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RACK ASSEMBLY

FIELD OF THE INVENTION

The present invention relates to rack assemblies such as racks adapted to be installed in factories for the convenience of loading and unloading operations by forklift trucks and those for use in automatic warehousing facilities.

BACKGROUND OF THE INVENTION

Rack assemblies adapted for the convenience of loading and unloading operations by forklift trucks of goods handling devices employed in automatic warehousing facilities have been known which are of the type having a plurality of support posts arranged in spaced apart relation, both depthwise and transversely of the rack assembly, bracings and longitudinal beams for interconnecting the depthwise disposed support posts so as to securely fix them together, and transverse beams for interconnecting the transversely disposed support posts. Brackets project from each adjacent pair of the transversely disposed support posts at opposed positions, and bracket rails extend between the brackets of each adjacent two depthwise disposed support posts for supporting goods placed in the rack assembly.

In such known rack assembly, the brackets are composed of the same material and painted the same color as of the support posts. Because of this, recognition of the scale of the rack, for example the number of tiers of the rack, is hard. Likewise, visual recognition is hard even if forks of forklift trucks or handling arms of goods handling device touch the rack as they are operated to move in and out of the said, and it is hard to easily and accurately adjust the level of forks of forklift trucks to the level of the rack. Furthermore, even if goods placed in the rack happen to slide, it is unrecognizable.

SUMMARY OF THE INVENTION

The present invention has an object to overcome the foregoing problems by presenting a rack assembly which enables to distinguish the existence of brackets and to easily recognize such happenings as a touching of the rack by an operating device.

In order to accomplish the foregoing object, according to the invention there is provided a rack assembly including vertically extending support posts disposed at least at four corners of the assembly, brackets disposed on transversely adjacent support posts at opposed positions such that the brackets on each of the support posts project toward the other support post, and bracket rails each of which extending between

adjacent brackets located depthwise of the rack assembly and capable of supporting goods placed in the rack assembly, wherein:

each bracket rail is colored differently from the support posts.

According to such arrangements, brackets are distinctly relieved against support posts and others in the back.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary exploded view in perspective of a rack assembly representing one embodiment of the invention;

FIGS. 2 and 3 are, respectively, a front view and a plan view showing the portions shown in FIG. 1 in assembled condition;

FIGS. 4 and 5 are, respectively, a front view and a side view which are explanatory of a strain caused when a load is applied to the rack assembly shown in FIG. 1;

FIG. 6 is a general perspective view of the rack assembly shown in FIG. 1;

FIG. 7 is a fragmentary exploded view in perspective of a rack assembly representing another embodiment of the invention;

FIG. 8 is a fragmentary exploded view in perspective of a rack assembly representing a further embodiment of the invention;

FIGS. 9, 10, and 11 are, respectively, a front view, a side

view, and a plan view showing the portions shown in FIG. 8 in assembled condition;

FIG. 12 is a plan view showing portions of the rack assembly shown in FIGS. 8 to 11 in the course of being assembled together;

FIG. 13 is a fragmentary exploded view in perspective of a rack assembly representing a still further embodiment of the invention;

FIGS. 14 to 17 are, respectively, a front view and a side view showing portions of the rack assembly shown in FIG. 13 in assembled condition, and a front view and a plan view showing other portions of the rack assembly in assembled condition;

FIG. 18 is a plan view of a somewhat larger portion of the rack assembly shown in FIGS. 13 to 16;

FIG. 19 is a fragmentary exploded view in perspective of a rack assembly representing another embodiment of the invention;

FIG. 20 is a fragmentary sectional view of a bracket rail in the rack assembly shown in FIG. 19;

FIG. 21 is a general perspective view of the rack assembly shown in FIG. 20;

FIG. 22 is a fragmentary exploded view in perspective of a rack assembly representing another embodiment of the invention;

FIGS. 23, 24 and 25 are, respectively, front, side and rear views of a brace mounting plate in the rack assembly shown in FIG. 22;

FIG. 26 is a front view of a modified form of the brace

mounting plate;

FIG. 27 is a fragmentary exploded view in perspective of a rack assembly representing a further embodiment of the invention;

FIG. 28 is a plan view showing portions of the rack assembly in FIG. 27;

FIGS. 29 to 31 are views showing modified forms of base plates and seating members;

FIGS. 32 and 33 are side and plan views showing other portions of the rack assembly in FIG. 27; and,

FIGS. 34 and 35 are plan views showing modified forms of the portions shown in FIG. 33.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

One embodiment of the invention will now be described with reference to FIGS. 1 through 5.

As FIG. 6 shows, a rack 1 has vertically extending support posts 2 spaced apart depthwise and longitudinally of the rack 1. Adjacent support posts 2 disposed depthwise of the rack 1 are connected together at their respective upper and lower ends by horizontals 3, and they are also connected by a plurality of bracings 4. In this way, each pair of support posts, front and rear, are securely connected. Support posts 2 disposed transversely of the rack 1 are connected by transversely extending horizontal beams 5 bolted in position at the front and

rear sides of the rack 1.

Each support post 2 had brackets 6 removably attached thereto which project horizontally toward transversely spaced adjacent support posts 2. Each bracket 6 comprises a connecting member 7 fitted to the support post 2 and a bracket member 8 continued to the connecting member 7. Respective bracket members 8 of each two adjacent support posts 2 spaced apart depthwise of the rack 1 are connected at their distal ends by a bracket rail 9 supporting goods 11 at the lower end thereof. Adjacent support posts 2 at the rear side of the rack 1 are connected, at diagonally opposed joints between respective support posts 2 and horizontal beams 5, by a diagonally extending reinforcing bracing 10. A seating member 12 is secured to the lower end of each support post 2.

As FIGS. 1 to 3 show, each support post 2 comprises outer and inner plate portions 21, 22 formed in opposed relation and a pair of side plate portions 23, the inner plate portion 22 being centrally formed with a longitudinally extending slit 24. A longitudinally extending strengthening groove 25 is formed in the outer plate portion 21 at a location opposite to the slit 24. The inner plate portion 22 is formed with a pair of connecting plate portions 26 bent 90° outwardly from opposite edges of the slit 24 and extending in parallel along the slit 24. Ends of horizontals 3 and bracings 4 are fitted in the space between the connecting plate portions 26 and fixed in position by rivets or

the like.

The strengthening groove 25 has a depth D and comprises a bottom plate 25a and side plates 25b, 25b. Corner portions defined by the bottom plate 25a and side plates 25b, as well as corner portions defined by the side plates 25b and outer plate portion 21, are bent at right angles. The bottom plate 25a of the strengthening groove 25 is formed with a pair of engagement holes 27A, 27B, upper and lower, across the full width of the bottom plate 25a and in spaced apart relation. The side plate portions 23 are formed with a slip-off preventing hole centrally at a location corresponding to the lower engagement hole 27B.

The connecting member 7 and bracket member 8 of each bracket 6 are integrally formed by pressing into an L shape. The connecting member 7 has a front plate portion 31 abutable to one side of the outer plate portion 21 of each support post 2, a side plate portion 32 bent 90° from the front plate portion 31 and abutable to one side plate portion 23 of the support post 23, and a locking plate portion 33 bent rectangularly at the edge of the front plate portion 31 toward the support post 2 and whose inner side is abutable to one side plate 25b of the strengthening groove 25. The locking plate portion 33 has, at upper and lower ends thereof, engaging projections 34A, 34B integrally formed therewith by pressing or otherwise which are insertable into the engagement holes 27A, 27B. The engaging projections 34A, 34B are formed at their respective lower ends

with locking pawls 35A,35B adapted to be locked to the rear surface of the respective bottom plates .25a of the engagement holes 27A,27B.

Each bracket member 8 includes a front plate 36 continued evenly from the lower end of front plate portion 31 of the connecting member 7, an upper plate 38 continued from the side plate portion 32 of the connecting member 7 through a curved portion 37, and a lower plate 39 bent 90° rearward along the lower end of the front plate 36 so that it has a channel shaped section. The bracket member 8 is provided at its front end with an end plate 40 having a connecting hole 40a. The proximal end of the lower plate 39 which abuts one side plate portion 23 of the support post 2 when the rack is assembled into shape is formed with a slip-off preventing projection 41 engageable with the slip-off prevention hole 28.

A strengthening raised portion 45 having an L shape as viewed in front elevation is formed by pressing on a combination of the front plate portion 31 of the connecting member 7 and the front plate 36 of the bracket member 8. This strengthening raised portion 45 prevents a strain 46 from being caused to the front plate portion 31 as shown in FIGS. 4 and 5 when a large load W is applied to the front end portion of the bracket member 8 as shown in FIG. 2.

To mount the bracket 6 to the support post 2, the engaging projections 34A,34B of the bracket 6 are inserted into the

corresponding engagement holes 27A, 27B from the position shown by solid line in FIG. 1 (in which case the slip-off preventing projection 41 is in abutment with one side plate portion 23 at a level above the slip-off preventing hole 41 through elastic deformation of the connecting member 7), then the bracket 6 is moved downward. The engaging pawls 35A, 35B are locked to the rear surface of the bottom plate 25a at positions below the engagement holes 27A, 27B, and the slip-off preventing projection 41 is fitted in the slip-off preventing hole 28. In this manner the bracket 6 can be easily and securely fixed to the support post 6.

Each bracket rail 9 has a channel-like configuration with a longitudinally extending groove portion 43 formed centrally of a connecting face 42, and is adapted to receive the front end of the bracket member 8 into a recessed portion thereof. A rivet or bolt is fitted into a connecting hole 44 formed in a bottom plate 43a of the groove portion 43 and into a connecting hole 40a of the end plate 40, whereby the bracket rail 9 is fixedly connected to the bracket member 8.

According to the above described arrangement, a load W applied to the front end of the bucket 6 via the bracket rail 9 because of goods 11 forms a turning moment M about point P at the proximal end of the bracket member 8 as shown in FIG. 2 thereby to urge the top portion of the connecting member 7 in the direction of the turning moment M . However, the connecting

member 7 can positively sustain the moment M since it holds a raised portion of the support post 2 consisting of the outer plate portion 21, side plate portions 23, and side plates 25b of the groove portion 25, in position through effective utilization of the depth D of the strengthening groove 25 and by means of the side plate portions 32, locking plate portion 33, and engaging projections 34A, 34B, and thus it can withstand a large load W . Furthermore, the strengthening raised portion 45 formed in continuation of the front plate portion 31 and front plate 36 serves to prevent a strain which may otherwise be caused to the front plate portion 31 by load W . In addition, since the slip-off preventing projection 41 engages the slip-off preventing hole 28, the bracket 6 will never become disengaged from the support post 2, even if any vibration due to incoming and outgoing movement of goods 11 is transmitted to the bracket 6.

FIG. 7 shows another embodiment of the invention. In this embodiment, each support post 2 has no strengthening groove 25 provided therein, and instead engagement holes 27A, 27B are formed centrally in the outer plate portion 21 of the support post 2. Therefore, the locking plate portion 33 is eliminated from the connecting member 7, and the engaging projections 34A, 34B are bent directly from the front plate portion 31. In this case, the strengthening raised portion 45 exhibits greater strengthening effect inasmuch as the front plate portion 31 is not strengthened by the locking plate portion 33 and thus the front plate portion

31 can be prevented from possible strain as well.

FIGS. 8 through 12 illustrate a further embodiment of the invention. In this embodiment, the construction of each support post 2 in particular is different from that of the embodiment shown in FIG. 7. More specifically, the outer plate portion 21 has a flat configuration as in the FIG. 7 embodiment, and is formed with upper and lower engagement holes 27A, 27B, one each, on a center line 20 thereof. The height of each engagement hole 27A, 27B is so fixed that engaging projections 34A, 34B can be respectively received therein, and its width is so fixed that two engaging projections can be received therein. For each support post 2 located at one end of the rack 1, the width of the engagement hole may be just sufficient to receive one engaging projection. In each support post 2, the connecting plate portions 26 are each formed at its front end with a flange 26a.

According to such arrangement, to assemble the rack 1 into shape, brackets 6 are first mounted to each support post 2. As FIG. 12 shows, the lower projection 34B is brought into engagement with the corresponding engagement hole 27B while the bracket 6 is held in tilted condition, and then the bracket 6 is erected up to allow the upper engaging projection 34A to engage the engagement hole 34B. Thus, the bracket 6 is put in position ready for attachment to the support post 2 with an inclination of 15 to 30° relative to the support post 2, as shown.

Subsequently, the bracket 8 is lowered to allow the locking

pawls 35A,35B to be locked to the lower edge of the engagement holes 27A,27B, whereby the slip-off preventing hole 28 and the slip-off preventing projection 41 are leveled. Then, the bracket 6 is pivotally moved about proximate positions for engagement of the engagement holes 27A,27B with the locking pawls 35A,35B as shown by arrow A in FIG. 12. Thereupon, the projection 41 is received in the slip-off preventing hole 38, and the side plate portion 32 goes into abutment with the side plate portion 23, so that bracket 6 mounting is completed. In this case, as FIG. 9 shows, the abutting width B of the front plate portion 31 of the bracket 6 is almost equal to the widthwise distance C from the edge of the outer plate portion 21 to the center line 20, and therefore the bracket 6 can be securely mounted in position.

FIGS. 13 to 18 illustrate a still further embodiment of the invention.

In these drawings, the bracket rail 9 has an upper plate 52, a side plate 53, and a lower plate 54, so that it is channel-shaped in section and fittable on the front end portion of the bracket member 8. The side plate 43 is formed at a specified location with a round shaped recessed portion 55 having a through-hole 56 formed centrally thereof which is adapted to match a connecting hole 40a. The holes 40a, 56 are fixedly connected by a rivet 57 or bolt after they are allowed to match each other, in which case a head 57a of the rivet 57 is fitted in the recessed portion 55. The bracket rail 9 can be fabricated by

passing a hoop formed with a recessed portion 55 and a through-hole 56 through a conventional roll mill for channel section material forming. It may be obtained in various sizes by effecting positional changes with respect to the mold.

As FIG. 6 shows, the rack 1 can store goods 11 therein in a plurality of tiers. As shown in FIG. 13, a topmost one of the bracket rails 9 which usually has no brace 10 is provided at the rear end thereof with an upwardly extending stopper member 58 which is fixed by a rivet 57. The stopper member 58 is of an L-shaped plate form and has a connecting plate portion 58a insertable into the bracket rail 9, and a stopper plate portion 58b projecting upward at the rear end of the bracket rail 9. As already stated, the side plate 53 of each bracket rail is formed with a recessed portion 55, which in turn forms an inwardly raised round protrusion 59. The connecting plate portion 58a is formed with a mounting hole 60 fittable on the round protrusion 59. The thickness of the connecting plate portion 58a is equal or about equal to the thickness of the round protrusion 59. Therefore, the mounting hole 60 is set so as to be ready for receiving the round protrusion 59 before coupling by the rivet 57, whereby the stopper member 58 can easily be fixed to the rear end of the bracket rail 9 through coupling by the rivet 57.

In the case of such construction, coupling of each bracket 8 and the associated bracket rail 9 is made through rivet 57 at the fabricating factory, in which case the stopper member 58 is set

in position. For each pair of support posts 2 integrally connected depthwise of the rack through horizontals 3 and bracings 4, engaging projections 34A, 34B of associated brackets 8 are brought in engagement with engagement holes 27A, 27B of the support posts 2, whereby a temporary rack assembly is made. Such temporary rack structures are stacked one over another, which are transported together with horizontal beams 5 and braces 10 for assembly into a complete rack at the erection site.

In an automatic warehousing facility, loading and unloading of goods 11 (pallets) onto and from the rack assembly 1 constructed in manner as above described are carried out by suitable handling means and/or a forklift. For this purpose, loading of incoming goods is carried out in such condition that goods 11 are prevented from contacting the stopper member 58 as shown by phantom lines in FIG. 18. In the event that the goods 11 should be moved off position depthwise of the rack on account of mishandling, earthquake or otherwise, the goods 11 would come in contact with the stopper member 58.

In the above described embodiment, a stopper member 58 is provided in each topmost bracket rail 9 which has no brace 10. Alternatively, the stopper member 58 may be provided in a lower bracket rail 9.

A laterally extending stopper member 61 is attached to each bracket rail 9 at a mid-point of the length thereof (as viewed depthwise of the rack). More particularly, the side plate 53 of

the bracket rail 9 is formed with mounting holes 62, one located slightly inward of the front end of the bracket rail 9 and the other located slightly before the rear end thereof. The stopper member 61 is of a bent plate shape and comprises a connecting plate portion 63 insertable into the bracket rail 9, an arm plate portion 64 bent rectangularly outward from the upper end of the connecting plate portion 63, and a stopper plate portion 65 rectangularly upward from a free end of the arm plate portion 64. The connecting plate portion 63 is formed with a mounting hole 66 registerable with the mounting hole 62. Therefore, the stopper member 61 can be fixedly connected to the bracket rail 9 by driving a rivet 67 (one example of connecting means, which may alternatively be a bolt and a nut; or such connection may take the form of welding) into the mounting holes 62, 66 when the two holes are registered with each other.

In the case of such construction, at the fabricating factory the bracket 8 and the bracket rail 9 are connected to each other by means of the rivet 57 and, at same time, the laterally extending stopper member 61 is coupled to the bracket rail 9 by means of the rivet 67.

Loading and unloading of goods 11 onto and from rack provided with such stopper member 61 are also carried out by suitable handling means or a forklift as earlier stated. For the purpose of storing incoming goods, arrangement is made for preventing the goods from contacting the stopper member 61; but

in the event that the goods 11 should be moved laterally on account of earthquake or otherwise, the goods are stopped by the stopper plate portion 65 of the stopper member 61.

FIGS. 19 to 21 illustrate another embodiment of the invention. As shown in the drawings, the bracket rail 9 and bracket 8 are differently colored from the support post 2 with respect to their entire outer surface. Such distinction in color may be effected by fabricating the bracket rail 9 and the bracket 8 by using such material as is different from that of the support post 2, or by applying two coats of a paint 68 as shown in FIG. 20. The paint may be applied in one coat, or three or more coats. For the paint, a rust preventive paint may be used.

According to such arrangement, bracket rails 9 and brackets 8 can be distinctly relieved against support posts 2, etc., whereby the size or number or tiers of the rack 1 can easily be recognized. Any off-position of stored goods 11 can readily be found out. Also, the fork of the forklift truck can be easily and accurately leveled to position. When the fork contacts the bracket rail 9, the paint 68 will come off, so that the base material of the bracket rail 9, or an inner layer paint of a different color may be exposed. Thus, it is possible to know that such contact has occurred. In the foregoing embodiment, both the bracket rail 9 and the bracket 8 are differently colored from the support post 2. Alternatively, the bracket rail 9 only may be differently colored.

FIGS. 22 to 26 show another embodiment of the invention. As is shown in FIG. 21 with respect to the previous embodiment, brace mounting plates 71 are provided a respective intersections between adjacent support posts 2 and associated horizontal beams 5, and braces are diagonally mounted between each pair of diagonally opposed brace mounting plates 71.

As FIGS. 22 to 25 show, each brace mounting plate 71 is a rectangular plate whose horizontal sides are slightly longer than its vertical sides, and has a pair of cut-raised pieces 72, right and left, centrally formed in inwardly opposed relation, and a rectangular through-portion 73 formed by utilizing the corresponding cut-off portion. An abutting member 74 set from the inner side in opposed relation to the through-portion 73 is C-shaped and has an abutting portion 74a for abutment against the support post 2, and a pair of bent portions 74b, upper and lower, which are bent outward from and rectangularly to the upper and lower ends of the abutting portion 74a. The front ends of the bent portions 74b are fixed by welding to the brace mounting plate 71 at locations above and below the through-portion 73, and the front ends of the cut-raised portions 72 are fixed by welding to the abutting portion 74a. Shown by 75, 76 are weld portions. The abutting portion 74a is formed with four (a plurality of) rivet holes 77 in opposed relation to the through-portion 73 for connection with the support post 2, and the support post 2 is formed with rivet holes 78 at corresponding locations which are

registerable with the rivet holes 77. At each corner portion of the brace mounting plate 6 there is formed a bolt hole 79 for connecting a brace 10 thereto, and intermediately between each vertically aligned pair of the bolt holes 79 there are formed bolt holes 80 for connecting a horizontal beam 5 to the brace mounting plate 6. Each brace mounting plate 6 for use at one end of the rack 1 is cut away at one end as shown in FIG. 26.

In the case of the above described arrangement, at the fabricating factory the abutting portion 74a is put in abutment with the outer surface of the support post 2 for registration of the rivet holes 77,78, and a rivet 81 is driven through the rivet holes 77,78 so that the abutting member 74 is fixed to the support post 2. Driving of the rivet 81 can be readily carried out via the through-portion 73. Brackets 6 are temporarily set to support posts 2 thereby to form a large number of partial rack structures.

At the erection site, partial rack structures are erected in parallel relation and, at the rear side thereof, laterally adjacent brace mounting plates 71 are connected together by horizontal beams 5. This connection can be effected by registering bolt holes of each horizontal beam 5 with corresponding bolt holes 80, then tightly fixing them with bolts and nuts 82. Braces 10 to be arranged in cross pattern have bolt holes 83 at their respective ends. The bolt holes 83 are brought in registration with corresponding bolt holes 79, then tightly

fixed together by means of bolts and nuts 84, whereby the brace 10 and the corresponding brace mounting plate 71 are fixedly connected together.

According to such arrangement, an abutting member 74 is first put in abutment against each support post 2, and then rivets 81 are driven into position through rivet holes 77,78, whereby a brace mounting plate 71 can be accurately fixed to the support post 2. Riveting can be carried out easily and efficiently through the through-portion 73. The brace mounting plate 71 and the abutting member 74 can be tightly connected together through a plurality of cut-raised pieces 72 and bent portions 74b. This assures long-time use without incurring damages.

FIGS. 27 to 35 show another embodiment of the invention.

In these drawings, a seating member 12 comprises a pair of side plate portions 92 erected by welding on a base plate 91 and abutable against the outer surface of the side plate portion 23 of a support post 2, and a front plate portion 93 abutable against the outer surface of the outer plate portion 21 of the support post 2, and has a C-shape structure formed by the side plate portions 92 and the front plate portion 93 in combination. The side plate portions 23 of the support post 2, at respective lower ends thereof, and the side plate portions 92 of the seating member 12, are respectively formed with connecting holes 23a,92a. The lower end of support post 2 is fitted in the plate portions

92,93 of the seating member 12, and a pin 95 (one example of connecting means) is fitted into each of the connecting holes 23a,92a. Then, slip-off preventing means is provided by caulking or otherwise. Thus, the seating member 12 is securely mounted to the support post 2.

Shown by 96 is a leveling adjuster which comprises a nut member 98 fixed to the underside of the base plate 91 in corresponding relation to a through-hole 97 formed centrally of the base plate 91, a fixing plate 99, and a bolt member 100 rotatably erected on the fixing plate 99 and threadingly engageable with the nut member 98. The fixing plate 99 is fixed to a floor 103 through engagement of a bolt 101 with a fixing cut-out hole 102. The adjuster 96 is employed in an automatic warehousing facility or the like facility in which level adjustment of bracket rails 9 is required. Where no such adjuster 96 is provided, a base plate 91 formed with a fixing cut-out hole 104 is mounted directly to the floor 103, as shown in FIG. 29.

FIGS. 30 and 31 show a modified form of seating member 12. In this example, a pair of side plate portions 112 are erected by welding on a base plate 111, the side plate portions 112 being abutable against the underside of the side plate portions 23 of the support post 2. The seating member 12 is connected to the support post 2 by inserting a pin into connecting holes 112a,23a formed respectively in the side plate portions 112 and support post 2.

In the case of the above described arrangement, plate portions 92,93,112 are abutable against the outer surface of the side plate portions 23 and outer plate portion 21 of the support post 2. Alternatively, they may be made abutable against the inner surface.

According to such arrangement, the seating member 12 can easily be mounted to the lower end of the support post 2. Also, by giving some allowance to the connecting portion it is possible to adjust the connecting portion to meet the condition of floor surface at the erection site. Further, since the support post 2 can be transported without the seating member 12 being mounted thereto, there is no possibility of the seating member 12 being a cause of a trouble during transport.

As shown, for the horizontal 3 and bracing 4 to be mounted between support posts 2, channel material is used which has a pair of side plates 3a,4a opposed to each other and connecting plates 3b,4b whose respective side edges connect the side plates 3a,4a. As FIG. 27 shows, a pair of support posts 2 are disposed in opposed relation, one at the inner side and the other at the front side. Between connecting plate portions 26 formed with connecting holes 115 are inserted with a horizontal 3 and a bracing 4 which have side plates 3a,4a formed with connecting holes 116. A pin 117 is inserted into the connecting holes 115,116, then caulking is effected whereby the horizontal 3 and bracing 4 are fastened in position. As FIG. 32 shows, the

horizontal 3 and bracing 4 is each formed with a strengthening portion 118 such that connecting plate 3a,3b is bent back between the side plates 3a,4b toward the proximity of the connecting hole 116, whereby the horizontal 3 and bracing 4 are prevented from becoming deformed by tightening of the pin 117. For the connecting means, one long pin 117 only which extends through the connecting plate portions 26 may be used, or as FIG. 33 shows, two rivets 121, one for each connecting plate portion 26, may be used.

FIG. 34 shows another modified form. The combined strength of the support post 2 and the horizontal 3 or bracing 4 is greatly influenced by a shear strength over a distance l between the connecting hole 115 and the front edge of the connecting plate portion 26. In view of this fact, a bent back portion 119 formed by bending 90° the front edge of the connecting plate portion 26 laterally is provided which extends over the entire length of the connecting plate portion 26, to improve the shear strength of the connected portion.

FIG. 35 shows another modified form. The space d between slits 24 in the support post 2 is rather narrow. In this case, ends of the horizontal 3 and bracing 4 are formed flat by pressing or otherwise, which are inserted between connecting plate portions 26 and fixed by rivet 120. In this modified form, a cylindrical pipe may be used for the horizontal 3 and bracing 4.

For the connecting means, bolts and nuts may be used in place of above mentioned pins 117 or rivets 120,121.

According to the above described arrangement, the horizontal 3 and bracing 4 are inserted between the connecting plate portions 26 of the support post 2 and fixed by connecting means, whereby assembly work can easily be carried out at the erection site. This eliminates the need for welding operation during assembly work, permits transport of the rack 1 in the form of unit parts, and thus enables transport cost reduction.



WHAT IS CLAIMED IS:

1. A rack assembly including vertically extending support posts disposed at least at four corners of the assembly, brackets disposed on transversely adjacent support posts at opposed positions such that the brackets on each of the support posts project toward the other support post, and bracket rails each of which extending between adjacent brackets located depthwise of the rack assembly and capable of supporting goods placed in the rack assembly, wherein:

2. A rack assembly including vertically extending support posts disposed at least at four corners of the assembly, brackets disposed on transversely adjacent support posts at opposed positions such that the brackets on each of the support rods project toward the other support post, and bracket rails each of which extending between adjacent brackets located depthwise of the rack assembly and capable of supporting goods to be placed in the rack assembly, comprising :

connecting means for each of said bracket rails to a corresponding bracket, and

an upwardly extending stopper member fixed by said connecting means to the depthwise rear end of each bracket rail.

3. A rack assembly including vertically extending support posts disposed at least at four corners of the assembly, brackets disposed on transversely adjacent support posts at opposed positions such that the brackets on each of the support posts





project toward the other support post, and bracket rails each of which extending between adjacent brackets located depthwise of the rack assembly and capable of supporting goods to be placed in the rack assembly, comprising:

a widthwise stopper member mounted intermediate portion of the length of each said bracket rail.

4. A rack assembly including a plurality of vertically extending support posts and braces individually connected to the support posts through mounting means, said mounting means comprising:

a brace mounting plate,

a plurality of cut-raised pieces formed in the brace mounting plate,

a through-portion defined by a cut-off corresponding to said cut-raised portion of the brace mounting place, and

an abutting member for abutment against a corresponding support post disposed in opposed relation to said through-portion and having a plurality of bent portions bent back toward the brace mounting plate,

the front end of said bent portion being welded to the brace mounting plate, the front ends of said cut-raised pieces being welded to the abutting member, and

mounting holes formed in opposed relation to said through-portion of said abutting member and positioned in corresponding relation to the support post.



FIG. 1

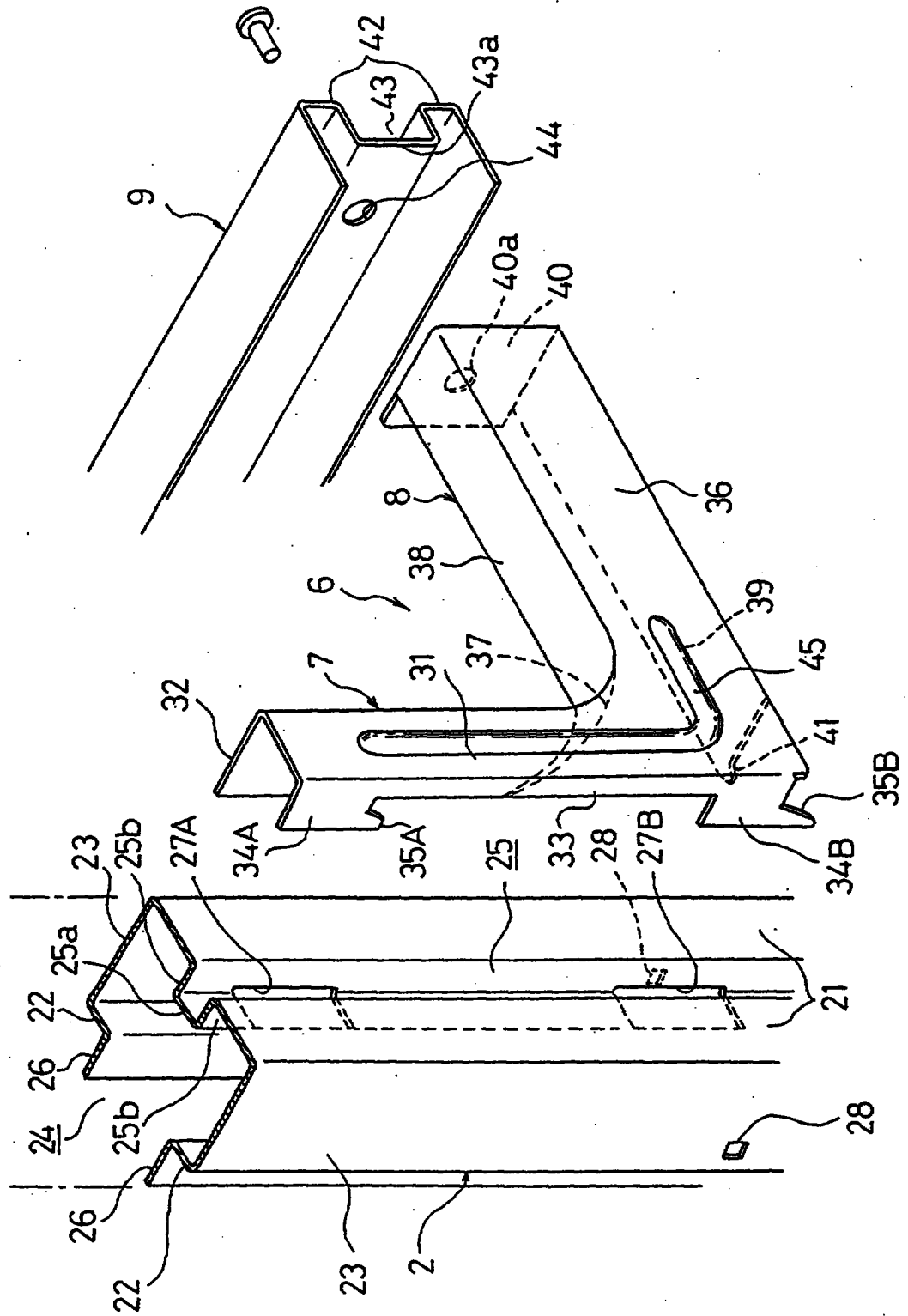


FIG. 2

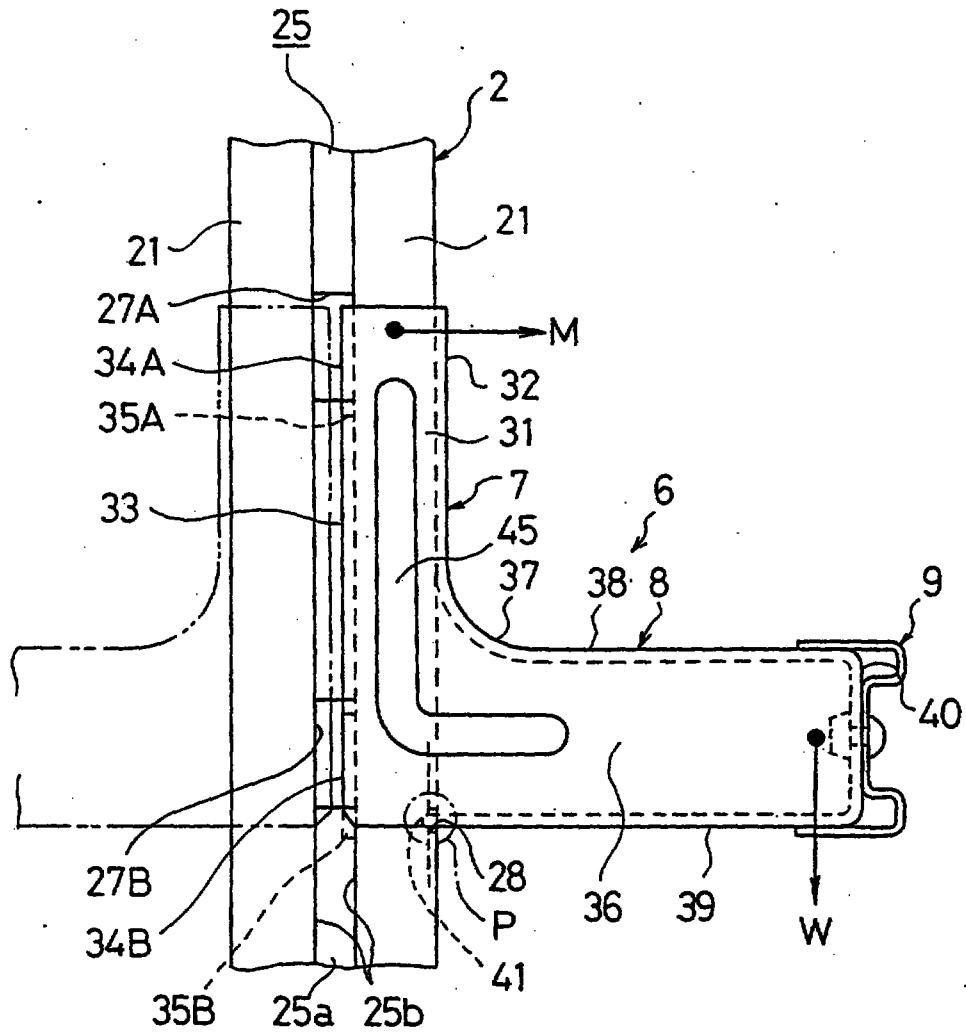
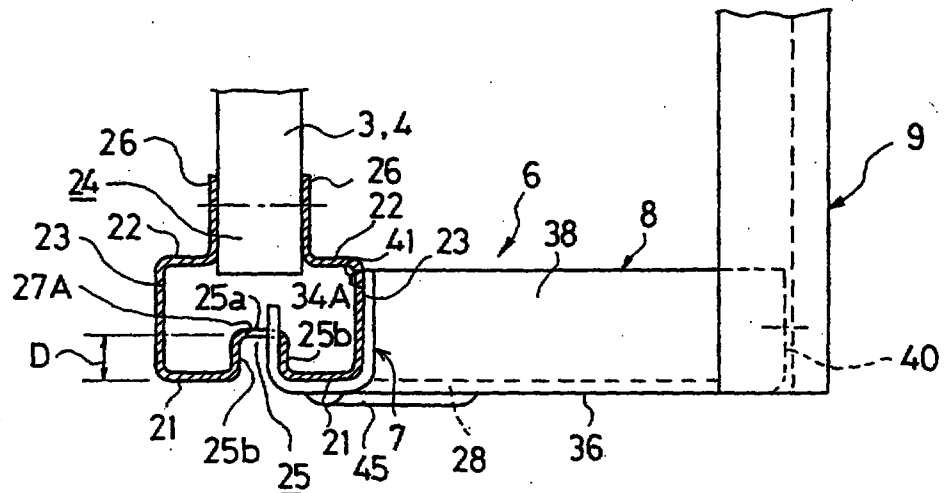


FIG. 3



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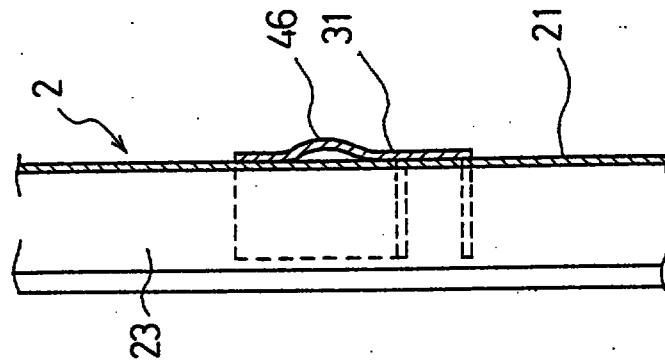
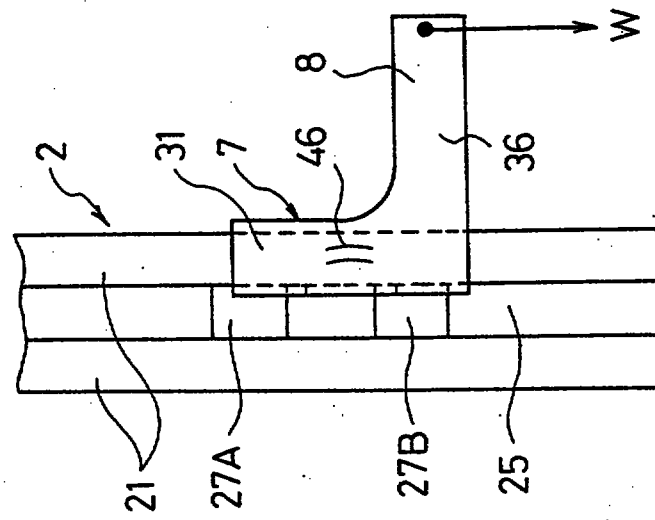


FIG. 4



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FIG. 6

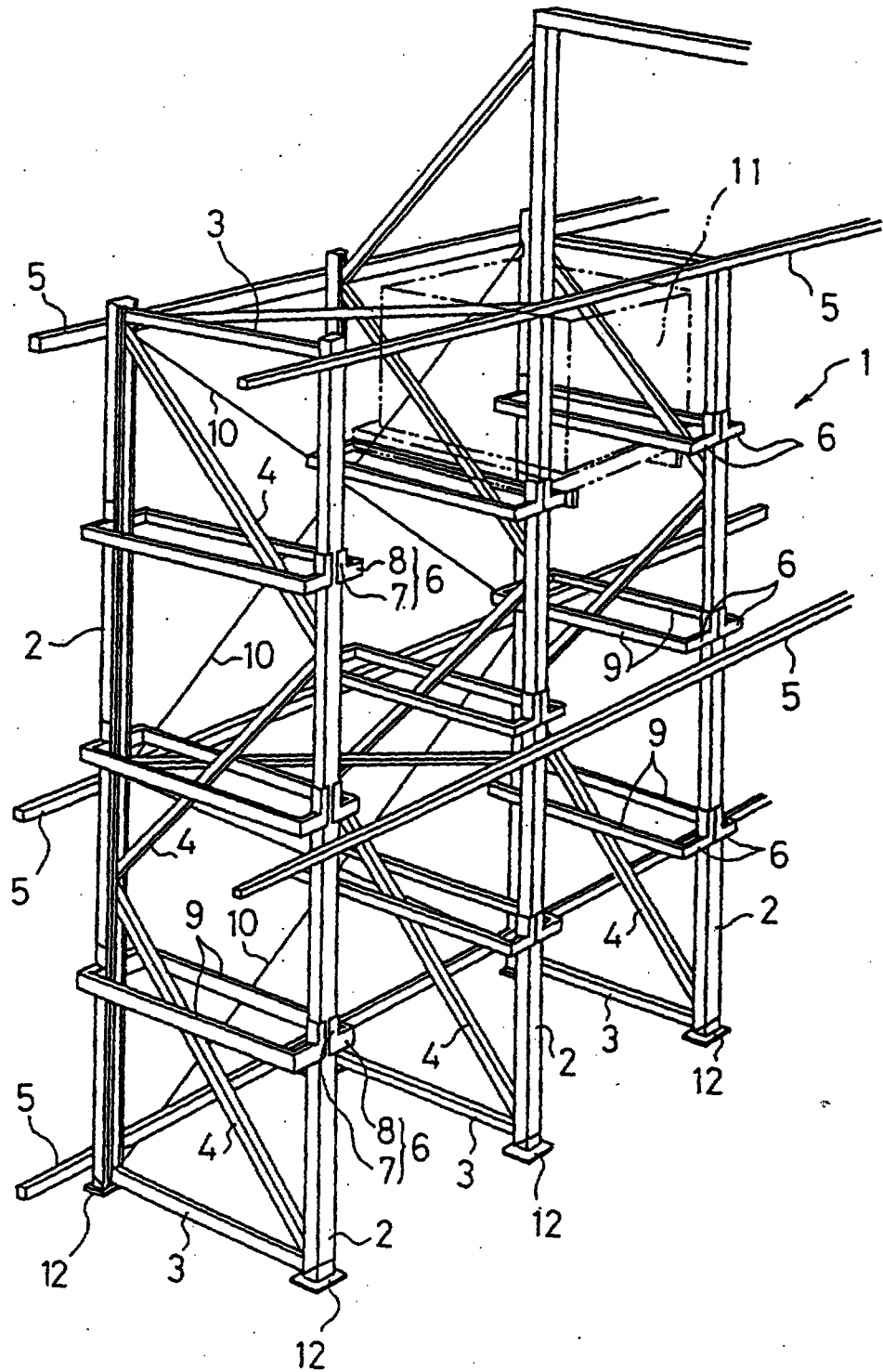


FIG. 8

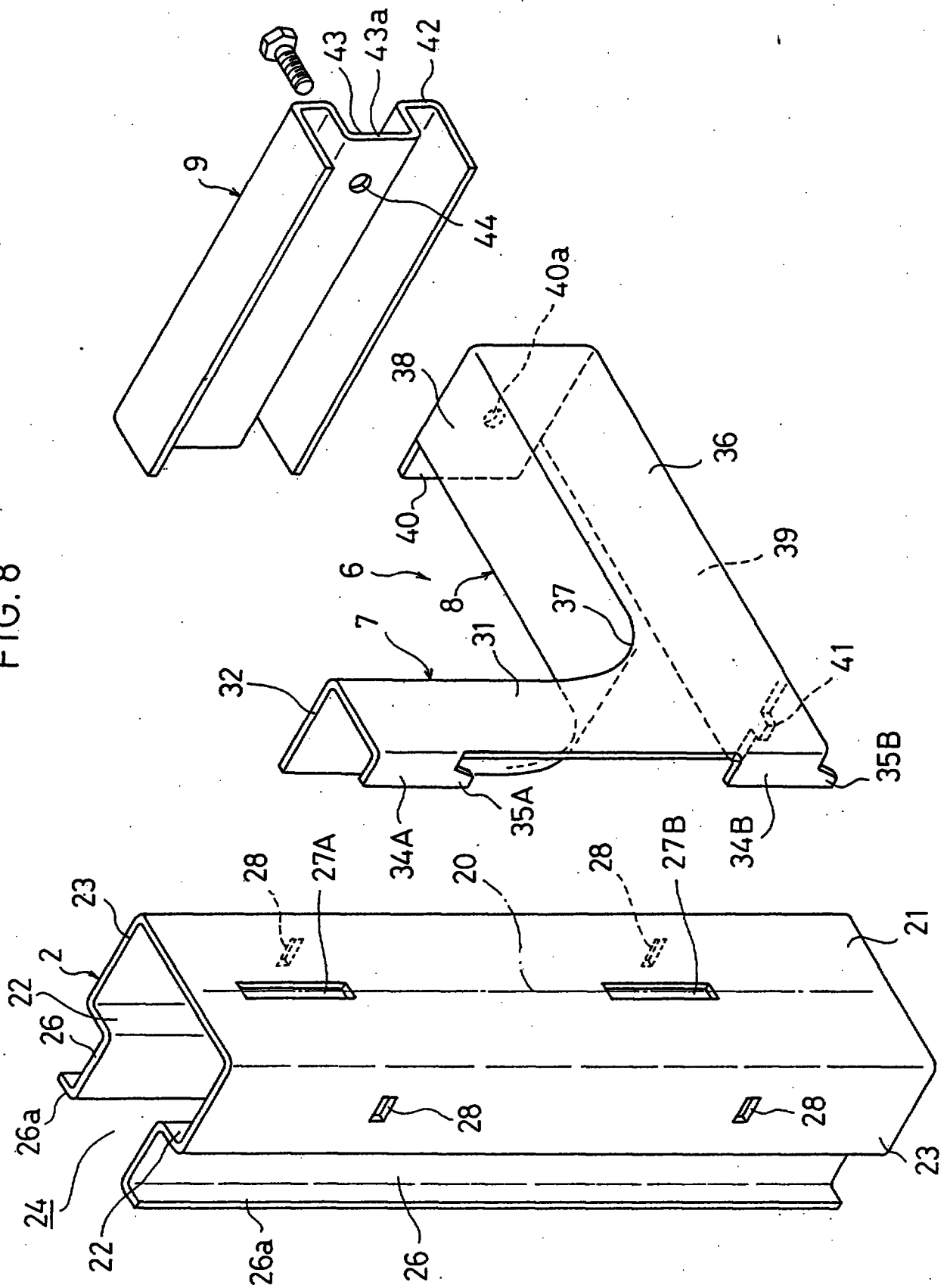


FIG. 9

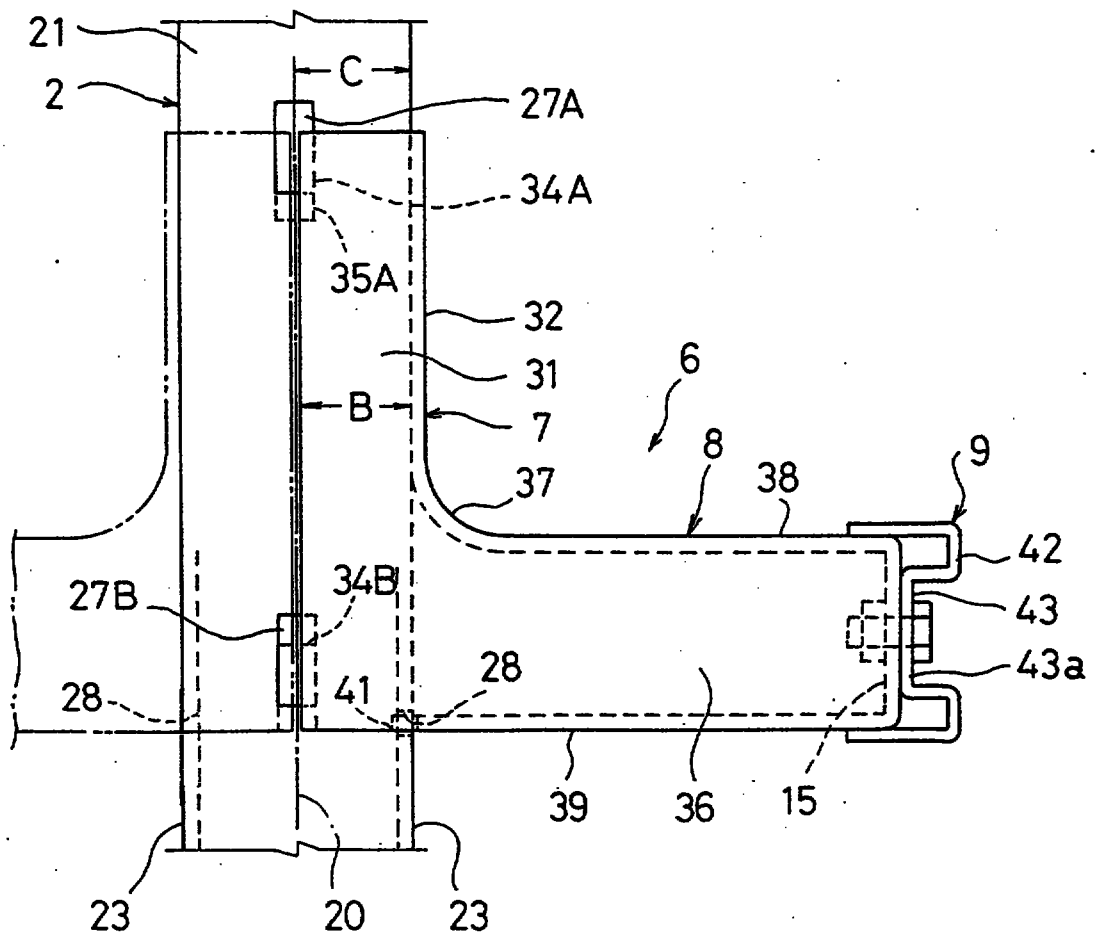
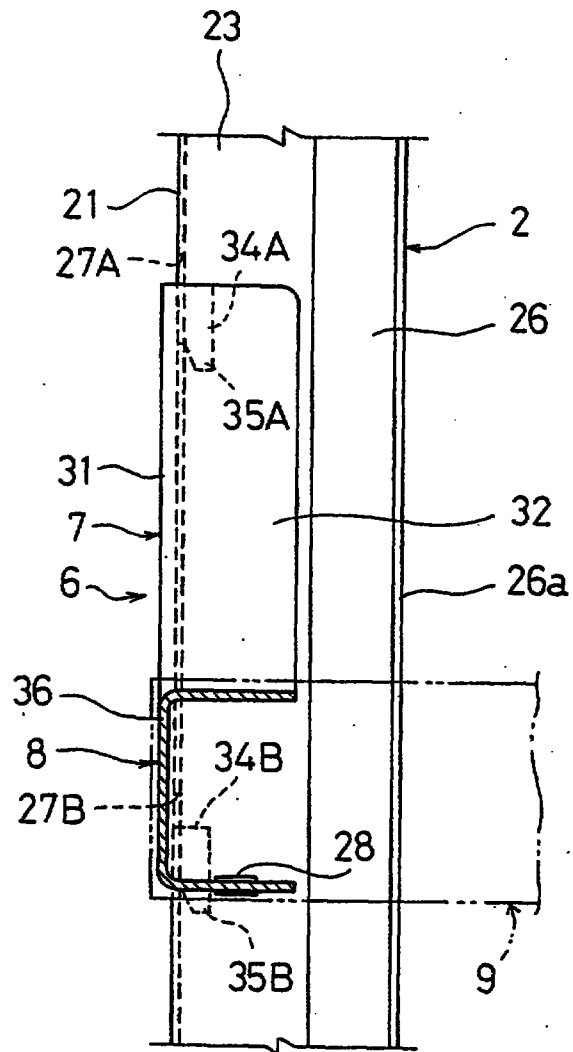


FIG. 10



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FIG.11

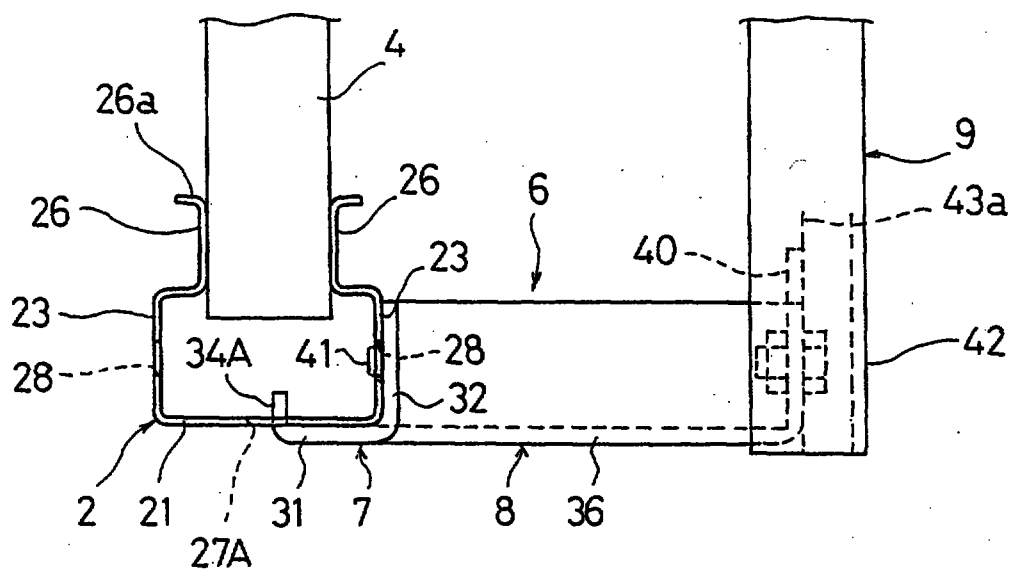
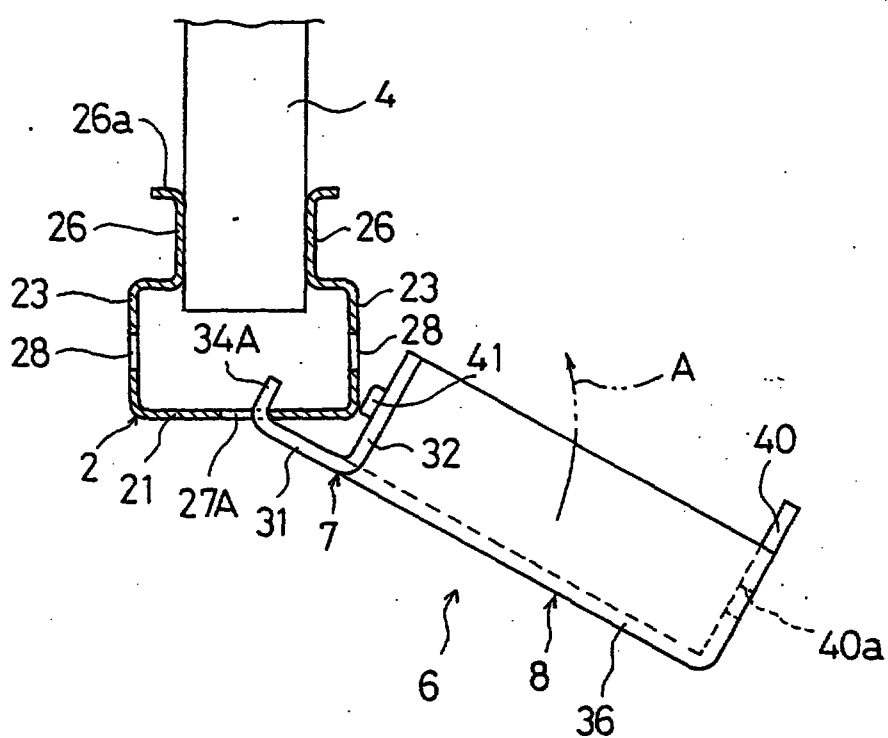


FIG.12



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FIG. 14

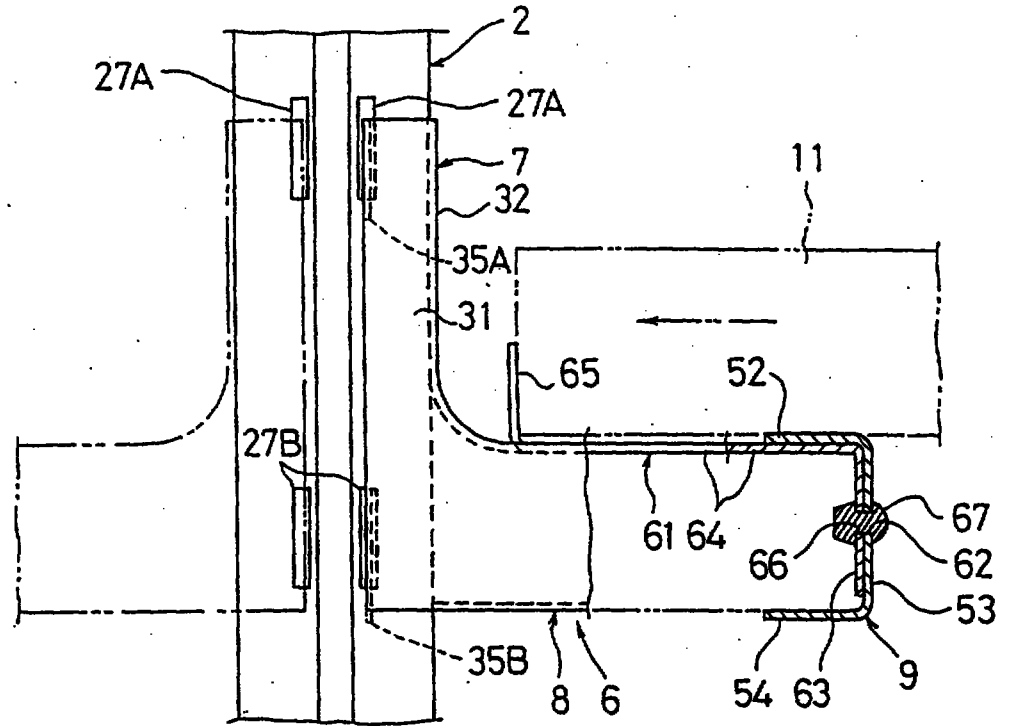


FIG. 15

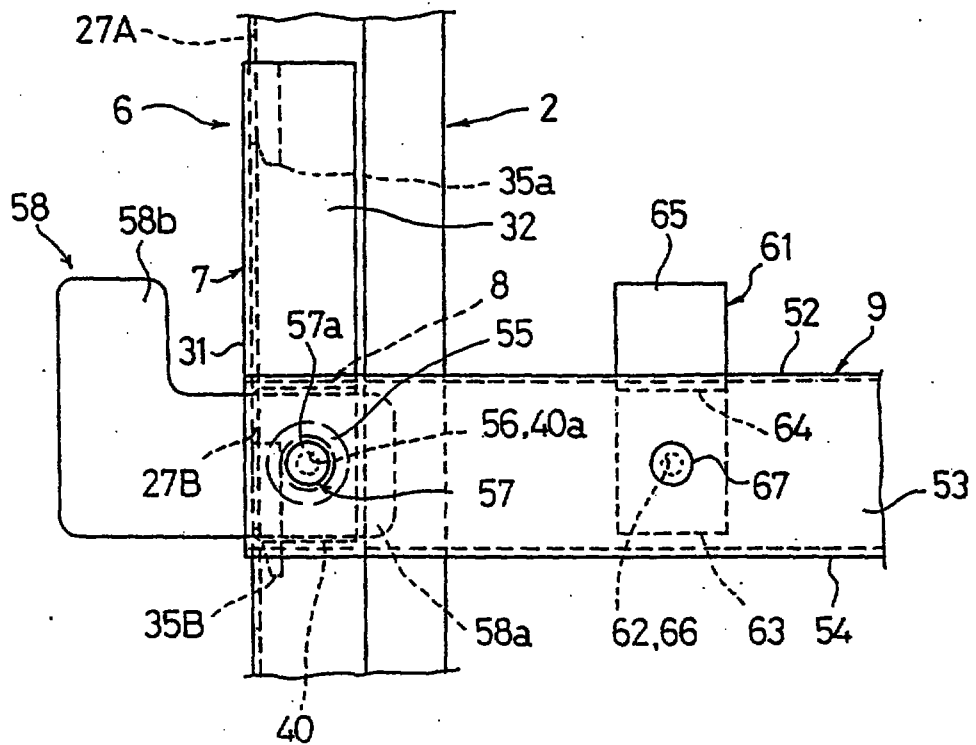


FIG. 16

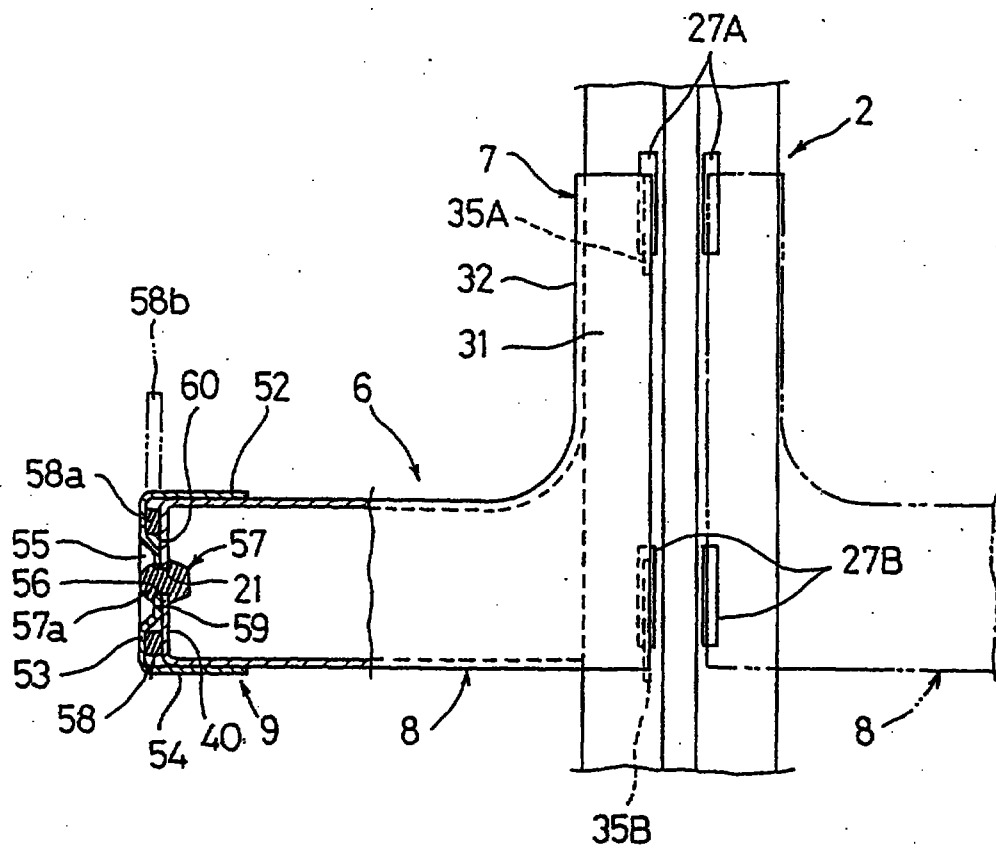


FIG. 17

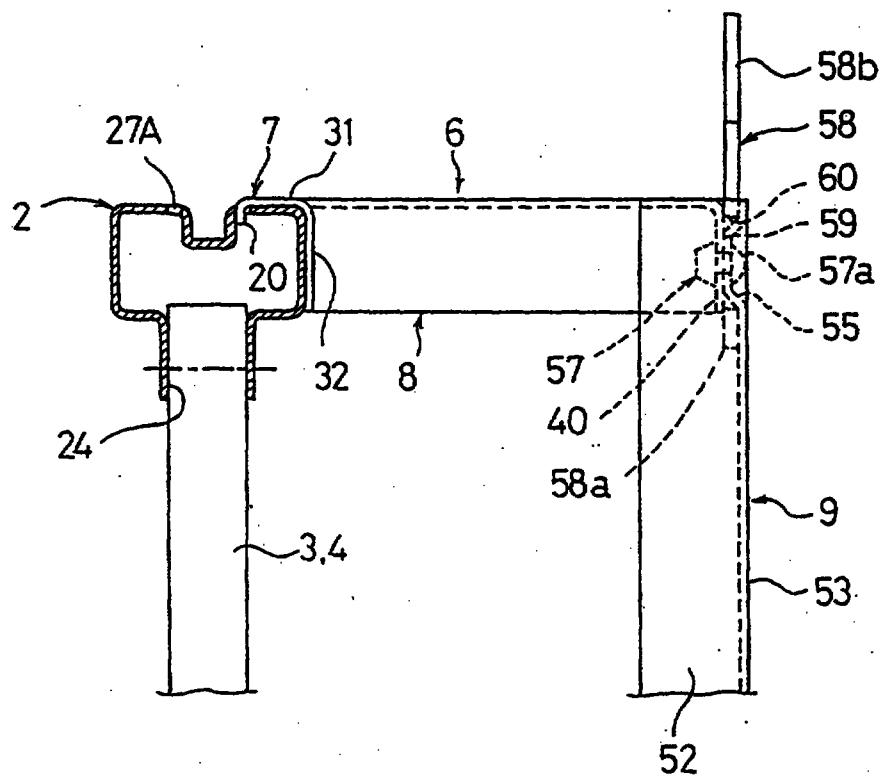


FIG.18

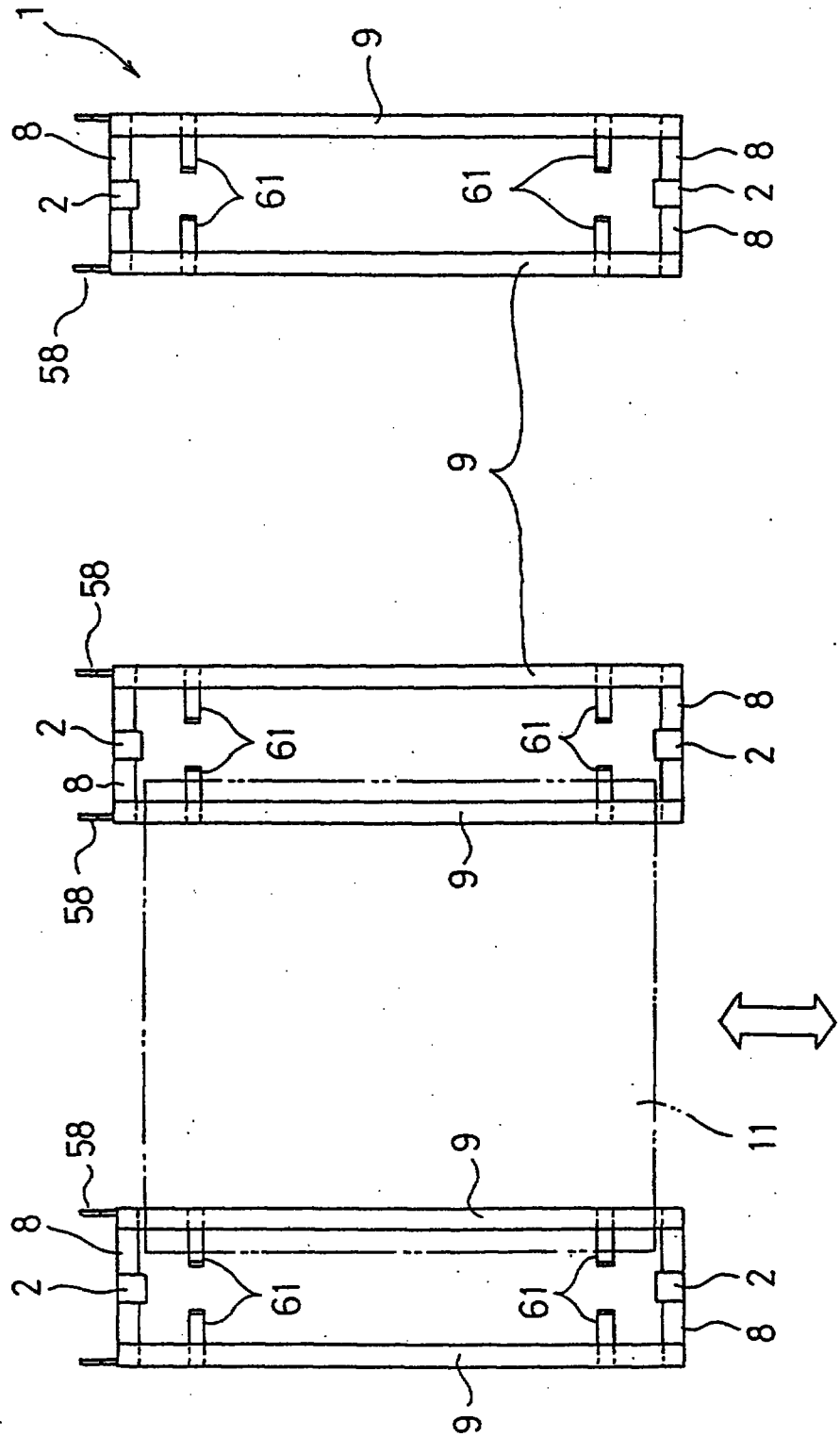


FIG.19

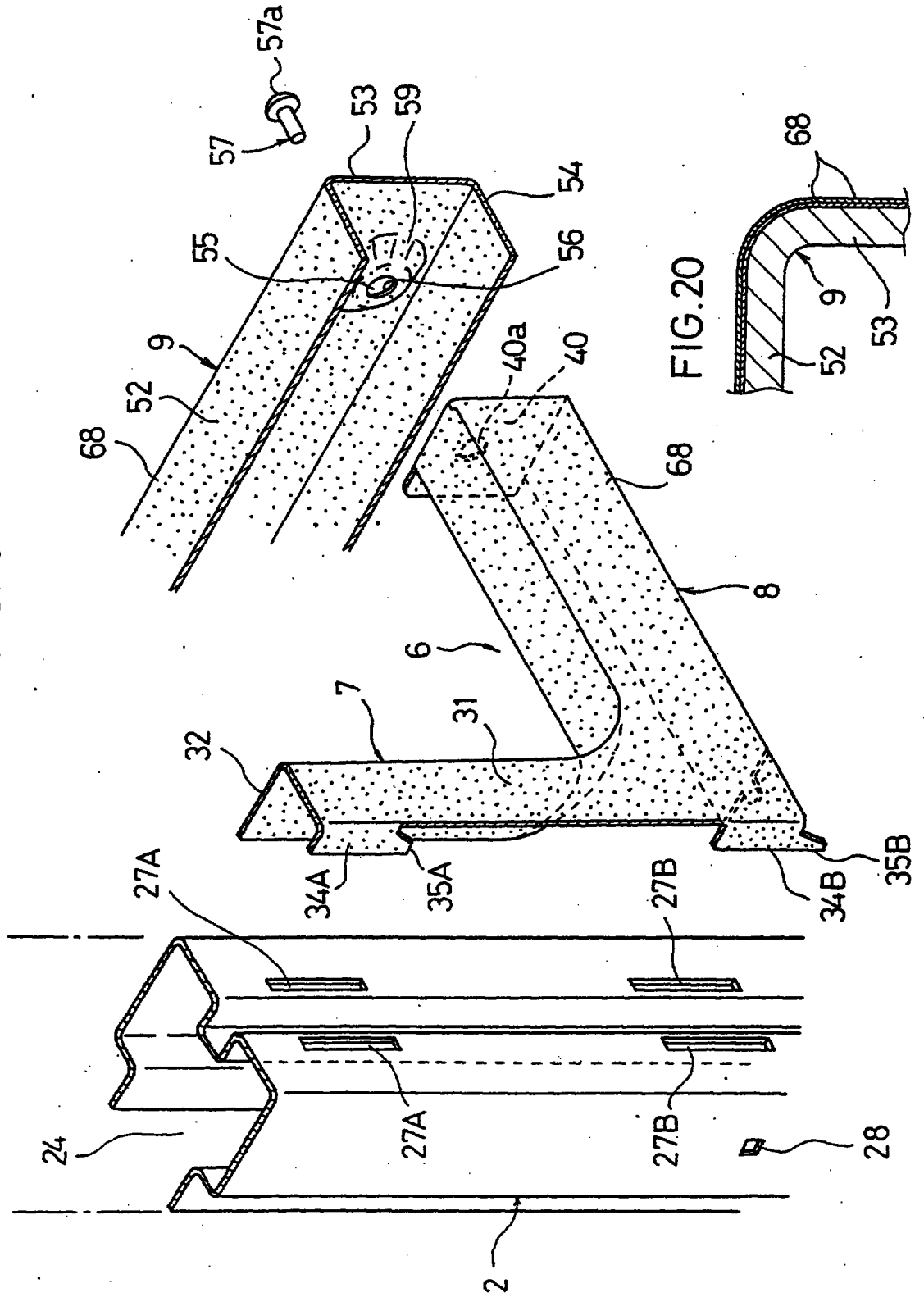


FIG.20

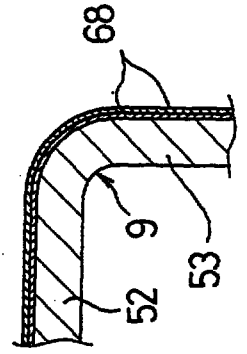
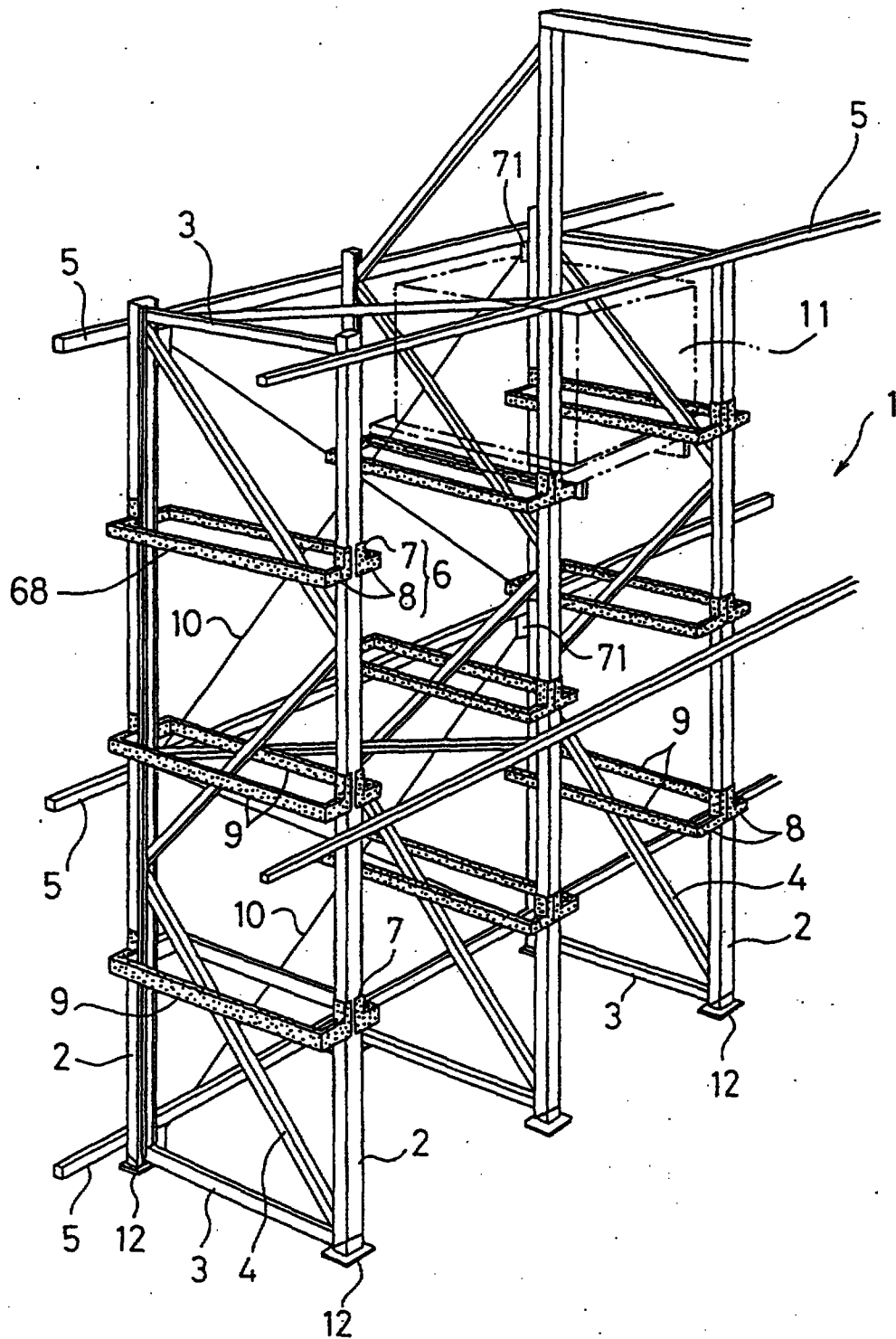
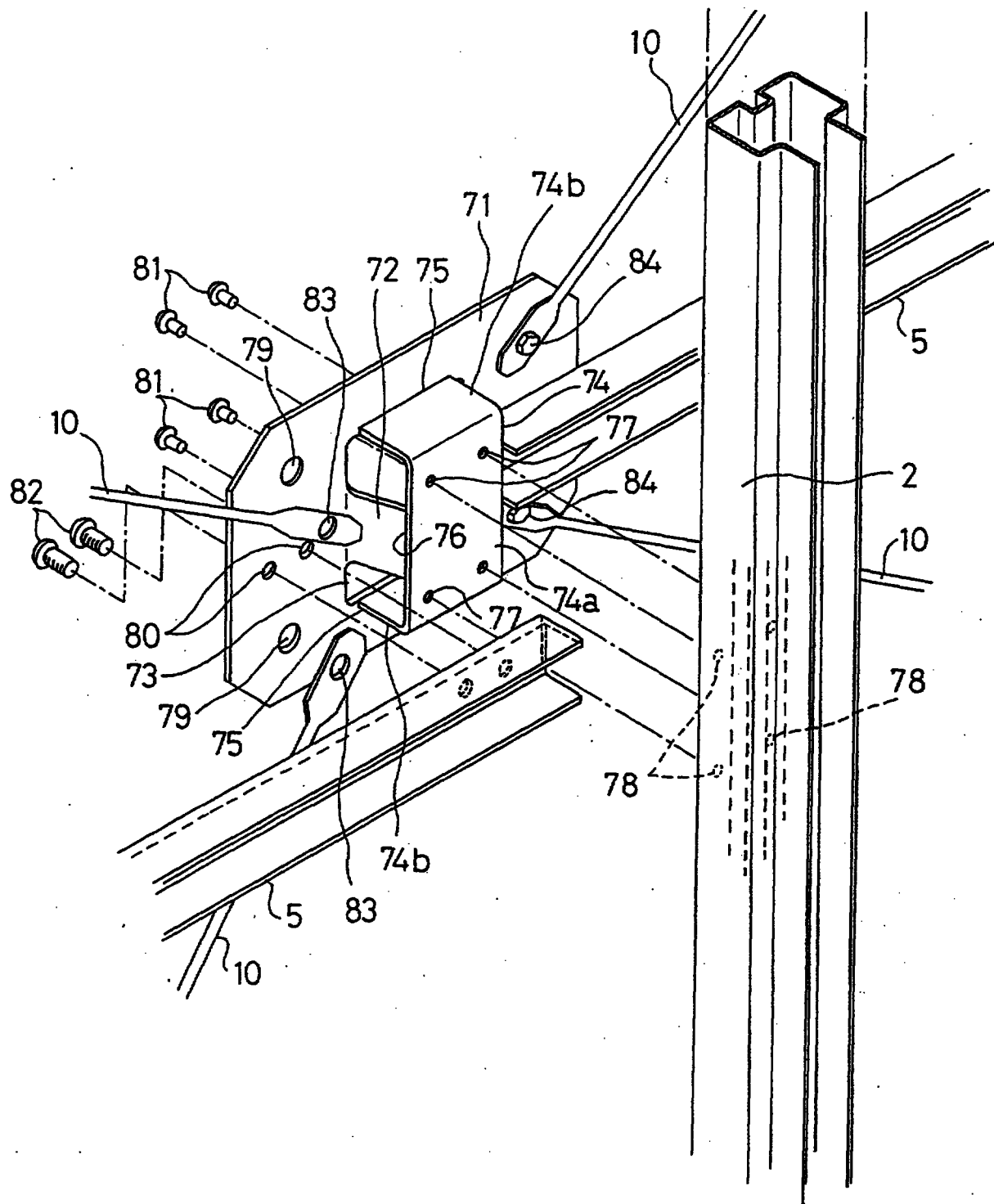


FIG. 21



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FIG. 22



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FIG. 23

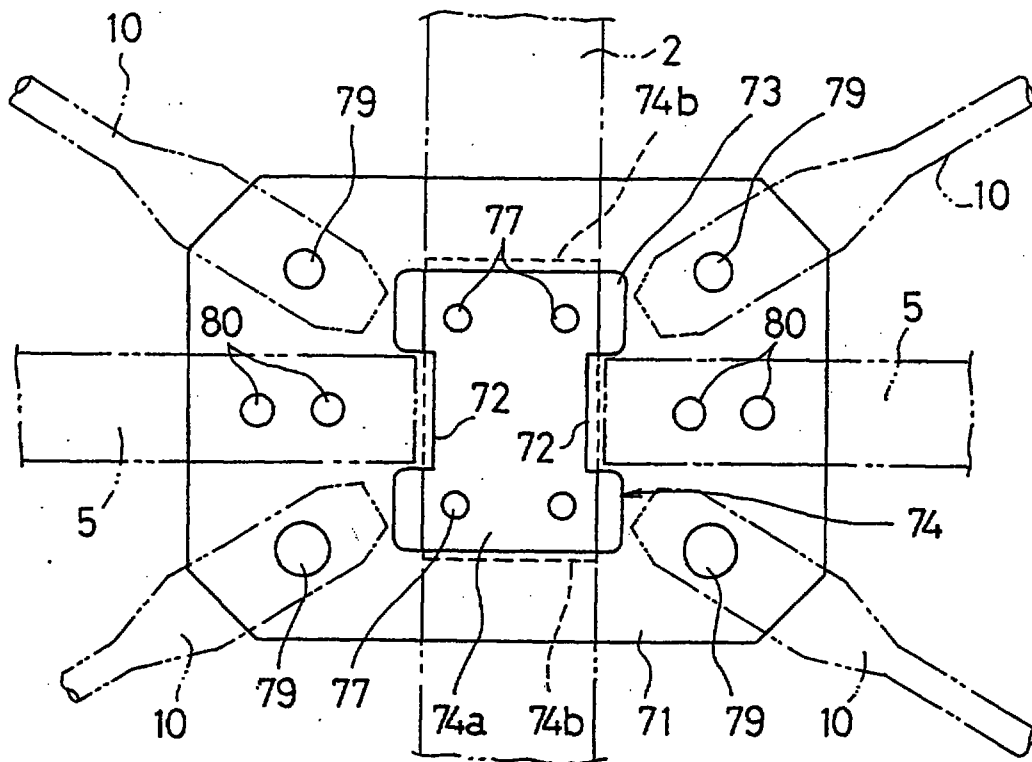


FIG. 24

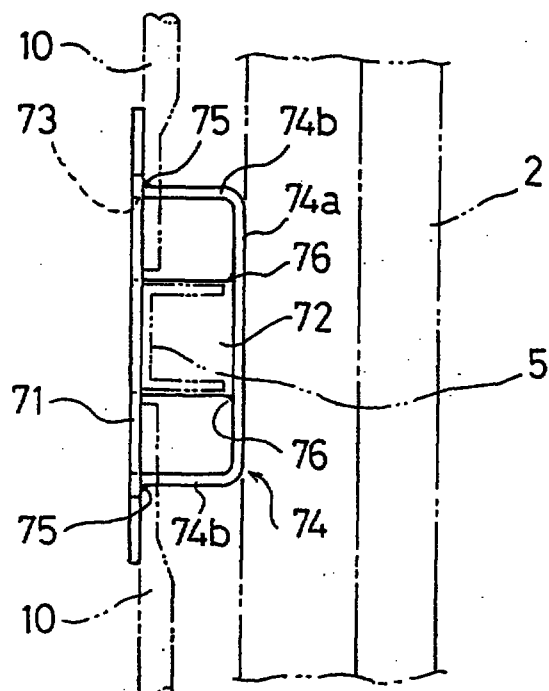


FIG. 25

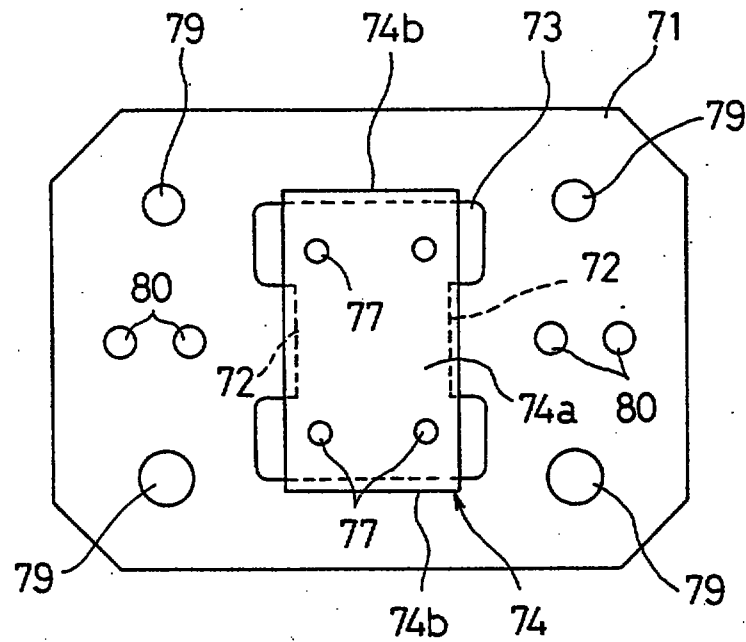


FIG. 26

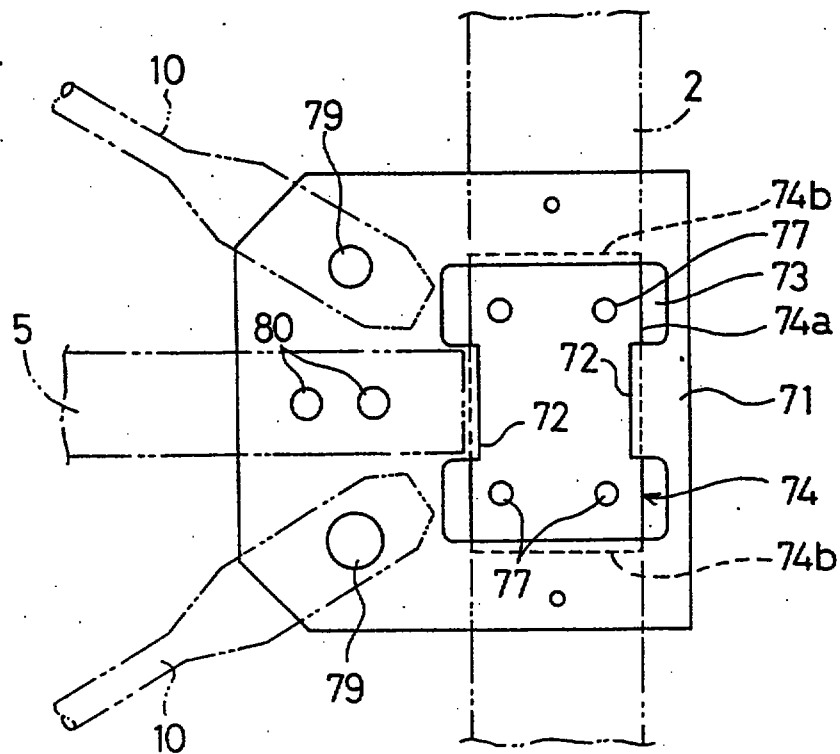


FIG. 27

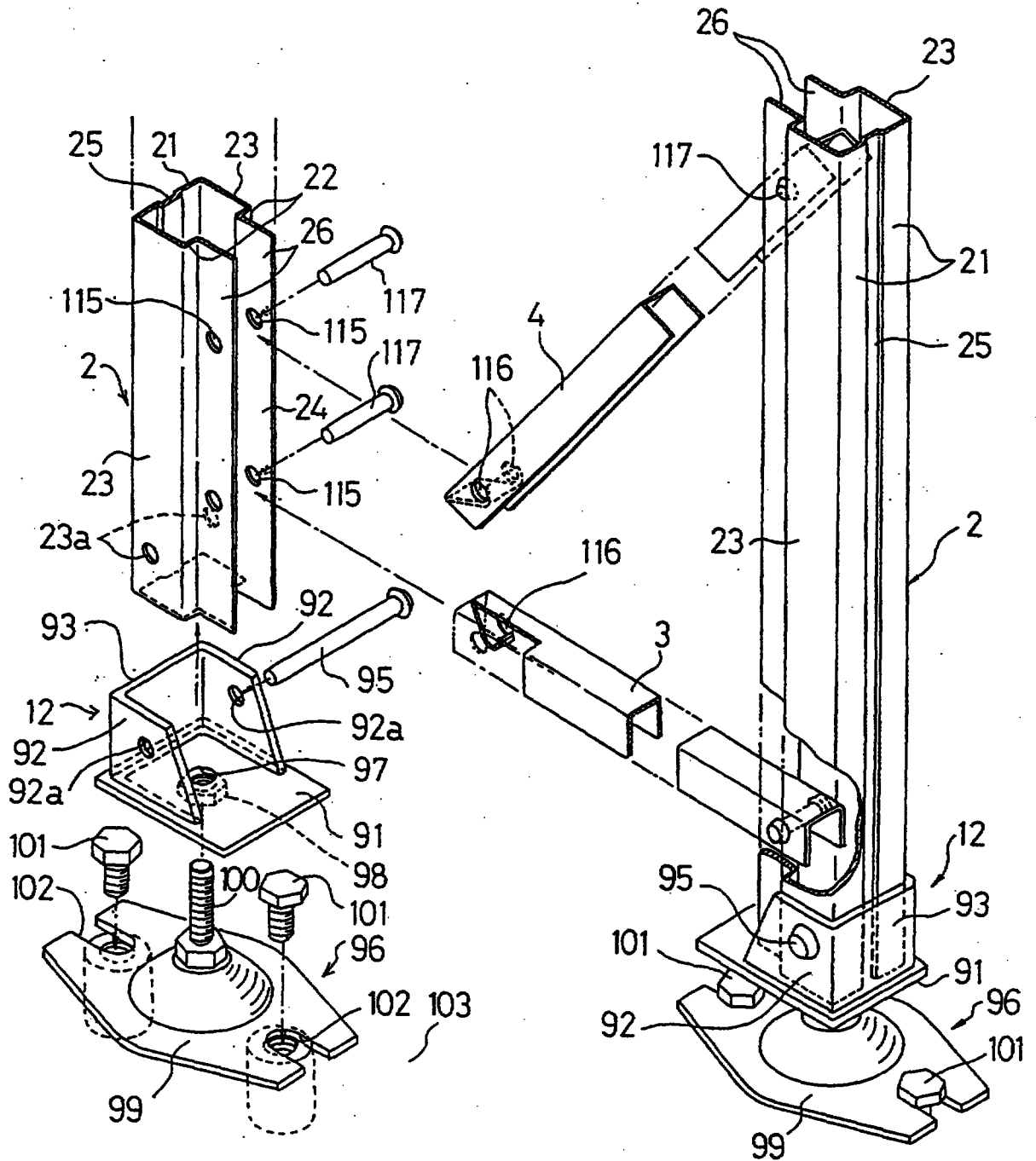


FIG. 28

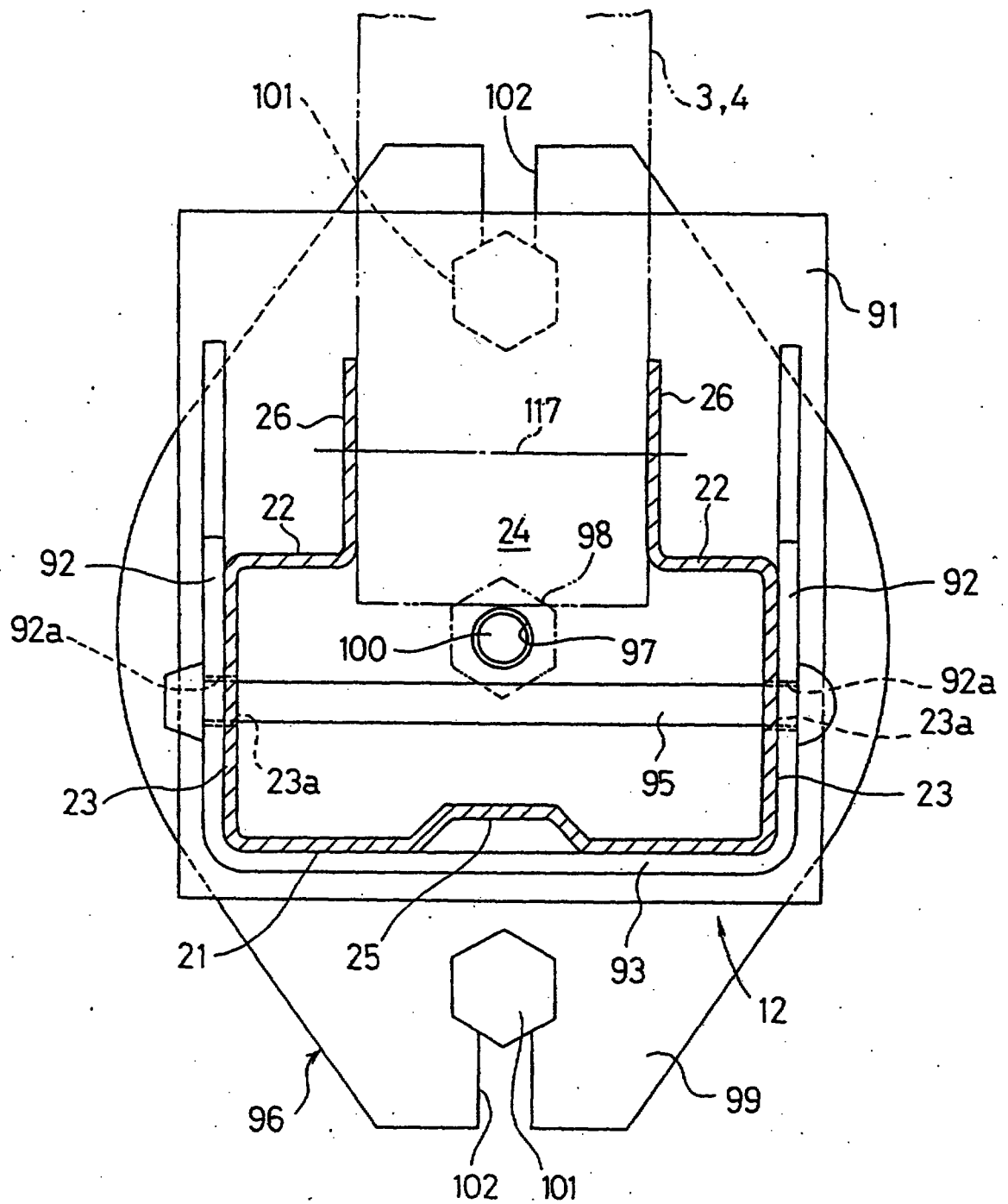


FIG. 29

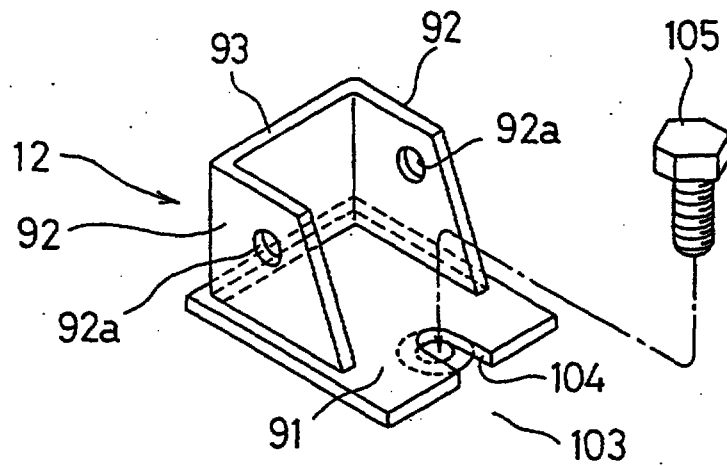


FIG.30

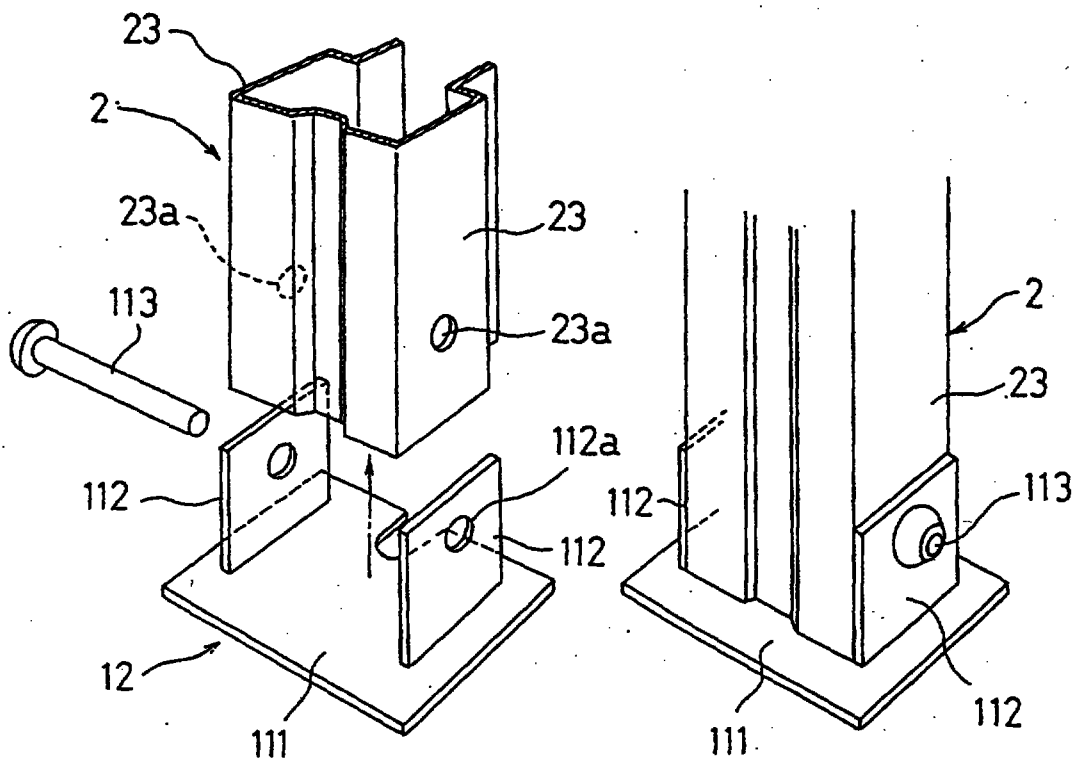


FIG.31

FIG. 32

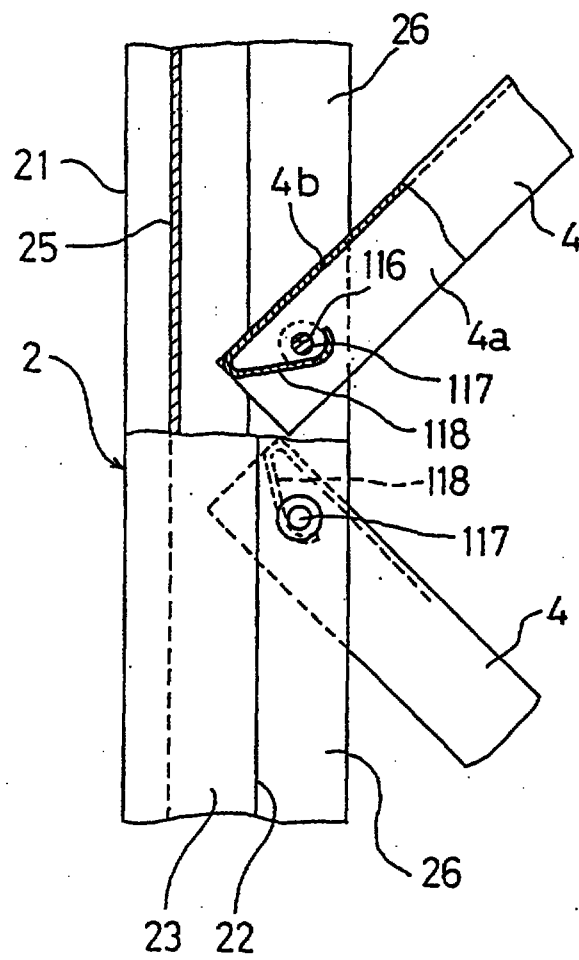


FIG. 34

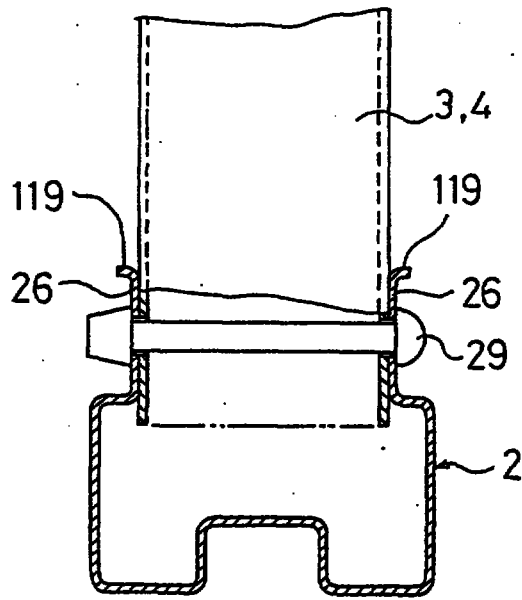


FIG. 33

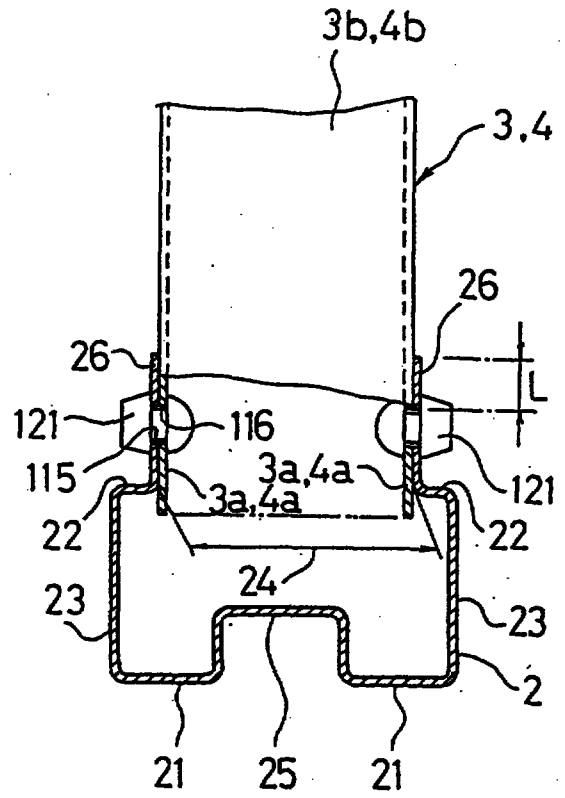
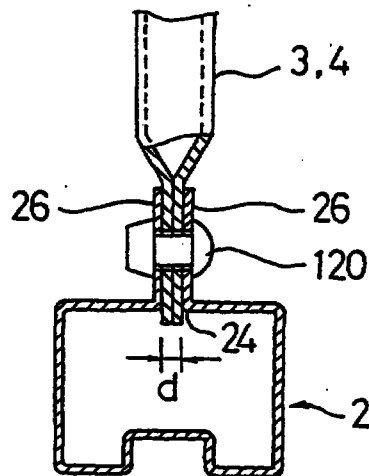


FIG. 35



ABSTRACT

RACK ASSEMBLY

A rack assembly having a plurality of support posts, brackets extending from individual support posts, and bracket rails extending between two or more brackets and capable of supporting goods. Each bracket rail is colored differently from the support posts. The bracket rails can be distinctly relieved against support posts, whereby the size or number of tiers of the rack can easily be recognized. Any off-position of stored goods can readily be found out. The fork of a forklift truck can be easily and accurately leveled to position.

Figure 13 - is to accompany the abstract when published.

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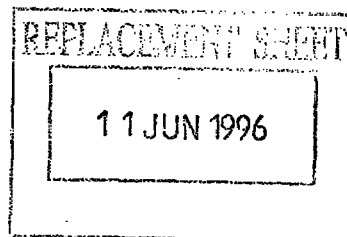
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ABSTRACT
RACK ASSEMBLY

A rack assembly having a plurality of support posts (2), brackets (6) extending from individual support posts (2), and bracket rails (9) extending between two or more brackets (6) and capable of supporting goods. Each bracket rail (9) is colored differently from the support posts. The bracket rails (9) can be distinctly relieved against support posts, whereby the size or number of tiers of the rack can easily be recognized. Any off-position of stored goods can readily be found out. A fork of a forklift truck can be easily and accurately leveled to position.

Figure 13 is to accompany the Abstract when published.

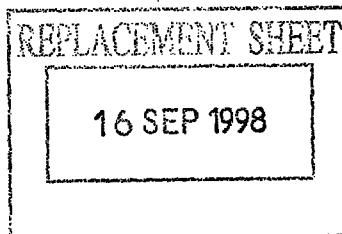




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project toward the other support post, and bracket rails each of which extending between adjacent brackets located depthwise of the rack assembly and capable of supporting goods to be placed in the rack assembly, comprising:

a widthwise stopper member mounted intermediate portion of the length of each said bracket rail.

A rack assembly including a plurality of vertically extending support posts and braces individually connected to the support posts through mounting means, said mounting means comprising:

a brace mounting plate,

a plurality of cut-raised pieces formed in the brace mounting plate,

a through-portion defined by a cut-off corresponding to said cut-raised portion of the brace mounting plate, and

an abutting member for abutment against a corresponding support post disposed in opposed relation to said through-portion and having a plurality of bent portions bent back toward the brace mounting plate,

the front end of said bent portion being welded to the brace mounting plate, the front ends of said cut-raised pieces being welded to the abutting member, and

mounting holes formed in opposed relation to said through-portion of said abutting member and positioned in corresponding relation to the support post.

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REPLACEMENT SHEETS		SG
☐	Description	: paged to paged
☒	Claim(s)	: paged 24 to paged 25
☐	Drawing(s)	: paged to paged
☐	Abstract	: paged to paged
DATE OF RECEIPT 26/6/99		

WHAT IS CLAIMED IS:

1. A rack assembly including
vertically extending support posts disposed at least at four corners of the assembly,
brackets disposed on transversely adjacent support posts at opposed positions such that brackets on each of the support posts project toward the other support post, a bracket rail extending between adjacent brackets located depthwise of the rack assembly and capable of supporting goods placed in the rack assembly;
said support posts each having a depthwise outwardly facing outer plate portion,
a pair of side plate portions continued to opposite side edges of the outer plate portion,
said brackets each having a connecting member connectable to said support post,
and a bracket member formed in continuation to said connecting member and to which said bracket rail is connectable;
said connecting member having a side plate portion abutable against one side plate portion of said support post,
and a front plate portion abutable against the outer plate portion of said support post,
said rack assembly comprises a plurality of vertically arranged holding means formed at predetermined distances in said outer plate portion,
and engagement projections are provided at the connecting member to fix the connecting member to the post
characterized in that
a strengthening groove is formed in the outer plate portion of said post longitudinally thereof;
the holding means are long engagement holes in the vicinity of said strengthening groove,
said engaging projections are formed in continuation to the end portion of



said front plate portion perpendicularly to said outer plate portion, being insertable into each engaging hole respectively from the front side of said outer plate portion,

locking pawls project downwardly from each engaging projection in order to engage with the lower edge of said engaging holes when each engaging projection is inserted into respective engaging hole,

slip-off preventing holes are formed in said side plate portions of each support post,

slip-off preventing projections are formed on each bracket in order to fit in laterally with corresponding slip-off preventing holes when said engaging projections are engaged with said engaging holes from the front side of said outer plate portion,

and that each bracket and bracket rail are coloured differently from the support posts.

2. A rack assembly as set forth in claim 1, characterized in that said bracket rail is channel-shaped in section and fittable over the front end portion of a corresponding bracket and said rack assembly further comprises a connecting hole formed in a front end portion of each bracket, a round recessed portion formed in each of said bracket rails, a through-hole formed in said recessed portion and registrable with said connecting hole, and an upward stopper member arranged at the rear end of each bracket rail depthwise of said assembly and fitting over said round recessed portion, whereby said stopper member is securely fixed between the front end portion of said bracket and said channel-shaped bracket rail.
3. A rack assembly as set forth in claim 2, characterized in that said assembly has a widthwise stopper member mounted intermediate the length of each said bracket rail.