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(54) CONSTRUCTION CLIP FOR JOINING STRUCTURAL INFRASTRUCTURE

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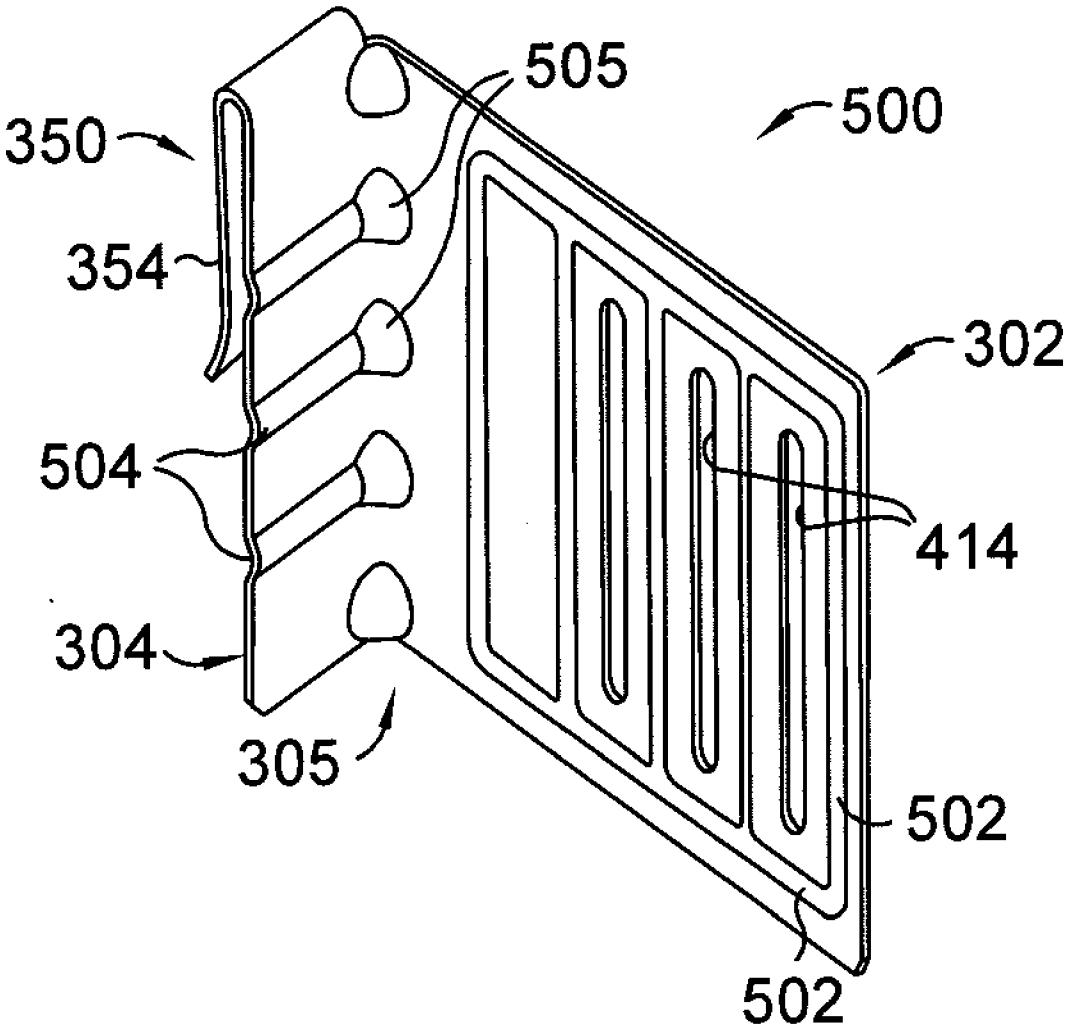
(52) **U.S. Cl.** **52/712**

(57) **ABSTRACT**

Devices for joining structural infrastructure and methods of making and using such devices are set forth herein. According to one embodiment, a device for joining structural infrastructure includes first and second flanges and a clip extending from the second flange away from the first flange. The first flange is adapted to be fastened to a first building support member using at least one fastener, and the second flange extends generally perpendicular from the first flange. The clip has an upper end and a wall; the clip upper end couples the clip wall to the second flange. The clip is adapted to secure the device to a second building support member by maintaining a portion of the second building support member between the clip wall and the second flange.



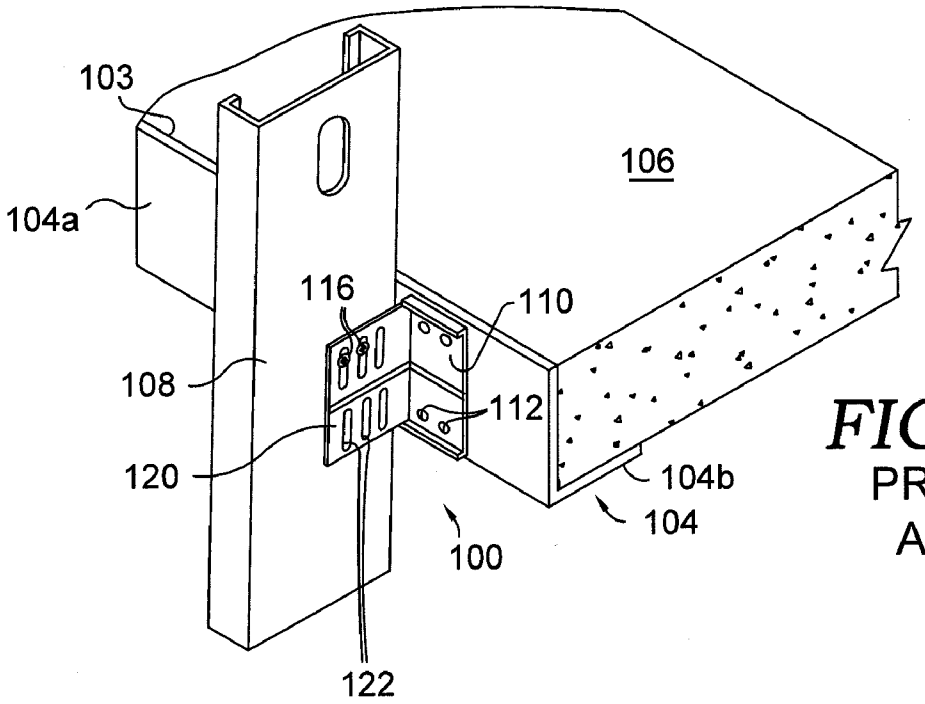


FIG. 1.
PRIOR
ART

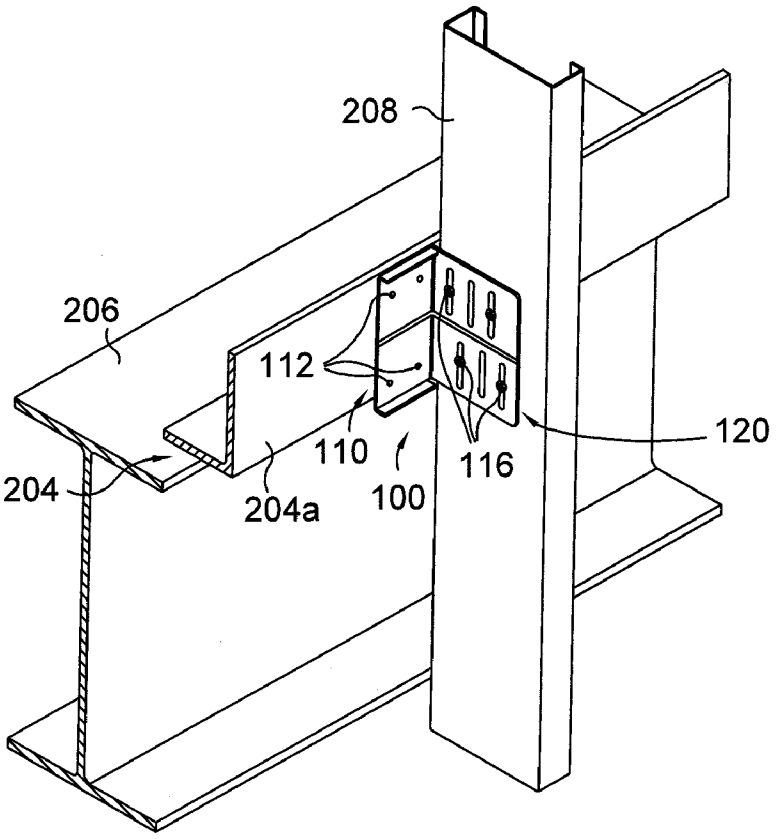


FIG. 2a.
PRIOR
ART

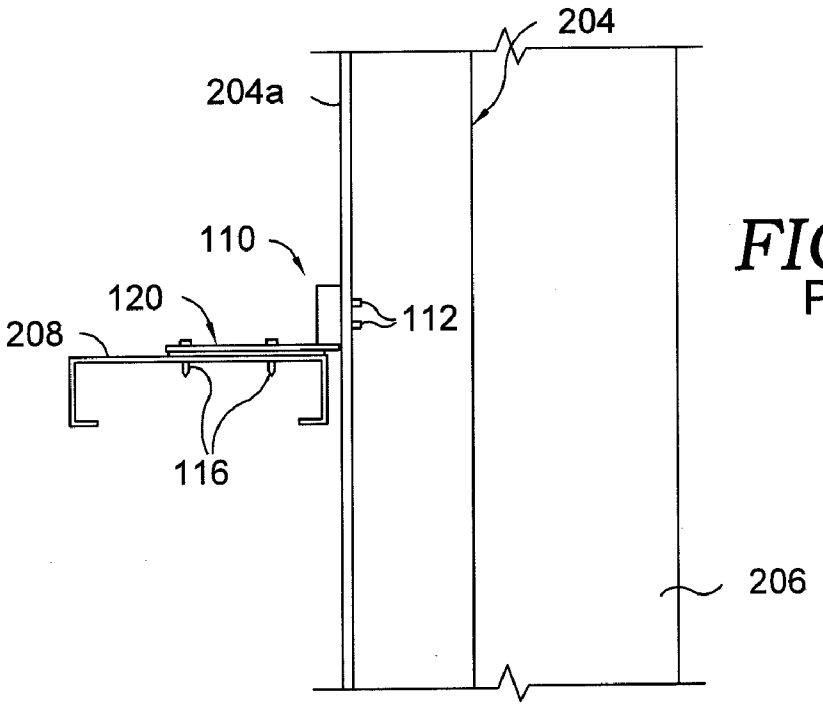


FIG. 2b.
PRIOR
ART

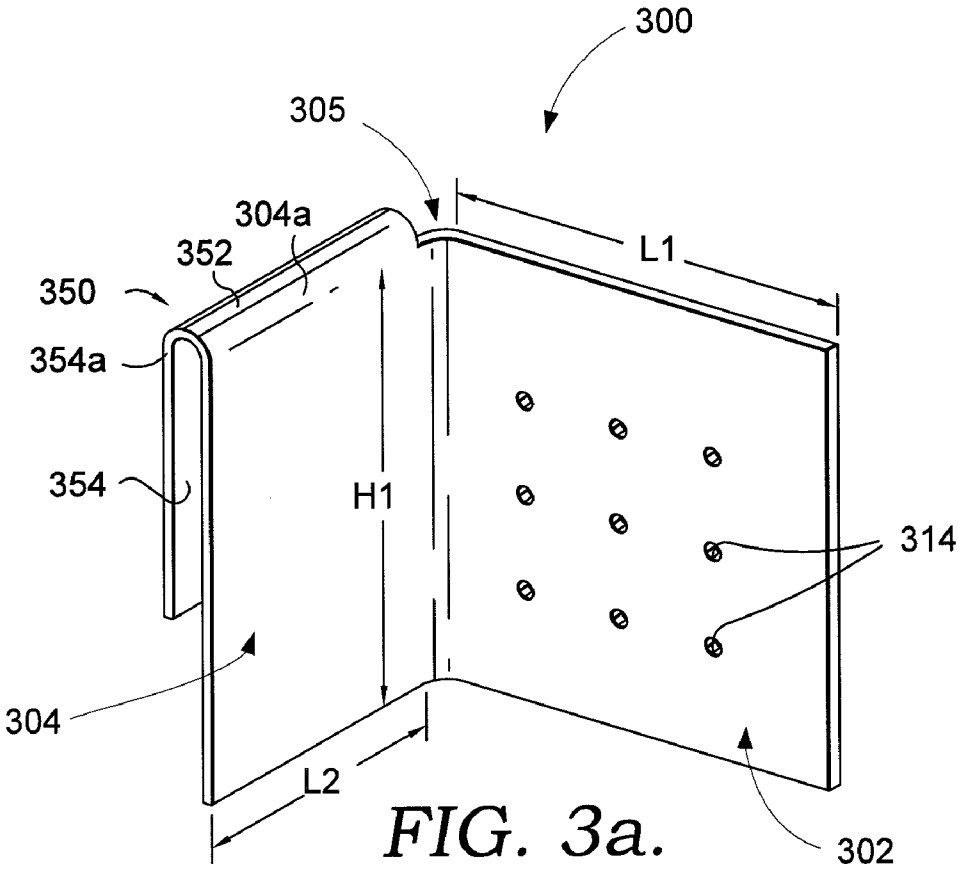


FIG. 3a.

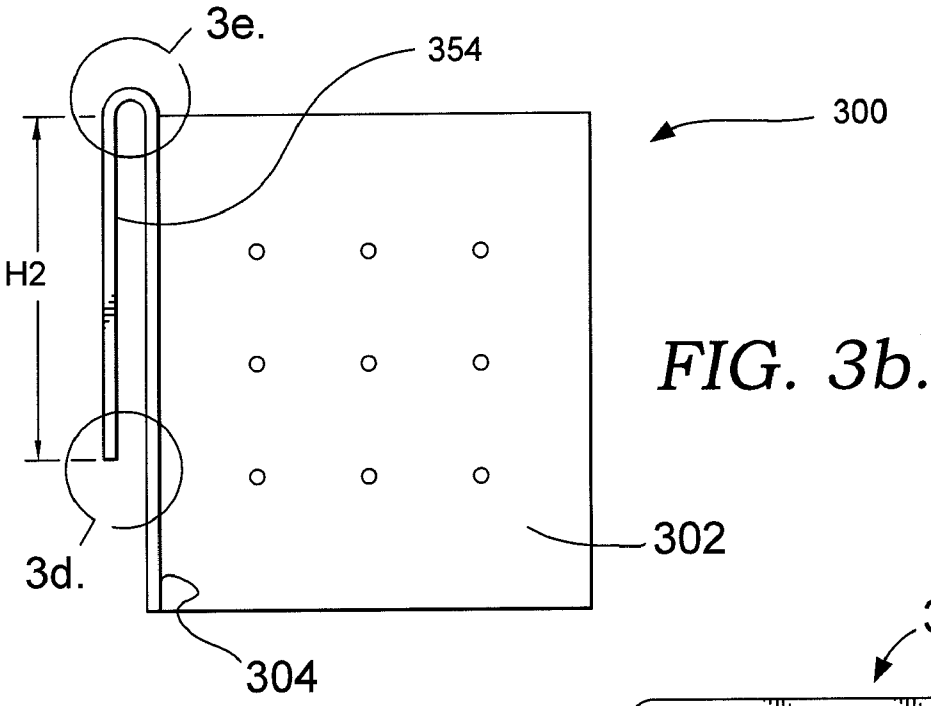


FIG. 3b.

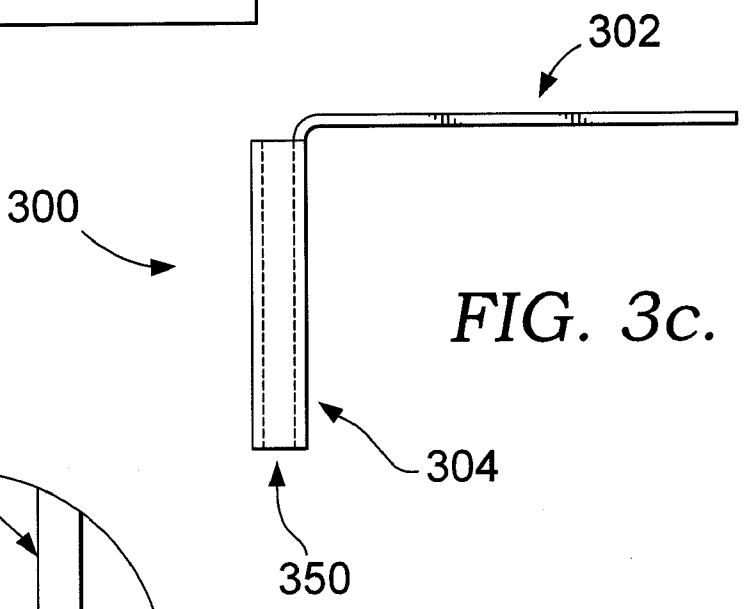


FIG. 3c.

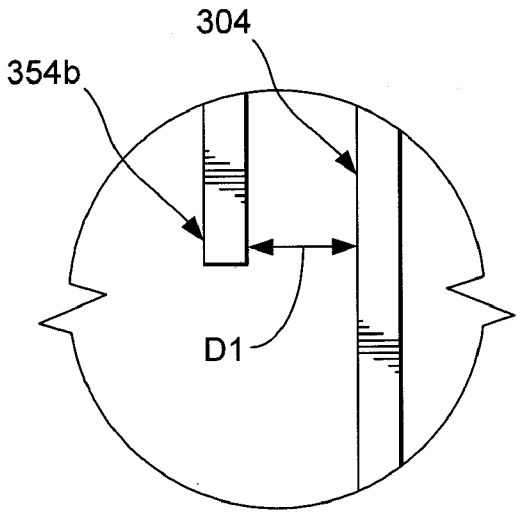


FIG. 3d.

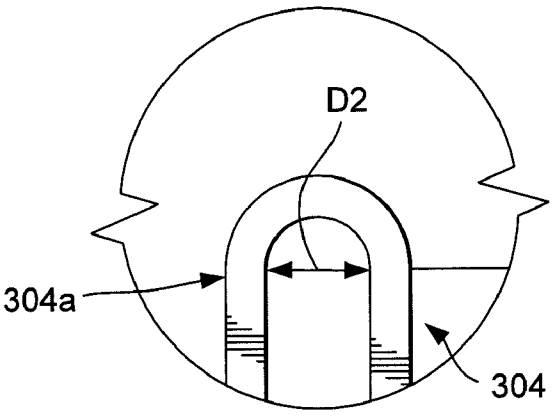


FIG. 3e.

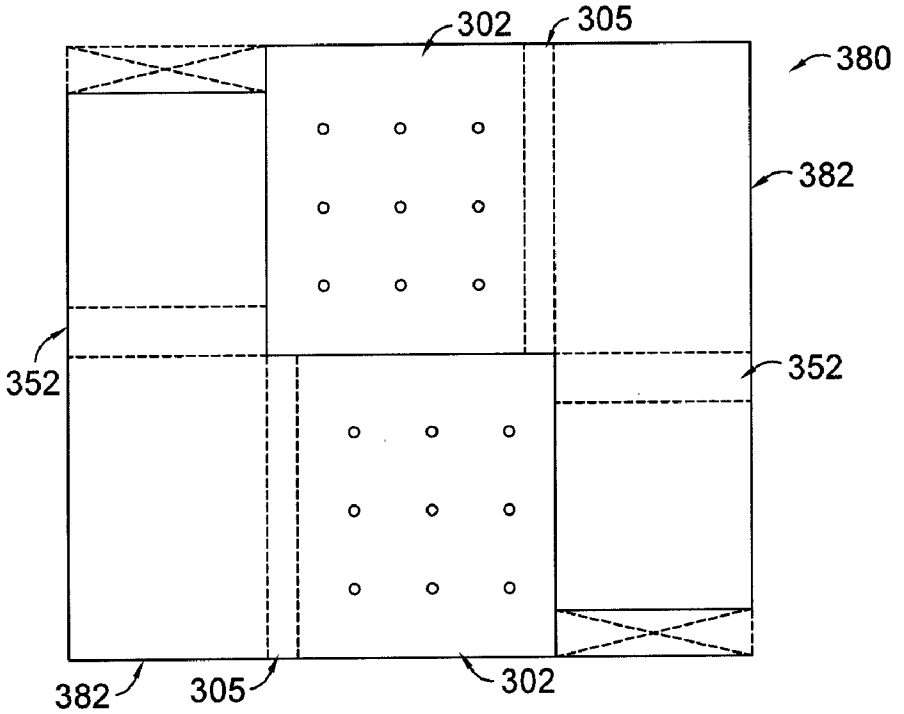


FIG. 3f.

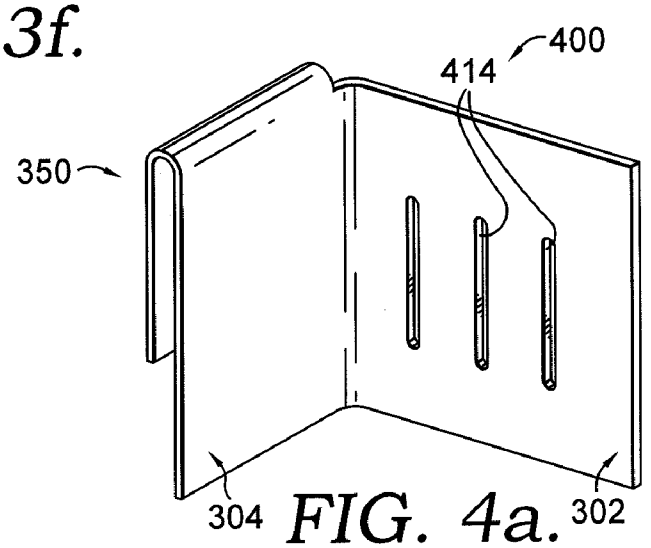


FIG. 4a.

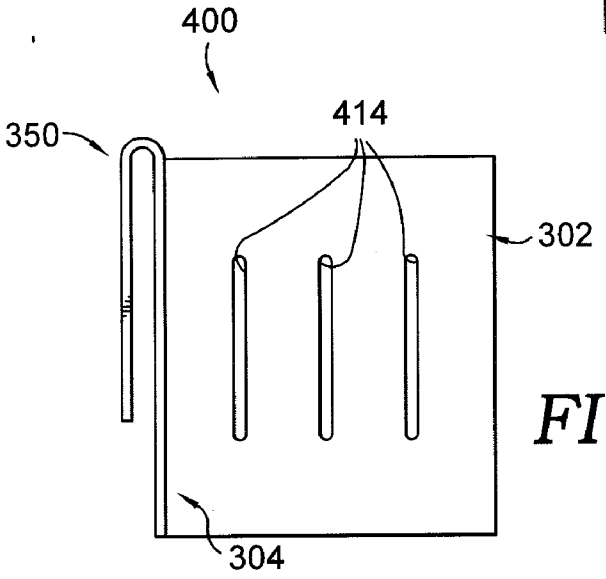


FIG. 4b.

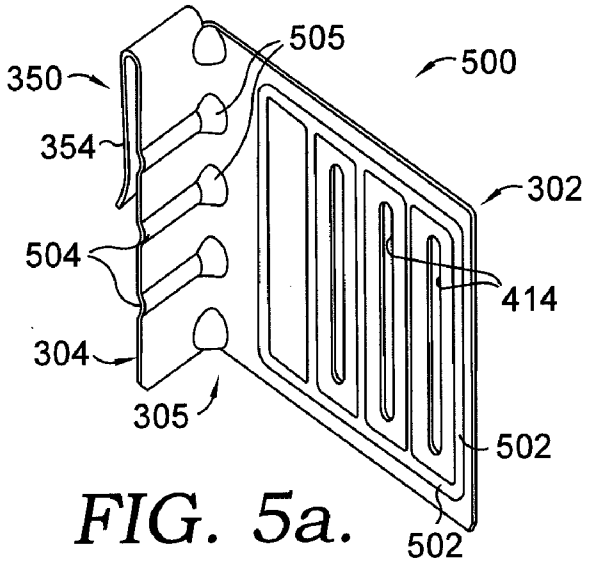


FIG. 5a.

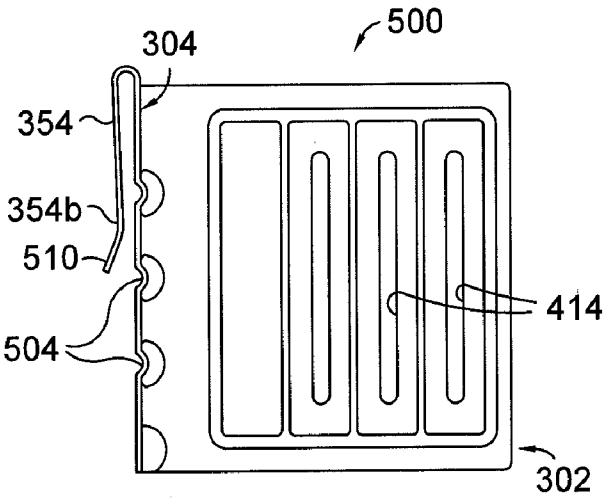


FIG. 5b.

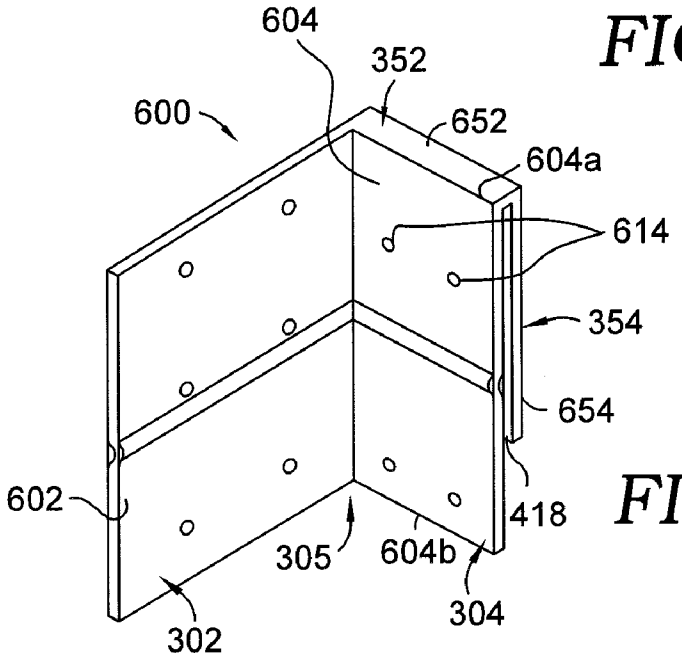


FIG. 6.

CONSTRUCTION CLIP FOR JOINING STRUCTURAL INFRASTRUCTURE

RELATED APPLICATIONS

[0001] This application claims priority to provisional U.S. Patent Application Ser. No. 61/026,655, filed Feb. 6, 2008, the disclosure of which is incorporated herein by reference.

BACKGROUND

[0002] The present invention relates generally to clips used in construction, and particularly to clips used in constructing buildings (e.g., commercial buildings, government buildings, residential buildings, etc.) to permanently couple structural infrastructure together.

SUMMARY

[0003] According to one embodiment, a device for joining structural infrastructure includes first and second flanges and a clip extending from the second flange away from the first flange. The first flange is adapted to be fastened to a first building support member using at least one fastener, and the second flange extends generally perpendicular from the first flange. The clip has an upper end and a wall; the clip upper end couples the clip wall to the second flange. The clip is adapted to secure the device to a second building support member by maintaining a portion of the second building support member between the clip wall and the second flange.

[0004] According to another embodiment, a device for joining structural infrastructure includes first and second flanges and a clip extending from the second flange away from the first flange. The first flange is generally planar and has at least one aperture for use in coupling the first flange to a first piece of structural infrastructure. The second flange extends generally perpendicular from the first flange. The clip has an upper end and a wall; the clip upper end couples the clip wall to the second flange. The clip wall is separated from the second flange to allow at least a portion of a second piece of structural infrastructure to be positioned between the second flange and the clip wall, so that placing the second piece of structural infrastructure between the second flange and the clip wall couples the device to the second piece of structural infrastructure and causes the second flange to be situated generally vertically.

[0005] According to yet another embodiment, a device for joining structural infrastructure includes first and second flanges and a clip extending from the second flange away from the first flange. The first flange is generally planar and has at least one aperture for use in coupling the first flange to a first piece of structural infrastructure. The second flange extends generally perpendicular from the first flange. The clip has an upper end and a wall; the clip upper end couples the clip wall to the second flange. The clip is adapted to secure the device to a second piece of structural infrastructure by maintaining a portion of the second piece of structural infrastructure between the clip wall and the second flange in a friction fit.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0006] Illustrative embodiments of the present invention are described in detail below with reference to the attached drawing figures, which are incorporated by reference herein and wherein:

[0007] FIG. **1** shows a perspective view of a PRIOR ART device in use;

[0008] FIG. **2***a* shows a perspective view of the PRIOR ART device shown in FIG. **1** when used in a different orientation;

[0009] FIG. **2***b* is a top view of FIG. **2***a;*

[0010] FIG. **3***a* shows a perspective view of one embodiment of the disclosed construction clip;

[0011] FIG. **3***b* shows a front view of the construction clip of FIG. **3***a;*

[0012] FIG. **3***c* shows a top view of the construction clip of FIG. **3***a;*

[0013] FIG. **3***d* is a sectional view taken from FIG. **3***b;*

[0014] FIG. **3***e* is a sectional view taken from FIG. **3***b;*

[0015] FIG. **3***f* illustrates part of a process of creating the construction clip of FIG. **3***a;*

[0016] FIG. **4***a* shows a perspective view of another embodiment of the disclosed construction clip;

[0017] FIG. **4***b* shows a front view of the construction clip of FIG. **4***a;*

[0018] FIG. **5***a* shows a perspective view of still another embodiment of the disclosed construction clip;

[0019] FIG. **5***b* shows a front view of the construction clip of FIG. **5***a*; and

[0020] FIG. **6** shows a perspective view of yet another embodiment of the disclosed construction clip.

DETAILED DESCRIPTION

[0021] Embodiments of the present invention provide devices and methods for use in the connection of studs, angle iron, and other structural infrastructure in the construction of buildings.

[0022] FIG. **1** shows a conventional (prior art) device **100** that is mounted on an outside vertical wall **104***a* of an angle iron support structure **104** supporting a horizontal building structure **106**. A horizontal wall **104***b* of angle iron **104** is shown as being underneath the structure **106**. Device **100** includes a small flange **110** which receives a plurality of fasteners **112** to rigidly secure device **100** to angle iron wall **104***a*. Typically, fasteners **112** are ½ inch ram-set powder-driven pins. Larger flange **120** is slidingly fixed to stud **108** using a plurality of screws **116**. Screws **116** are received in a plurality of slots **122** defined in the larger flange **120**, and interaction between the screws **116** and slots **122** allows slideable movement vertically but not horizontally. As those skilled in the art will know, vertical movement allowed by slots **118** is useful to enable structures to endure relative vertical movement (e.g., movement due to earthquakes, settling, etc.) without failing.

[0023] FIGS. **2***a* and **2***b* show the conventional device **100** used in a different orientation. As will be apparent by comparing FIGS. **2***a* and **2***b* to FIG. **1**, a stud **208** is oriented in a different way than stud **108**. Because of this, the components of device **100** in FIGS. **2***a* and **2***b* appear as a mirror image to FIG. **1**. Apart from stud **208** being oriented differently than stud **108**, an angle iron support structure **204** (generally similar to angle iron support structure **104**) is atop an I-beam **206**. The small flange **110** is secured to vertical wall **204***a* of the angle iron **204** by fasteners **112**, as set forth above regarding the angle iron wall **104***a*, and the larger flange **120** is secured to the stud **208** by screws **116**, as set forth above regarding stud **108**.

[0024] A first embodiment of the disclosed device for joining structural infrastructure (also referred to herein as a "con-

struction clip") is shown in FIGS. **3***a* through **3***e*. Referring to the figures, a construction clip **300** includes a generally planar first flange **302**, which, in some embodiments, will be fastened to a first piece of structural infrastructure (e.g., a stud oriented similar to stud **208** shown in FIG. **2***a*) through holes **314** using fasteners (e.g., screws, bolts, etc.). An electrically driven device may be used to drive the fasteners. Alternatively, the flange **302** could be welded or adhered to the first piece of structural infrastructure.

[0025] A second flange **304** of the device **300** exists in a substantially perpendicular plane to the first flange **302**, and the flanges **302**, **304** meet at a corner **305** that extends generally vertically. While various configurations may be utilized, in some embodiments the flanges **302**, **304** have generally equal heights and the first flange **302** is longer than (e.g., at least twice as long as) the second flange **304**. The length of the first flange **302** is denoted L**1** and the length of the second flange **304** is denoted L**2** in FIG. **3***a*. As discussed in additional detail below, the second flange **304** may be void of apertures (i.e., holes, slots, etc.) for use with fasteners.

[0026] A clip **350** extends from the second flange **304** away from the first flange **302**. The clip **350** has an upper end **352** and a wall **354**, and the clip upper end **352** may couple the clip wall **354** to the second flange **304**. For example, the clip upper end **352** may extend from an upper end **304***a* of the second flange **304** to an upper end **354***a* of the clip wall **354**. The clip **350** is configured to fit over a vertical portion of a second piece of structural infrastructure (e.g., vertical wall **204***a* of angle iron shown in FIG. **2***a*) and secure the device **300** to the second piece of structural infrastructure by maintaining a portion of the second piece of structural infrastructure between the clip wall **354** and the second flange **304**. As such, the clip wall **354** is separated from the second flange **304** at least a sufficient distance to allow a portion of the second piece of structural infrastructure to be located between the second flange **304** and the clip wall **354**.

[0027] The clip **350** may be configured to cause a friction fit when the second piece of structural infrastructure is between the clip wall **354** and the second flange **304**. For example, the clip wall **354** may be spaced apart from the second flange **304** a distance approximately equal to or slightly less than the thickness of the second piece of structural infrastructure that will be located therebetween. The interaction between the device **300** (i.e., the clip wall **354** and the second flange **304**) and the second piece of structural infrastructure, with or without a friction fit present, may be configured to allow the second piece of structural infrastructure to move laterally relative to the device **300** after the second piece of structural infrastructure is between the clip wall **354** and the second flange **304**. This lateral movement may be useful to enable structures to endure relative lateral movement (e.g., movement due to wind, earthquakes, etc.) without failing.

[0028] As shown in FIG. **3***b*, the clip wall **354** of the device **300** is generally planar and extends generally parallel to the second flange **304** (e.g., less than thirty degrees from vertical). In some embodiments, the clip wall **354** extends within ten degrees of being parallel to the second flange **304**. It may be desirable for a lower end **354***b* of the clip wall **354** to extend toward (instead of away from) the second flange **304** if the clip wall **354** is not parallel to the second flange **304**. In other words, with reference to FIGS. **3***d* and **3***e*, it may be desirable for a distance denoted D**1** between the clip wall lower end **354***b* and the second flange **304** to be less than or equal to a distance denoted D**2** between the clip wall upper end **354***a* and the second flange **304**.

[0029] Returning to FIGS. **3***a* and **3***b*, the second flange **304** has a height denoted H**1**, the clip wall **354** has a height denoted H**2**, and it may be desirable for the height H**2** to be at least one fourth as tall as the height H**1**. In the embodiment shown in FIGS. **3***a* through **3***e*, the height H**2** is over half as tall as the height H**1**.

[0030] While the device **300** may be made using various processes, FIG. **3***f* shows a piece of metal **380** that has been cut (i.e., along the solid lines, by a punch, saw, etc.) into two blanks **382**, and holes **314** have been added (e.g., through a punch process, a drill process, etc.). Waste material is labeled **384** in FIG. **3***f*. After being cut, each blank **382** may then be bent (i.e., along the dashed lines) to form the corner **305** and the clip upper end **352**.

[0031] In one method of use, the clip **350** is placed over a vertical portion of a second piece of structural infrastructure (e.g., vertical wall **204***a* of angle iron shown in FIG. **2***a*) so that a portion of the second piece of structural infrastructure is between the clip wall **354** and the second flange **304** and the second flange **304** is generally vertical. The first piece of structural infrastructure (e.g., a stud oriented similar to stud **208** shown in FIG. **2***a*) may be moved adjacent to the first flange **302**, either before or after the device **300** is attached to the second piece of structural infrastructure, and fasteners may be inserted through holes **314** to couple the first flange **302** to the first piece of structural infrastructure. It may be advantageous to couple the device **300** to the second piece of structural infrastructure before coupling the device **300** to the first piece of structural infrastructure, as coupling the second piece of structural infrastructure to the device **300** does not require the use of fasteners, can be done relatively quickly and with relatively little effort, and can easily align the device **300** (i.e., so that the second flange **304** and the corner **305** are generally vertical). Further, if the second piece of structural infrastructure is coupled to the device **300** first, the user does not have to manually hold the device **300** while inserting a screw or other fastener through the device **300**, which is an advantage over the prior art.

[0032] FIGS. **4***a* and **4***b* show another embodiment of the disclosed construction clip. Referring to the figures, a construction clip **400** is generally similar to the construction clip **300**, except for as set forth herein, shown in the drawings, and/or inherent. Elements of the construction clip **400** that are specifically discussed as being different from those of the construction clip **300** may have reference numbers between **400** and **499**; common elements/features may be referred to herein and in the drawings by the same reference numbers set forth above. In construction clip **400**, the holes **314** have been replaced by generally vertical slots **414**. The slots **414** may allow the fasteners coupling the first flange **302** to the first piece of structural infrastructure to move vertically, which in turn may allow the first piece of structural infrastructure to move vertically relative to the construction clip **400**. It should be appreciated that, while not shown, slots **414** and holes **314** may both be included.

[0033] FIGS. **5***a* and **5***b* show another embodiment of the disclosed construction clip. Referring to the figures, a construction clip **500** is generally similar to the construction clip **400**, except for as set forth herein, shown in the drawings, and/or inherent. Elements of the construction clip **500** that are specifically discussed as being different from those of the

construction clip **300** or the construction clip **400** may have reference numbers between **500** and **599**; common elements/features may be referred to herein and in the drawings by the same reference numbers set forth above.

[0034] The first flange **302** in the device **500** includes channels **502** that may be stamped or otherwise formed in the first flange **302** to increase the strength of the first flange **302**, and the second flange **304** and the corner **305** similarly include reinforcing channels **504**, **505**. By including channels **502**, **504**, and/or **505**, it may be possible to utilize lighter gauge or different materials than would otherwise be appropriate.

[0035] While the clip wall **354** is shown to be parallel to the second flange **304** in FIGS. **3***a* and **3***b*, the lower end **354***b* of the clip wall **354** in the device **500** extends toward (instead of away from) the second flange **304** and a flared portion **510** is included that extends away from the second flange **304**. The angling of the clip wall **354** in the device **500** may provide a friction fit when in use (as discussed above regarding device **300**), and the flared portion **510** may ease insertion of a vertical portion of a second piece of structural infrastructure (e.g., vertical wall **204***a* of angle iron shown in FIG. **2***a*) between the clip wall **354** and the second flange **304**.

[0036] FIG. **6** shows another embodiment of the disclosed construction clip. Referring to the figure, a construction clip **600** is generally similar to the construction clip **300**, except for as set forth herein, shown in the drawings, and/or inherent. Elements of the construction clip **600** that are specifically discussed as being different from those of the construction clip **300** may have reference numbers between **600** and **699**; common elements/features may be referred to herein and in the drawings by the same reference numbers set forth above.

[0037] The construction clip **600** differs from the construction clip **300** in three main ways: construction, orientation, and holes in the second flange. First, instead of bending a piece of material (e.g., a blank **382**) to form the corner **305** and the clip upper end **352** (as in the construction clip **300**), the device **600** is formed by coupling separate members together. More particularly, in the device **600**, the first flange **302**, the second flange **304**, the clip upper end **352**, and the clip wall **354** are separate plates **602**, **604**, **652**, **654** welded together. Though not shown, various embodiments may include a mixture of bends (as in the device **300**) and welding (as in the device **600**); for example, the corner **305** may be formed by bending, the clip upper end **352** may be welded to the second flange **304** and the clip wall **354**, etc.

[0038] Second, as can be seen by comparing FIG. **6** to FIG. **3***a*, the device **600** is oriented as a mirror image of the device **300**; the first flange **302** in the device **300** is at a right-hand side of the corner **305** in FIG. **3***a* and at a left-hand side of the corner **305** in FIG. **6**. This mirror orientation may be useful in coupling a first piece of structural infrastructure oriented similar to stud **108** in FIG. **1** to a second piece of structural infrastructure oriented similar to outside vertical wall **104***a* in FIG. **1** and outside vertical wall **204***a* in FIG. **2***a*. To obtain this mirror orientation in the device **300**, the first flange **302** and the clip **350** may be bent in opposite directions relative to the second flange **304** from the embodiment shown in FIG. **3***a*. To obtain an opposite orientation than that shown for the device **600**, the clip upper end **352** (i.e., the plate **652**) may be welded to the opposite end of the second flange **304** (i.e., onto end **604***b* instead of end **604***a*).

[0039] Third, the second flange **304** in the device **600** includes holes **614** that may be used for securing the second flange **304** to a piece of structural infrastructure (e.g., using fasteners after the piece of structural infrastructure is positioned between the second flange **304** and the clip wall **354**). But, as discussed above in relation to the device **300**, it may be disadvantageous and/or unnecessary to secure the second flange **304** to the piece of structural infrastructure using fasteners.

[0040] Many different arrangements of the various components depicted, as well as components not shown, are possible without departing from the spirit and scope of the present invention. Embodiments of the present invention have been described with the intent to be illustrative rather than restrictive. Alternative embodiments will become apparent to those skilled in the art that do not depart from its scope. A skilled artisan may develop alternative means of implementing the aforementioned improvements without departing from the scope of the present invention.

[0041] It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations and are contemplated within the scope of the claims. Not all steps listed in the various figures need be carried out or carried out in the specific order described.

The invention claimed is:

1. A device for joining structural infrastructure, comprising:

a first flange adapted to be fastened to a first building support member using at least one fastener;

a second flange extending generally perpendicular from the first flange; and

a clip extending from the second flange away from the first flange, the clip having an upper end and a wall, the clip upper end coupling the clip wall to the second flange, the clip being adapted to secure the device to a second building support member by maintaining a portion of the second building support member between the clip wall and the second flange.

2. The device of claim **1**, wherein:

the clip wall is generally planar and extends within ten degrees of being parallel to the second flange;

the clip wall has upper and lower ends;

the clip wall lower end is a distance D**1** from the second flange;

the clip wall upper end is a distance D**2** from the second flange; and

the distance D**1** is not greater than the distance D**2**.

3. The device of claim **2**, wherein the clip includes a flared portion extending from the clip wall lower end away from the second flange.

4. The device of claim **2**, wherein:

the first and second flanges meet at a corner extending generally vertically;

the first flange extends a length L**1** from the corner;

the second flange extends a length L**2** from the corner;

the length L**1** is at least twice as long as the length L**2**;

the second flange has a height H**1**;

the clip wall has a height H**2**; and

the height H**2** is at least one fourth as tall as the height H**1**.

5. The device of claim **4**, wherein a piece of metal is bent to form the corner and bent to form the clip upper end.

6. The device of claim **1**, wherein:

the first and second flanges meet at a corner extending generally vertically;

the first flange extends a length L**1** from the corner;

the second flange extends a length L**2** from the corner;

the length L1 is at least twice as long as the length L2;
the second flange has a height H1;
the clip wall has a height H2; and
the height H2 is at least one fourth as tall as the height H1.

7. The device of claim 6, wherein a piece of metal is bent to form the corner and bent to form the clip upper end.

8. The device of claim 1, wherein:
the clip wall has upper and lower ends;
a point along the clip wall is a distance D from the second flange;
the clip wall upper end is a distance D2 from the second flange; and
the distance D is less than the distance D2.

9. A device for joining structural infrastructure, comprising:
a first flange being generally planar and having at least one aperture for use in coupling the first flange to a first piece of structural infrastructure;
a second flange extending generally perpendicular from the first flange; and
a clip extending from the second flange away from the first flange, the clip having an upper end and a wall, the clip wall being separated from the second flange to allow at least a portion of a second piece of structural infrastructure to be positioned between the second flange and the clip wall, the clip upper end coupling the clip wall to the second flange, wherein placing the second piece of structural infrastructure between the second flange and the clip wall couples the device to the second piece of structural infrastructure and causes the second flange to be situated generally vertically.

10. The device of claim 9, wherein:
the first and second flanges meet at a corner extending generally vertically;
the first flange extends a length L1 from the corner;
the second flange extends a length L2 from the corner; and
the length L1 is at least twice as long as the length L2.

11. The device of claim 10, wherein:
the second flange has a height H1;
the clip wall has a height H2; and
the height H2 is at least one fourth as tall as the height H1.

12. The device of claim 11, wherein a piece of metal is bent to form the corner and bent to form the clip upper end.

13. The device of claim 9, wherein:
the clip wall extends within ten degrees of being parallel to the second flange;
the clip wall has upper and lower ends;
the clip wall lower end is a distance D1 from the second flange;
the clip wall upper end is a distance D2 from the second flange; and
the distance D1 is not greater than the distance D2.

14. The device of claim 13, wherein the clip includes a flared portion extending from the clip wall lower end away from the second flange.

15. The device of claim 9, wherein the at least one aperture in the first flange is a generally vertical slot.

16. A device for joining structural infrastructure, comprising:
a first flange being generally planar and having at least one aperture for use in coupling the first flange to a first piece of structural infrastructure;
a second flange extending generally perpendicular from the first flange; and
a clip extending from the second flange away from the first flange, the clip having an upper end and a wall, the clip upper end coupling the clip wall to the second flange, the clip being adapted to secure the device to a second piece of structural infrastructure by maintaining a portion of the second piece of structural infrastructure between the clip wall and the second flange in a friction fit.

17. The device of claim 16, wherein the friction fit allows the second piece of structural infrastructure to move laterally relative to the clip after the portion of the second piece of structural infrastructure is between the clip wall and the second flange.

18. The device of claim 16, wherein a piece of metal is bent to form the clip upper end.

19. The device of claim 16, wherein the second flange does not include an aperture for use in coupling the second flange to the second piece of structural infrastructure.

20. The device of claim 16, wherein:
the second flange has an upper end; and
the clip upper end extends from the flange upper end.

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