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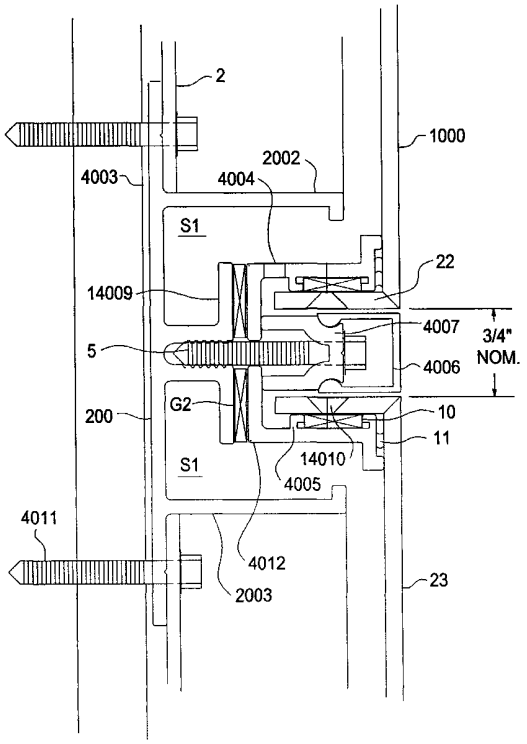
(54) Title: CURTAIN WALL SUPPORT METHOD AND APPARATUS



(57) Abstract: A curtain wall (ACM) system has vertical mullions and horizontal supports which provide a dry as well as a structural system for non-sequential construction of curtain wall exteriors. Internal gutters offer a failsafe moisture proof system. The horizontal and vertical framework members may be mounted in the reverse orientation for special exterior wall configurations. Individual panels can be replaced without sealants or tear down of neighboring panels. A face support for the thin ACM panels is provided. Thermal expansion is addressed with a floating panel on a track design. Alternate embodiment includes transition frame members having glass and metal panel integral supports, freestanding X-Y sub-frame assemblies, fiber optic outboard channels and novel methods of assembly.

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TITLE

Curtain Wall Support Method and Apparatus

CROSS REFERENCED PATENTS

This application is a continuation in part U.S. App. No. 09/483,586 filed 1/14/00, which was a continuation in part of U.S. App. Ser. No. 09/415,947 filed 10-8-99, now abandoned.

FIELD OF INVENTION

The present invention relates to building exteriors, and interior wall and ceiling covering using curtain wall systems; said systems having box top shaped composite panels hung on the exterior building sheathing or other framework.

BACKGROUND OF THE INVENTION

There are two basic type of systems for the curtain wall aluminum composite material (ACM) market. They are a wet and a dry system. A wet system uses a sealant as its primary seal against moisture. A dry system uses a gasket as its primary seal against moisture.

Most patented curtain wall systems pertain to flat glass panel type curtain wall panels. A brief summary of this flat glass panel support structure art follows below.

U.S. Pat. No. 3,548,558 (1970) to Grossman discloses a mullion system (vertical members between window lights) for a curtain wall exterior. An anchor 101 supports a plate which supports a mullion column having segments 107.

U.S. Pat. No. 3,978,629 (1976) to Echols Sr. discloses a glass panel thermal barrier

vertical mullion. Each mullion has an exterior member with a track for maintenance conveyances and has an interior metal member, and has a insulating foam layer therebetween.

U.S. Pat. No. 4,015,390 (1977) to Howorth discloses a glazing structure for a glass panel/curtain wall building. U.S. Pat. No. 4,121,396 (1978) to Oogami *et al.* discloses a curtain wall frame structure having channel crossings with four integral legs and backup bars.

U.S. Pat. No. 4,418,506 (1983) to Weber *et al.* discloses a curtain wall frame structure adding a insulating separator (56) and an insulated bolt to a known frame structure for insulation.

U.S. Pat. No. 4,471,584 (1984) to Dietrich discloses a skylight system with a unique support structure to support a curtain wall flat.

U.S. Pat. No. 4,841,700(1989) to Matthews discloses a two-piece mullion frame for reducing the face dimension of an aluminum frame.

U.S. Pat. No. 4,996,809 (1991) to Beard discloses a flat panel skylight support frame having built in condensate gutters.

U.S. Pat. No. 5,065,557 (1991) to Laplante *et al.* discloses a dry gasket seal frame structure for a curtain wall which uses a flat curtain wall panel having inner and outer panel faces, and a spaced apart vertical edge therebetween. A panel can be replaced without having to dismantle any portion of the curtain wall other than the damaged panel.

U.S. Pat. No. 5,199,236 (1993) to Allen discloses a flush appearance glass panel frame structure.

U.S. Pat. No. 5,493,831 (1996) to Jansson discloses a glass panel building support frame

presenting a sealed glaze edge between the glass panels.

As Laplante *et* al teaches it is advantageous to be able to replace a damaged curtain wall panel using a dry seal, and further advantageous to be able to leave the horizontal and vertical support channels in place for the replacement. The present invention meets these needs in a dry ACM system.

One patented ACM system is U.S. Pat. No. 4,344,267 (1982) to Sukolics which discloses a curtain wall frame structure which allows thermal expansion of the panels to be absorbed by the joints. A vertical channel has a pair of pivotable arms to receive the sides of adjoining panels. In the present invention the exact same ACM may be used. Sukolics requires that a sheathing be installed over the support studs of the building. Then Sukolics' thin and relatively weak, non-structural mullions and horizontal supports can be mounted in a non-sequential (also called non-directional) fashion. This non-sequential erection fashion is preferred over sequential systems. Sequential systems require starting construction at the bottom of a building and progressing left to right, one row at a time, building one row on top of a lower row. Sukolics enables wall construction from the top down which is how rain hits the building during construction. Therefore, using Sukolics' system a builder can erect the frame, complete the roof, then construct the curtain walls from the top down to minimize rain damage to the exposed sheathing of the building.

The present invention provides the same non-sequential method for construction; additionally adding structural mullions and horizontal supports thereby allowing direct fastening to the frame and eliminating the sheathing if desired.

The present invention provides for thermal expansion by means of using floating curtain wall members which expand and contract in their mounting tracks located in the vertical mullions and horizontal supports.

Another prior art reference is a patent pending curtain wall apparatus trademarked RRD200 ™ by Elward Systems Corporation of Denver, Colorado. A combination horizontal support and perimeter extrusion (corner brace) is used, made of aluminum. The top and one side of the curtain wall is firmly bolted to the building. Thus, no "flotation" of the curtain wall exists on an X-Y frame structure as is the case in the present invention. Flotation reduces stresses on the curtain wall panels during thermal and/or stresses on the curtain wall panels setting movement of the building.

Panel installation begins at the bottom with panels inter-leaving at the sides utilizing "male/female" joinery working left to right. Installation continues by stacking the next row on top of the first row and continuing the left to right sequence. Therefore, an individual panel cannot be removed from the center of the wall without removing adjacent panels.

While it is basically a "dry" system because of the use of wiper gaskets, exposed sealant is used in the 4-way intersections due to the male/female differences of the perimeter extrusions.

Route and return and curtain face support is provided by the perimeter extrusions. The ACM panels are fabricated utilizing known rout and return methodology. The various perimeter extrusions for the curtain wall panels are four different extrusions making the panel "handed". The present invention uses panels which are symmetrical, facilitating installation.

The system does include a gutter, but it is not continuous and not part of a sub-system, and the gutter only exists on the horizontal member. Weep holes in the horizontal member allow water to flow out and over the curtain wall panels. No integrated X-Y gutter system exists.

The system requires 16ga (non-standard) studs at precise locations for vertical attachment to the structure, thereby greatly adding to the building cost compared to the present invention.

The system does not allow for a "jointless" appearance because it doesn't have a face cap that can be flushed or recessed from the face of the panel. The system does not allow for multiple "joint" colors.

Perimeter extrusions are not the same depth, thus requiring complex shimming; sequential, non-subsystem installation does not allow for integrated three dimensional panels to be incorporated within the system (i.e. signage or column covers, or accent bands that are not flat). The system does not allow for three dimensional joints like a rounded bullnose that would protrude away from the panel.

Further new and non-obvious enhancements to curtain wall methods and apparatus provided by the present invention include a dry system having a built in gutter system for rain and condensate, a failsafe moisture proof system, a flexible framework enabling vertical and horizontal support structures to be interchanged (providing flexibility during construction), support braces for the face of the curtain wall, and an alignment process for curtain wall panel alignment during construction.

SUMMARY OF THE INVENTION

The main aspect of the present invention is to provide a non-sequential, dry ACM system having structural mullions which can be mounted to the raw studs of a building.

Another aspect of the present invention is to provide a built in gutter system for the vertical mullions and the horizontal supports, thereby providing a failsafe moisture prevention system.

Another aspect of the present invention is to provide a support for the face of the curtain wall panel.

Another aspect of the present invention is to provide a framework having interchangeable vertical and horizontal mounting options.

Another aspect of the present invention is to provide for symmetrical (versus "handed") panels to facilitate installation.

Another aspect of the present invention is to provide a method to align curtain wall panels during construction.

Another aspect of the present invention is to provide three curtain wall systems, wherein there exists interchangeable parts for all three systems from the curtain wall face to the bottom of the primary seal.

Other aspects of this invention will appear from the following description and appended claims, reference being made to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 (prior art) is a horizontal sectional view of a Miller-Clapperton Partnership, Inc. (MCP) ™ Austell, Georgia curtain wall system.

FIG. 2 (prior art) is a vertical sectional view of the MCP ™ system.

FIG. 3 (prior art) is a top perspective view of an assembled MCP ™ system.

FIG. 4 (prior art) is a front plan view of the frame of a building.

FIG. 5 is the same view as FIG. 4 with horizontal supports installed.

FIG. 6 is a front plan view of the framework of the preferred embodiment being assembled on the building shown in FIGS. 4,5.

FIGS. 6A,6B are front plan views of the joint of the horizontal and vertical supports of FIG. 6.

FIG. 7 is a cross sectional view of the vertical mullion.

FIG. 8 is a cross sectional view of the horizontal support.

FIG. 9 is a top perspective view of a curtain wall panel and support brackets therefor of the preferred embodiment.

FIG. 10 is a front plan view of the building shown in FIG. 8 having curtain wall panels being mounted to the framework.

FIG. 11 is a sectional view of the curtain wall panel taken along line 10-10 of FIG. 9.

FIG. 12 is a cross sectional view taken along line 12-12 of FIG. 10.

FIG. 13 is a front plan view of a horizontal support.

FIG. 14 is a top perspective view of vertical support(s) being joined with a horizontal support.

FIG. 15 is an exploded view of the preferred

embodiment of the gutters (DPS 4000™) system at one joint.

FIG. 16 is a vertical sectional view showing the horizontal support taken along line 16-16 of FIG. 10.

FIG. 17 is a horizontal sectional view showing the vertical mullion taken along line 17-17 of FIG. 10.

FIG. 18 is a front plan view of the framework showing the operation of the built in gutter system.

FIG. 19 is the same view as FIG. 16 showing the operation of the built in gutter system.

FIG. 20 is a side plan view of the alignment fastener.

FIG. 21 is a front plan view of a panel being installed using an alignment fastener.

FIG. 22 is a cross sectional view of the alignment fastener is use.

FIG. 23 is a vertical sectional view of an alternate embodiment (DPS 3000 ™) system.

FIG. 24 is a horizontal sectional view of an alternate embodiment (DPS 5000 CW ™) system.

FIG. 25 is a horizontal sectional view of an alternate embodiment (DPS 5000 T ™) system.

FIG. 26 is an identical view as shown in FIG. 16, but with the preferred embodiment of the gutter and the curtain wall composite assembly.

FIG. 27 is an identical view as shown in FIG. 17, but using the preferred embodiment components shown in FIG. 26, which are shown mounted as vertical gutters.

FIG. 28 is an identical view as shown in FIG. 26, but using a flash joint embodiment.

FIG. 29 is an identical view as FIG. 27, but using a flash joint embodiment.

FIG. 30 is an identical view as FIG. 17, but with the preferred embodiment of the gutter and the curtain wall composite assembly.
FIG. 31 is an identical view as FIG. 16, but with the preferred embodiment components shown in FIG. 30.
FIG. 32 is an identical view as shown in FIG. 30, but with a flush joint embodiment.
FIG. 33 is an identical view as shown in FIG. 31, but with a flush joint embodiment.
FIG. 34 is a vertical sectional view of a lower termination segment of the preferred embodiment, as illustrated in FIG. 53.
FIG. 35 is a horizontal sectional view of a lower termination segment of the preferred embodiment, as illustrated in FIG. 53.
FIG. 36 is vertical sectional view of a lower termination segment(s) of the preferred embodiment, as illustrated in FIG. 53.
FIG. 37 is an identical view as shown in FIG. 36, but using a recessed joint embodiment.
FIG. 38 is a vertical sectional view of an upper termination segment of the preferred embodiment, as illustrated in FIG. 53.
FIG. 39 is an identical view as shown in FIG. 38, but using a flush joint embodiment.
FIG. 40 is a horizontal sectional view of an upper termination segment of the preferred embodiment, as illustrated in FIG. 53.
FIG. 41 is an identical view as shown in FIG. 40, but using a flush joint embodiment.
FIG. 42 is a cross sectional view of gutter 200 showing nominal dimensions.
FIG. 43 is a cross sectional view of gutter 2 showing nominal dimensions.
FIG. 44 is a cross sectional view of

termination gutter 4017 showing nominal dimensions.

FIG. 45 is a cross sectional view of termination gutter 4015 showing nominal dimensions.

FIG. 46 is a cross sectional view of flush perimeter extrusion 4012 showing nominal dimensions.

FIG. 47 is a cross sectional view of recessed perimeter extrusion 4008 showing nominal dimensions.

FIG. 48 is a cross sectional view of a pressure channel 4007 showing nominal dimensions.

FIG. 49 is a cross sectional view of a snap cover 4006 showing nominal dimensions.

FIG. 50 is a cross sectional view of a curtain wall composite assembly with a recessed joint embodiment.

FIG. 51 is the identical view as shown in FIG. 50, but using a flush joint embodiment.

FIG. 52 is a perspective view showing the reglet corner clip attached to one member of a pair of perimeter extrusions.

FIG. 53 is a schematic of an imaginary building face showing the locations of components keyed to the above numbered figures.

FIG. 54 is a cross sectional view of an alternate embodiment (DPS 3000™) system, using the same curtain wall composite assembly as used in the FIG. 30 embodiment.

FIG. 55 is a cross sectional view of an alternate embodiment (DPS 300™) system, using the same curtain wall composite assembly as used in the FIG. 31 embodiment.

FIG. 56 is a cross sectional view of a lower base 13002 showing nominal dimensions.

FIG. 57 is a cross sectional view of an upper base 3015 showing nominal dimensions.

FIG. 58 is a vertical cross section of the lower gutter with the curtain wall composite assembly shown

attached over and through modern stucco known as exterior insulated finish systems (EIDS).

FIG. 59 is a vertical cross section of a horizontal gutter for an alternate embodiment (DPS2500 ™) incorporating a continuous guttered sub-system.

FIG. 60 is a horizontal cross section of a vertical gutter for an alternate embodiment (DPS2500 ™) incorporating a continuous guttered sub-system.

FIG. 61 is an identical view as shown in Figure 59, but utilizing a recessed joint embodiment.

FIG. 62 is an identical view as shown in Figure 60, but utilizing a recessed joint embodiment.

FIG. 63 is a vertical cross section of a horizontal termination gutter for an alternate embodiment (DPS2500 ™) incorporating a continuous guttered sub-system.

FIG. 64 is a horizontal cross section of a vertical termination gutter for an alternate embodiment (DPS2500 ™) incorporating a continuous guttered sub-system.

FIG. 65 is an identical view as shown in Figure 63, but utilizing a recessed joint embodiment.

FIG. 66 is an identical view as shown in Figure 64, but utilizing a recessed joint embodiment.

FIG. 67 is a frontal view of the preferred embodiment illustrating the assembly method of installing framework units.

FIG. 68 is a cross sectional view of a splice joint assembly used for joining the framework units of the preferred embodiment.

FIG. 69 is a horizontal cross sectional view of a vertical joint of an alternate embodiment (DPS2000 ™) illustrating an integrated framework which supports an ACM curtain wall panel that

attached to a building structure.

FIG. 70 is a vertical cross sectional view of a horizontal joint of an alternate embodiment (DPS2000 ™) illustrating an integrated framework which supports an ACM curtain wall panel that attaches to a building structure.

FIG. 71 is an identical view as shown in Figure 69, but with a flush joint embodiment.

FIG. 72 is an identical view as shown is Figure 70, but with a flush joint embodiment.

FIG. 73 is a horizontal cross sectional view of a vertical joint of an alternate embodiment (DPS2000 ™) illustrating clip attachment to the framework.

FIG. 74 is a vertical cross sectional view of a horizontal joint of an alternate embodiment (DPS2000 ™) illustrating clip attachment to the framework.

FIG. 75 is a horizontal cross sectional view of a vertical joint of an alternate embodiment (DPS2000 ™) illustrating a termination joint of the framework.

FIG. 76 is a vertical cross sectional view of a horizontal joint of an alternate embodiment (DPS2000 ™) illustrating a termination joint of the framework.

FIG. 77 is an identical view as shown in Figure 75, but with a recessed joint embodiment.

FIG. 78 is an identical view as shown in Figure 76, but with a recessed joint embodiment.

FIG. 79 is a frontal exploded view of a 4-way intersection of the vertical and horizontal frame members illustration connection methods of the framing members.

FIG. 80 is a horizontal cross sectional view illustrating member connections, and framework attachment to

the building structure.

FIG. 81 is an identical view as shown in Figure 79, but exploded.

FIG. 82 is a vertical cross sectional view of a framework assembly illustrating one method of raising it to the building structure.

FIG. 83 is a frontal exploded view of a 4-way intersection of the vertical and horizontal frame members illustrating connection methods of the framing members.

FIG. 84 is a frontal view of a 4-way intersection of the vertical and horizontal frame members illustrating connection methods of the framing members.

FIG. 85 is a cross sectional view of framework joinery illustration member to member connection and framework connection to the building structure.

FIG. 86 is a frontal view of typical framework support of the preferred embodiment and all alternate embodiments. It illustrates four-point vertical frame member to horizontal frame member connections as well as two-point horizontal frame member connections to the building structure.

FIG. 87 is a frontal view of a partial building structure showing preferred embodiment DPS 4000 guttered non-directional dry system per figures 27 and 30, as well as, alternate embodiments for window glazing which include transitions from aluminum composite panel 1000 to glass panel 8701 to aluminum composite panel 1000.

FIG. 88 is a frontal view of framework of preferred embodiment DPS 4000 guttered non-directional dry system including alternate embodiments for window glazing shown in figure 87, with aluminum composite panels 1000 and glass panels 8701 removed.

FIG. 89 is a vertical sectional view of the upper

transition from glass panel 8701 to aluminum composite panel 1000.

FIG. 89A is a horizontal sectional view of the side transition from glass panel 8701 to aluminum composite panel 1000.

FIG. 90 is a vertical sectional view of the lower transition from glass panel 8701 to aluminum composite panel 1000.

FIG. 91 is a horizontal sectional view of vertical window mullion 8801 looking down toward window sill 8803.

FIG. 91A is a horizontal sectional view of vertical window mullion 8801 looking up toward window head 8804.

FIG. 92 is a vertical sectional view of a glass panel assembly using figures 89 and 90.

FIG. 93 is a vertical sectional view of a panel assembly using figures 89 and 90.

FIG. 94 is a frontal view of a partial building structure showing alternate embodiment DPS 3000 non-directional dry system per figures 54 and 55, as well as, additional alternate embodiments for window glazing which include transitions from aluminum composite panel 1000 to glass panel 8701 to aluminum composite panel 1000.

FIG. 95 is a frontal view of framework of alternate embodiment DPS 3000 non-directional dry system including additional alternate embodiments for window glazing shown in figure 94, with aluminum composite panels 1000 and glass panels 8701 removed. From top to bottom, the framework is comprised of lower base 3015 vertically transitioning to horizontal window head 9504, and connected through overlapping flanges 9509 and 9505 using flange bolt 2112.

FIG. 96 is a vertical sectional view of the upper

transition from glass panel 8701 to aluminum composite panel 1000.

FIG. 96A is a horizontal sectional view of the side transition from glass panel 8701 to aluminum composite panel 1000.

FIG. 97 is a vertical sectional view of the lower transition from glass panel 8701 to aluminum composite panel 1000.

FIG. 98 is a horizontal sectional view of vertical window mullion 8801 looking down toward window sill 9503.

FIG. 98A is a horizontal sectional view of vertical window mullion 8801 looking up toward window head 9504.

FIG. 99 is a vertical sectional view of a glass panel assembly using figures 96 and 97.

FIG. 100 is a vertical sectional view of a panel assembly using figures 96 and 97.

FIG. 101 is a frontal view of a partial building structure showing alternate embodiment DPS 5000CW incorporating structural vertical mullions per figures 24 and 108, as well as, alternate embodiments for window glazing, which include transitions from aluminum composite panel 1000 to glass panel 8701 to aluminum composite panel 1000.

FIG. 102 is a frontal view of framework of alternate embodiment DPS 5000CW incorporating structural vertical mullions per figures 24 and 108 including alternate embodiments for window glazing shown in figures 103 and 104, with aluminum composite panels 1000 and glass panels 8701 removed.

FIG. 103 is a vertical sectional view of the upper transition from glass panel 8701 to aluminum composite panel 1000.

FIG. 103A is a horizontal sectional view of the side transition from glass panel 8701 to aluminum

composite panel 1000.

FIG. 104 is a vertical sectional view of the lower transition from glass panel 8701 to aluminum composite panel 1000.

FIG. 105 is a horizontal sectional view of vertical window mullion 8801 looking down toward window sill 8803.

FIG. 106 is a vertical sectional view of a glass panel assembly using figures 103 and 104.

FIG. 107 is a vertical sectional view of a panel assembly using figures 103 and 104.

FIG. 108 is a structural vertical mullion 10203 of alternate embodiment DPS 5000CW which provides windload and deadload support for the preferred embodiment by using attachment clip 10803 to connect to building structure 8750 using bolts 10804.

FIG. 109 is identical to figure 108, but shows glass panel 8701 integrated into structural vertical mullion 10203 using glazing channel 10901 in lieu of aluminum composite panel 1000.

FIG. 110 is a vertical sectional view of alternate embodiment DPS 5000CW assembled as a unit incorporating structural vertical mullion 10203 and guttered end closure 11002.

FIG. 111 is a horizontal sectional view of alternate embodiment DPS 5000CW showing top view of structural vertical mullion 10203 being supported by structural floor attachment assembly 11001 to building structure 8750.

FIG. 112 is a horizontal sectional review or an alternate embodiment illustrating the use of a light source.

Before explaining the disclosed embodiment of the present invention in detail, it is to be understood that the invention is not limited in its application to the details of the particular arrangement shown, since

the invention is capable of other embodiments. Also, the terminology used herein is for the purpose of description and not of limitation.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1,2,3 as compared to FIGS. 16,17 a comparative parts list follows below.

Glossary for *Horizontal Joint* Comparison Between DPS 4000 Dry System ™ (FIG 13, preferred embodiment) and "closest prior art" Miller-Clapperton MCP System 200-D ™ simulated dry system (FIG. 2).

#1 & #1'	Aluminum Composite Material (ACM), which is a component of an exterior curtain wall or facade of a building.
#2 00	Horizontal Gutter Support (screwed into sheathing such as plywood or directly into structural building members).
#30'	Horizontal Attachment Support (screwed into sheathing such as plywood or through non-structural sheathing such as gypsum board into structural building members.
#3	Perimeter Corner Brace (continuous Return and Face support around 90-degree perimeter of corner).
#3'	Vertical Corner Clip (only clips to Return leg of panel with no support to the Face).
#4	Continuous Support Channel which is secured by a plurality of machine screws, #5, without penetrating Vertical Gutter Support, #2, which offers a dry, watertight assembly even with failure of Primary Seal, G.
#4'	Continuous Inverted Support Channel which is secured by a plurality of

	self-drilling fasteners, #5', which penetrate Vertical Attachment Support, #2', thereby breaching watertight seal into the building if failure of Primary Seal, C.
G	Dry Gasket Primary Seal to insulate air and water from vertical gutter space, S, but failure of G merely allows water into vertical gutter space, S.
C	Caulking Primary Seal keeps air and water from Inverted Support Channel, #4', but a failure of caulking breaches building with uncontrolled water.
#60 & #6'	Structural Screws; however, #6 is located outside gutter space, S.
#7 & #7'	Continuous Snap Cover onto #4 and #4'.
#8	Recessed Positive Return Attachment Screw into self-sealing butyl tape, #10.
#8'	Raised Positive Return Attachment Rivet sealed by primary caulking seal, C.
#11	Corner Sealant for air/water integrity, and attaches Face to Corner Brace, #3, providing Face diaphragm.
#10	Butyl Tape which provides air/water seal for Positive Return Screw, #8.
Face	Exterior side of aluminum composite material.
Rout	Removal of a portion of the inside metal skin and the polyethylene plastic core in V-groove allowing a 90-degree bend.
Return	The leg that is folded 90-degrees after a rout is performed, perpendicular to the Face.
Exterior Sheathing	A continuous covering that is attached to the building structure

(i.e. plywood, gypsum board, fiberglass board).

Building Structure Structural members that carry the wind load deflections of the building (i.e. structural steel, miscellaneous steel, structural studs, dimensional lumber, concrete).

Glossary for *Vertical Joint* Comparison Between DPS 4000 Dry System ™ (FIG. 14) and "closest prior art" Miller-Clapperton MCP System 200-D ™ simulated dry system (FIG 1)

#1 & #1'	Aluminum Composite Material (ACM), which is a component of an exterior curtain wall or facade of a building.
#211	Vertical/Horizontal Gutter Support Interface
#2	Vertical Gutter Support which screws into the horizontal Gutter Support flanges and into the building structure creating a guttered sub-system.
#30'	Horizontal Attachment Support which screws into sheathing such as plywood or through non-structural sheathing such as gypsum board into structural building members.
#39	Perimeter Corner Brace (continuous Return and Face support around 90-degree perimeter of corner).
#40'	Vertical Corner Clip (only clips to Return leg of panel with no support to the Face).
#6	Continuous Support Channel which is secured by a plurality of machine screws, #5, without penetrating Vertical Gutter Support, #3, which offers a dry,

	watertight assembly even with failure of Primary Seal, G.
#60'	Continuous Inverted Support Channel which is secured by a plurality of self-drilling fasteners, #5', which penetrate Horizontal Attachment Support, #30', thereby breaching watertight seal into the building if failure of Primary Seal, C.
G	Dry Gasket Primary Seal to insulate air and water from vertical gutter space, S, but failure of G merely allows water into vertical gutter space, S.
C	Caulking Primary Seal keeps air and water from Inverted Support Channel, #4', but a failure of caulking breaches building with uncontrolled water.
#70 & #70'	Structural Screws; however, #6 is located outside gutter space , S.
#80 & #80'	Continuous Snap Cover onto #6 and #6'.
#90	Recessed Positive Return Attachment Screw into self-sealing butyl tape, #10.
#9'	Raised Positive Return Attachment Rivet sealed by primary caulking seal, C.
#10	Butyl Tape which provides air/water seal for Positive Return Screw, #90.
#11	Corner Sealant for air/water integrity, and attaches Face to Corner Brace, #39, providing Face diaphragm.
Face	Exterior side of aluminum composite material.
Rout	Removal of a portion of the inside metal skin and the polyethylene plastic core in V-groove allowing a 90-degree bend.
Return	The leg that is folded 90-degrees after a rout is performed, perpendicular to

the Face.

Exterior Sheathing A continuous covering that is attached to the building structure (i.e. plywood, gypsum board, fiberglass board).

Building Structure Structural members that carry the wind load deflections of the building (i.e. structural steel, miscellaneous steel, structural studs, dimensional lumber, concrete).

PRIOR ART COMPARISON

I Sub-systems

A. MCP ™ has a horizontal member (30') and a vertical member (2') that are used to support the panels.

1. They do not have built-in gutters.
2. They do not assemble together by means of mechanical attachment, but rather butt one another instead of being contiguous by integration.
3. They offer no secondary or failsafe water seal.
4. The vertical member requires two 18ga metal studs for attachment because they do not interface mechanically.
5. Neither member is structural; they both require support from the building structure.

B. DPS 4000 ™ (FIGS. 13,14) has a sub-system of integrated horizontal (FIG. 13) and vertical (FIG. 14) lower gutters.

1. In most cases, the horizontal gutter will run horizontal making attachments to standard spacing of the vertical metal studs allowing for a continuous horizontal gutter.

2. The vertical gutter will interface with the horizontal gutter into factory-milled openings and join together with fasteners through the overlapping flanges outside of the gutters. The gutters receive a lap sealant when joined together and the four outside corners of the gutter intersection receive sealant providing a secondary seal.

3. The vertical gutter attaches to the horizontal gutter through its flanges that are outside of the gutter.

4. The horizontal gutter is a structural member secured directly to the building structure.

II Panel Assembly utilizing Rout and Return fabrication of the ACM.

A. MCP ™ utilizes three different extrusions

1. The top and bottom extrusions are similar and

are continuous along those edges; however, the vertical extrusion is only a clip and not continuous. Accordingly, the panel has a top and

a bottom because of the different extrusions.

2. Each of the three extrusions attach to the Return leg of the ACM panel through the use of a

pop rivet.

3. Neither of the three extrusions provides corner

support to the face of the ACM panel allowing the

Return leg to flex thus allowing stress to the .020'' aluminum corner. (Note: The ACM is

typically 3mm, 4mm, or 6mm, but when the inside face and the polyethylene core are routed out from the back, all that remains holding the cover together is the .020'' aluminum face.)

4. Because the extrusions are not continuous around the ACM panel, the panel receives no diaphragm support and can distort the face under stress.

5. The three extrusions attach directly to the aluminum sub-system without any provision for being thermally broken thus allowing transfer of heat and cold.

B. DPS 4000 ™ utilizes the same perimeter extrusion

1. Because the same extrusion is used on all four sides of the panel, the panel can be flipped 180 degrees and still work within the system.

2. The perimeter extrusion is built into a frame and placed inside the panel. It is then attached to the Return leg with a countersunk fastener through non-curing butyl tape that is on the inside Return leg providing a watertight seal.

3. The perimeter extrusion frame provides corner support eliminating stress to the .020'' aluminum corner.

4. The perimeter extrusion frame creates a rigid

box top out of the once flexible ACM panel giving it diaphragm.

5. Continuous around the bottom of the perimeter extrusion frame is a neoprene gasket, which provides a thermal break when the frame is placed in the guttered sub-system.

6. The horizontal legs of the perimeter extrusion frame have weep holes in them allowing for condensation to exit to the face of the building.

III. Attachment to the Sub-System

A. MCP ™ uses a continuous inverted channel.

1. The panels are held to the sub-system through the use of an inverted channel. The channel has a screw, which penetrates the sub-system face to hold it in place.

2. After the channel fastener penetrates the sub-system, two beads of silicone sealant are applied between the outside legs and the Return leg of the ACM; thus providing the primary seal for the system.

3. After the system is ``wet-sealed', the face cover is snapped in place.

B. DPS 4000 ™ uses a continuous structural channel.

1. The panels are held to the sub-system without

penetrating the gutter. The machine screw goes through the structural channel and into an extruded screw boss, which holds the machine screw threads.

2. The pressure provided by the channel forces the neoprene gasket on the bottom of the perimeter extrusion frame to the guttered sub-system; thus providing the primary seal without the use of sealants.

3. After the system is ``dry'', the face cover is snapped in place.

Refer to FIGS. 1 and 17 wherein each shows a vertical joint (a cross section of a vertical mullion). The MCP ™ system will allow water to reach the support bolt 6' when the wet sealant C fails as shown by arrow wet. Overlapping arm assembly 25 of the corner brace 3' leaks. The preferred embodiment 4000 of FIG. 17 has a built in gutter S_2. A failure of the gasket G only allows water to pass to the gutter S as shown by arrow failsafe. The support bolts 70 are shielded by gutter walls 4001, 4002. The MCP ™ vertical attachment support 2' has a non-structural (meaning cannot support an intersecting horizontal support) mounting face 20. Whereas the system 4000 vertical gutter support 2 has a reinforced screw boss 4020 which is a structural component fully integrated with its intersecting horizontal support as shown in FIGS. 6,8.

The MCP ™ corner brace 3' only supports the route and return member 21 of the curtain wall CW and not the face 23. Whereas the system 4000 corner brace 3 supports both the face 23 and route and return member

21 of the same curtain wall CW.

Referring next to FIG. 3 the MCP ™ vertical attachment support 2' requires two parallel studs 50,51 to secure it to the exterior of a building via structural screws 53.

Referring next to FIG. 4 the wall 40 of the building has vertical studs 41 which are typically built 16 inches on center. No double studding is required for the present invention in any of its various embodiments.

Referring next to FIG. 5 the horizontal supports 200 for the present invention are installed. The builder can choose to install all the horizontal supports 200 before installing the vertical supports 2, or just a pair of them to build one curtain wall row at a time, either from the bottom up or from the top down. Cutouts 54 receive the flanges 61 of the vertical supports 2.

Referring next to FIGS. 6,6A,6B it is clearly shown that horizontal supports 200 fasten to standard 16 inch center studs via fasteners 53. The horizontal supports 200 may be built in sections and joined in convenient lengths such as six feet at joints 62. The vertical supports 2 have a flange 61 at each end which integrally fits into the notch 54 of the horizontal flange. A sealant FS is used at the joint(s) 63 to keep moisture away from the building.

Referring next to FIG. 7,8 the horizontal support 200 has a base 2001 which is mounted to the building. The center longitudinal axis 4060 extends perpendicularly out of the page. The screw boss 2004 has sufficient strength to provide structural support for both the curtain wall panels and the adjoining vertical supports 2. The screw boss is located centered in the longitudinal axis. It has a central hole 2006 which is threaded. It has a mounting flange 2005 to receive the curtain wall perimeter braces 39. The mounting

holes 2007 are located distally from the gutter walls 2002,2003. The gutter side walls 2002,2003 extend co-planar with the screw boss 2004 away form the mounting side 2008 of the base 2001, thereby forming a support side 2009 of the horizontal support 200. In referring to the vertical support 2 it has a base 4059, a building side 4070, and a support side 4072. It must form a curtain wall plane 2019 which is the same plane as 2019 for the horizontal support 200. Feet 4023 raise the vertical support 2 a distance d_3 away from the frame plane 2029 of the building, such that $d_1 = d_1$ and $d_2 = d_2$ and $d_3 + d_4 = d_1$ and $d_1 > d_4$.

The vertical support 2 has a pair of gutter walls 4001,4002, wherein their distal ends 4009,4010 define curtain wall plane 2019. The distal ends 2017,2031 are also co-planar along plane 2019. The screw boss 4020 has a mounting flange 4021 and a threaded hole 4022. The mounting holes 4024 are located distally from the gutter walls 4009,4010.

Referring next to FIG. 10 the builder has chosen to build the entire framework comprised of elements 2,200 before installing the curtain wall panels. The builder has the choice of now hanging the curtain wall panels from the top down, thereby keeping the building as dry as possible during rain during construction.

Referring next to FIGS. 9,15 the curtain wall panel(s) is not ``handed'' rather it is symmetrical from side to side and from top to bottom and fully symmetrical if the curtain wall panel is square. The curtain wall panel 1000 has a face 23 and route and return edges 1001,1002,1003,1004. The perimeter corner braces 39 have a face member 30 which adds strength to the relatively weak face 23 of the curtain wall panel 1000. Corner sealant 11 is applied for air/water integrity. A recessed positive return attachment screw 8 screws

into a self sealing gasket (butyl tape) 10 to secure the corner brace 39 to the curtain wall 1000. The curtain wall 1000 floats on gaskets G which are supported against flanges 2005,4021 to provide for movement in thermal expansion and construction. Machine screw 5 holds the continuous support panel 6 against the screw boss 4020. A continuous snap cover 780 provides an aesthetic outside appearance over the screws 5.

Referring next to FIGS. 10,13,14,15 the preferred embodiment curtain wall apparatus 4000 is shown partly erected. For alignment integrity among the curtain wall panels 1000, the builder will normally erect by rows of contiguous panels. A slotted hole 4024 of the vertical gutters allows for additional expansion and contraction.

Referring next to FIGS. 11,12 the various system 4000 components are shown in a sectional view.

Referring next to FIGS. 18,19 the rain water W_1 runs down the gutter S_2 to the horizontal support 200, and then weeps out through the face up 80 (known as a pressure equalized system). A relief cut 1580 cuts through the gutter walls 2002,2003 of the horizontal support 200, thereby allowing condensate drops CD to drain. Water W_2 runs along gutter S_1 to gutter S_2 to the sill flashing or to the next gutter and exits through the weep hole WH and then the joints in the face cap 7.

Referring next to FIG. 19 condensate drops CD (and/or water from the primary seal) flow down the vertical support 2 gutter S_2 into the horizontal support 200 gutter S_1, and then out weep hole WH to the space S_4 between the curtain wall panels 1000, as shown by arrow out. Sealant FS can be seen between the vertical support 2 flange 61 and the horizontal support 200 notch 54.

Referring next to FIG. 20 an alignment fastener 1735 is shown to have a cylindrical body 1737 ¾ inch in diameter, and preferably made of ABS plastic. A hex

washer head machine screw 1736 is threaded through the body 1737. A stop 1738 is 1/8 inch by 1 ½ inch diameter, ABS plastic.

Referring next to FIGS. 21,22 the method to install a panel 1001 in proper alignment is shown as to secure at least one alignment fastener into an adjoining vertical support screw boss; to secure at least two alignment fasteners into an adjoining lower horizontal support screw boss(es); place the panel 1001 down on the lower alignment fasteners and against the vertical support alignment fastener; align the panel and fasten the alignment fasteners; remove the vertical support alignment fastener and install the permanent continuous support panel; and remove the lower alignment fasteners and install the horizontal permanent continuous support panel.

Referring next to FIG. 23 an alternate embodiment 3000 system is shown to have no internal gutters, but offers lower costs. The building 3001 supports a symmetrical vertical and horizontal channel 3002 as part of a dry, non-directional system. An optional gutter OG is shown in dots. The channel 3002 is fastened by fastener 3003, and sealant 3004 may be used to protect the building 3001 from moisture. Countersunk fasteners 3005 secure a plate 3006 having a screw boss 3007 to the channel 3002, after the channel 3002 is attached to the building 3001. The curtain wall panel 1000 has a corner brace 3010 with a smaller face segment 3011 than the preferred embodiment. A gasket G is placed between the channel 3002 and the corner brackets 3010. The continuous channel 3012 secures the corner brackets 3010 via fastener 3013. A facial clip 3014 provides an aesthetic appearance over the fasteners 3013. It is not a failsafe water prevention system because a failure of G could allow water into space 3049 which would

attack sealant 3004.

Referring next to FIG. 24 a horizontal support 5000 CW is designed to attach to a steel angle SA which protrudes from the building slab 5090. The circled portion labeled 4000 is equivalent to the preferred embodiment. However, longer fins 5091 are needed for strength on the horizontal supports; and an integrated tube 5092 is formed as part of the base for the horizontal support 5093. A bolt 5094 using a shim G secures the integrated tube 5092 to the steel angle SA. Member 5092 is known in the prior art in curtain wall systems, but not in combination with assembly 4000.

Referring next to FIG. 25 an alternate embodiment 5000T is shown to have a horizontal support 5850 wherein the assembly in the circle 4000 is the same as the preferred embodiment. However, for the first time ever an exterior building structure vertical member VSM can be used to support a curtain wall as shown. The horizontal support base 5850 has (preferably aluminum) fins 5851, 5852 extending from the building side of the base 5850. Fasteners (machine screws) 5853 secure the fins 5851,5852 to the VSM using a shim GS. No sheath exists on this building. Optional legs 5857 may be used to strengthen the vertical supports.

Figure 26 (the preferred embodiment) is a vertical sectional view of lower gutter 200 attached to upper gutter 2 at right angles through the flanges F1, F2 outside of gutter legs 2002 and 2003. A continuous X-Y gutter is formed on which the curtain wall composite assembly, Figure 53, makes attachment to the building structure 4003 using fastener 4011 or/a similar fastener. The curtain wall panel 1000 is supported

by symmetrical recessed perimeter extrusion 4008 which acts as a corner brace around all four sides of the curtain wall panel 1000 and seals the corners with corner sealant 11. It is positively attached to return leg 22 by countersunk fastener 14010, which penetrates recessed perimeter extrusion 4008, and is sealed by butyl tape 10. The recessed perimeter extrusion 4008 is held together at the four corners by the corner reglet clip 4005 providing a framework without the use of fasteners. The curtain wall panel 1000 is attached to the continuous gutter created by lower gutter 200 and upper gutter 2 by machine screw 5 into the integral screw boss of the gutter members. A continuous gasket G2 which is applied to the bottom of recessed perimeter extrusion 4008 provides a thermal break between the curtain wall composite assembly, Figure 50. The curtain wall composite assembly rests upon 14009 lower gutter bearing leg which provides compression and the primary seal. Continuous pressure channel 4007 attaches the curtain wall panel to lower gutter 200 and upper gutter 2 through the screw bosses SB1 located in the gutters S1,S2. Continuous snap cover 4006 covers pressure channel 4007 covering machine screw 5. Any water that would penetrate the primary seal would flow into lower gutter 200 and upper gutter 2 into space S1 and drain to the bottom of the building

elevation. Air pressure equalization is achieved through weep hole 4004 which allows the pressure within the curtain wall composite assembly to equalize with the pressures outside of the curtain wall face 23.

Figure 27 is a horizontal sectional view of lower gutter 200 attached to upper gutter 2 at right angles through the flanges F1, F2 outside of gutter legs 2002 and 2003 which forms a continuous gutter on which the curtain wall composite assembly, Figure 53, makes attachment to the building structure 4003 using fastener 4011. The curtain wall panel 1000 is supported by symmetrical recessed perimeter extrusion 4008 which acts as a corner brace around all four sides of the curtain wall panel 1000 and seals the corners with corner sealant 11. It is positively attached to return leg 22 by countersunk fastener 14010, which penetrates recessed perimeter extrusion 4008, and is sealed by butyl tape 10. The recessed perimeter extrusion 4008 is held together at the four corners by the corner reglet clip 4005 providing a framework without the use of fasteners. The curtain wall panel 1000 is attached to the continuous gutter created by lower gutter 200 and upper gutter 2 by machine screw 5 into the integral screw boss SB1 of the gutter members. A continuous gasket G2 which is applied to the bottom of recessed perimeter extrusion 4008 provides a thermal break between the curtain wall composite assembly, Figure 53. The curtain wall composite assembly rests upon 14009 lower gutter bearing leg which provides compression and the primary seal. Continuous pressure channel 4007 attaches the curtain wall panel to lower gutter 200 and upper gutter 2 through the screw bosses SB1 located in the gutters. Continuous snap cover 4006 covers pressure channel 4007 covering machine screw 5. Any water that would penetrate the primary seal

would flow into lower gutter 200 and upper gutter 2 into space S1 and drain to the bottom of the building elevation. Air pressure equalization is achieved through weep hole 4004 which allows the pressure within the curtain wall composite assembly to equalize with the pressures outside of the curtain wall face 23.

Figure 28 is an identical view as shown in Figure 26, but utilizing a flush joint embodiment which varies from Figure 26 by using flush perimeter extrusion 4012.

Figure 29 is an identical view as shown in Figure 27, but utilizing a flush joint embodiment which varies from Figure 27 by using flush perimeter extrusion 4012.

Figure 30 is a horizontal sectional view of upper gutter 2 attached to lower gutter 200 at right angles through the flanges F3, F4 outside of gutter legs 2002 and 2003 which forms a continuous gutter on which the curtain wall composite assembly, Figure 53, makes attachment to the building structure 4003 using fastener 4011. The curtain wall panel 1000 is supported by symmetrical recessed perimeter extrusion 4008 which acts as a corner brace around all four sides of the curtain wall panel 1000 and seals the corners with corner sealant 11. It is positively attached to return leg 22 by countersunk fastener 14010, which penetrates recessed perimeter extrusion 4008, and is sealed by butyl tape 10. The recessed perimeter extrusion 4008 is held together at the four corners by the corner reglet clip 4005 providing a framework without the use of fasteners. The curtain wall panel 1000 is attached to the continuous gutter created by lower gutter 200 and upper gutter 2 by machine screw 5 into the integral screw boss of the gutter members. A continuous gasket G2 which is applied to the bottom of recessed

perimeter extrusion 4008 provides a thermal break between the curtain wall composite assembly, Figure 53. The curtain wall composite assembly rests upon 4013 upper gutter bearing leg which provides compression and the primary seal. Continuous pressure channel 4007 attaches the curtain wall panel to lower gutter 200 and upper gutter 2 through the screw bosses located in the gutters. Continuous snap cover 4006 covers pressure channel 4007 covering machine screw 5. Any water that would penetrate the primary seal would flow into lower gutter 200 and upper gutter 2 into space S1 and drain to the bottom of the building elevation. Air pressure equalization is achieved through weep hole 4004 which allows the pressure within the curtain wall composite assembly to equalize with the pressures outside of the curtain wall face 23.

Figure 31 is a vertical sectional view of upper gutter 2 attached to lower gutter 200 at right angles through the flanges outside of gutter legs 2002 and 2003 which forms a continuous gutter on which the curtain wall composite assembly, Figure 53, makes attachment to the building structure 4003 using fastener 4011. The curtain wall panel 1000 is supported by symmetrical recessed perimeter extrusion 4008 which acts as a corner brace around all four sides of the curtain wall panel 1000 and seals the corners with corner sealant 11. It is positively attached to return leg 22 by countersunk fastener 14010, which penetrates recessed perimeter extrusion 4008, and is sealed by butyl tape 10. The recessed perimeter extrusion 4008 is held together at the four corners by the corner reglet clip 4005 providing a framework without the use of fasteners. The curtain wall panel 1000 is attached to the continuous gutter created by lower gutter 200 and upper gutter 2 by machine screw 5 into the integral screw boss of the gutter members.

A continuous gasket G2 which is applied to the bottom of recessed perimeter extrusion 4008 provides a thermal break between the curtain wall composite assembly, Figure 50. The curtain wall composite assembly rests upon 4013 upper gutter bearing leg which provides compression and the primary seal. Continuous pressure channel 4007 attaches the curtain wall panel to lower gutter 200 and upper gutter 2 through the screw bosses located in the gutters. Continuous snap cover 4006 covers pressure channel 4007 covering machine screw 5. Any water that would penetrate the primary seal would flow into lower gutter 200 and upper gutter 2 into space S1 and drain to the bottom of the building elevation. Air pressure equalization is achieved through weep hole 4004 which allows the pressure within the curtain wall composite assembly to equalize with the pressures outside of the curtain wall face 23.

Figure 32 is an identical view as shown in Figure 30, but utilizing a flush joint embodiment which varies from Figure 30 by utilizing flush perimeter extrusion 4012.

Figure 33 is an identical view as shown in Figure 31, but utilizing a flush joint embodiment which varies from Figure 31 by utilizing flush perimeter extrusion 4012.

Figure 34 is a horizontal sectional view of lower termination gutter 4015 attached to upper gutter 2 at right angles through the flanges outside of gutter legs 2002 and 2003 which forms a continuous gutter on which the curtain wall composite assembly, Figure 53, makes attachment to the building structure 4003 using fastener 4011 or similar. The curtain wall panel 1000 is supported by symmetrical flush perimeter extrusion 4012 which acts as a corner brace around all four sides of the curtain wall panel 1000

and seals the corners with corner sealant 11. It is positively attached to return leg 22 by countersunk fastener 14010, which penetrates flush perimeter extrusion 4012, and is sealed by butyl tape 10. The flush perimeter extrusion 4012 is held together at the four corners by the corner reglet clip 4005 providing a framework without the use of fasteners. The curtain wall panel 1000 is attached to the continuous gutter created by lower gutter 200 and upper gutter 2 by machine screw 5 into the integral screw boss of the gutter members. A continuous gasket G2 which is applied to the bottom of flush perimeter extrusion 4012 provides a thermal break between the curtain wall composite assembly, Figure 53. The curtain wall composite assembly rests upon 14009 lower gutter bearing leg which provides compression and the primary seal. Continuous pressure channel 4007 attaches the curtain wall panel to lower gutter 200 and upper gutter 2 through the screw bosses located in the gutters. Continuous snap cover 4006 covers pressure channel 4007 covering machine screw 5. Any water that would penetrate the primary seal would flow into lower gutter 200 and upper gutter 2 into space S1 and drain to the bottom of the building elevation. Air pressure equalization is achieved through weep hole 4004 which allows the pressure within the curtain wall composite assembly to equalize with the pressures outside of the curtain wall face 23. The continuous pressure channel 4006 rests upon termination closure 4016 and gasket spacer G3. The system is sealed to adjacent materials by perimeter sealant 4014.

Figure 35 is an identical view as shown in Figure 34, but utilizing a flush joint embodiment which varies from Figure 34 by utilizing recessed perimeter extrusion 4008.

Figure 36 is a vertical sectional view of

lower termination gutter 4015 attached to upper gutter 2 at right angles through the flanges F9 outside of gutter legs 2002 and 2003 which forms a continuous gutter on which the curtain wall composite assembly, Figure 53, makes attachment to the building structure 4003 using fastener 4011. The curtain wall panel 1000 is supported by symmetrical flush perimeter extrusion 4012 which acts as a corner brace around all four sides of the curtain wall panel 1000 and seals the corners with corner sealant 11. It is positively attached to return leg 22 by countersunk fastener 14010, which penetrates flush perimeter extrusion 4012, and is sealed by butyl tape 10. The flush perimeter extrusion 4012 is held together at the four corners by the corner reglet clip 4005 providing a framework without the use of fasteners. The curtain wall panel 1000 is attached to the continuous gutter created by lower gutter 200 and upper gutter 2 by machine screw 5 into the integral screw boss of the gutter members. A continuous gasket G2 which is applied to the bottom of flush perimeter extrusion 4012 provides a thermal break between the curtain wall composite assembly, Figure 53. The curtain wall composite assembly rests upon 14009 lower gutter bearing leg which provides compression and the primary seal. Continuous pressure channel 4007 attaches the curtain wall panel to lower gutter 200 and upper gutter 2 through the screw bosses located in the gutters. Continuous snap cover 4006 covers pressure channel 4007 covering machine screw 5. Any water that would penetrate the primary seal would flow into lower gutter 200 and upper gutter 2 into space S1 and drain to the bottom of the building elevation. Air pressure equalization is achieved through weep hole 4004 which allows the pressure within the curtain wall composite assembly to equalize with the pressures

outside of the curtain wall face 23. The continuous pressure channel 4006 rests upon termination closure 4016 and gasket spacer G3. The system is sealed to adjacent materials by perimeter sealant 4014. The dotted lines for curtain wall 1000 show a recessed cap embodiment which use a different corner brace 4008 (see FIG. 37).

Figure 37 is an identical view as shown in Figure 36, but utilizing a recessed joint embodiment which varies from Figure 36 by utilizing recessed perimeter extrusion 4008.

Figure 38 is a vertical sectional view of upper termination gutter 4017 attached to lower gutter 200 at right angles through the flanges F10 outside of gutter legs 2002 and 2003 which forms a continuous gutter on which the curtain wall composite assembly, Figure 53, makes attachment to the building structure 4003 using fastener 4011. The curtain wall panel 1000 is supported by symmetrical flush perimeter extrusion 4012 which acts as a corner brace around all four sides of the curtain wall panel 1000 and seals the corners with corner sealant 11. It is positively attached to return leg 22 by countersunk fastener 14010, which penetrates flush perimeter extrusion 4012, and is sealed by butyl tape 10. The flush perimeter extrusion 4012 is held together at the four corners by the corner reglet clip 4005 providing a framework without the use of fasteners. The curtain wall panel 1000 is attached to the continuous gutter created by lower gutter 200 and upper gutter 2 by machine screw 5 into the integral screw boss of the gutter members. A continuous gasket G2 which is applied to the bottom of flush perimeter extrusion 4012 provides a thermal break between the curtain wall composite assembly, Figure 53. The curtain wall composite assembly rests upon 14009

lower gutter bearing leg which provides compression and the primary seal. Continuous pressure channel 4007 attaches the curtain wall panel to lower gutter 200 and upper gutter 2 through the screw bosses located in the gutters. Continuous snap cover 4006 covers pressure channel 4007 covering machine screw 5. Any water that would penetrate the primary seal would flow into lower gutter 200 and upper gutter 2 into space S1 and drain to the bottom of the building elevation. Air pressure equalization is achieved through weep hole 4004 which allows the pressure within the curtain wall composite assembly to equalize with the pressures outside of the curtain wall face 23. The continuous pressure channel 4006 rests upon termination closure 4016 and gasket spacer G3. The system is sealed to adjacent materials by perimeter sealant 4014.

Figure 39 is an identical view as shown in Figure 38, but utilizes a flush joint embodiment which varies from Figure 38 by utilizing flush perimeter extrusion 4012.

Figure 40 is a horizontal sectional view of upper termination gutter 4017 attached to lower gutter 200 at right angles through the flanges F10 outside of gutter legs 2002 and 2003 which forms a continuous gutter on which the curtain wall composite assembly, Figure 53, makes attachment to the building structure 4003 using fastener 4011. The curtain wall panel 1000 is supported by symmetrical flush perimeter extrusion 4012 which acts as a corner brace around all four sides of the curtain wall panel 1000 and seals the corners with corner sealant 11. It is positively attached to return leg 22 by countersunk fastener 14010, which penetrates flush perimeter extrusion 4012, and is sealed by butyl tape 10. The flush perimeter extrusion 4012 is held together at

the four corners by the corner reglet clip 4005 providing a framework without the use of fasteners. The curtain wall panel 1000 is attached to the continuous gutter created by lower gutter 200 and upper gutter 2 by machine screw 5 into the integral screw boss of the gutter members. A continuous gasket G2 which is applied to the bottom of flush perimeter extrusion 4012 provides a thermal break between the curtain wall composite assembly, Figure 50. The curtain wall composite assembly rests upon 14009 lower gutter bearing leg which provides compression and the primary seal. Continuous pressure channel 4007 attaches the curtain wall panel to lower gutter 200 and upper gutter 2 through the screw bosses located in the gutters. Continuous snap cover 4006 covers pressure channel 4007 covering machine screw 5. Any water that would penetrate the primary seal would flow into lower gutter 200 and upper gutter 2 into space S1 and drain to the bottom of the building elevation. Air pressure equalization is achieved through weep hole 4004 which allows the pressure within the curtain wall composite assembly to equalize with the pressures outside of the curtain wall face 23. The continuous pressure channel 4006 rests upon termination closure 4016 and gasket spacer G3. The system is sealed to adjacent materials by perimeter sealant 4014.

Figure 41 is an identical view as shown in Figure 40, but utilizing a flush joint embodiment which varies from Figure 40 by utilizing flush perimeter extrusion 4012.

Figure 42 shows lower gutter 200 nominal dimensions:

d10 = .246
d11 = .060
d12 = .110
d13 = .071
d14 = .015

d15 = .192
d16 = .018
d17 = .074
d18 = .250
d19 = 4.877
d20 = 3.877
d21 = 2.877
d22 = 1.624
d23 = .500
d24 = .575 d27 = .020 X 90°
d25 = .750 d28 = .050R
α = 30° P.I. = Point Inbetween
d26 = 1.750

Figure 43 shows upper gutter 2 nominal dimensions:

d10 - d23 are same as FIG. 42
d29 = 1.625
d30 = .450
d34 = .125
d27 = .020 X 90°
d28 = .050R P.I. = Point Inbetween
d31 = .125 α = 30°
d32 = .125
d33 = .125

Figure 44 shows upper termination 4017 nominal dimensions:

d35 = 2.909
d36 = 1.625
d37 = 1.000

Figure 45 shows lower termination 4015 nominal dimensions:

d35 = 2.909
d37 = 1.000
d38 = 1.750

Figure 46 shows flush perimeter extension 4012 nominal dimensions:

d39 = .500
d40 = .063
d41 = .125
d42 = 1.214
d43 = .526
d44 = .060
d45 = .689
d46 = .050R
d47 = .020R
d48 = .250

Figure 47 shows Recessed Perimeter Extension 4008 nominal dimensions:

d39 = .500
d40 = .063
d41 = .125
d43 = .526
d44 = .060
d45 = .689
d46 = .050R
d47 = .020R
d48 = .250
d49 = .375
d50 = 1.714

Figure 48 shows pressure channel 4007 nominal dimensions:

d51 = .696
d52 = .537
d53 = .508
d54 = .020 X 90°
d55 = .010R
a1 = 60°
d56 = .030R
d57 = .188
d58 = .249R
d59 = .115R

PT = Point
PI = Point Inbetween
d64 = .125
d65 = .417
d66 = .666
Sym = Symmetrical

d60 = .015R
d61 = .730
d62 = .622
d63 = .513

Figure 49 shows Snap Cover 4006 nominal dimensions:

d67 = .063
d68 = .738
d69 = .211
d70 = .050
d71 = .109R
d72 = .477
d73 = .713
PT = Point
D74 = .118

Referring next to FIG. 50 and 51 they show the common gasket to curtain wall parts which are used interchangeably between the guttered systems shown in FIGS. 27 and 29 respectively, and the non-guttered systems shown in FIGS. 54 and 55. The recessed systems shown in FIGS. 54 and 55 could be interchanged to a flush system as shown in FIG. 51.

Referring next to FIG. 52 a reglet 4005 is a metal clip that adds structural rigidity to corner joints of corner braces 4008 and/or 4112, where they meet at the inside corners of the curtain wall panels 1000.

In FIGS. 56, 57 the nominal dimensions of lower base 13002 and upper base 3015 are:

d100 = .246''
d101 = .192 +.000/-.024''
d102 = .060''
d103 = .110''
d104 = .071''
d105 = .015''
d106 = .018''
d107 = .074''

d108 = 1.000'' α = 30°
d109 = .125''
d110 = .020 X 90°
d111 = .500''
d112 = 1.624''
d113 = 3.624
d114 = .575''
d115 = .875''

It can be seen that d115 + d109 = d108 to allow the upper base 3015 to sit atop the flanges F99 of the lower base 13002 as shown in FIG. 54, and result in a single plane mounting platform shown by dotted lines MP.

Referring next to Figures 54 and 55 an alternate embodiment 3000 system is shown to have no internal gutters, but offers the same features of the preferred embodiment, as well as lower costs. The building 4003 supports a symmetric lower base member 13002 and upper base member 3015 as part of a dry, non-directional system. The lower base member 13002 and upper base member 3015 join at right angles and overlap to create a sub-system framework through the use of fastener 4011 which penetrates the flange legs. The curtain wall panel 1000 has a corner brace 4008 exactly as the preferred embodiment. The corner brace 4008 is comprised of four symmetric extrusions which are joined at the corners with a corner reglet clip 4005. Prior to corner 4008 being inserted into curtain wall panel 1000, corner sealant 3117 is applied to all inside corners and butyl sealant 10 is applied in corner brace 4008 at the location of the drilled holes for fastener 1401. Countersunk fasteners 14010 are inserted through the drilled hole in the curtain wall panel 1000 and through the butyl sealant 10 into corner brace 4008 forming a watertight rigid panel assembly. A gasket G2 is factory-applied to the bottom of corner brace 4008. The continuous channel 4007

secures the corner braces 4008 via fastener 53 into screw boss 3007. A facial clip 4006 provides an aesthetic appearance over the fasteners 53. The facial clip 4006 can be flush with the face of the curtain wall panel 1000 or recessed ½'' from the face of the curtain wall panel 1000.

DPS4000™ System Glossary Preferred Embodiment

Number	Description
2	Upper gutter
5	¼ - 20 machine screw into screw boss
10	Butyl sealant
11	Corner sealant
22	Rout and return leg
23	.020 panel face
200	Lower gutter
1000	ACM curtain wall panel
2002	Lower gutter leg
2003	Lower gutter leg opposite 2002
4001	Upper gutter leg
4002	Upper gutter leg opposite 4001
4003	Building structure
4004	Weep hole 12'' on center
4005	Corner reglet clip
4006	Snap cover
4007	Pressure channel (support channel)
4008	Recessed face perimeter extrusion (corner brace)
14009	Lower gutter bearing leg
14040	Countersunk positive attachment
4011	System to building fastener
4012	Flush face perimeter extrusion (corner brace)
4013	Upper gutter bearing leg
4014	Perimeter sealant
4015	Lower termination gutter

1	4016	Termination closure
2	4017	Upper termination gutter
3	S1	Lower gutter space
4	S2	Upper gutter space
5	G2	Gutter compression gasket
6	G3	Termination closure compression gasket
7		DPS2000 ™ Glossary Key
8	22	Return leg of ACM
9	23	Curtain wall panel face
10	1000	Curtain wall panel
11	2100	Sealant
12	2101	Backer Rod
13	2102	Screw boss machine screw
14	2103	Flush joint corner brace clip
15	2104	Recessed joint corner brace clip
16	2105	Screw boss
17	2106	Horizontal frame member
18	2107	Vertical frame member
19	2108	Horizontal termination frame member
20	2109	Vertical termination frame member
21	2110	Horizontal flange leg
22	2111	Vertical flange leg
23	2112	Flange attachment bolt
24	2113	Attachment screw to building structure
25	2114	Clip slot
26	2115	Panel stiffener
27	2116	Clip screw
28	2117	Building structure
29		DPS2500 ™
30	2501	Snap cover
31	2502	Machine screw
32	2503	Pressure channel
33	2504	Weep hole
34	2505	Horizontal gutter
35	2506	Vertical gutter

2507	Horizontal termination gutter
2508	Vertical termination gutter
2509	Attachment screw
2510	Pivot point
2511	Screw boss
2512	Vertical flange leg
2513	Horizontal flange leg
2514	Flange leg bolt
HGS	Horizontal gutter space
VGS	Vertical gutter space
1000	Curtain wall panel
4003	Building structure
23	Curtain wall panel face
22	Return leg

Figure 58 Notes plus standard notes

4101	EIFS/Stucco
4100	Long structural fastener
4102	Insulation
4103	Structural studs

Figure 68 Notes

4003	Building structure
4104	Right splice plate
4105	Left splice plate
4106	Lower splice plate
4107	Splice fastener

Figure 58 is a vertical cross sectional view of the preferred embodiment as shown in Figure 26, but with varying building structure components and attachment fastener. Sheathing known as exterior insulated finish system 4101 is applied to insulation 4102 which is attached to the structural studs 4103 comprises an alternate composite building structure. The framework of lower gutter 200 and upper gutter 2 are attached to the structural studs 4103 using long structural fastener 4100 without crushing the composite building

structure comprised of exterior insulated finish system (EIFS) 4101 and insulation 4102.

Figure 59 is a vertical cross sectional view of horizontal gutter 2505 which is joined with vertical gutter 2506 at right angles and connected through vertical flange leg 2512 and horizontal flange leg 2513 using flange bolt attachment screw 2509. The pivot point leg 2510 on each side of the horizontal gutter space HGS is milled out at the location of the intersection of the vertical gutter 2505 which forms a continuous guttered framework. The ACM curtain wall panel 1000 has an additional rout 2500 in return leg 22 which fits over pivot point 2510 allowing curtain wall panel face 23 to flex. The curtain wall panel 1000 does not have a corner brace as in the preferred embodiment, but incorporates the framework and continuous gutter embodiments of such. The framework of horizontal gutter 2505 and vertical gutter 2506 is attached to the building structure 4003 using attachment screw 2509. The curtain wall panel 1000 is placed on the framework and held in place by pressure to the return leg 22 over the pivot point 2510 by pressure channel 2503 which is attached to the gutters 2505 and 2506 by machine screw 2502 into screw boss 2511. Snap cover 2501 covers machine screw 2502 and pressure channel 2503. The bottom horizontal return leg 22 of the curtain wall panel 1000 shall incorporate a weep hole 2504 used to remove moisture from condensation and act as a failsafe against water that may have traveled outside of horizontal gutter space HGS. Water within the horizontal gutter space HGS travels to the vertical gutter space VGS and then downward to the bottom of the framework and out the building.

Figure 60 is a horizontal cross sectional view of vertical gutter 2506 which is joined with horizontal gutter 2505 at right angles and connected

through vertical flange leg 2412 and horizontal flange leg 2513 using flange bolt attachment screw 2509. The ACM curtain wall panel 1000 has an additional rout 2500 in return leg 22 which fits over pivot point 2510 allowing curtain wall panel face 23 to flex. The curtain wall panel 1000 does not have a corner brace as in the preferred embodiment, but incorporates the framework and continuous gutter embodiments of such. The framework of horizontal gutter 2505 and vertical gutter 2506 is attached to the building structure 4003 using attachment screw 2509. The curtain wall panel 1000 is placed on the framework and held in place by pressure to the return leg 22 over the pivot point 2510 by pressure channel 2503 which is attached to the gutters 2505 and 2506 by machine screw 2502 into screw boss 2511. Snap cover 2501 covers machine screw 2502 and pressure channel 2503. Water that enters the vertical gutter space VGS travels downward to horizontal gutter space HGS and weeps to the face of the curtain wall panel face 23 through weep hole 2504.

Figure 61 is an identical view as shown in Figure 57, but varies by having a recessed joint embodiment whereby the face of the panel 23 extends beyond snap cover 2501.

Figure 62 is an identical view as shown in Figure 58, but varies by having a recessed joint embodiment whereby the face of the panel 23 extends beyond snap cover 2501.

Figure 63 is a vertical cross sectional view of the horizontal termination gutter 2507 which connects to vertical gutter 2506 at right angles forming a continuous gutter framework. The pivot leg 2510 is milled out at the location of the vertical gutters to allow water to drain down vertical gutter 2506 to the bottom of the building structure and out the building. The guttered framework is attached to the building structure 4003

using attachment screw 2509. The curtain wall panel 1000 is placed on the framework and held in place by pressure to the return leg 22 over the pivot point 2510 by pressure channel 2503 which is attached to the gutters 2505 and 2506 by machine screw 2502 into screw boss 2511. Snap cover 2501 covers machine screw 2502 and pressure channel 2503.

Figure 64 is a horizontal cross sectional view of the vertical termination gutter 2508 which connects to horizontal gutter 2505 at right angles forming a continuous gutter framework. Water that enters the gutter travels downward to the bottom of the building structure and out the building. The guttered framework is attached to the building structure 4003 using attachment screw 2509. The curtain wall panel 1000 is place on the framework and held in place by pressure to the return leg 22 over the pivot point 2510 by pressure channel 2503 which is attached to the gutters 2505 and 2508 by machine screw 2502 into screw boss 2511. Snap cover 2501 covers machine screw 2502 and pressure channel 2503.

Figure 65 is an identical view as shown in Figure 61, but varies by having a recessed joint embodiment whereby the face of the panel 23 extends beyond snap cover 2501.

Figure 66 is an identical view as shown in Figure 62, but varies by having a recessed joint embodiment whereby the face of the panel 23 extends beyond snap cover 2501.

Figure 67 is a frontal view of the assembly of vertical frame members VFM and horizontal frame members VFM at right angle to create a framework FW. It illustrates the ability to stack one framework FWon top of another against the building structure BS and to join them using a splice joint SJ.

Figure 68 is a horizontal cross sectional view of splice joint assembly which connects the gutter of one framework to the gutter of another framework by attaching the left splice plate 4105 and right splice plate 4104 to he lower splice plate 4106 to the gutters utilizing splice fastener 4107. The composite assembly keeps the gutter intact while providing structural support to the framework.

Figure 69 is a horizontal cross sectional view of the vertical frame member 2107 which is joined at right angles to the horizontal frame member 2106 through the horizontal flange leg 2110 and the vertical flange leg 2111 utilizing flange attachment bolt 2112. They make a framework that is attached to building structure 2117 utilizing attachment screw 2113. The curtain wall panel 1000 is attached to the framework comprised of horizontal frame member 2106 and vertical frame member 2107 by machine screw 2102 which slips through clip slot 2114 in recessed joint corner brace clip 2104 which attaches to return leg 22 by clip fastener 2116. Clip slot 2114 allows the curtain wall panel 1000 to float on top of the framework. The primary seal of the system is achieved by the application of backer rod 2101 and sealant 2100 in the recessed joint.

Figure 70 is a vertical cross sectional view of the horizontal frame member 2106 which is joined at right angles to the vertical frame member 2107 through the horizontal flange leg 2110 and the vertical flange leg 2111 utilizing flange attachment bolt 2112. They make a framework that is attached to building structure 2117 utilizing attachment screw 2113. The curtain wall panel 1000 is attached to the framework comprised of horizontal frame member 2106 and vertical frame member 2107 by machine screw 2102 which slips through clip slot

2114 in recessed joint corner brace clip 2104 which attaches to return leg 22 by clip fastener 2116. Clip slot 2114 allows the curtain wall panel 1000 to float on top of the framework. The primary seal of the system is achieved by the application of backer rod 2101 and sealant 2100 in the recessed joint.

Figure 71 is an identical view as shown in Figure 67, but varies by having a flush joint embodiment utilizing flush joint corner brace 2103 whereby the face of the panel 23 is flush with snap cover 2501.

Figure 72 is an identical view as shown in Figure 68, but varies by having a recessed joint embodiment whereby the face of the panel 23 extends beyond snap cover 2501.

Figure 73 is an identical view as shown in Figure 69, but with one curtain wall panel 1000 eliminated for clarity to illustrate the flush corner brace clip 2103.

Figure 74 is an identical view as shown in Figure 70, but with one curtain wall panel 1000 eliminated for clarity to illustrate the flush corner brace clip 2103.

Figure 75 is a horizontal cross sectional view of the vertical termination frame member 2109 which is joined at right angles to the horizontal frame member 2106 through the horizontal flange leg 2110 and the vertical flange leg 2111 utilizing flange attachment bolt 2112. They make a framework that is attached to building structure 2117 utilizing attachment screw 2113. The curtain wall panel 1000 is attached to the framework comprised of horizontal frame member 2106 and vertical frame member 2107 by machine screw 2102 which slips through clip slot 2114 in recessed joint corner brace clip 2104 which attaches to return leg 22 by clip fastener 2116. Clip slot 2114 allows the curtain wall panel 1000 to float on top of the framework. The primary seal of the system is achieved by the application

of backer rod 2101 and sealant 2100 in the recessed joint.

Figure 76 is a vertical cross sectional view of the horizontal termination frame member 2108 which is joined at right angles to the vertical frame member 2107 through the horizontal flange leg 2110 and the vertical flange leg 2111 utilizing flange attachment bolt 2112. They make a framework that is attached to building structure 2117 utilizing attachment screw 2113. The curtain wall panel 1000 is attached to the framework comprised of horizontal frame member 2106 and vertical frame member 2107 by machine screw 2102 which slips through clip slot 2114 in recessed joint corner brace clip 2104 which attaches to return leg 22 by clip fastener 2116. Clip slot 2114 allows the curtain wall panel 1000 to float on top of the framework. The primary seal of the system is achieved by the application of backer rod 2101 and sealant 2100 in the recessed joint.

Figure 77 is an identical view as shown in Figure 73, but varies by having a recessed joint embodiment utilizing recessed joint corner brace 2104 whereby the face of the panel 23 is flush with snap cover 2501. Figure 78 is an identical view as shown in Figure 74, but varies by having a recessed joint embodiment utilizing recessed joint corner brace 2104 whereby the face of the panel 23 is flush with snap cover 2501.

Figure 79 is an exploded frontal view showing vertical frame member 2107 and horizontal frame member 2106 illustrating connection of flange bolts 2112 from vertical flange leg 2111 and horizontal flange leg 2110. Fastener 2113 illustrates connection of the framework comprised of vertical frame member 2107 and horizontal frame member 2106 to the building structure.

Figure 80 is a cross sectional view of framework comprised of vertical frame member 2107 and

horizontal frame member 2106 illustrating frame connection using flange bolt 2112 and frame to building structure 2117 attachment utilizing fastener 2113.

Figure 81 is an frontal view showing vertical frame member 2107 and horizontal frame member 2106 illustrating connection of flange bolts 2112 from vertical flange leg 2111 and horizontal flange leg 2110. Fastener 2113 illustrates connection of the framework comprised of vertical frame member 2107 and horizontal frame member 2106 to the building structure.

Figure 82 is a vertical cross sectional view of a framework assembly consisting of vertical frame member 2107 and horizontal frame member 2106 with flanges 2110 and 2111 illustrating one method of attaching a framework to the building structure 2117.

Figure 83 is an exploded frontal view of vertical frame member 2506 and horizontal frame member 2505 illustrating assembly connections through flanges 2512 and 2513 utilizing flange connection 2514. The assembled connection is attached to the building structure utilizing fastener 2509.

Frame 84 is a frontal view of vertical frame member 2506 and horizontal frame member 2505 illustrating assembly connections through flanges 2512 and 2513 utilizing flange connection 2514. The assembled connection is attached to the building structure utilizing fastener 2509.

Figure 85 is a cross sectional view of framework consisting of vertical frame member 2506 and horizontal frame member 2505 illustrating connection through flange 2512 and flange 2511 with flange bolt 2514. The curtain wall panel 1000 is attached to the framework by attaching return leg 22 to pivot leg 2510 and held in place by pressure channel 2503 by fastener 2502 and covered by snap cover 2501. The frame assembly attaches to

the building structure 4003.

Figure 86 shows horizontal frame members HFM joined to vertical frame members VFM at right angles. The left flange leg LFL and right flange leg RF of the vertical frame members VFM overlap the lower flange leg LF and the upper flange leg UF of the horizontal frame members HFM above and below the vertical extents VE of the curtain wall panel, and are connected utilizing bolts and nuts at the intersection. Upon the horizontal frame members HFM and vertical frame members VFM being bolted together, it comprises the framework FW. The framework FW is placed against the building structure BS and joined through the horizontal frame members HFM utilizing building fasteners BF1 in the upper flange leg UF and BF2 in the lower flange leg LF, as required by wind loading requirements, between the horizontal extents HE of the curtain wall panel. The vertical bearing surface VBS and horizontal bearing surface HBS prevent the framework FW from crushing any sheathing SH, such as gypsum board or insulation, which may be attached over the building structure BS. The vertical spacing VS of the building fasteners BF1 and BF2 provide constant force to the flanges UF, LF, RF, LFL of the framework FW to the building structure BS while also providing for two connection points in lieu of one.

Nominal Dimensions are:

A1 = 4' x 5' = 20'

A2 = 2 (4') x (.40) + 2 (5') x (.40) = 7.12

A2 over A1 = .36

A = 4'0

B = 5'0

C = 4'0

D = 5'0

E = 4'0

F = 5'0

G = 4.750''

H = 4.750''

FIG. 87 is a frontal view of a partial building structure showing preferred embodiment DPS 4000 guttered non-directional dry system per figures 27 and 30, as well as, alternate embodiments for window glazing which include transitions from aluminum composite panel 1000 to glass panel 8701 to aluminum composite panel 1000. Lower transition from aluminum composite panel 1000 to glass panel 8701 is accomplished using integrated window sill 8803 as shown in figure 90. Upper transition from glass panel 8701 to aluminum composite panel 1000 is accomplished using integrated window head 8804 as shown in figure 89. The end or jamb transition from glass panel 8701 to aluminum composite panel 1000 is accomplished using window head 8804, but rotated 90 degrees as shown in figure 89A. Glass panel 8701 to glass panel 8701 transition is made using vertical window mullion 8801 as shown in figures 91 and 91A.

FIG. 88 is a frontal view of framework of preferred embodiment DPS 4000 guttered non-directional dry system including alternate embodiments for window glazing shown in figure 87, with aluminum composite panels 1000 and glass panels 8701 removed. From top to bottom, the framework is comprised of lower gutter 200 vertically transitioning to horizontal window head 8804, and connected through overlapping flanges 8809 and 8810 using flange bolt 2112. Window head 8804 transitions to vertical window mullion 8801 and continues to window sill 8803. Window mullion 8801 is held static at both ends by sliding mullion clip 8802 which rides upon integrated clip rails 8805 and 8806 in window sill 8803, and integrated clip rails 8807 and 8808 in window head 8804. Between each vertical window mullion 8801 is a decorative snap insert; 8902 at window head 8804, and 9001

at window sill 8803. Window sill 8803 transitions to vertical lower gutter 200 and connects through overlapping flanges 8809 and 8811 using flange bolt 2112. Framework attachment to building structure 8750 is made using attachment screw 4011 through flanges 8810 and 8811.

FIG. 89 is a vertical sectional view of the upper transition from glass panel 8701 to aluminum composite panel 1000. Window head 8804 is connected to lower gutter 200 using flange bolt 2112. Lower gutter 200 rests upon gutter leg 2002 of window head 8804. Window head 8804 includes integrated clip rails 8807 and 8808 which form reglets or grooves upon which mullion clip 8802 slides. Vertical window mullion 8801 captures mullion clip 8802 and is made static using clip-stay 8901. Decorative snap cover 8902 fits between vertical window mullions 8801 into window head 8804. Glass panel 8701 is held in window head 8804 using gaskets 8904 and 8903. Silicone 8905 provides waterproofing. Aluminum composite panel 1000 is mechanically fastened to perimeter extrusion 4012 by fastener 14010. Gasket G2 is attached to the bottom of perimeter extrusion 4012. Panel 1000 corners are joined by integrated clip 4005. Sealant 10 provides water barrier around perimeter extrusion 4012 face and corners. Panel 1000 is attached to window head 8804 by pressure channel 4007 and machine screw 5. Decorative snap cap 4006 covers pressure channel 4007.

FIG. 89A is a horizontal sectional view of the side transition from glass panel 8701 to aluminum composite panel 1000. Window head 8804 is rotated 90 degrees and used as a window jamb to transition glass panel 8701 to aluminum composite panel 1000. Window head (jamb) insert 8902 snaps in between window head 8804 and window sill 8803. Window sill insert 9001 snaps into window sill

8803 between vertical window mullions 8801. Glass panel 8701 is held in window head (jamb) 8804 using gaskets 8904 and 8903. Silicone 8905 provides waterproofing. Aluminum composite panel 1000 is mechanically fastened to perimeter extrusion 4012 by fastener 14010. Gasket G2 is attached to the bottom of perimeter extrusion 4012. Panel 1000 corners are joined by integrated clip 4005. Sealant 10 provides water barrier around perimeter extrusion 4012 face and corners. Panel 1000 is attached to window head (jamb) 8804 by pressure channel 4007 and machine screw 5. Decorative snap cap 4006 covers pressure channel 4007.

FIG. 90 is a vertical sectional view of the lower transition from glass panel 8701 to aluminum composite panel 1000. Window sill 8803 is connected to lower gutter 200 using flange bolt 2112. Lower gutter 200 rests against gutter leg 2002 of window sill 8803. Window sill 8803 includes integrated clip rails 8805 and 8806 which form reglets or grooves upon which mullion clip 8802 slides. Vertical window mullion 8801 captures mullion clip 8802 and is made static using clip-stay 8901. Decorative snap cover 9001 fits between vertical window mullions 8801 into window sill 8803. Glass panel 8701 is held in window sill 8803 using gaskets 8904 and 8903. Silicone 8905 provides waterproofing. Aluminum composite panel 1000 is mechanically fastened to perimeter extrusion 4012 by fastener 14010. Gasket G2 is attached to the bottom of perimeter extrusion 4012. Panel 1000 corners are joined by integrated clip 4005. Sealant 10 provides water barrier around perimeter extrusion 4012 face and corners. Panel 1000 is attached to window sill 8803 by pressure channel 4007 and machine screw 5. Decorative snap cap 4006 covers pressure channel 4007. Baffle BFL prevents water blockage from debris and negative wind pressure. Weep hole WH

allows water to exit to the face of aluminum composite panel 1000.

FIG. 91 is a horizontal sectional view of vertical window mullion 8801 looking down toward window sill 8803. Mullion clip 8802 holds vertical window mullion 8801 static within window sill 8803. Decorative insert 9001 snaps into window sill 8803 in-between vertical window mullions 8801. Spacers 9103 provide cushion and gap for silicone 8905. Gaskets 8903 and 8904 hold glass panel 8701 in place. Backer rod 9102 and face sealant 9101 provide waterproofing.

FIG. 91A is a horizontal sectional view of vertical window mullion 8801 looking up toward window head 8804. Mullion clip 8802 holds vertical window mullion 8801 static within window head 8804. Decorative insert 8902 snaps into window head 8804 in-between vertical window mullions 8801. Spacers 9103 provide cushion and gap for silicone 8905. Gaskets 8903 and 8904 hold glass panel 8701 in place. Backer rod 9102 and face sealant 9101 provide waterproofing.

FIG. 92 is a vertical sectional view of a glass panel assembly using figures 89 and 90.

FIG. 93 is a vertical sectional view of a panel assembly using figures 89 and 90.

FIG. 94 is a frontal view of a partial building structure showing alternate embodiment DPS 3000 non-directional dry system per figures 54 and 55, as well as, additional alternate embodiments for window glazing which include transitions from aluminum composite panel 1000 to glass panel 8701 to aluminum composite panel 1000.. Lower transition from aluminum composite panel 1000 to glass panel 8701 is accomplished using integrated window sill 9503 as shown in figure 97. Upper transition from glass panel 8701 to aluminum composite panel 1000 is accomplished using integrated window head 9504

as shown in figure 96. The end or jamb transition from glass panel 8701 to aluminum composite panel 1000 is accomplished using window head 9504, but rotated 90 degrees as shown in figure 96A. Glass panel 8701 to glass panel 8701 transition is made using vertical window mullion 8801 as shown in figures 98 and 98A.

FIG. 95 is a frontal view of framework of alternate embodiment DPS 3000 non-directional dry system including additional alternate embodiments for window glazing shown in figure 94, with aluminum composite panels 1000 and glass panels 8701 removed. From top to bottom, the framework is comprised of lower base 3015 vertically transitioning to horizontal window head 9504, and connected through overlapping flanges 9509 and 9505 using flange bolt 2112. Window head 9504 transitions to vertical window mullion 8801 and continues to window sill 9503. Window mullion 8801 is held static at both ends by sliding mullion clip 8802 which rides upon integrated clip rails 9501 and 9502 in window sill 9503, and integrated clip rails 9506 and 9507 in window head 9504. Between each vertical window mullion 8801 is a decorative snap insert; 8902 at window head 9504, and 9001 at window sill 9503. Window sill 9503 transitions to vertical lower base 3015 and connects through overlapping flanges 9505 and 9508 using flange bolt 2112. Framework attachment to building structure 8750 is made using attachment screw 4011 through flanges 9509 and 9508.

FIG. 96 is a vertical sectional view of the upper transition from glass panel 8701 to aluminum composite panel 1000. Window head 9504 is connected to lower base 3015 using flange bolt 2112. Lower base 3015 rests upon window head 9504. Window head 9504 includes integrated clip rails 9506 and 9507 which form reglets or grooves upon which mullion clip 8802 slides. Vertical window mullion 8801 captures mullion clip 8802 and is

made static using clip-stay 8901. Decorative snap cover 8902 fits between vertical window mullions 8801 into window head 9504. Glass panel 8701 is held in window head 9504 using gaskets 8904 and 8903. Silicone 8905 provides waterproofing. Aluminum composite panel 1000 is mechanically fastened to perimeter extrusion 4012 by fastener 14010. Gasket G2 is attached to the bottom of perimeter extrusion 4012. Panel 1000 corners are joined by integrated clip 4005. Sealant 10 provides water barrier around perimeter extrusion 4012 face and corners. Panel 1000 is attached to window head 9504 by pressure channel 4007 and machine screw 5. Decorative snap cap 4006 covers pressure channel 4007.

FIG. 96A is a horizontal sectional view of the side transition from glass panel 8701 to aluminum composite panel 1000. Window head 9504 is rotated 90 degrees and used as a window jamb to transition glass panel 8701 to aluminum composite panel 1000. Window head (jamb) insert 8902 snaps in between window head 9504 and window sill 9503. Window sill insert 9001 snaps into window sill 9503 between vertical window mullions 8801. Glass panel 8701 is held in window head (jamb) 9504 using gaskets 8904 and 8903. Silicone 8905 provides waterproofing. Aluminum composite panel 1000 is mechanically fastened to perimeter extrusion 4012 by fastener 14010. Gasket G2 is attached to the bottom of perimeter extrusion 4012. Panel 1000 corners are joined by integrated clip 4005. Sealant 10 provides water barrier around perimeter extrusion 4012 face and corners. Panel 1000 is attached to window head (jamb) 9504 by pressure channel 4007 and machine screw 5. Decorative snap cap 4006 covers pressure channel 4007.

FIG. 97 is a vertical sectional view of the lower transition from glass panel 8701 to aluminum composite panel 1000. Window sill 9503 is connected to lower

base 3015 using flange bolt 2112. Lower base 3015 rests against window sill 9503. Window sill 9503 includes integrated clip rails 9501 and 9502 which form reglets or grooves upon which mullion clip 8802 slides. Vertical window mullion 8801 captures mullion clip 8802 and is made static using clip-stay 8901. Decorative snap cover 9001 fits between vertical window mullions 8801 into window sill 9503. Glass panel 8701 is held in window sill 8803 using gaskets 8904 and 8903. Silicone 8905 provides waterproofing. Aluminum composite panel 1000 is mechanically fastened to perimeter extrusion 4012 by fastener 14010. Gasket G2 is attached to the bottom of perimeter extrusion 4012. Panel 1000 corners are joined by integrated clip 4005. Sealant 10 provides water barrier around perimeter extrusion 4012 face and corners. Panel 1000 is attached to window sill 9503 by pressure channel 4007 and machine screw 5. Decorative snap cap 4006 covers pressure channel 4007. Baffle BFL prevents water blockage from debris and negative wind pressure. Weep hole WH allows water to exit to the face of aluminum composite panel 1000.

FIG. 98 is a horizontal sectional view of vertical window mullion 8801 looking down toward window sill 9503. Mullion clip 8802 holds vertical window mullion 8801 static within window sill 9503. Decorative insert 9001 snaps into window sill 9503 in-between vertical window mullions 8801. Spacers 9103 provide cushion and gap for silicone 8905. Gaskets 8903 and 8904 hold glass panel 8701 in place. Backer rod 9102 and face sealant 9101 provide waterproofing.

FIG. 98A is a horizontal sectional view of vertical window mullion 8801 looking up toward window head 9504. Mullion clip 8802 holds vertical window mullion 8801 static within window head 9504. Decorative insert 8902 snaps into window head 9504 in-between vertical

window mullions 8801. Spacers 9103 provide cushion and gap for silicone 8905. Gaskets 8903 and 8904 hold glass panel 8701 in place. Backer rod 9102 and face sealant 9101 provide waterproofing.

FIG. 99 is a vertical sectional view of a glass panel assembly using figures 96 and 97.

FIG. 100 is a vertical sectional view of a panel assembly using figures 96 and 97.

FIG. 101 is a frontal view of a partial building structure showing alternate embodiment DPS 5000CW incorporating structural vertical mullions per figures 24 and 108, as well as, alternate embodiments for window glazing, which include transitions from aluminum composite panel 1000 to glass panel 8701 to aluminum composite panel 1000. Lower transition from aluminum composite panel 1000 to glass panel 8701 is accomplished using integrated window sill 8803 as shown in figure 104. Upper transition from glass panel 8701 to aluminum composite panel 1000 is accomplished using integrated window head 8804 as shown in figure 103. The end or jamb transition from glass panel 8701 to aluminum composite panel 1000 is accomplished using window head 8804, but rotated 90 degrees as shown in figure 103A. Glass panel 8701 to glass panel 8701 transition is made using vertical window mullion 8801 as shown in figures 105 and 105A.

FIG. 102 is a frontal view of framework of alternate embodiment DPS 5000CW incorporating structural vertical mullions per figures 24 and 108 including alternate embodiments for window glazing shown in figures 103 and 104, with aluminum composite panels 1000 and glass panels 8701 removed. From top to bottom, the framework is comprised of structural vertical mullion 10203 vertically transitioning to horizontal window head 8804, and connected through overlapping flanges 10204

and 8810 using flange bolt 2112. Window head 8804 transitions to vertical window mullion 8801 and continues to window sill 8803. Window mullion 8801 is held static at both ends by sliding mullion clip 8802 which rides upon integrated clip rails 10201 and 10202 in window sill 8803, and integrated clip rails 10207 and 10208 in window head 8804. Between each vertical window mullion 8801 is a decorative snap insert; 8902 at window head 8804, and 9001 at window sill 8803. Window sill 8803 transitions to structural vertical mullion 10203 and connects through overlapping flanges 10204 and 8811 using flange bolt 2112. Framework attachment to building structure 8750 is made per figure 108.

FIG. 103 is a vertical sectional view of the upper transition from glass panel 8701 to aluminum composite panel 1000. Window head 8804 is connected to structural vertical mullion 10203 using flange bolt 2112. Structural vertical mullion 10203 rests upon gutter leg 2002 of window head 8804. Window head 8804 includes integrated clip rails 10207 and 10208 which form reglets or grooves upon which mullion clip 8802 slides. Vertical window mullion 8801 captures mullion clip 8802 and is made static using clip-stay 8901. Decorative snap cover 8902 fits between vertical window mullions 8801 into window head 8804. Glass panel 8701 is held in window head 8804 using gaskets 8904 and 8903. Silicone 8905 provides waterproofing. Aluminum composite panel 1000 is mechanically fastened to perimeter extrusion 4012 by fastener 14010. Gasket G2 is attached to the bottom of perimeter extrusion 4012. Panel 1000 corners are joined by integrated clip 4005. Sealant 10 provides water barrier around perimeter extrusion 4012 face and corners. Panel 1000 is attached to window head 8804 by pressure channel 4007 and machine screw 5. Decorative snap cap 4006 covers pressure channel 4007.

FIG. 103A is a horizontal sectional view of the side transition from glass panel 8701 to aluminum composite panel 1000. Window head 8804 is rotated 90 degrees and used as a window jamb to transition glass panel 8701 to aluminum composite panel 1000. Window head (jamb) insert 8902 snaps in between window head 8804 and window sill 8803 covering slide rails 10207 and 10208. Window sill insert 9001 snaps into window sill 8803 between vertical window mullions 8801. Glass panel 8701 is held in window head (jamb) 8804 using gaskets 8904 and 8903. Silicone 8905 provides waterproofing. Aluminum composite panel 1000 is mechanically fastened to perimeter extrusion 4012 by fastener 14010. Gasket G2 is attached to the bottom of perimeter extrusion 4012. Panel 1000 corners are joined by integrated clip 4005. Sealant 10 provides water barrier around perimeter extrusion 4012 face and corners. Panel 1000 is attached to window head (jamb) 8804 by pressure channel 4007 and machine screw 5. Decorative snap cap 4006 covers pressure channel 4007.

FIG. 104 is a vertical sectional view of the lower transition from glass panel 8701 to aluminum composite panel 1000. Window sill 8803 is connected to structural vertical mullion 10203 using flange bolt 2112. Structural vertical mullion 10203 rests against gutter leg 2002 of window sill 8803. Window sill 8803 includes integrated clip rails 8805 and 8806 which form reglets or grooves upon which mullion clip 8802 slides. Vertical window mullion 8801 captures mullion clip 8802 and is made static using clip-stay 8901. Decorative snap cover 9001 fits between vertical window mullions 8801 into window sill 8803. Glass panel 8701 is held in window sill 8803 using gaskets 8904 and 8903. Silicone 8905 provides waterproofing. Aluminum composite panel 1000 is mechanically fastened to perimeter extrusion 4012 by fastener 14010. Gasket G2 is attached to the bottom

of perimeter extrusion 4012. Panel 1000 corners are joined by integrated clip 4005. Sealant 10 provides water barrier around perimeter extrusion 4012 face and corners. Panel 1000 is attached to window sill 8803 by pressure channel 4007 and machine screw 5. Decorative snap cap 4006 covers pressure channel 4007. Baffle BFL prevents water blockage from debris and negative wind pressure. Weep hole WH allows water to exit to the face of aluminum composite panel 1000.

FIG. 105 is a horizontal sectional view of vertical window mullion 8801 looking down toward window sill 8803. Mullion clip 8802 holds vertical window mullion 8801 static within window sill 8803. Decorative insert 9001 snaps into window sill 8803 in-between vertical window mullions 8801. Spacers 9103 provide cushion and gap for silicone 8905. Gaskets 8903 and 8904 hold glass panel 8701 in place. Backer rod 9102 and face sealant 9101 provide waterproofing.

FIG. 105A is a horizontal sectional view of vertical window mullion 8801 looking up toward window head 8804. Mullion clip 8802 holds vertical window mullion 8801 static within window head 8804. Decorative insert 8902 snaps into window head 8804 in-between vertical window mullions 8801. Spacers 9103 provide cushion and gap for silicone 8905. Gaskets 8903 and 8904 hold glass panel 8701 in place. Backer rod 9102 and face sealant 9101 provide waterproofing.

FIG. 106 is a vertical sectional view of a glass panel assembly using figures 103 and 104.

FIG. 107 is a vertical sectional view of a panel assembly using figures 103 and 104.

FIG. 108 is a structural vertical mullion 10203 of alternate embodiment DPS 5000CW which provides windload and deadload support for the preferred embodiment by using attachment clip 10803 to connect to

building structure 8750 using bolts 10804. Assembly bolt 10802 connects structural vertical mullion 10203 to attachment clip 10803. Shim 10801 provides continuous support between structural vertical mullion 10203 and attachment clip 10803. Preferred embodiment attachments to structural vertical mullion 10203 are made to flange 10204. Aluminum composite panel 1000 is mechanically fastened to perimeter extrusion 4012 by fastener 14010. Gasket G2 is attached to the bottom of perimeter extrusion 4012. Panel 1000 corners are joined by integrated clip 4005. Sealant 10 provides water barrier around perimeter extrusion 4012 face and corners. Panel 1000 is attached to window sill 8803 by pressure channel 4007 and machine screw 5. Decorative snap cap 4006 covers pressure channel 4007.

FIG. 109 is identical to figure 108, but shows glass panel 8701 integrated into structural vertical mullion 10203 using glazing channel 10901 in lieu of aluminum composite panel 1000.

FIG. 110 is a vertical sectional view of alternate embodiment DPS 5000CW assembled as a unit incorporating structural vertical mullion 10203 and guttered end closure 11002. The assembled unit is know in the industry as being unitized, and supports its own weight plus the aluminum composite panel 1000 by attachment to building structure 8750 using structural floor attachment assembly 11001.

FIG. 111 is a horizontal sectional view of alternate embodiment DPS 5000CW showing top view of structural vertical mullion 10203 being supported by structural floor attachment assembly 11001 to building structure 8750.

Although the present invention has been described with reference to preferred embodiments, numerous modifications and variations can be made and

still the result will come within the scope of the invention. No limitation with respect to the specific embodiments disclosed herein is intended or should be inferred.

I CLAIM:

1. A curtain wall support frame comprising:
   a corner brace for a curtain wall panel;
   a horizontal support having a built in gutter and a mounting member; and
   a fastener to secure said corner brace to said mounting member.

2. The apparatus of claim 1, wherein the corner brace further comprises a peripheral segment for each route and return edge of a curtain wall panel, and each peripheral segment has a panel face support segment, and all four corner braces for all four sides of the curtain wall panel are identical.

3. The apparatus of claim 1 further comprising a vertical support having an integral joint segment for attachment to the horizontal support.

4. The apparatus of claim 3, wherein the integral joint segment further comprises a flange which is received by a notch in the horizontal support, thereby forming an integrated joint.

5. The apparatus of claim 1, wherein the integrated gutter comprises a pair of gutter walls extending from a support surface of a base of the horizontal support, and a mounting hole is located outboard of said gutter walls.

6. The apparatus of claim 3, wherein the vertical support further comprises a built in gutter and a support hole outside the gutter, thereby forming an integrated X-Y gutter system.

7. The apparatus of claim 4, wherein the vertical support further comprises a built in gutter on a base, and having a foot on a building side of the base to support an outside end of said gutter co-planar with an outside edge of the horizontal support gutter.

8. The apparatus of claim 1 further comprising a dry, non-directional system mountable on a

standard single stud building exterior.

9. The apparatus of claim 6 further comprising a dry, non-directional system mountable on a standard single stud building exterior.

10. The apparatus of claim 9, wherein the fastener further comprises a continuous channel secured to the corner brace via a bolt and in turn secured to a gasket over the mounting member.

11. The apparatus of claim 10, wherein the mounting member is a screw boss having a flange.

12. The apparatus of claim 1, wherein the corner brace provides a floating mount for an attached curtain wall panel to accommodate thermal expansion/contraction.

13. The apparatus of claim 9, wherein the horizontal support has a central longitudinal axis, the mounting member is a screw boss located along the central longitudinal axis, and the built in gutter further comprises a pair of gutters symmetrically opposed from the central longitudinal axis extending from a support side of the horizontal support.

14. The apparatus of claim 2, wherein the corner brace further comprises a positive return screw and gasket attachment to the route and return edge.

15. The apparatus of claim 1 further comprising a base having an integrated tube extending from a building side of the base.

16. The apparatus of claim 10, wherein the continuous channel further comprises a snap cover, forming a recessed joint curtain wall assembly.

17. The apparatus of claim 10, wherein the continuous channel further comprises a snap cover, forming a flush joint curtain wall assembly.

18. The apparatus of claim 10, wherein the continuous channel further comprises a snap cover, forming a projecting joint curtain wall

assembly.

19. An X-Y frame for a curtain wall system, said frame comprising:

a X member and a Y member, wherein each X and Y member has a base member having an internal gutter to resist a moisture seepage from a building side of the frame.

20. The apparatus of claim 19, wherein the X and Y base members form a structural joint, thereby providing a framework suitable for mounting to a support structure.

21. The apparatus of claim 19, wherein each X and Y member has a screw boss to receive a fastener that clamps a curtain wall panel corner brace to the screw boss.

22. The apparatus of claim 21, wherein the fastener provides a recessed and a flush and a projected mount curtain wall system using a desired depth corner brace.

23. The apparatus of claim 20 further comprising a dry, non-directional system.

24. The apparatus of claim 23, wherein the internal gutter further comprises a pair of gutter walls extending from a support side of the base, and a mounting hole(s) located outboard of said gutter walls.

25. The apparatus of claim 24, wherein the mounting holes in the X member provide a structural mount to a standard single stud building exterior.

26. A system for erecting a plurality of curtain wall panels to form a wall structure having horizontally adjacent panels and vertically adjacent panels, each pair of said horizontally adjacent panels having a vertical gap therebetween, and each pair of said vertically adjacent panels having a horizontal gap therebetween, said system comprising:

each of said panels having an outer face and a route and return edge for a top, bottom,

left and right side;

a symmetrical rail secured to the top and bottom route and return edges; and

a symmetrical rail secured to the left and right route and return edges, thereby allowing the panel to be flipped 180 degrees and still work within the system.

27. The system of claim 26 further comprising a structural horizontal support having mounting holes to attach to a building exterior of standard single stud construction.

28. The system of claim 26 further comprises a structural vertical support received by the horizontal support, thereby forming an integrated joint.

29. The system of claim 28, wherein each horizontal and vertical support has a base with a mount to receive the rail.

30. The system of claim 29, wherein the bases all have an integral gutter.

31. The system of claim 28, wherein the horizontal and vertical supports form a non-sequential panel framework.

32. The system of claim 29, wherein the mount receives a gasket and a continuous channel located in the gap, said continuous channel secured by a fastener, thereby providing a dry system.

33. The system of claim 32, wherein the fastener receives a snap cover forming a flush and a recessed and a projecting mount for the curtain wall panels.

34. The system of claim 32, wherein the panel is thermally insulated from the bases, and is floating on the mount to accommodate thermal movement.

35. An X-Y symmetrical curtain wall frame comprising:

a support channel having a mount for a

building exterior;

a screw boss secured to the support channel;

a corner brace for a route and return edge of a panel; and

a fastener assembly to secure the corner brace to the screw boss.

36. The frame of claim 35 further comprising integral X - Y segment joints.

37. The frame of claim 36, wherein said support channel further comprises a built in gutter.

38. A horizontal support for a curtain wall system, said horizontal support comprising:

a base having a mounting member;

said base having a plurality of mounting holes to mount to a standard single stud building exterior;

a corner brace and fastener assembly to attach to the mounting member; and

said fastener assembly and a selected corner brace member forming a flush, and a recessed, and a projecting mount curtain wall system.

39. A method to mount a curtain wall panel comprising the steps of:

mounting a horizontal and vertical support to a building;

fastening an alignment fastener to the vertical support;

fastening at least two alignment fasteners to the horizontal support;

mounting a curtain wall panel against all the alignment fasteners;

aligning the curtain wall panel;

replacing the vertical support alignment

fastener with a permanent fastener; and replacing the horizontal alignment fasteners with a permanent fastener.

40. The method of claim 39 further comprising the step of using an alignment fastener comprising a body, a threaded fastener therethrough, and a stop which captures an outside edge of the curtain wall panel.

41. A method to mount a curtain wall panel to a structure, said method comprising the steps of:

a) joining an X to a Y support channel at an integral joint;

b) repeating step (a) to form a free standing X-Y subassembly; and

c) mounting the subassembly to the structure.

42. The method of claim 41 further comprising the steps of attaching a plurality of subassemblies together on the structure to form a curtain wall framework, and using a joint splice assembly.

43. The method of claim 42 further comprising the step of mounting curtain wall panels to the curtain wall framework.

44. A sheath for a structure, said sheath comprising:

a curtain wall having a planar face and a route and return edge;

a corner brace fastened to the curtain wall at a planar face/route and return edge junction;

said corner brace having a base, a longitudinal member adjacent said route and return edge and a facial member adjacent said planar face; and

a fastener assembly suited to fasten the base to a receiving mount.

45. The sheath of claim 44, wherein the fastener assembly further comprises a screw boss which receives a fastener, said screw boss also receiving a surface

bracket located adjacent said route and return edge.

46. The sheath of claim 45, wherein the surface bracket and a chosen corner brace form a recessed mount and a flush mount and a projecting mount for the curtain wall planar face.

47. The sheath of claim 44, wherein the receiving mount is a guttered X-Y framework.

48. The sheath of claim 44, wherein the receiving mount is a non-guttered X-Y framework.

49. A framework for a curtain wall, said framework comprising:

a pair of X and a pair of Y members joined at intersections to form four structural joints;

said joined X and Y members having a perimeter form of a rectangle;

said X and Y members each having a width w and a length l dimension for their planar rear mounting surfaces;

an area of said rectangle of (Xl).(Yl) = A.;

an area of said X and Y members planar rear mounting surfaces of 2(Xl) (Xw) + (Yl) (Yw) = A_2;

wherein A_2 over A_1 = .36; and

said X and Y members each having a front surface mount for a curtain wall assembly.

50. The framework of claim 49, wherein the structural joints each further comprise a bolt.

51. The framework of claim 49, wherein at least one structural joint further comprises a splice plate assembly.

52. The framework of claim 51, wherein the splice plate assembly further comprises a left, right and lower splice plate and a splice fastener joining the left to the lower splice plate and a second splice fastener joining the right to the lower splice plate.

53. The framework of claim 49 further comprising extended structural fasteners suited to secure the framework to an insulation and stucco building exterior.

54. In combination with a building structural wall having an insulation layer and an exterior layer, an improvement comprising an X-Y framework for a curtain wall, said X-Y framework comprising:

X and Y supports each having a front mount for a curtain wall;

a structural joint at each X-Y support intersection; and

said X and Y supports having an adequate rear planar mounting area to eliminate point pressures which degrade the exterior layer.

55. A curtain wall X-Y support frame for a curtain wall having route and return edges, said X-Y support frame comprising:

a groove in the route and return edges;

an X and a Y support each having a rear planar mounting surface and a front surface gutter having a left and a right gutter wall;

said left and right gutter walls each having a pivot point facing into the gutter space suited to receive the respective groove of the route and return edge;

a screw boss between the gutter walls; and

a pressure channel screwed to the screw boss to clasp the route and return edge between itself and the pivot point.

56. The X-Y support frame of claim 54, wherein

the pressure channel further comprises a snap cover to provide a recessed and a flush and a projecting joint.

57. An X-Y framework for a curtain wall, said framework comprising:

a pair of X and a pair of Y members joined at intersections to form four structural joints; and

said framework fastened to a structure exclusively along said X members.

58. An X-Y framework for a curtain wall, said framework comprising:

a pair of Y and a pair of Y members joined at intersections to form four structure joints; and

said framework fastened to a structural exclusively along said Y members.

59. A curtain wall framework comprising:

X and Y sub-frame members at least one set of X and Y sub-frame members having a fastener channel;

a cover for the fastener channel;

said cover having an outer wall which transmits light; and

a light source located in the fastener channel.

60. A sub-frame for a curtain wall, said curtain wall having a plurality of route and return edges, said sub-frame comprising:

a plurality of interconnectable vertical and horizontal curtain wall support members;

wherein a self supporting array can be pre-assembled therefrom;

said curtain wall support members further comprise a peripheral segment for each route and return edge of said curtain wall.

61. The apparatus of claim 60 further comprising a plurality of gaskets providing a primary moisture protection system for the vertical and horizontal support members.

62. The apparatus of claim 61, wherein the plurality of interconnectable vertical and horizontal curtain wall support members each further comprise an internal gutter, thereby providing a secondary moisture protection system.

63. The apparatus of claim 62, wherein the plurality of interconnectable vertical and horizontal curtain wall support members further comprise a non-directional system.

64. The apparatus of claim 63, wherein the peripheral segment further comprises a corner brace having a floating mount to a respective vertical or horizontal curtain wall support member.

65. A curtain wall support sub-frame comprising:

a corner brace for a curtain wall panel;

a horizontal support having a built in gutter and a mounting member;

a fastener to secure said corner brace to said mounting member; and

said horizontal support further comprises a window sill.

66. A combination curtain wall and window wall sub-frame comprising:

a curtain wall support bracket;

a horizontal frame member having a support for the curtain wall support bracket; and

said horizontal frame member having an integral window sill.

67. The apparatus of claim 66, wherein the integral window sill is made of a one piece construction with the horizontal frame member.

68. The apparatus of claim 67, wherein the

horizontal frame member further comprises an internal gutter for the window sill.

69. The apparatus of claim 68, wherein the horizontal frame member further comprises an internal gutter for the curtain wall.

70. The apparatus of claim 66, wherein the sub-frame further comprises a plurality of interconnectable sub-frame members formable into a pre-assembled self-supporting framework for panels and glass.

71. The apparatus of claim 65, wherein the corner brace further comprises a peripheral segment for each route and return edge of a curtain wall panel, and each peripheral segment has a panel face support segment, and all four corner braces for all four sides of the curtain wall panel are identical.

72. The apparatus of claim 65 further comprising a vertical support having an integral joint segment for attachment to the horizontal support.

73. The apparatus of claim 72, wherein the integral joint segment further comprises a flange which is received by a notch in the horizontal support, thereby forming an integrated joint.

74. The apparatus of claim 65, wherein the integrated gutter comprises a pair of gutter walls extending from a support surface of a base of the horizontal support, and a mounting hole is located outboard of said gutter walls.

75. The apparatus of claim 72, wherein the vertical support further comprises a built in gutter and a support hole outside the gutter, thereby forming an integrated X-Y gutter system.

76. The apparatus of claim 73, wherein the vertical support further comprises a built in gutter on a base, and having a foot on a building side of the base to support an outside end of said gutter co-planar with

an outside edge of the horizontal support gutter.

77. The apparatus of claim 65 further comprising a dry, non-directional system mountable on a standard single stud building exterior.

78. The apparatus of claim 75 further comprising a dry, non-directional system mountable on a standard single stud building exterior.

79. The apparatus of claim 78, wherein the fastener further comprises a continuous channel secured to the corner brace via a bolt and in turn secured to a gasket over the mounting member.

80. The apparatus of claim 79, wherein the mounting member is a screw boss having a flange.

81. The apparatus of claim 65, wherein the corner brace provides a floating mount for an attached curtain wall panel to accommodate thermal expansion/contraction.

82. The apparatus of claim 78, wherein the horizontal support has a central longitudinal axis, the mounting member is a screw boss located along the central longitudinal axis, and the built in gutter further comprises a pair of gutters symmetrically opposed from the central longitudinal axis extending from a support side of the horizontal support.

83. The apparatus of claim 71, wherein the corner brace further comprises a positive return screw and gasket attachment to the route and return edge.

84. The apparatus of claim 65 further comprising a base having an integrated tube extending from a building side of the base.

85. The apparatus of claim 79, wherein the continuous channel further comprises a snap cover, forming a recessed joint curtain wall assembly.

86. The apparatus of claim 79, wherein the continuous channel further comprises a snap cover, forming a flush joint curtain wall assembly.

87. The apparatus of claim 79, wherein the continuous channel further comprises a snap cover, forming a projecting joint curtain wall assembly.

88. The apparatus of claim 66, wherein the support for the curtain wall further comprises a corner brace having a peripheral segment for each route and return edge of a curtain wall panel, and each peripheral segment has a panel face support segment, and all four corner braces for all four sides of the curtain wall panel are identical.

89. The apparatus of claim 88 further comprising a vertical support having an integral joint segment for attachment to the horizontal frame member.

90. The apparatus of claim 89, wherein the integral joint segment further comprises a flange which is received by a notch in the horizontal frame member, thereby forming an integrated joint.

91. The apparatus of claim 68, wherein the internal gutter comprises a pair of gutter walls extending from a support surface of a base of the horizontal frame member, and a mounting hole is located outboard of said gutter walls.

92. The apparatus of claim 89, wherein the vertical support further comprises a built in gutter and a support hole outside the gutter, thereby forming an integrated X-Y gutter system.

93. The apparatus of claim 89, wherein the vertical support further comprises a built in gutter on a base, and having a foot on a building side of the base to support an outside end of said gutter co-planar with an outside edge of a horizontal support gutter.

94. The apparatus of claim 66 further comprising a dry, non-directional system mountable on a standard single stud building exterior.

95. The apparatus of claim 92 further comprising

a dry, non-directional system mountable on a standard single stud building exterior.

96. The apparatus of claim 95, wherein the support for the curtain wall has a fastener further comprising a continuous channel secured to the corner brace via a bolt and in turn secured to a gasket over a mounting member.

97. The apparatus of claim 96, wherein the mounting member is a screw boss having a flange.

98. The apparatus of claim 88, wherein the corner brace provides a floating mount for an attached curtain wall panel to accommodate thermal expansion/contraction.

99. The apparatus of claim 95, wherein the horizontal frame member has a central longitudinal axis, a mounting member has a screw boss located along the central longitudinal axis, and the built in gutter further comprises a pair of gutters symmetrically opposed from the central longitudinal axis extending from a support side of the horizontal support.

100. The apparatus of claim 88, wherein the corner brace further comprises a positive return screw and gasket attachment to the route and return edge.

101. The apparatus of claim 88 further comprising a base having an integrated tube extending from a building side of the base.

102. The apparatus of claim 96, wherein the continuous channel further comprises a snap cover, forming a recessed joint curtain wall assembly.

103. The apparatus of claim 96, wherein the continuous channel further comprises a snap cover, forming a flush joint curtain wall assembly.

104. The apparatus of claim 96, wherein the continuous channel further comprises a snap cover, forming a projecting joint curtain wall assembly.

105. A system for erecting a curtain wall system having metal and glazing panels to form a wall

structure having horizontally adjacent panels and vertically adjacent panels, each pair of said horizontally adjacent panels having a vertical gap therebetween, and each pair of said vertically adjacent panels having a horizontal gap therebetween, said system comprising:

each of said metal panels having an outer face and a route and return edge for a top, bottom, left and right side;

a symmetrical rail secured to the top and bottom route and return edges;

a symmetrical rail secured to the left and right route and return edges, thereby allowing the panel to be flipped 180 degrees and still work within the system; and

an integral sub-frame having a glazing panel support.

106. An X-Y symmetrical curtain wall frame comprising:

a support channel having a mount for a building exterior;

a screw boss secured to the support channel;

a corner brace for a route and return edge of a panel;

a fastener assembly to secure the corner brace to the screw boss; and

an integrated glazing panel and metal panel transition support channel.

107. The frame of claim 106 further comprising integral X - Y segment joints.

108. The frame of claim 107, wherein said support channel further comprises a built in gutter.

109. A horizontal support for a curtain wall system, said horizontal support comprising:

a base having a mounting member;

said base having a plurality of mounting holes to mount to a standard single stud building exterior;

a corner brace and fastener assembly to attach to the mounting member;

said fastener assembly and a selected corner brace member forming a flush, and a recessed, and a projecting mount curtain wall system; and

said base further comprises an integrated glazing panel and metal transition member.

110. A method to mount a curtain wall system to a structure, said system comprising a plurality of metal and glazing panels, said method comprising the steps of:

a) joining an X to a Y support channel at an integral joint;

b) repeating step (a) to form a free standing X-Y subassembly; and

c) mounting the subassembly to the structure.

111. A sheath for a structure, said sheath comprising:

a curtain wall system with metal panels each having a planar face and a route and return edge;

said curtain wall system also having a glazing panel;

a transition frame member for supporting both the metal panel and the glazing panel;

a corner brace fastened to the curtain wall at a planar face/route and return edge junction;

said corner brace having a base, a longitudinal member adjacent said route and return edge and a facial member adjacent said planar face; and

a fastener assembly suited to fasten

the base to a receiving mount.

FIG. 112 is a horizontal sectional review or an alternate embodiment illustrating the use of a light source. The light source 11201 could be fiber optics, rope light, LED, hardwire with bulbs, located within the fastener channel 11202 and covered with light transmittable cover 11203 which could be perforated or translucent.

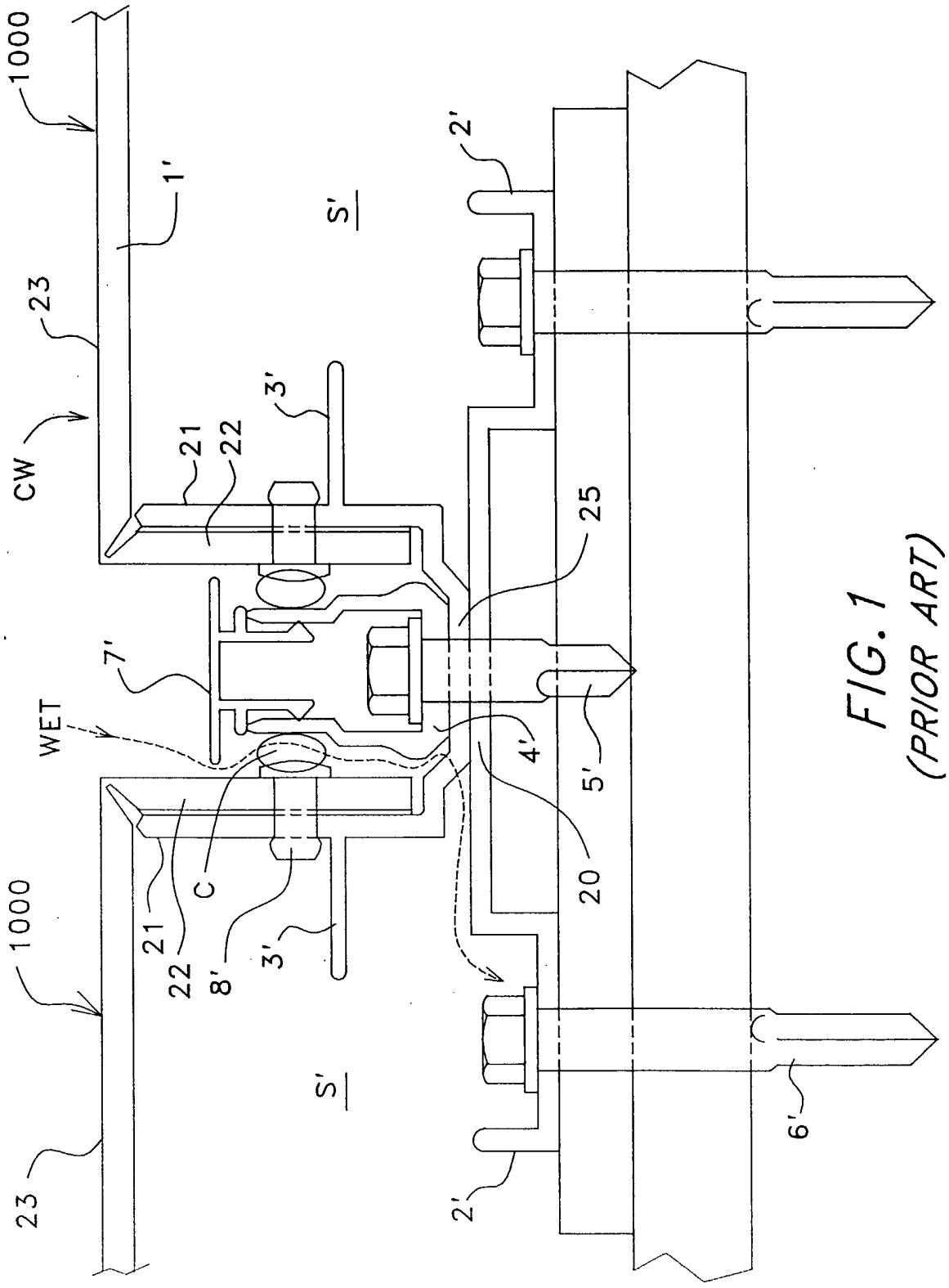


FIG. 1
(PRIOR ART)

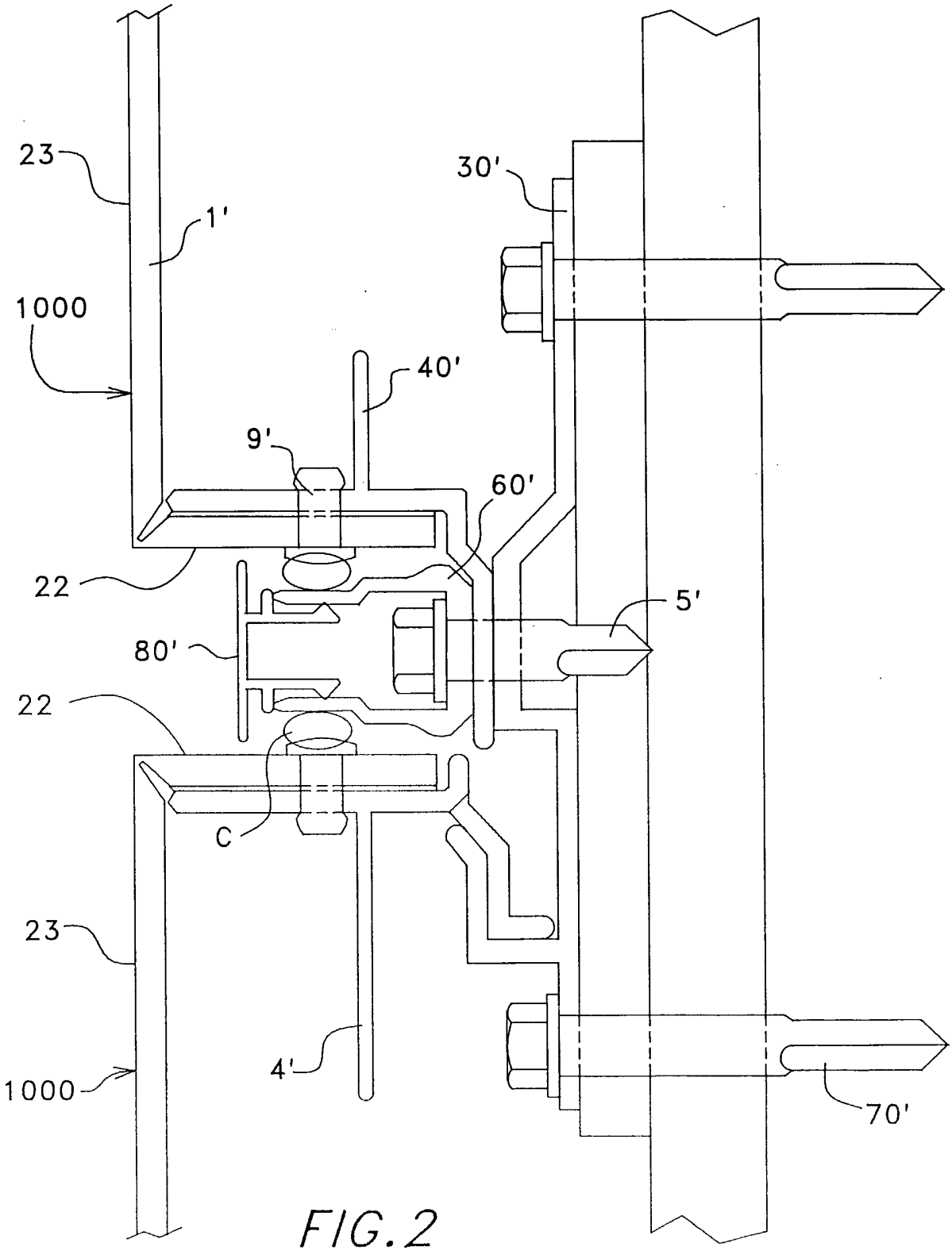


FIG. 2
(PRIOR ART)

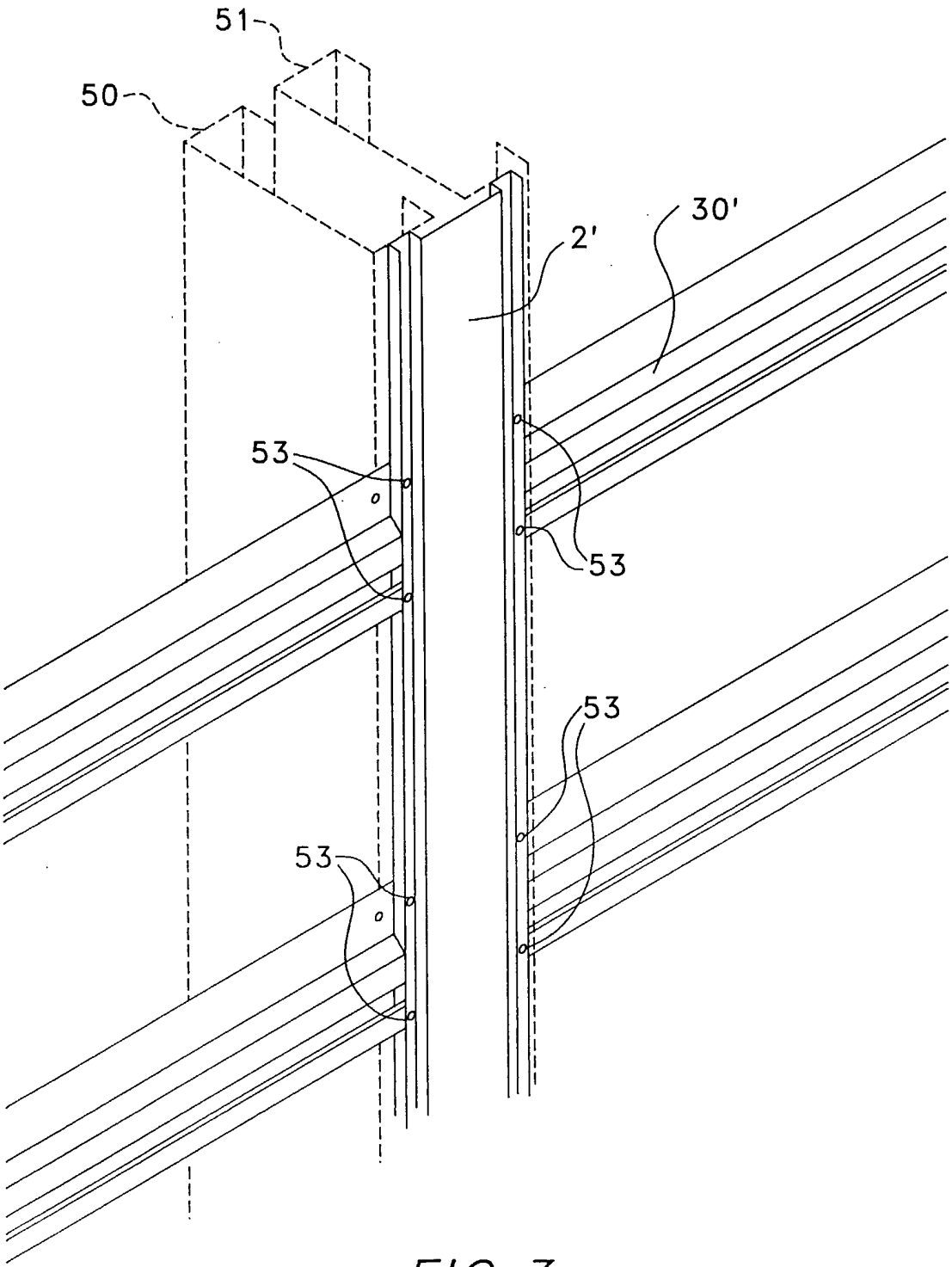


FIG. 3
(PRIOR ART).

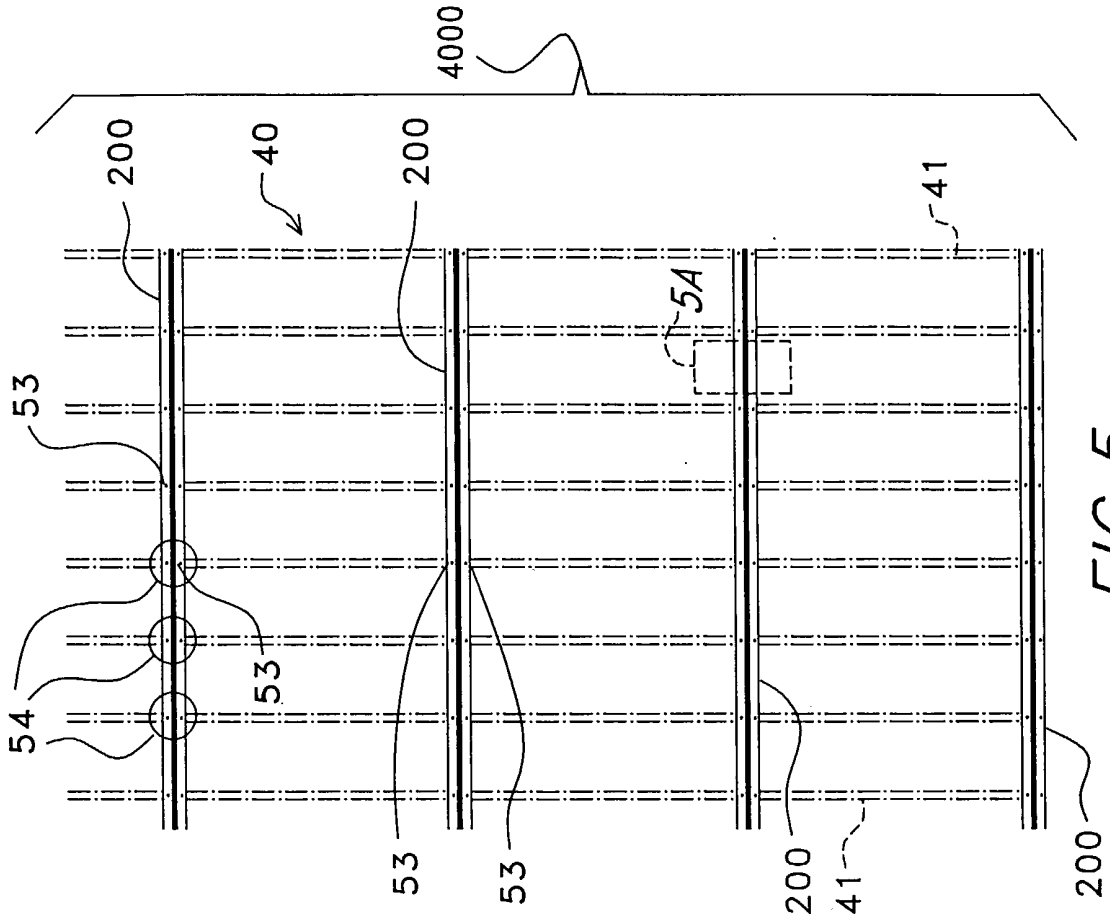


FIG. 5

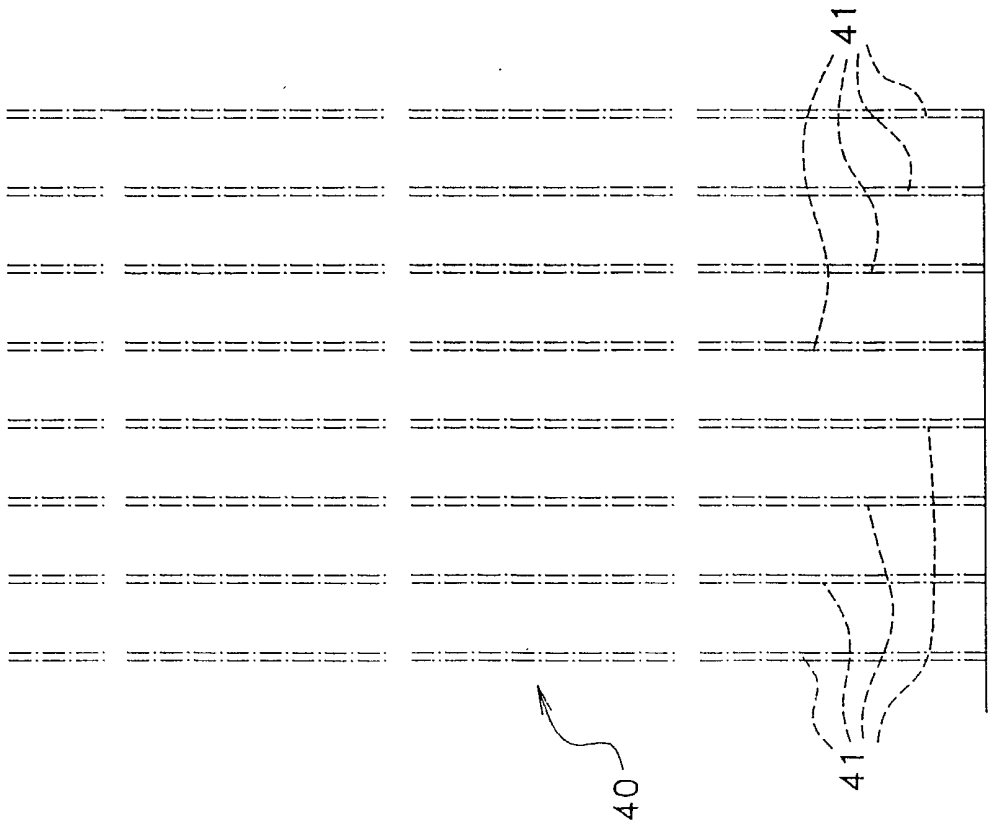


FIG. 4
(PRIOR ART)

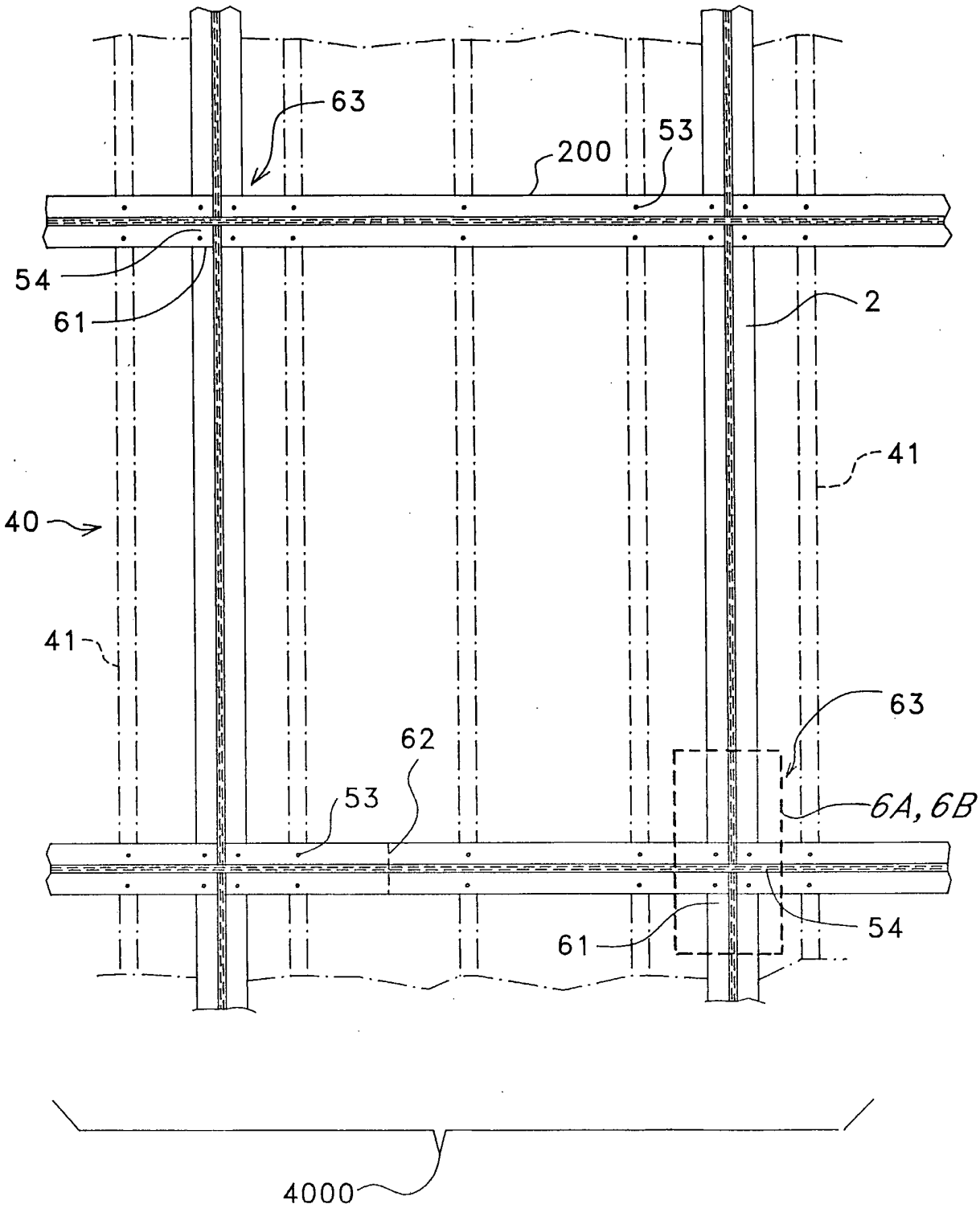
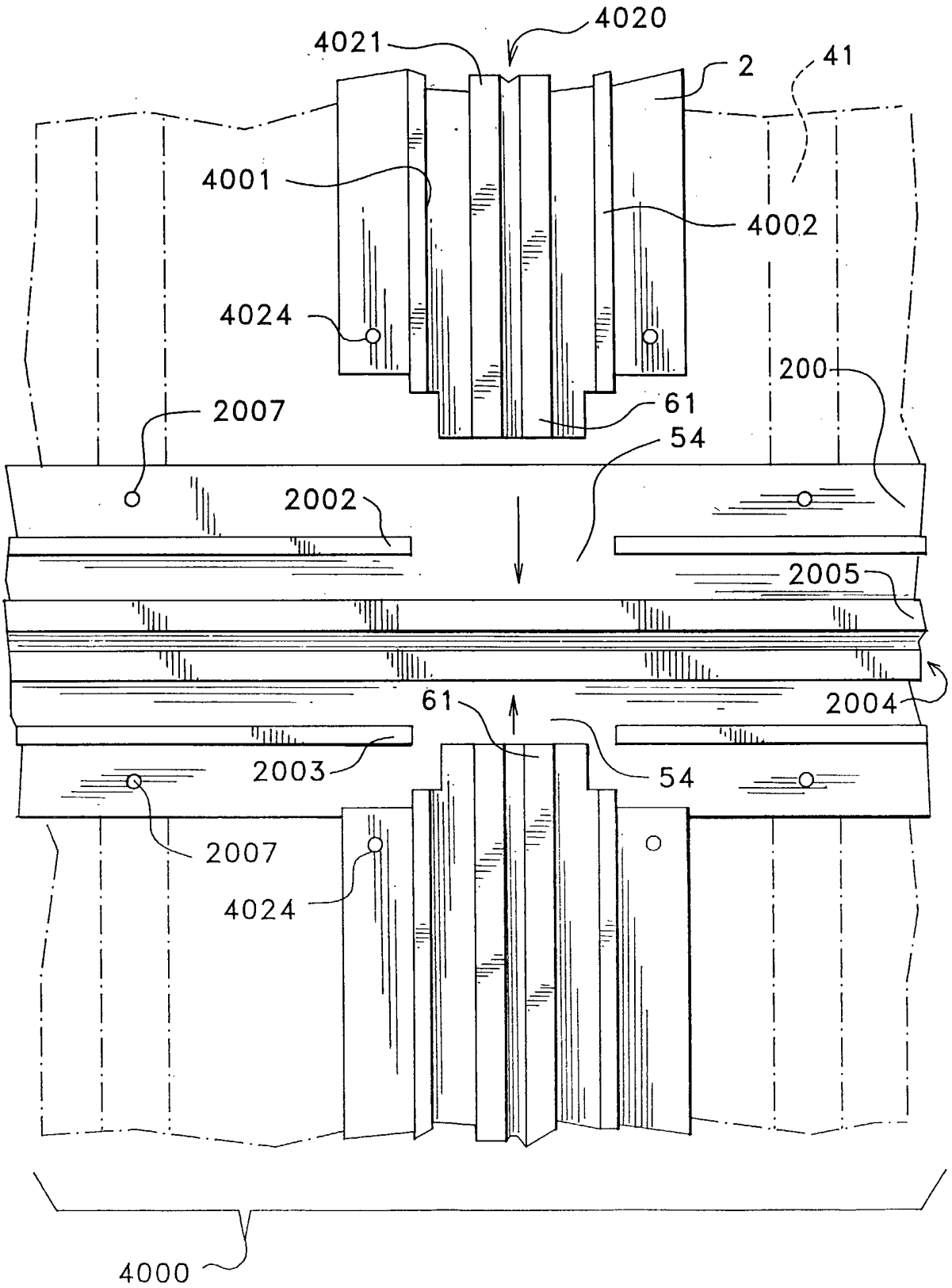


FIG. 6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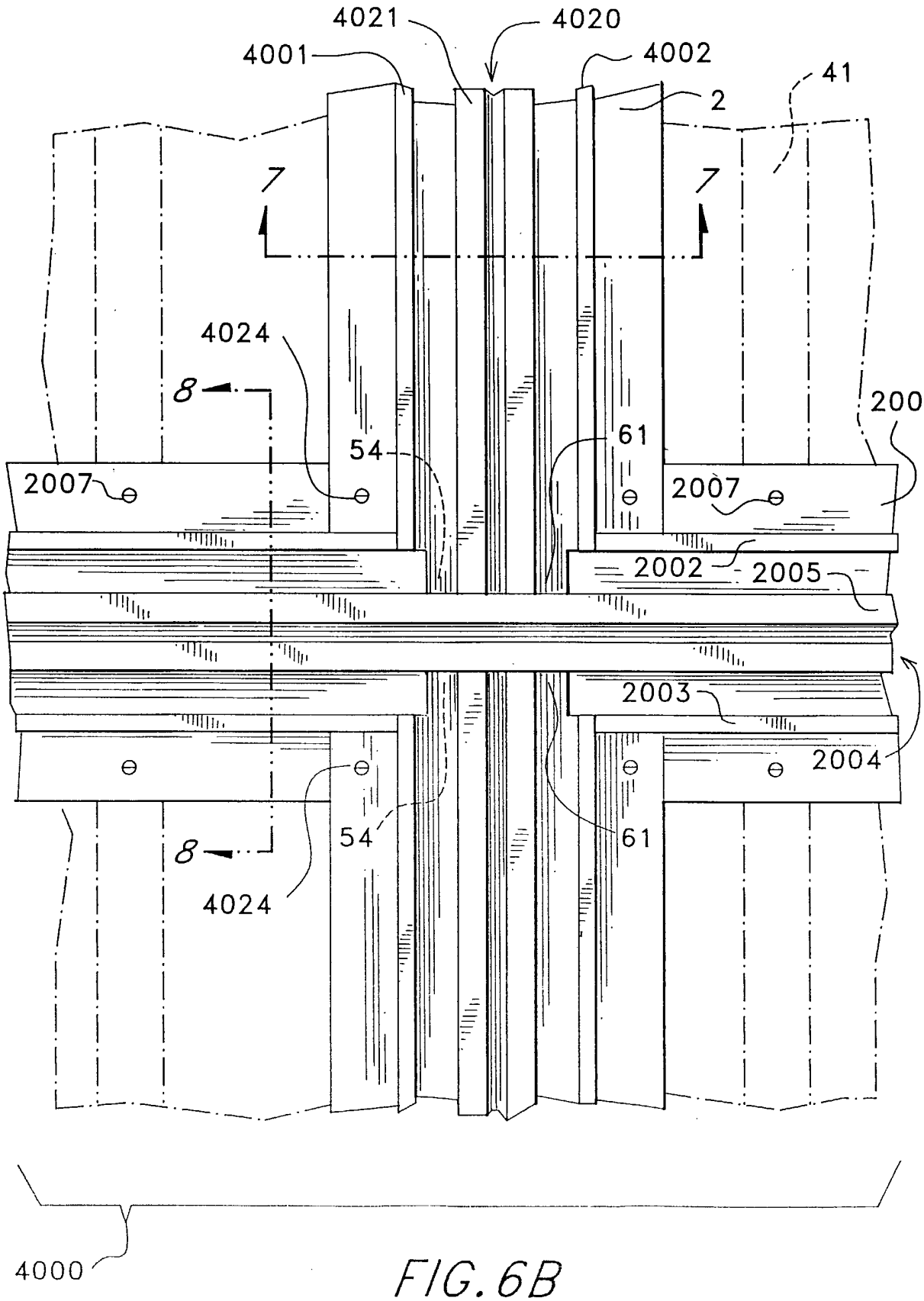
4021
2
41
4001
4002
4024
200
2007
61
54
2002
2005
61
2004
2003
54
2007
4024
4000

FIG. 6A


4021
4020
4001
4002
41
2
7
7
4024
8
200
61
54
2007
2007
2002
2005
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2004
54
61
8
4024
4000

FIG. 6B

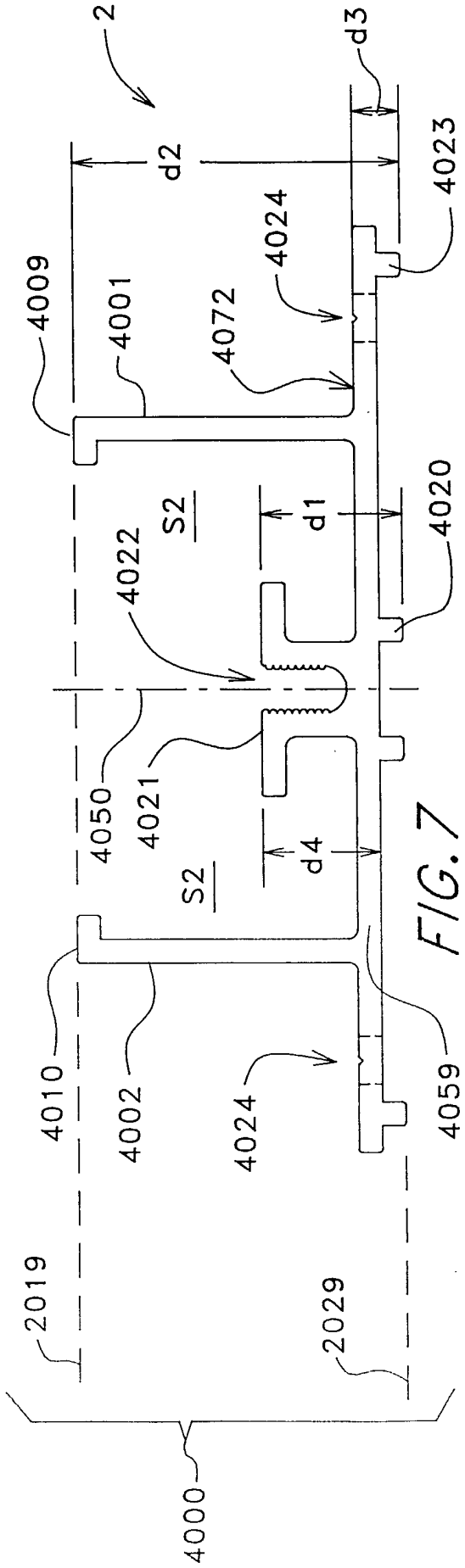
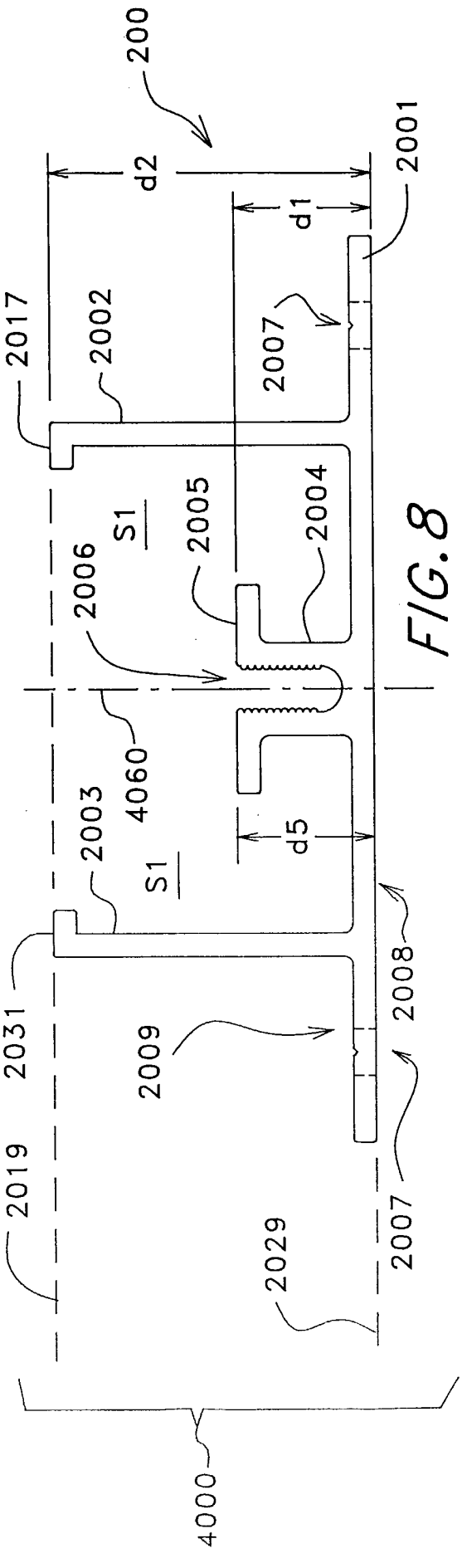

2
d3
d2
4023
4009
4001
4024
4072
4020
S2
d1
4022
4050
4021
S2
d4
4010
4002
4024
4059
2019
2029
4000

FIG. 7


200
d2
2001
d1
2017
2002
2007
2005
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S1
2006
2003
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S1
d5
2031
2009
2008
2019
2029
2007
4000

FIG. 8

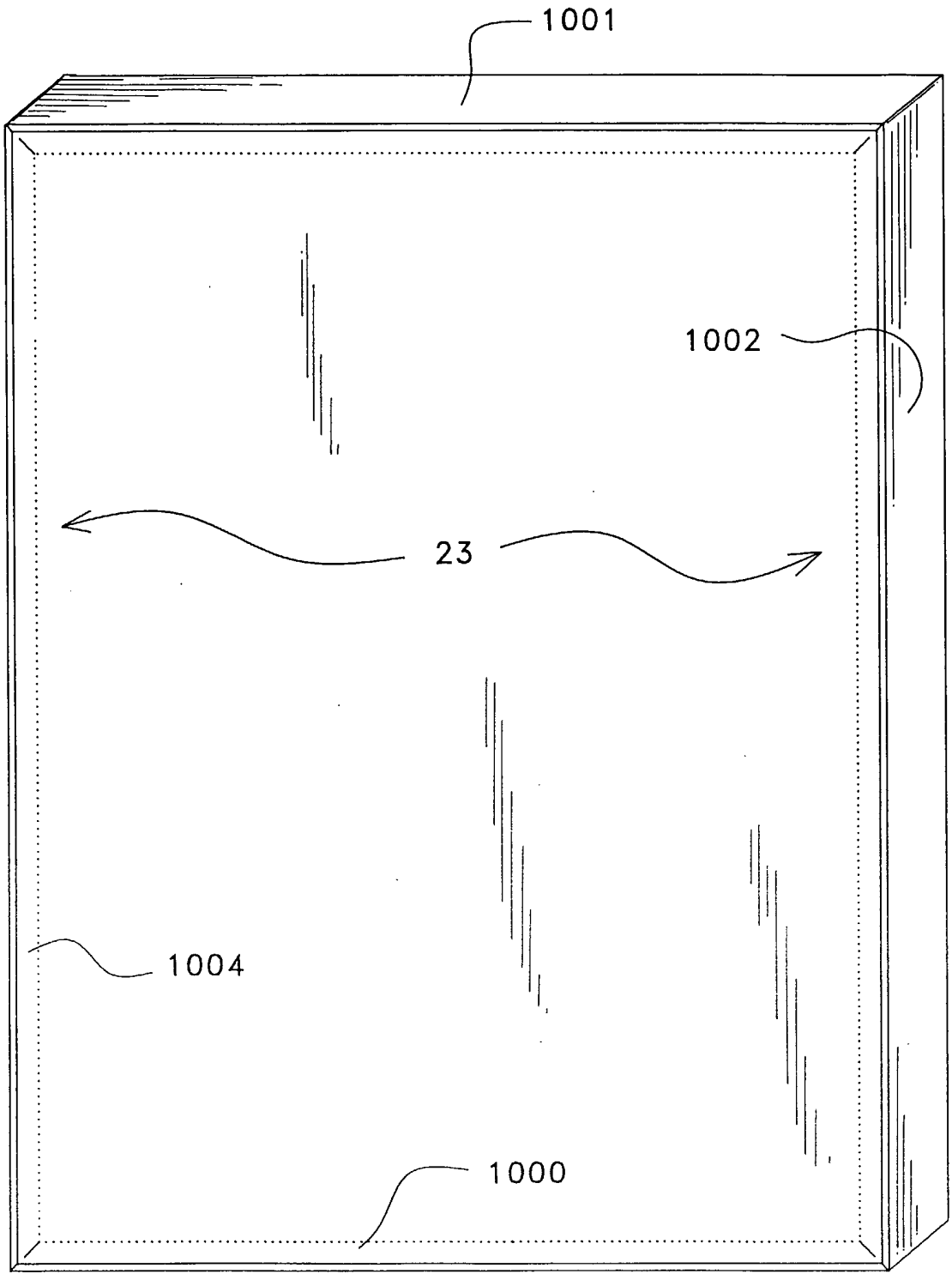


FIG. 9

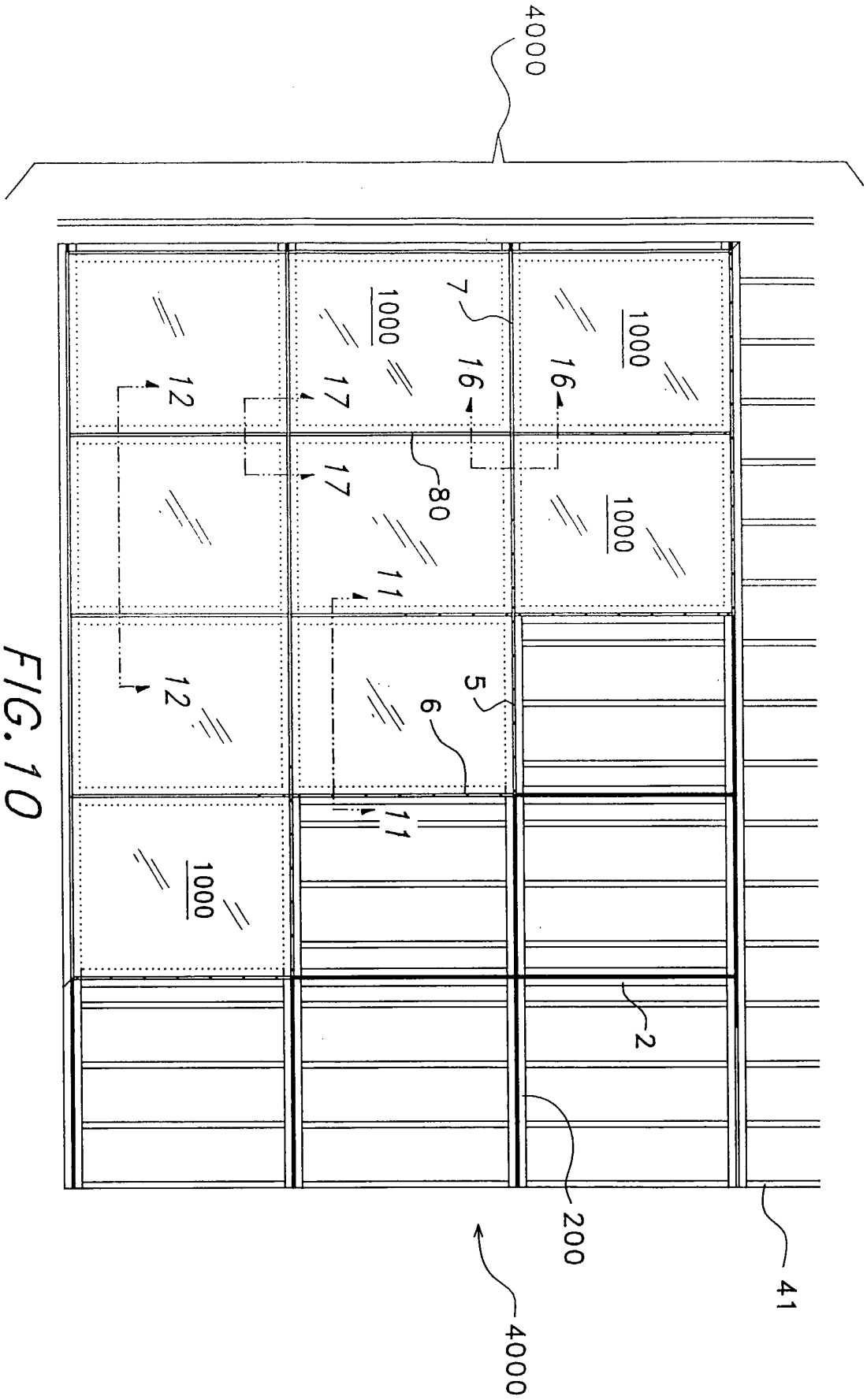


FIG. 10

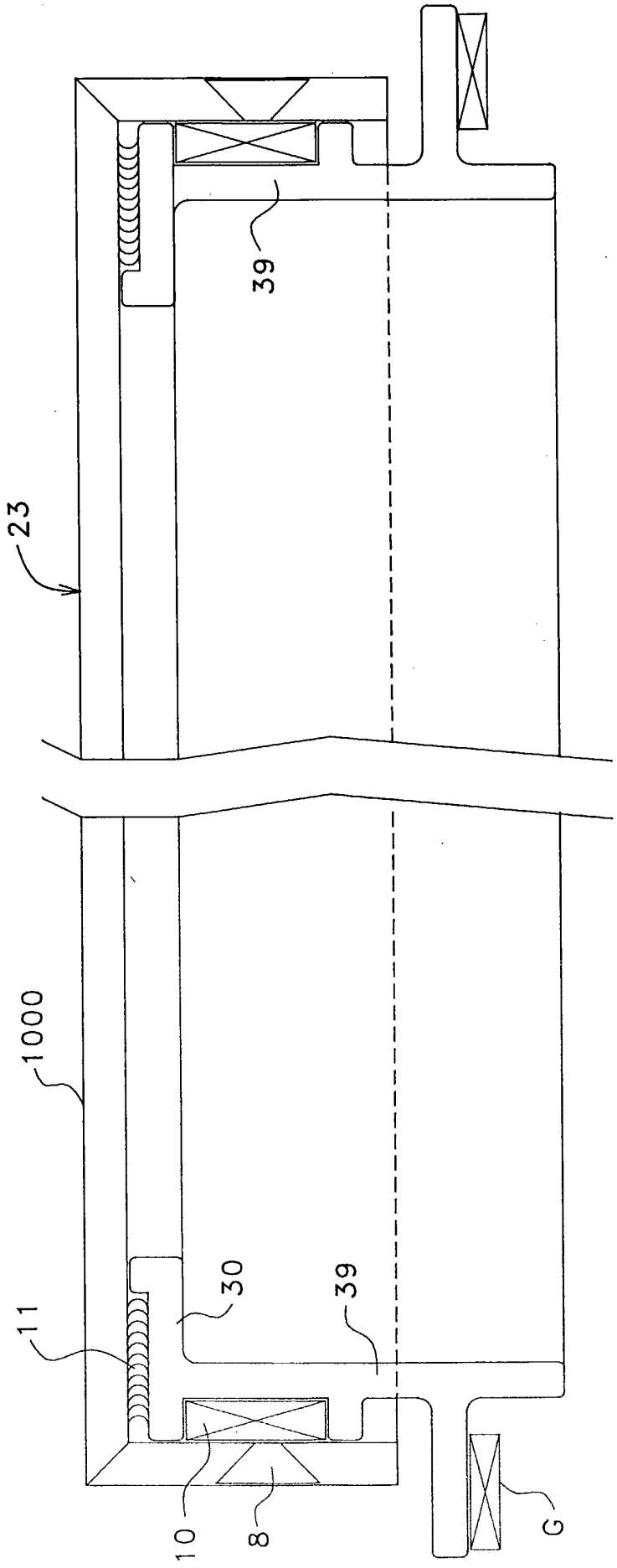


FIG. 11

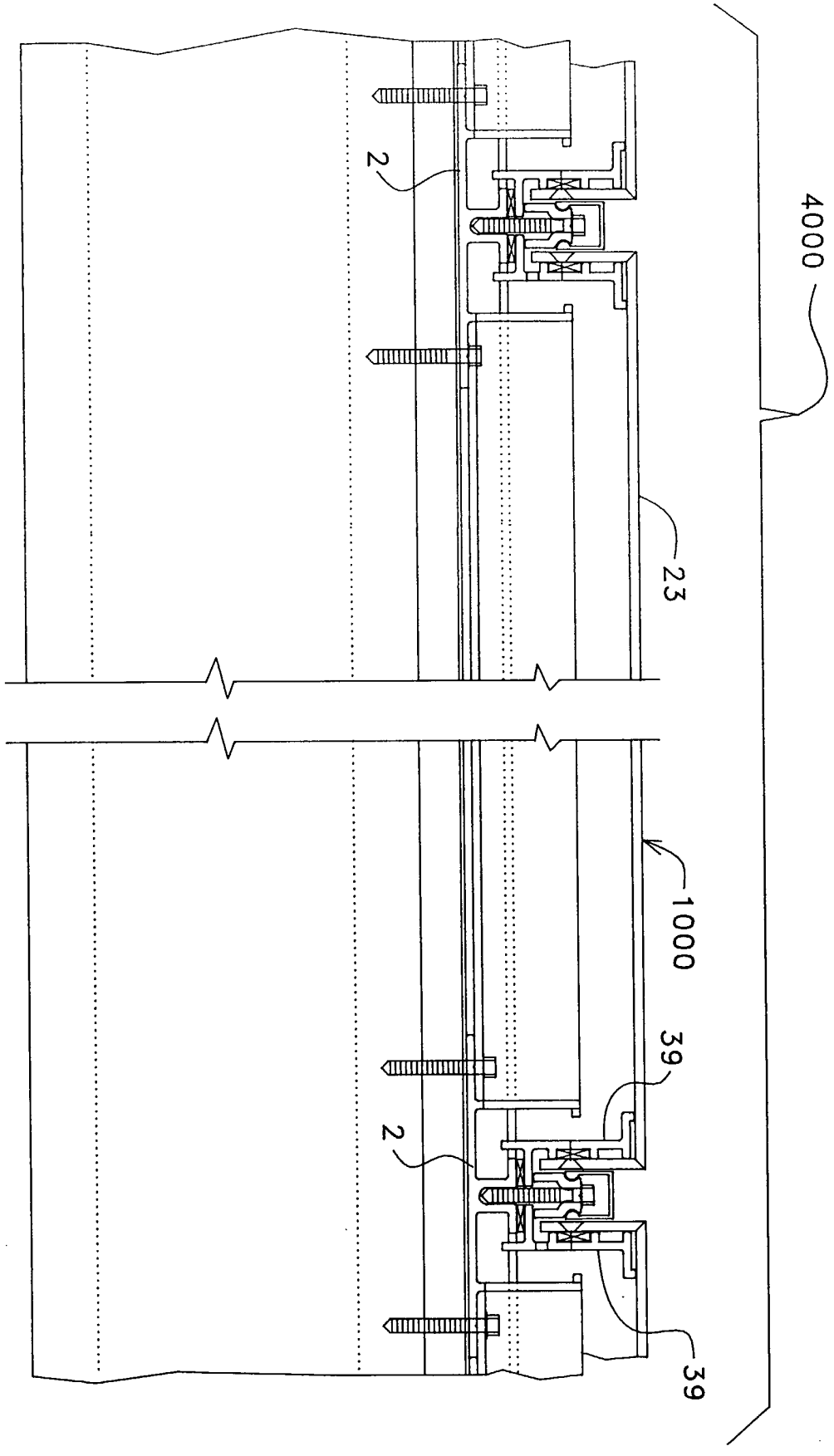


FIG. 12

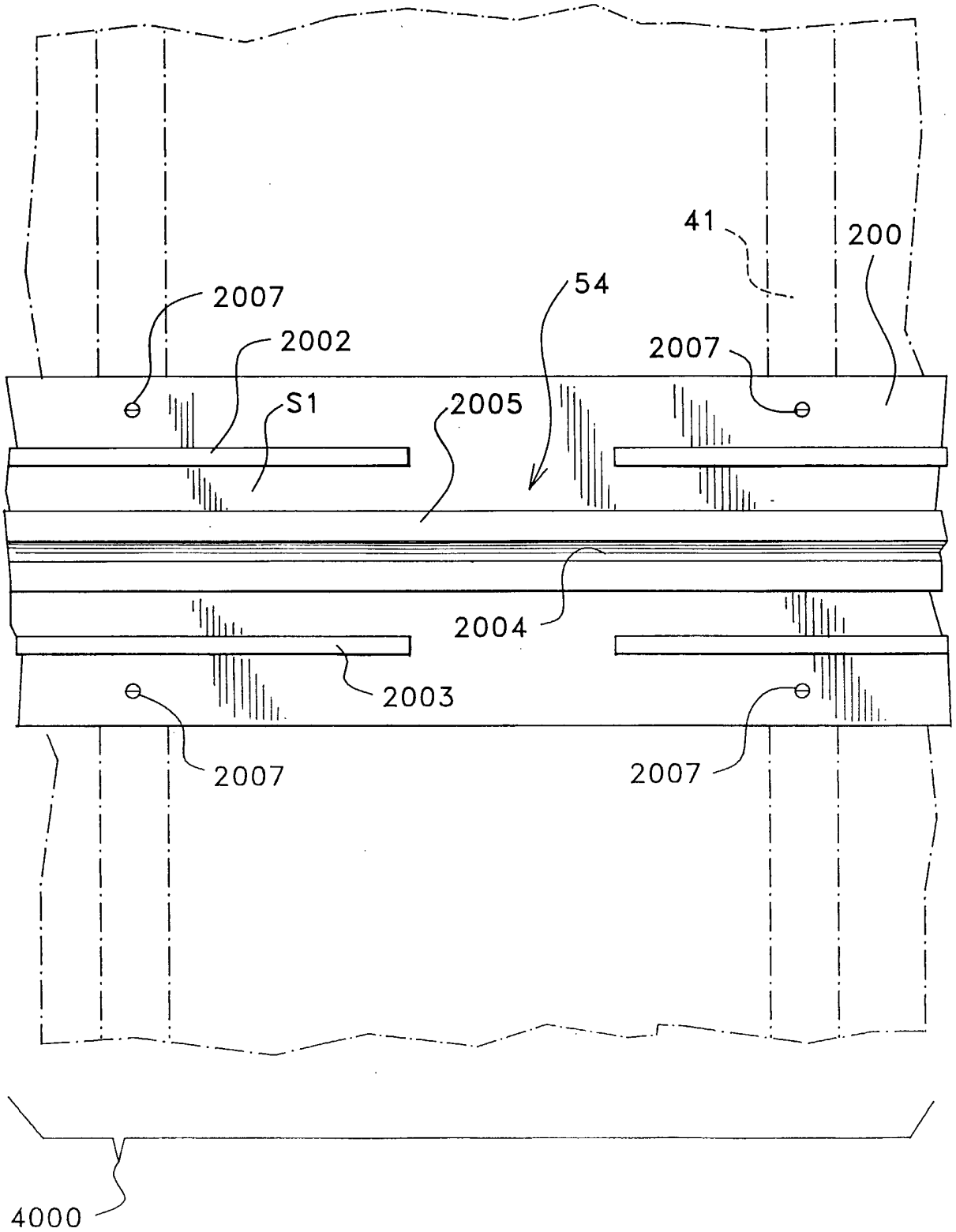


FIG. 13

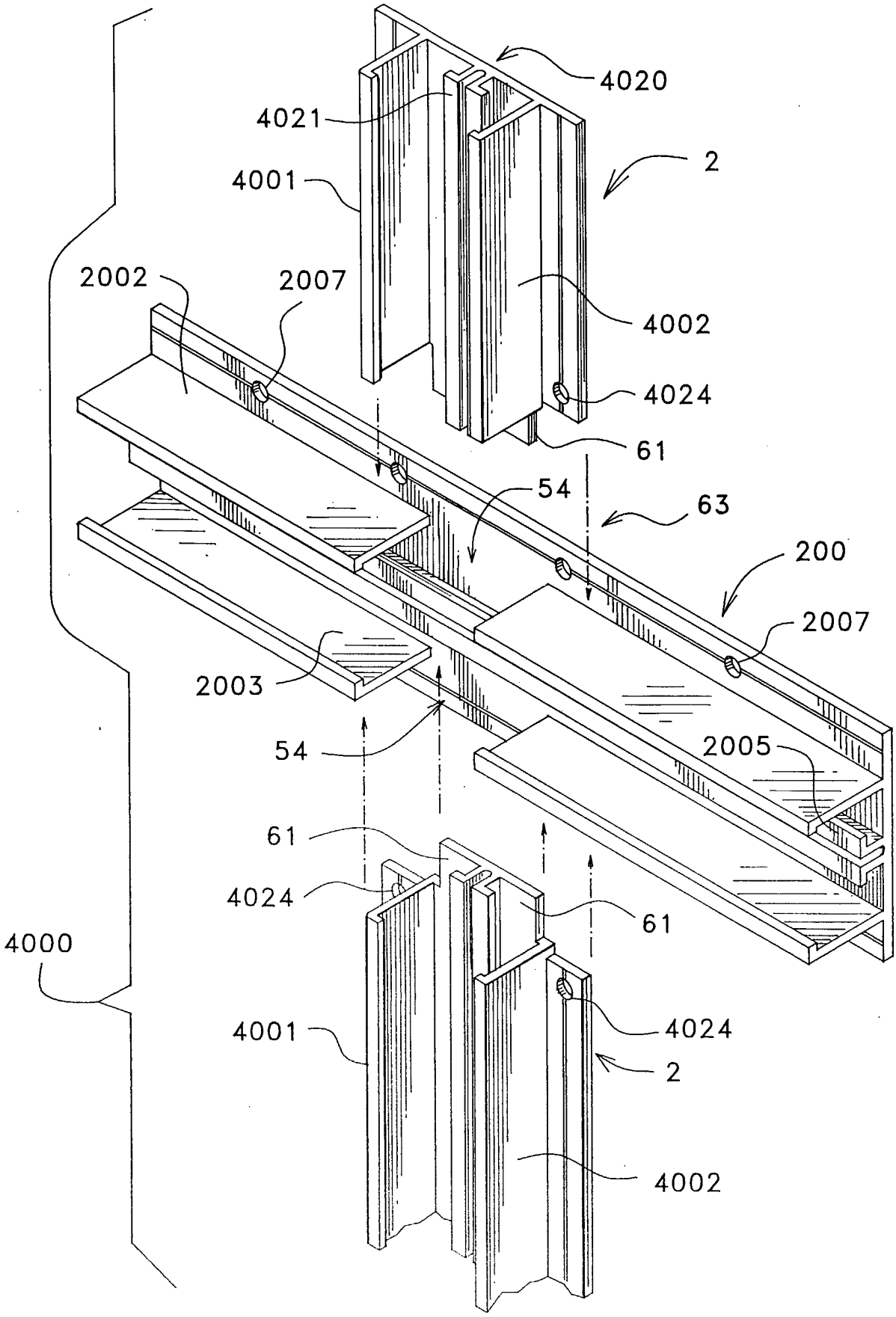

4020
4021
2
4001
2002
2007
4002
4024
61
54
63
200
2007
2003
54
2005
61
4024
61
4000
4001
4024
2
4002

FIG. 14

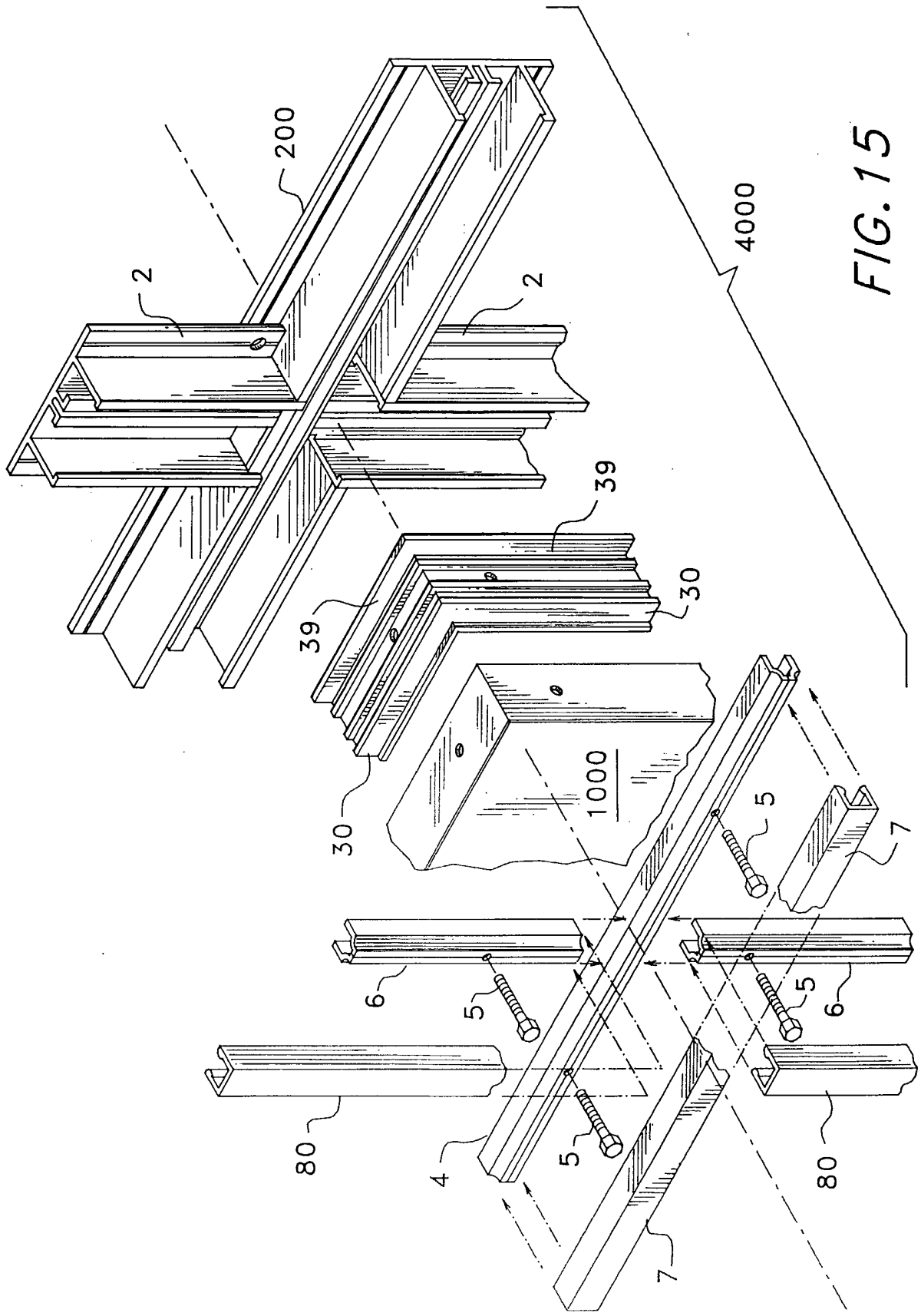


FIG. 15

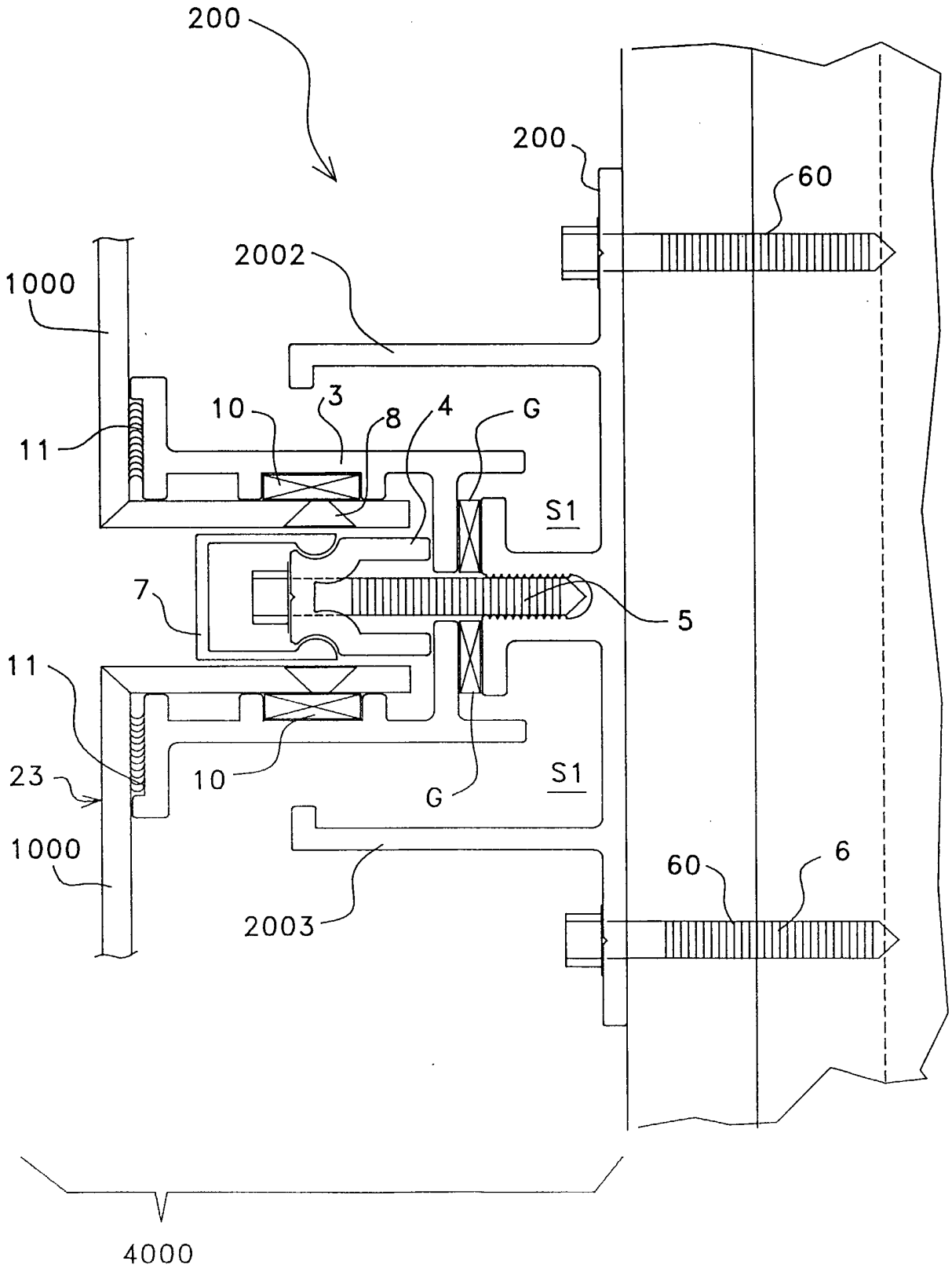

200
200
60
2002
1000
10
3
8
4
G
11
S1
7
5
11
23
10
G
S1
1000
60
6
2003
4000

FIG. 16

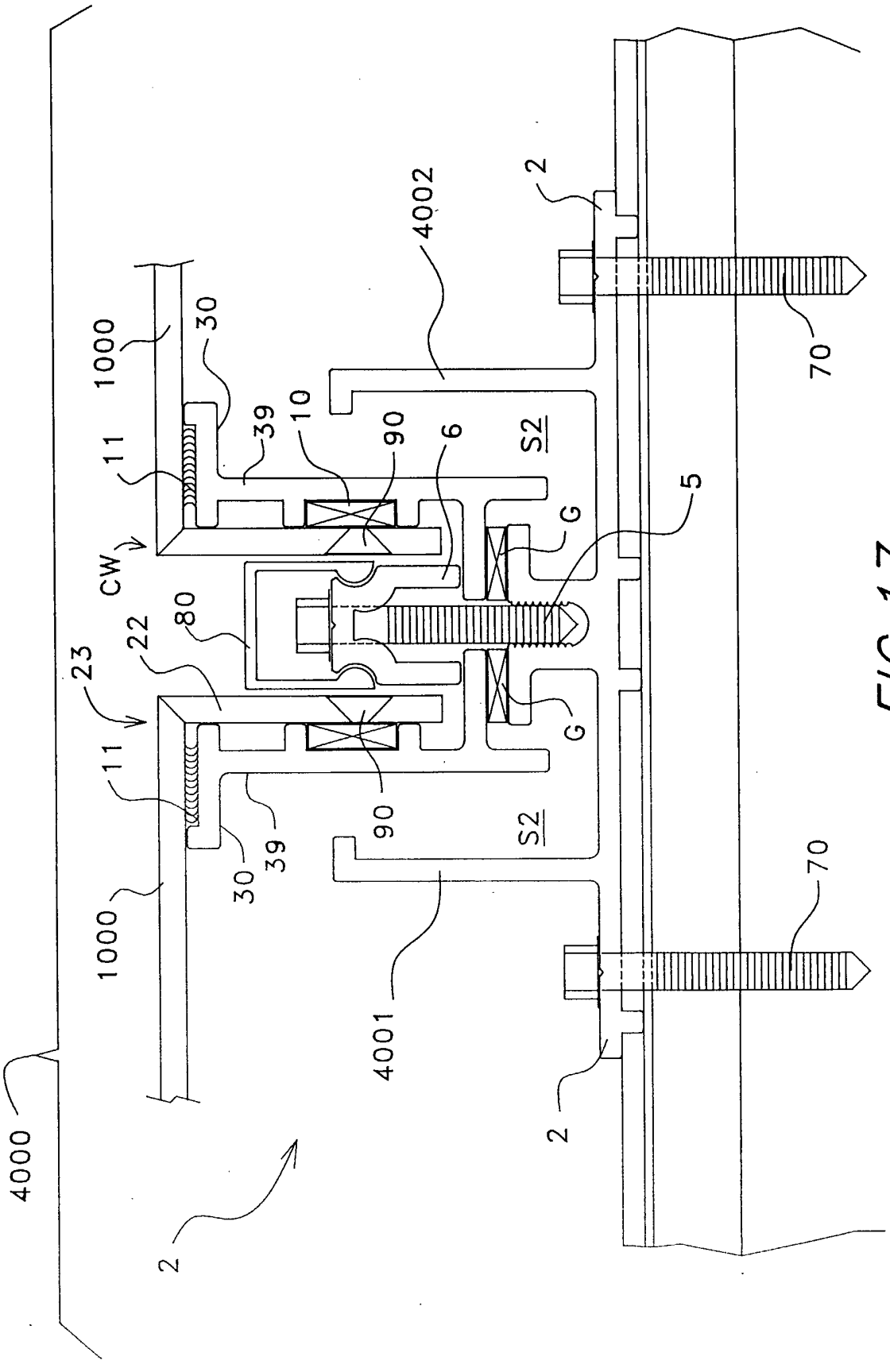


FIG. 17

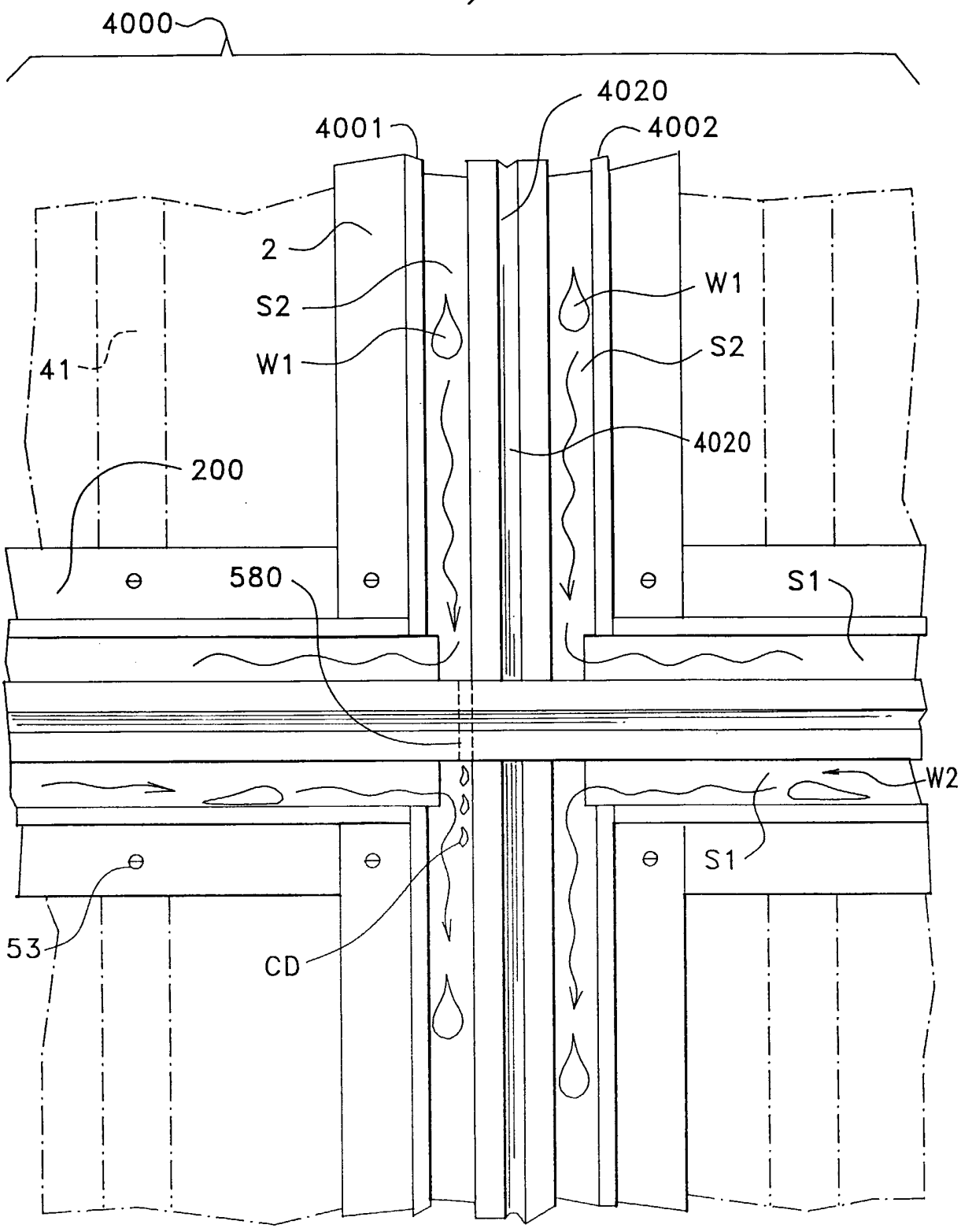


FIG. 18

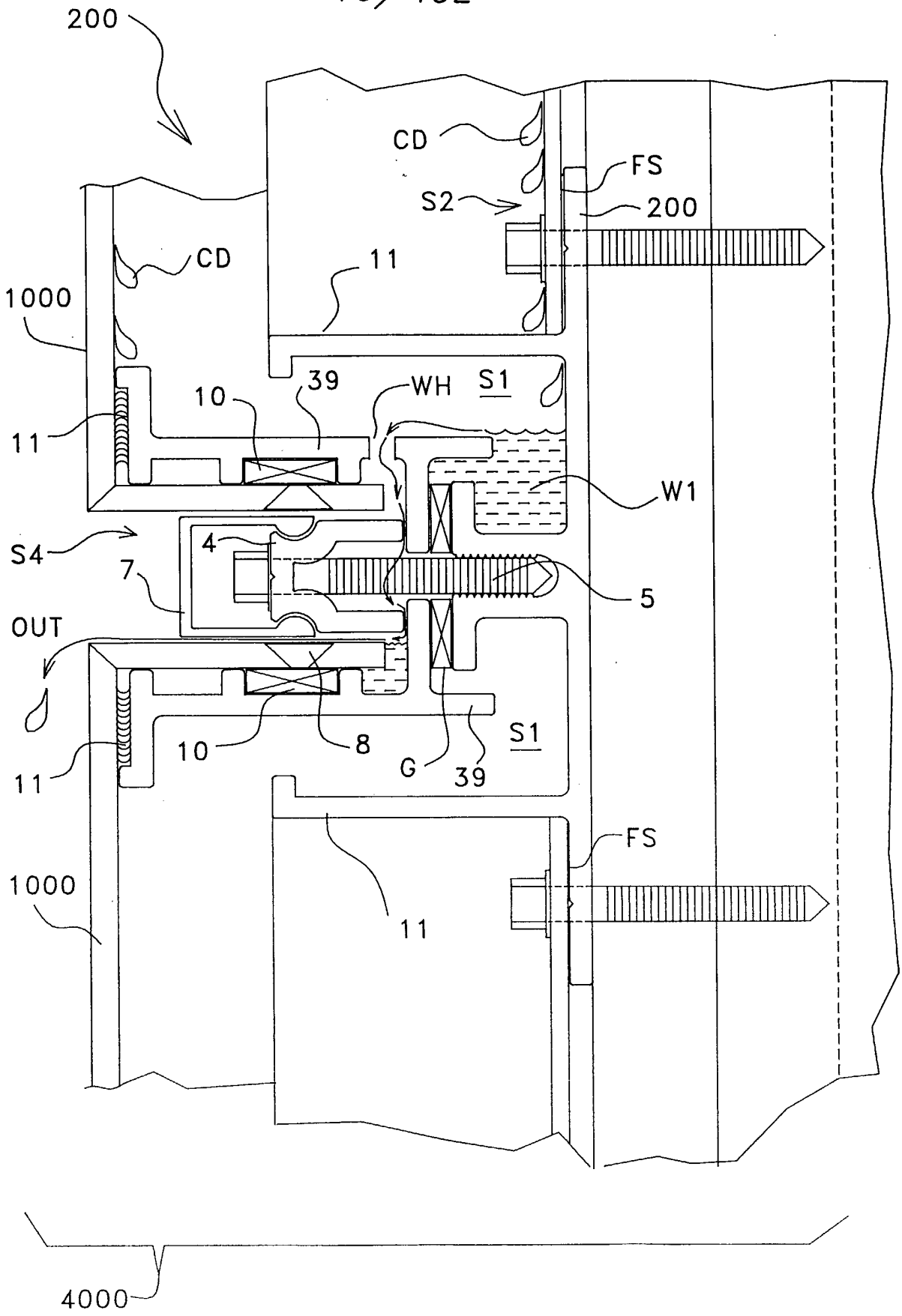

200
CD
FS
S2
200
CD
11
1000
39
WH
S1
10
11
W1
S4
4
7
5
OUT
10
8
G
39
S1
11
FS
1000
11
4000

FIG. 19

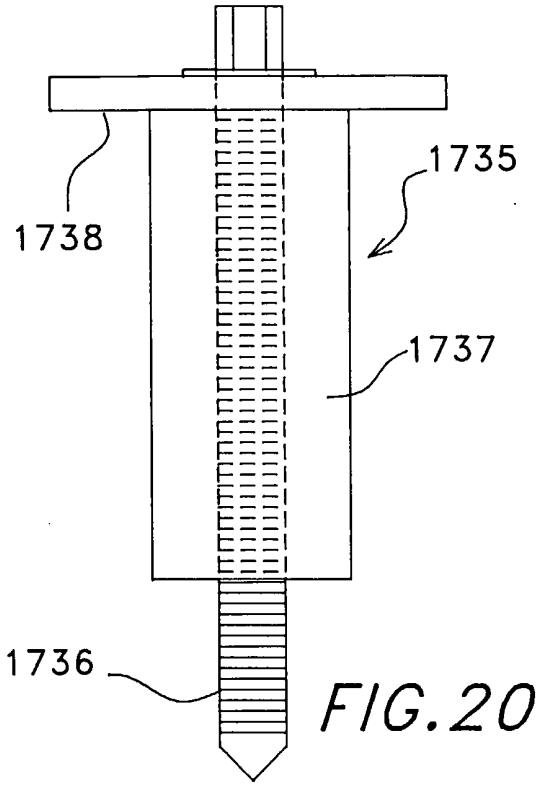


FIG.20

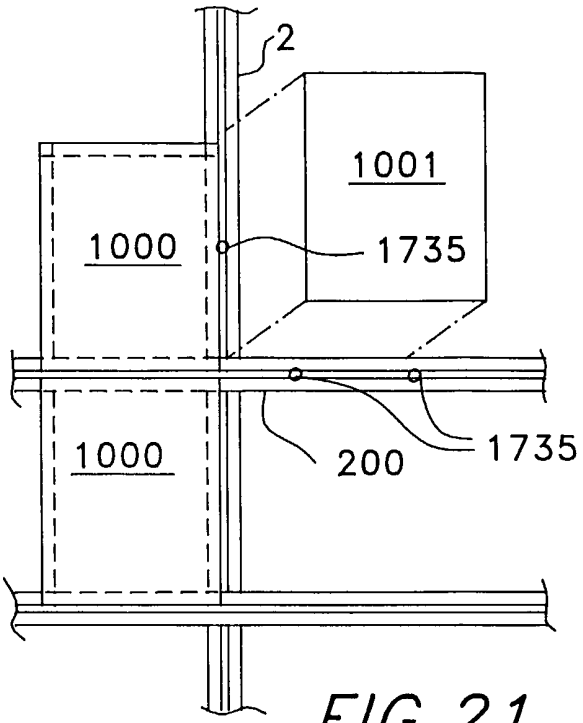


FIG.21

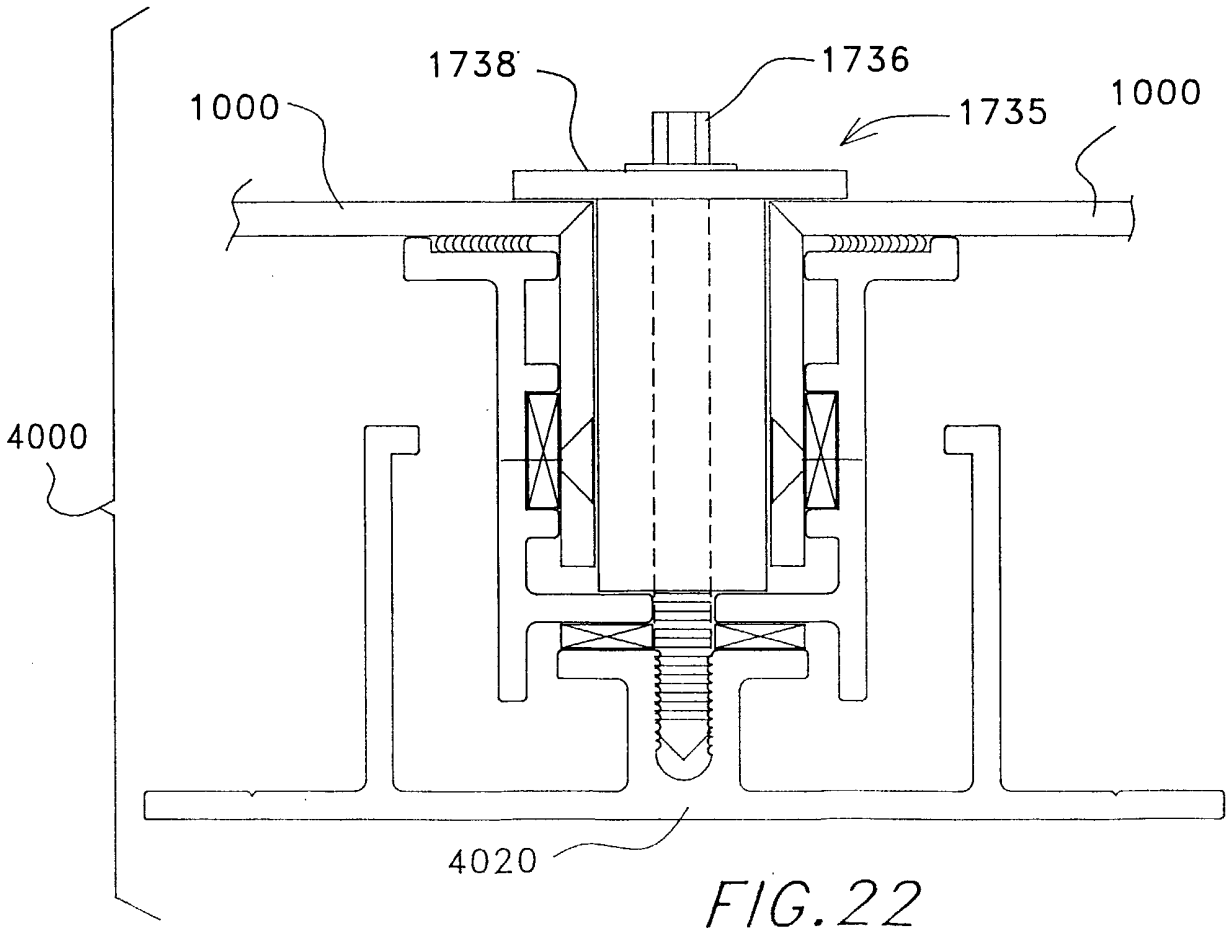


FIG.22

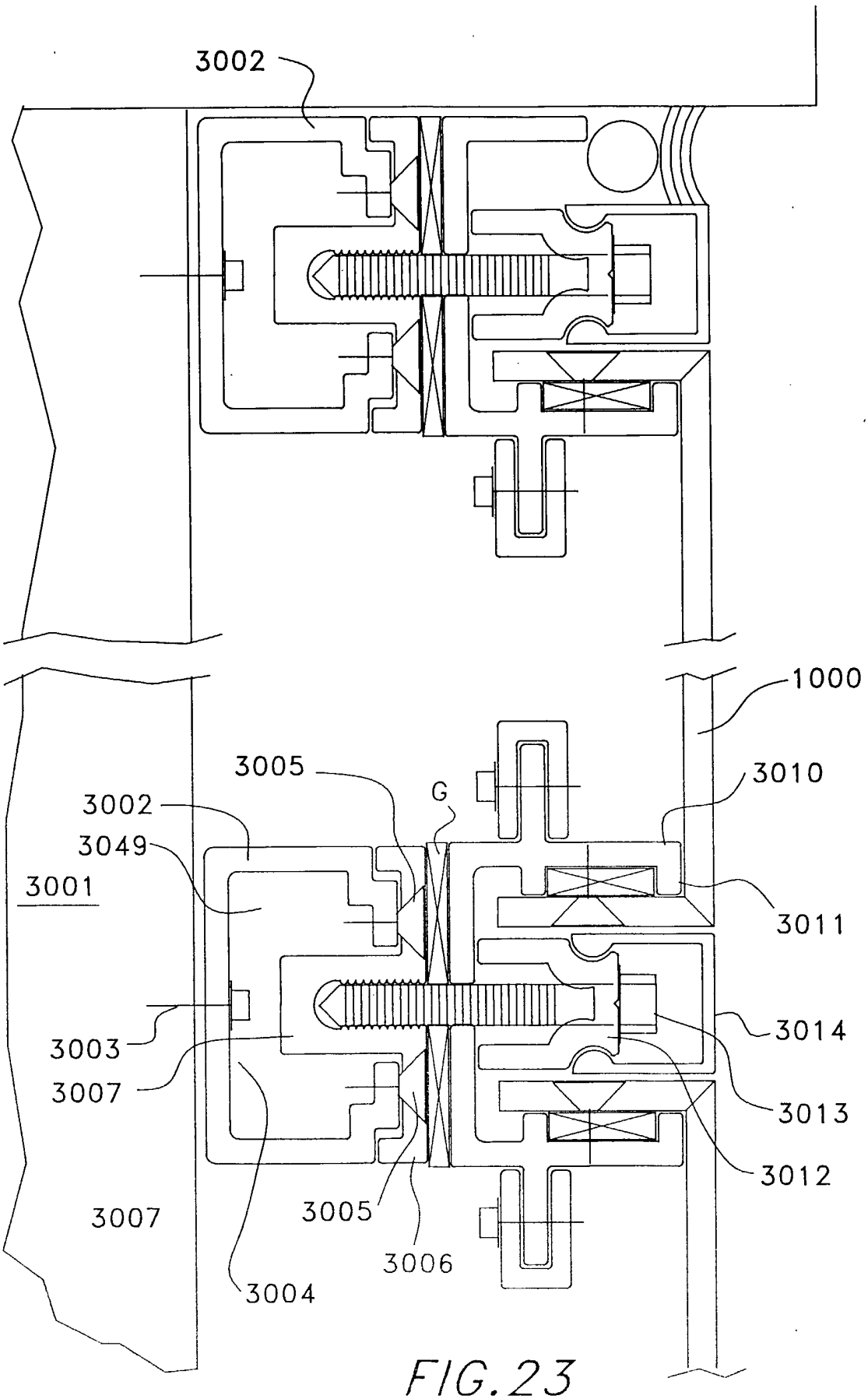

3002
1000
3005
G
3010
3002
3049
3001
3011
3003
3014
3007
3013
3012
3007
3005
3006
3004

FIG. 23

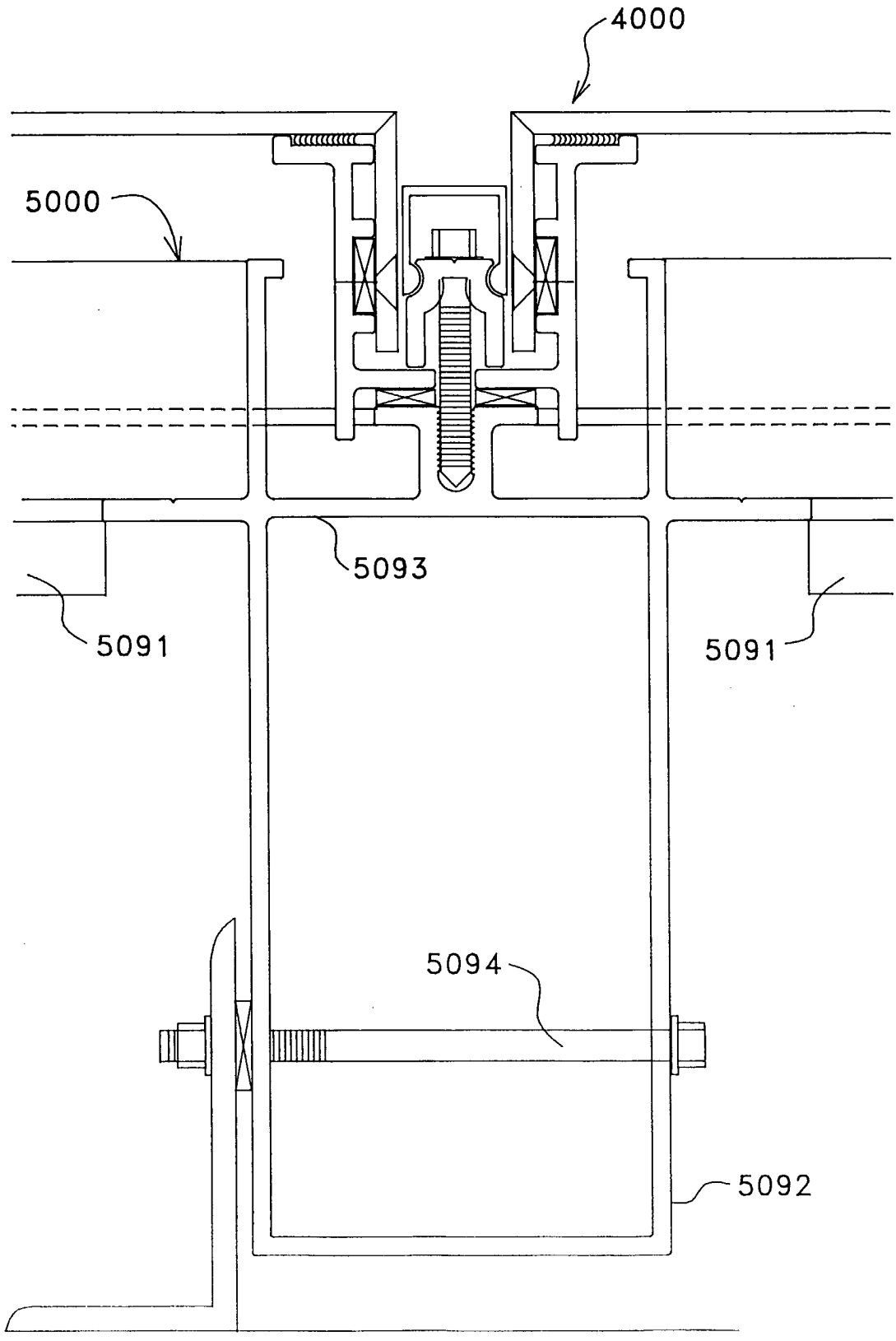


FIG. 24

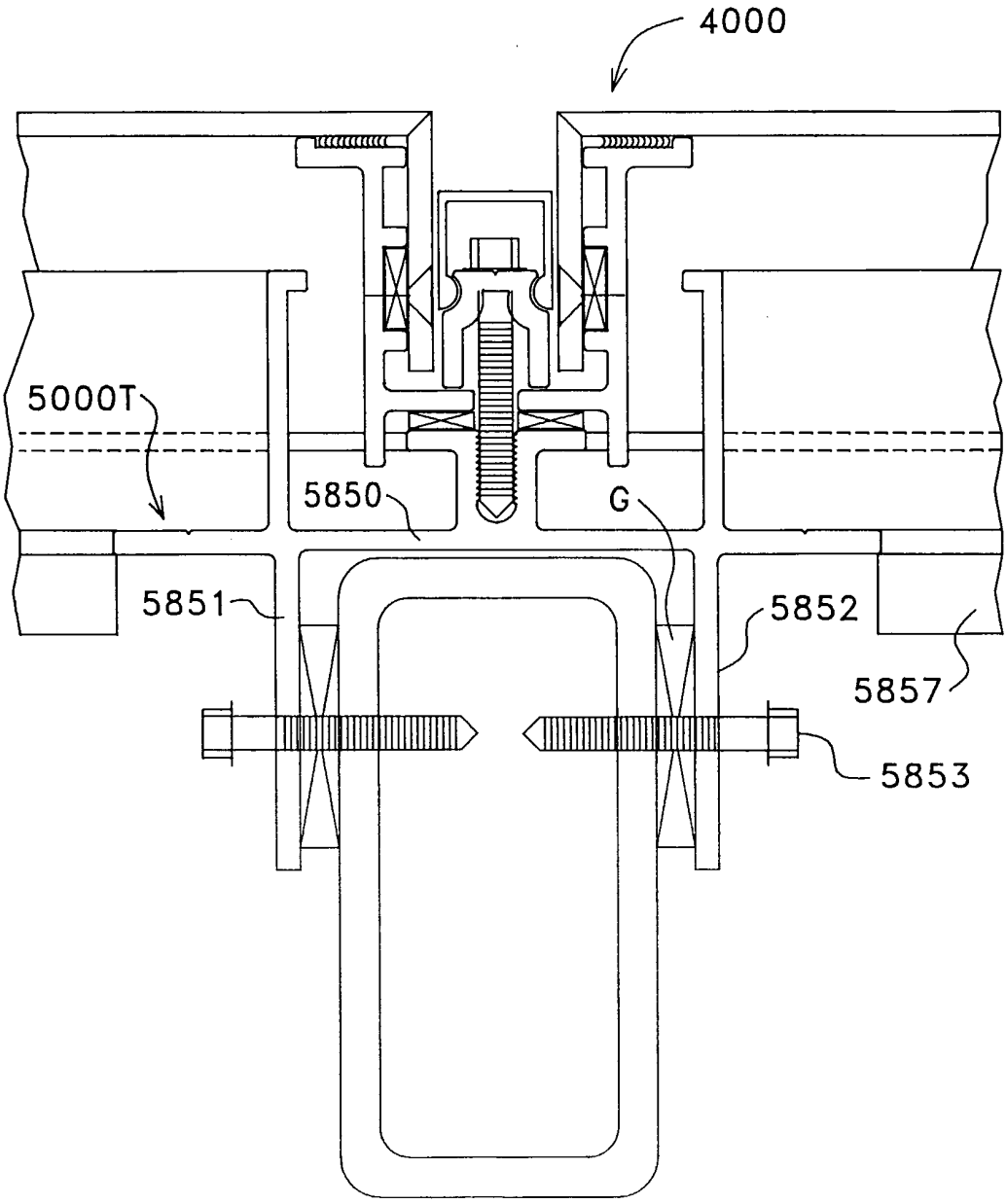


FIG. 25

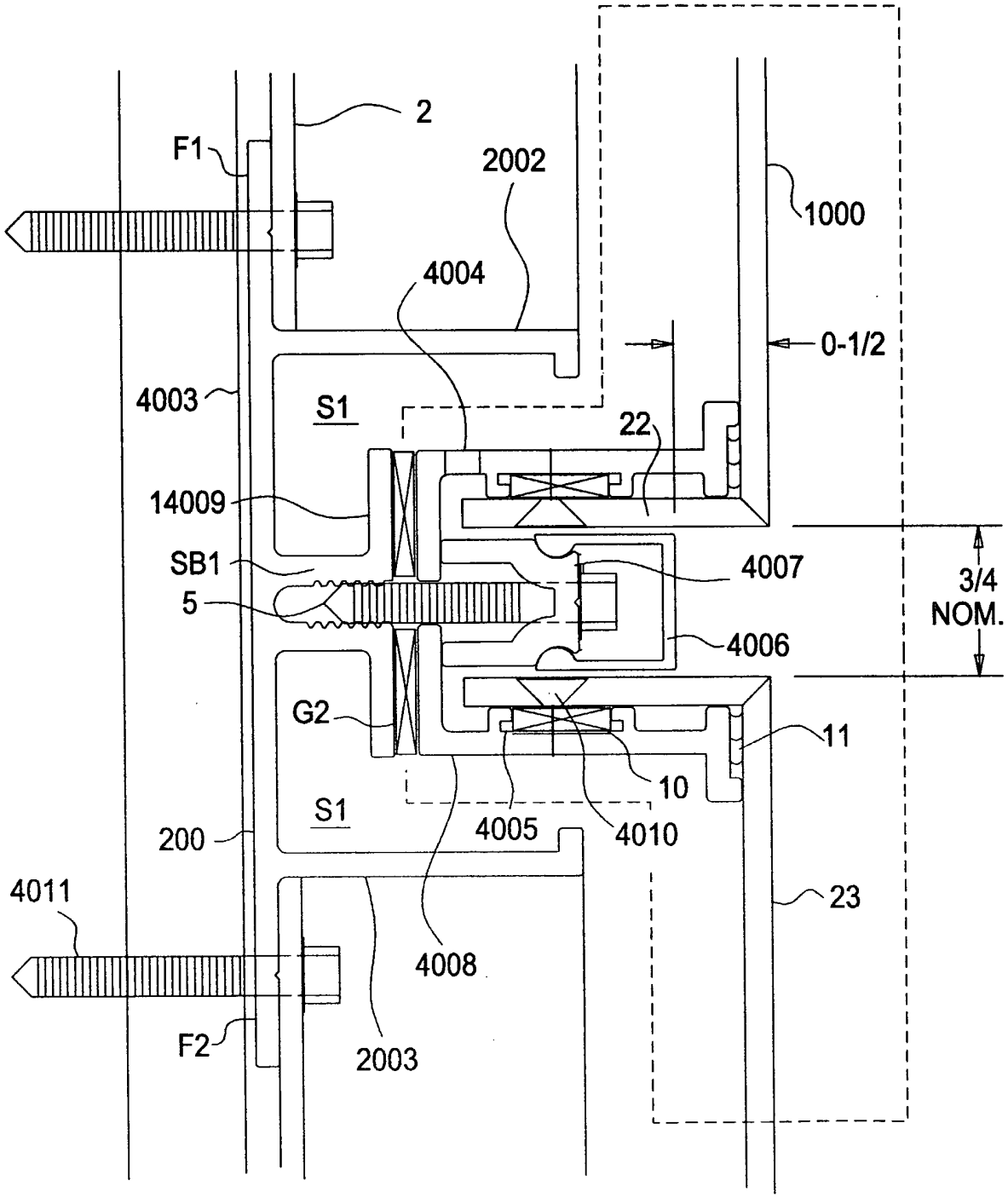

2
F1
2002
1000
4004
0-1/2
4003
S1
22
14009
SB1
4007
3/4
NOM.
5
4006
G2
11
10
S1
200
4005
4010
4011
23
4008
F2
2003

FIG.26

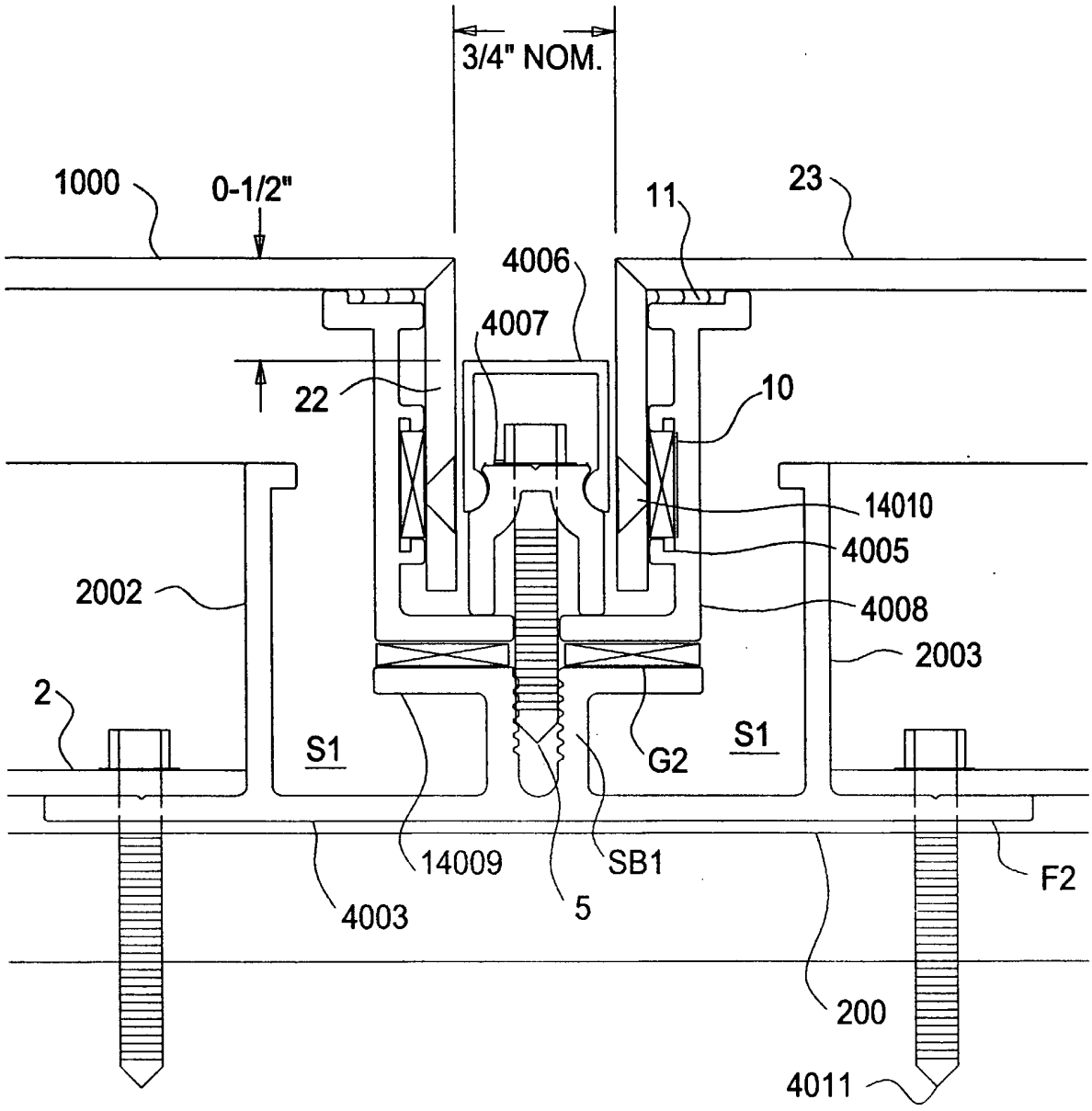

3/4" NOM.
1000
0-1/2"
11
23
4006
4007
22
10
14010
4005
2002
4008
2003
2
S1
S1
G2
14009
SB1
5
4003
F2
200
4011

FIG.27

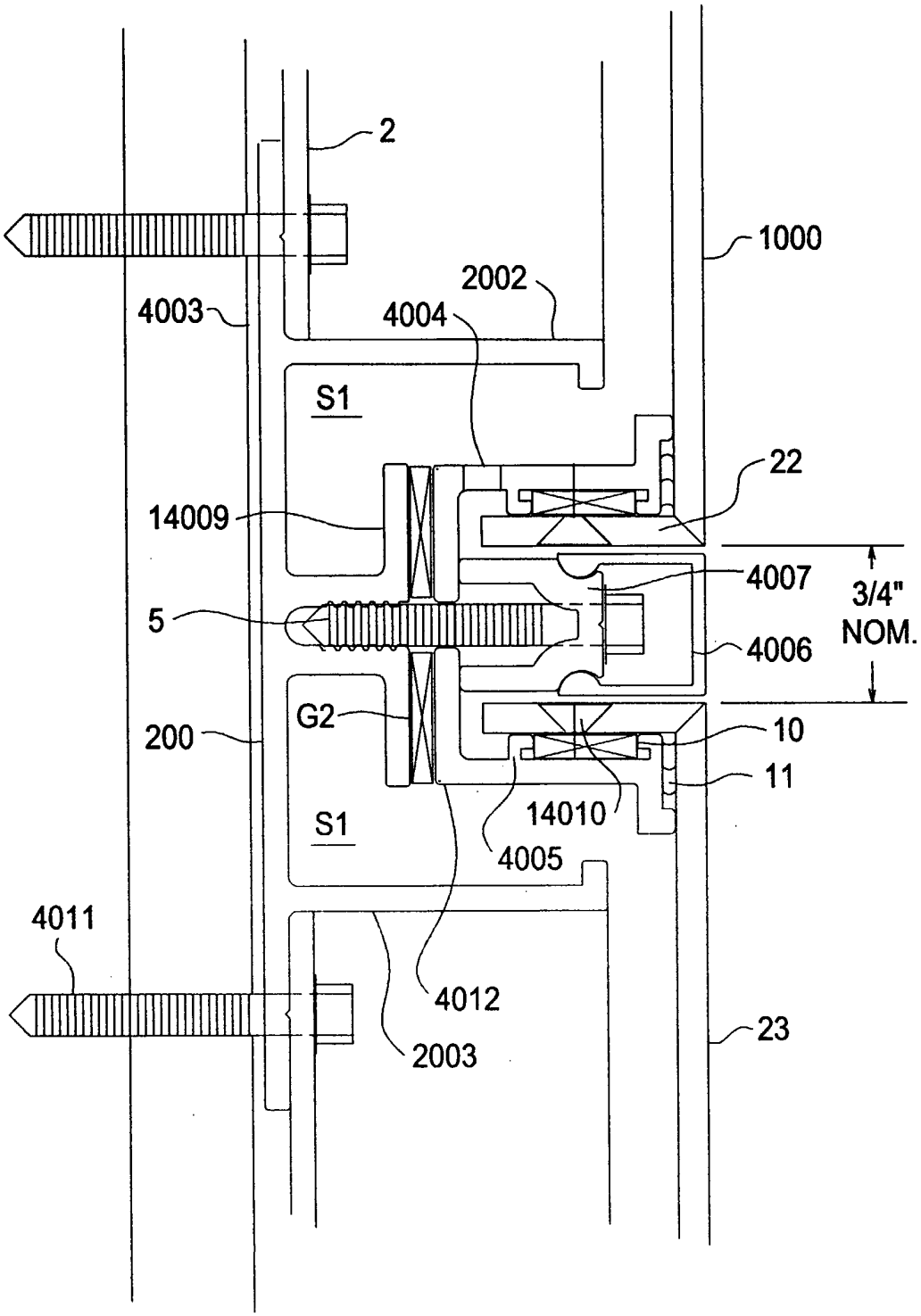

2
1000
2002
4003
4004
S1
22
14009
4007
3/4"
NOM.
5
4006
G2
10
200
11
14010
S1
4005
4011
4012
23
2003

FIG.28

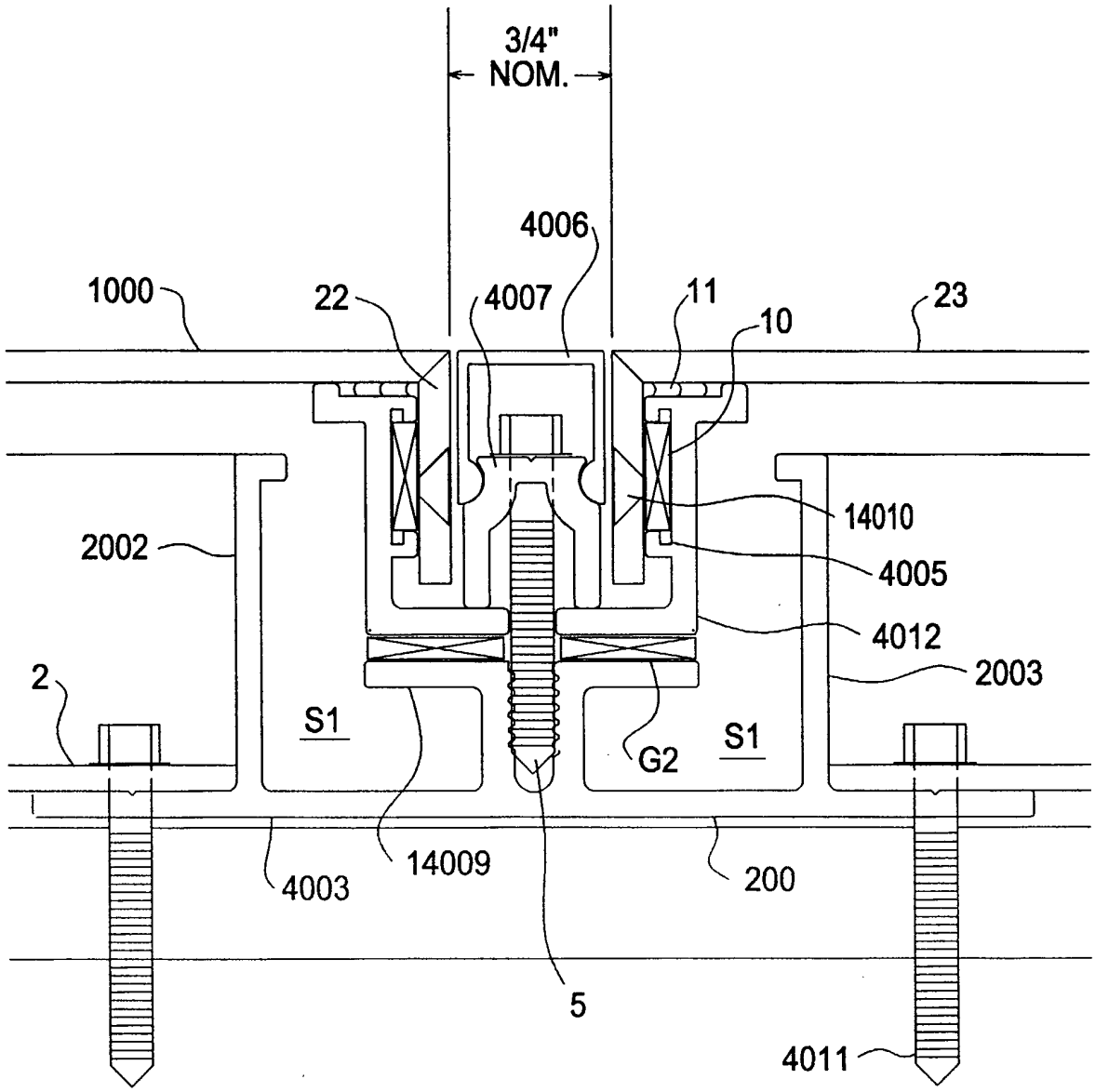

3/4"
NOM.
4006
1000
22
4007
11
10
23
14010
2002
4005
4012
2003
2
S1
G2
S1
4003
14009
200
5
4011

FIG.29

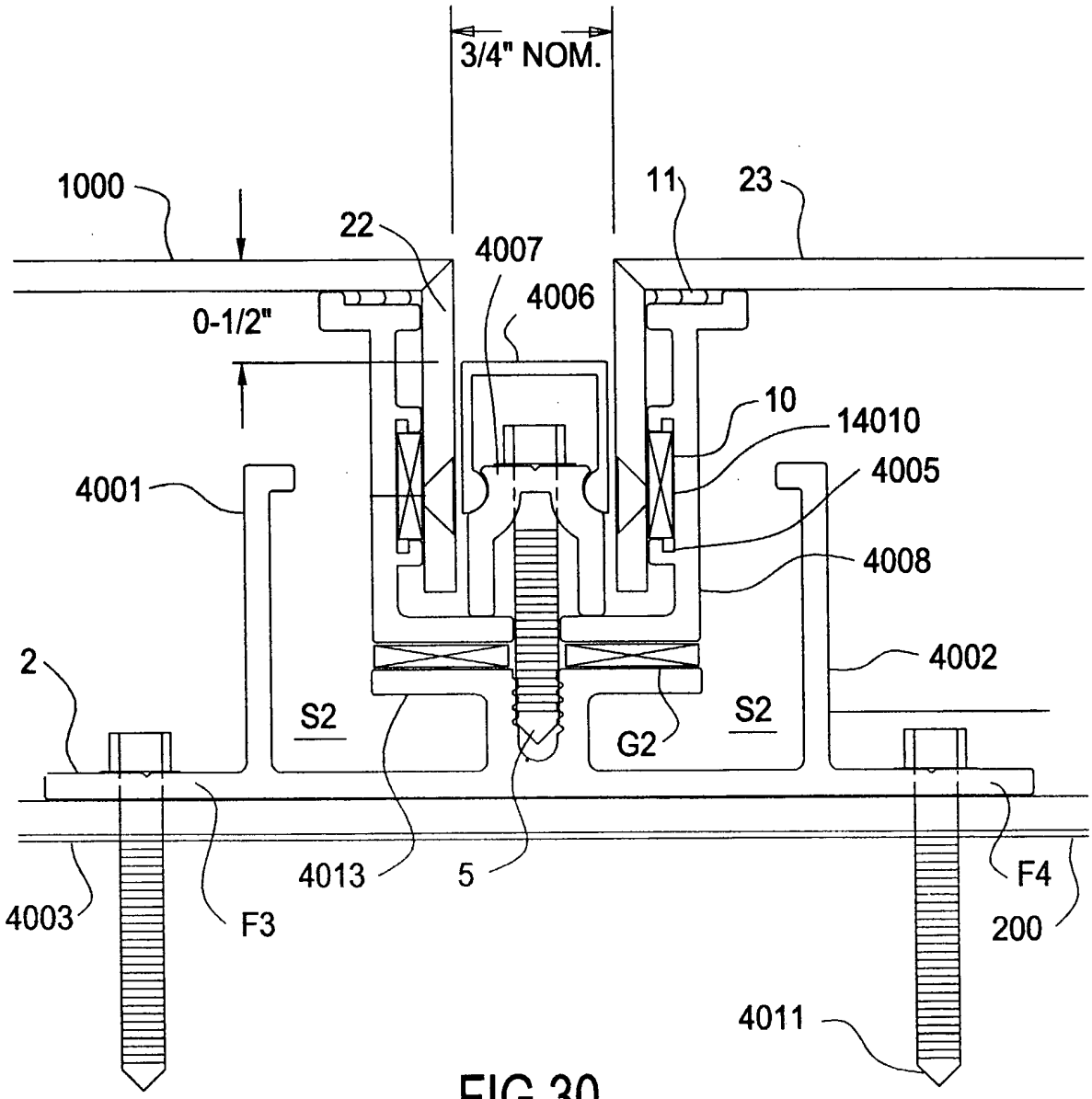

3/4" NOM.
1000
22
4007
4006
11
23
0-1/2"
10
14010
4005
4001
4008
2
4002
S2
S2
G2
4013
5
4003
F3
F4
200
4011

FIG.30

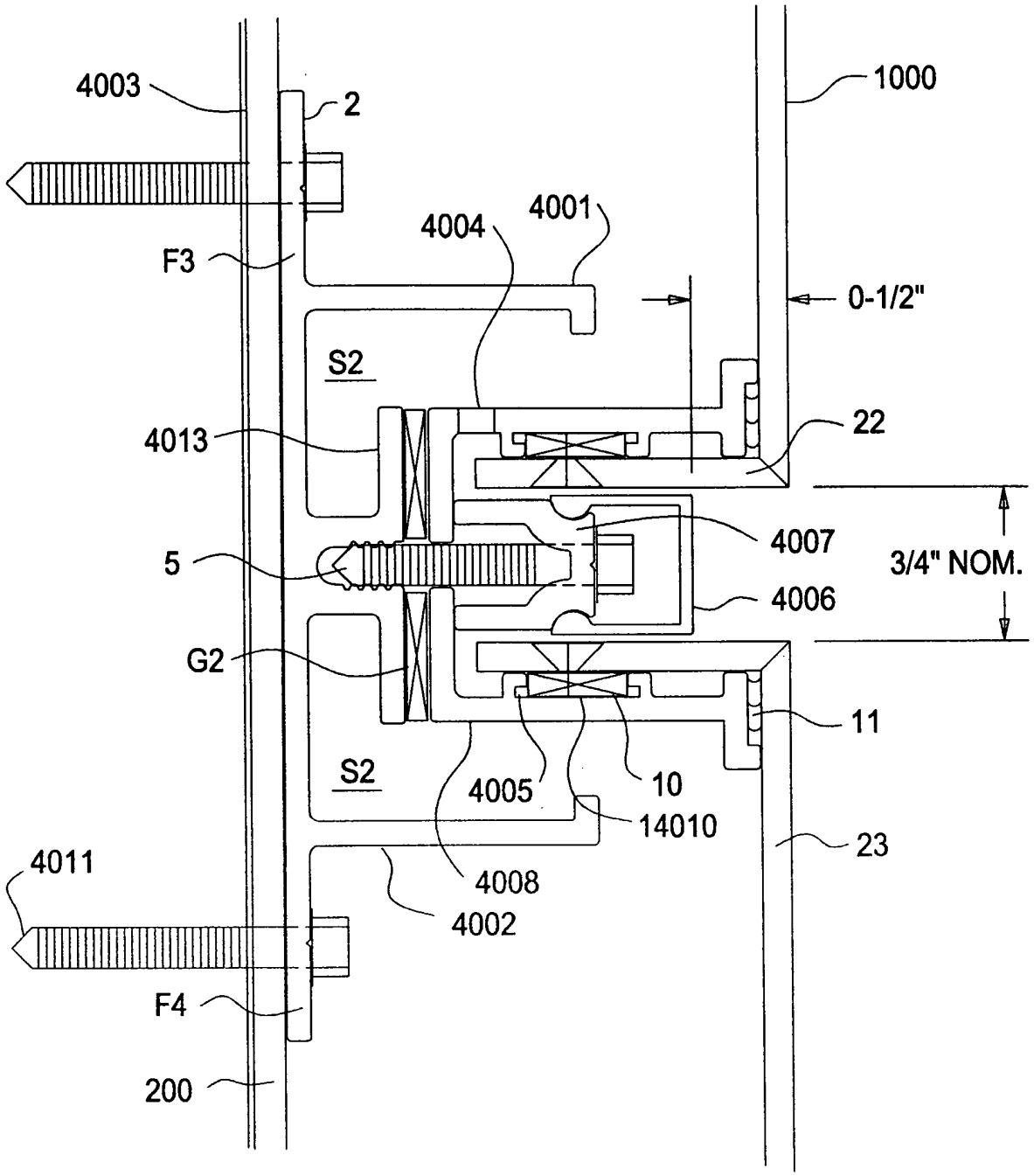

4003
2
1000
4004
4001
F3
0-1/2"
S2
4013
22
4007
5
3/4" NOM.
4006
G2
11
S2
4005
10
14010
23
4011
4008
4002
F4
200

FIG.31

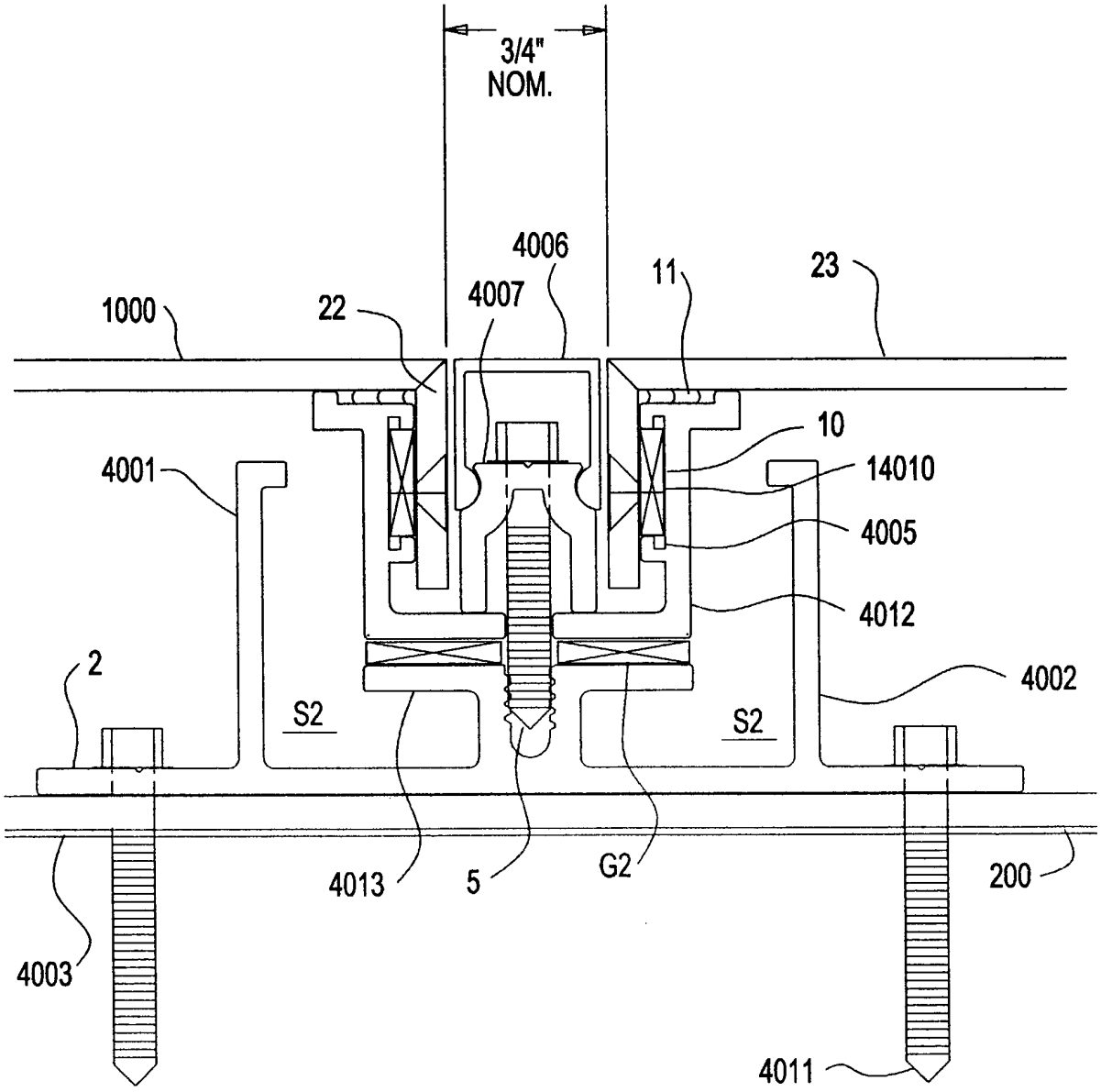

3/4"
NOM.
4006
11
23
1000
22
4007
10
4001
14010
4005
4012
2
4002
S2
S2
4013
5
G2
200
4003
4011

FIG.32

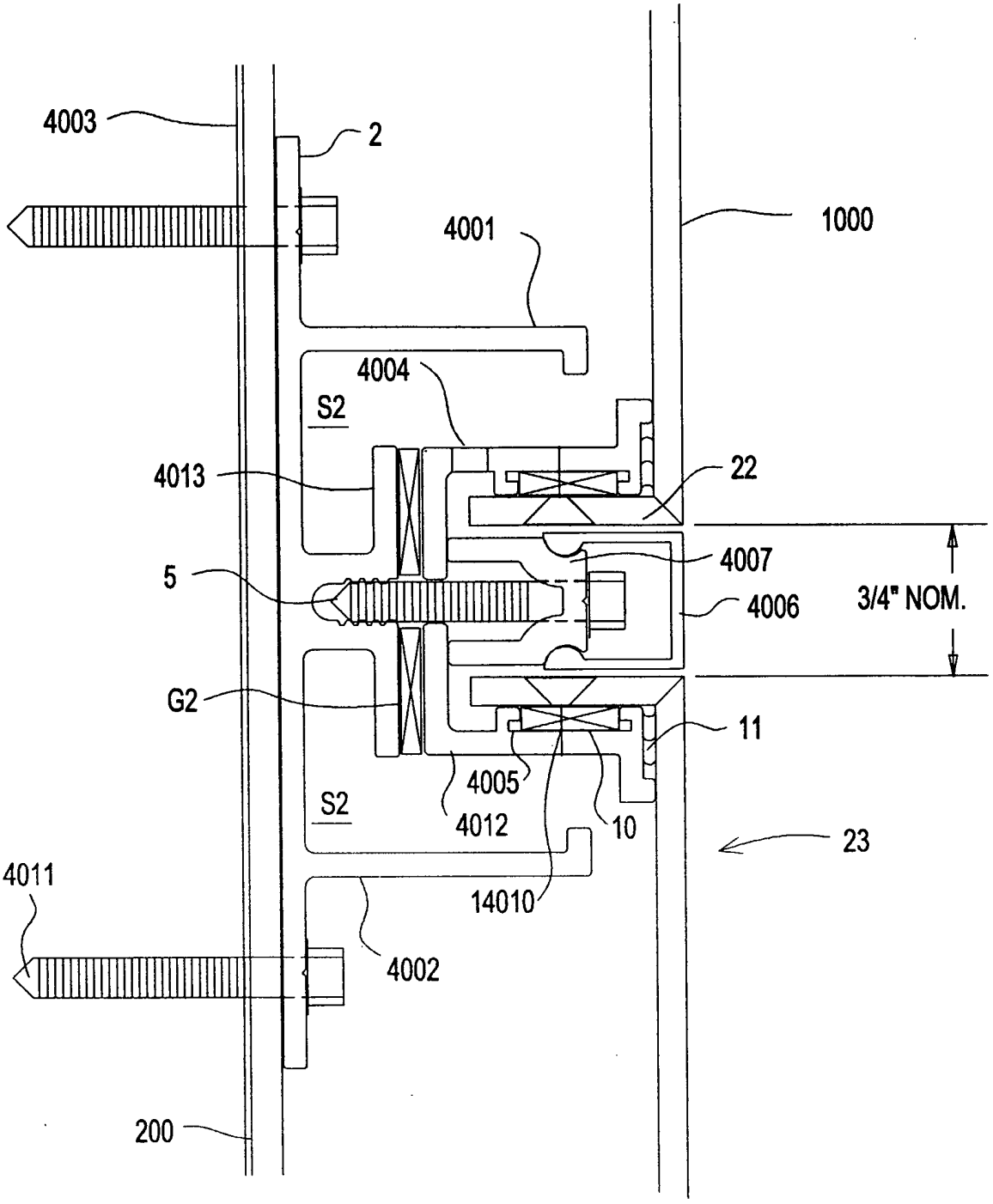

4003
2
1000
4001
4004
S2
4013
22
4007
5
4006
3/4" NOM.
G2
11
4005
S2
4012
10
23
4011
14010
4002
200

FIG.33

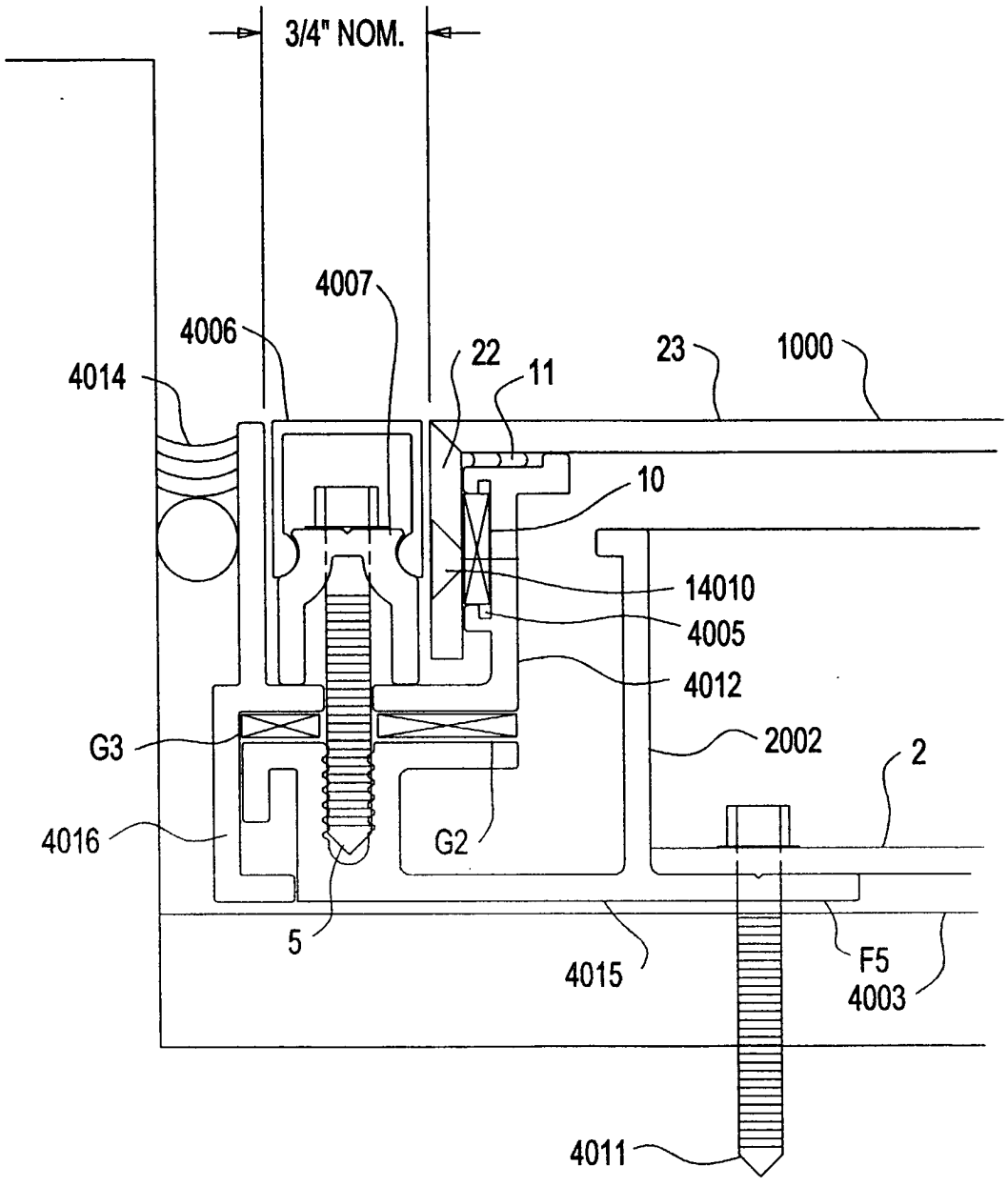

3/4" NOM.
4007
4006
22
11
23
1000
4014
10
14010
4005
4012
G3
2002
2
4016
G2
5
4015
F5
4003
4011

FIG.34

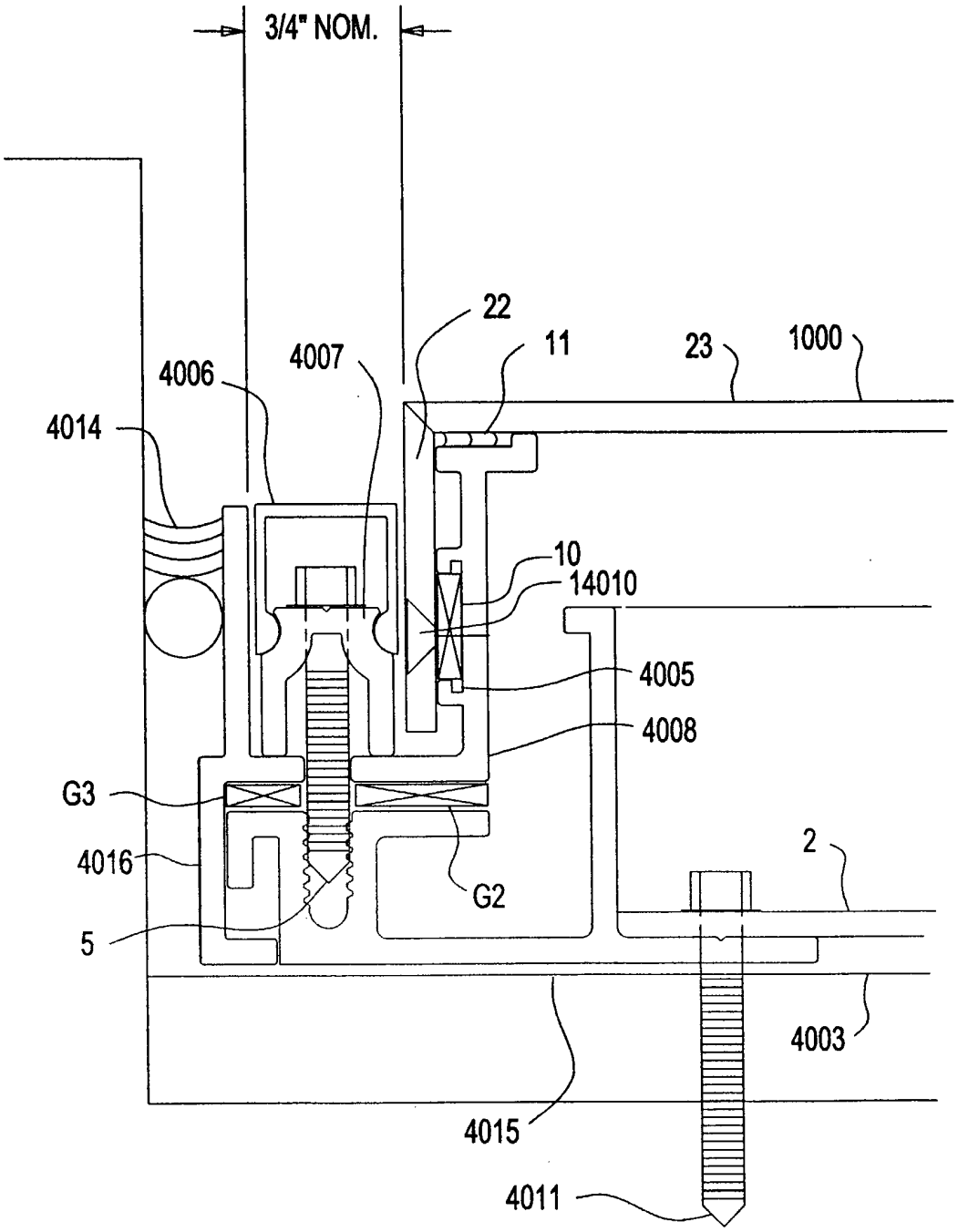

3/4" NOM.
22
11
23
1000
4006
4007
4014
10
14010
4005
4008
G3
4016
5
G2
2
4003
4015
4011

FIG.35

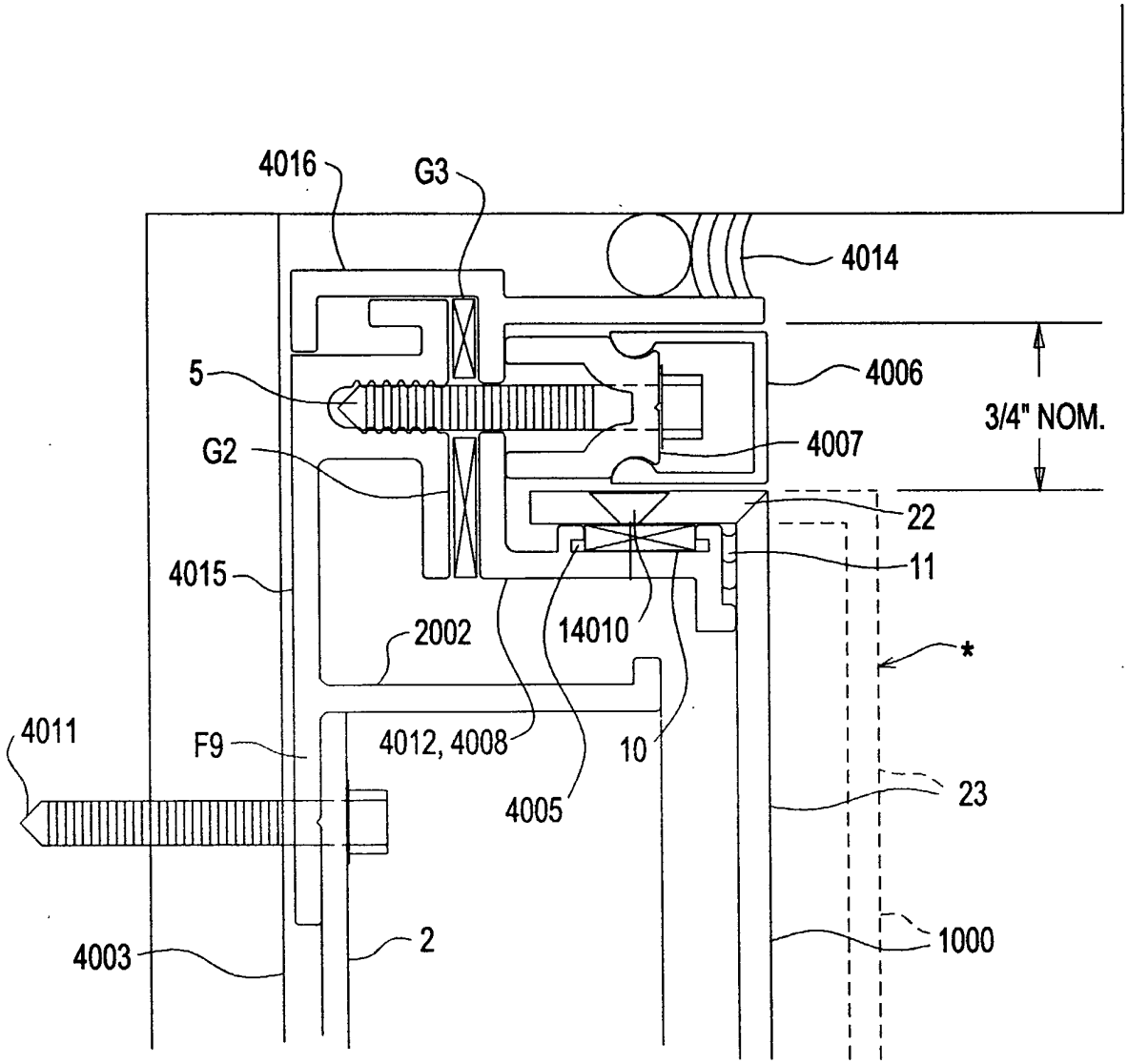

4016
G3
4014
5
4006
3/4" NOM.
G2
4007
22
11
4015
2002
14010
*
4011
F9
4012, 4008
10
23
4005
2
4003
1000

FIG.36

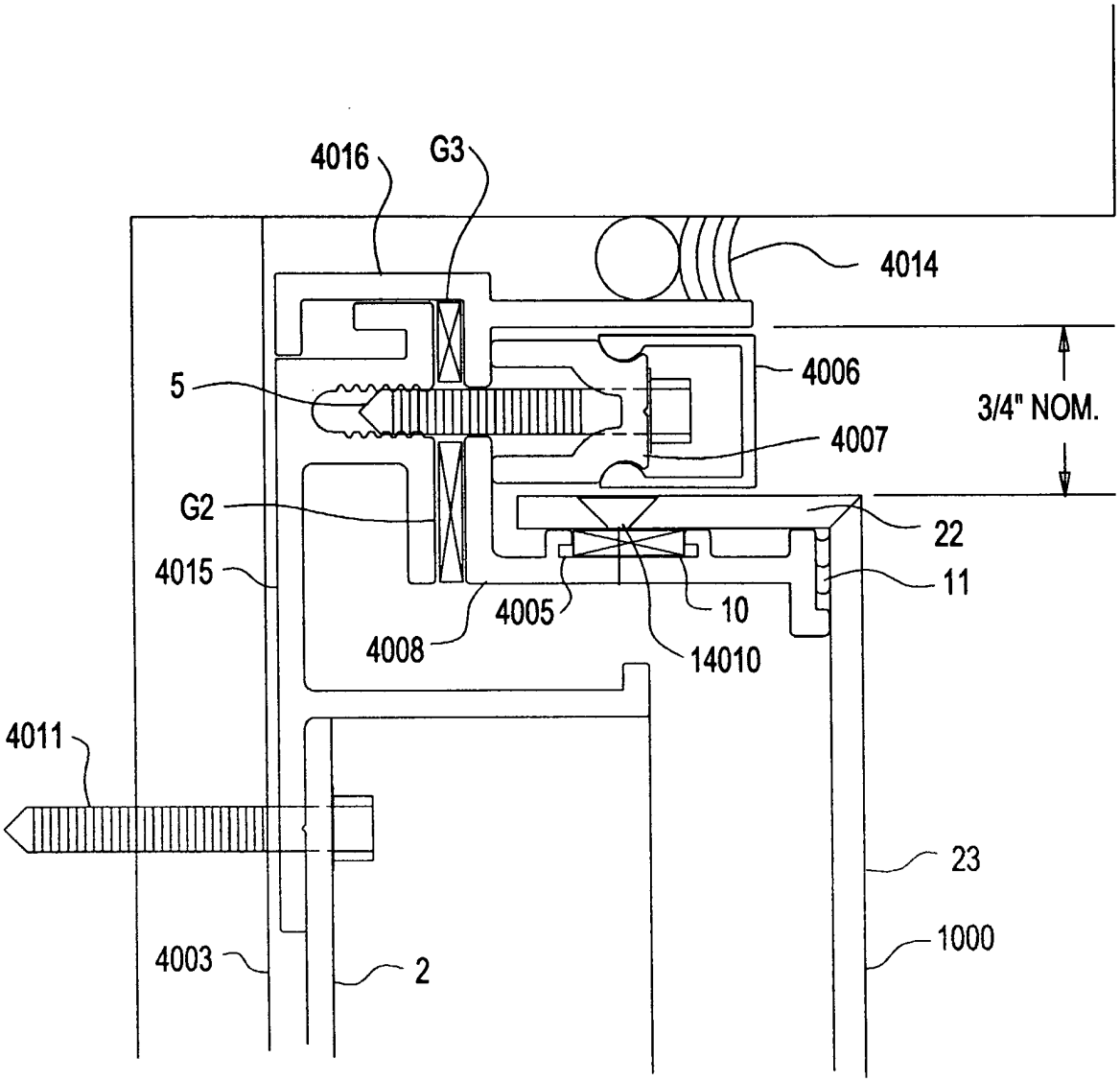

4016
G3
4014
4006
5
3/4" NOM.
4007
G2
22
4015
11
4005
10
4008
14010
4011
23
1000
4003
2

FIG.37

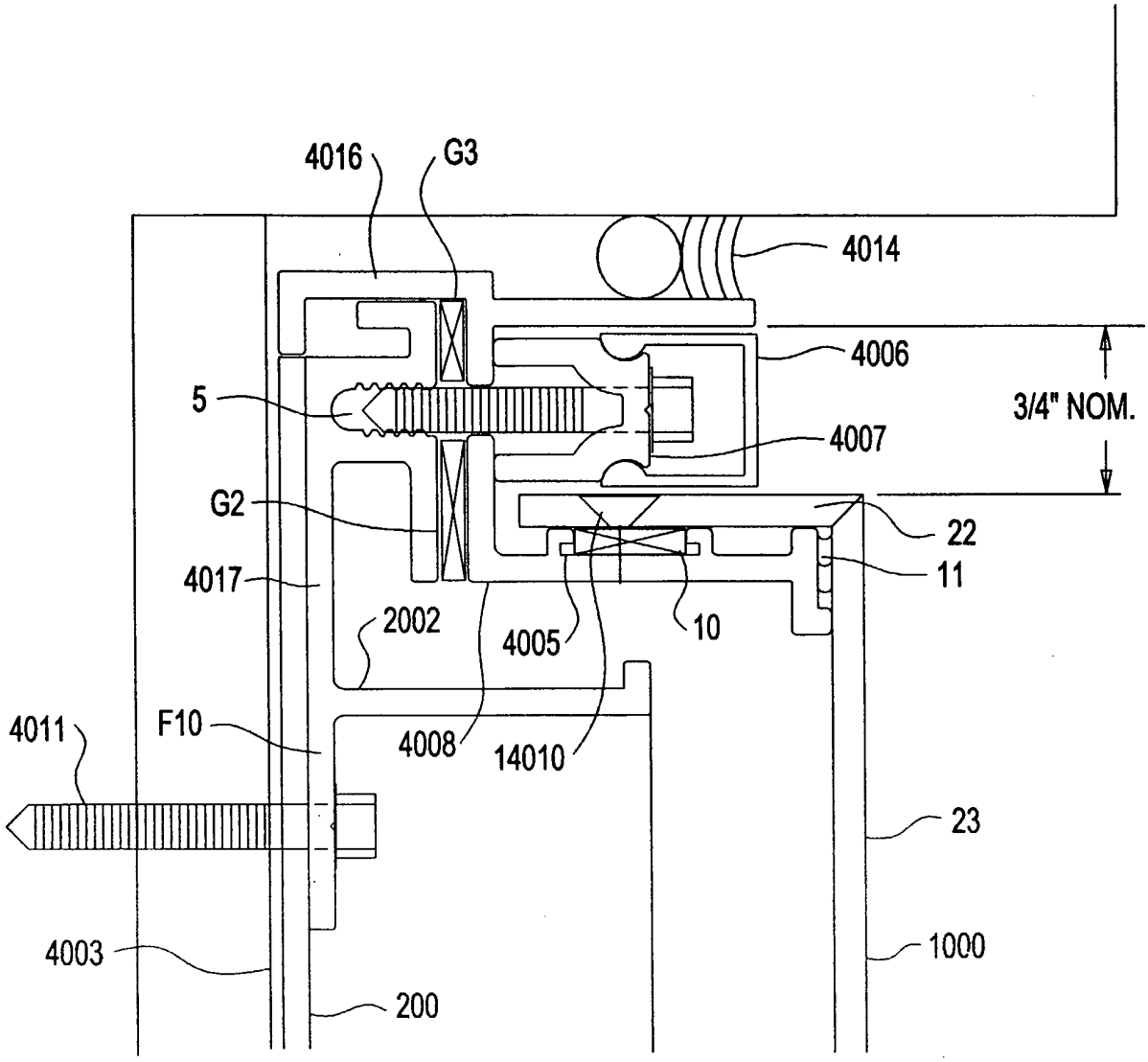

4016
G3
4014
4006
5
3/4" NOM.
4007
G2
22
11
4017
2002
4005
10
4011
F10
4008
14010
23
4003
1000
200

FIG.38

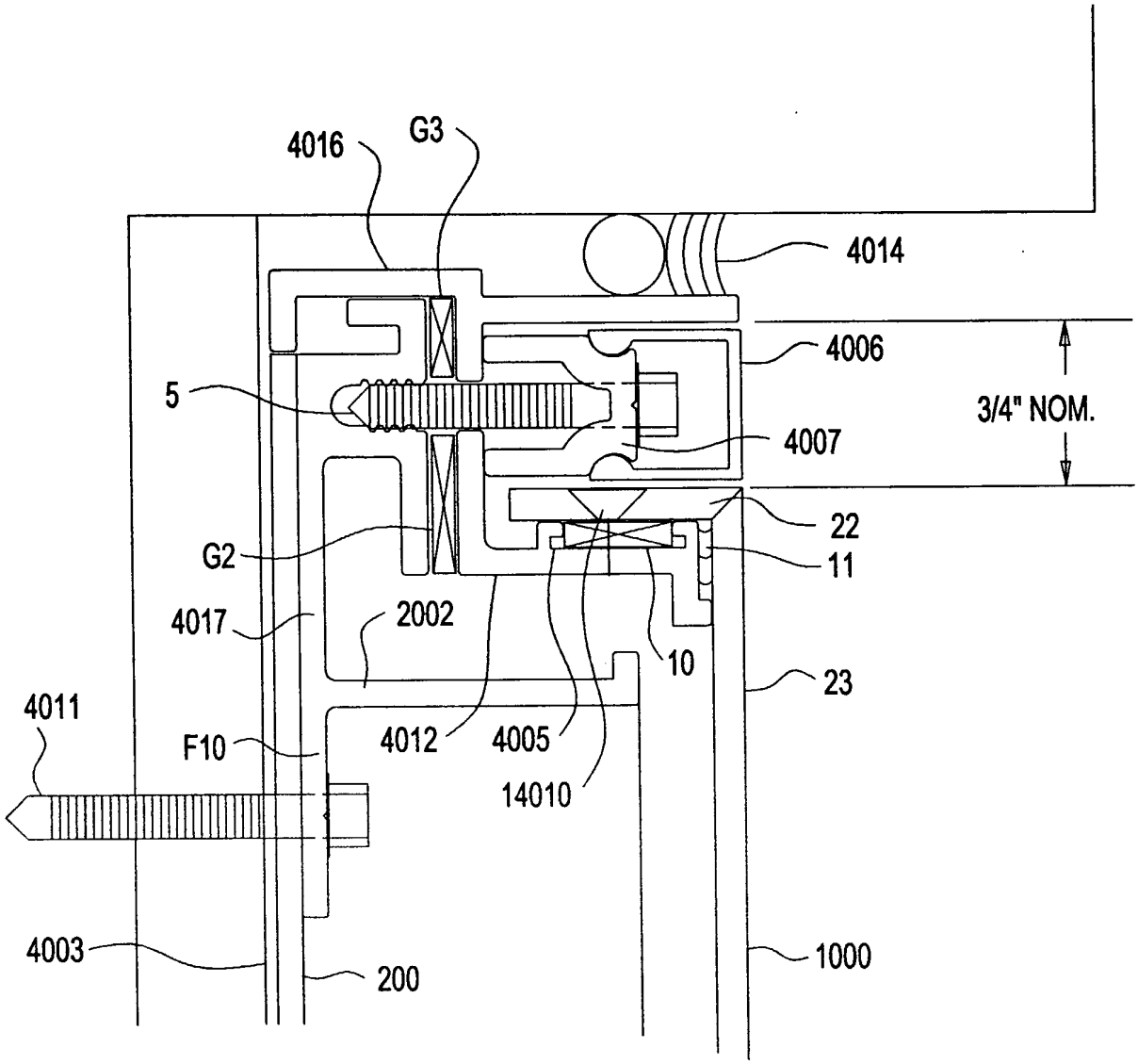

4016
G3
4014
4006
5
3/4" NOM.
4007
22
G2
11
4017
2002
10
23
4011
F10
4012
4005
14010
4003
200
1000

FIG.39

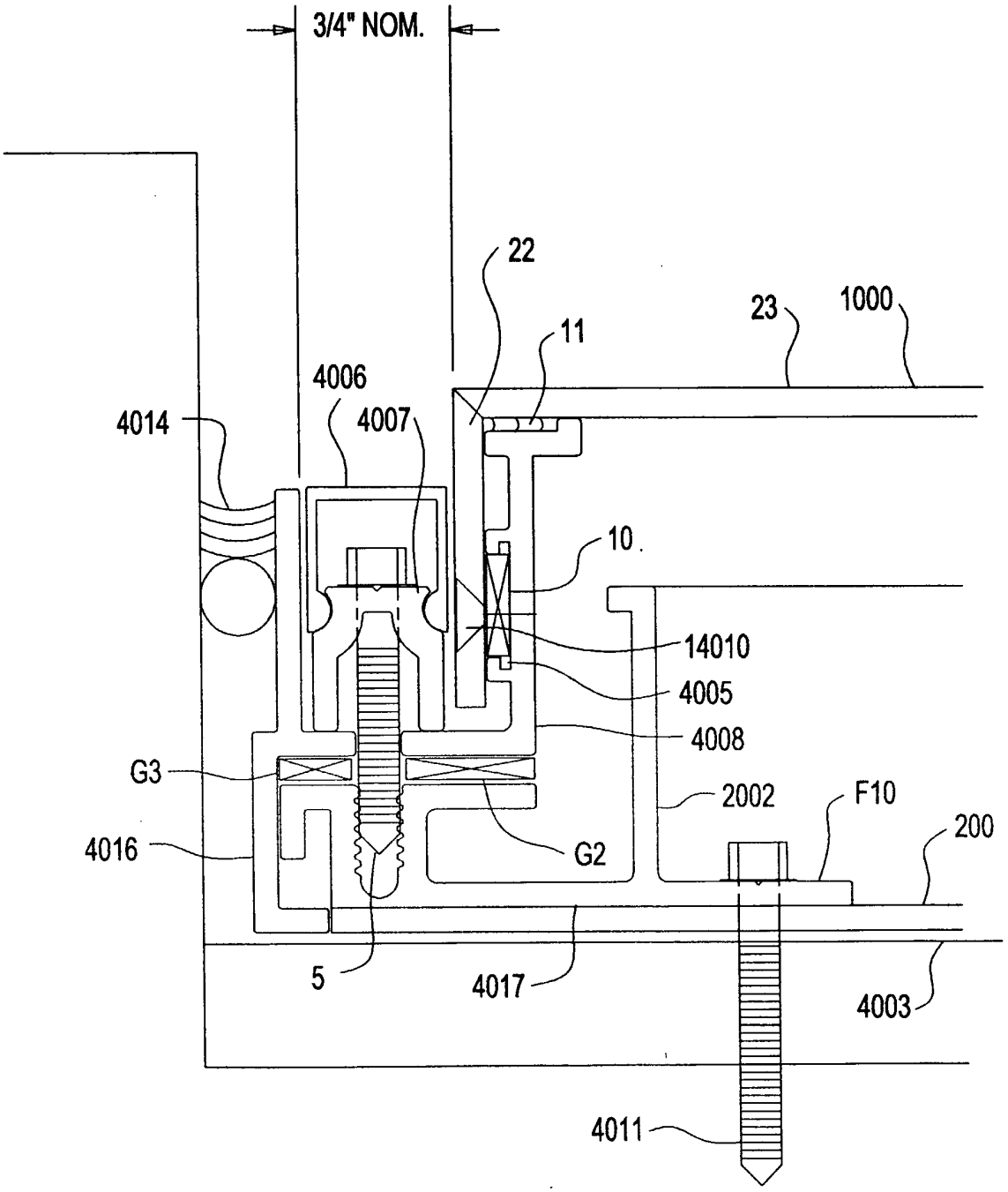

3/4" NOM.
22
23
1000
11
4006
4014
4007
10
14010
4005
4008
G3
2002
F10
200
4016
G2
5
4017
4003
4011

FIG.40

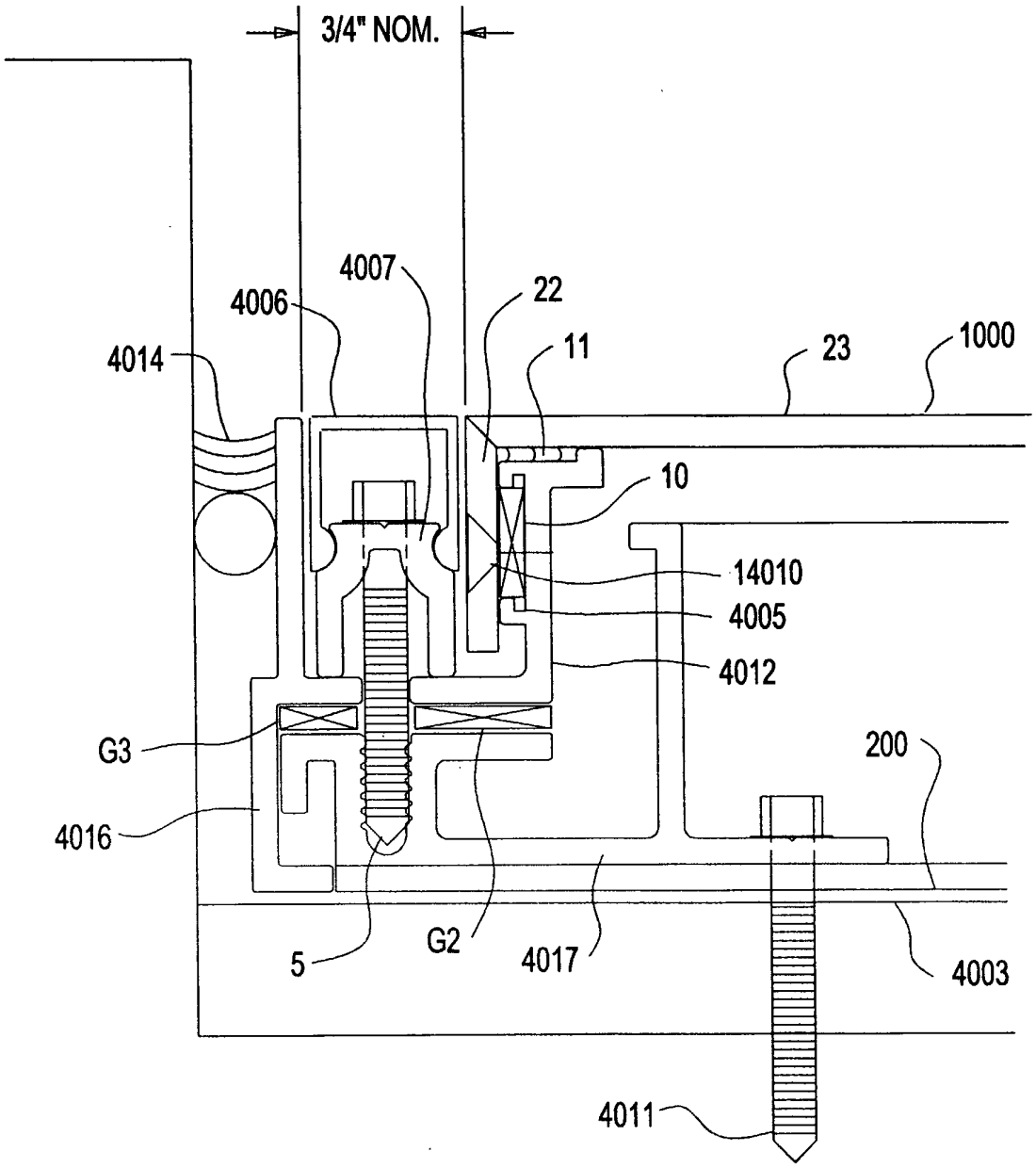

3/4" NOM.
4007
4006
22
4014
11
23
1000
10
14010
4005
4012
G3
200
4016
5
G2
4017
4003
4011

FIG.41

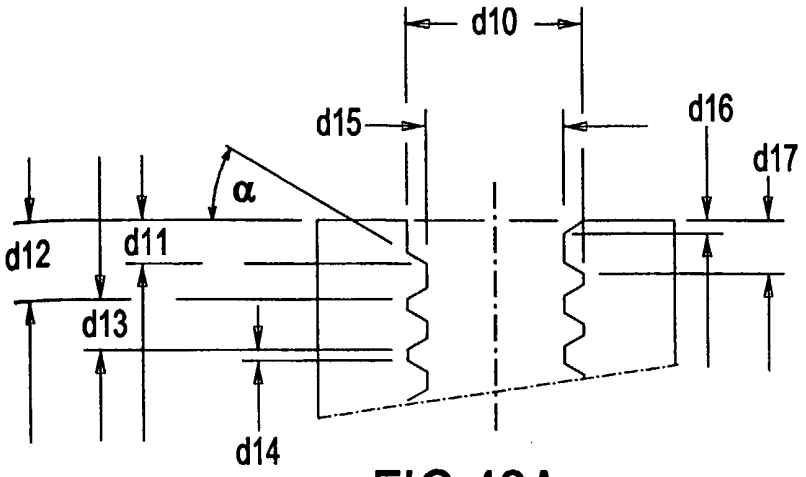


FIG.42A

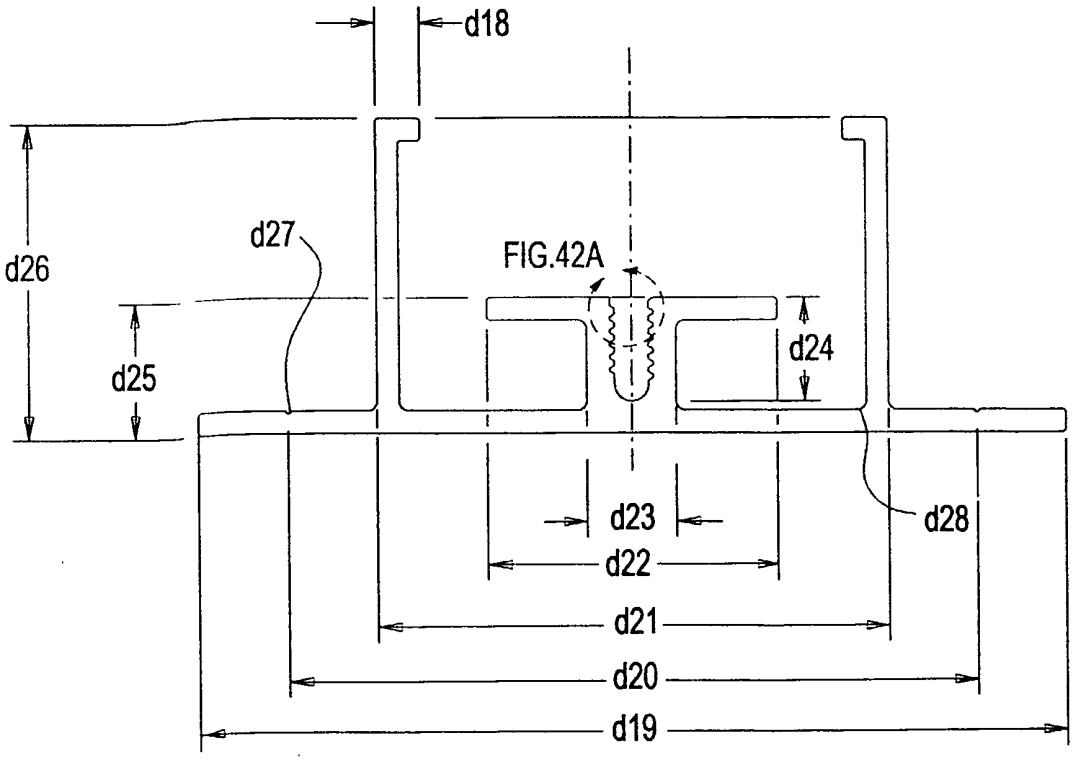


FIG.42

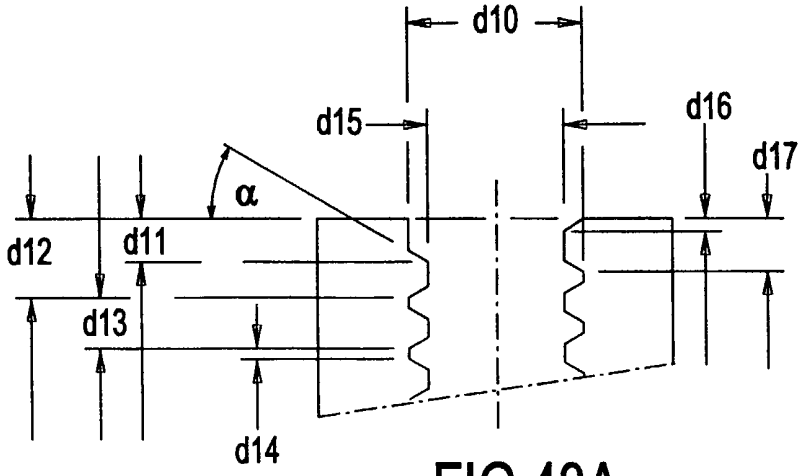


FIG.43A

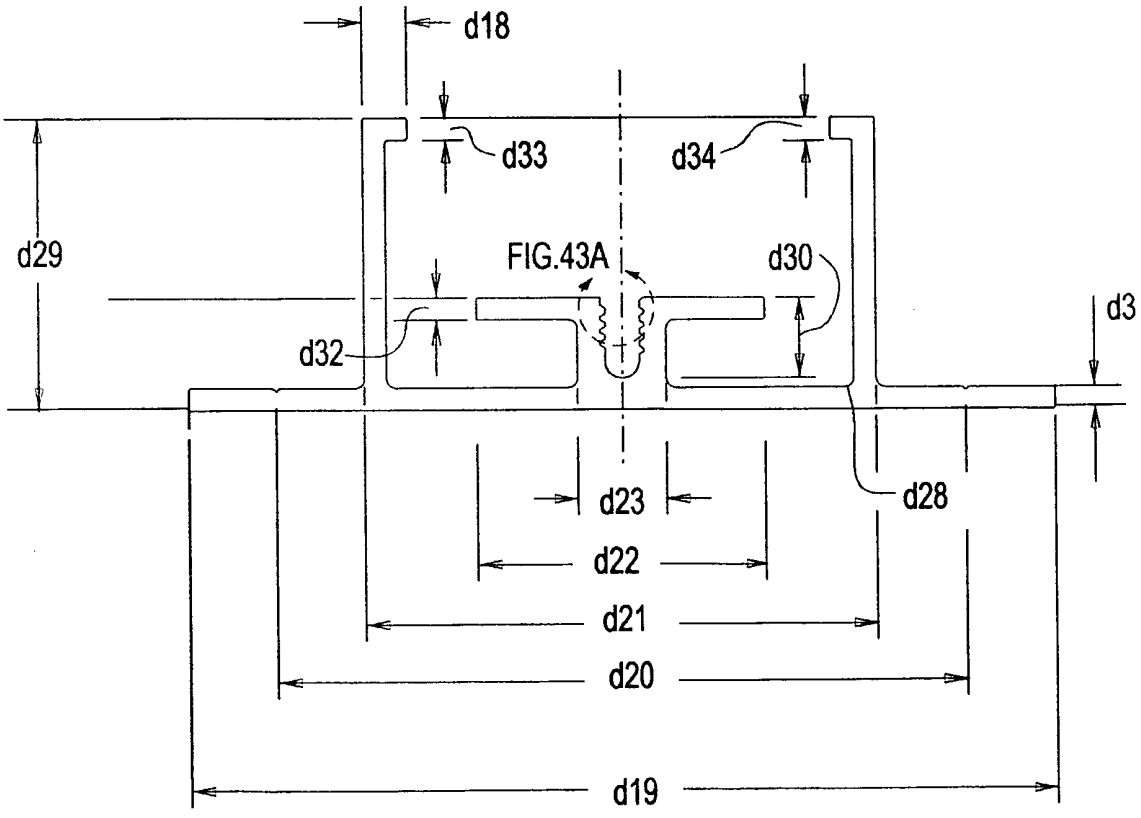


FIG.43

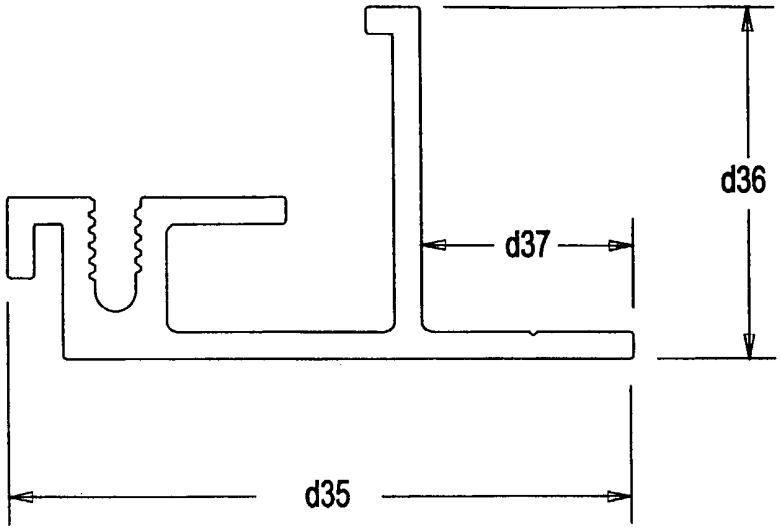


FIG.44

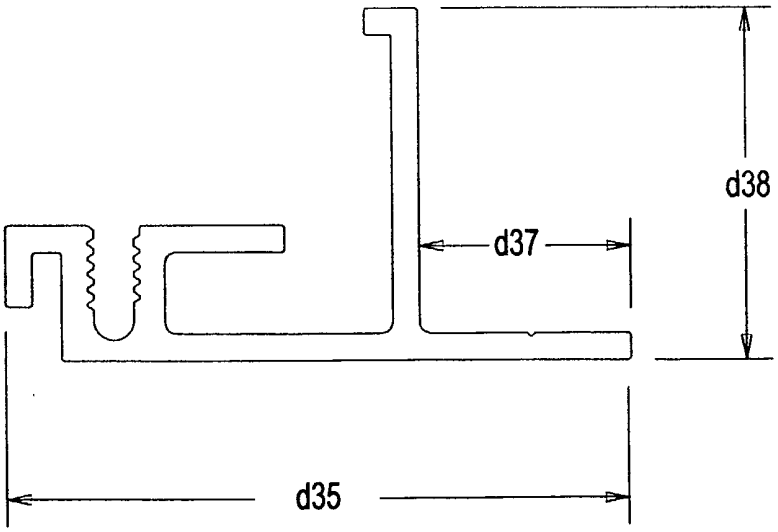


FIG.45

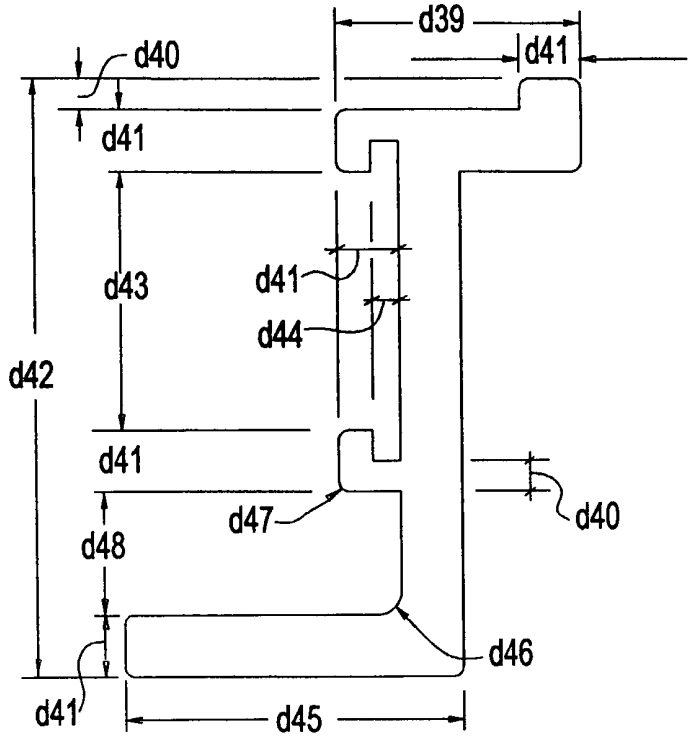

d39
d40
d41
d41
d43
d41
d44
d42
d41
d47
d40
d48
d46
d41
d45

FIG.46

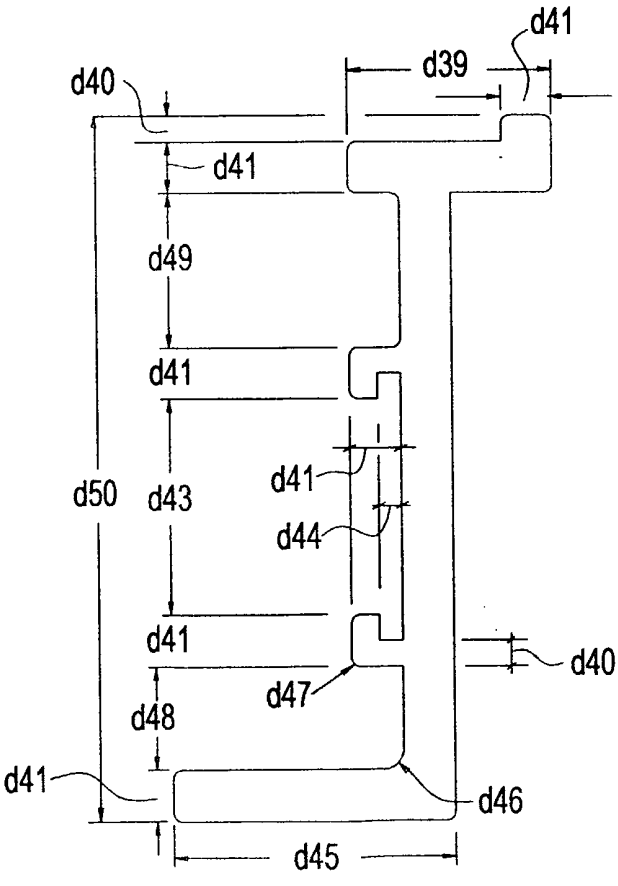

d41
d39
d40
d41
d49
d41
d41
d50
d43
d44
d41
d40
d47
d48
d41
d46
d45

FIG.47

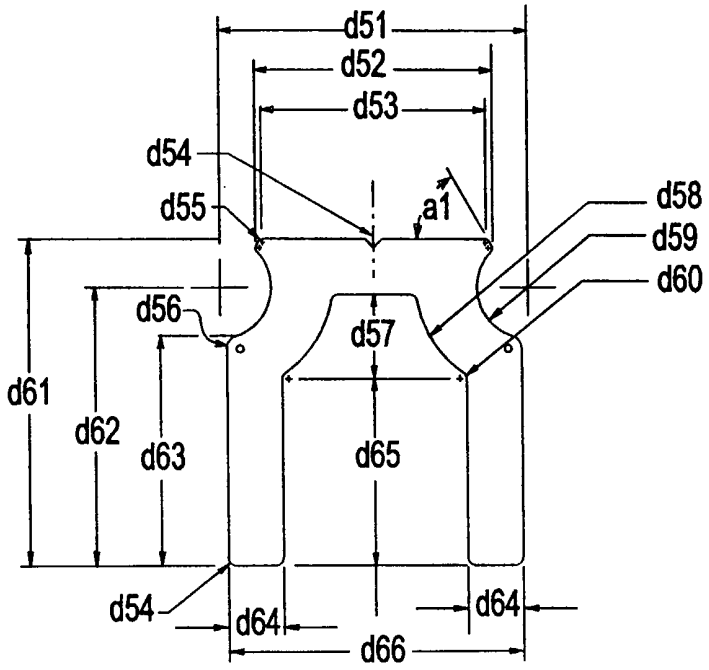

d51
d52
d53
d54
d55
a1
d58
d59
d60
d56
d57
d61
d62
d63
d65
d54
d64
d64
d66

FIG.48

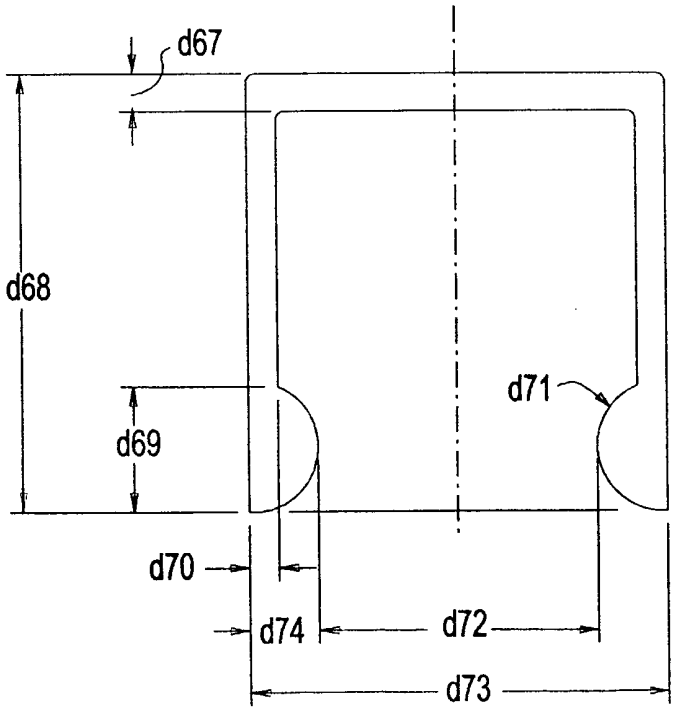

d67
d68
d71
d69
d70
d74
d72
d73

FIG.49

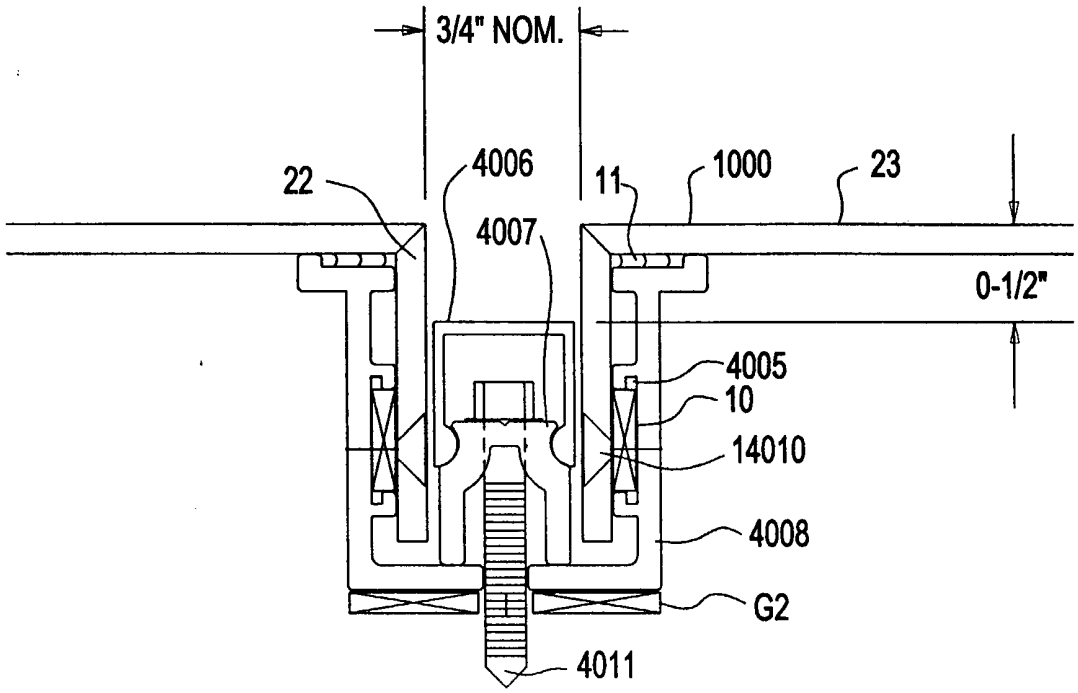

3/4" NOM.
22
4006
4007
11
1000
23
0-1/2"
4005
10
14010
4008
G2
4011

FIG.50

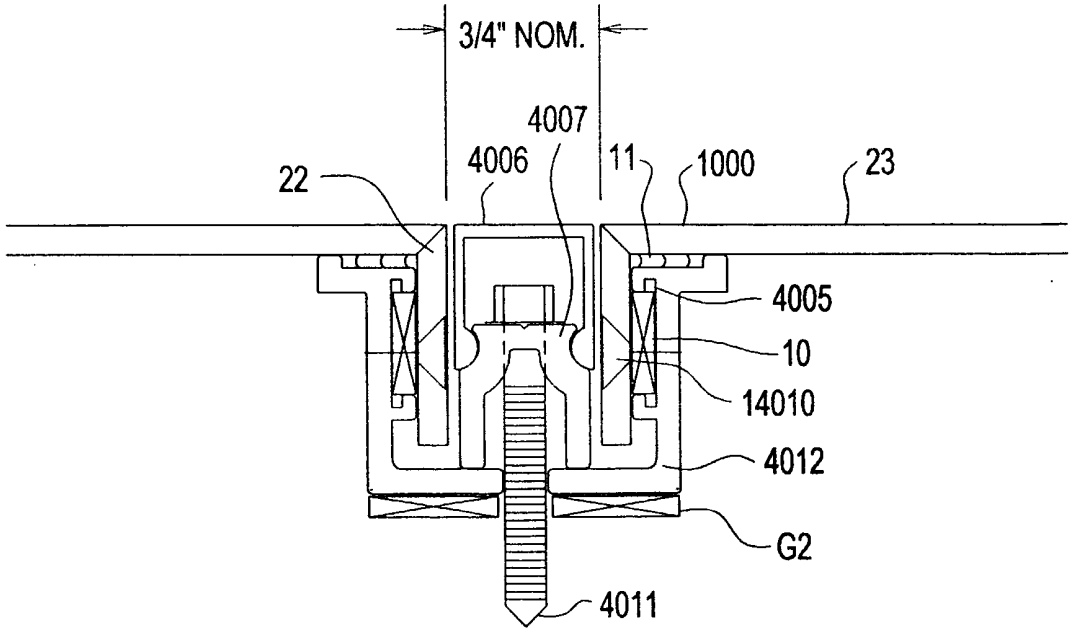

3/4" NOM.
4007
22
4006
11
1000
23
4005
10
14010
4012
G2
4011

FIG.51

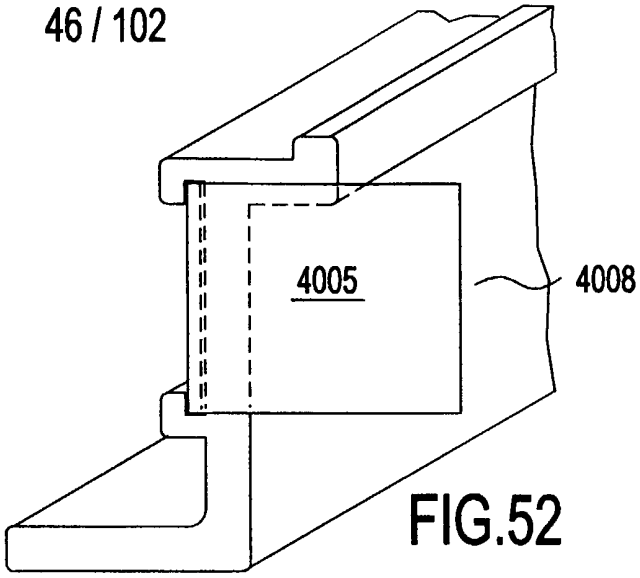


FIG.52

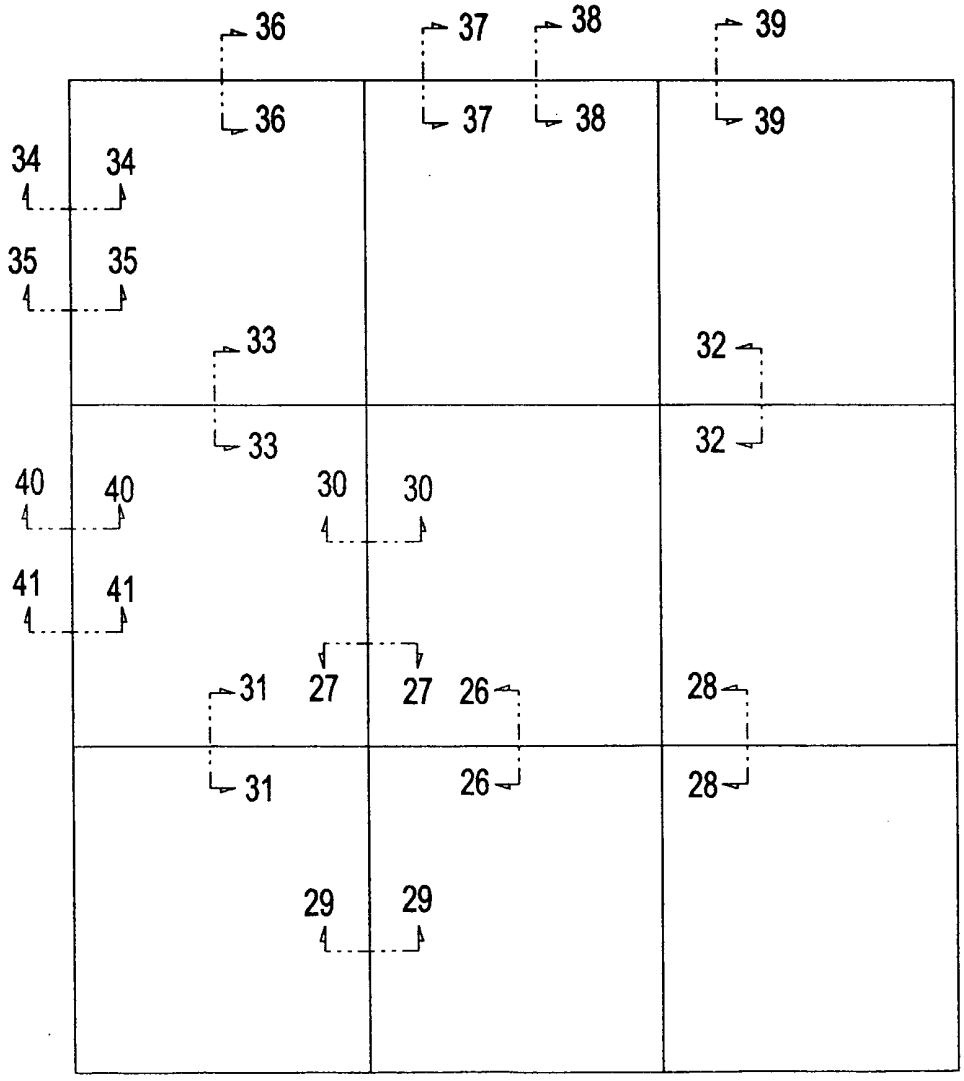


FIG.53

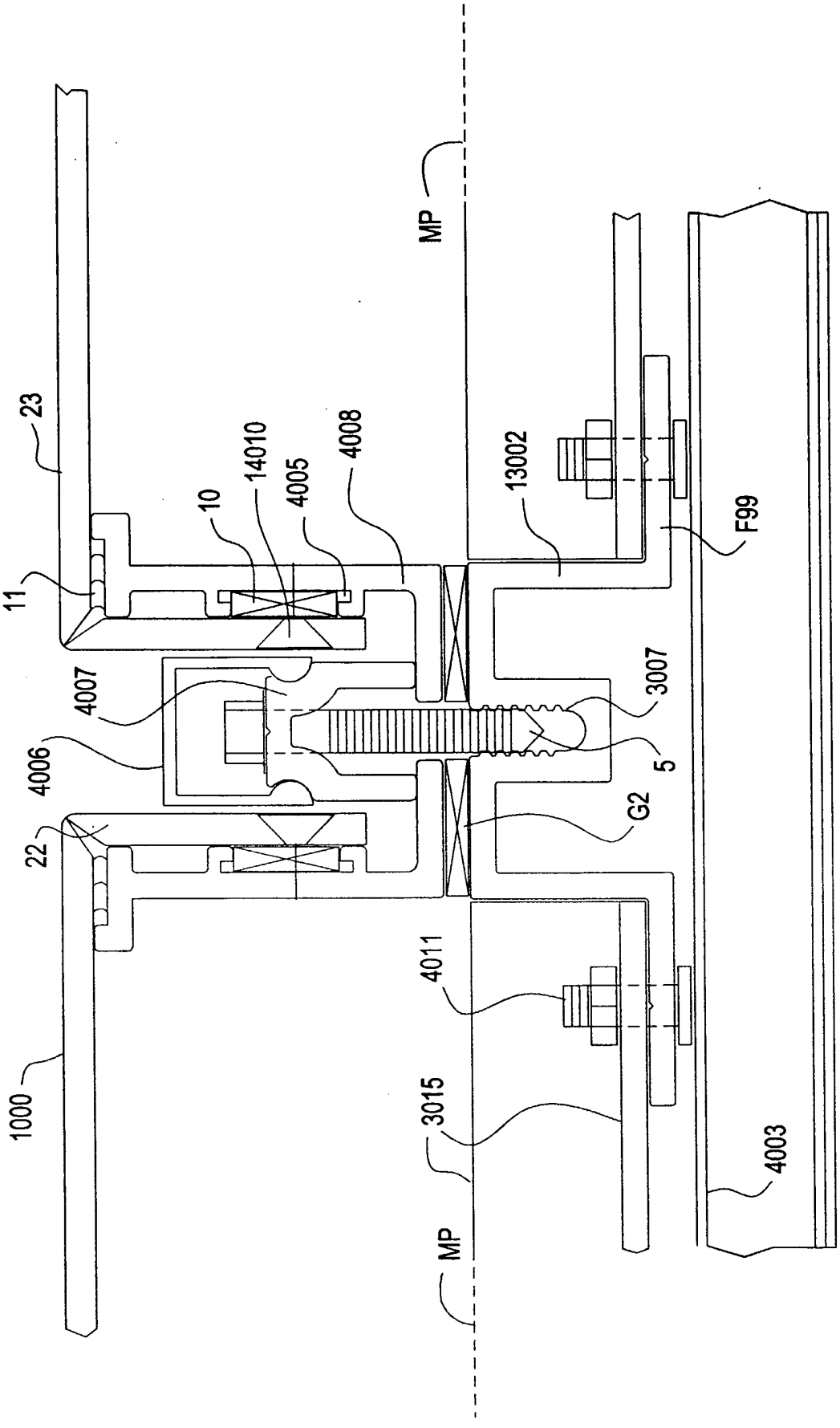

MP
23
14010
4008
10
4005
13002
F99
11
4007
3007
4006
5
G2
22
4011
1000
3015
4003
MP

FIG.54

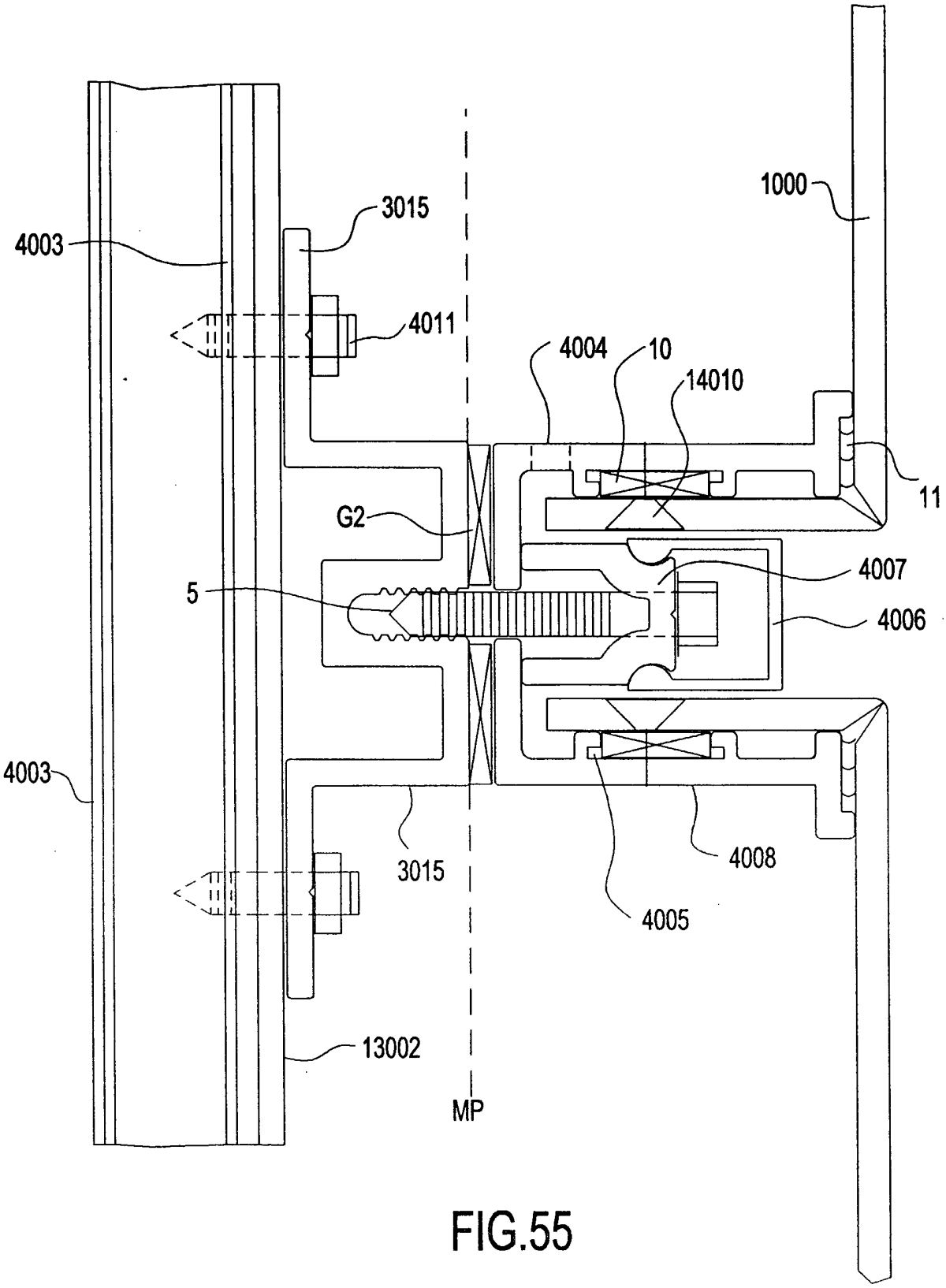

1000
3015
4003
4011
4004
10
14010
11
G2
4007
5
4006
4003
3015
4008
4005
13002
MP

FIG.55

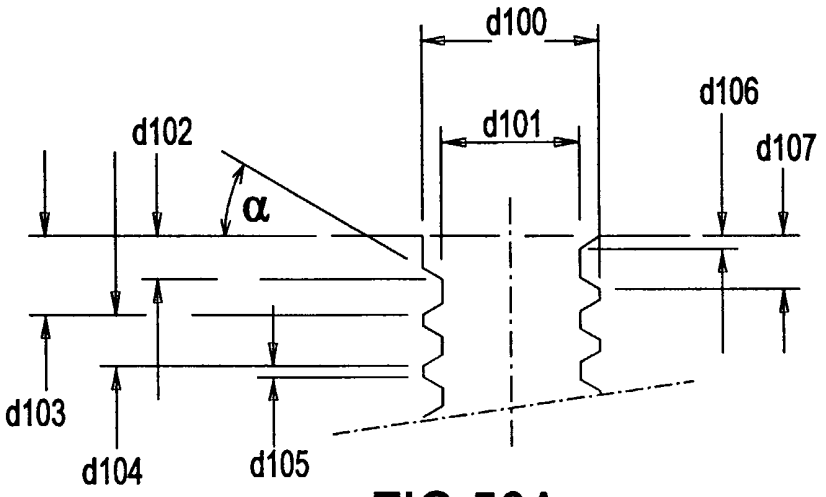


FIG.56A

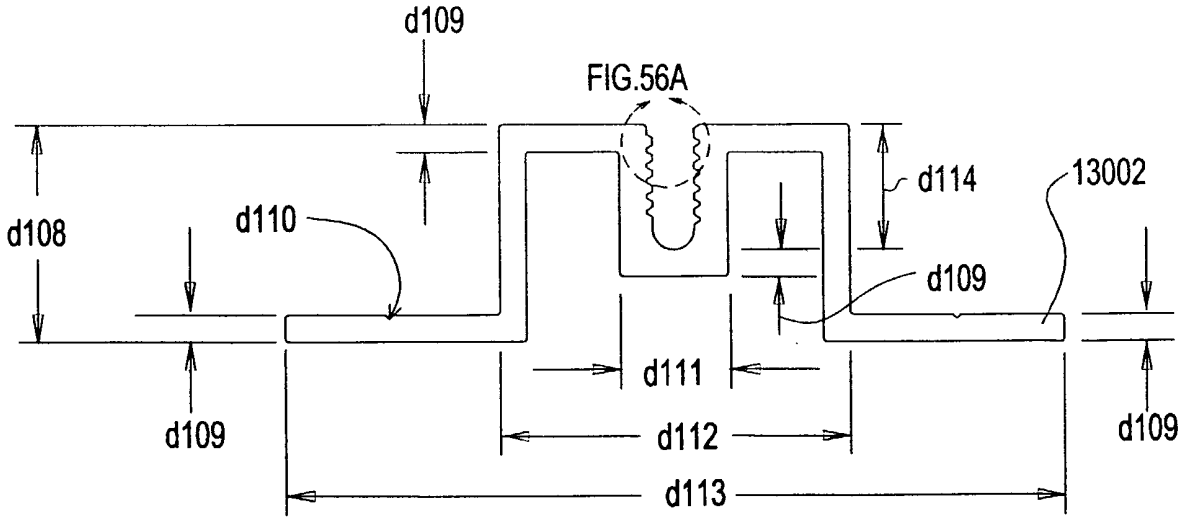


FIG.56

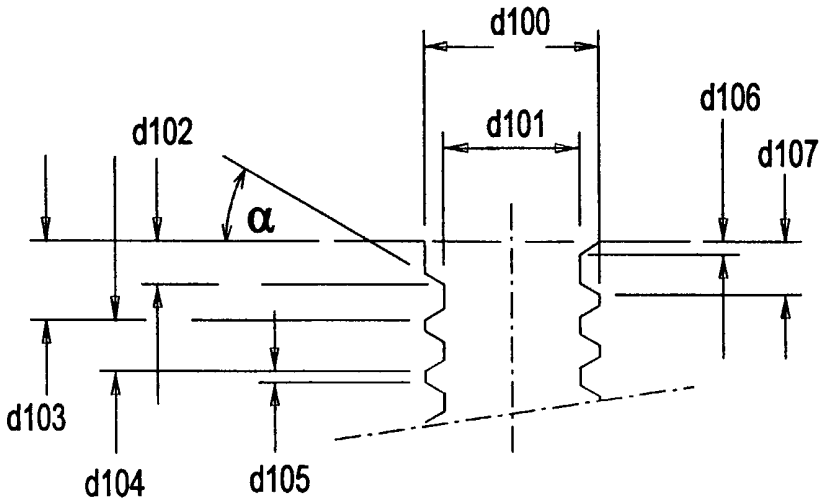


FIG.57A

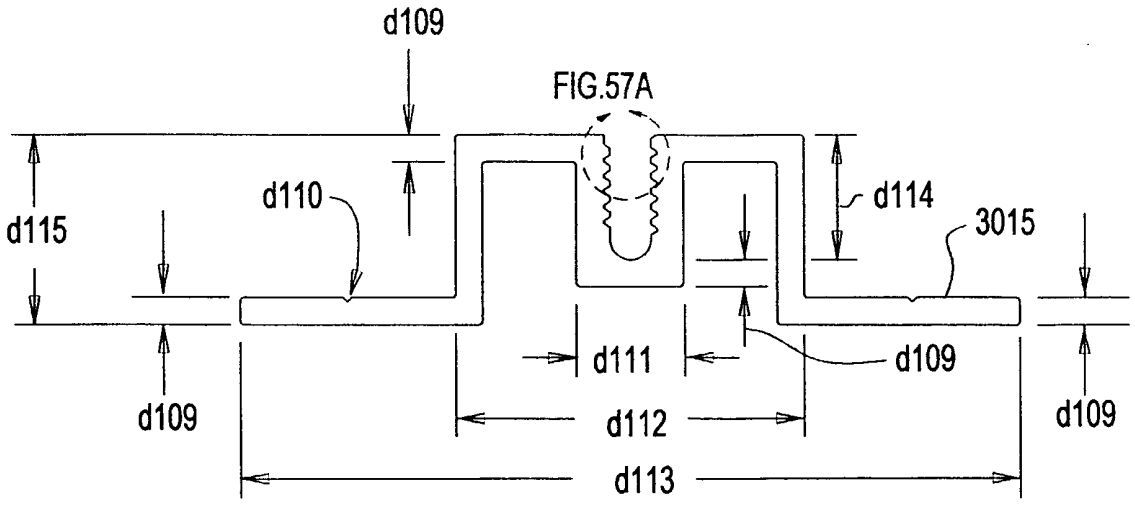


FIG.57

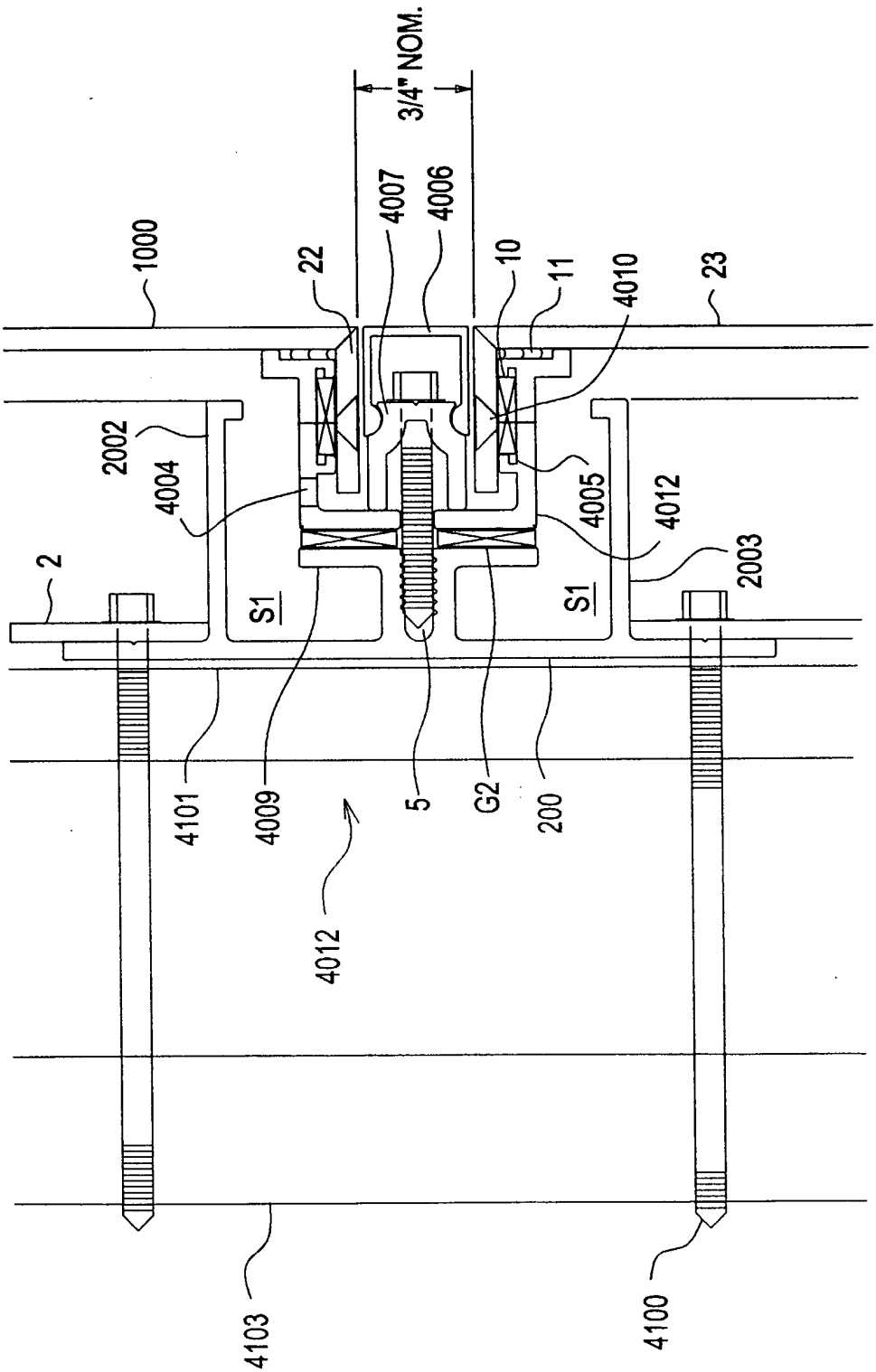

3/4" NOM.
1000
22
4007
4006
10
11
4010
23
2002
4004
4005
4012
2003
2
S1
S1
4101
4009
5
G2
200
4012
4103
4100

FIG.58

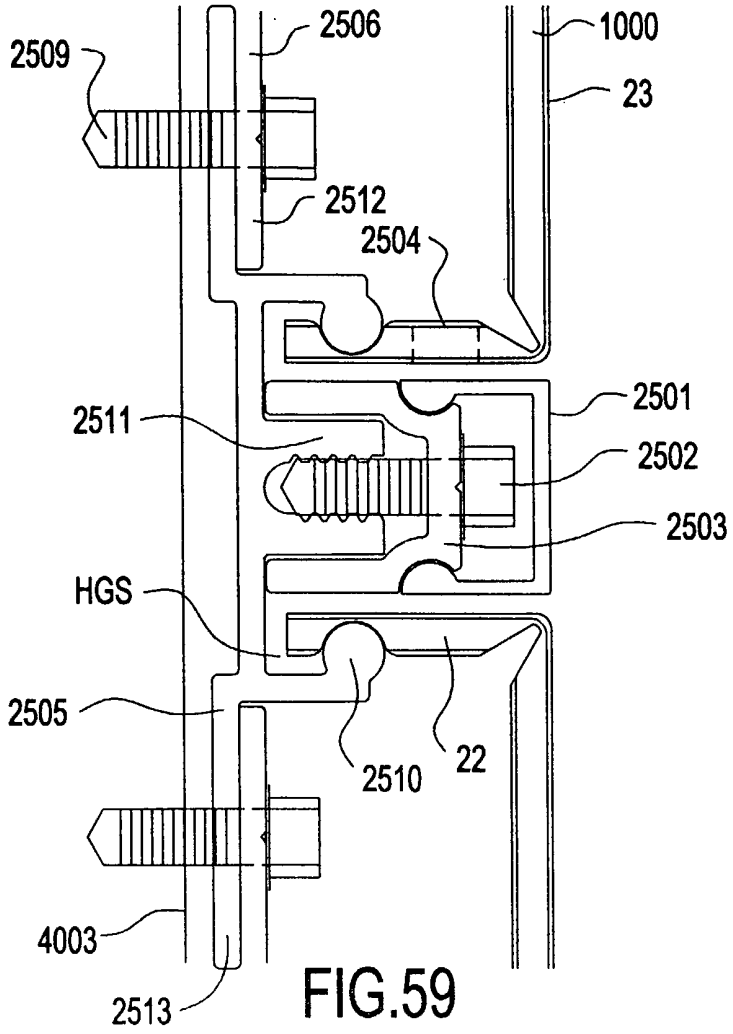

2509
2506
1000
23
2512
2504
2501
2511
2502
2503
HGS
2505
2510
22
4003
2513

FIG.59

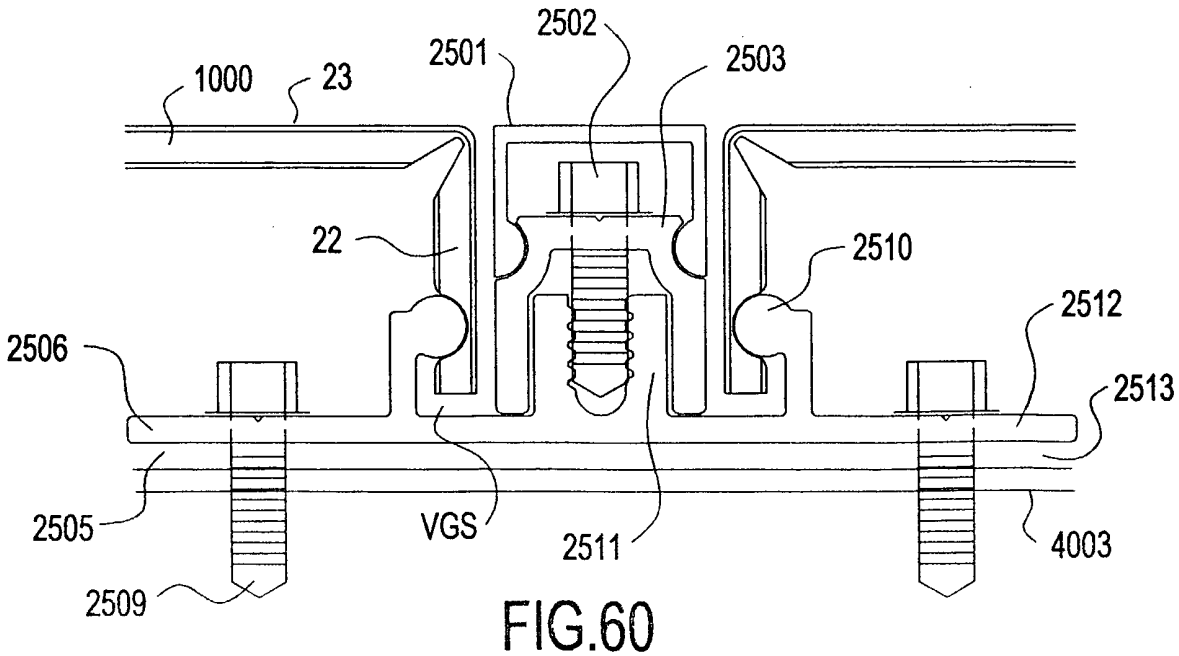

2502
2501
2503
1000
23
22
2510
2512
2506
2513
2505
VGS
2511
4003
2509

FIG.60

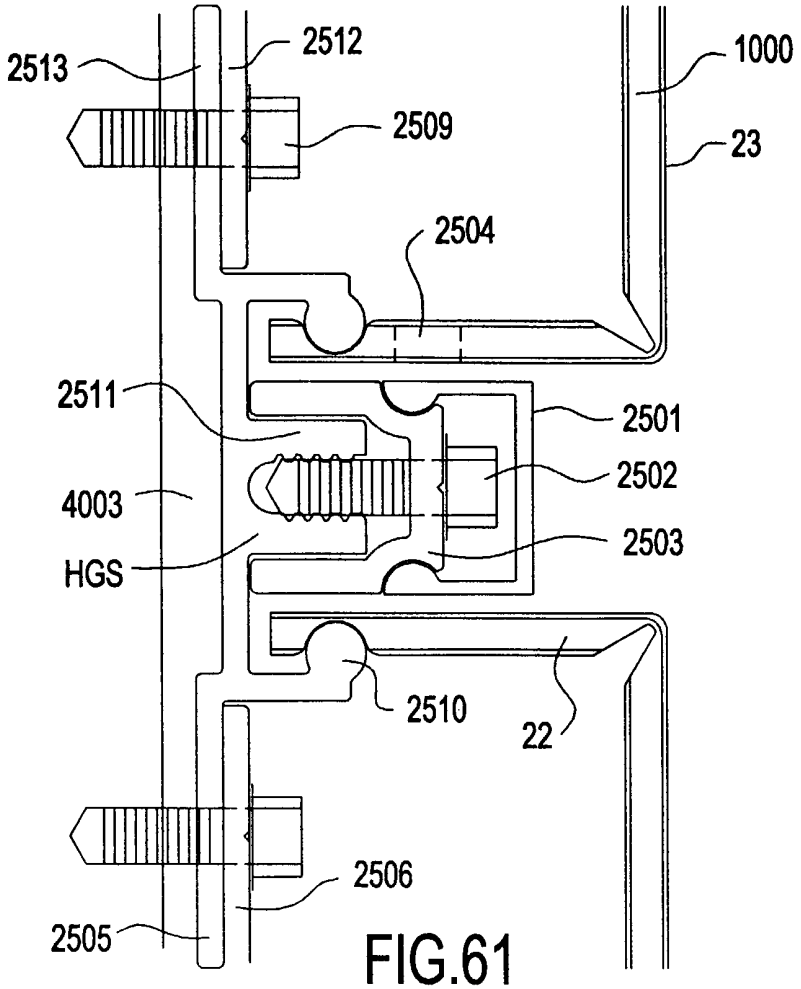

2513
2512
1000
2509
23
2504
2511
2501
2502
4003
2503
HGS
2510
22
2506
2505

FIG.61

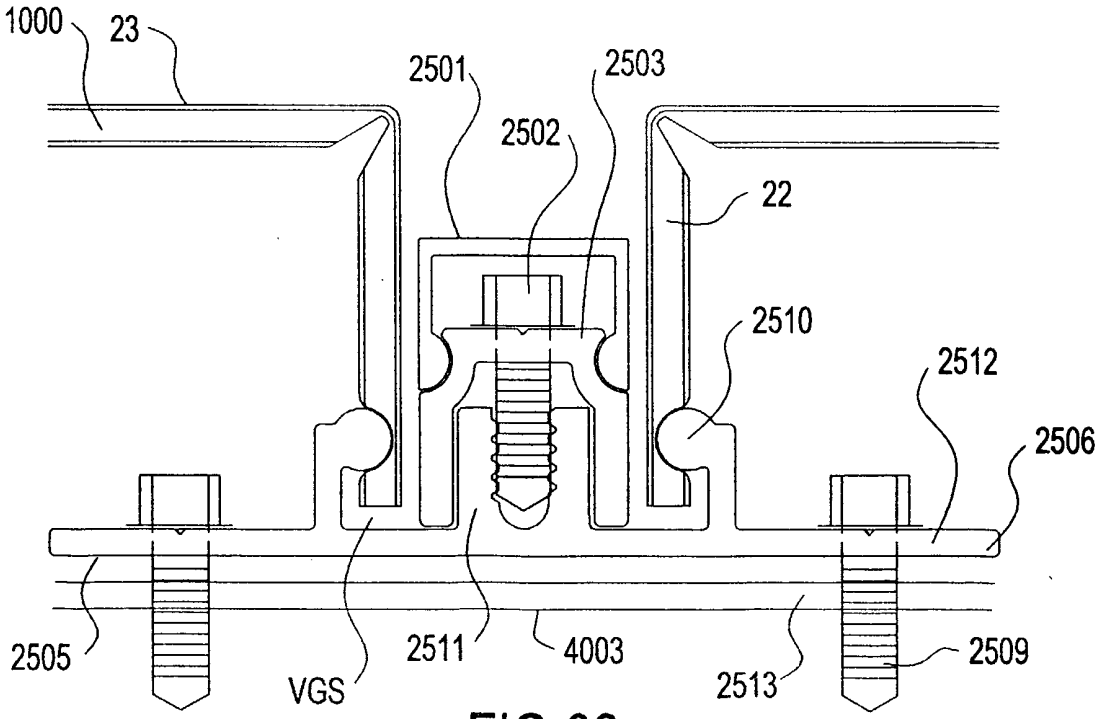

1000
23
2501
2503
2502
22
2510
2512
2506
2505
VGS
2511
4003
2513
2509

FIG.62

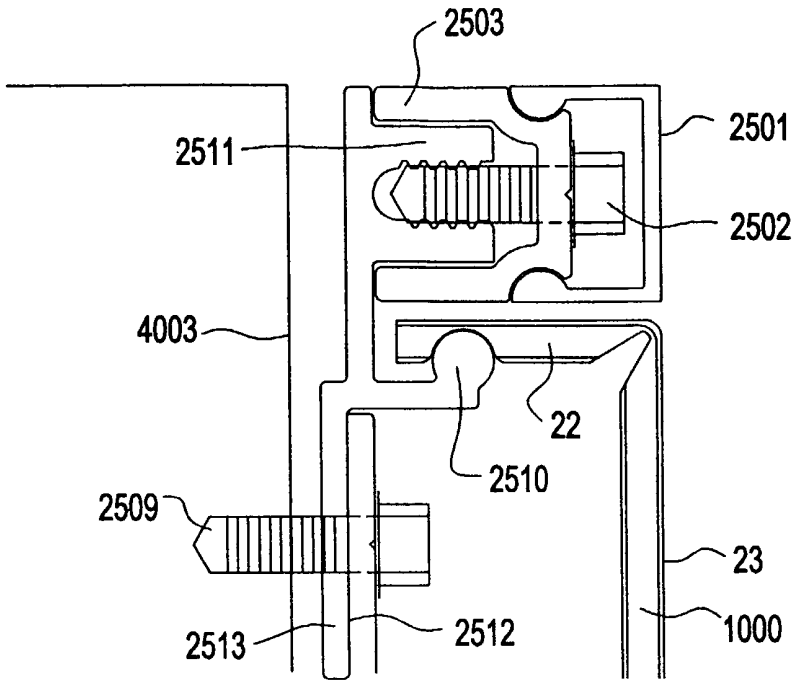

2503
2501
2511
2502
4003
22
2510
2509
23
2513
2512
1000

FIG.63

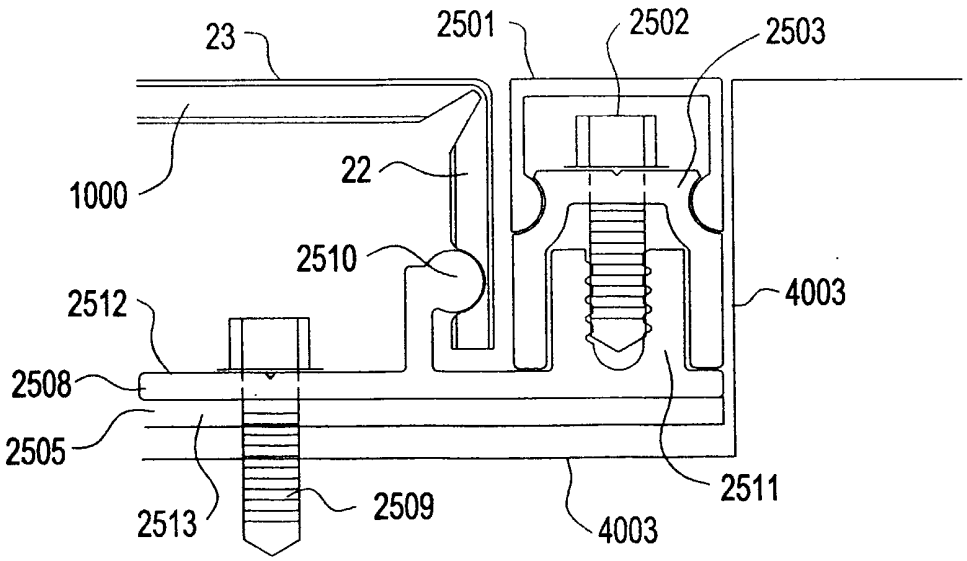

23
2501
2502
2503
1000
22
2510
4003
2512
2508
2505
2511
2513
2509
4003

FIG.64

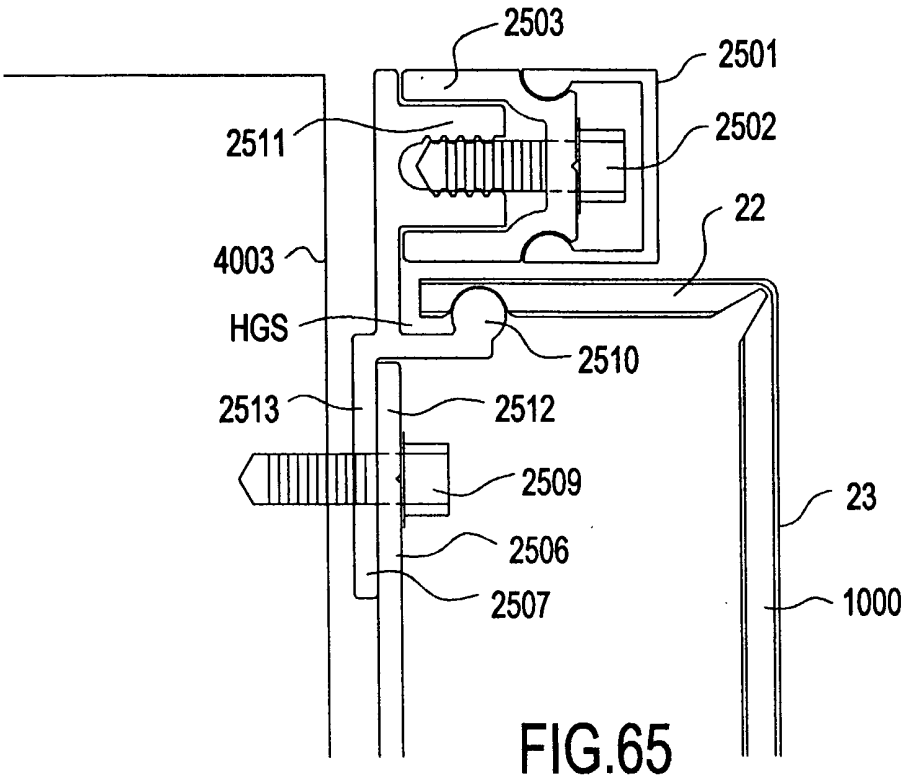

2503
2501
2511
2502
22
4003
HGS
2510
2513
2512
2509
23
2506
2507
1000

FIG.65

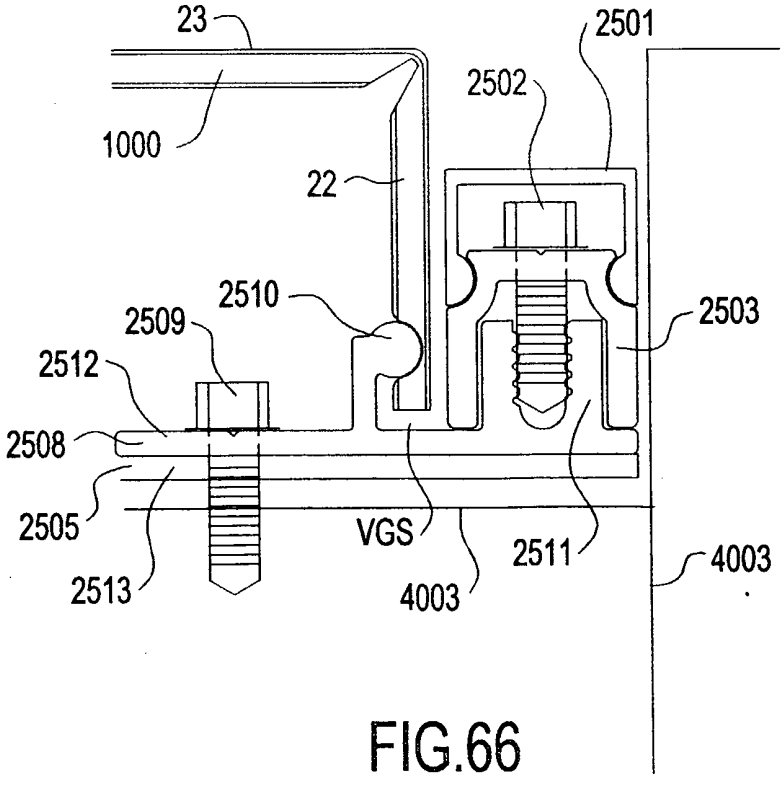

23
2501
2502
1000
22
2510
2509
2503
2512
2508
2505
VGS
2511
4003
2513
4003

FIG.66

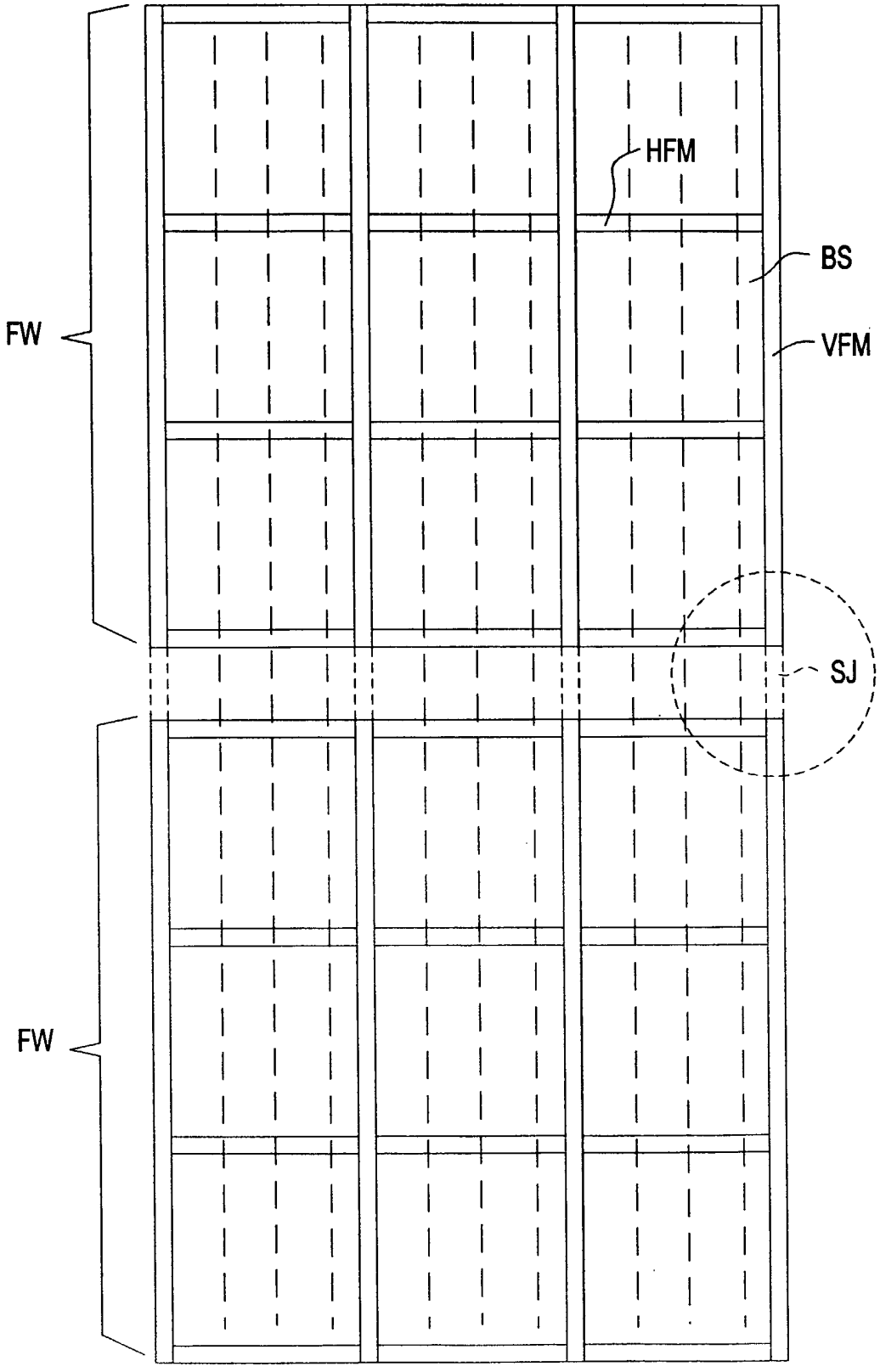


FIG.67

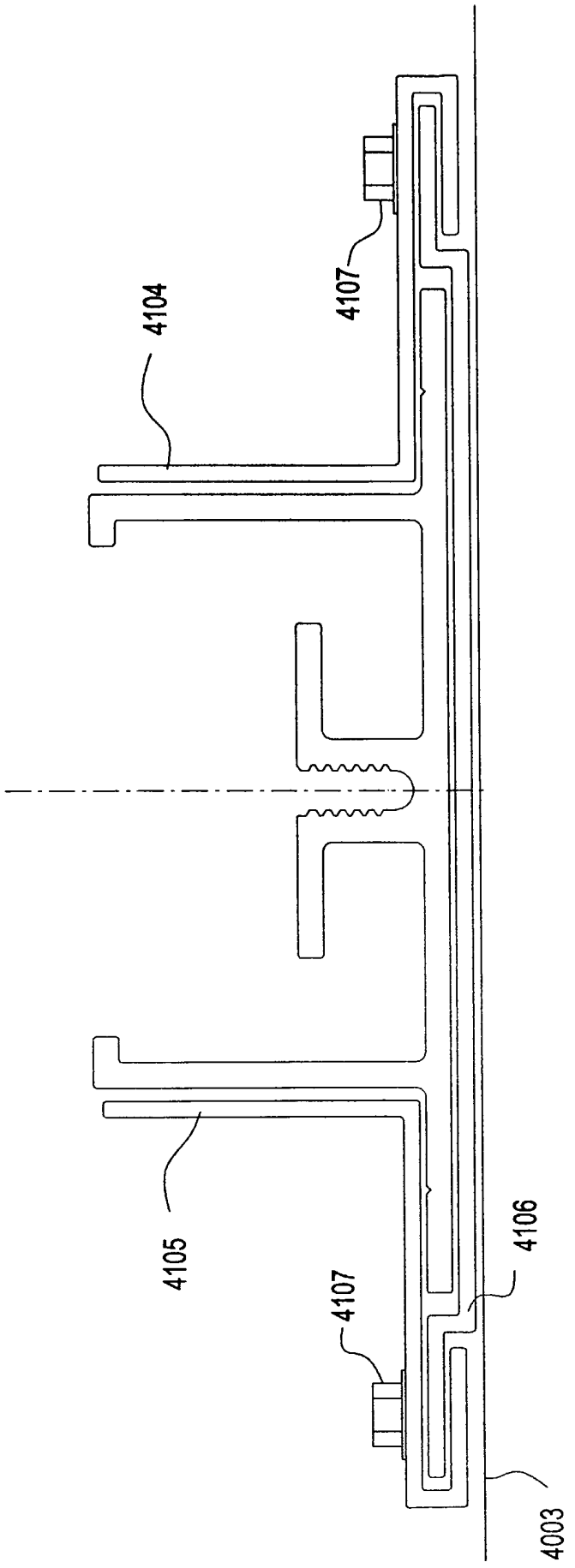


FIG.68

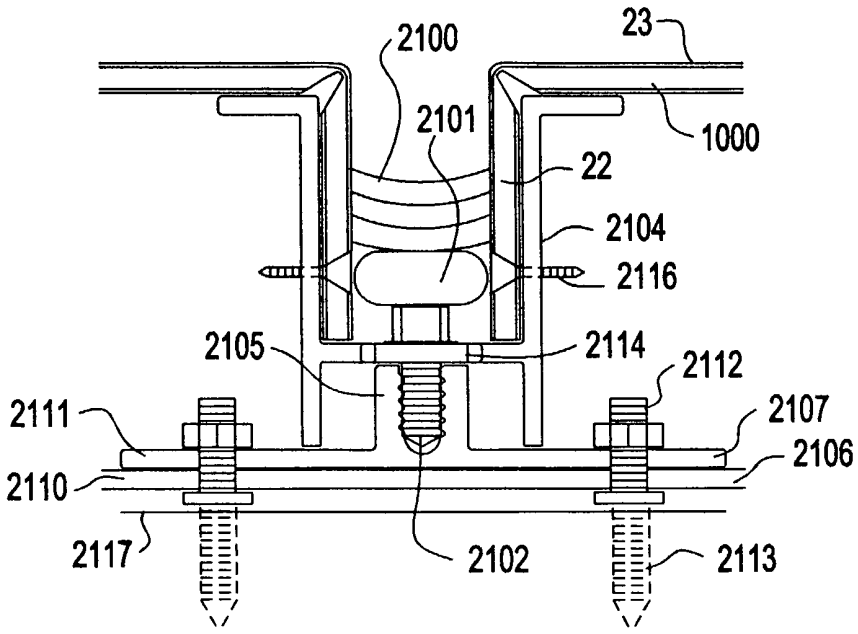

2100
23
2101
1000
22
2104
2116
2105
2114
2112
2111
2107
2106
2110
2117
2102
2113

FIG.69

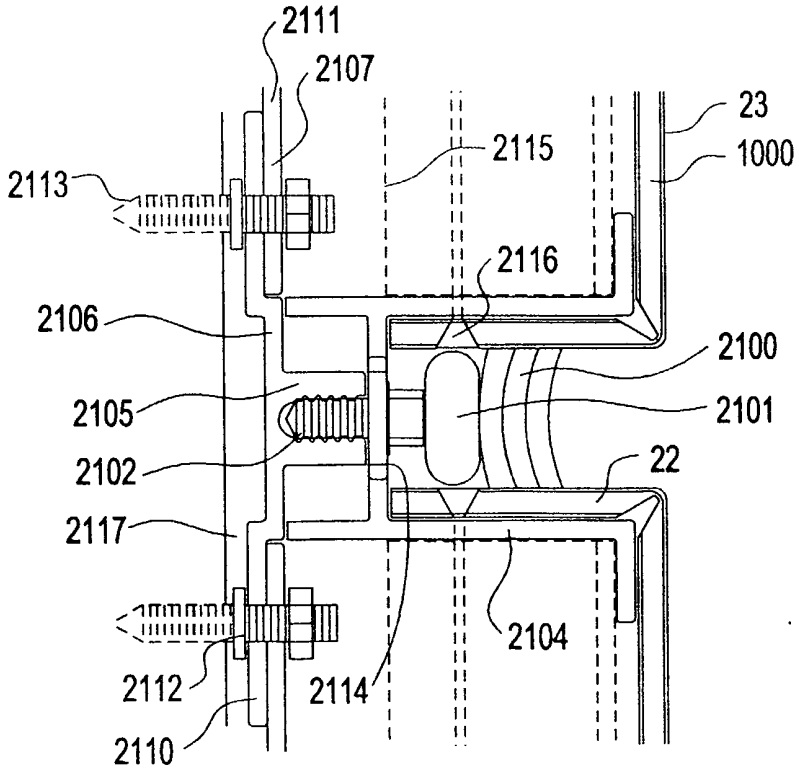

2111
2107
23
2115
1000
2113
2116
2106
2100
2105
2101
2102
22
2117
2104
2112
2114
2110

FIG.70

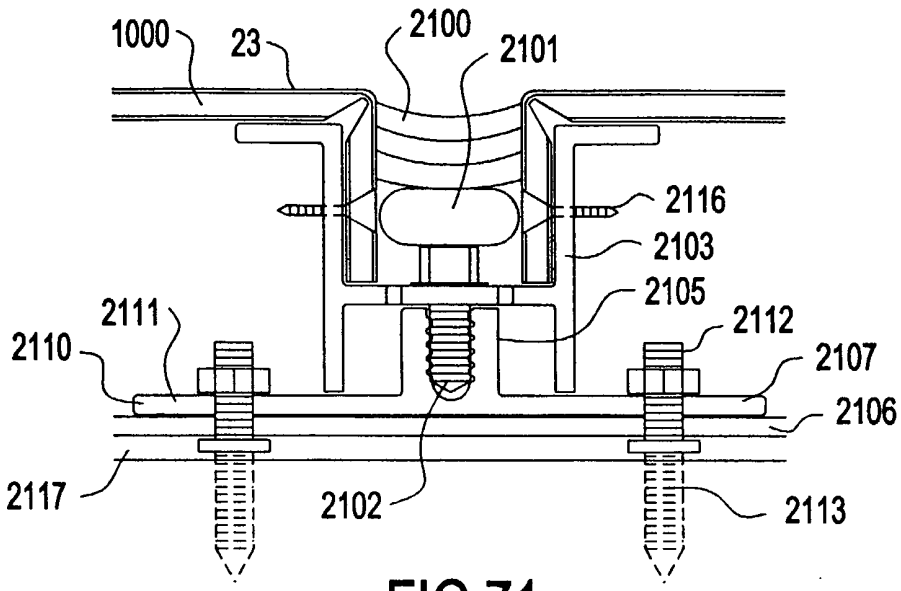

1000
23
2100
2101
2116
2103
2105
2111
2112
2110
2107
2106
2117
2102
2113

FIG.71

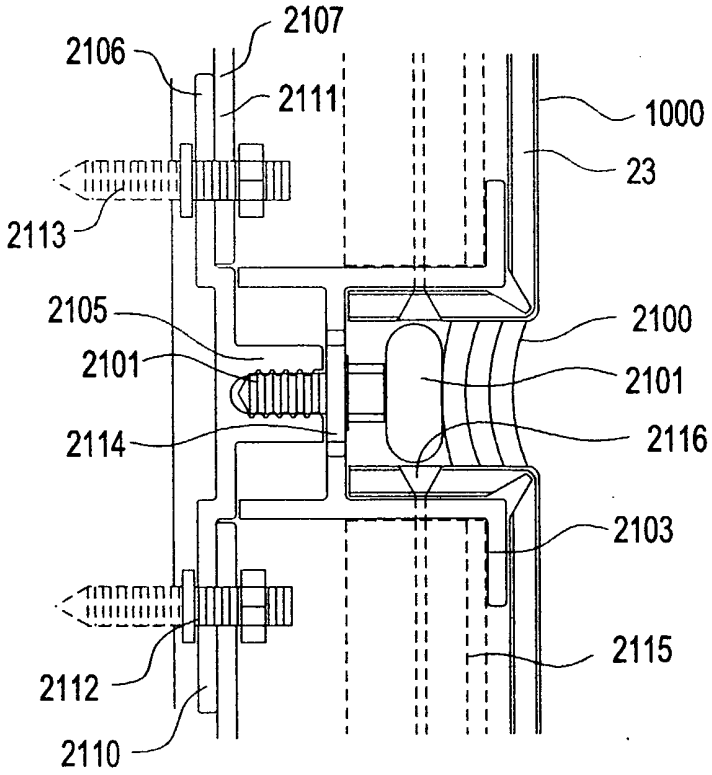

2107
2106
2111
1000
23
2113
2105
2100
2101
2101
2114
2116
2103
2115
2112
2110

FIG.72

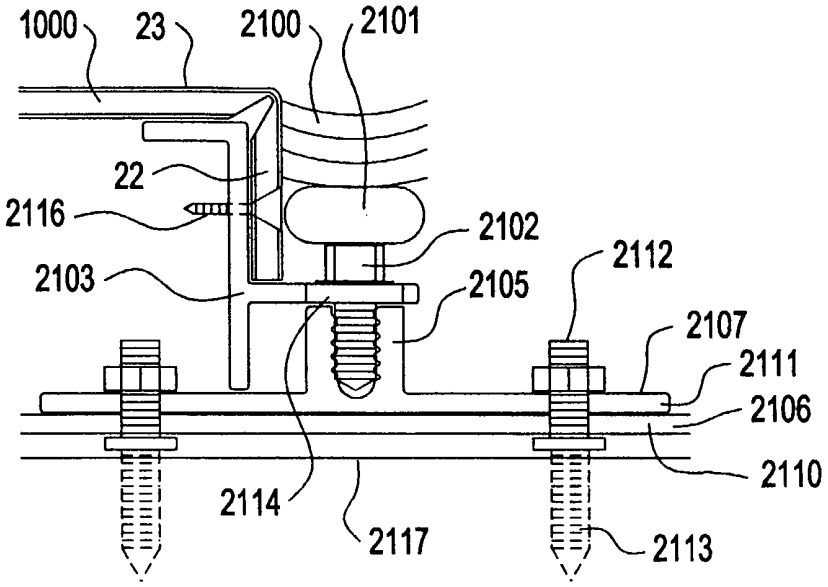

1000
23
2100
2101
22
2116
2102
2112
2103
2105
2107
2111
2106
2110
2114
2117
2113

FIG.73

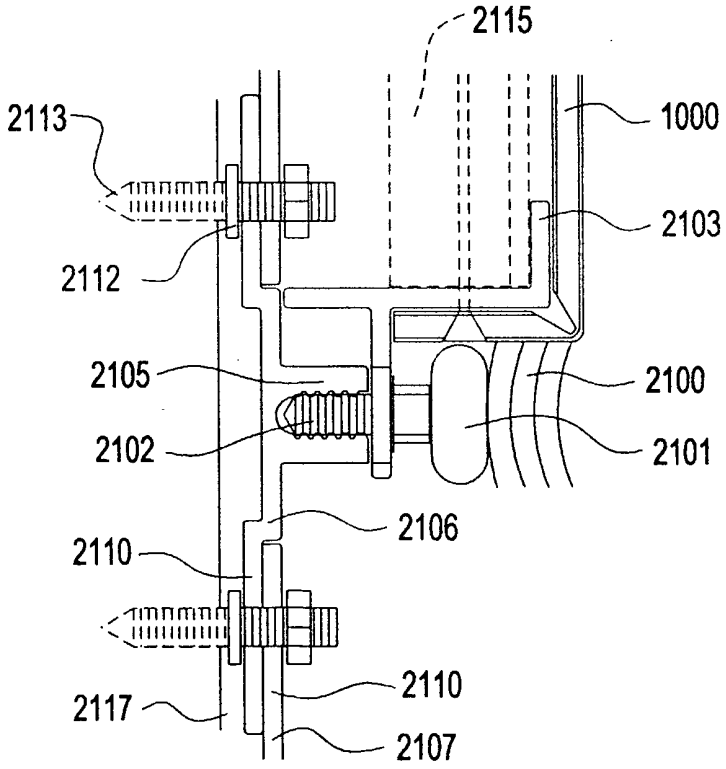

2115
2113
1000
2103
2112
2105
2100
2102
2101
2106
2110
2110
2117
2107

FIG.74

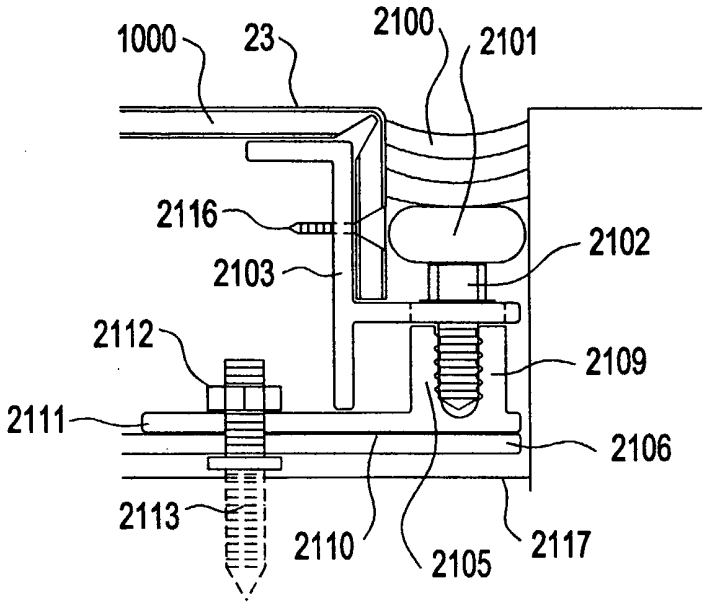

1000
23
2100
2101
2116
2102
2103
2112
2109
2111
2106
2113
2110
2105
2117

FIG.75

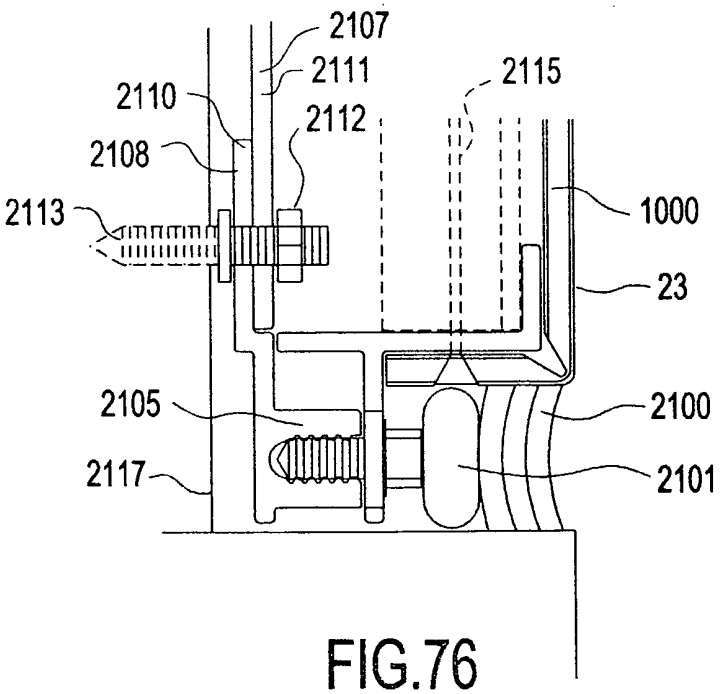

2107
2111
2115
2110
2112
2108
2113
1000
23
2105
2100
2117
2101

FIG.76

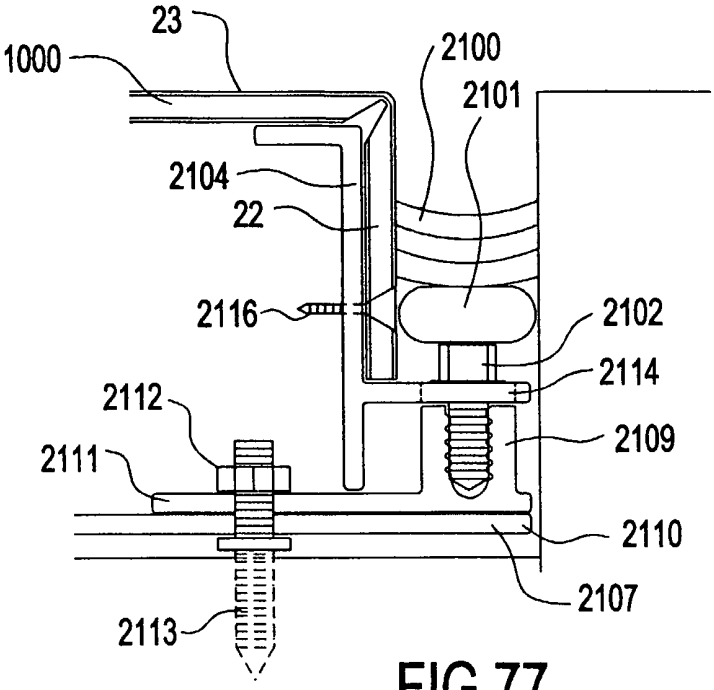

23
1000
2100
2101
2104
22
2116
2102
2114
2112
2109
2111
2110
2107
2113

FIG.77

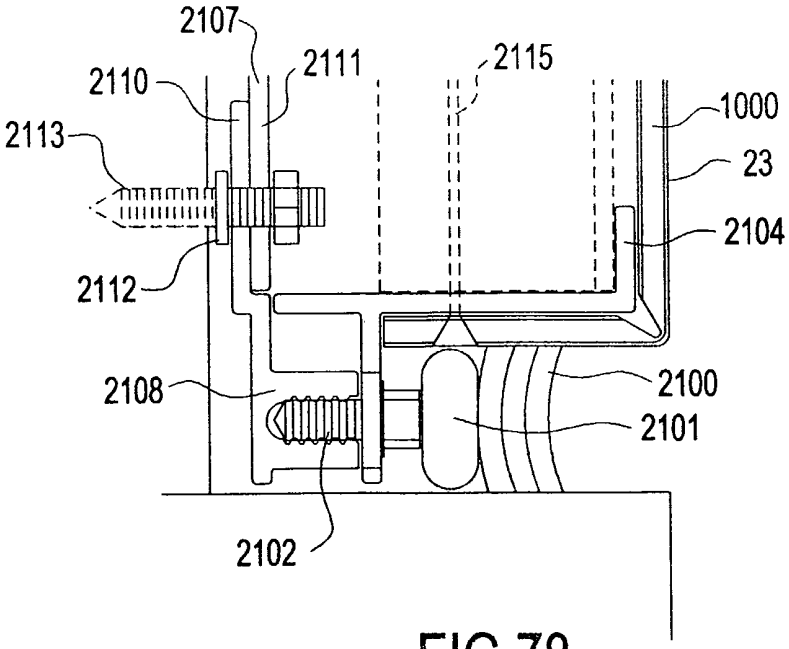

2107
2111
2115
2110
1000
2113
23
2104
2112
2108
2100
2101
2102

FIG.78

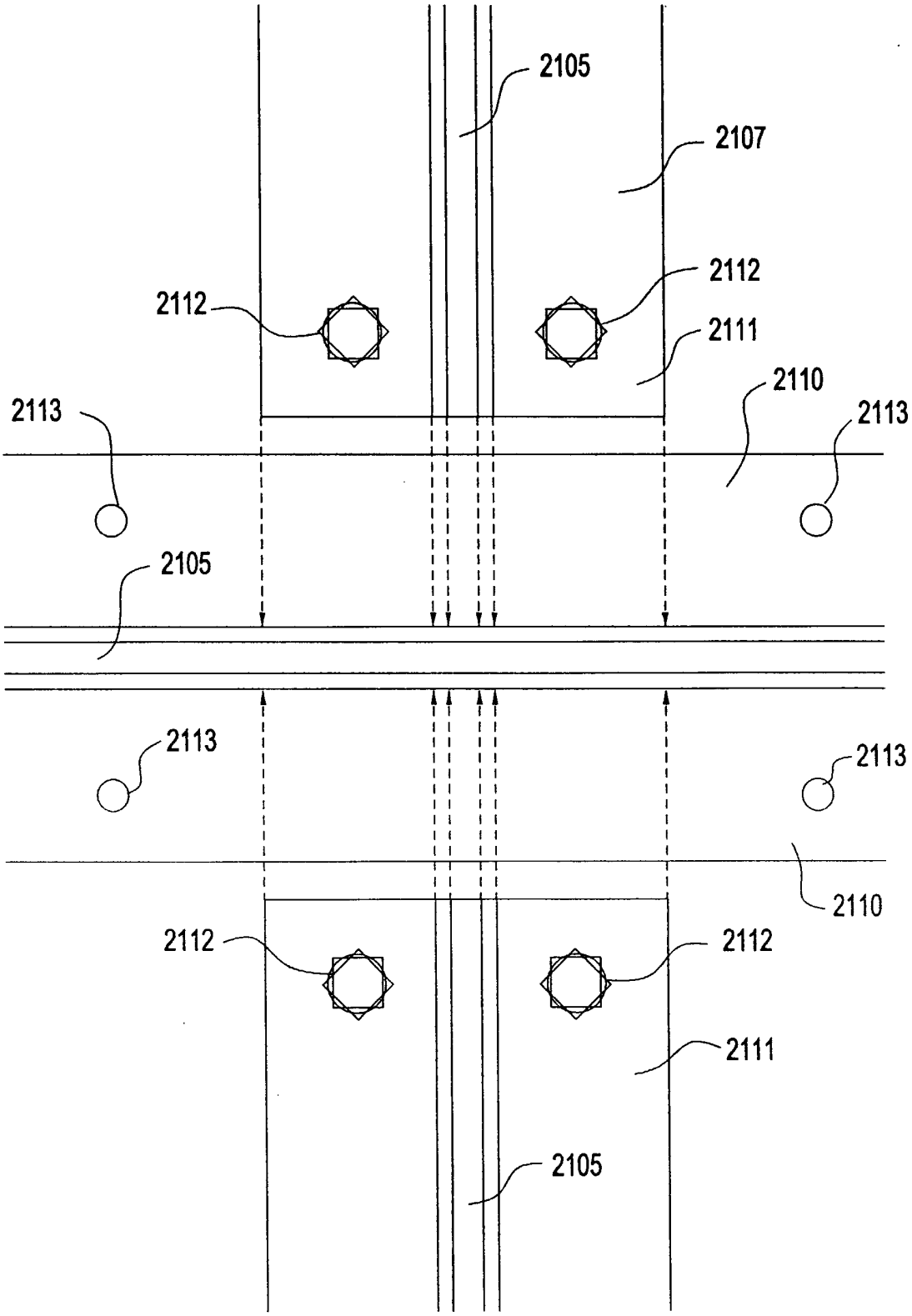

2105
2107
2112
2112
2111
2110
2113
2113
2105
2113
2113
2110
2112
2112
2111
2105

FIG.79

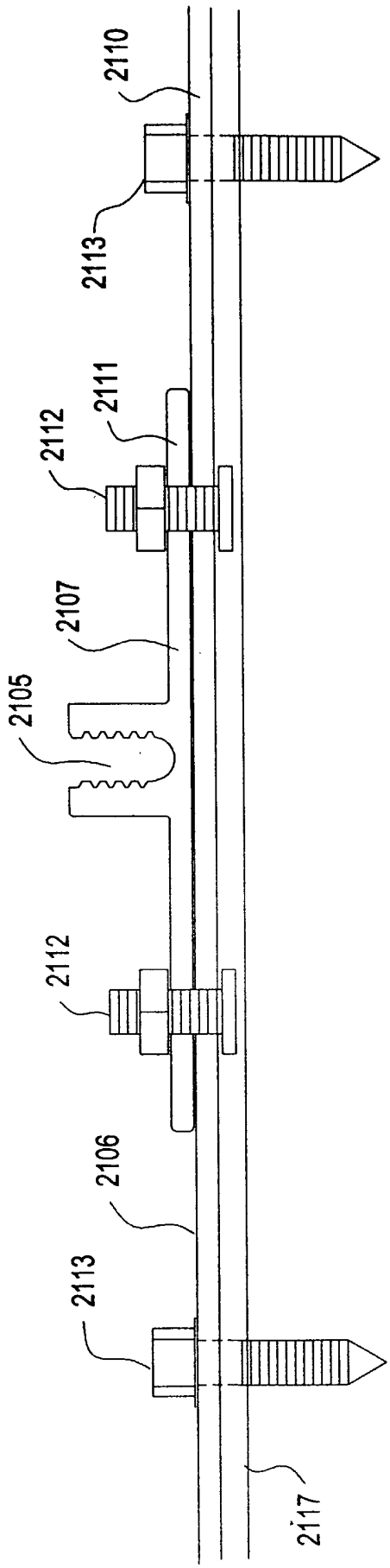


FIG.80

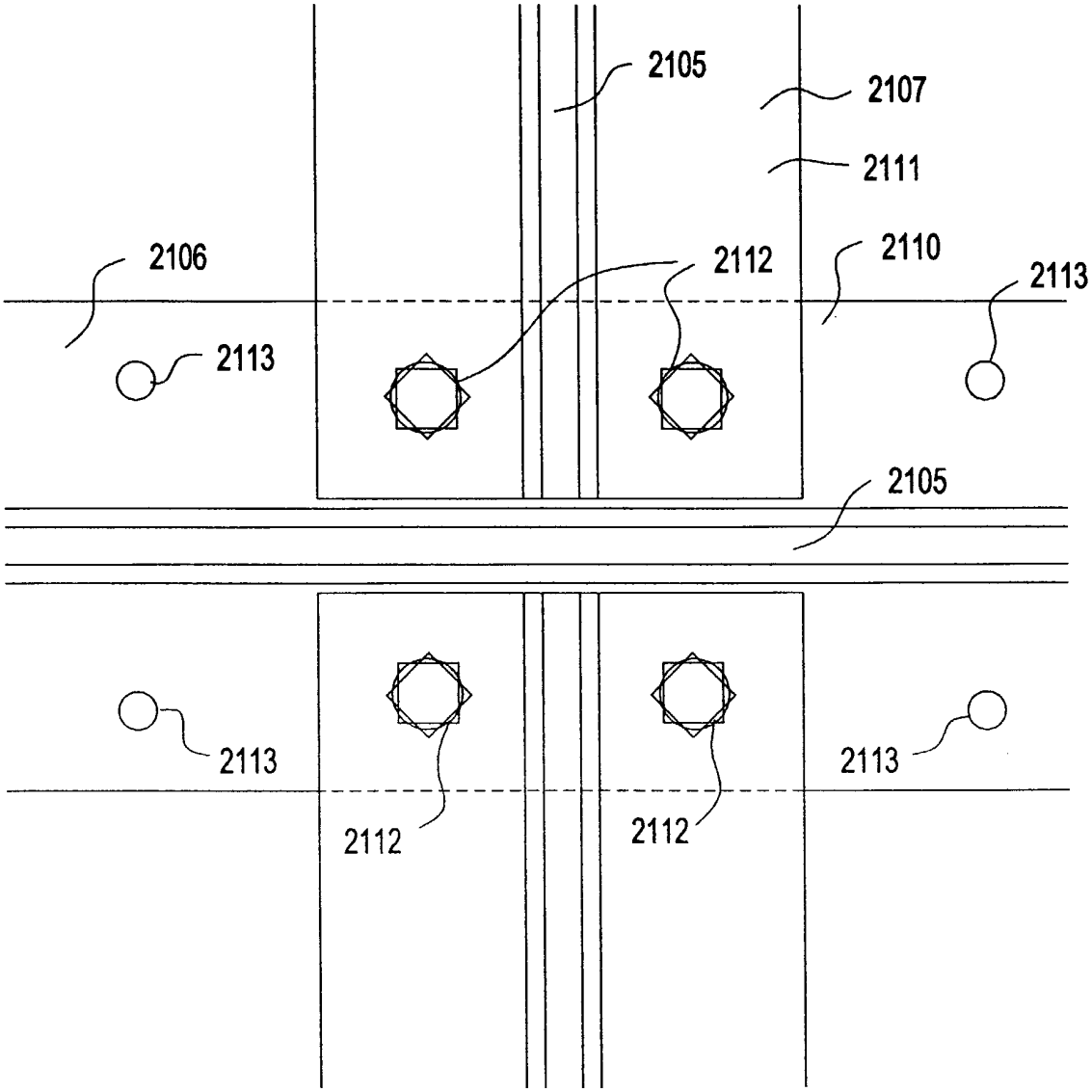

2105
2107
2111
2106
2112
2110
2113
2113
2105
2113
2113
2112
2112

FIG.81

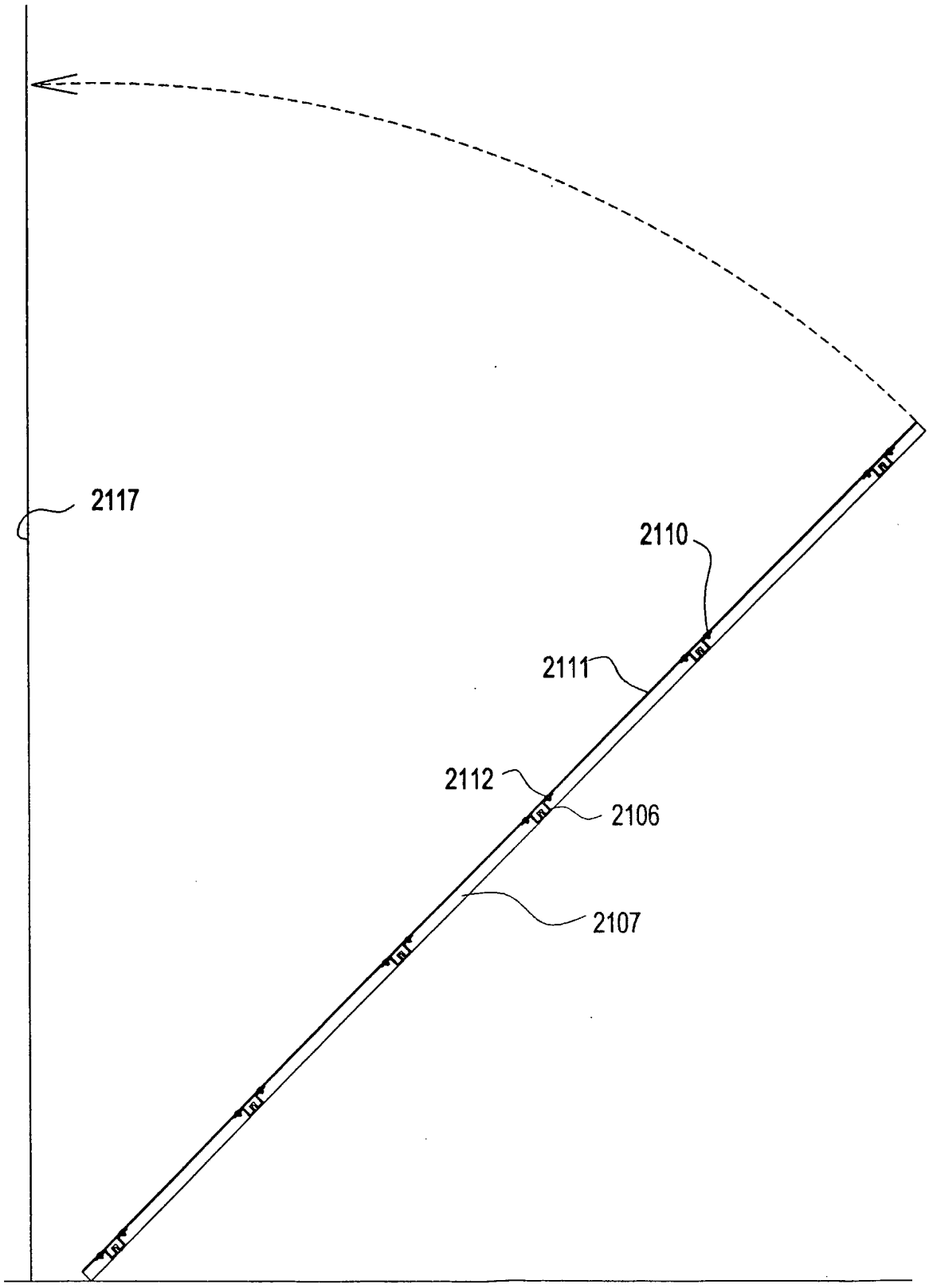


FIG.82

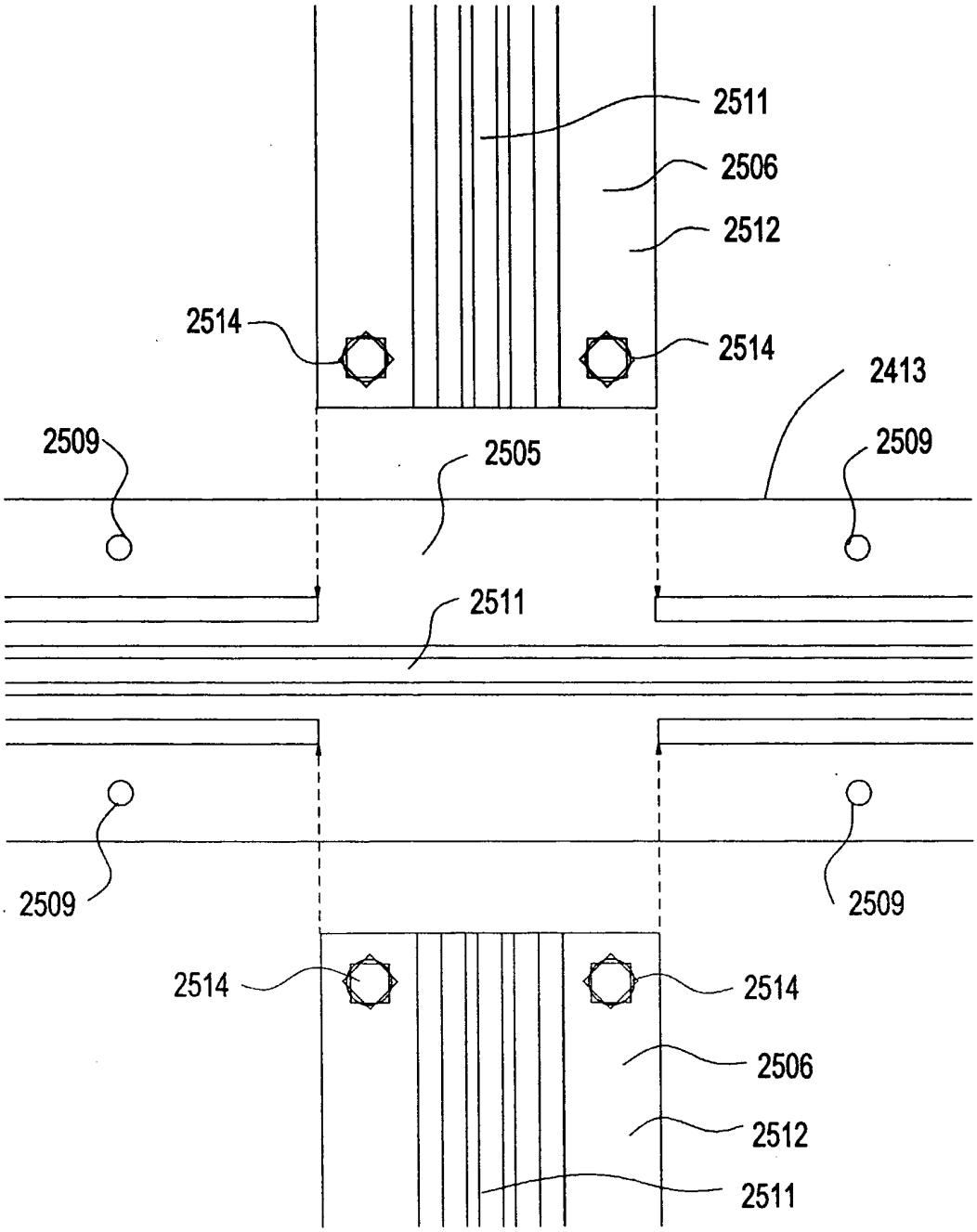

2511
2506
2512
2514
2514
2413
2509
2505
2509
2511
2509
2509
2514
2514
2506
2512
2511

FIG.83

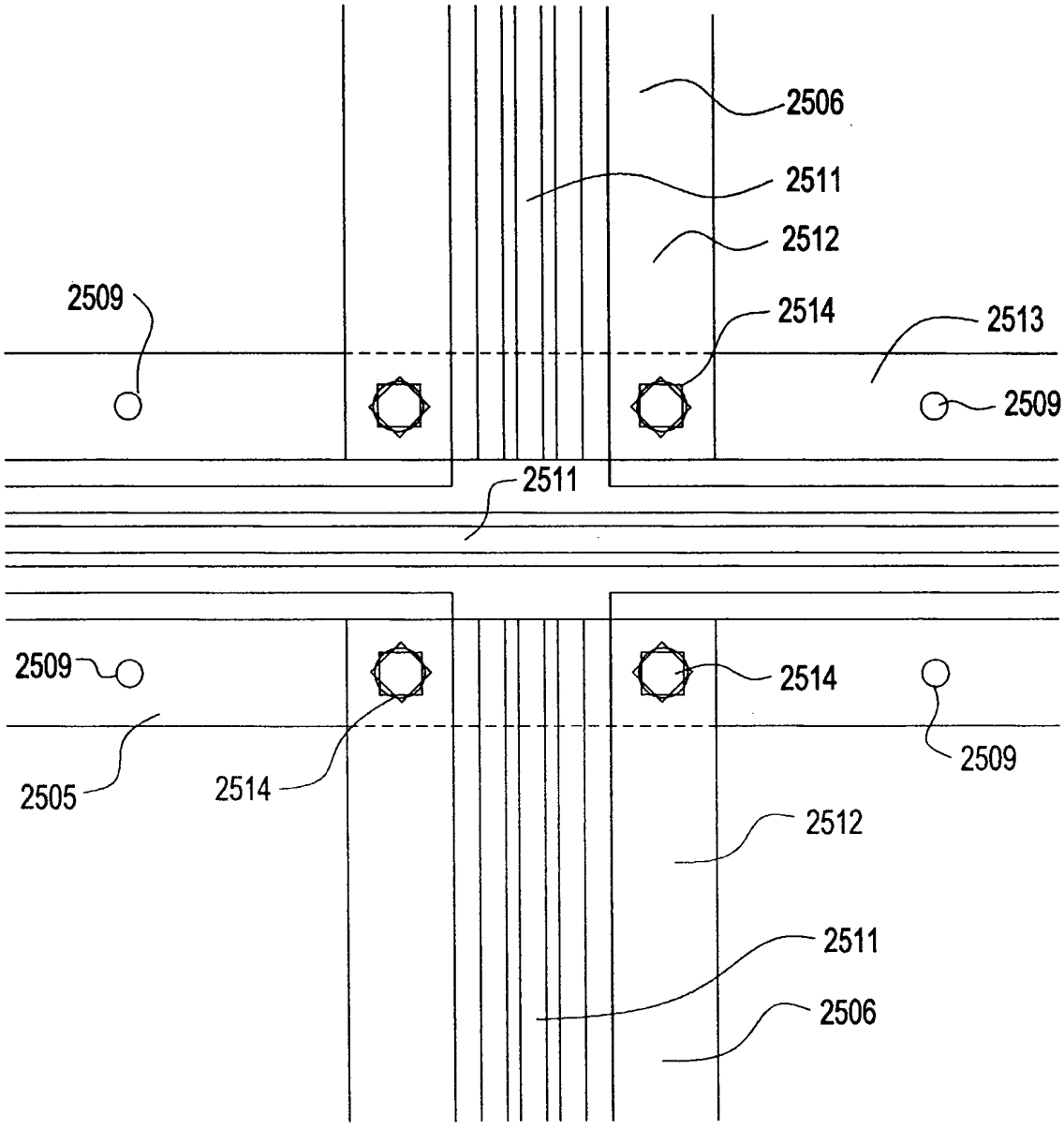

2506
2511
2512
2509
2514
2513
2509
2511
2509
2514
2509
2505
2514
2512
2511
2506

FIG.84

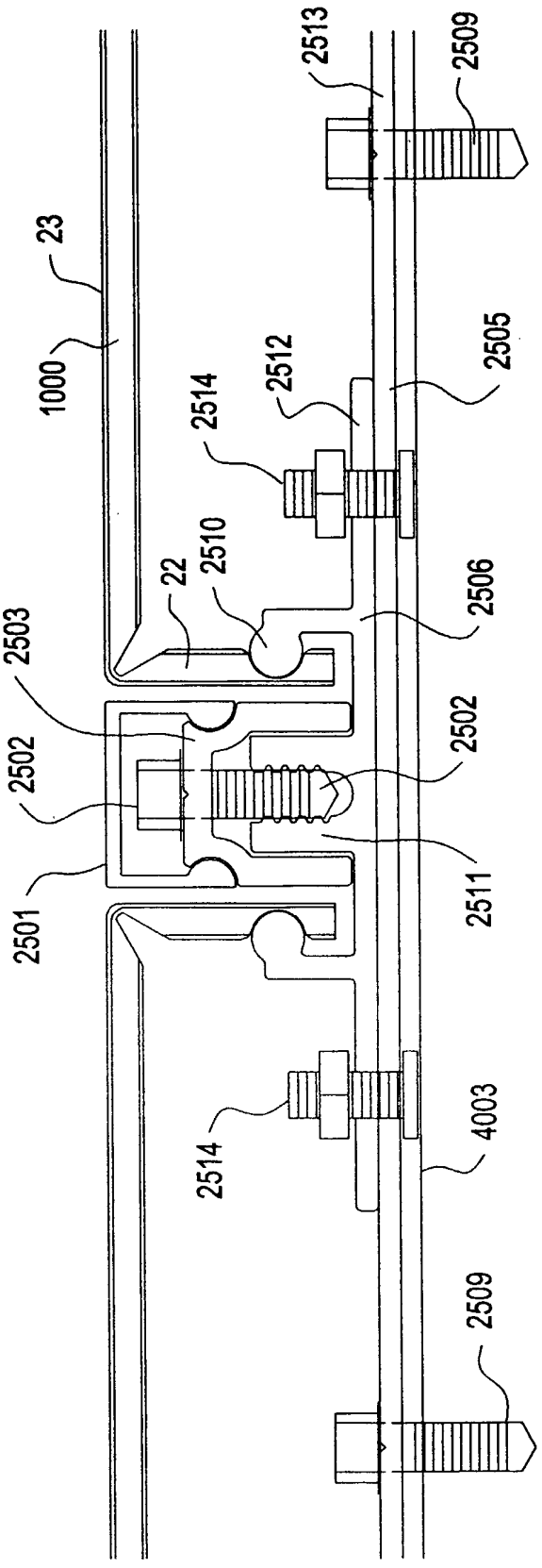

2513
2509
23
1000
2512
2505
2514
2510
22
2506
2503
2502
2502
2501
2511
2514
4003
2509

FIG.85

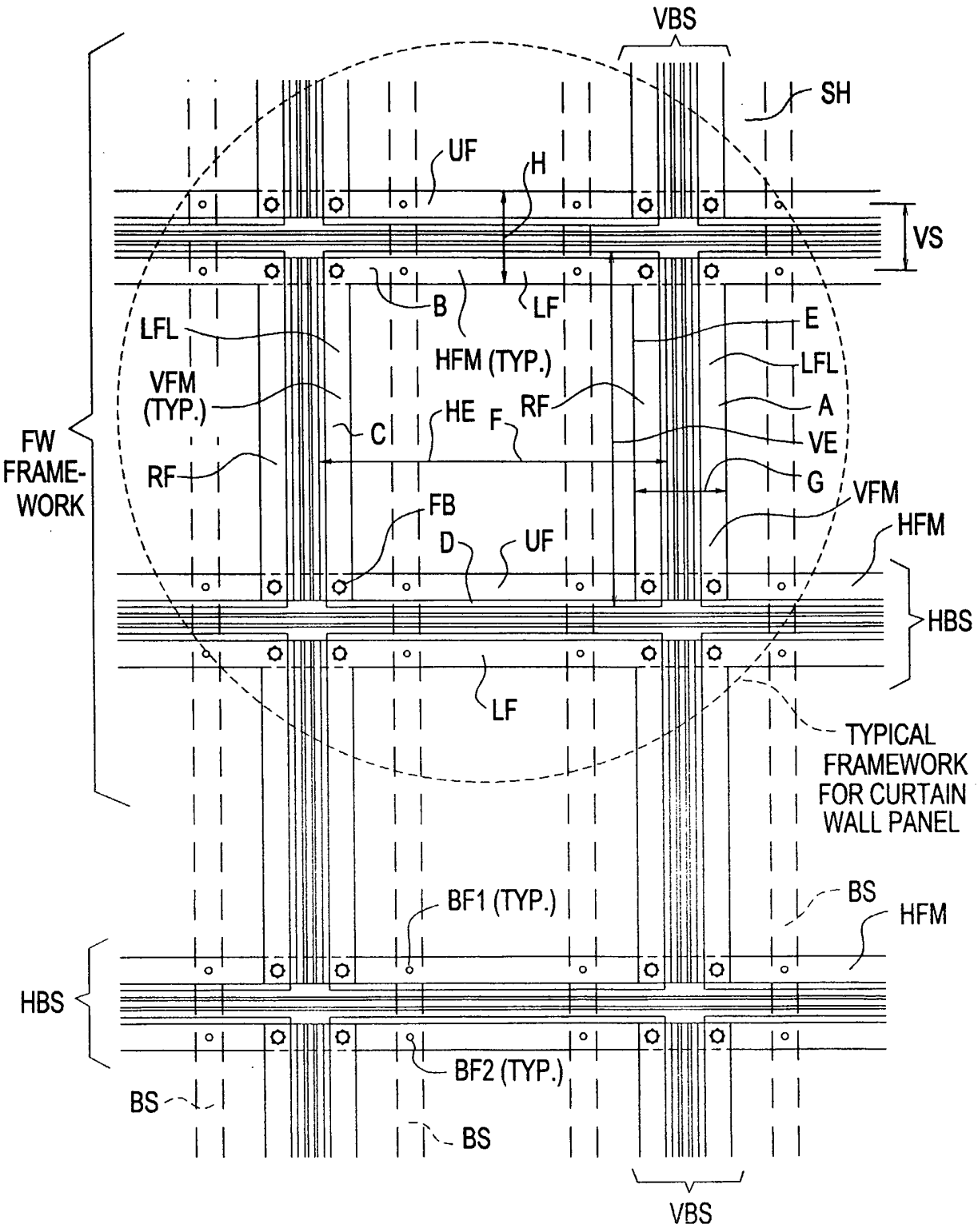

VBS
SH
UF
H
VS
B
LF
LFL
E
HFM (TYP.)
LFL
VFM
(TYP.)
HE
F
RF
A
C
VE
FW
FRAME-
WORK
RF
G
VFM
FB
HFM
D
UF
HBS
LF
TYPICAL
FRAMEWORK
FOR CURTAIN
WALL PANEL
BF1 (TYP.)
BS
HFM
HBS
BF2 (TYP.)
BS
BS
VBS

FIG.86

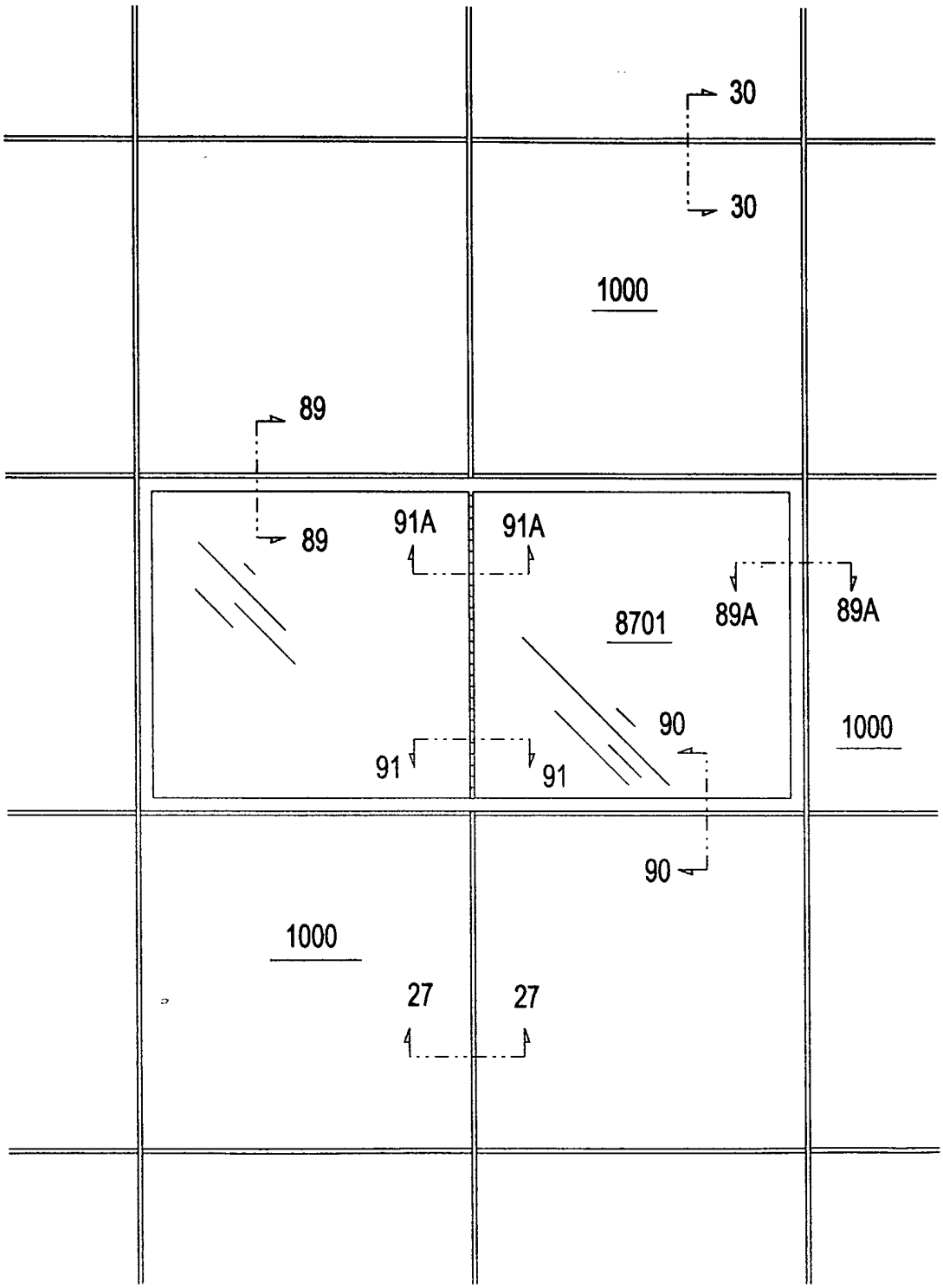


FIG.87

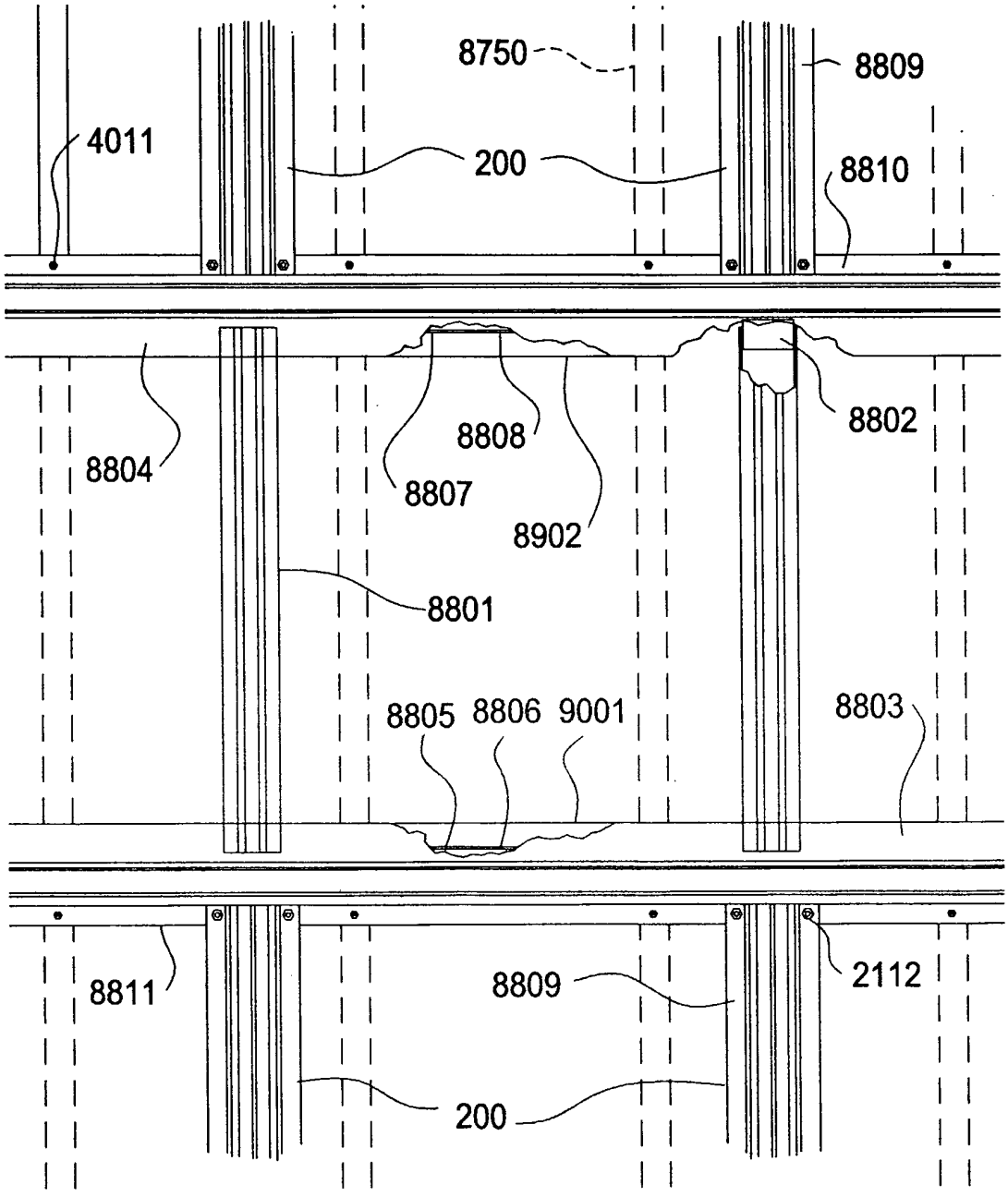

8750
8809
4011
200
8810
8804
8808
8802
8807
8902
8801
8805
8806
9001
8803
8811
8809
2112
200

FIG.88

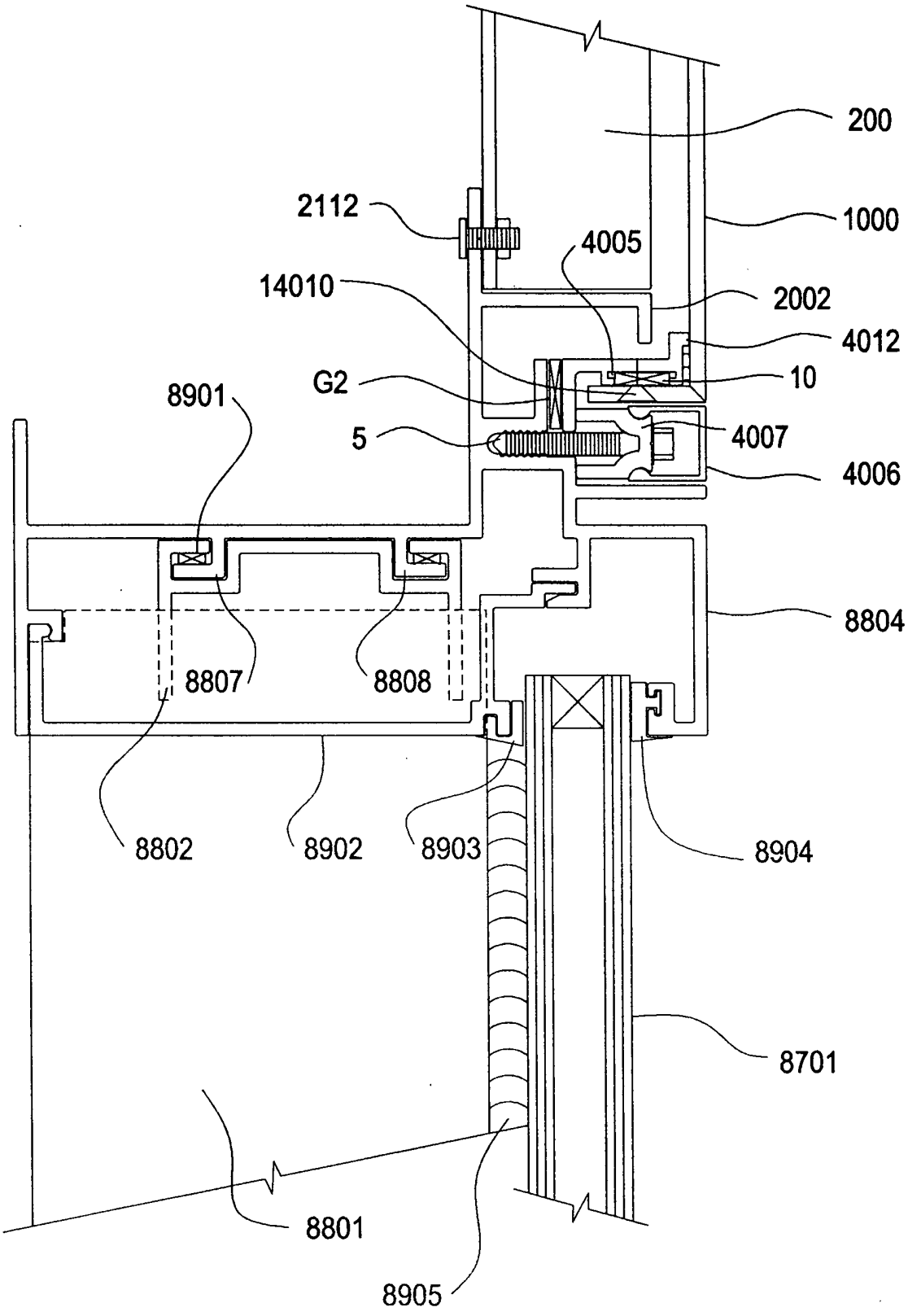

200
2112
1000
4005
14010
2002
4012
G2
10
8901
5
4007
4006
8804
8807
8808
8802
8902
8903
8904
8701
8801
8905

FIG.89

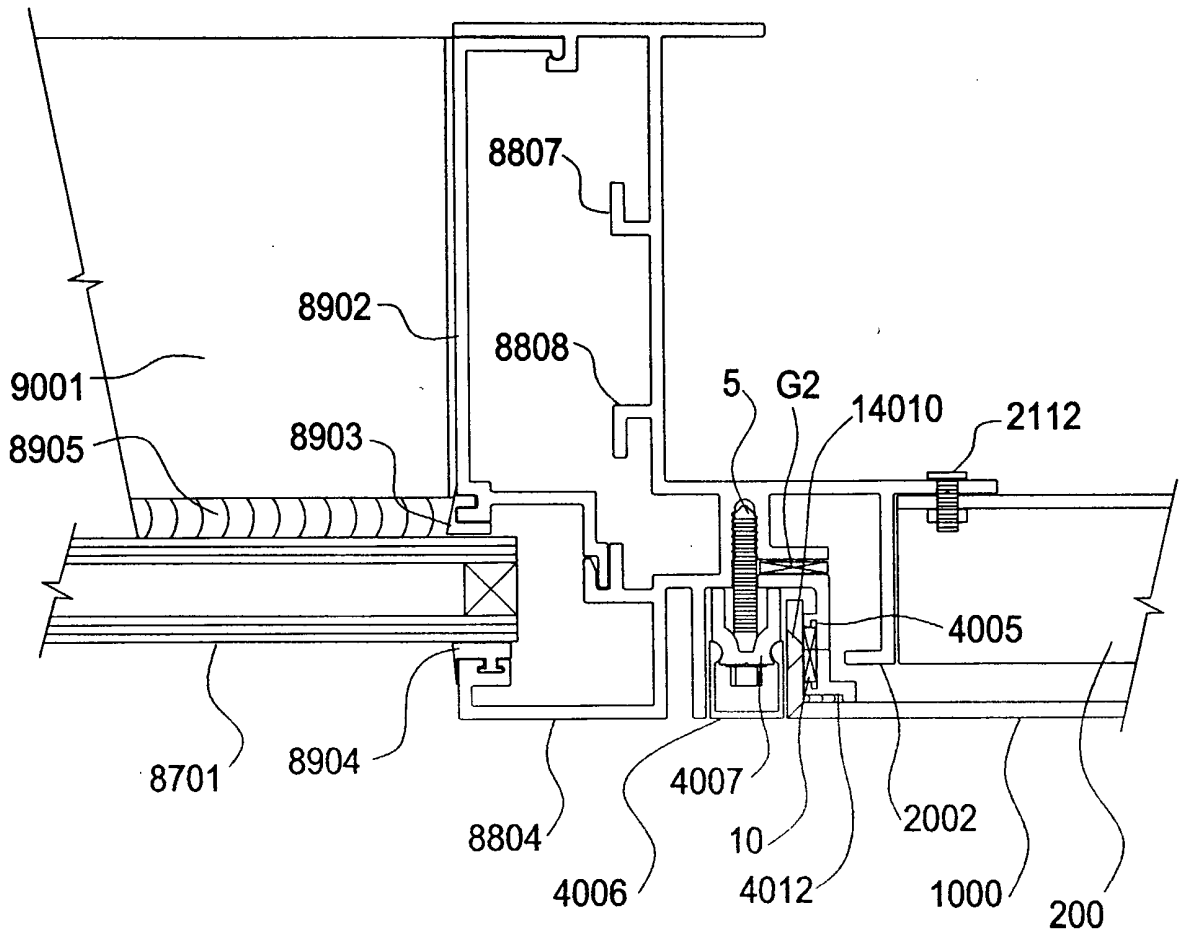

8807
8902
8808
9001
8905
8903
5
G2
14010
2112
4005
8701
8904
8804
4007
10
2002
4006
4012
1000
200

FIG.89A

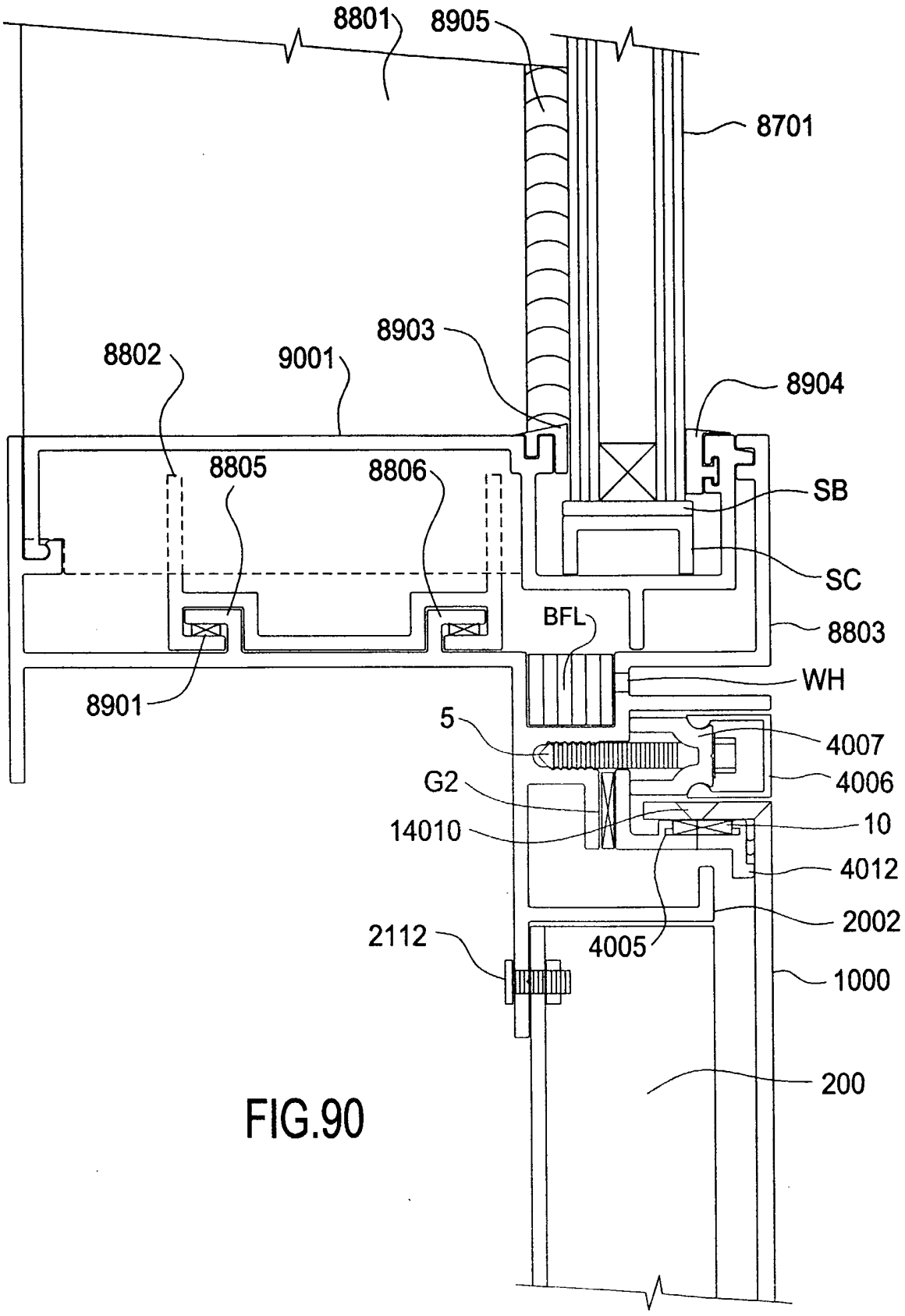
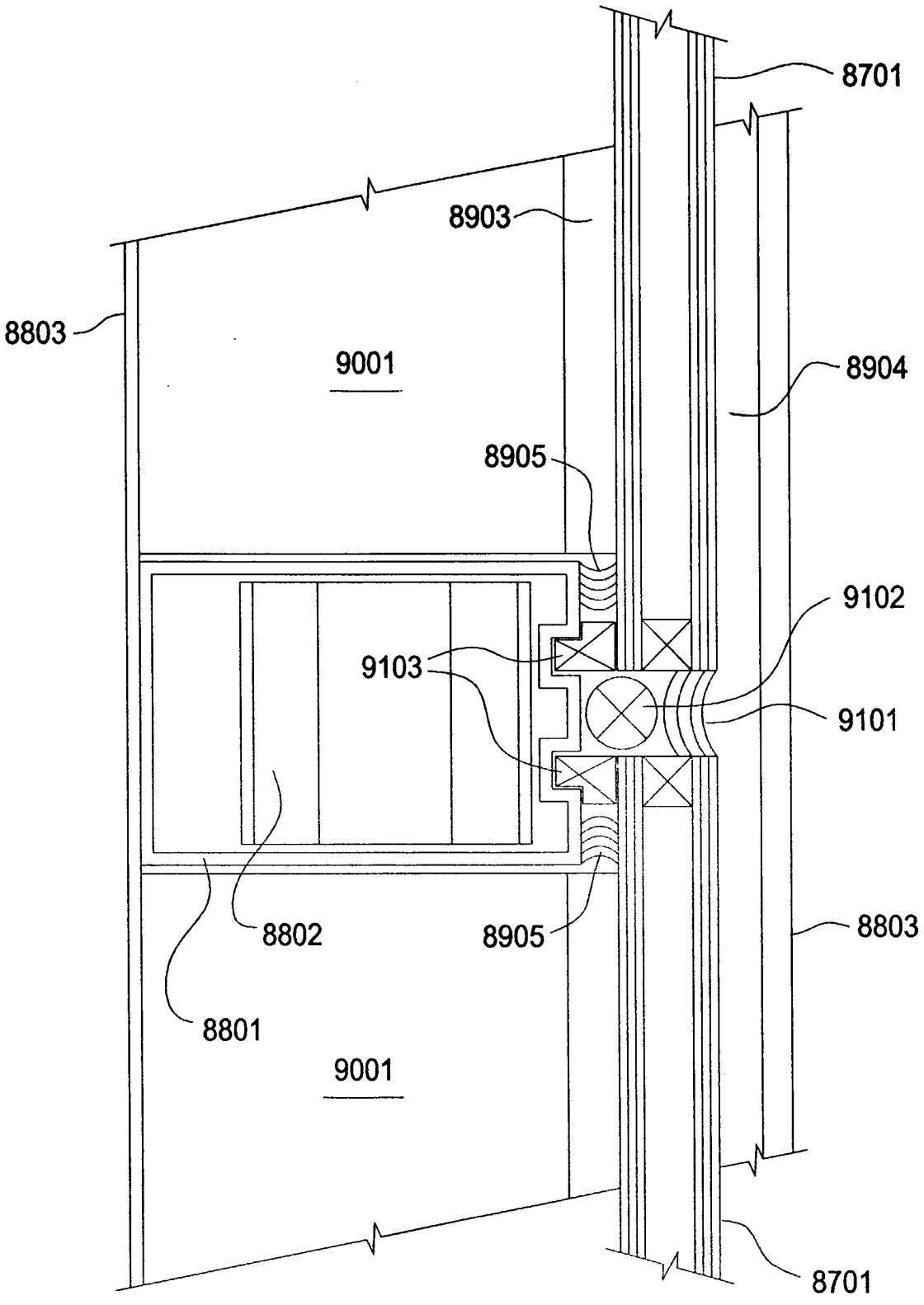

8801
8905
8701
8903
8802
9001
8904
8805
8806
SB
SC
BFL
8803
WH
8901
5
4007
G2
4006
14010
10
4012
2002
2112
4005
1000
200

FIG.90


8701
8903
8803
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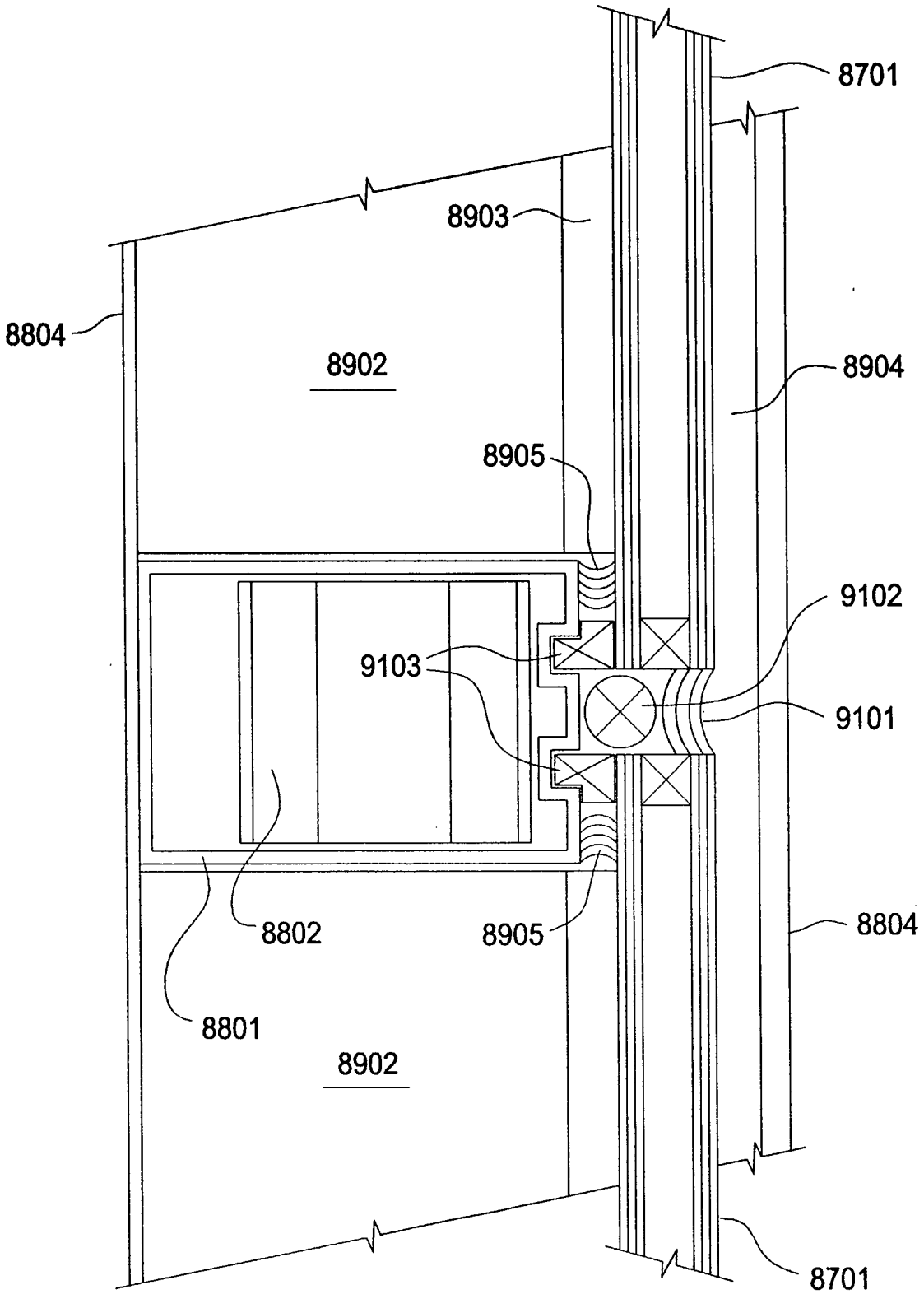
8904
8905
9102
9103
9101
8802
8905
8803
8801
9001
8701

FIG.91


8701
8903
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8902
8904
8905
9102
9103
9101
8802
8905
8804
8801
8902
8701

FIG.91A

FIG.89

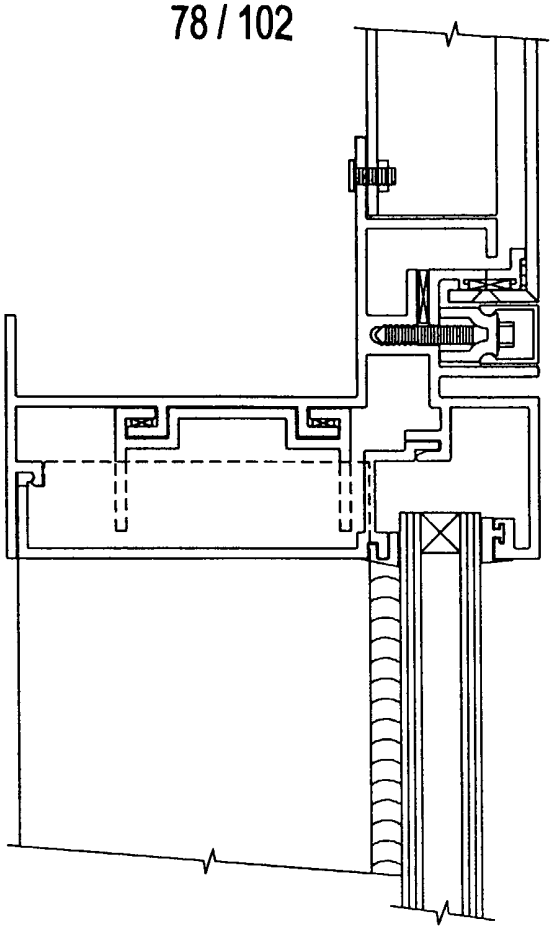


FIG.90

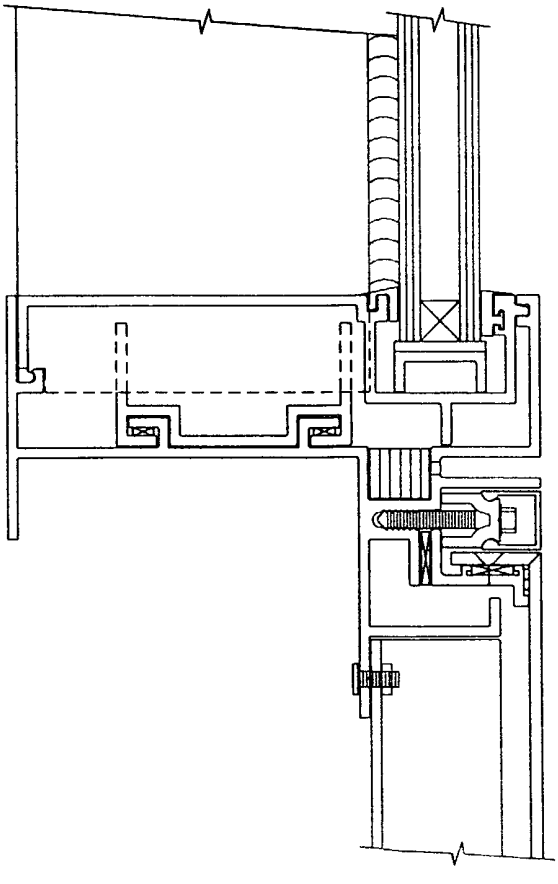


FIG.92

FIG.90

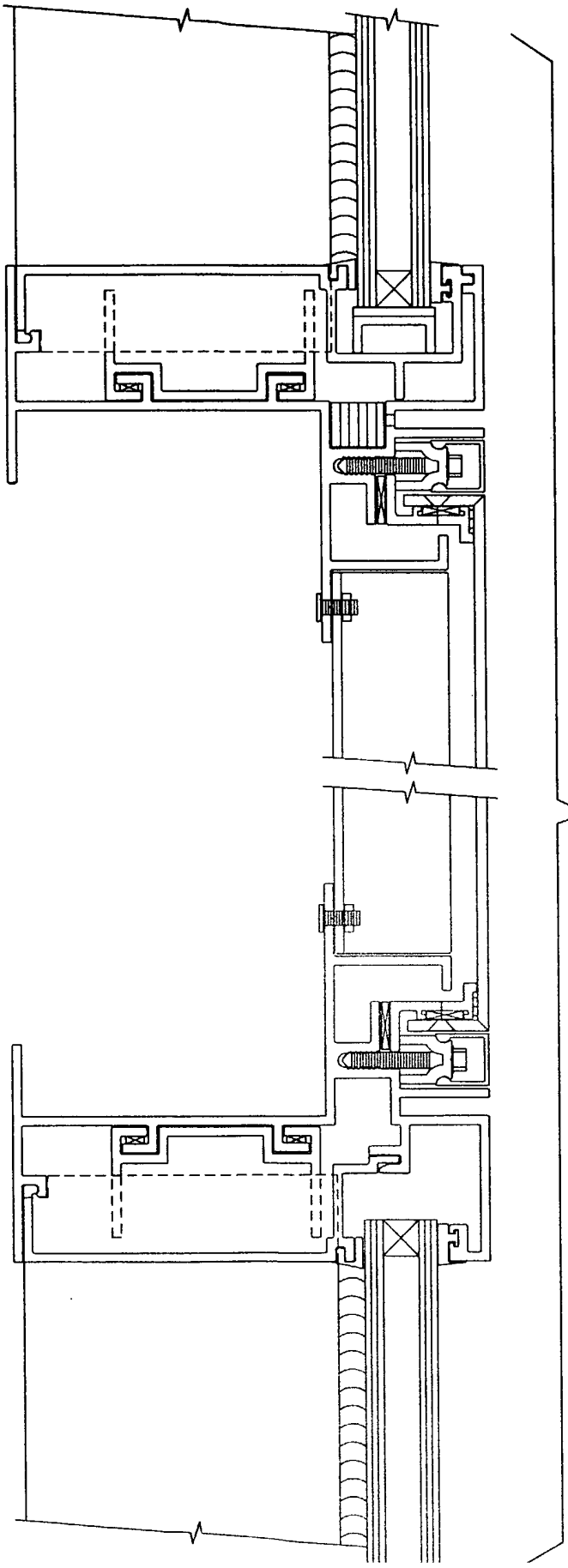


FIG.89

FIG.93

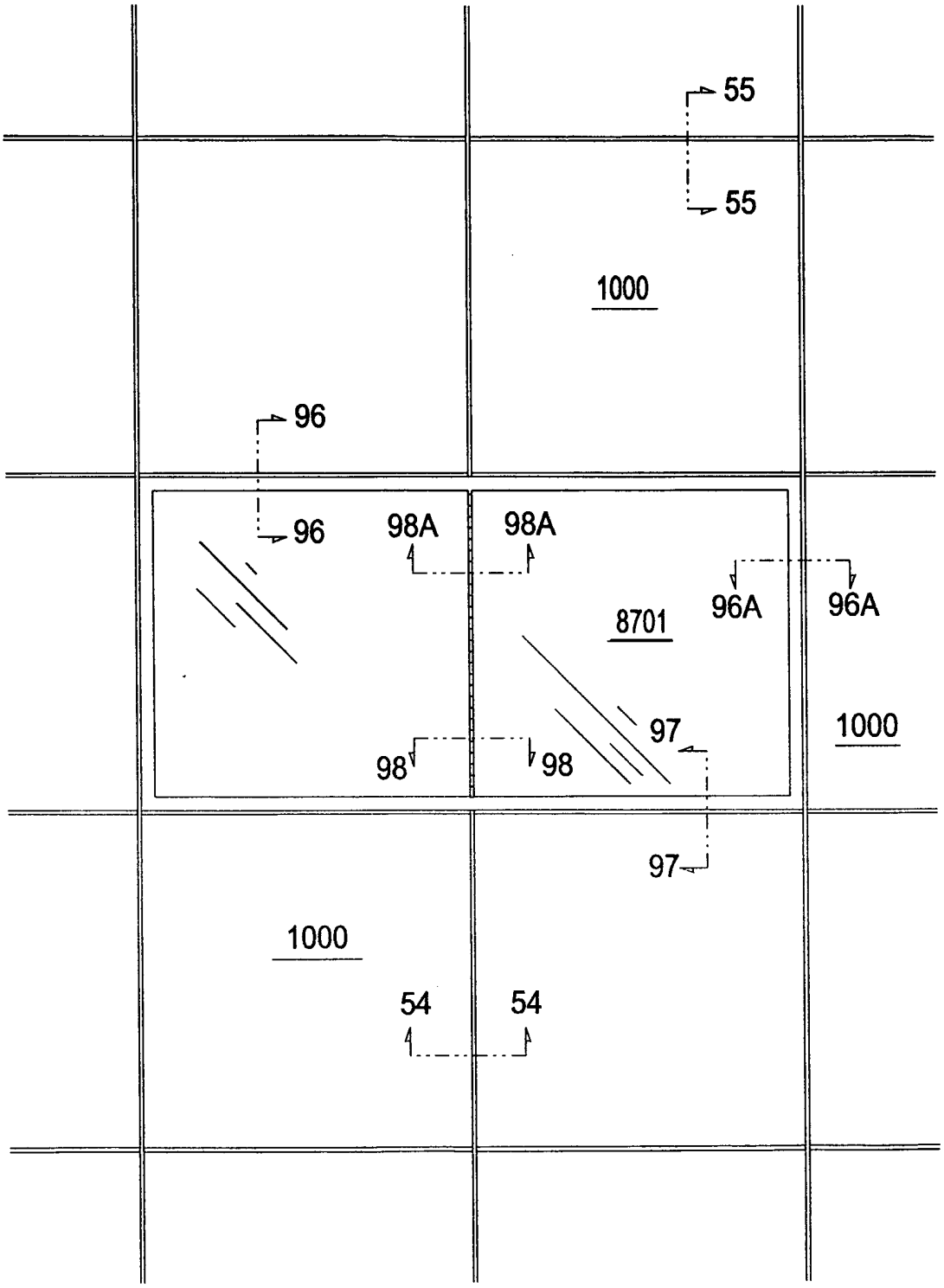


FIG.94

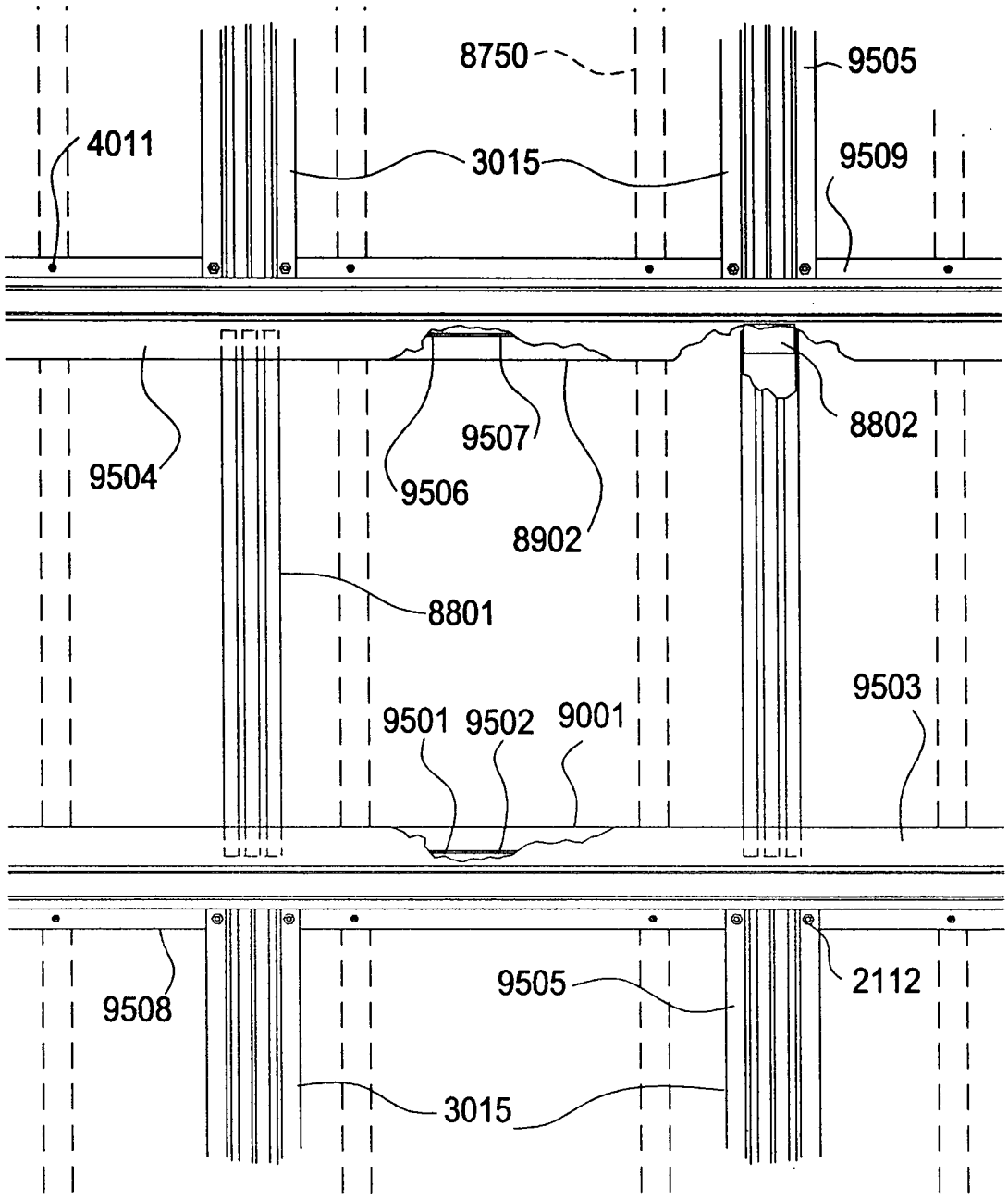
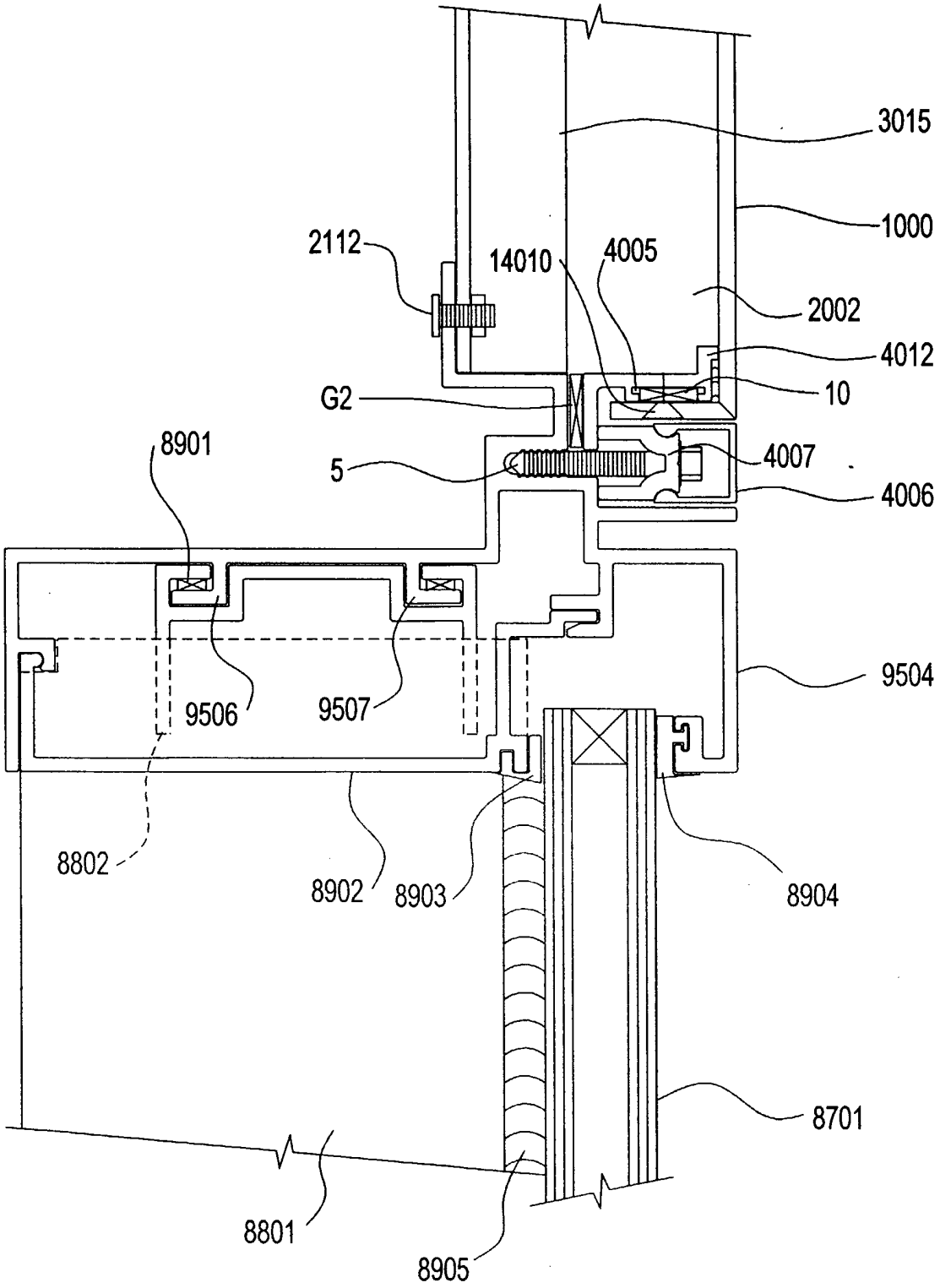

8750
9505
4011
3015
9509
9504
9507
9506
8902
8802
8801
9503
9501
9502
9001
9508
9505
2112
3015

FIG.95


3015
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4005
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4012
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4006
9504
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9507
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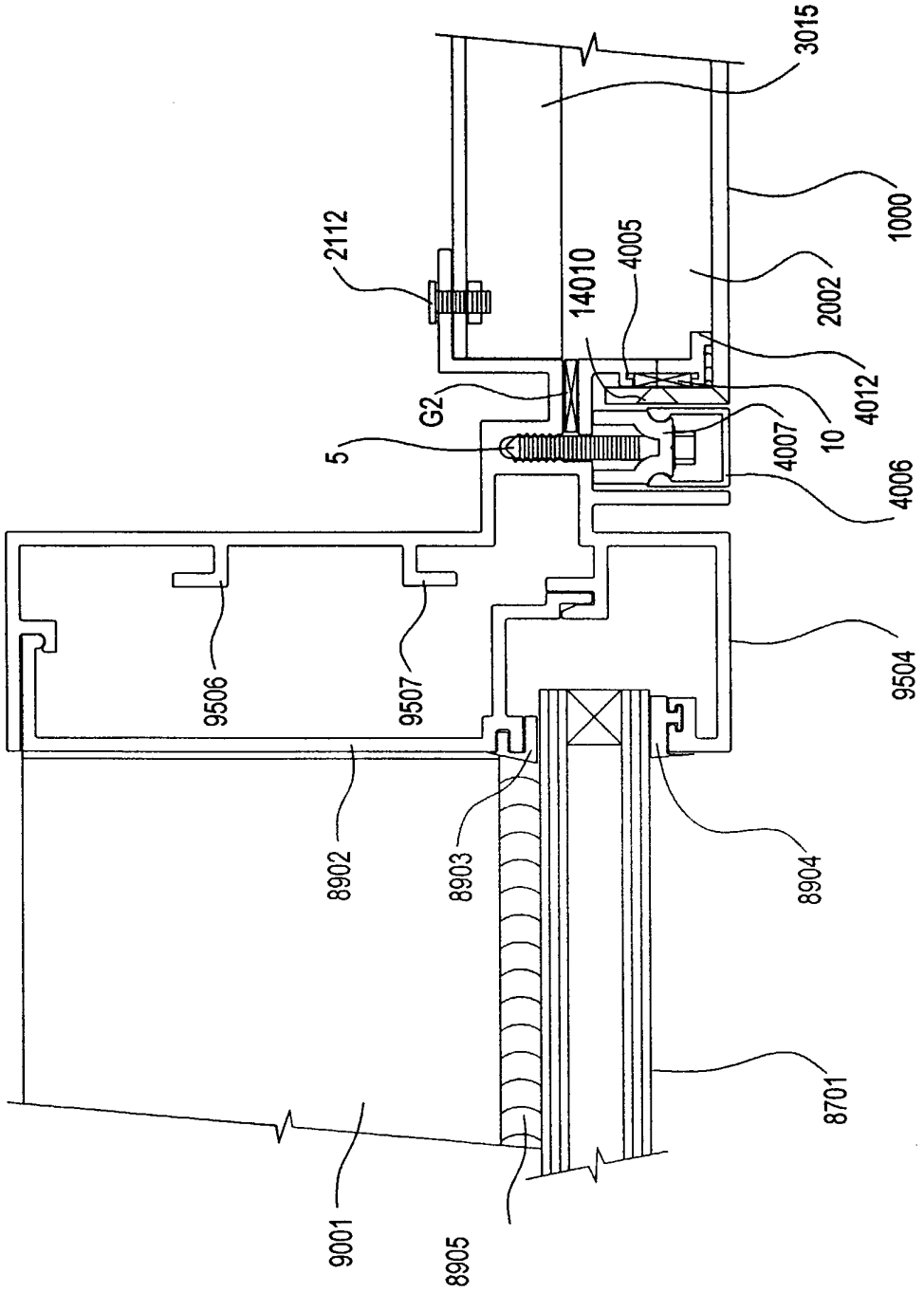
8902
8903
8904
8701
8801
8905

FIG.96


3015
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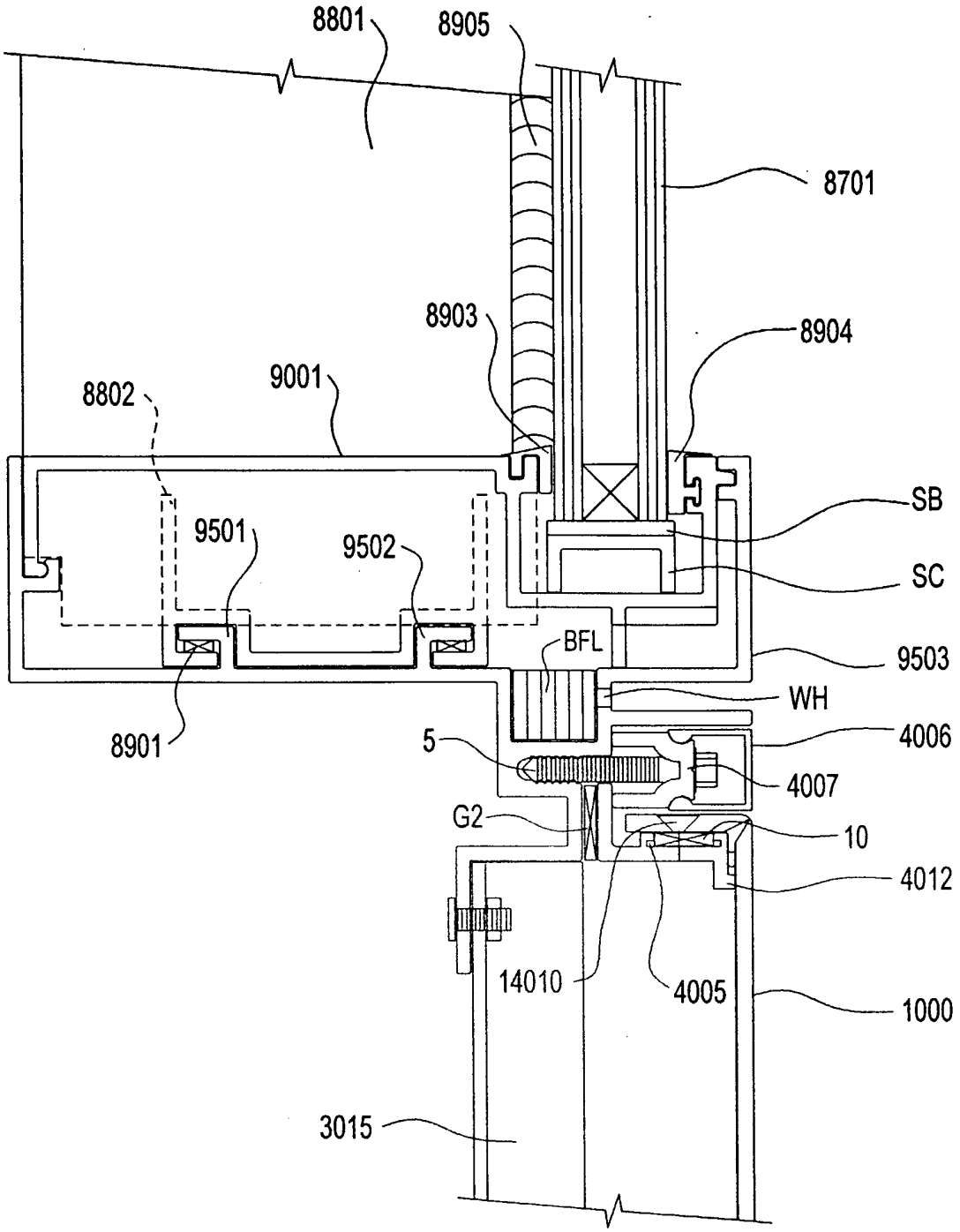
8904
8701
9001
8905

FIG.96A


8801
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4007
G2
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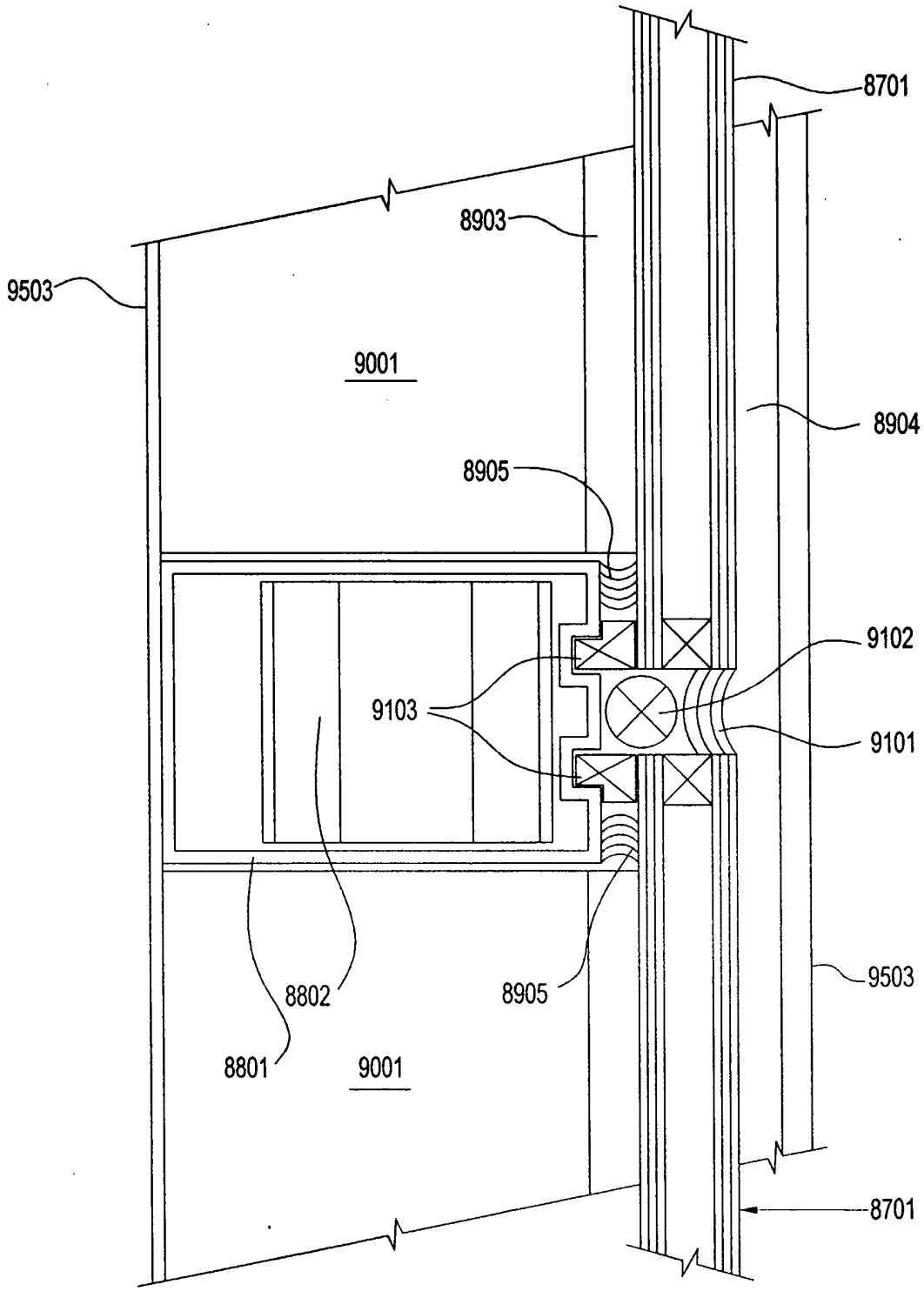
4012
14010
4005
1000
3015

FIG.97


8701
8903
9503
9001
8904
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9102
9103
9101
9503
8802
8905
8801
9001
8701

FIG.98

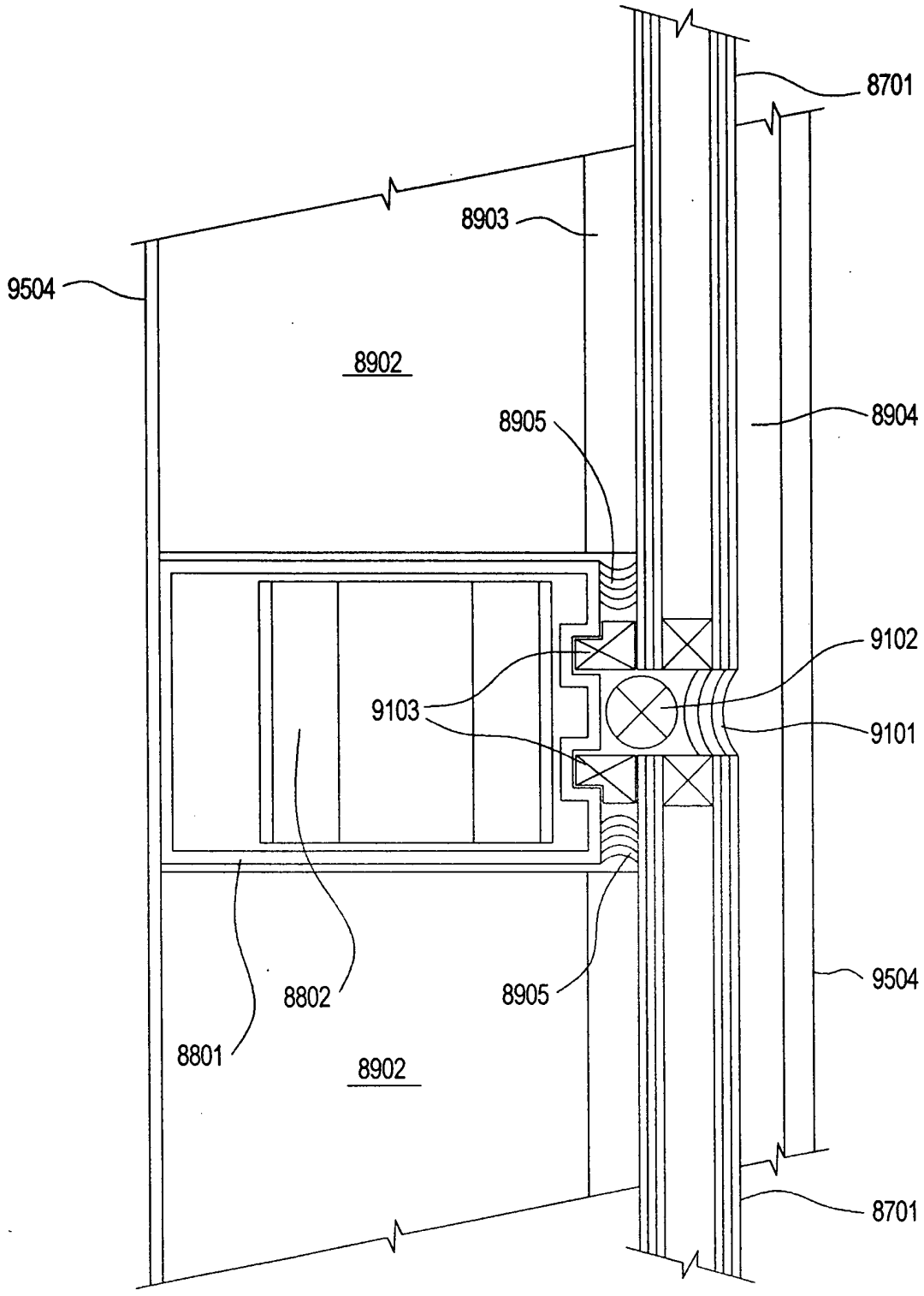

8701
8903
9504
8902
8905
8904
9102
9103
9101
9504
8802
8905
8801
8902
8701

FIG.98A

FIG.96

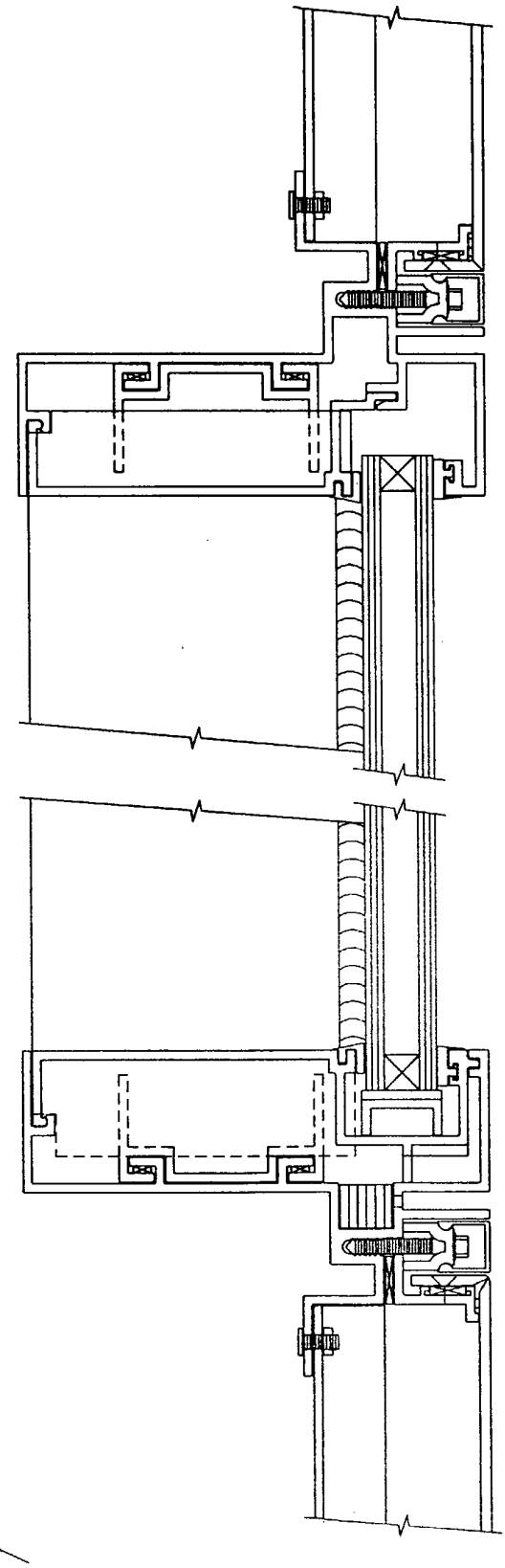
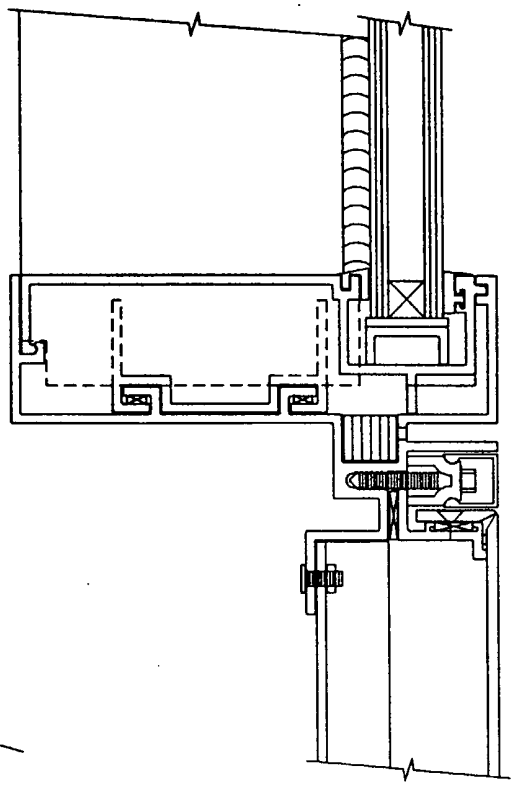


FIG.97

FIG.99

FIG.97



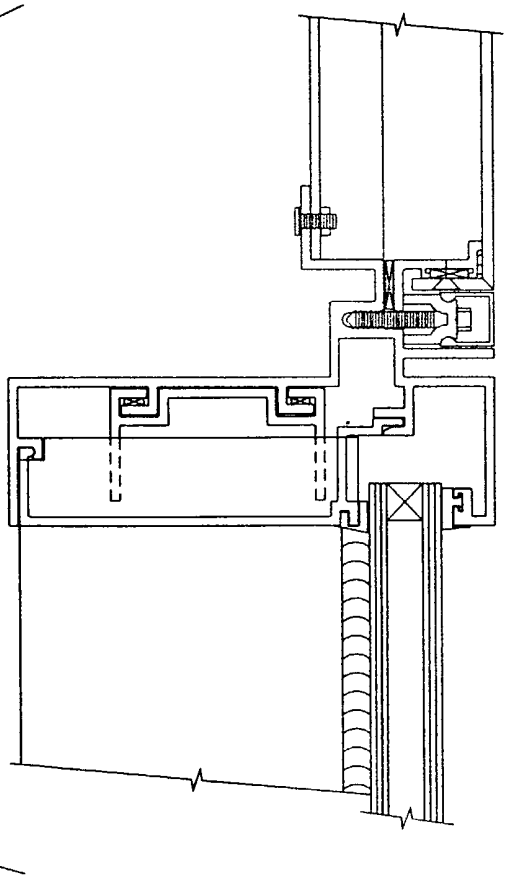


FIG.96

FIG.100

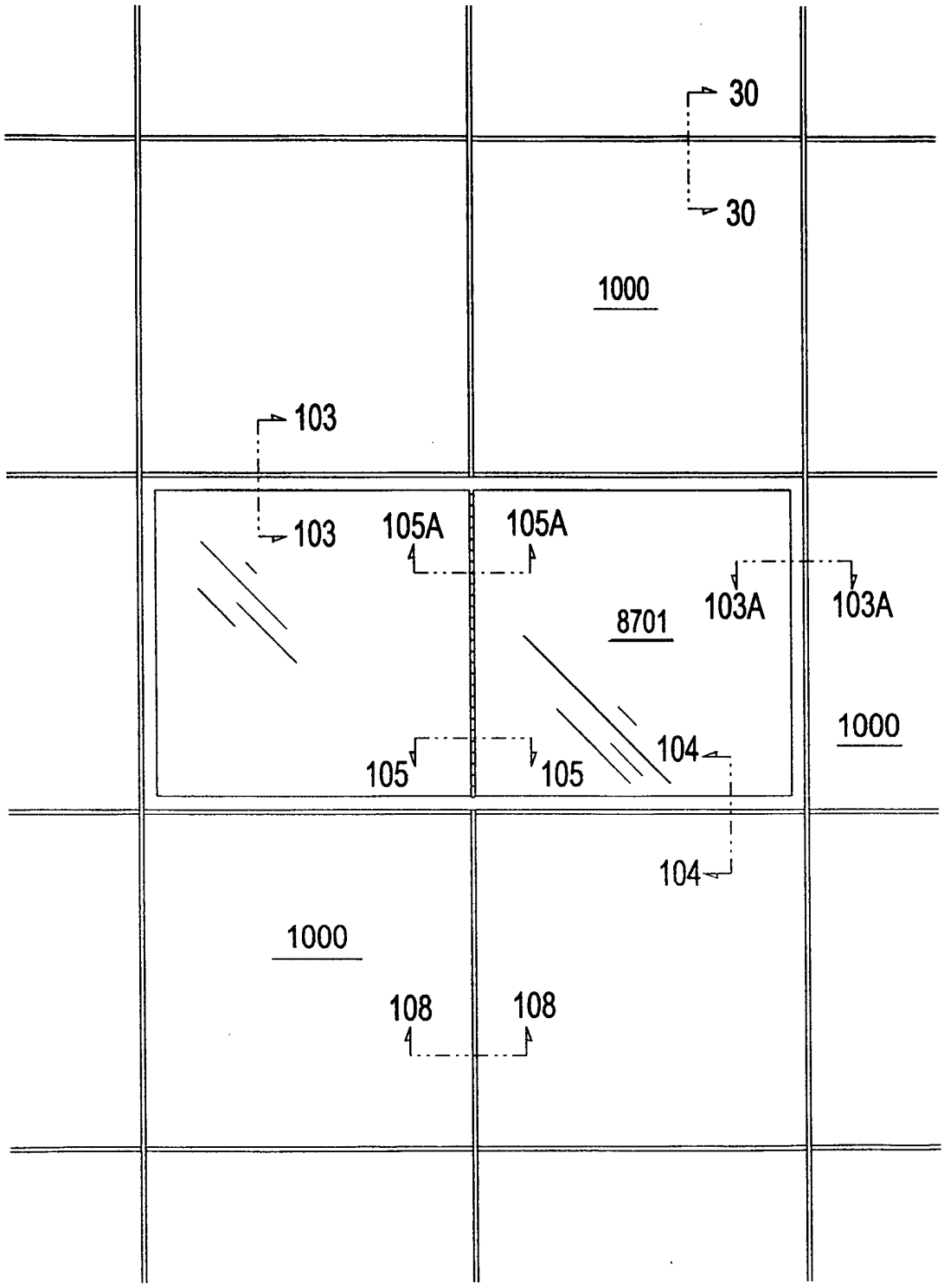

30
30
1000
103
103
105A
105A
103A
103A
8701
1000
104
105
105
104
1000
108
108

FIG.101

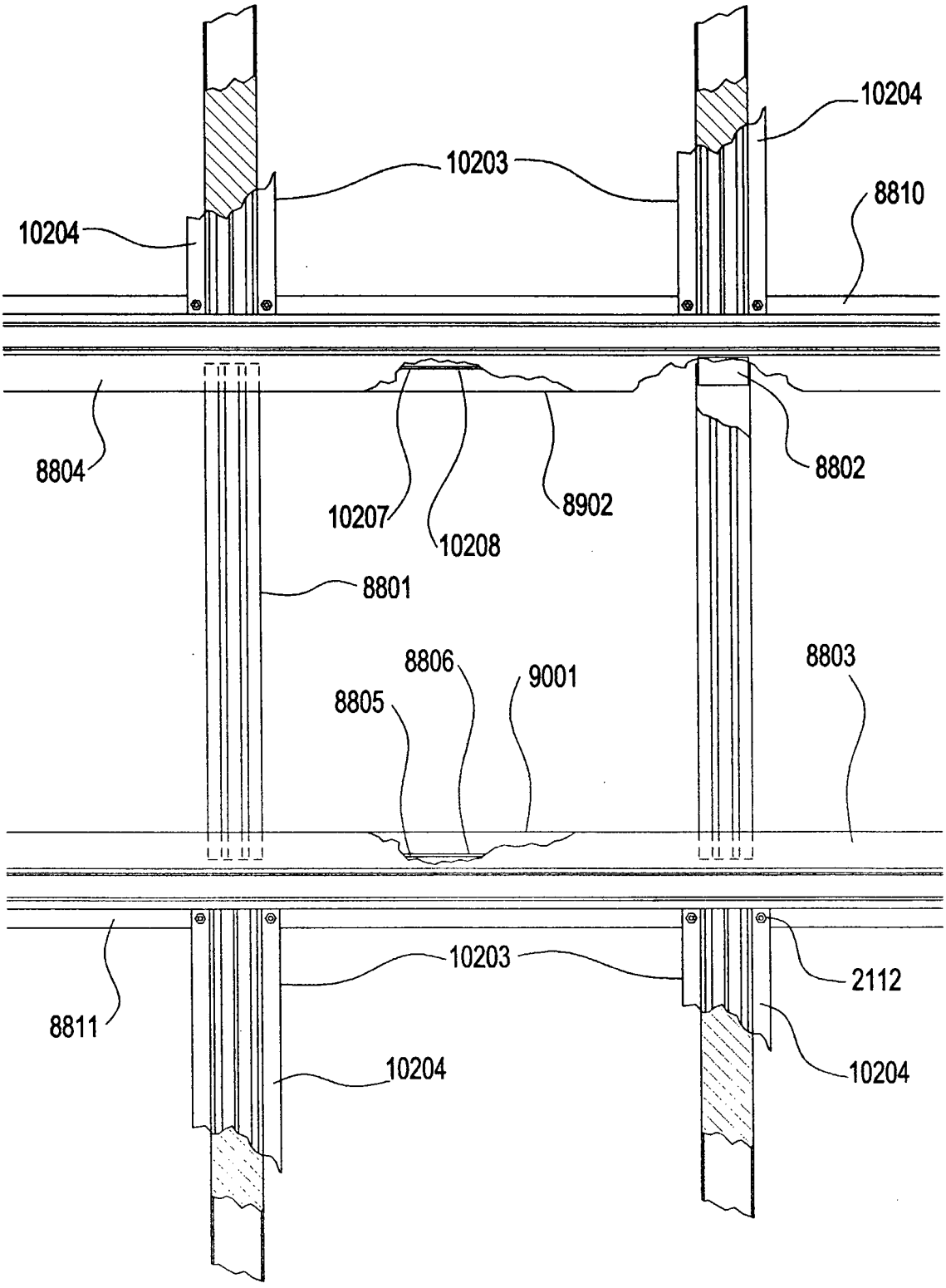

10204
10203
10204
8810
8804
8802
10207
10208
8902
8801
8806
9001
8805
8803
8811
10203
2112
10204
10204

FIG.102

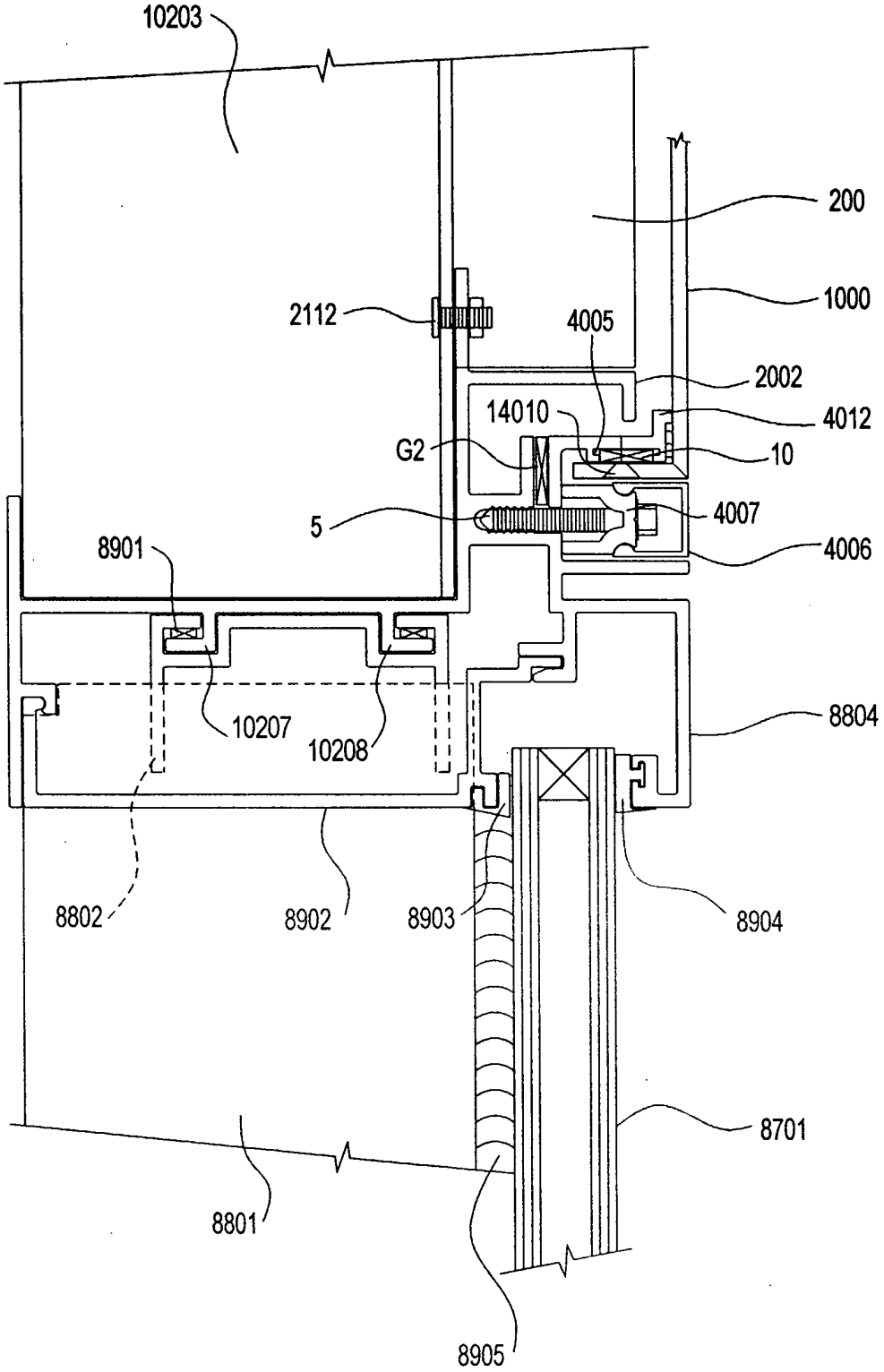

10203
200
1000
2112
4005
2002
14010
4012
G2
10
5
4007
4006
8901
8804
10207
10208
8802
8902
8903
8904
8701
8801
8905

FIG.103

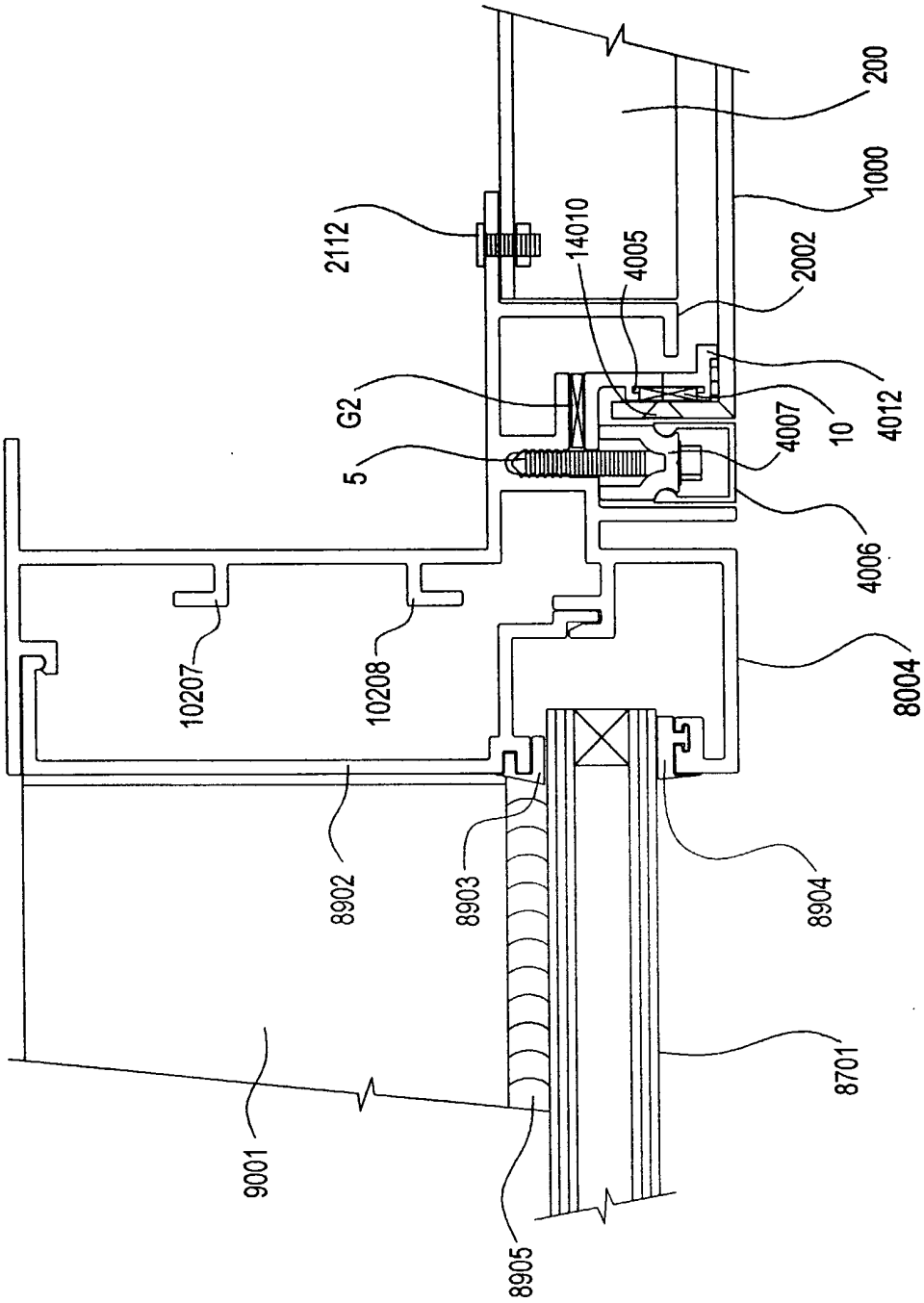
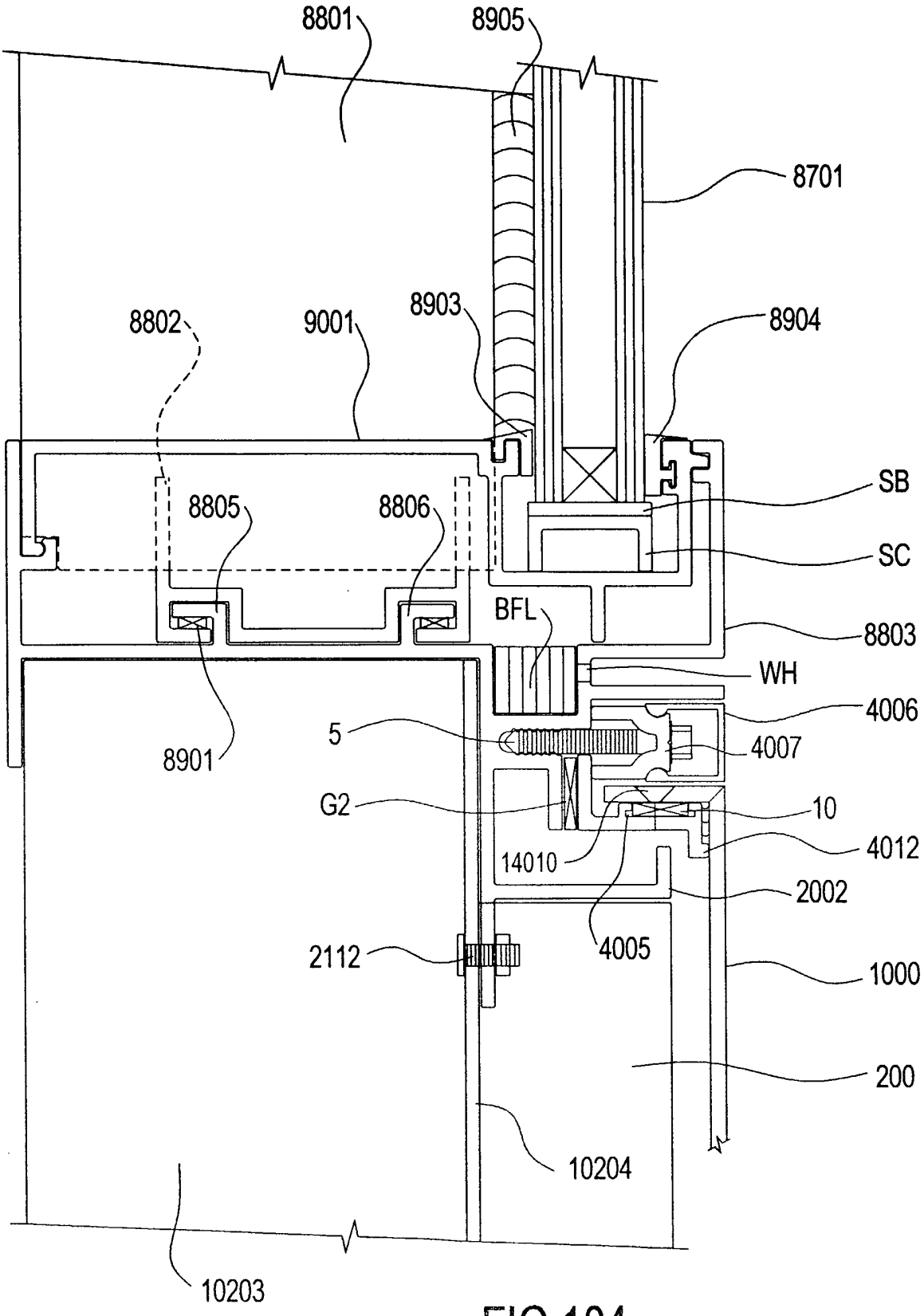

200
1000
2112
14010
4005
2002
G2
4012
10
4007
5
4006
10207
10208
8004
8902
8903
8904
8701
9001
8905

FIG.103A


8801
8905
8701
8802
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8903
8904
SB
8805
8806
SC
BFL
8803
WH
4006
5
4007
8901
G2
10
14010
4012
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2112
4005
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10204
10203

FIG.104

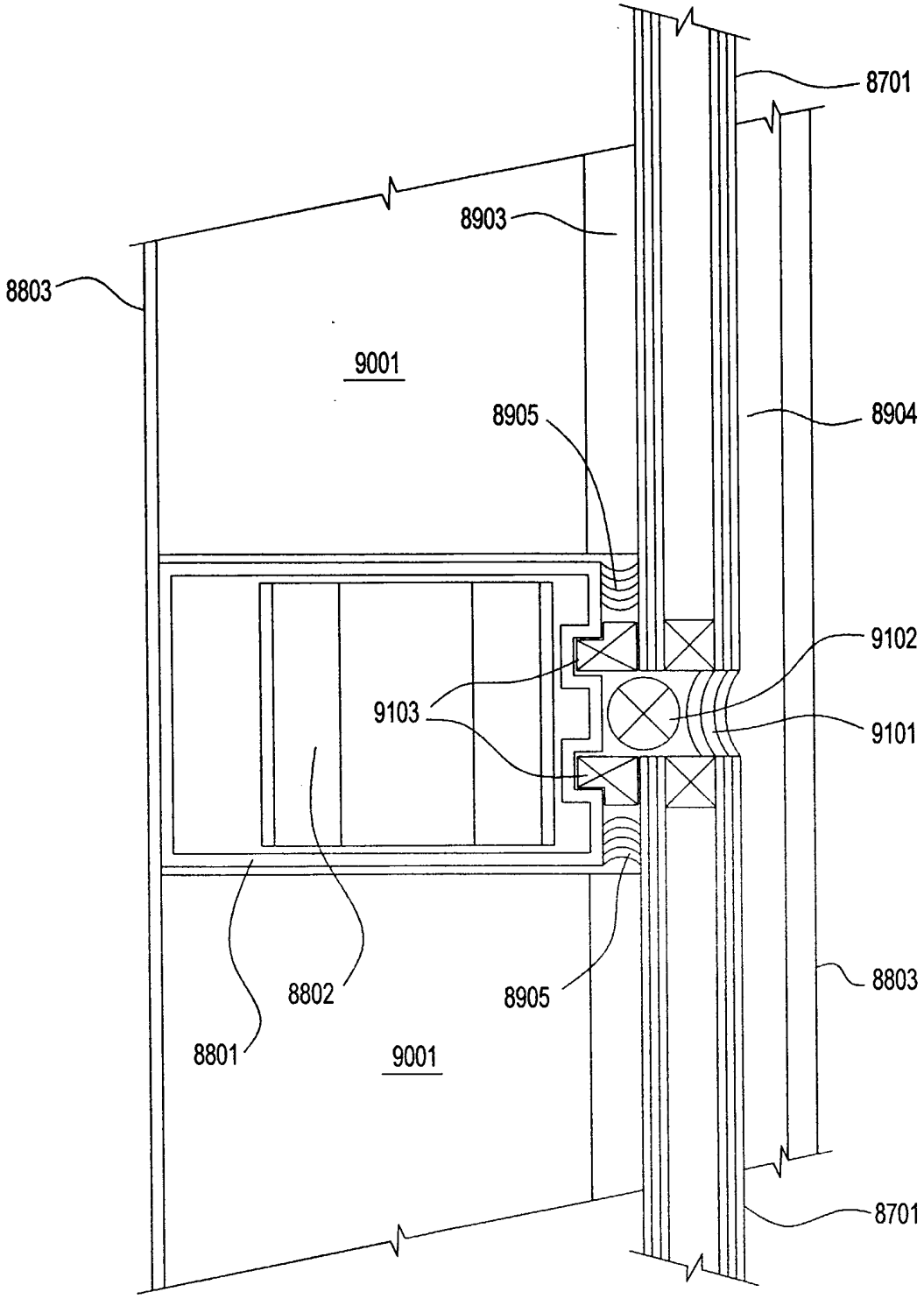

8701
8903
8803
9001
8905
8904
9102
9103
9101
8802
8905
8803
8801
9001
8701

FIG.105

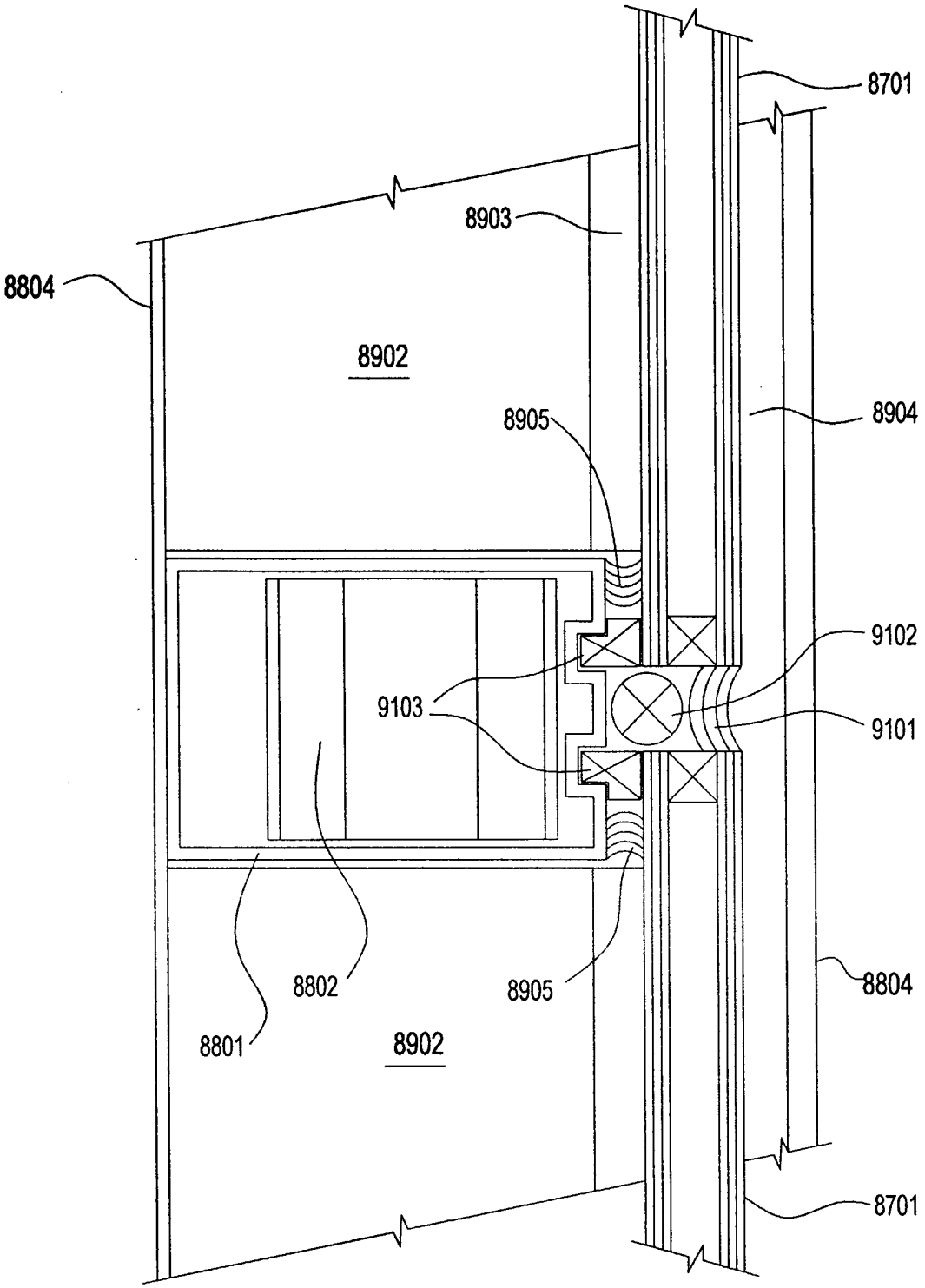

8701
8903
8804
8902
8905
8904
9102
9103
9101
8802
8905
8804
8801
8902
8701

FIG.105A

FIG.103

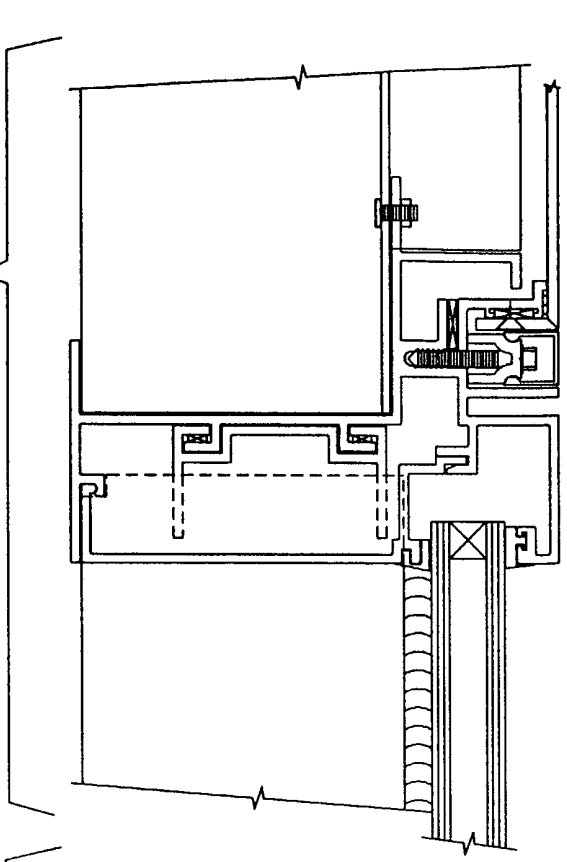


FIG.104

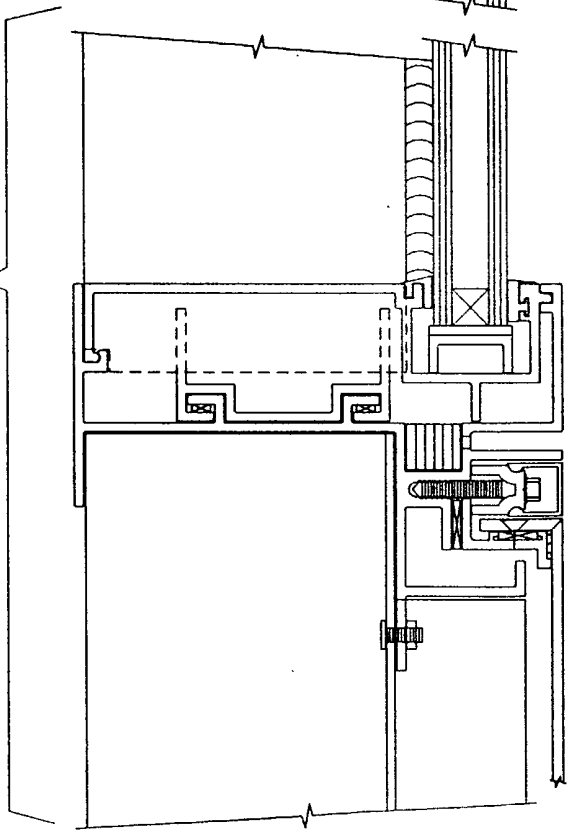


FIG.106

FIG.104

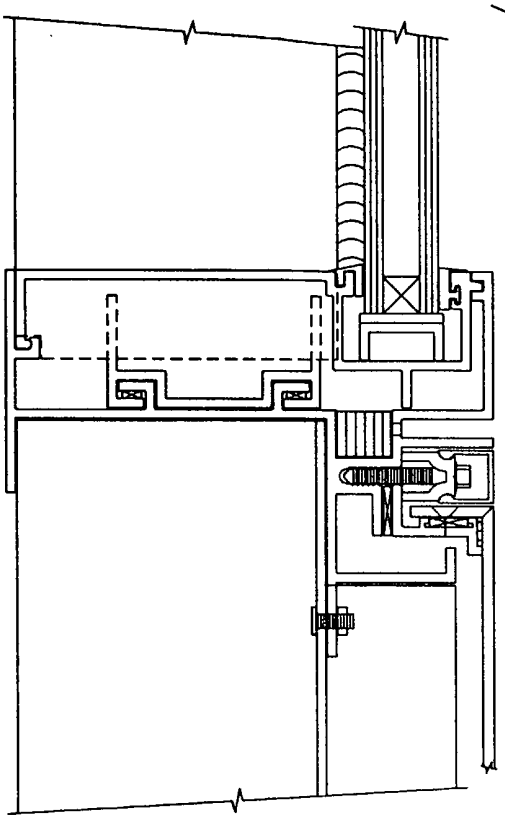


FIG.107

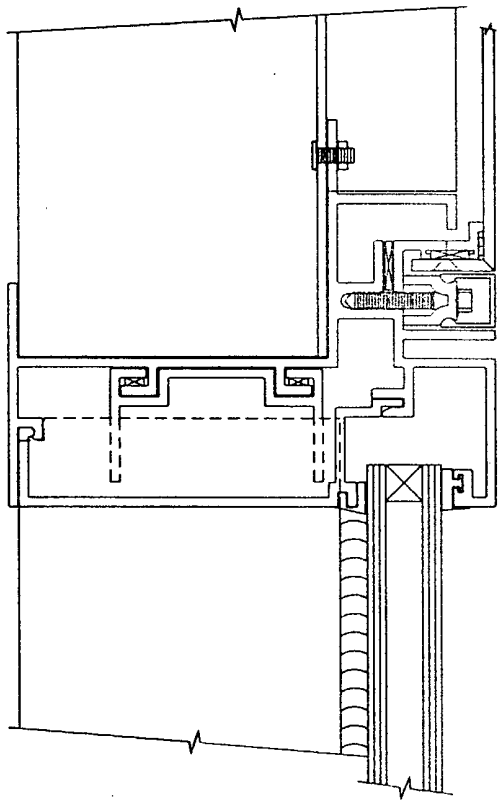


FIG.103

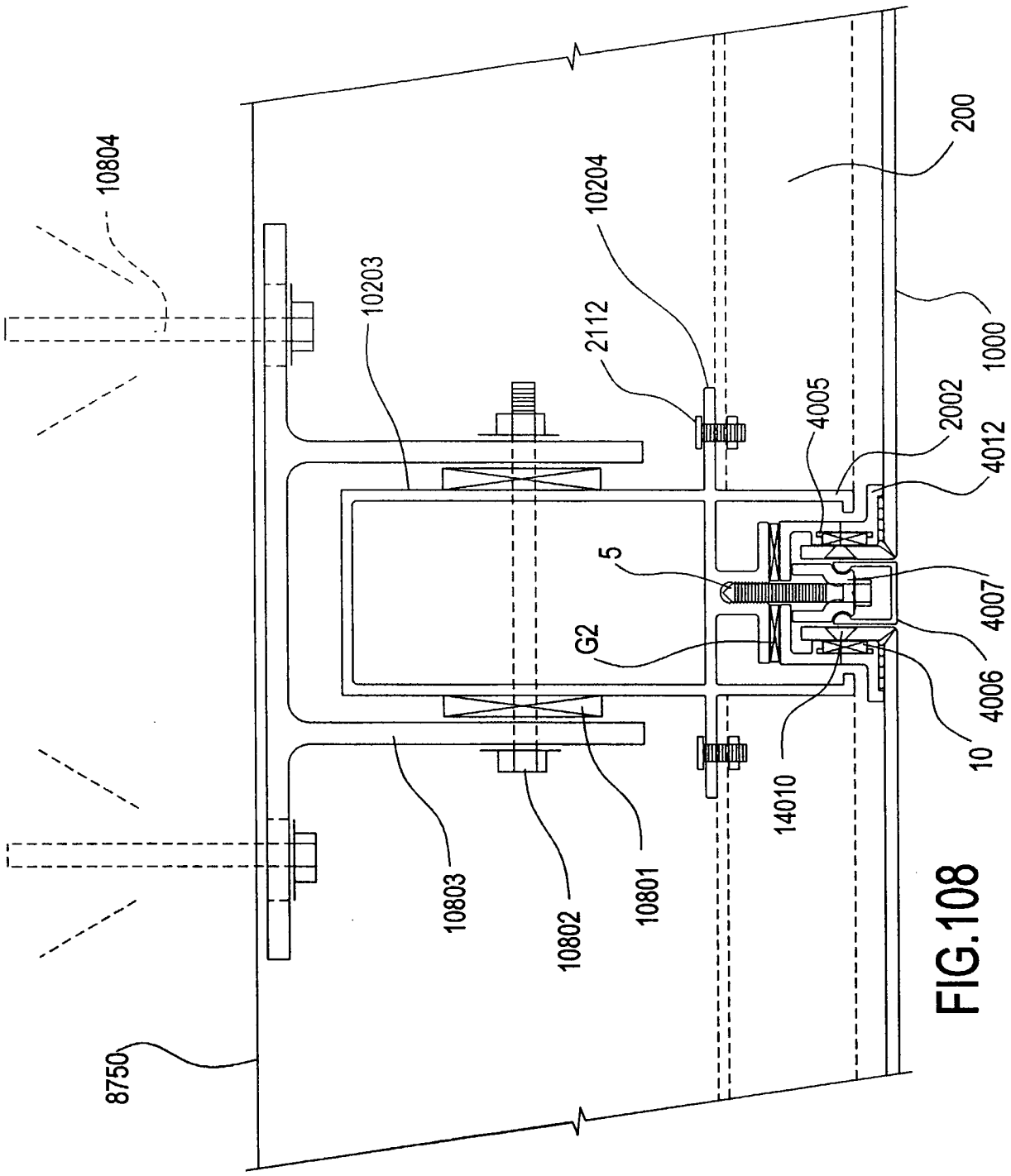

10804
10203
10204
2112
200
1000
4005
2002
4012
5
4007
G2
4006
10
14010
10803
10802
10801
8750

FIG.108

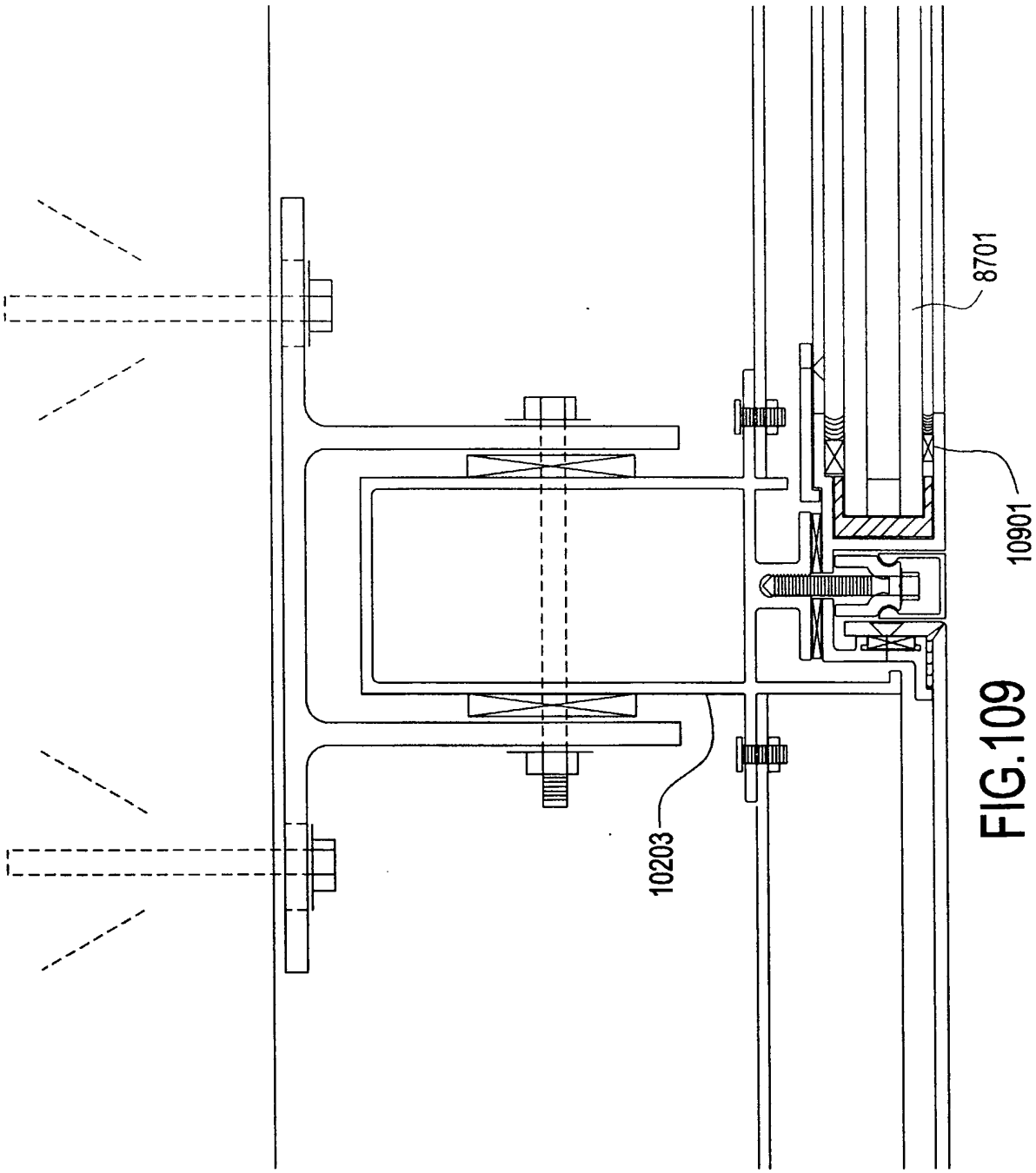
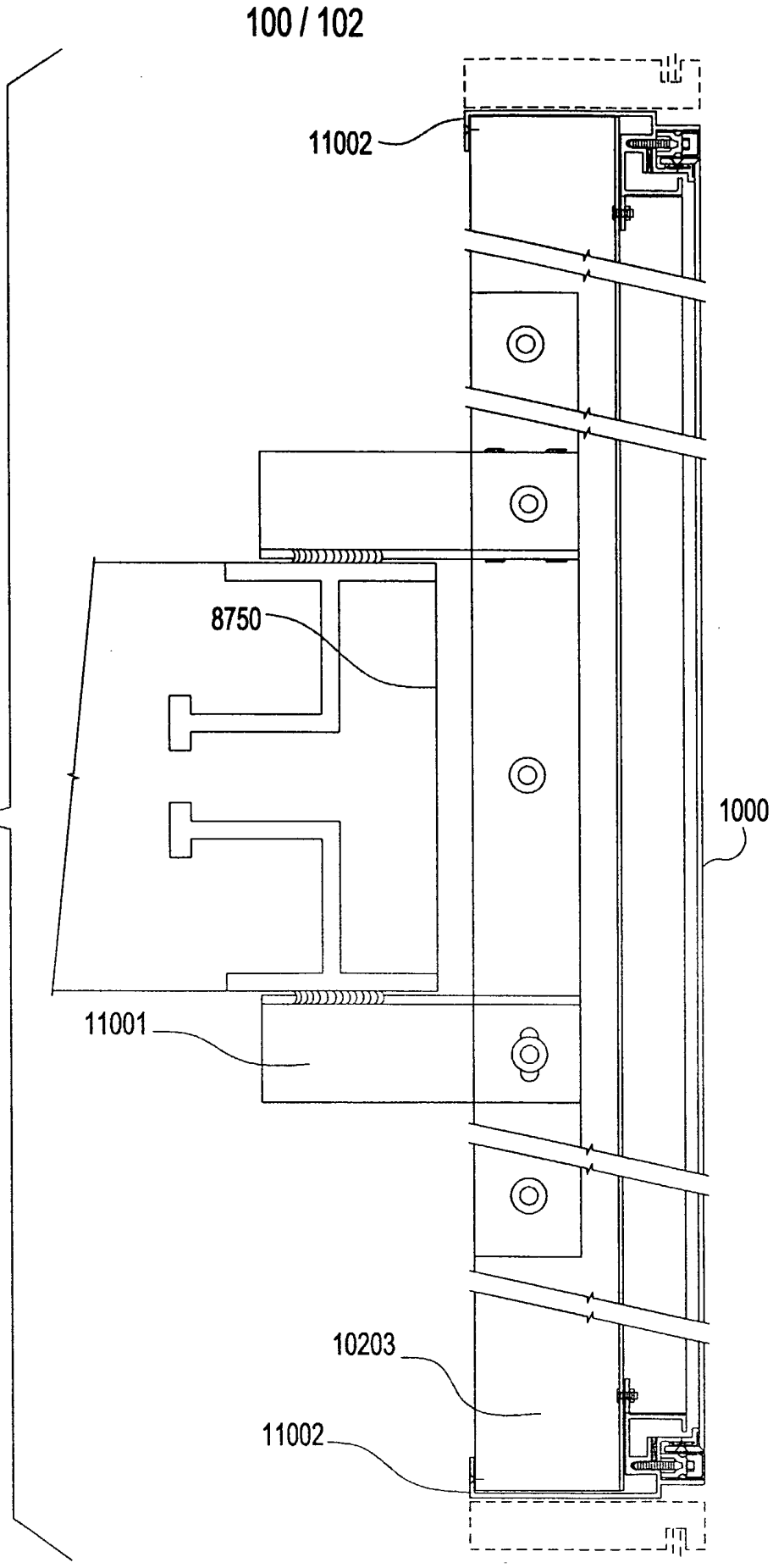


FIG.109

FIG.110



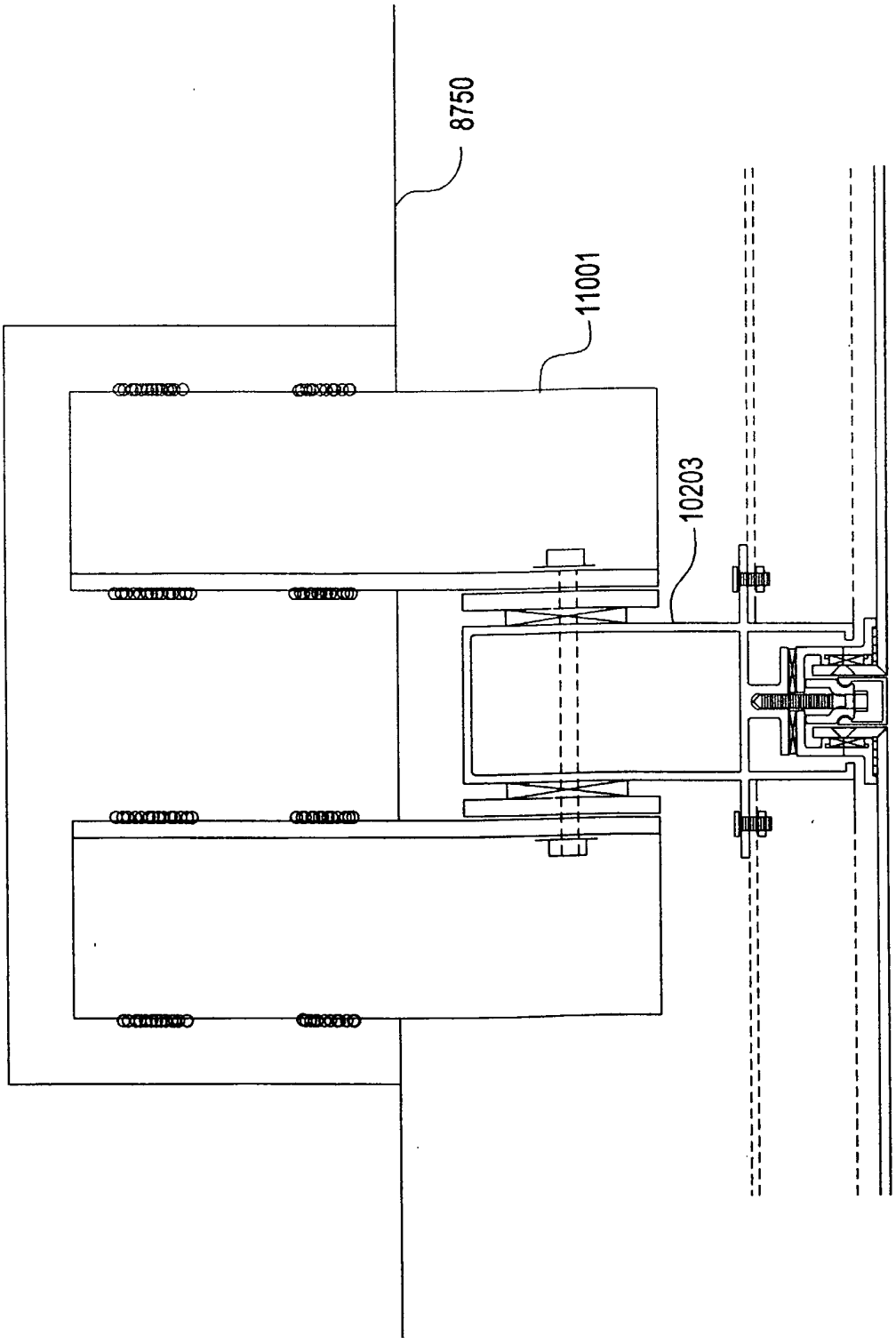


FIG.111

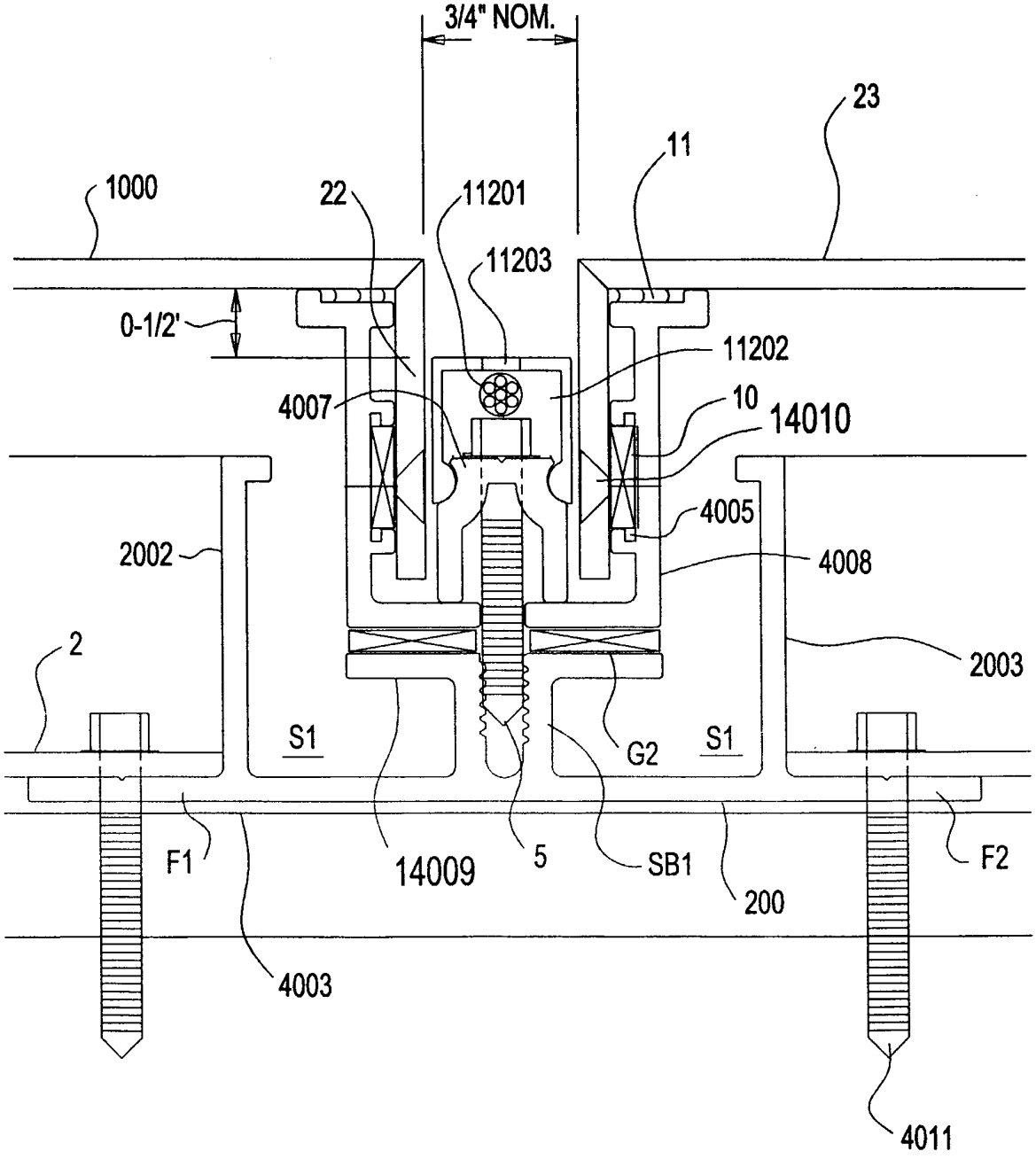

3/4" NOM.
23
11
1000
22
11201
11203
0-1/2'
11202
4007
10
14010
4005
2002
4008
2
2003
S1
G2
S1
F1
14009
5
SB1
200
F2
4003
4011

FIG.112