52 to uphold as shown in Fig. 24 (Fig. 25 shows the installation of Cap 53). Elastic and V-shaped Fixing Leg 53a, provided in Cap 53, is inserted into the gap between the projected Cap Support 52 and the inner edge of Wiring Outlet 10 to fasten elastically Fixing leg 53a onto the side edge of Wiring Outlet 10. There is Hole 53b provided in Cap 53 for inserting jigs such as screwdriver so that Cap 53 can be removed by unfastening screws with jigs inserted from Hole 53b.



Wiring Outlet 10 is created by trimming some, not all, Cutting Section 9 avoiding Cap Support 52 area, and prepared Wiring Outlet 10 is covered with Cap 53. This requires no cutoff at job site for connection to the building ground. If more electrical connection is assigned, the untouched Cutting Section 9 is trimmed to create Wiring Outlet 10.

In this actual practice, there is Support 54, figured in slender sunken or projecting parts, provided parallel to four sides of the back bottom of Bottom Pan 2 as shown in Fig. 18 and Fig. 20. Therefore, deformation of Bottom Pan 2 can be prevented by Support 54 as well as Floor Panel 3 can be formed accurately. The intensity of Floor Panel 3 is also reinforced. Slender sunken or projecting Support 54 is pushed inward from the upper rim of Floor Panel 3 so that Mortar 40a is easily encased from the sides of Floor Panel 3.

Fig. 27 shows that the upper surface of Floor Panel 3 has a projected part in the center surrounded by the edge. (The difference of the height H between the edge and the projected surface is measured in 0.5mm in Fig. 27.) Therefore, the seams between arranged Floor Panel 3 are hidden when Floor Panel 3 is carpeted. Because a pile of Floor Panel 3, with a projected part in the center surrounded by the outer edge, is unsteady, the back bottom of Floor Panel 3, that is, the base, excluding the outer edge, of Bottom Pan 2, is dented. When the above mentioned H is measured in 0.5mm, Center 2b, which is surrounded by Outer Edge 2a, is dented by 1mm as shown in Fig. 20 for Bottom Pan 2. By this process, balance is secured even when many Floor Panel 3 are piled up.



When Floor Panel 3 is piled for processing after encased with mortar, a 5mm height of projected part cannot be formed on the upper surface of Floor Panel 3 as long as the back bottom of Floor Panel 3 is flat. By denting center 2b, which is surrounded by Outer Edge 2a, by 1mm as the above mentioned, there will be a room over the upper surface when Floor Panel 3 is piled to keep projected part in shape. Center 2b is dented by 1mm, and the measurement of projected part does not exceed 1mm. Therefore, even if a projected part is risen by the behavior of mortar, the quality in terms of flatness is secured.

Fig. 29 shows the structure of Piling Inlayed Part 45, which is formed in the back bottom of Floor Panel 3, that of Piling Inlaying Part 46, which is formed in the upper surface of Floor Panel 3, and others. In the actual practice, Dent 45a is formed by denting upward the back bottom of Floor Panel 3, and Piling Inlayed Part 45 is provided by projecting downward the center of Dent 45a. Therefore, when Floor Panel 3 is piled up and below, Piling Inlaying Part 46 is fitted into Piling Inlayed Part 45 so that misalignment to sides will not caused. A nonskid rubber may be adhered on the base of Dent 45a, if necessary, to prevent sliding.

Following is the effect of the invented article described on Claim 1: To assemble a bottom pan, connective pieces are attached to project out of the level from the upper rim of a body, thin-box figured in plain view with an opening on the top. The sunken part for wires, which stretches upward, is formed by denting the surface inward from the upper end to the bottom of each wall piece of the thing-box figured body. The opening of the bottom pan is closed with a top plate, and connective pieces, provided to the outer rim of the top plate, and conjugation pieces, provided to the top outer rim of the bottom pan, are attached together so that the top of the



sunken part is closed. The closed top of the upward-stretching sunken part is reserved as a cutting section for formation of wiring outlet to pass cables through to the floor void. Unlike former article, the uncomplicated structure simplifies the construction: no extra installation of cable screening cover when no electrical connection is needed, no missing installation of cable screening cover, no cable screening cover's falling off floor panel during construction, etc. In addition, the intensity is not spoiled unnecessarily. When electrical connection is required, Cutting Section, which covers the top of upward stretching Sunken Part, is treated to create Wiring Outlet through which cables come out from the floor void. This structure achieves simplified wiring construction.

Following is the effect of the invented article described on Claim 2 in addition to the above description on Claim 1: there are dotted lines or fine grooves provided as cutoff guidance onto both or either connective pieces and/or conjugation pieces, which are closing the upper rim of the upward-stretching sunken part. By trimming a cutting section along with the dotted lines or fine grooves as cutoff guidance, opening the top of the sunken part can be effortlessly and accurately done.

Following is the effect of the invented article described on Claim 3 in addition to the descriptions on Claims 1 and 2: cutting sections are provided around the sides of the floor panel where face others when mounted so that the length of cutting section, measured in the same direction as the sunken part, becomes around $\frac{1}{2}$ diameter of standard flexible cable. Since the width necessary for wiring can be minimized, the intensity of floor panel is kept for electrical connection, and this invention may be used as floor panel to support weighty loads.



Following is the effect of the invention articles described on Claim 4 in addition to the description on Claim 1: several projections, provided upward from the bottom of the thin-box figured body of a bottom pan, are jointed to a top plate. The joints are provided in a radial pattern from the center of the top plate surface so that the joints, located on a diagonal line on top plate, are numbered more than on other diagonals. Therefore, the intensification of the part on longest diagonal in plain view achieves reasonable structure and reinforces the intensity of floor panel.

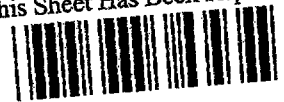
Following is the effect of the invested article described on Claim 5 in addition to the description on Claim 1: the central anti-space projection, an upward dent in to the center of bottom pan, is provided for mortar to set firmly in the center after encased. When mortar is encased incompletely because Bottom Pan 2 is held the bottom side up, the center of floor panel generates space between mortar and the base of the bottom pan. Mortar, however, contacts and is supported by the central anti-space projection in the center base on the bottom pan so that no crack will be generated when concentrated loads are applied over the center. Therefore, the quality in terms of flatness is secured.

Following is the effect of the invented article described on Claim 6 in addition to the description on Claim 1: the four corners of body, thin-box figured in plain view with an opening on the top, are inflated over the level of lines which create a square. Therefore, the corner inflated parts of the bottom pan are placed on the head of the upper pedestal, and if the width W of the head is constant, the length from pedestal to the edge of the head can be shorter. The moment of force against the head decreases, and the quality in terms of stability is secured.



Following is the effect of the invented article described on Claim 7 in addition to the description on Claim 1: some, not all, cutting sections are trimmed avoiding cap support area to create wiring outlet, which is covered with a cap. Therefore, cutting sections may be prepared before installation so that no cutting task is needed at job site. When extra electrical connection is assigned, untreated cutting sections can be trimmed to create wiring outlets.

Following is the effect of the invented article described on Claim 8 in addition to the description on Claim 1: there is support, figured in slender sunken and projecting parts parallel to the four sides of the base of bottom pan. Therefore, deformation of bottom pan can be prevented by the above mentioned support as well as the floor panel can be formed accurately. As the result, the quality in terms of intensity and formation is secured.

WHAT IS CLAIMED:

1. Following is a feature of the invented floor panel. The floor panel is constructed of top plate and bottom pan of which the rims are attached together. For bottom pan, connective pieces are attached to project out of the level from the upper brim of a body, thin-box figured in plain view with an opening on the top. Sunken Parts for wires are formed by denting the surface inward from the upper end to the bottom of each wall piece of the body. The opening of the bottom pan is closed with a top plate, and connective pieces, provided to the outer rim of the top plate, and conjugation pieces, provided to the top outer rim of the bottom pan, are attached together so that the top of the sunken parts is closed. The closed top of the sunken parts, as stretch upward, is reserved as Cutting Section sections for formation of wiring outlets to pass cables through to the floor void.
2. Following is an additional feature of the invented floor panel described in Claim 1. Dotted lines or fine grooves are provided as cutoff guidance onto both or either connective pieces and/or Conjugation Pieces, which are closing the upper rim of upward-stretching sunken parts.
3. Following is an additional feature of the invented floor panel described in Claim 1 and Claim 2. Cutting sections are provided around the sides the floor panel so that the length of cutting section, measured in the same direction as sunken parts, become around $\frac{1}{2}$ diameter of a standard flexible cable.





4. Following is an additional feature of the invented floor panel described in Claim 1. Several projections, provided upward from the bottom of the thin-box figured body of bottom pan, are jointed to top plate. The joints are provided in radial pattern from the center of the top plate surface so that the joints, located on diagonal on top plate, are numbered more than on other diagonals.
5. Following is an additional feature of the invented floor panel described in Claim 1. A central anti-space projection, an upward dent in the center of bottom pan, is provided for mortar to set firmly in the center after encased.
6. Following is an additional feature of the invented floor panel described in Claim 1. The four corners of the body, thin-box figured in plain view with an opening on the top, are inflated over the level of lines which form a square.
7. Following is an additional feature of the invented floor panel described in Claim 1. Some, not all, cutting sections are trimmed avoiding cap support area to create wiring outlets to pass cables through to the floor void. These wiring outlets are covered with cap.
8. Following is an additional feature of the invented floor panel described in Claim 1. Bottom Pan is provided with supports figured in slender sunken and projecting parts parallel to the four sides of the base.





ABSTRACT

FLOOR PANEL

No extra installment of wire screening cover when no electrical connection is required, and simple wiring process only with cutoff for connection to the building ground.

Connective pieces 5 are attached to project out of the level from the upper brim of Body 4, thin-box figured in plain view with an opening on the top, and this is Bottom pan 2. Sunken part 7 for circuit is formed by denting the surface inward from the top side to the bottom of Wall Piece 6 of the thing-box figured Body 4. The opening of Bottom pan 2 is covered with Top plate 1, and Conjugation part 8, provided on the outer rim of Top plate 1, and Connective part 5, provided on the upper outer rim of Bottom Plate 2, are attached together so that the edge of Sunken part 7 is closed. The closed top of Sunken part 7 is reserved as Adjustable cutoff part 9 for formation of outlets to pass cables through to the floor void.

FIG. 1

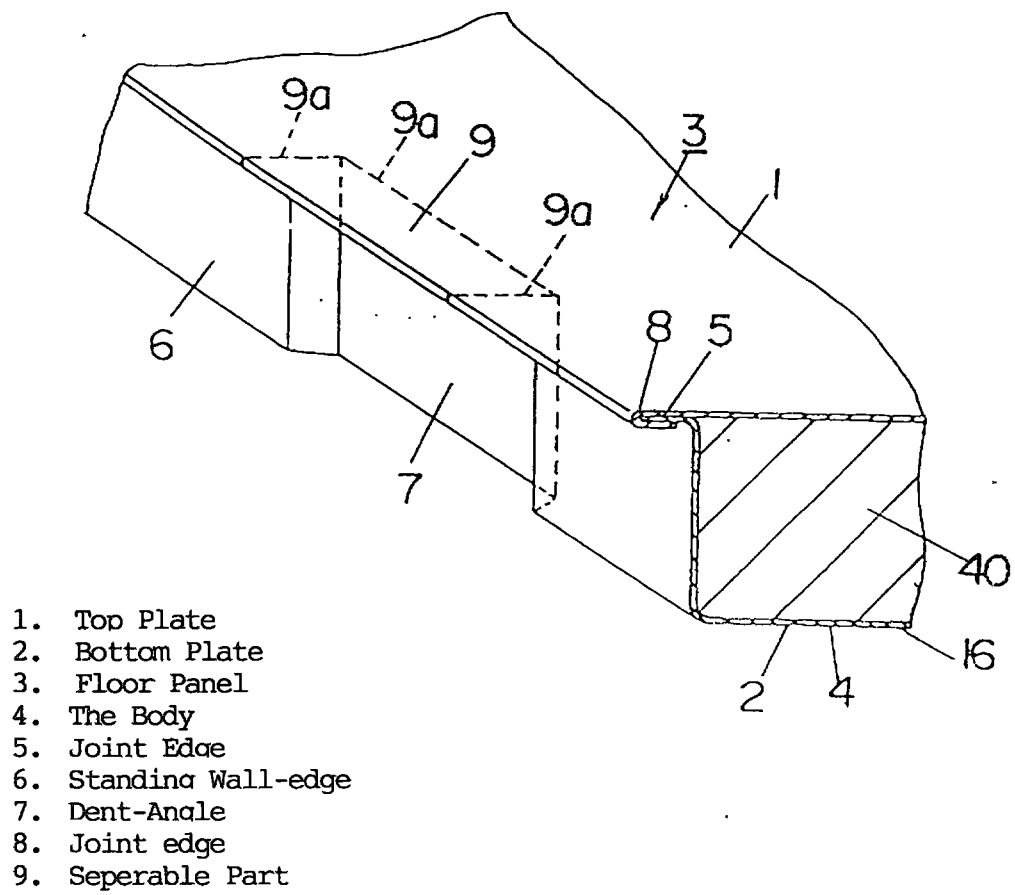


FIG. 1

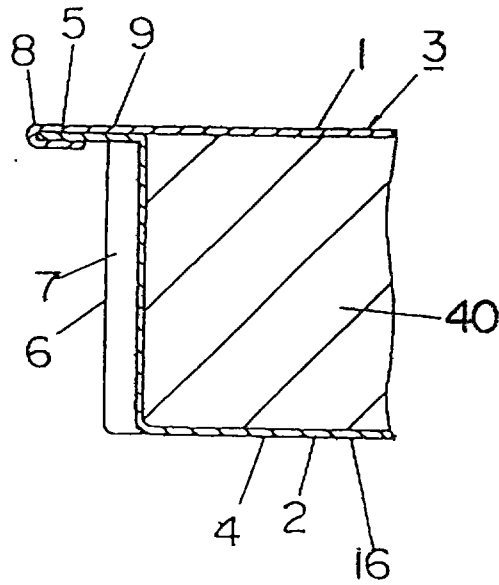
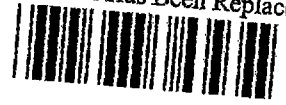


FIG. 2

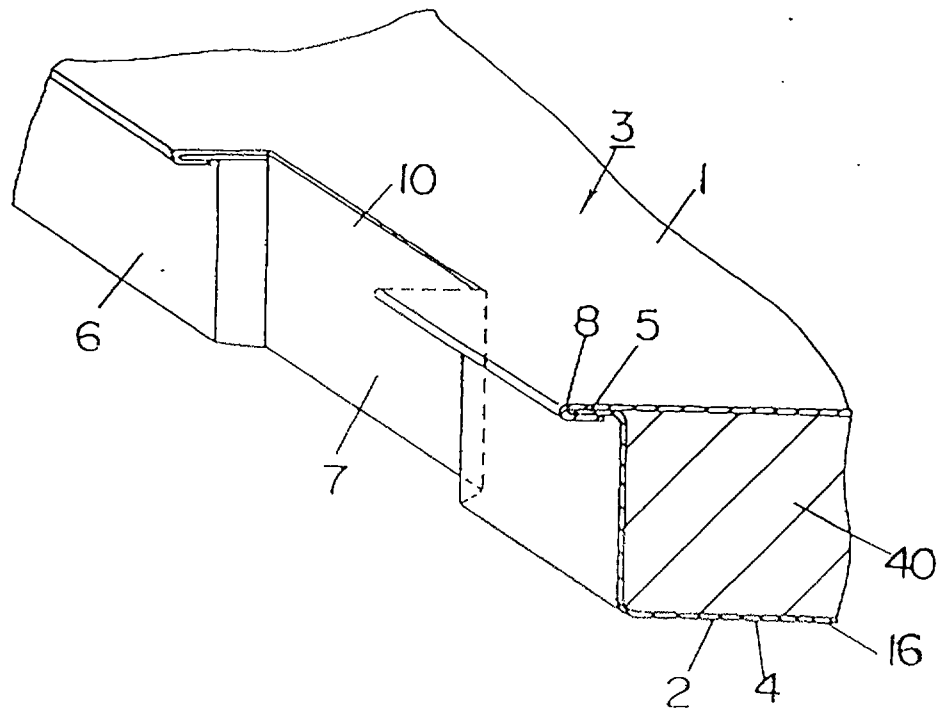


FIG. 3



3/23

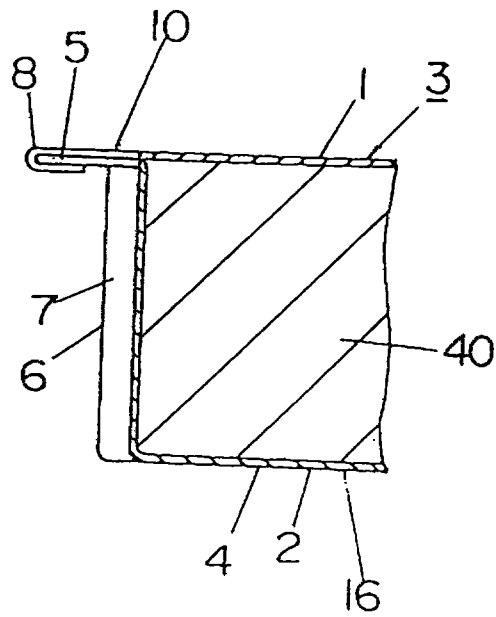


FIG. 4

THIS SHEET HAS BEEN
REPLACED

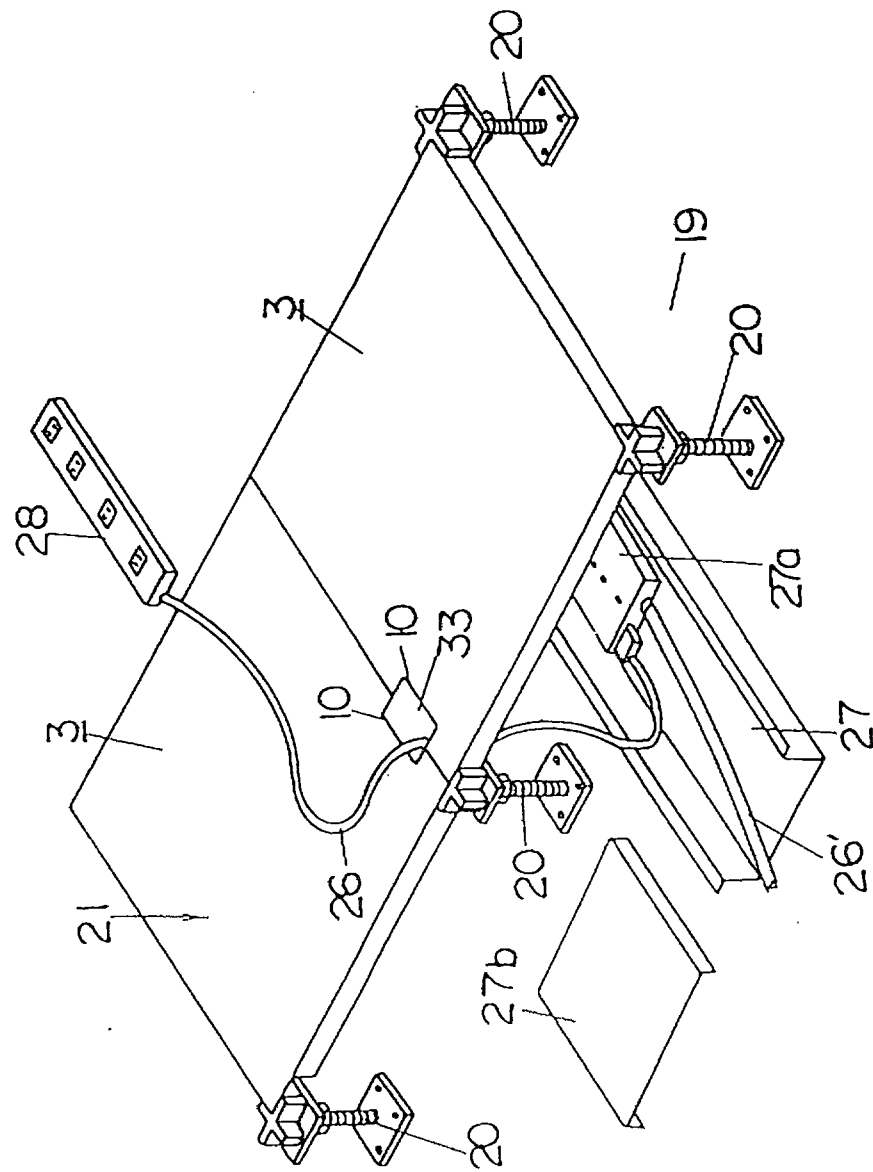


FIG. 5

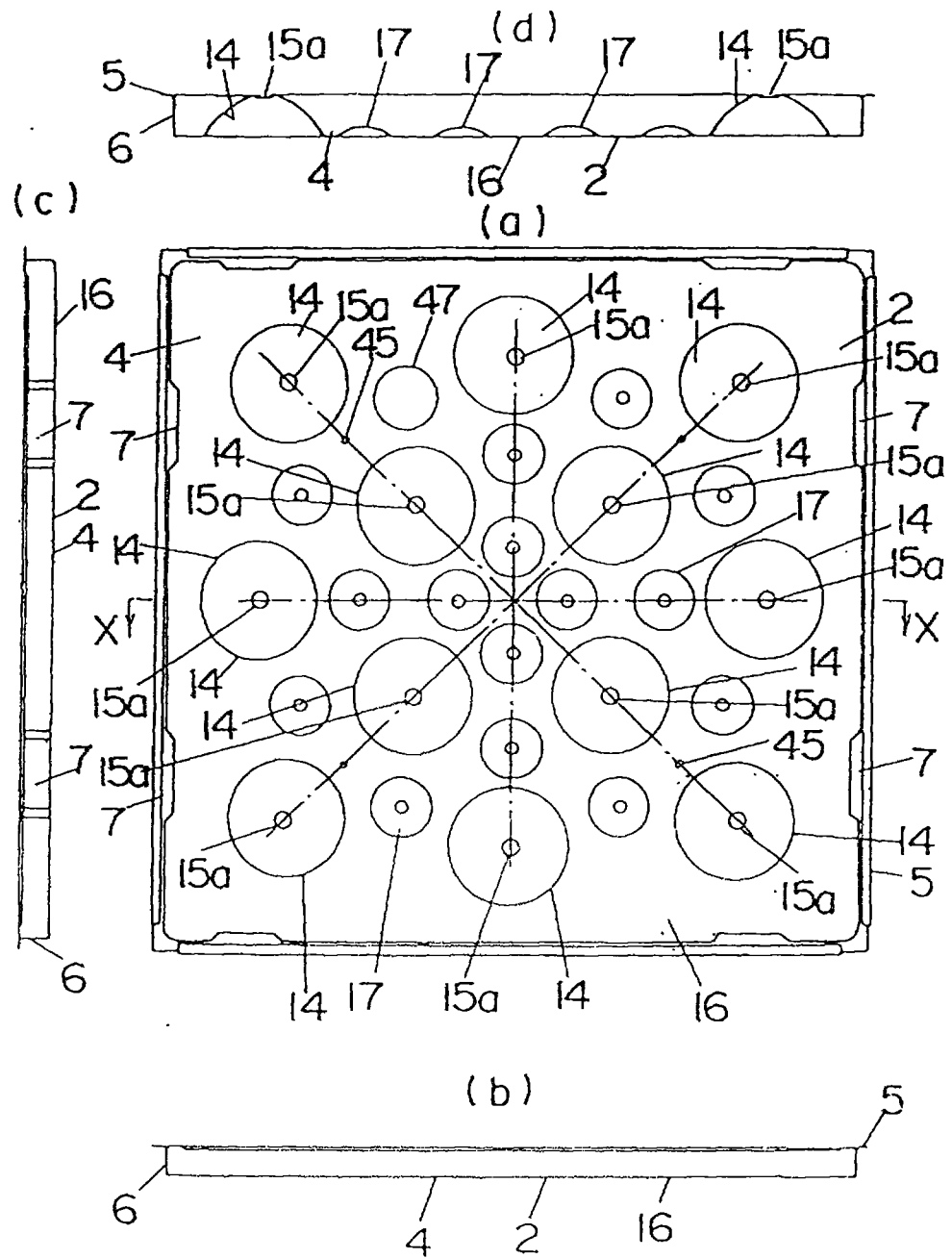


FIG. 6

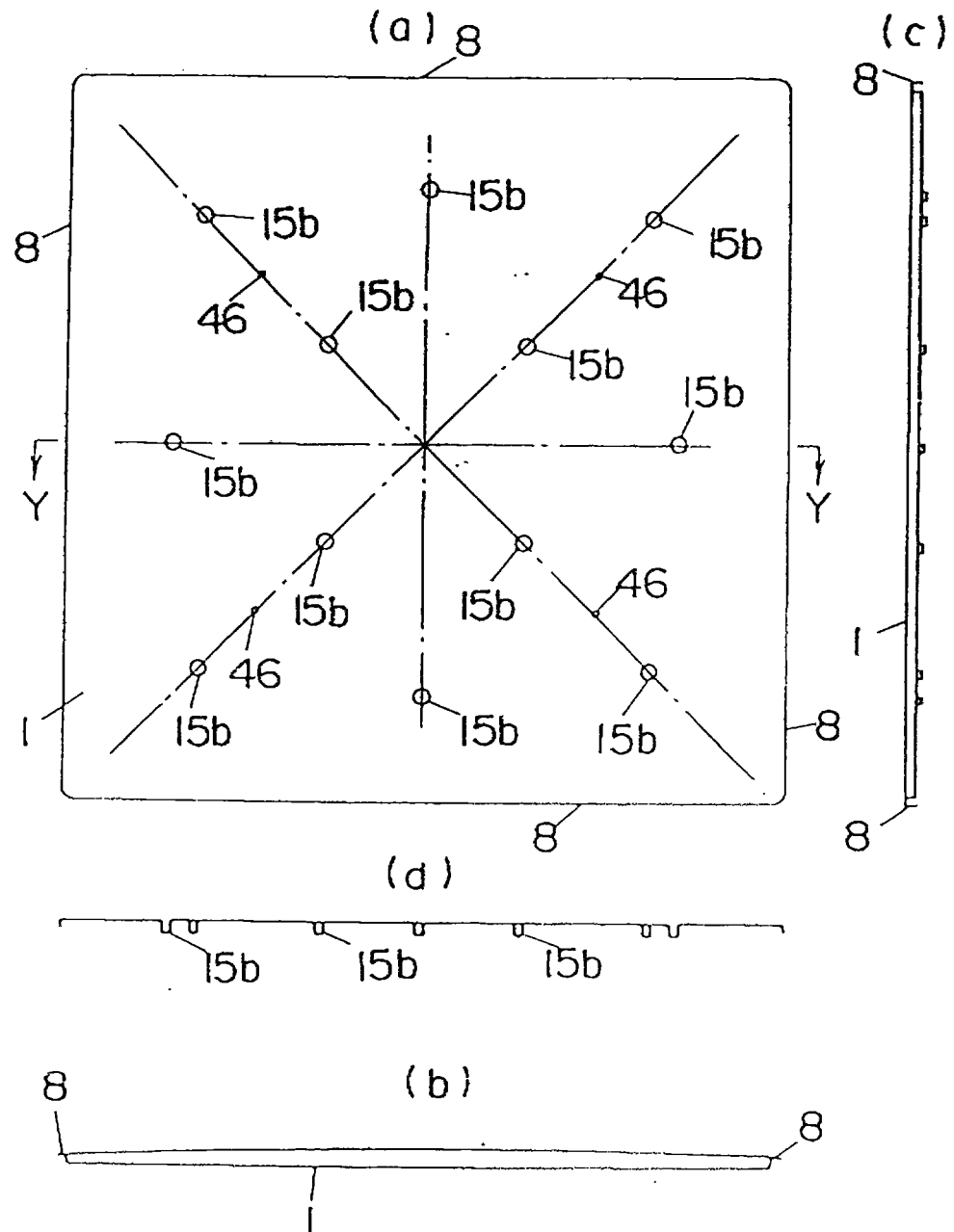


FIG. 7

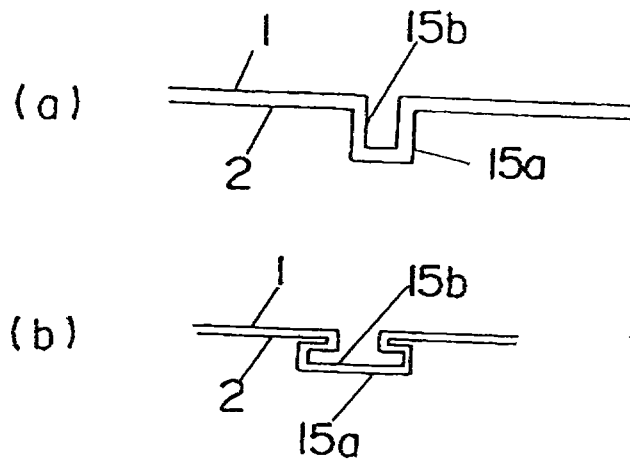


FIG. 8

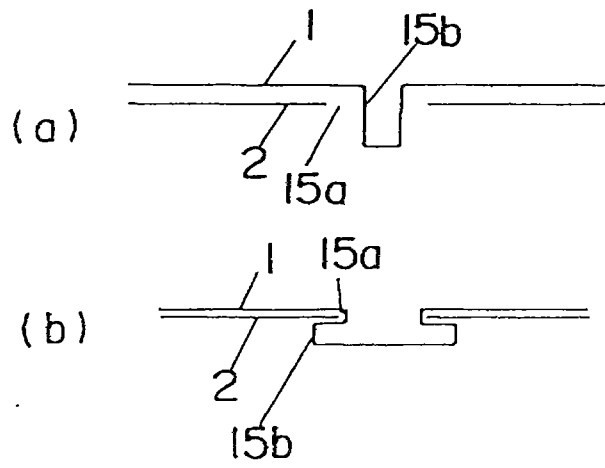


FIG. 9

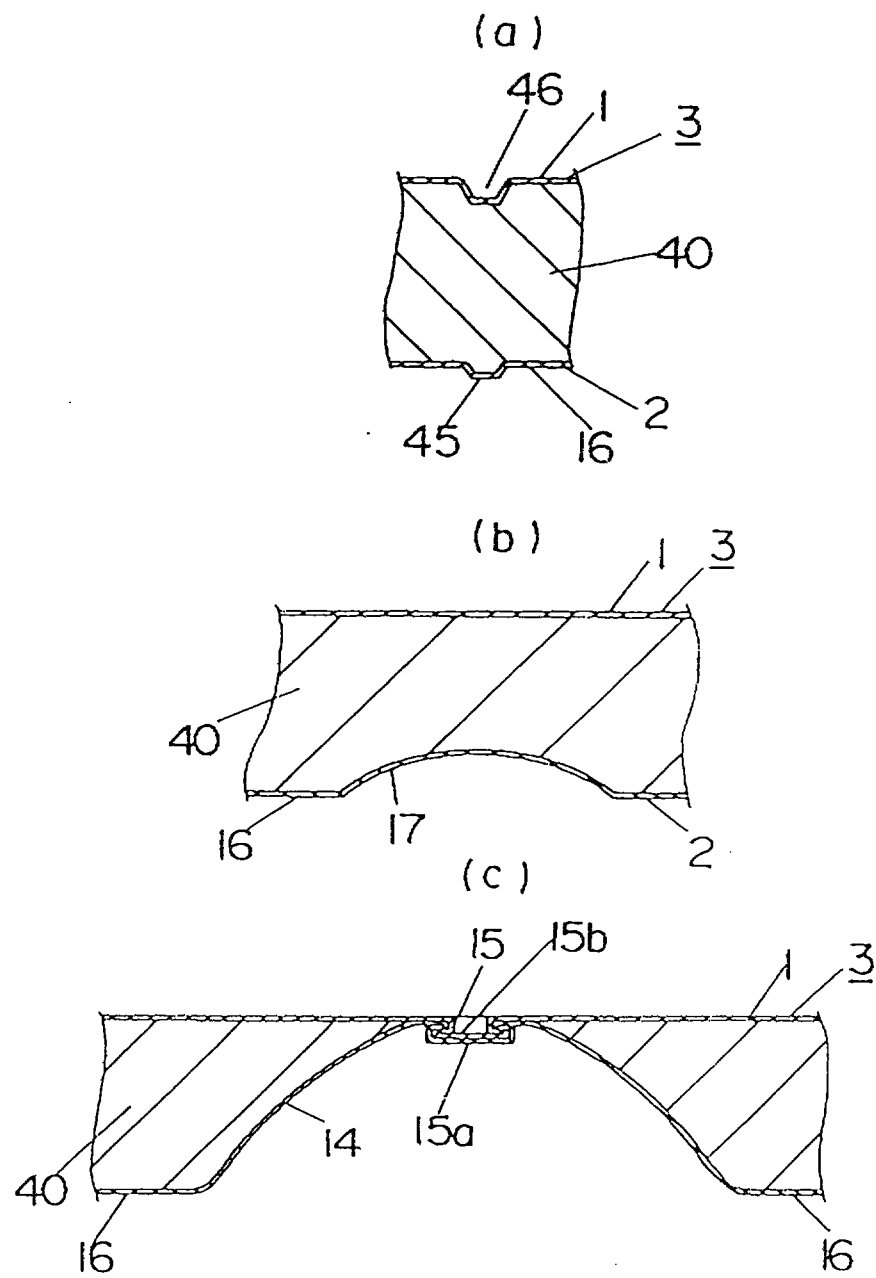
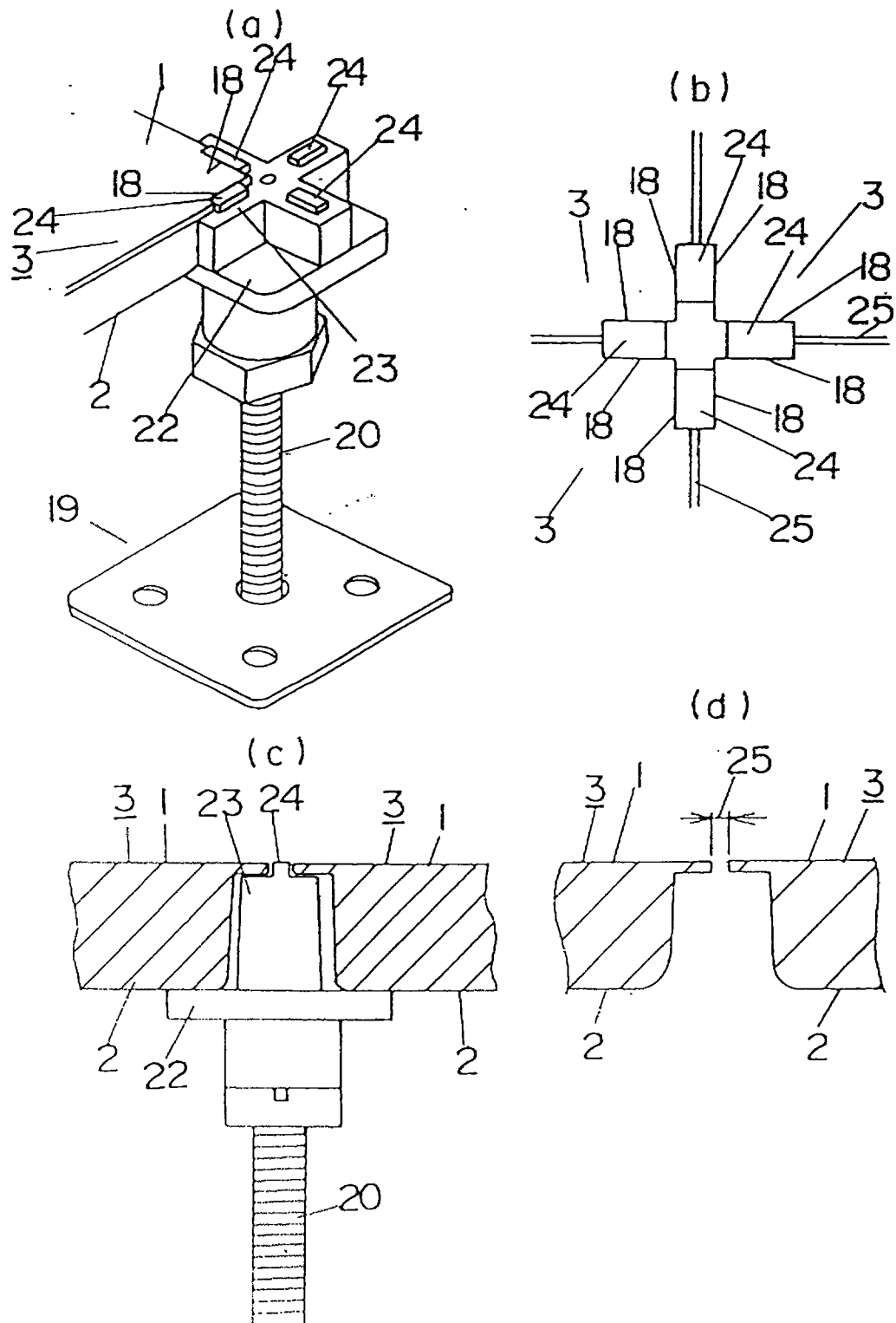


FIG. 10



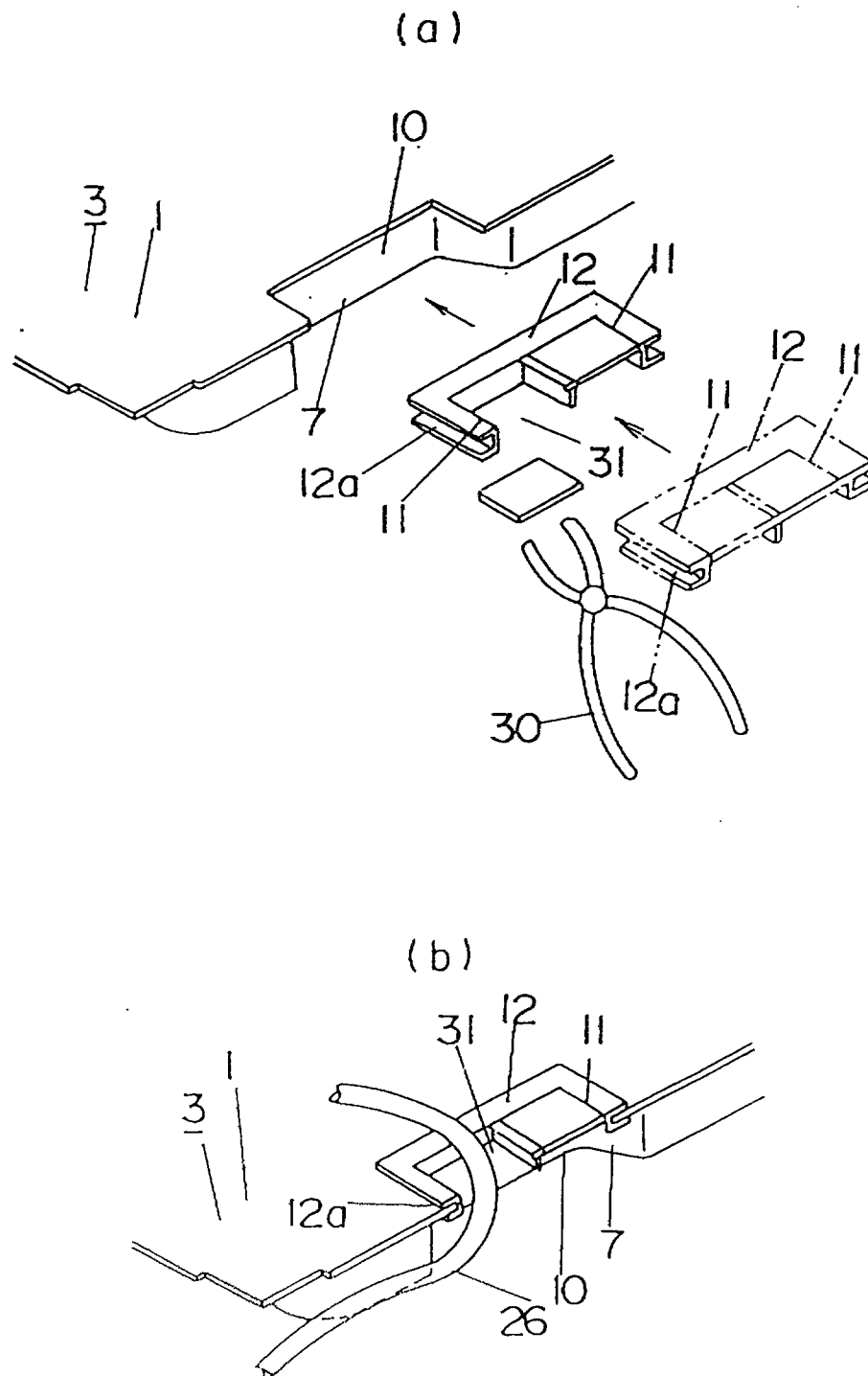


FIG. 12

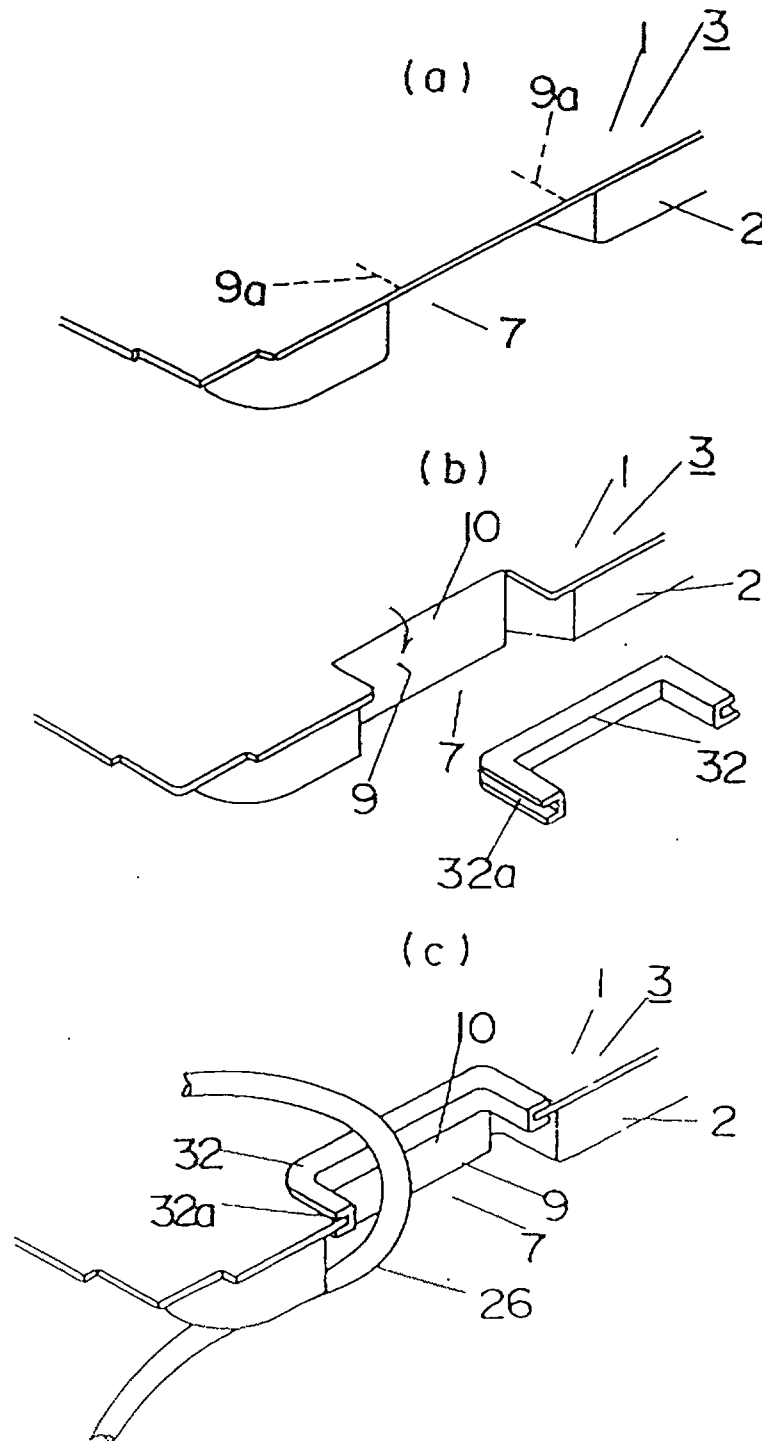


FIG. 13

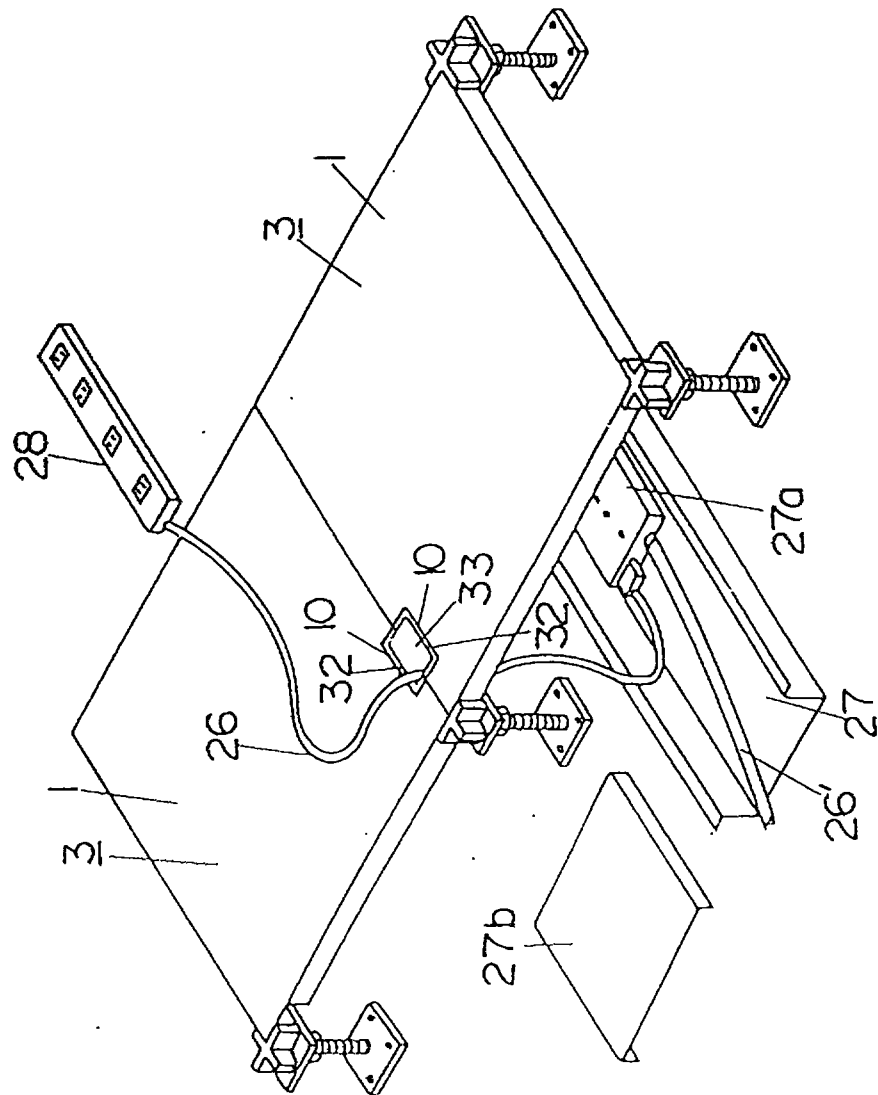


FIG. 14

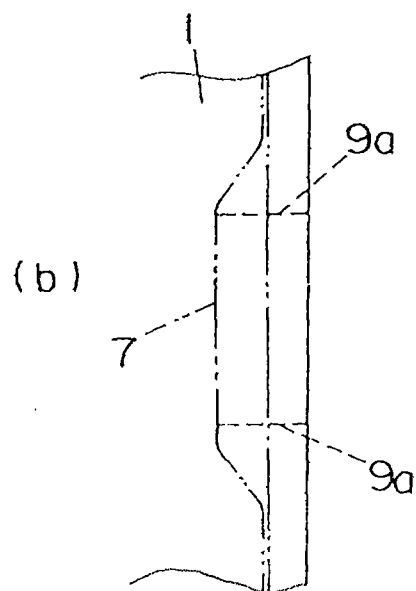
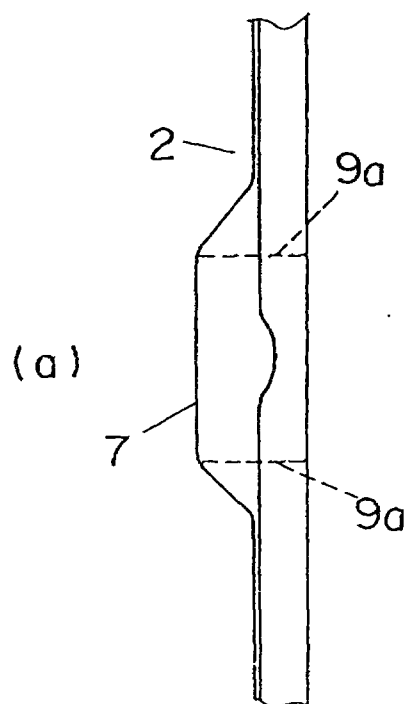


FIG. 15

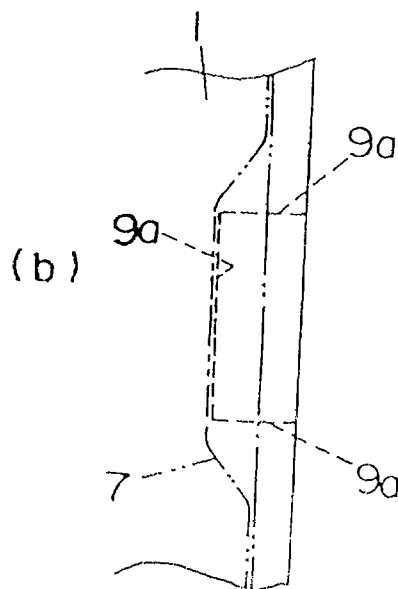
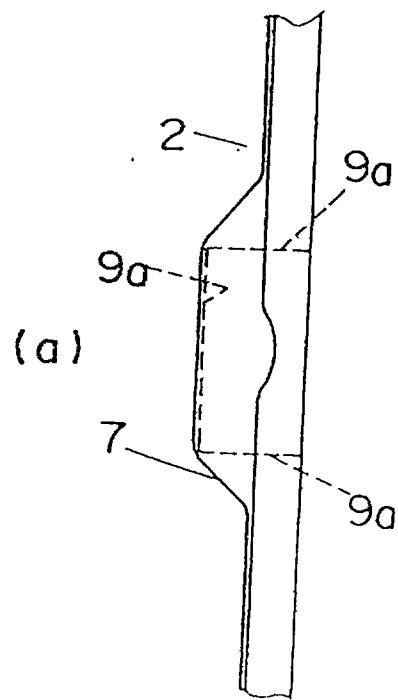


FIG. 16

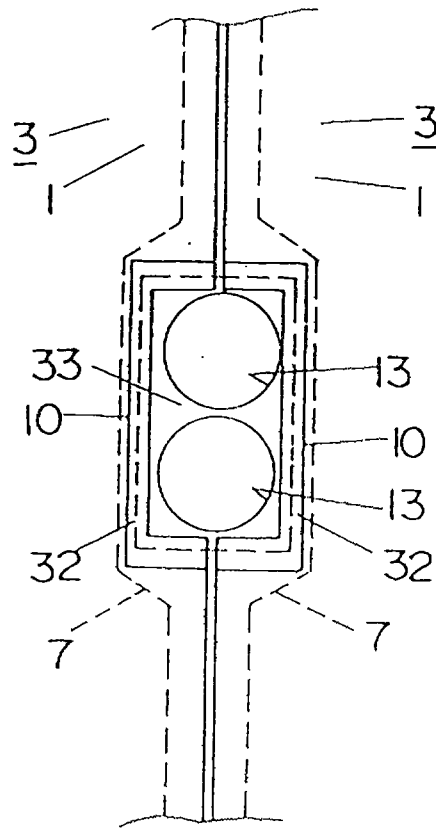


FIG. 17

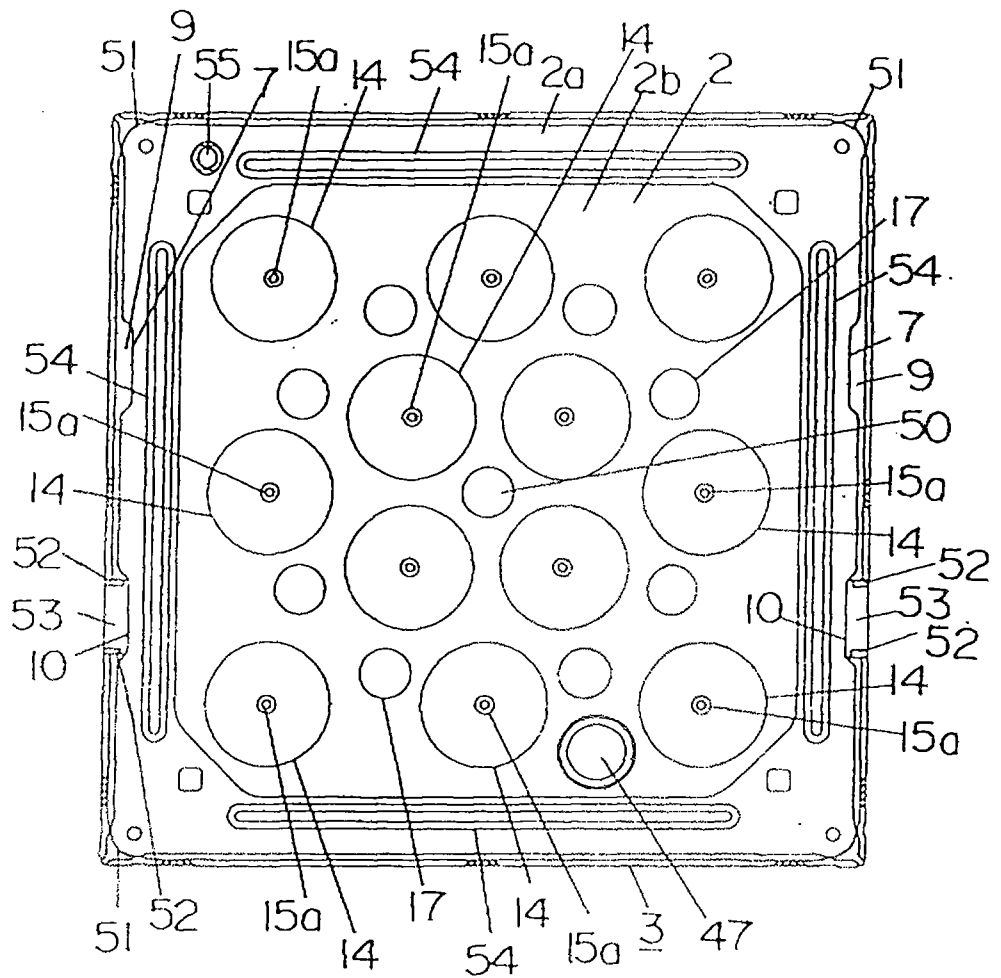


FIG. 19

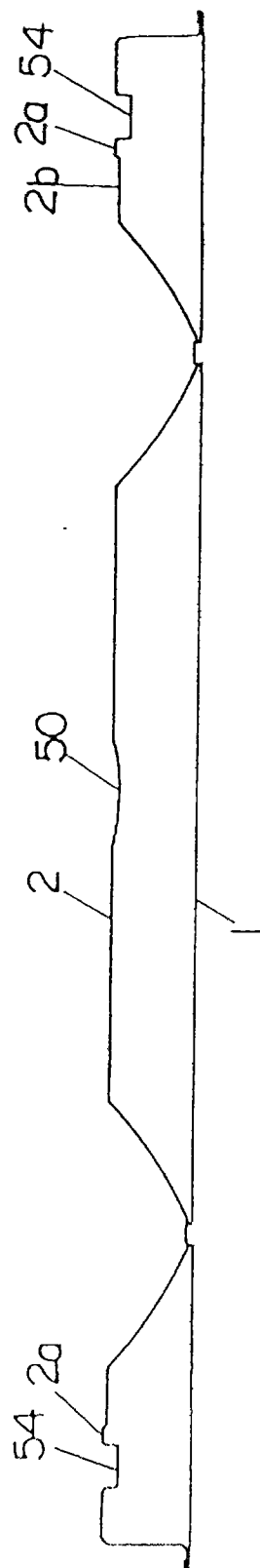


FIG. 20

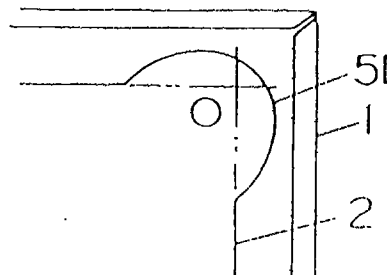
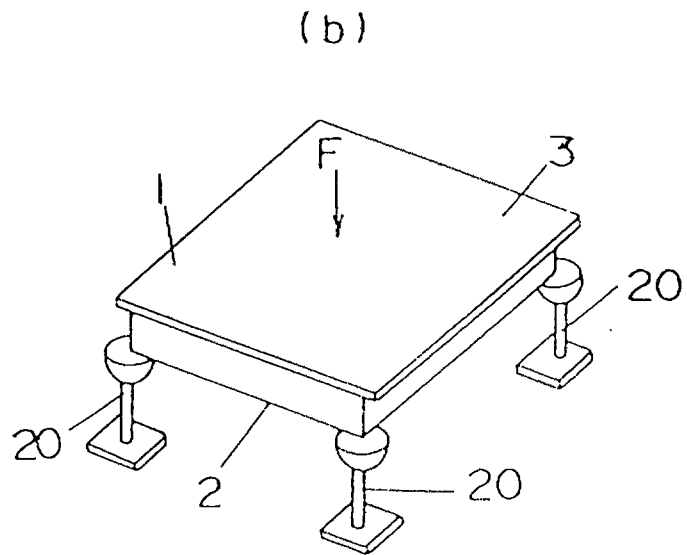
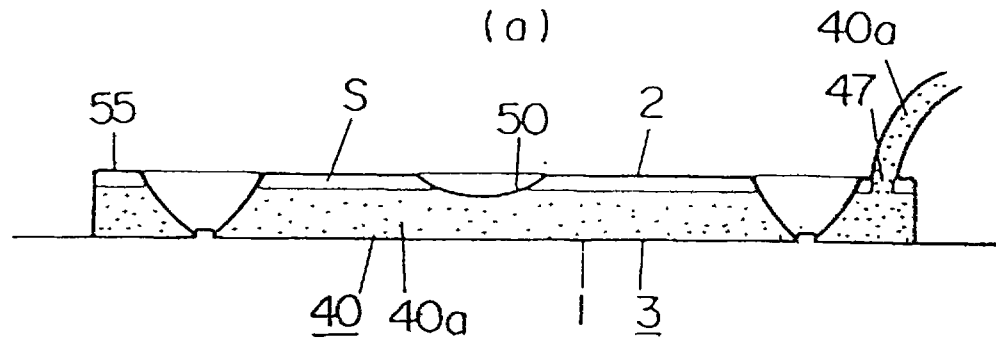


FIG. 21

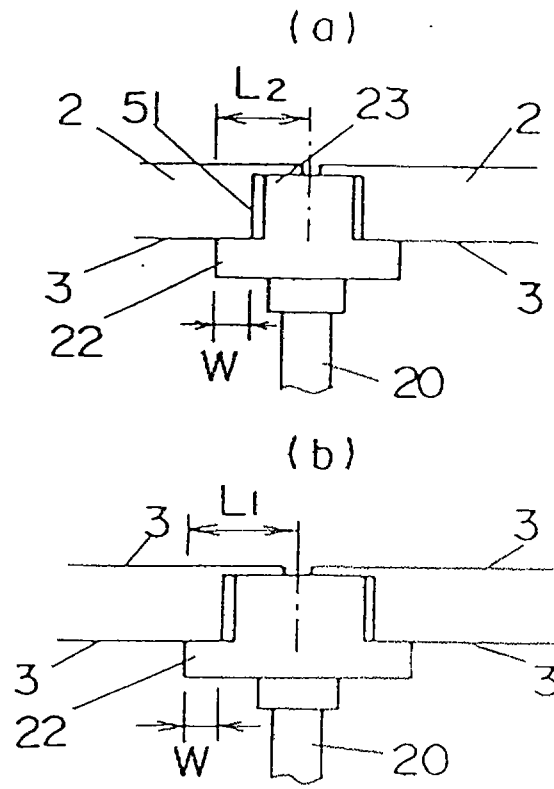


FIG. 23

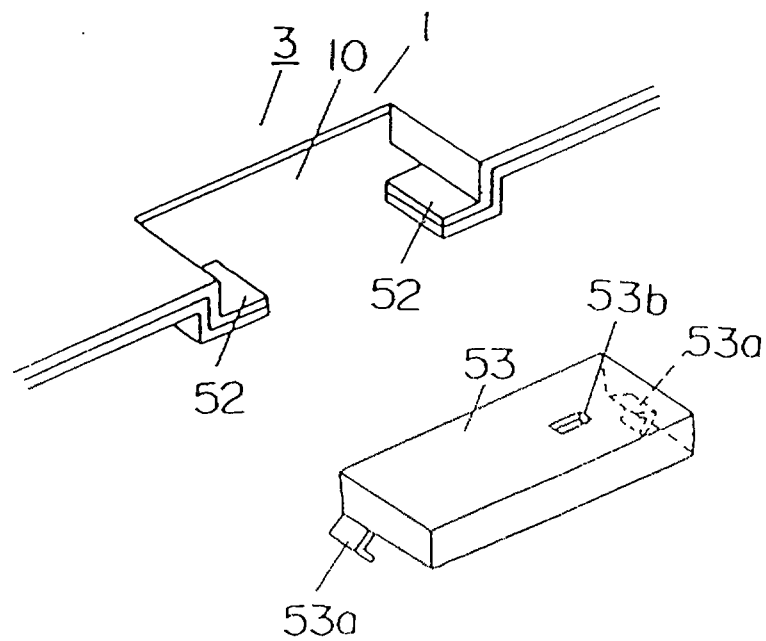


FIG. 24

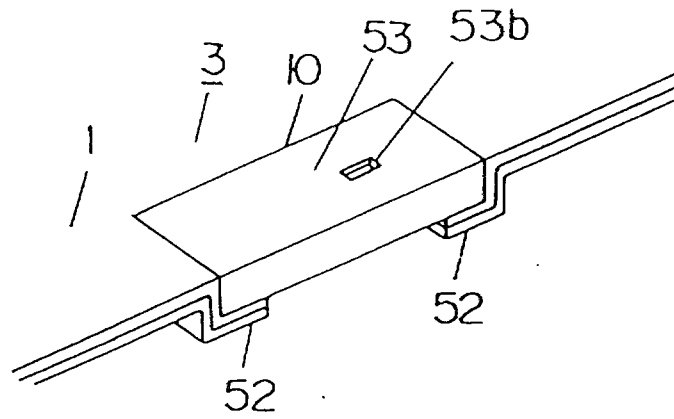


FIG. 25

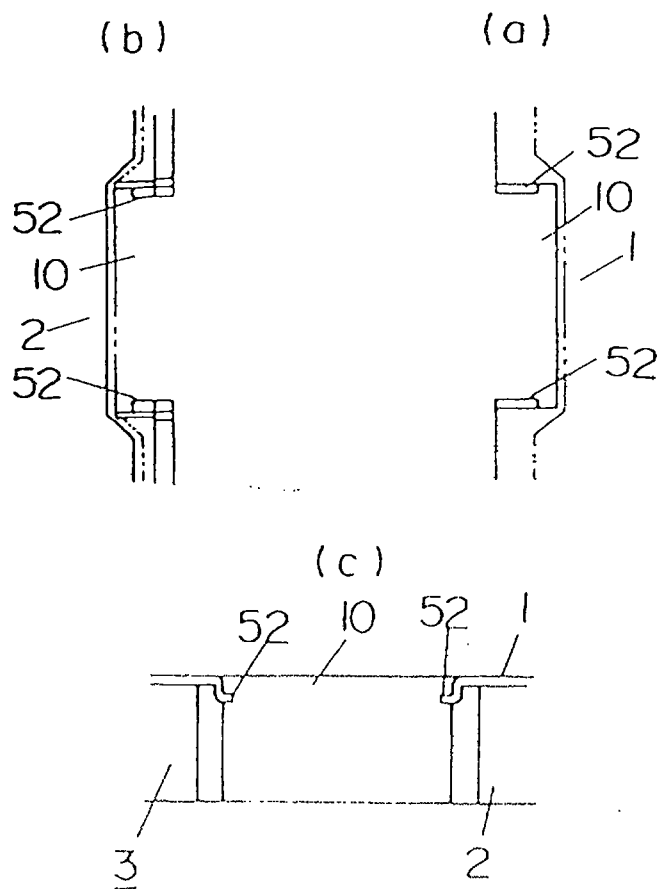


FIG. 26

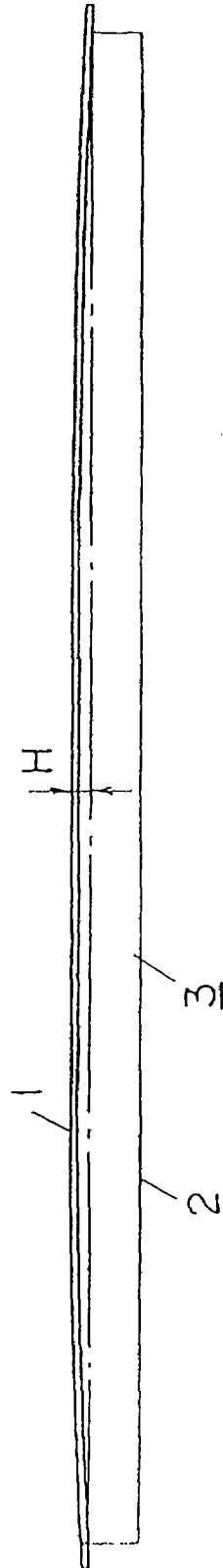


FIG. 27

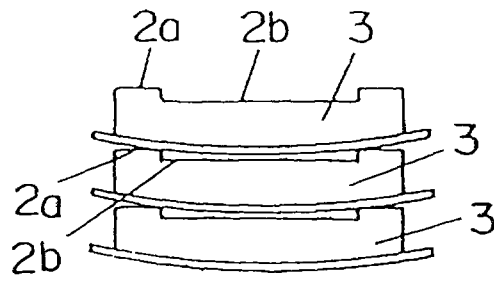


FIG. 28

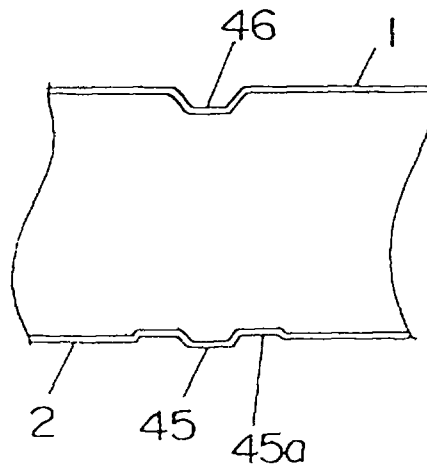


FIG. 29

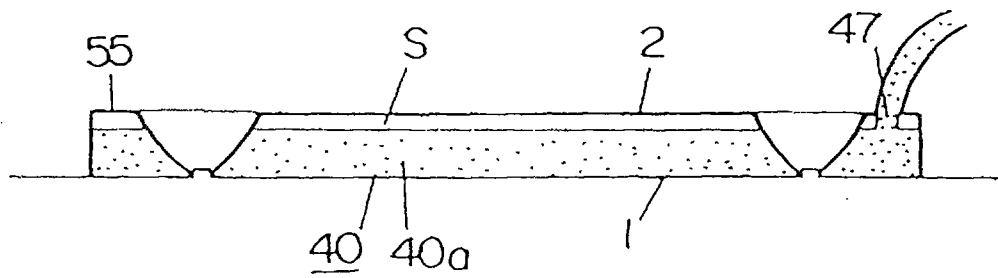
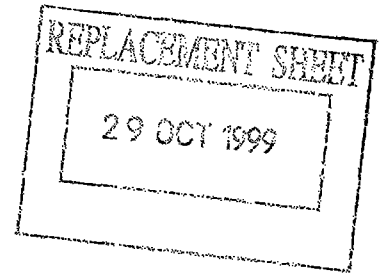


FIG. 30

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FLOOR PANEL



Field of the invention

This invention relates to floor panels formed to allow passage of cables.

Background of invention

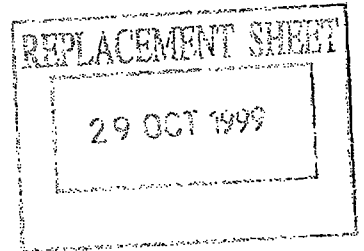
Japanese patent publication (Kokai) 6-113433 discloses a floor panel which provides for electrical cables to be passed through the floor panel.

In this example, a cable screening cover, built into a wiring outlet on the panel at the time of constructing the floor panel, has two configurations: (i) flush with the panel when no cable passage is required; or (ii) inclined with respect to the panel to provide an opening through the panel to allow for the passage of cables along the inclined surface of the cover through the panel.

The cable screening cover is installed in one of two configurations, and the installation is complicated as there are different individual parts used for each method, which increases the cost of manufacture.

The necessary installation of the cable screening cover may be missed, and the cover may dislodge from the panel during construction or otherwise. Moreover, incorrect installation of the cable screening cover could occur since there are two kinds of installation methods provided.

Further, existing floor panels, when filled with mortar as shown in Fig. 30, have a space S when mortar does not completely fill the volume of the floor panel. As a result of this space, the mortar is prone to cracking when the floor panel is subject to concentrated loads.



Summary of the invention

Accordingly, the invention provides a floor panel having a top plate and a bottom plate whose peripheries are joined together. The bottom plate has a bottom plate coupling piece projecting sideways at an upper open edge of a body portion of the bottom plate. This body portion includes a wall piece which is formed from its lower end to its upper end with a vertically extending recess for passing a cable through said upper opening of said bottom plate (which is occluded by said top plate). A top plate coupling piece provided on an outer peripheral edge of said top plate and said bottom plate coupling piece provided on an upper end outer peripheral edge of said bottom plate are coupled to each other for occluding said vertically extending recess. An occluded portion formed at an upper end of said vertically extending recess is formed as a cutaway portion for forming an opening.

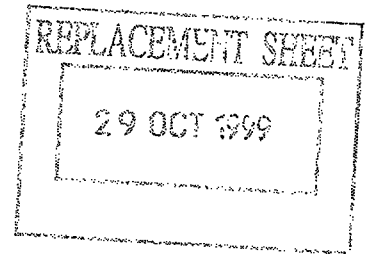
Preferably, a portion of (a) the bottom plate coupling piece or (b) the top plate coupling piece (for occluding the upper end of said vertically extending recess) is provided with a cutting assistant portion such as perforations and/or a thin groove.

Preferably, the cutaway portion has a width in the recessing direction of the recess of about $1/2$ of a diameter of a standard flexible electric cable tube.

Preferably, a plurality of projections are formed upwardly from a bottom of the bottom plate, and the top plate and upper ends of the projections are coupled to each other, wherein the projections are positioned at a plurality of locations spaced radially around a center of said top plate as viewed on a plane, and the number of projections located on diagonal lines of said top plate is greater than those located on other portions.

Preferably, a central portion of the bottom plate is recessed to form an internal projection for supporting mortar after the mortar is charged.

Preferably, the four corners of the body portion (which is rectangular as viewed on a plane) are swelled outward with respect to lines forming four sides of a



rectangle, thereby forming swelled corner portions.

Preferably, of the plurality of cutaway portions for forming openings, cutaway portions except one or more are cut except cap supporting portions, thereby forming the openings, and said openings are occluded by caps.

Preferably, the four sides of the bottom surface periphery of said bottom plate are formed with thin and long recessed or projected reinforcing portions.

Description of drawings

Fig. 1 is a fragmentary isometric view of a portion of a floor panel constructed in accordance with an embodiment of the invention, showing a recess in the peripheral wall.

Fig. 2 is a cross-sectional view of the portion of floor panel shown in Fig. 1.

Fig. 3 is a view similar to Fig. 1, showing the panel after removal of a segment of the rim to open a cable passage at the recess in the peripheral wall.

Fig. 4 is a cross-sectional view of the floor panel shown in Fig. 3, at the location of the removed segment.

Fig. 5 is a diagrammatic isometric view of part of a raised panelled floor constructed from floor panels of the kind shown in Figs. 1 to 4, with a cable passing through an opening in the floor.

Fig. 6(a) to 6(d) are respectively underneath and side elevational views of a bottom pan used to construct the floor panel shown in the preceding drawings.

Fig. 7(a) to 7(d) are respectively underneath and side elevational views of a top plate used to construct the floor panel shown in the preceding drawings.

Fig. 8(a) and (b) are fragmentary diagrams depicting the engagement of co-operative connective elements used in the floor panel shown in Fig. 1.

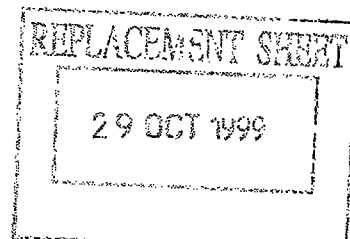


Fig. 9(a) and (b) are similar views of alternative engagement arrangements for the co-operative connective elements.

Fig. 10(a) is a partial cross-sectional view of the floor panel, indicating a corresponding projection and recess to enable secure stacking of the floor panels.

Fig. 10(b) is a partial cross-sectional view of the floor panel, indicating an internal projection formed in the bottom pan of the floor panel.

Fig. 10(c) is a partial cross-sectional view of the floor panel, indicating joined co-operating connective elements formed integrally in the bottom pan and top tray of the floor panel.

Fig. 11(a) to 11(d) are various views of the floor panel used in conjunction with a pedestal to form a raised floor as depicted in Fig. 5.

Fig. 12(a) and 12(b) are views indicating the operation of installing a cable screening cover in place of the rim segment removed to open the cable passageway at the recess in the peripheral wall.

Fig. 13(a) to 13(c) are perspective views indicating the operations involved in creating a wiring outlet in the floor panel.

Fig. 14 is a view of a raised floor similar to Fig. 5, but with the modification of Figs. 13(a) to 13(c).

Fig. 15(a) and 15(b) are respectively a bottom view and plan view showing the provision of cutoff guidance in the floor panel.

Fig. 16(a) and (b) are respectively a bottom view and plan view of further examples of providing cutoff guidance in the floor panel.

Fig. 17 is a fragmentary plan view of two adjacent floor panels with two flexible cable tubes passing through the wiring outlet created between the floor panels.

Fig. 18(a) to 18(c) are respectively a base view, front view and side view of an alternative floor panel according to another embodiment of the invention.

Fig. 19 is a base view of the alternative floor panel shown in Fig. 18, in which some of the recess passageways are closed with a cap.

Fig. 20 is a cross-sectional view of the alternative floor panel of Fig. 18, prior to being filled with mortar.

Fig. 21(a) is a cross-sectional diagrammatic view indicating how the alternative floor panel is filled with mortar.

Fig. 21(b) is a diagram showing the alternative floor panel on pedestals with an applied force.

Fig. 22 is a partial plan view of a modified corner of the alternative floor panel.

Fig. 23(a) and (b) are cross-sectional views of floor panels placed on a pedestal, for indicating the effect of the modification of Fig. 22.

Fig. 24 is a perspective view of a wiring outlet and a cap for covering the wiring outlet.

Fig. 25 is a perspective view of a wiring outlet when covered by the cap.

Fig. 26(a) to (c) are cross-sectional views indicating the wiring outlet trimmed to avoid the cap support area.

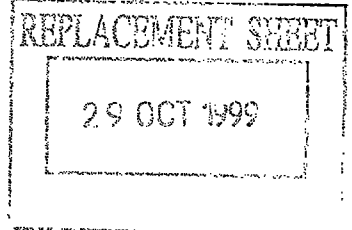
Fig. 27 is a side view of the floor panel, illustrating a preferred slightly domed effect.

Fig. 28 is a cross-sectional view indicating a number of floor panels stacked on top of each other.

Fig. 29 is a partial cross-sectional view of the floor panel, indicating a further example of a corresponding recess and projection for facilitating stacking of the floor panels.

Description of embodiment

With reference to Figs. 1 to 4, floor panel 3 has a structure defined by a top plate



1 and a bottom pan 2, which are both preferably manufactured from a metallic material such as iron or steel. Between the top plate 1 and bottom pan 2 there is a volume filled with a core 40 which typically consists of mortar, but which is alternatively any suitable settable material, for example, expanded synthetic resin.

The top plate 1 and bottom pan 2 are joined at a peripheral rim 25 of the panel 3 to enclose an internal volume. The pan 2 defines a peripheral wall of the floor panel 3 which extends about the volume enclosed by the floor panel. The peripheral wall is shaped to define one or more external recesses 7 in the peripheral wall closed by the rim 25. Each recess is able to serve as a passageway across the panel for passing cables between the sides of the panel 3. The structure of the panel 3 is shown in greater detail in Figs. 6 and 7.

Fig. 10 shows three cross-sectional views of part of the floor panel 3, respectively detailing (a) a stacking projection 45 and recess 45, (b) an inwardly extending portion 17 formed in the bottom pan 2, and (c) an internal projection 14 formed in the bottom pan 2 and extending to the top plate 1.

The bottom pan 2 has an array of multiple internal projections 14 that extend upwardly from the base of the pan 2 to the top plate 1. The internal projections 14 are preferably provided in a spaced array distributed on the bottom pan 2: in the illustrated embodiment, they are formed primarily along the diagonals of the panel 3, though projections 14 are also formed in other positions in the bottom pan 2 as indicated in Fig. 6.

The projections 14 extend between the bottom pan 2 and the top plate 1 to enhance the strength of the floor panel 3. The projections 14 are preferably formed as local deformations in the surface of the bottom pan 2, in the shape of circularly-symmetrical mounds. Each of the internal projections 14 has a connective element 15(a) formed at the upper peak of each projection 14. The connective elements 15(a) are adapted to engage with corresponding connective elements 15(b) formed in the top plate 1. Preferably, the respective connective elements are pressed together to interengage in a firm fit.

Figs. 8 and 9 show alternative arrangements that can be used for connective elements 15(a) and 15(b). When the bottom pan 2 and top plate 1 are attached, the connective elements 15(a) and 15(b) are securely engaged to ensure that the bottom pan 2 and top plate 1 do not come apart.

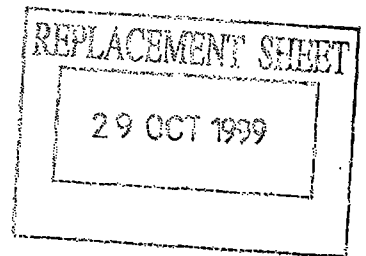
Also provided on the bottom pan 2 are inwardly extending portions 17 that do not extend to the top of the bottom pan 2. These portions 17 are, as with the projections 14, formed as local deformations of the surface of the bottom pan 2. The portions 17 are also formed in the shape of circularly-symmetrical mounds, and are preferably smaller than the projections 14. The portions 17 are distributed amongst the projections 14. Fig. 6 shows the preferred arrangement of the inwardly extending portions 17 amongst the internal projections 14. The portions 17 increase the strength of the floor panel 3, and minimise the amount of filling needed to fill the volume between the bottom pan 2 and the top plate 1.

Stacking projection 45 and mortar filler opening 47 are also provided in the base of the pan 2. Top plate 1 shown in Fig. 7 is a generally square plate having connective elements 15(b) as described above in relation to connective elements 15(a) formed on the projections 14 of the bottom pan 2. The top plate 1 has a number of connective elements 15(b) located to co-operate with the connecting elements 15(a) in the bottom pan.

Also shown in Figs. 6 and 7 are, respectively, small complementary projections 45 and recesses 46. The projections 45 and recesses 46 are sized and located to mate with each other when floor panels 3 are stacked on top of each other.

Floor panels 3 having these projections 45 and recesses 46 described above can be stacked for storage or transport without misalignment, as the aligned recesses 46 and projections 45 respectively formed on the upper and lower surfaces of the floor panel 3 engage to prevent relative transverse movement of adjacent floor panels 3.

Bottom pan 2 has an integral external flange 5 extending around the opening of the pan 2. Top plate 1 includes a peripheral edge 8, adapted to be securely



attached with the flange 5, as indicated in Figs. 1 and 2. The peripheral edge 8 and the integral flange 5 form the earlier mentioned peripheral rim 25 of the panel 3. The peripheral edge 8 extends to the edge of the flange 5 and turns under the flange 5. As the peripheral edge 8 encompasses the flange 5 on all sides of the panel 3, the flange 5 integral with the pan 2 is secured with the peripheral edge of the top plate 1 so that the top plate 1 is securely attached with the pan 2.

Returning to Fig. 1, the peripheral rim 25 covers the top of recess 7. The cutaway portion (indicated by reference number 9) of the rim 25 which closes or covers the recess 7 can be opened by cutting it away to create a wiring outlet 10 so that the recess 7 which extends between the bottom and top of the floor panel 3 is open on the upper side of the floor panel 3, as well as the lower side, as shown in Figs. 3 and 4. The wiring outlet 10 so formed serves as a passageway across the panel 3 to allow for the passage of a cable or the like between the sides of the panel 3.

In this way, cable 26 can pass through a floor formed from panels 3, from one side of the floor to the other, via the wiring outlet 10. Fig. 5 shows an example of a cable 26 connected through a terminal join 27a to the cable tray 27 placed on the floor base such as a slab 19. If no passage for electrical cables is required, there is no need to cut away any portion of the rim 25 around the periphery of the panel 3 which covers the top of the recess 7, as the recess 7 is closed by portion 9 of rim 25, comprising integral flange 5 and peripheral edge 8 as shown in Fig. 1 and 2.

Figs. 12 and 13 show how portion 9 of the rim 25 can be cut out to create a wiring outlet 10 (Fig. 12a, Fig. 13b). The initial step of cutting out part of the rim 25 formed by the integral flange 5 and peripheral edge 8 can be aided by a cutaway assistant portion such as perforations or a thin groove 9a as shown in Fig. 13a. Various types of indications can be used to show where the rim 25 is to be cut, for example, a dotted line, a fine groove or similar indication. Figs. 15 and 16 show some examples.

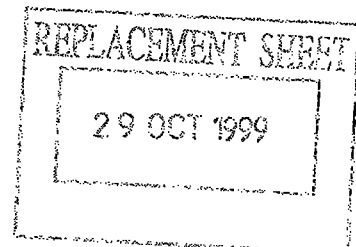
When wiring outlet 10 is created by trimming the rim 25, a cable screen cover 12 can be installed as shown in Fig. 12. Cable screen cover 12 in Fig. 12 has two U-

shaped knockouts 11, and a grooved fixing part 12a provided on the edge of the cover 12. Fixing part 12a of the cover 12 is slotted onto the edge of the wiring outlet 10. Either of the two knockouts 11 from the cover 12 can be cut off with a jig 30, such as a pair of pliers as shown in Fig. 12(a). Thus cutoff part 31 is formed so that a cable 26 passing through recess 7 (as shown in Fig. 12b) passes through the opening so formed. Each of the knockouts 11 can be designated for a particular purpose. For example, one can be reserved for an electrical cable and the other for a communications cable.

Alternatively, a U-shaped guard 32 as shown in Fig. 13 can be used. Guard 32 is preferably made from a pliable material such as rubber, synthetic resins etc. and can be inserted into the edge of wiring outlet 10 as shown in Fig. 13(a) to 13(c), as with cover 12. The arrangement of corresponding recesses 7 on all sides of the floor panel 3 is intended to allow maximum flexibility in using the floor panel 3. Fig. 14 shows, in use, floor panels 3 including a wiring outlet 10 having a guard 32 as in Fig. 13.

In the various arrangements described above, the wiring outlets 10 are conveniently about half the desired dimensions, so that adjoining wiring outlets 10 on adjacently positioned floor panels 3 can be cut out to create two adjoining wiring outlets 10 of the desired size that co-operate as a single opening in the floor. This avoids openings in the floor formed from the floor panels 3 being larger than necessary. Fig. 17 illustrates two adjoining wiring outlets 10 which, together, are just able to accommodate two flexible cable tubes 13.

Figs. 5 and 11 show use of the floor panel 3 when installed. Fig. 11 shows in greater detail how the panels 3 are positioned when a raised floor is installed. Each panel 3 is supported at each of its corners on a respective pedestal 20, and each pedestal 20 can in turn support four panels. Floor panels 3 are placed at each of the corners of pedestal 20 on panel supports 22. The panel supports 22 are separated by a generally cross-shaped panel positioning member 23. Each arm of the panel positioning member 23 has a spacer 24 which is provided to suitably space adjacently positioned floor panels 3.



At the corners of each floor panel, there is a small rebate 18 cut away from the rim 25 (as shown). This small rebate 18 is dimensioned to match the spacer 24 provided on the cross-shape positioning member 23. The relative dimensions of the cut away rebate 18 and the spacer 24 are adapted to allow a small space (for example, 1 mm) between adjoining floor panels 3 of the floor.

Figs. 18 to 29 depict an alternative floor panel. Fig. 18 and other drawings show a hole 55 diagonally opposite the mortar opening 47. The hole 55 and the mortar opening 47 are both formed in the pan 2, and allow air to escape while mortar is filled into the upturned floor panel 3. The mortar opening 47 is desirably of sufficient diameter to allow for rapid filling and to avoid blockage, for example 50 mm. The escape hole 55 also provides an opening for excess mortar to flow out from the floor panel 3, when the floor panel 3 is completely filled with mortar.

As the panel is filled with mortar through the bottom pan 2, the mortar collects and sets in the "upper" side of the floor panel 3 closed by the top plate 1. Accordingly, when the volume enclosed by the panel 3 is not fully occupied by mortar, there is a space remaining between the surface of the set mortar 40a and the bottom of pan 2. This can be seen in Fig. 21(a). A centrally located inward projection 50 is formed in the bottom pan 2, and is intended to support the mortar when the panel 3 is partially filled. This discourages the mortar from cracking when concentrated loads are applied to the top plate 1, as indicated in Fig. 21(b).

Fig. 20 shows channels 54 formed around the edges of the floor panel 3 in the bottom pan 2. These channels 54 are also indicated in Figs. 18 and 19 as being formed along the majority of each edge of the floor panel 3. The inner edges of the channels 54 adjoin ridges 2a, as seen in Fig. 20. The combination of the channels 54 and ridges 2a assist in increasing the strength of the bottom pan 2, and guard against deformation of the bottom pan 2 when the floor panel 3 is filled with mortar, and while the panel is being used after installation.

Fig. 22 shows a modified corner section 51 of the floor panel 3, as also indicated in Figs. 18 and 19. The modified corner section 51 is an outside enlargement of the generally rectangular side wall of the pan 2. The modified corner section 51 is

of use when the floor panel 3 is placed on the alternative form of pedestal 20 as indicated in Fig. 23. The corner section 51 extends closer to the edge of the rim 25 of the floor panel 3 than the main edges of the pan 2. This allows (when the panel 3 is installed) the distance from the centre of the pedestal to the edge of the panel support 22 to be shortened, which assists in stabilising the floor as explained below.

Fig. 23(b) shows floor panels 3 without modified corner sections 51 supported on a pedestal 20. This is in contrast with the arrangement shown in Fig 23(a) in which the floor panels have modified corner sections 51. The distance L_1 , without modified corner sections 51, is longer than L_2 , the distance with modified corner sections 51, for a given width W as indicated in Figs. 23(a) and (b). The reduced distance L_2 reduces the moment of force against the panel support 22 and, as a result, the floor is more stable.

Fig. 24 shows an alternative arrangement which uses cap 53 to cover the wiring outlet 10. Figs. 25 and 26 show this arrangement in greater detail. In this case, the wiring outlet 10 is pre-formed during manufacture of the components of the floor panel 3, with a cap support 52 provided in the form of a pair of support ledges. The cap 53 is an insert installed in the floor panel 3 to block or close the recess 7, and can be removed to open the recess 7 and thus provide a wiring outlet 10.

The cap 53 is snap-fastened to the floor panel 3 by means of the resilient V-shaped legs 53a shown in Fig. 24. The legs 53a engage under the support ledges to prevent the cap 53 from separating from the floor panel 3 during ordinary handling. The opening 53b on the cap 53 allows a tool to be inserted into this hole 53b to assist in removing the cap 53 once the floor panel is installed. This is convenient, because once the floor is installed, the cap 53 must be removed in this way as the underside of the cap cannot be accessed to "push out" the cap out, due to the close spacing of adjacent floor panels.

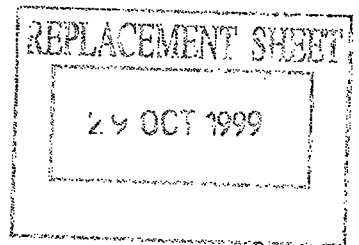
Thus, the cap 53, and the cap support 52 allow the recess 7 to be closed and opened to provide a wiring outlet 10 as required.

Fig. 27 shows a floor panel 3 having a slightly domed effect. The top plate 1 of the floor panel 3 is higher at its centre - by about 0.5mm. As a result, the "joins" between adjacent floor panels 3 tend to be less noticeable when a floor formed from the floor panels 3 is carpeted. When floor panels 3 having a slightly domed effect are as shown in Fig. 27, it is desirable, as shown in Fig 28, to provide a ridge 2a around the outer edge of the bottom of pan 2. The height of the ridge 2a compared with the main portion of pan 2b is about 1mm. The ridge 2a allows the slightly domed panels 3 to be safely stacked "upside down" after they have been filled with mortar. A clearance of about 1 mm between the ridge 2a and the rest of the pan 2b allows the panels 3 to be securely stacked even if the curvature of the top plate 1 is further accentuated after being filled with mortar.

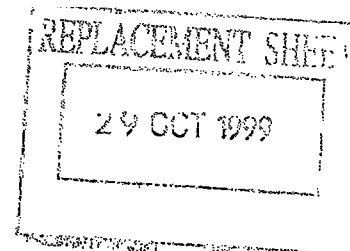
Fig. 29 shows an alternative recess 46 and projection 45 for stacking the panels 3. The projection 45 is surrounded by recesses 45a. Floor panels 3 which use this combination of recesses and projections can be stacked in a similar fashion as the earlier described floor panels.

The described floor panel 3 involves no modifications when cables are not required to pass across the floor panel. Instead, wiring outlets 10 can be opened as required by a simple procedure of removing a portion of the rim 25, or detaching a cap insert from the rim 25. The wiring outlets 10 that are pre-formed before installation of the floor panels 3 can be rimmed with a guard 32, or a cable screening cover 12 can be installed so that wiring outlets can be selectively formed by removing knockouts 11. As the width of the wiring outlet 10 is minimised by collocating the recesses 7 of adjacently located floor panels 3, the strength of the floor panel 3 is maintained, making it suitable for construction of weight-bearing floors. The mortar in floor panels 3 which are not completely filled is not prone to cracking as it is supported by a centrally located projection extending from the bottom of the pan 2. The stability of the resulting floors is enhanced by the use of modified corner portions 51.

It will be understood that the invention disclosed and defined in this specification extends to all alternative combinations of two or more of the individual features mentioned or evident from the text or drawings. All of these different combinations



constitute various alternative aspects of the invention.

**THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:**

1. A floor panel having a top plate and a bottom plate whose peripheries are joined together, characterized in that said bottom plate has a bottom plate coupling piece projecting sideways at an upper open edge of a body portion of said bottom plate, said body portion including a wall piece which is formed from its lower end to its upper end with a vertically extending recess for passing a cable through ^{or} said upper opening of said bottom plate being occluded by said top plate, and a top plate coupling piece being provided on an outer peripheral edge of said top plate and said bottom plate coupling piece provided on an upper end outer peripheral edge of said bottom plate being coupled to each other for occluding said vertically extending recess, and an occluded portion formed at an upper end of said vertically extending recess being formed as a cutaway portion for forming an opening.
2. A floor panel according to claim 1, wherein a portion of said bottom plate coupling piece or said top plate coupling piece for occluding the upper end of said vertically extending recess is provided with a cutting assistant portion such as perforations and/or a thin groove.
3. A floor panel according to claim 1, wherein said cutaway portion has a width in the recessing direction of said recess of about 1/2 of a diameter of a standard flexible electric cable tube.
4. A floor panel according to claim 1, wherein a plurality of projections are formed upwardly from a bottom of said bottom plate, and said top plate and upper ends of said projections are coupled to each other, wherein said projections are positioned at a plurality of locations spaced radially around a center of said top plate as viewed on a plane, and the number of projections located on diagonal lines of said top plate is greater than those located on other portions.
5. A floor panel according to claim 1, wherein a central portion of said bottom



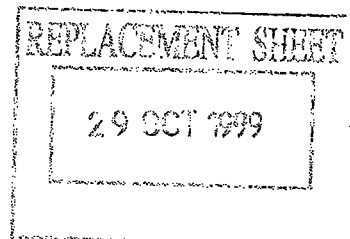


plate is recessed to form an internal projection for supporting mortar after the mortar is charged.

6. A floor panel according to claim 1, wherein four corners of said body portion which is rectangular as viewed on a plane are swelled outward with respect to lines forming four sides of a rectangle, thereby forming swelled corner portions.
7. A floor panel according to claim 1, wherein of said plurality of cutaway portions for forming openings, cutaway portions except one or more are cut except cap supporting portions, thereby forming the openings, and said openings are occluded by caps.
8. A floor panel according to claim 1, wherein four sides of the bottom surface periphery of said bottom plate are formed with thin and long recessed or projected reinforcing portions.



ABSTRACT

FLOOR PANEL

No extra installment of wire screening cover when no electrical connection is required, and simple wiring process only with cutoff for connection to the building ground.

Connective pieces 5 are attached to project out of the level from the upper brim of Body 4, thin-box figured in plain view with an opening on the top, and this is Bottom pan 2. Sunken part 7 for circuit is formed by denting the surface inward from the top side to the bottom of Wall Piece 6 of the thing-box figured Body 4. The opening of Bottom pan 2 is covered with Top plate 1, and Conjugation part 8, provided on the outer rim of Top plate 1, and Connective part 5, provided on the upper outer rim of Bottom Plate 2, are attached together so that the edge of Sunken part 7 is closed. The closed top of Sunken part 7 is reserved as Adjustable cutoff part 9 for formation of outlets to pass cables through to the floor void.

FIG. 1

1/23

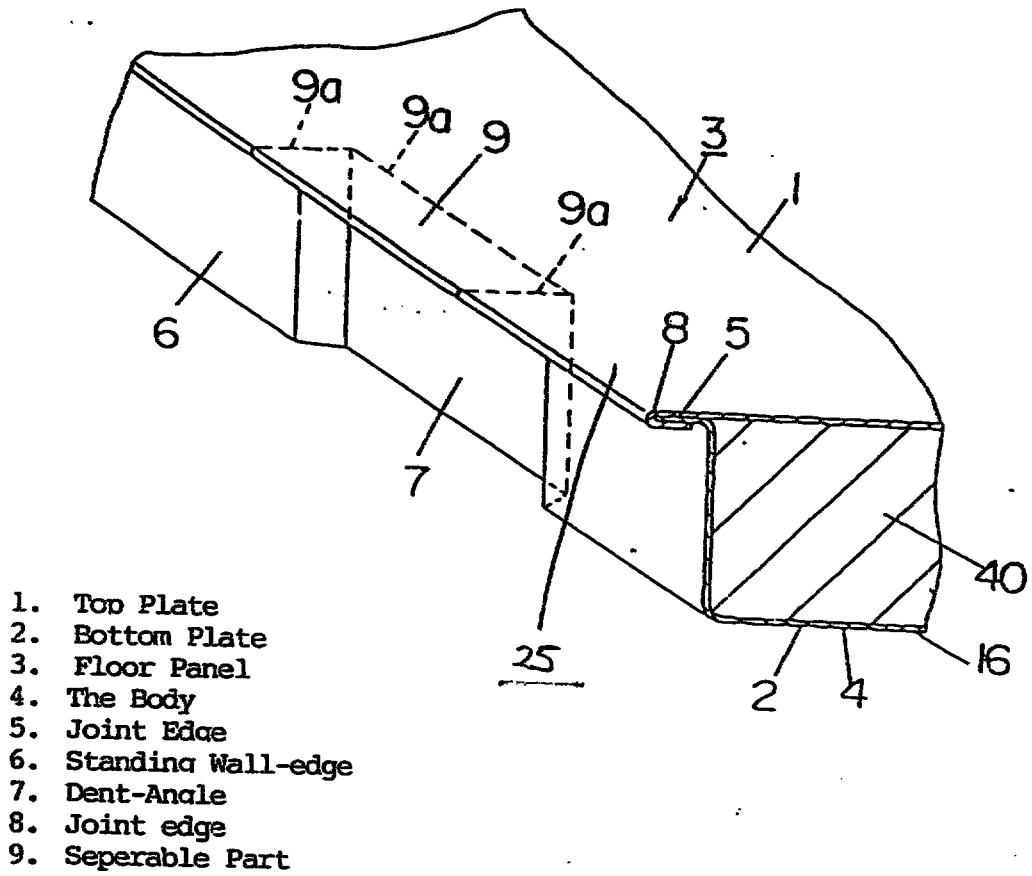


FIG. 1

2/23

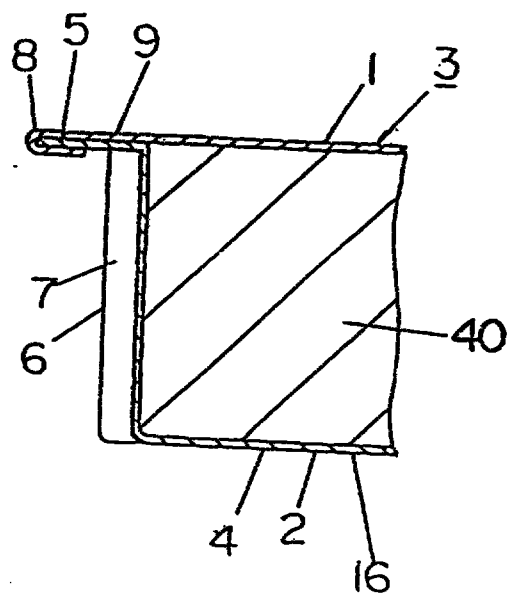


FIG. 2

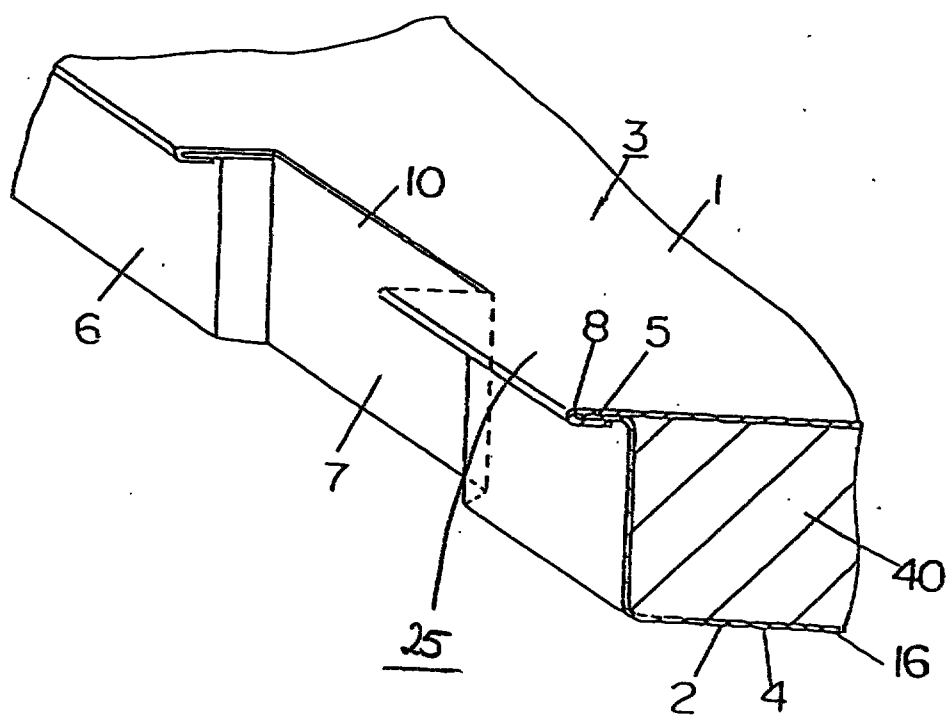


FIG. 3

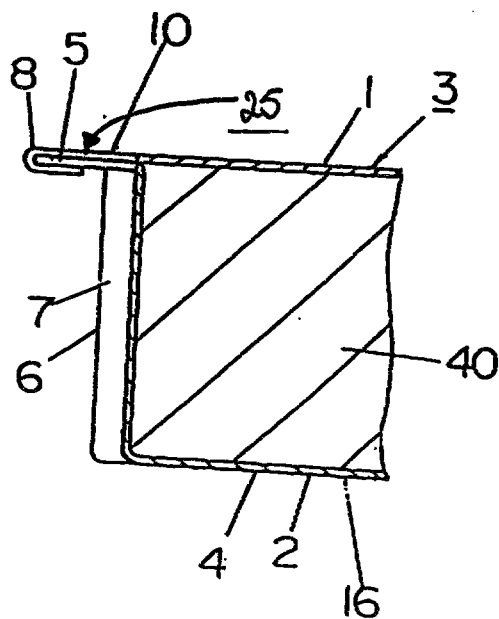
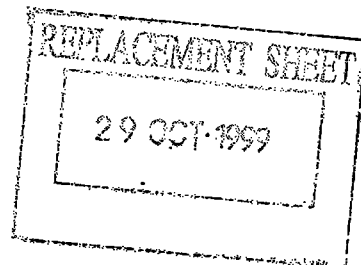


FIG. 4

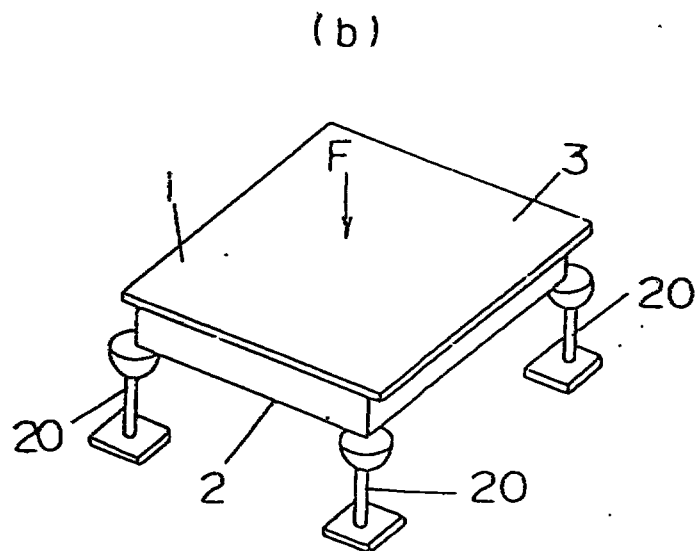
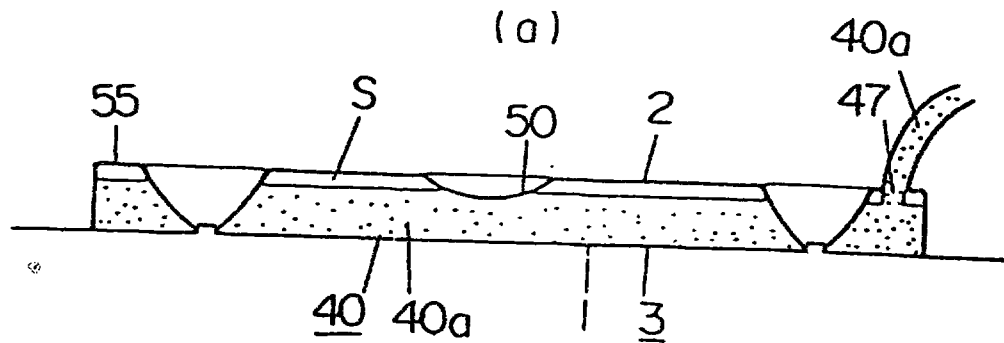


FIG. 21

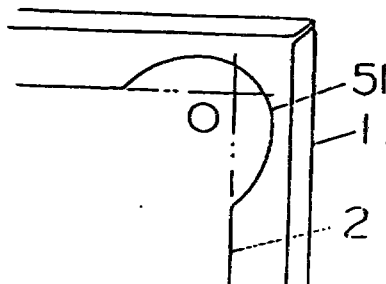


FIG. 22