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STRUCTURAL SHAPE CONNECTOR

Filed Dec. 22, 1966

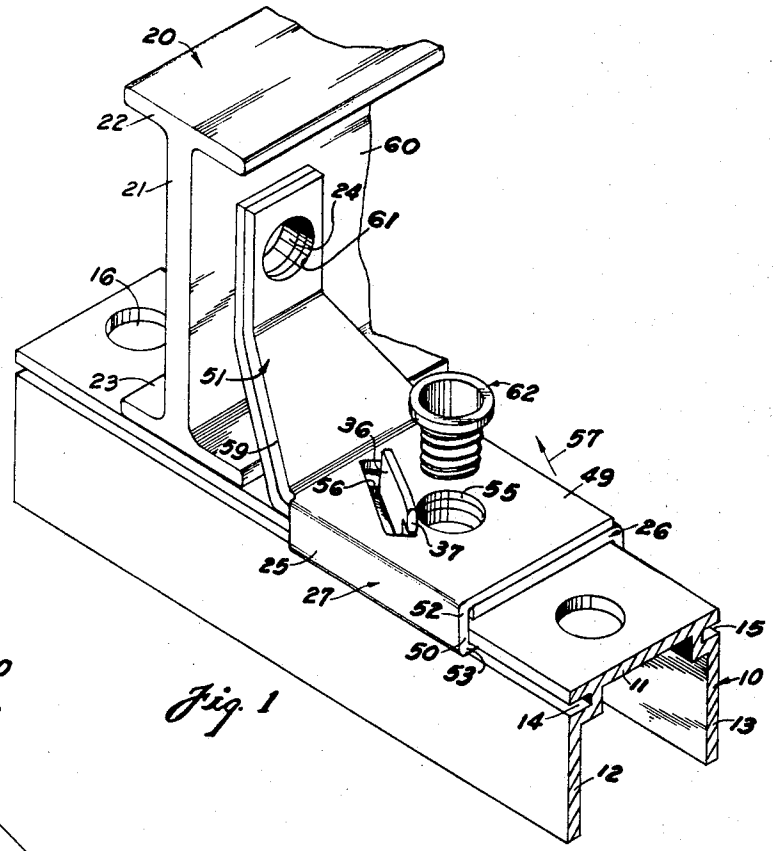

Fig. 1

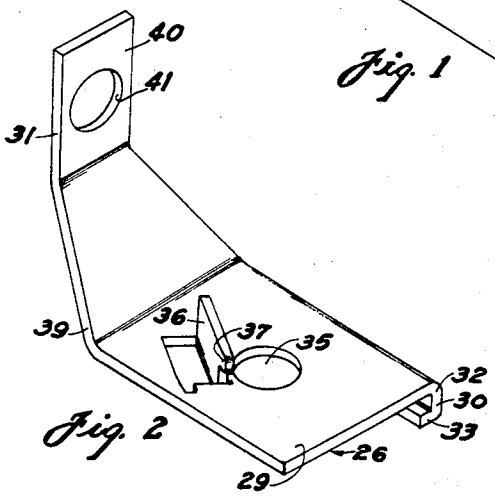

Fig. 2

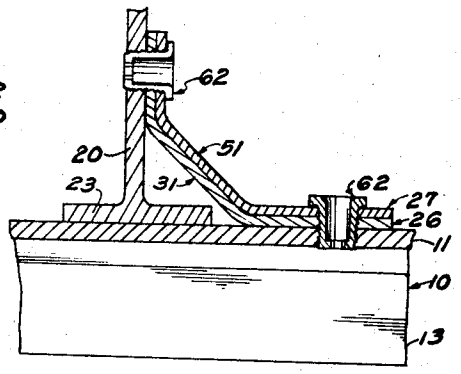

Fig. 3

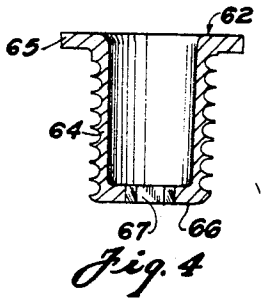

Fig. 4

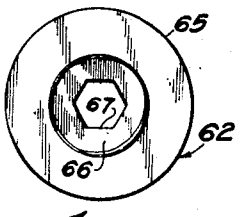

Fig. 5

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STRUCTURAL SHAPE CONNECTOR

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ABSTRACT OF THE DISCLOSURE

A structural shape connector of the type utilized to connect the joist of a floor to the sill. The connector is formed of two parts that are placed in side by side relationship, includes flanges that grip a corresponding groove in the sill structure, and a sloped, upwardly extending stem which is connectable to the web of an I-beam joist. A resilient fastener attaches the connector to the sill and floor joist. The fastener is constructed of spring steel and defines a hexagonal through bore and external threads so that it can be threaded into an aperture defined in a structural shape from the remote side of the shape.

In building construction, it is common practice to place floor or ceiling joists on the upper surface of a sill or similar structural shape so that the weight of the floor is transmitted downwardly through the joist onto the upper surface of the sill. Since most of the force exerted from the floor is exerted downwardly from the floor, through the joist to the sill, the forces exerted by the joists to the sill are primarily compressive forces. In ceiling construction, the sill structure also primarily encounters compressive forces from the joists; however, forces exerted on the sides of the building by wind, and expansion and contraction of the building cause some working movement of the structural supports of the building so that some sliding or shearing or twisting motion between the building support elements is encountered. Thus, it is desirable to have the joists connected to the sill or other support structure in such a manner that relative movement therebetween is resisted. However, since the primary force encountered between these elements is primarily compressive force, the connection between these elements to resist the remaining forces need not be as strong.

Accordingly, it is an object of this invention to provide a structural shape connector for connecting joists and the like to sills which resists relative movement between these elements.

Another object of this invention is to provide a connector having interlocking parts for interconnection between the sill and joist elements of a building.

Another object of this invention is to provide a connector for the sill and joist elements of a building wherein the movement of the joist with regard to the sill is resisted.

Another object of this invention is to provide a fastener for connecting structural shapes together, wherein the fastener is resilient and compensates for the movement between the structural shapes.

Another object of this invention is to provide a convenient, economical and firm connection between a joist and its support surface in a building.

Other objects, features and advantages of the present invention will become apparent upon reading the following specification, taken in conjunction with the accompanying drawing, in which:

FIG. 1 is a perspective view of the structural shape connector, showing the manner in which floor joists are connected to the sill structure;

FIG. 2 is a perspective view of the internal bracket of the connector;

FIG. 3 is an elevational view, in cross section, of the connector;

FIG. 4 is an elevational view, in cross section, of the fastener utilized with the connector.

FIG. 5 is a bottom view of the fastener of FIG. 4.

Referring now more particularly to the drawing, in which like numerals indicate like parts throughout the several views, FIG. 1 shows a channel beam **10** having a base **11** and a pair of downwardly extending sides **12** and **13**. External grooves **14** and **15** are defined in sides **12** and **13**, adjacent base **11**, and extend longitudinally of the exterior surface of beam **10**. Base **11** is apertured at **16**, at spaced intervals along its length. Channel beam **10** may be supported in any manner in the building construction in order to function as a sill or similar support piece.

An I-beam **20** is positioned so that it rests on the upper surface of base **11** of the channel beam **10**. I-beam **20** includes a central web **21** and upper and lower flanges **22** and **23**. I-beam **20** is positioned so that it extends in a horizontal plane, in a direction disposed substantially at right angles to the direction in which the channel beam **10** extends. Near the end of I-beam **20** central web **21** defines an aperture **24** of a diameter substantially equal to the diameter of the apertures **16** in the channel beam **10**.

Connector **25** extends between channel beam **10** and I-beam **20** and connects these elements to each other. Connector **25** comprises a pair of brackets, internal bracket **26** and external bracket **27**. Internal bracket **26** includes a substantially flat base portion **29**, a downwardly extending clip **30** and an upwardly extending stem **31**. Base portion **29** is generally rectangular in configuration, and clip **30** includes a downwardly extending leg **32** extending integrally from one edge of the base portion **29**, and an inwardly turned tab **33** folded back toward and extending in a plane parallel to base portion **29**. Base portion **29** defines an aperture **35** in its central portion, the diameter of which is substantially equal to the diameter of the apertures **16** of channel beam **10**. A locking tab **36** is struck upwardly from the base portion **29** of internal bracket **26**, to one side of aperture **35**. Locking tab **36** includes a backwardly extending projection **37**.

Stem **31** includes a sloped portion **39** extending at an upward angle from one edge of the base portion **29** and a connecting portion **40** extending upwardly from the sloped portion **39**, at a right angle with respect to the base portion **29** of the bracket **26**. Connecting portion **40** is centrally apertured at **41**; the diameter of aperture **41** being approximately equal to the diameter of aperture **24** of I-beam **20**.

External bracket **27** generally conforms in shape to internal bracket **26**, and comprises base portion **49**, clip **50** and stem **51**. Clip **50** includes a leg **52** extending downwardly from base portion **49**, along one of its edges, and an inwardly turned tab **53** folded back toward and extending in a plane parallel to the base portion **49**. Base portion **49** defines a central aperture **55** and a locking slot **56**. Central aperture **55** is approximately equal in its diameter to that of central aperture **35** of internal bracket **26** and the apertures **16** defined in channel beam **10**. Locking slot **56** is slightly greater in length and width than locking tab **36** of internal bracket **26**.

Stem **51** of external bracket **27** includes an upwardly sloped portion **59** extending upwardly from one edge of base portion **49** and a connecting portion **60** disposed substantially at a right angle with respect to base portion **49**. Connecting portion **60** is centrally apertured at **61**; the diameter of aperture **61** corresponding to that of apertures **41** and **24** of internal bracket **26** and I-beam **20**, respectively.

As is best shown in FIG. 4, fasteners **62** are provided

to connect the brackets 26 and 27 to each other and to channel beam 10 and I-beam 20. Fastener 62 is fabricated of spring steel, or similar resilient material, and comprises a tubular, sleeve-like body portion 64. An annular, outwardly extending flange 65 extends about one end of the body portion 64, and an annular, inwardly extending flange 66 extends about the opposite end of body portion 64. The outer perimeter of flange 65 is generally circular, and the inner perimeter of flange 66 defines a hexagonal opening 67 as shown in FIG. 5. The outer surface of body portion 64 is threaded with conventional helical screw threads of approximately four threads per turn. Body portion 64 is slightly tapered inwardly from flange 65 toward flange 66.

OPERATION

When it is desired to connect I-beams to channel beams, as when connecting elements of this configuration to form joists of a floor or ceiling, the I-beams 20 are positioned with their lower flanges 23 resting on the base 11 of a channel beam 10. Connectors 25 are connected to channel beam 10, adjacent each one of the I-beams 20. Connectors 25 are connected to channel beam 10 by first placing the lower surface of the base portion 29 of the internal bracket 26 in juxtaposition with the upper surface of base 11 of channel beam 10. This positions tab 33 of the internal bracket 26 into groove 15 of channel beam 10. External bracket 27 is then fitted over internal bracket 26 by allowing locking tab 36 of internal bracket 26 to slide through locking slot 56 of the external bracket 27. This places base portion 29 of external bracket 27 in juxtaposition with base portion 29 of the internal bracket 26. External bracket 27 is then moved in a lateral direction with respect to channel beam 10 so that its tab 53 engages groove 14 of the channel beam. Locking slot 56 is of sufficient width so as to accommodate this movement. External bracket 27 is then moved in a longitudinal direction as indicated by arrow 57 so as to align its central aperture 55 with that of internal bracket 26. Thus, backwardly extending projection 37 of internal bracket 27 projects over the edge of locking slot 56 of the external bracket so that internal and external brackets 26 and 27 are positively held together and onto base 11 of channel beam 10, and no pivotal movement or inadvertent motion of brackets 26 and 27 will function to allow these brackets to separate.

When internal and external brackets 26 and 27 are aligned, as previously described, their stems 31 and 51 are placed in immediate juxtaposition, as is shown in FIG. 1, and their apertures 41 and 61 are aligned with each other. Of course, stem 51 of external bracket 27 is slightly smaller in its overall dimensions than stem 31 of internal bracket 26 so as to allow this mating of surfaces and apertures, while downwardly extending leg 52 of external bracket 27 is longer than downwardly extending leg 32 of internal bracket 26 to compensate for the additional thickness of the base portion 29 of internal bracket 26 being positioned between base portion 49 of external bracket 27 and channel beam 10.

After connector 25 has been assembled in this manner, the apertures 35 and 55 of base portions 29 and 49 are aligned with one of the apertures 16 of channel beam 10 and a fastener 62 is threadedly engaged within the aligned apertures. Fastener 62 is rotatably urged into the aligned apertures, and the threads thereof engage the internal perimeters of the aligned apertures so as to pull the fastener 62 into the apertures.

After connector 25 is attached to channel beam 10, the I-beam 20 which is in its vicinity is moved toward the mated stems 31 and 51 so that aperture 24 of the central web 21 of the I-beam is aligned with the mated apertures 41 and 61 of stems 31 and 51. Since sloped portions 39 and 59 of stems 31 and 51 slope upwardly and outwardly of the base portions 29 and 49 of the brackets, the connecting portions 40 and 60 of stems 31 and 51 will be adjacent the central web 21 of I-beam 20. Thus, the leg of the lower flange 23 of I-beam 20 will extend below sloped portions 39 and 59 of stems 31 and 51, as is shown in FIGS. 1 and 3. A fastener 62 is inserted through the aligned apertures 61, 41 and 24 of the brackets and I-beam.

Fasteners 62 are rotatable by means of any tool which has a rotatable hexagonal bit of the proper dimensions. A fastener 62 may be mounted on such a bit and rotated so that its external threads will engage the inner perimeter of the aligned apertures. In instances where it is convenient to rotate a fastener 62 from the remote side of the structural shape, the fastener may be aligned with the apertures, and the hexagonal bit inserted through the apertures from the remote side of the shape and fitted into the hexagonal opening 67. Of course, with this arrangement, the bit must be rotated in the opposite direction.

It is anticipated that the channel beam 10, I-beam 20, connector 27 and fastener 62 may be fabricated of any number of metals; however, it is anticipated that the most practical combination of these elements would be with the channel beam, I-beam and connector being fabricated of aluminum and the fastener 62 being fabricated of spring steel. With this combination of materials, the threads of the fasteners 62 would function to dig into the inner perimeter of the aligned apertures of the connector and its adjacent beam. Also, the resiliency of the spring steel fastener would be such that if the apertures of the elements were not perfectly aligned, the fastener, being deformable, could compensate for the misalignment. Furthermore, after the beams have been connected to each other as disclosed, any working or relative movement between the beams, such as expansion and contraction of the building or slight movement of the building due to wind pressure, will be compensated for by the resiliency of the fastener 62 without any appreciable loosening of or damage to the beams or connector 25. Thus, it can be seen that connector 25 functions to expediently interconnect the beams of a building while the fastener 62 functions to allow slight movement of the beams with each other. Also, the configuration of the clips 30 and 50 of brackets 26 and 27 prevent any significant lateral movement of I beams 20 with channel beam 10.

It will be obvious to those skilled in the art that many variations may be made in the embodiments chosen for the purpose of illustrating the present invention without departing from the scope thereof as defined by the appended claims.

What is claimed as invention is:

1. Apparatus for connecting an I-beam to a channel beam comprising:

an internal bracket including a flat base portion, a clip extending along one edge of said base portion and having an inwardly turned tab extending generally parallel to said flat base portion and adapted to engage a first external groove of a channel beam, a stem connected to an edge of said base portion adjacent said one edge and including a sloped portion extending at an obtuse angle away from said base portion and a connecting portion extending generally at a right angle from said base portion, said base portion defining a central aperture and the connecting portion of said stem defining a central aperture, said base portion including a locking tab struck from its surface,

an external bracket comprising a base portion of a size and shape corresponding generally to the base portion of said internal bracket, a clip extending along an edge of said base portion corresponding to the edge opposite said one edge of the base portion of said internal bracket having an inwardly turned tab extending generally parallel to its flat base portion and adapted to engage a second external groove of a channel beam, a stem connected to the edge of said

base portion corresponding to the edge of the base portion of said internal bracket to which its stem is connected and including a sloped portion extending at an obtuse angle away from its base portion and a connecting portion extending generally at a right angle from said base portion, the base portion and connecting portion of said external bracket each defining central apertures corresponding in position with the apertures of said internal bracket, the base portion of said external bracket defining a locking slot of a size larger than and positioned corresponding to the locking tab of said internal bracket, whereby said external bracket is placed in juxtaposition with said internal bracket and the apertures of the brackets are in alignment with each other and the locking tab of said internal bracket projects through the locking slot of said external bracket, and

fastening means extending through the aligned apertures for connection to an I-beam and a channel beam.

2. Apparatus for connecting an I-beam to a second beam defining external grooves along its edges, comprising gripping means including a pair of substantially flat juxtaposed plates each including a downwardly extending clip along one of its edges for engagement with the external grooves of a second beam, one of said plates defining an opening therein and the other of said plates including a locking tab struck from its surface and extending through said opening, and stem means including a sloped portion extending upwardly and outwardly from said gripping means and terminating in a connecting portion extending generally at a right angle with respect to said gripping means.

3. Apparatus for connecting an I-beam to a second beam, wherein both beams extend in horizontal planes and at right angles with respect to each other and the I-beam rests on a flat surface of the second beam, said apparatus comprising substantially flat gripping means connectable to the flat surface of the second beam, stem means integrally connected to said gripping means and sloping upwardly from said gripping means for extension over the base of the I-beam, and a connecting plate integrally connected to said stem means and extending at substantially a right angle with respect to said gripping means for connection to the web of the I-beam.

4. The invention of claim 3 wherein said apparatus is formed in two overlapping sections, with one section connectable to one side of said second beam and the other section connectable to the other side of said second beam, and means for locking together said overlapping sections.

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