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[19]

[11] E

Patent Number: Re. 35,479**Witherbee et al.****[45] Reissued Date of Patent: Mar. 18, 1997****[54] CABLE TRAY HOLD-DOWN DEVICE****[75] Inventors: Martin L. Witherbee, Edwardsville;**
Eric R. Rinderer, Highland, both of Ill.**[73] Assignee: B-Line Systems, Inc., Highland, Ill.****[21] Appl. No.: 495,379****[22] Filed: Jun. 28, 1995****Related U.S. Patent Documents**

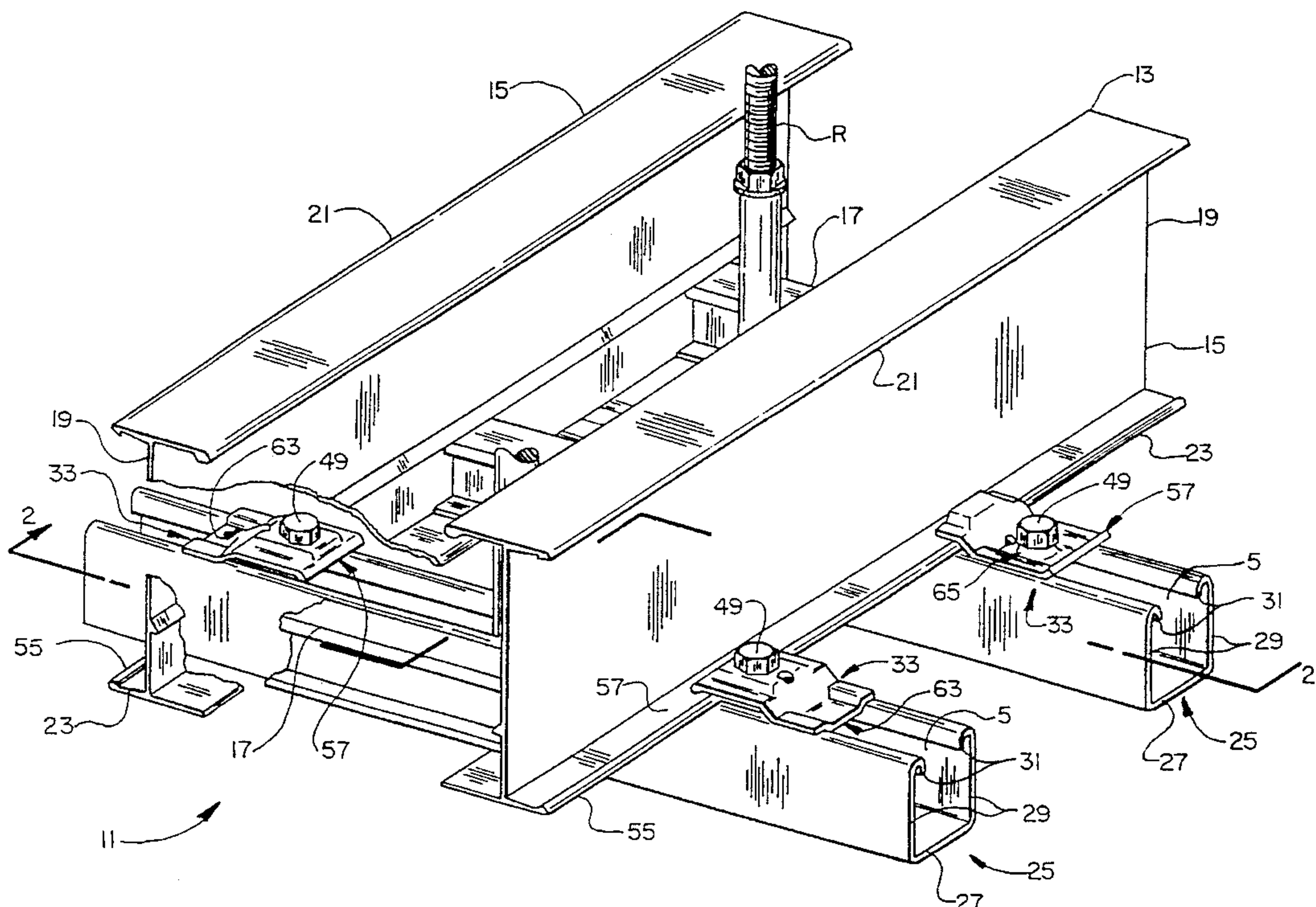
Reissue of:

[64] Patent No.: 5,372,341
Issued: Dec. 13, 1994
Appl. No.: 132,751
Filed: Oct. 6, 1993**[51] Int. Cl.⁶ F16L 3/00****[52] U.S. Cl. 248/49; 248/72; 411/84****[58] Field of Search 248/49, 58, 62,**
248/72, 73, 68.1; 411/84, 85, 169**[56] References Cited****U.S. PATENT DOCUMENTS**

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Hold Down Clamp and Expansion Guide, 2 pages, date
unknown, Feasterville, Penn.**Cable Tray Systems, B-Line Systems, Inc., pp. 136,**
138-139, 1990 Highland, Ill.**Primary Examiner—Ramon O. Ramirez****Attorney, Agent, or Firm—Senninger, Powers, Leavitt &**
Roedel**[57]****ABSTRACT**

A hold-down device for holding a cable tray on a support includes a rigid member having opposite side edges, opposite side margins adjacent respective side edges, and opposite end portions. The member may be placed on the support in a position in which the opposite side margins of the member bear on edges of the support with the member overlying the slot adjacent a flange of the cable tray. The member is constructed and arranged such that it is selectively securable to the support by a threaded fastener either in a clamping position in which one end portion of the member overlies the flange of the cable tray and may clamp the flange of the cable tray thereby to hold the rail in fixed position with respect to the support, or in a non-clamping position in which the opposite end portion of the member overlies the flange of the cable tray but cannot clamp the flange thereby to permit lengthwise thermal expansion and contraction of the rail while still holding the rail on the support. First and second anti-spin structures are provided at respective end portions of the member engageable with the support to prevent rotation of the member relative to the support as the threaded fastener is rotated to secure the member in its clamping or non-clamping position.

17 Claims, 6 Drawing Sheets

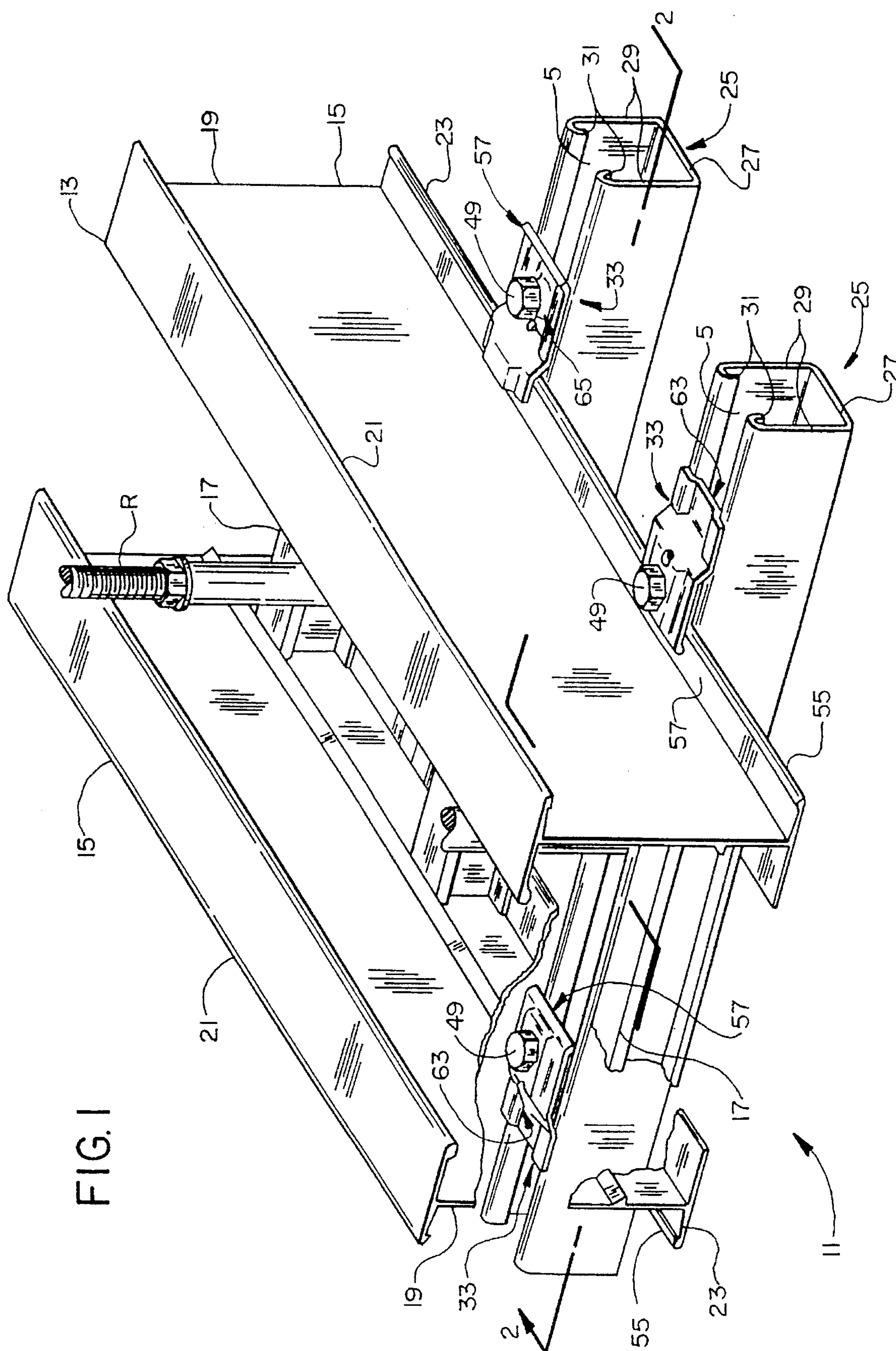


FIG. 2

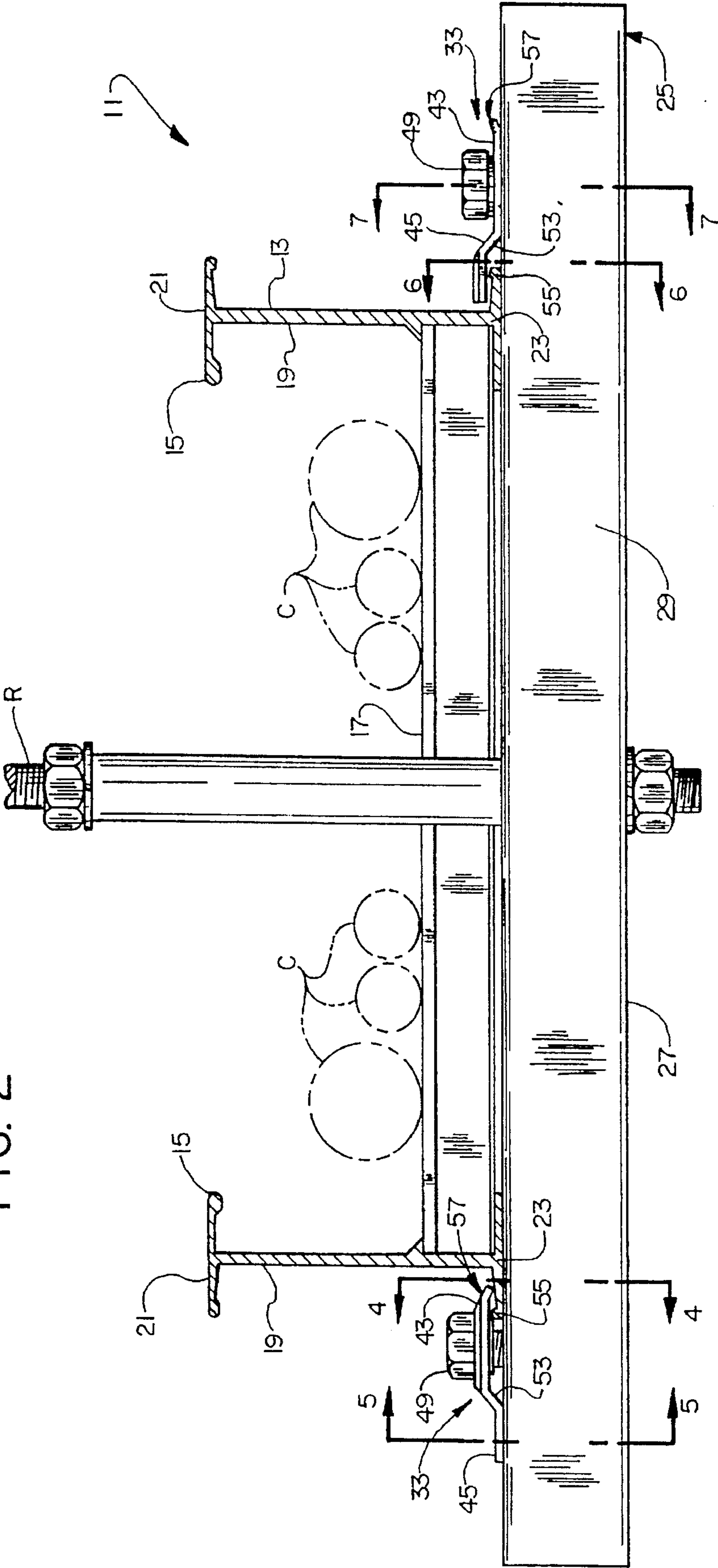


FIG. 3

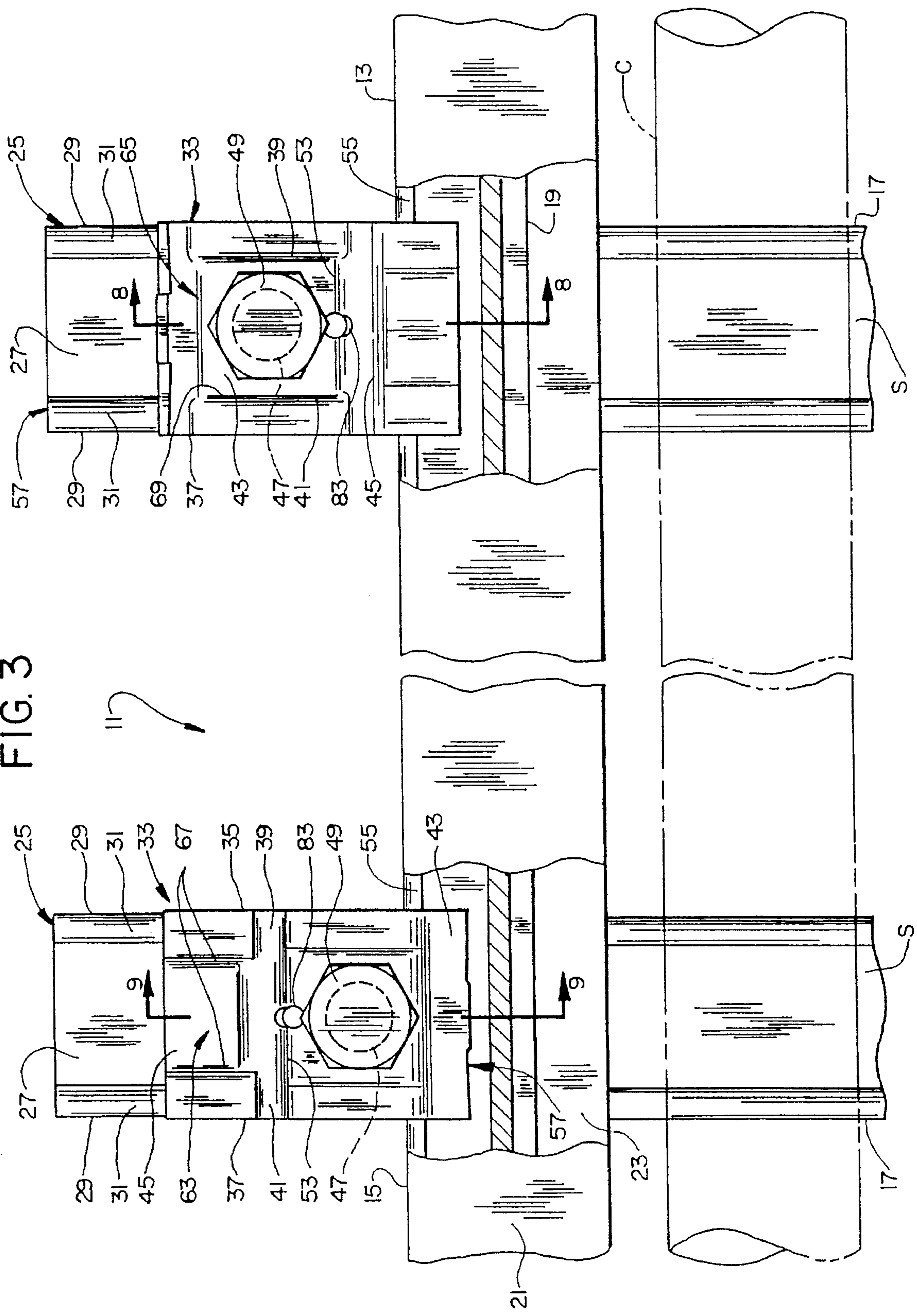


FIG. 4

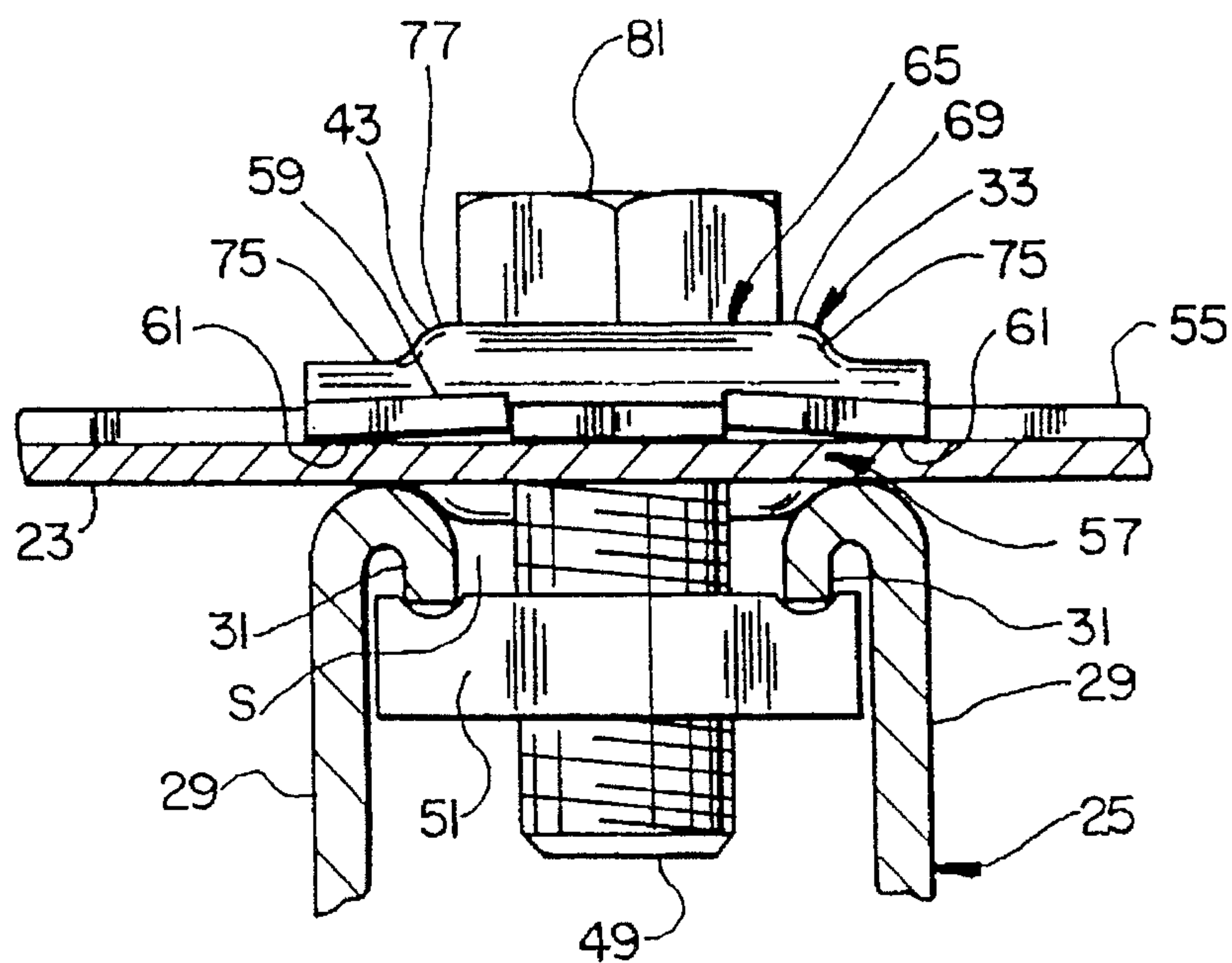


FIG. 5

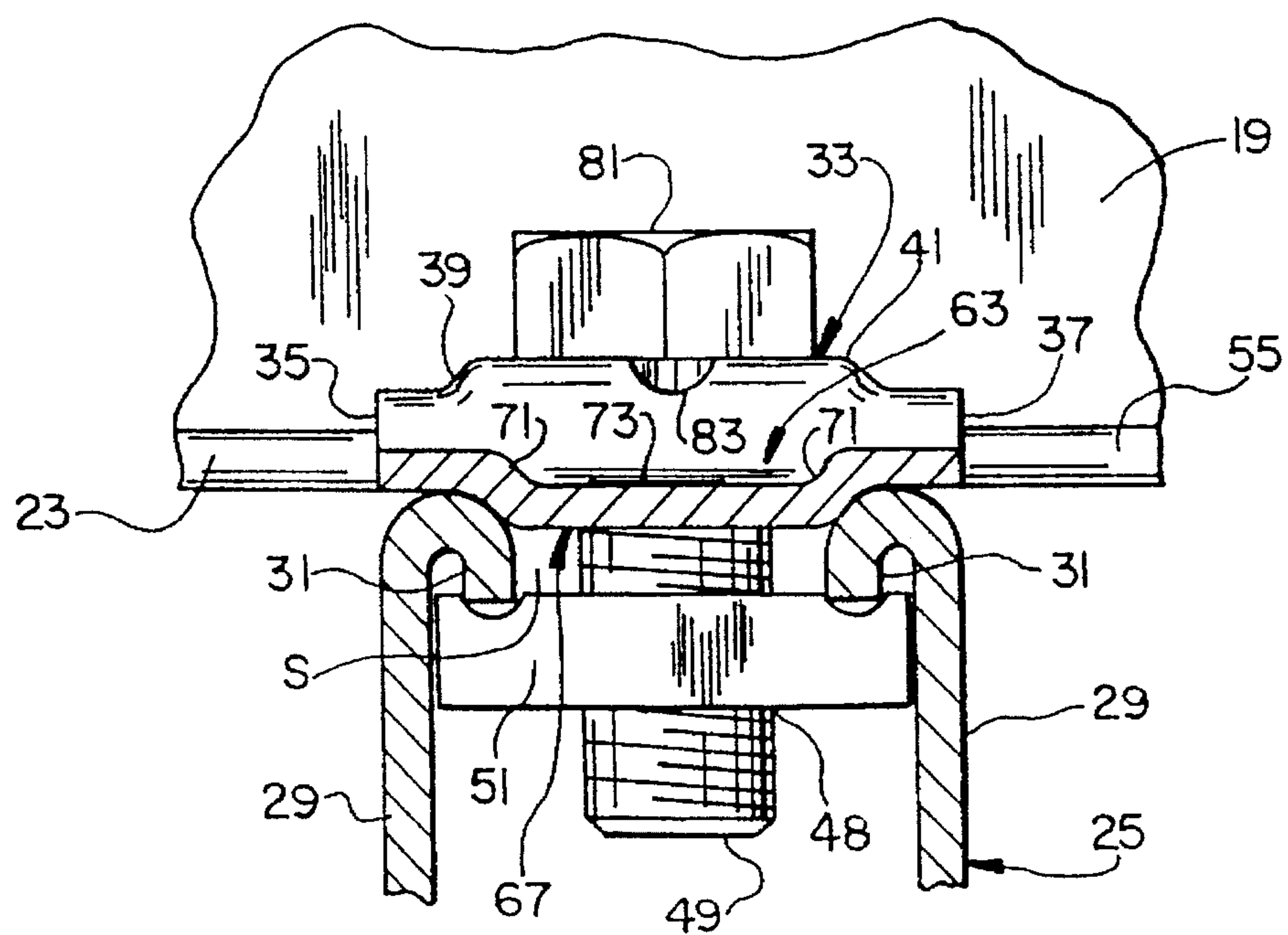


FIG. 8

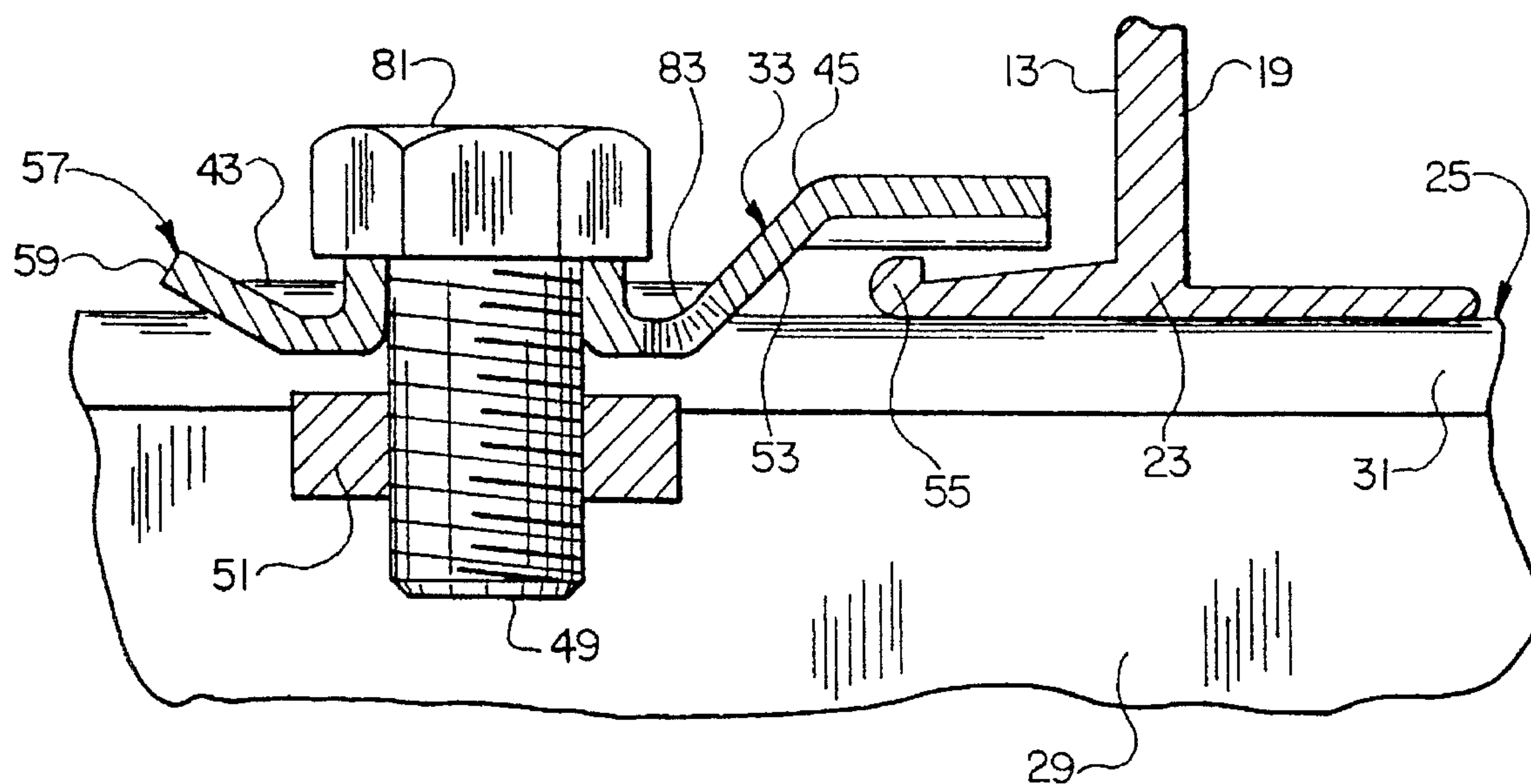
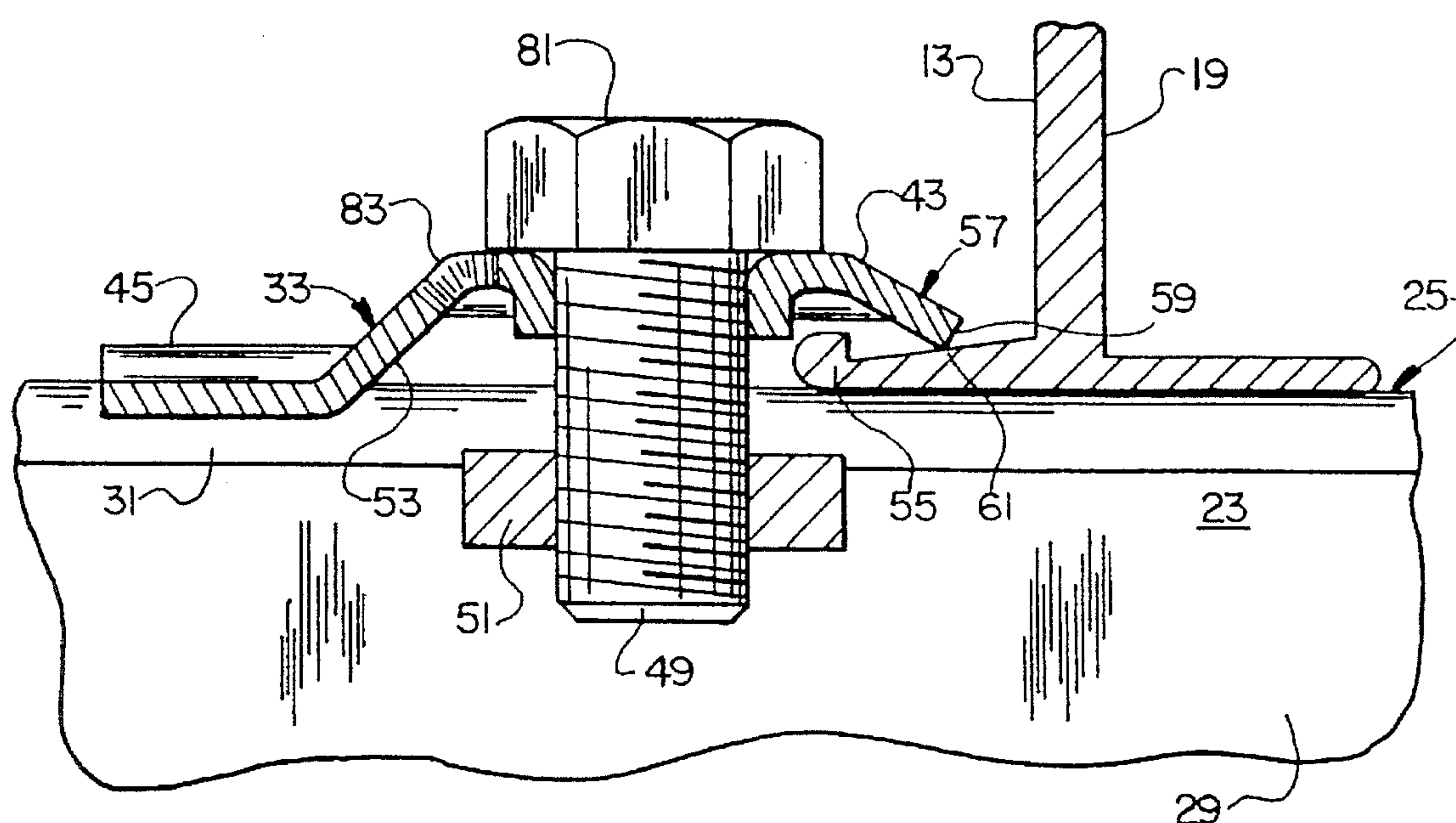


FIG. 9



CABLE TRAY HOLD-DOWN DEVICE

Matter enclosed in heavy brackets [] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

BRIEF SUMMARY OF THE INVENTION

This invention relates generally to support systems, and more particularly to a system for supporting what is referred to in the trade as "cable tray", which is a support structure comprising a pair of parallel rails connected by cross members and used in commercial buildings to support long runs of electrical wiring, conduit and the like.

Cable tray is typically supported by a series of parallel support bars suspended at intervals and spaced lengthwise of the cable tray. The cable tray rests on these support bars and is held in position on the bars by hold-down members which are affixed to the support bars by suitable fasteners (e.g., bolts). These hold-down members are intended to hold the cable tray on the support bars and to prevent lateral shifting of the cable tray relative to the bars.

Two types of hold-down members are prevalent in the industry, one type for rigidly clamping a cable tray against its support, and a second type which holds the cable tray loosely on the support to permit thermal expansion and contraction of the cable tray due to temperature variations. For reasons of economy, it is preferable to have a single "combination" hold-down member which can be used in either capacity, that is, one which can be selectively applied in either a clamping or non-clamping (expansion) mode. Co-assigned U.S. Pat. No. 5,100,086 shows one such combination hold-down. PW Industries Inc. also markets a combination hold-down. The former, however, is designed to be used in a cable tray system which does not use standard cable tray channel supports, and the latter has several drawbacks, including its tendency to spin when being tightened on a support, and its relatively low strength characteristics.

Among the several objects of this invention may be noted the provision of an improved "combination" hold-down device which may be selectively used in either a clamping or non-clamping (expansion) mode; the provision of such a hold-down device which may be used on supports of standard configuration (e.g., channel or "strut" of standard dimension and design); the provision of such a hold-down device which has an anti-spin feature to prevent the device from spinning relative to the support when the device is tightened on the support in its clamping or non-clamping positions; the provision of such a hold-down device which has increased strength characteristics for holding greater loads; the provision of such a hold-down device which readily accommodates different types of cable tray having rails of different cross sectional shapes and dimensions; and the provision of such a hold-down device which is relatively economical to manufacture and easy to install.

Generally, this invention is directed to a hold-down device for holding a cable tray on a support. The support is of the type having opposing side walls terminating in edges defining a slot therebetween. The cable tray is of the type having a pair of generally parallel rails with flanges extending lengthwise of the rails adapted to bear on the support with the flanges overlying the slot and extending generally transversely with respect to the slot. The hold-down device comprises a rigid, generally rectangular member having

opposite side edges, opposite side margins adjacent respective side edges, and opposite end portions. The rigid member is adapted to be placed on the support in a position in which the opposite side margins of the rigid member bear on the edges of the support with the rigid member overlying the slot adjacent a flange of the cable tray. A fastener opening is provided in one end portion of the rigid member. A threaded fastener is insertable inwardly through the fastener opening and through the slot of the support for threaded engagement with a complementary threaded opening associated with the support. The arrangement is such that rotation of the fastener is adapted to fixedly secure the rigid member to the support. The rigid member is selectively securable to the support by the fastener either in a clamping position in which one end portion of the rigid member overlies the flange of the cable tray and is adapted for clamping engagement with the flange of the cable tray thereby to hold the rail in fixed position with respect to the support, or in a non-clamping position in which the opposite end portion of the rigid member overlies the flange of the cable tray but is not adapted for clamping engagement with the flange thereby to permit lengthwise thermal expansion and contraction of the rail while still holding the rail on the support. A first anti-spin structure is formed on said one end portion of the rigid member and configured to project inwardly into the slot and to engage the support at opposite sides of the slot when the rigid member is in its said clamping position thereby to prevent rotation of the rigid member relative to the support as the threaded fastener is rotated to secure the rigid member in its said clamping position. A second anti-spin structure is formed on said opposite end portion of the rigid member and configured to project inwardly into the slot and to engage the support at opposite sides of the slot when the rigid member is in its said non-clamping position thereby to prevent rotation of the rigid member relative to the support as the threaded fastener is rotated to secure the rigid member in its said non-clamping position.

Other objects and features will be in part apparent and in part pointed out hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective of a cable tray support system utilizing hold-down devices of the present invention;

FIG. 2 is an elevational view taken on line 2—2 of FIG. 1 showing one hold-down device mounted on a support bar in a clamping position and another hold-down device mounted on a support bar in a non-clamping position;

FIG. 3 is an enlarged plan view showing portions of FIG. 1;

FIG. 4 is an enlarged vertical section taken on line 4—4 of FIG. 2;

FIG. 5 is an enlarged vertical section taken on line 5—5 of FIG. 2;

FIG. 6 is an enlarged vertical section taken on line 6—6 of FIG. 2;

FIG. 7 is an enlarged vertical section taken on line 7—7 of FIG. 2;

FIG. 8 is an enlarged vertical section taken on line 8—8 of FIG. 3; and

FIG. 9 is an enlarged vertical section taken on line 9—9 of FIG. 3.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, and more particularly to FIG. 1, a support system of the present invention, indicated

generally by the reference numeral **11**, is shown supporting a run of cable tray indicated generally at **13**. As illustrated, the cable tray **13** is of the type comprising a pair of generally parallel side rails, each designated **15**, interconnected by a series of parallel, spaced apart cross members **17**. The cross-sectional sectional shape of the rails **15** will vary depending on the type of cable tray. For example, the cable tray **13** shown in the drawings has rails **15** formed from aluminum I beams, each having a vertical web **19** and upper and lower horizontal flanges indicated at **21** and **23**, respectively, extending laterally from the web on opposite sides of the web. The cable tray **13** is adapted to carry various types of conduit, for example, as indicated in phantom at C in FIGS. 2 and 3.

The support system **11** comprises a series of support bars, each generally indicated at **25**, adapted to be suspended (e.g., by rods R) at intervals spaced lengthwise of the cable tray **13** and with the support bars extending generally cross-wise relative to the rails **15** of the cable tray. The rods R suspend the support bars **25** in a manner similar to that shown in U.S. Pat. No. 5,100,086. As shown in FIG. 1, the support bars **25** lie in a single generally horizontal plane. However, it will be understood that the bars could lie in planes other than horizontal for supporting non-horizontal (e.g., vertical) runs of cable tray. Each support bar **25** is of generally U-shape in transverse section, the bar thereby having a bottom wall **27** and two opposing side walls, each designated **29**, extending up from the bottom wall and terminating in downwardly turned lips, each designated **31**, extending longitudinally of the bar and defining a slot S therebetween. As shown, the rails **15** of the cable tray **13** run transversely with respect to the support bars **25** and rest on the top surfaces of the bars **25** (i.e., on the tops of lips **31**).

A pair of hold-down members, each generally indicated at **33**, are provided for holding the two rails **15** of the cable tray **13** on each support bar **25**. Each hold-down member **33** comprises a rigid, generally rectangular member stamped from suitable sheet metal material (e.g., 12-ga. carbon or stainless steel, or aluminum, or plastic in certain situations, as where plastic cable tray is being installed). Each member **33** has opposite first and second side edges, designated **35**, **37**, respectively, opposite first and second side margins, designated **39**, **41**, respectively, spaced inwardly from and adjacent respective side edges **35**, **37**, and opposite first and second end portions designated **43**, **45**, respectively. Generally, each hold-down member **33** is configured to be placed on a support bar **25** in a position in which the first and second side margins **39**, **41** of the member bear on the lips **31** of the support bar **25** with the member overlying the slot S and with one end portion of the member overlying the lower flange **23** of the cable tray **13**.

A fastener opening **47** is provided in end portion **43** of the rigid member **33** for receiving a threaded fastener, e.g., a bolt **49**, which is insertable inwardly (downwardly as viewed in the drawings) through the opening and through the slots S of the support bar **25** for threaded engagement with a complementary opening **48** associated with the support bar. As illustrated in the drawings (e.g., FIGS. 8 and 9), this complementary opening is in a channel nut **51** disposed between the side walls **29** of the support bar immediately below its downwardly turned lids **31** (this nut may be of the type shown in co-assigned U.S. Pat. Nos. 5,054,978, 5,067,863 and 5,209,619 but without the disclosed nut retainer or "cage" structures). The arrangement is such that rotation of the bolt to tighten it brings the rigid member **33** and the nut **51** into clamping engagement with the lips **31** of the support bar **25** to secure the rigid member in fixed position on the

bar. It is to be understood that other methods of securing the hold-down member **33** to the support bar **25** may be employed. For example, the bolt **37** may be threaded into a complementary tapped hole (not shown) in the bottom wall **27** of the support bar **25**, or the bolt may be dimensioned to extend through a non-threaded clearance opening in the bottom wall for threaded engagement with a nut (not shown) on the underside of the support bar.

The first and second end portions **43**, **45** of each member **33** are offset as indicated at **53** in a stepped configuration relative to one another so that the end portions extend away from each other in substantially parallel but offset planes (see FIGS. 8 and 9). The arrangement is such that when the member **33** is secured to the support bar **25** with one end portion (e.g., end portion **45**) in engagement with the support bar, the other end portion (e.g., end portion **43**) is spaced outwardly from the support bar for bridging over a raised portion or bead **55** typically present on the lower flange **23** of the cable tray **13**. Preferably, the offset **53** is dimensioned so that the end portion (e.g., end portion **43**) clears the tallest bead **55** provided on standard cable tray while the other end portion (e.g., end portion **45**) is resting flat on the support bar.

The hold-down member **33** includes a clamping formation indicated generally at **57** for clamping engagement with the lower flange **23** of the rail **15**. As illustrated in FIGS. 4 and 5, the member **33** is shown as being mounted in what may be referred to as a clamping position in which end portion **43** overlies the lower flange **23** of the cable tray **13** and the clamping formation **57** is in clamping engagement with the flange of the cable tray, thereby holding the rail **15** of the cable tray in fixed position relative to the support bar. The clamping formation **57** is formed so that when the member **33** is in its clamping position, the clamping formation projects inwardly from the member for clamping engagement with the lower flange **23** inboard of the bead **55** of the flange. The clamping formation **57** shown in the embodiment of FIGS. 8 and 9 comprises a lip **59** extending downwardly at about a 45° angle relative to end portion **43** of the member. The lip has two spaced apart teeth, each designated **61**, located adjacent opposite side edges **35**, **37** of the rigid member **33** for biting into the flange **23** of the cable tray **13**. As illustrated in the drawings, the fastener opening **47** is provided in the same end portion **43** having the clamping formation **57** so that when the bolt **49** is tightened, the hold-down member **33** exerts a strong clamping force against the flange **23** of the rail **15**.

In accordance with this invention, the hold-down members **33** may also be selectively mounted on the support bar **25** in a non-clamping position (see FIGS. 6 and 7). In this position, the members **33** are not in clamping engagement with the rails **15** to permit free lengthwise thermal expansion and contraction of the rails relative to the support bar. When installed in a non-clamping position, a member **33** is inverted with respect to its clamping position so that its end portion **43** lies flat on the support bar and its end portion **45** extends over the lower flange **23** of the rail **15** (and the bead **55**) to hold the cable tray **13** on the support bar **25**. As mentioned earlier, the offset **53** located between the end portions **43**, **45** is preferably sufficient to enable the hold-down member **33** to clear (but only slightly) the bead **55** adjacent the outer edge of the lower flange **23**. It will be noted that end portion **45** of member **33** has no clamping formation thereon and is spaced above the lower flange of the rail, the design being such that the member functions to hold the cable tray on the support bar **25** while allowing the cable tray to expand and contract due to temperature changes.

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Each of the hold-down members **33** of the present invention is provided with first and second anti-spin structures generally indicated at **63**, **65**, respectively, for preventing rotation of the member relative to the support bar **25** as the bolt **49** is tightened to secure the member in either its clamping position or its non-clamping position. The first anti-spin structure **63** is formed on end portion **45** for preventing rotation of the hold-down member **33** when tightening it in its clamping position. As best illustrated in FIG. 5, the first anti-spin structure **63** comprises a first rib structure **67** on end portion **45** between side margins **39**, **41**. This rib structure **67** projects inwardly (downwardly) into the slot **S** of the support bar **25** and engages the lips **31** of the support bar when the hold-down member is in its clamping position to prevent rotation of the member relative to the support bar. Similarly, the second anti-spin structure **65** is formed on end portion **43** for preventing rotation of the member **33** when tightening it in its non-clamping position. The second anti-spin structure **65** comprises a second rib structure **69** on end portion **43** between side margins **39**, **41** as illustrated in FIG. 7. This rib structure **69** projects inwardly (downwardly) into the slot of the support bar **25** and engages the lips **31** of the support bar when the hold-down member **33** is in its non-clamping position to prevent rotation of the member relative to the support bar. As shown, the first and second rib structures **67**, **69** project in opposite directions from respective end portions **45**, **43** of the hold-down member.

Referring now to FIG. 5, it will be observed that rib structure **67** is generally channel shaped in cross section and has opposite side walls, each designated **71**, connected to each other by a horizontal connecting wall **73**. When the hold-down member **33** is in its clamping position, the side walls **71** are configured to engage the lips **31** of the support bar **25** at opposite sides of the slot **S** to prevent rotation of the member relative to the support bar when tightening the bolt **49**. Similarly, as shown in FIG. 7, rib structure **69** is generally channel shaped in cross section and has opposite side walls, each designated **75**, connected by connecting wall **79**. When the hold-down member **33** is in its non-clamping position, as shown, these side walls **75** are configured to engage the lips **31** of the support bar **25** at opposite sides of the slot **S** to prevent rotation of the member relative to the support bar.

The fastener opening **47** is formed in the connecting wall **77** of the second rib structure **69** and is surrounded by a boss **79** formed by upset metal projecting in the same direction as the first rib structure **67** a distance not substantially less than the height of the side walls **75** of the second rib structure **69** (that is, a distance which places the top of the boss **79** at a level not substantially below the top surfaces of the side edge margins **39**, **41**). The bolt **49** includes a head **81** which is adapted to bear on the boss **79** as the bolt is tightened in the non-clamping position. The boss **79** strengthens the area around the fastener opening and facilitates tightening of the bolt **49** by maintaining the head **81** of the bolt at an elevation where it is easily accessible and where it may be turned without substantial interference with the side walls **75**.

A drain hole **83** is provided in the connecting wall **77** of the second rib structure **69** immediately adjacent the offset **53** for preventing the build up of fluids in the hold-down member **33** when in its clamping position. This helps to avoid corrosion of the hold-down member.

It will be observed from the foregoing that the hold-down member **33** of the present invention has several important advantages. Member **33** is a "combination" hold-down device which may be selectively used in either a clamping

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or non-clamping mode. Further, the member **33** has an anti-spin feature to prevent the device from spinning relative to the support when the device is tightened on the support in its clamping or non-clamping positions. Moreover, the hold-down member has increased strength characteristics attributable to rib structures **67** and **69** and boss **79** for holding greater loads.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A hold-down device for holding a cable tray on a support, said support being of the type having opposing side walls terminating in edges defining a slot therebetween, and said cable tray being of the type having a pair of generally parallel rails with flanges extending lengthwise of the rails adapted to bear on said support with the flanges overlying said slot and extending generally transversely with respect to the slot, said hold-down device comprising

a rigid, generally rectangular member having opposite side edges, opposite side margins adjacent respective side edges, and opposite end portions, said rigid member being adapted to be placed on said support in a position in which said opposite side margins of the rigid member bear on the edges of the support with the rigid member overlying the slot adjacent a flange of said cable tray,

a fastener opening in [one] an end portion of the rigid member,

a threaded fastener insertable inwardly through said fastener opening and through the slot of the support for threaded engagement with a complementary threaded opening associated with the support, the arrangement being such that rotation of the fastener is adapted to fixedly secure the rigid member to the support,

said rigid member being selectively securable to the support by said fastener either in a clamping position in which one end portion of the rigid member overlies said flange of the cable tray and is adapted for clamping engagement with said flange of the cable tray thereby to hold the rail in fixed position with respect to the support, or in a non-clamping position in which the opposite end portion of the rigid member overlies said flange of the cable tray but is not adapted for clamping engagement with said flange thereby to permit lengthwise thermal expansion and contraction of the rail while still holding the rail on the support,

a first anti-spin structure on said [one] opposite end portion of the rigid member configured to project inwardly into the slot and to engage the support at opposite sides of the slot when the rigid member is in its said clamping position thereby to prevent rotation of the rigid member relative to the support as the threaded fastener is rotated to secure the rigid member in its said clamping position, and

a second anti-spin structure on said [opposite] one end portion of the rigid member configured to project inwardly into the slot and to engage the support at opposite sides of the slot when the rigid member is in its said non-clamping position thereby to prevent rotation of the rigid member relative to the support as the

threaded fastener is rotated to secure the rigid member in its said non-clamping position.

2. A hold-down device as set forth in claim 1 wherein said first anti-spin structure comprises a first rib structure on said [one] opposite end portion of the rigid member between the side margins of the rigid member, and wherein said second anti-spin structure comprises a second rib structure on said [opposite] one end portion of the rigid member between the side margins of the rigid member.

3. A hold-down device as set forth in claim 2 wherein said first and second rib structures project in opposite directions from respective end portions of the rigid member, and wherein said rigid member is invertible relative to the support between its said clamping and non-clamping positions.

4. A hold-down device as set forth in claim 2 wherein each rib structure is generally channel shaped in cross section to have opposite side walls and a connecting wall connecting the two side walls, said side walls of the rib structure being engageable with said support at opposite sides of the slot to prevent said rotation.

5. A hold-down device as set forth in claim 4 wherein said first and second rib structures project outwardly from the rigid member in opposite directions.

6. A hold-down device as set forth in claim 5 wherein said fastener opening is formed in the connecting wall of said second rib structure.

7. A hold-down device as set forth in claim 6 wherein said fastener opening is surrounded by a boss projecting in the same direction as the first rib structure a distance not substantially less than the height of the side walls of said second rib structure, said fastener having a head adapted to bear on said boss as the fastener is tightened in its said non-clamping position.

8. A hold-down device as set forth in claim 1 wherein said first and second end portions of the rigid member are offset in a stepped configuration relative to one another whereby when said rigid member is secured to the support with an end portion in engagement with said support, the other end portion is spaced outwardly from the support for bridging over a raised portion of said flange of the cable tray.

9. A hold-down device as set forth in claim 8 wherein said one end portion of the rigid member has a clamping formation thereon formed so that when the rigid member is in its said clamping position, said clamping formation projects inwardly from said rigid member for clamping engagement with said flange inboard of said raised portion of said flange.

10. A hold-down device as set forth in claim 9 wherein said clamping formation comprises a downwardly extending lip having at least two teeth formed therein.

11. A hold-down device as set forth in claim 9 wherein said fastener opening is formed in said one end portion having the clamping formation so that when the fastener is tightened, the rigid member exerts a strong clamping force against said flange.

12. A hold-down device for holding a cable tray on a support, said support being of the type having opposing side walls terminating in edges defining a slot therebetween, and said cable tray being of the type having a pair of generally parallel rails with flanges extending lengthwise of the rails adapted to bear on said support with and flanges overlying said slot and extending generally transversely with respect to the slot, said hold-down device comprising

a rigid, generally rectangular member having opposite side edges, opposite side margins adjacent respective side edges, and opposite end portions, said rigid member being adapted to be placed on said support in a

position in which said opposite side margins of the rigid member bear on the edges of the support with the rigid member overlying the slot adjacent a flange of said cable tray,

a fastener opening in an end portion of the rigid member, a thread fastener insertable inwardly through said fastener opening and through the slot of the support for threaded engagement with a complementary threaded opening associated with the support, the arrangement being such that rotation of the fastener is adapted to fixedly secure the rigid member to the support,

said rigid member being selectively securable to the support by said fastener either in a clamping position in which one end portion of the rigid member overlies said flange of the cable tray and is adapted for clamping engagement with said flange of the cable tray thereby to hold the rail in fixed position with respect to the support, or in a non-clamping position in which the opposite end portion of the rigid member overlies said flange of the cable tray but is not adapted for clamping engagement with said flange thereby to permit lengthwise thermal expansion and contraction of the rail while still holding the rail on the support, and

anti-spin structure on said opposite end portion of the rigid member configured to project inwardly into the slot and to engage the support at opposite sides of the slot when the rigid member is in its said clamping position thereby to prevent rotation of the rigid member relative to the support as the threaded fastener is rotated to secure the rigid member in its said clamping position, said anti-spin structure comprising a rib structure on said opposite end portion of the rigid member between the side margins of the rigid member, said rib structure being generally channel shaped in cross section to have opposite side walls and a connecting wall connecting the two side walls, said side walls of the rib structure being engageable with said support at opposite sides of the slot to prevent said rotation.

13. A hold-down device as set forth in claim 12 wherein said fastener opening is formed in said one end portion of the rigid member.

14. A hold-down device as set forth in claim 13 wherein said opposite end portions of the rigid member are offset in a stepped configuration relative to one another whereby when said rigid member is secured to the support with an end portion in engagement with said support, the other end portion is spaced outwardly from the support for bridging over a raised portion of said flange of the cable tray.

15. A hold-down device as set forth in claim 14 wherein said one end portion of the rigid member has a clamping formation thereon formed so that when the rigid member is in its said clamping position, said clamping formation projects inwardly from said rigid member for clamping engagement with said flange inboard of said raised portion of said flange.

16. A hold-down device as set forth in claim 15 wherein said clamping formation comprises a downwardly extending lip having at least two teeth formed therein.

17. A hold-down device as set forth in claim 16 wherein said fastener opening is formed in said one end portion having the clamping formation so that when the fastener is tightened, the rigid member exerts a strong clamping force against said flange.