Dec. 8, 1970 J. H. SUHR 3,545,151

JOINT CONSTRUCTION FOR BUILDING ELEMENTS

Filed June 20, 1968 2 Sheets-Sheet 1

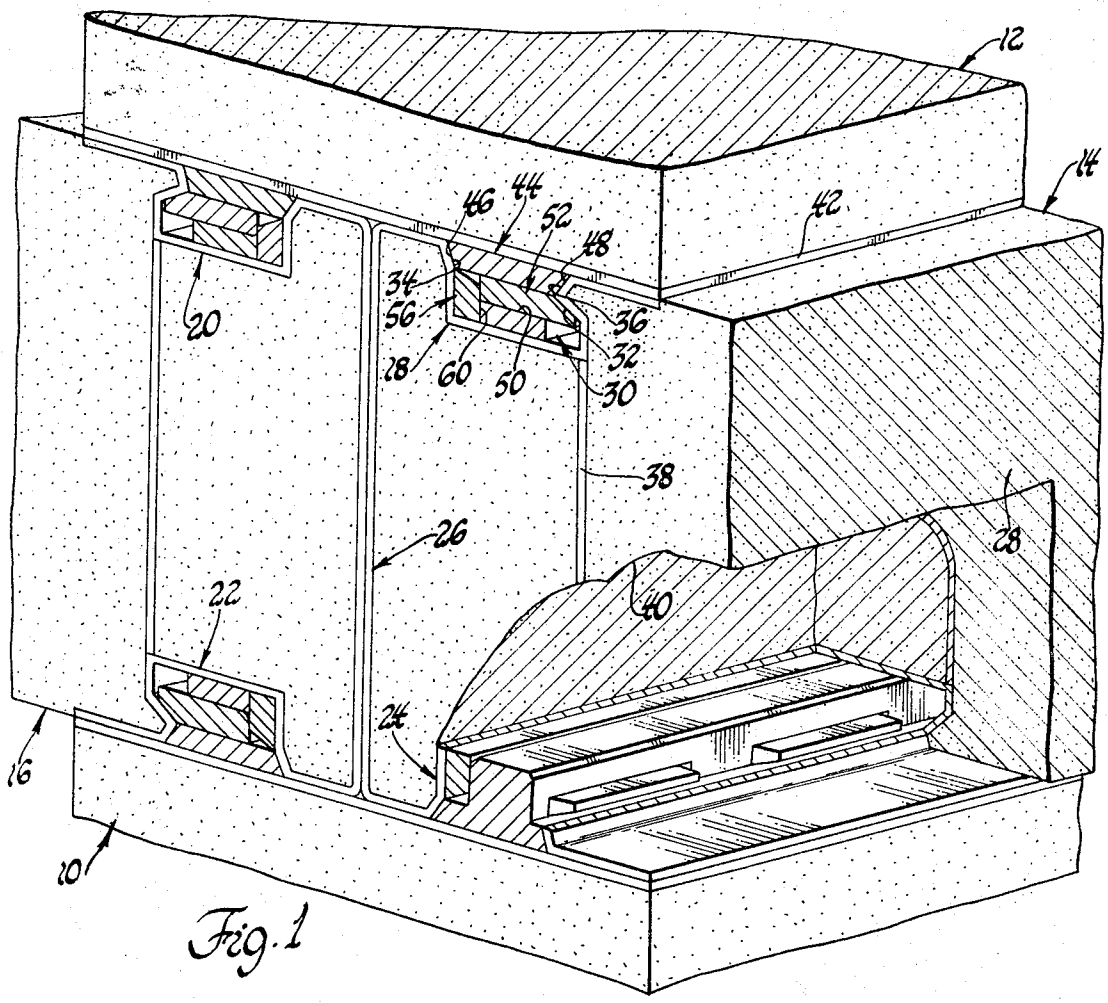

Fig. 1

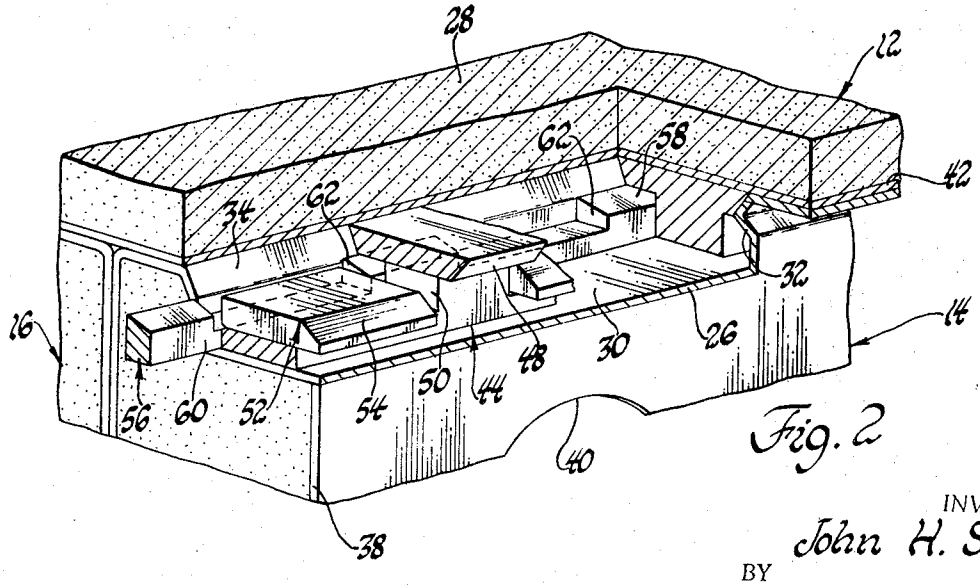

Fig. 2

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Filed June 20, 1968 2 Sheets-Sheet 2

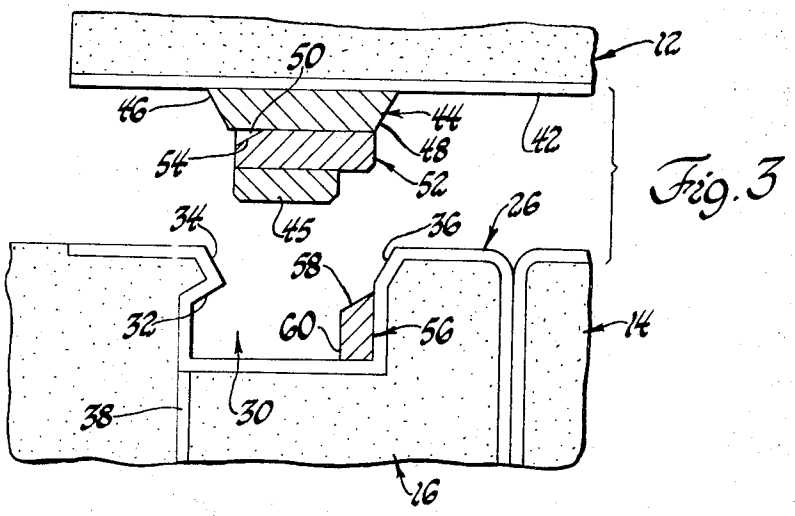

Fig. 3

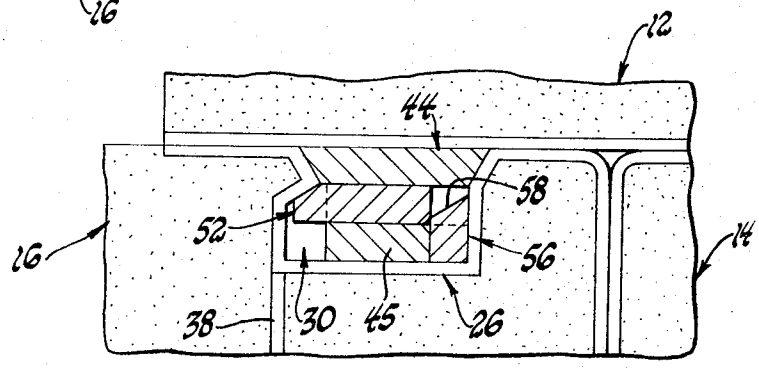

Fig. 4

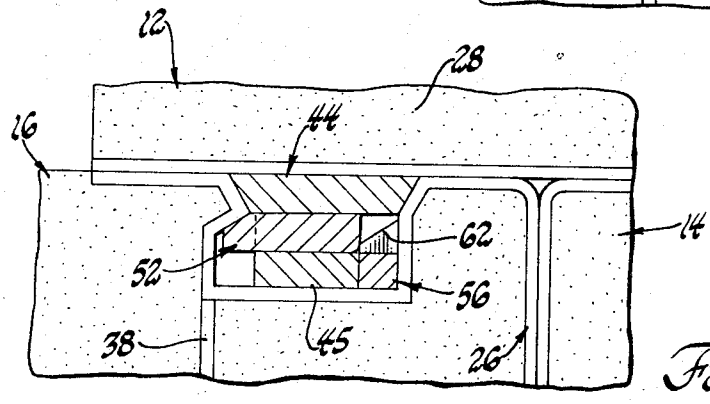

Fig. 5

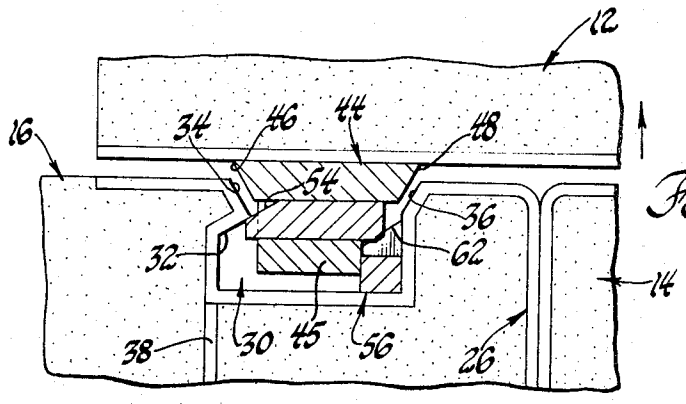

Fig. 6

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JOINT CONSTRUCTION FOR BUILDING ELEMENTS

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U.S. Cl. 52—285 11 Claims

ABSTRACT OF THE DISCLOSURE

There is provided an improvement in joining systems for building elements wherein such building elements are to be secured together to form a load bearing structure, as in a building or the like, and wherein such building elements may be precast panels, beams, posts or other components. The improvement comprises a recess formed in a first building element, such recess having an outwardly directed angular surface formed thereon. The recess may extend longitudinally of the building element or may take the form of a series of spaced recesses disposed along a line longitudinally of the element. A rib extends from a second building element and is adapted to be secured to the first element, such rib being receivable in the recess in the first building element. The rib may extend longitudinally of the second building element or may consist of a series of spaced rib members disposed along a line longitudinally of the building element. The rib is provided with a transverse slot to receive and retain a slider member adapted to be moved into engagement with the angular surface on the recess when the rib is received therein. When the slider member is moved into such engagement, a secure lock is provided between the first and second building elements. An actuating strip, disposed in the recess and oppositely located from the angular surface, is also provided with an angular surface adapted to be engaged by a corner of the slider member. Such engagement of the slider member on the angular surface of the actuating element causes outward movement of the slider member to locking engagement with the angular surface on the recess. The locking member is slidable in the recess so that spaced grooves, so located as to receive the slider member upon such movement of the actuating member, permit retraction of the rib from the recess and disengagement of the joint construction.

This invention relates to joint constructions for building elements, and more particularly to a joint construction adapted to be formed in and secured to adjoining elements and having interlocking and latching means to retain the elements in mounted position.

The present invention is particularly applicable to panel type building elements and will be more particularly discussed with reference thereto. However, it is to be appreciated that the invention has much broader application and may be used with other types of building elements, such as posts, beams and the like.

In the construction industry, it is quite often desirable to provide building elements, such as panel structures, as integral parts of the building being erected. The panel structures may be of any shape or size disposed either horizontally or vertically, and may form the various load bearing components of the building. Such building elements make more inviting the concept of prefabrication of buildings on a large scale, and can solve economic and labor needs, provided some suitible and economical joining system can be supplied to secure the prefabricated components together at the building site.

Many joining systems have been known in the past for securing panels and the like together. However, most

of these systems are expensive, complicated and cumbersome affairs that take a great deal of time and precision to assemble and install. They provide little flexibility of design in the finished building structure, since they seldom permit disconnection and relocation of the building elements to meet changing needs or changes in the building design after initial erection. Such devices seldom provide the load bearing potential that is necessary to support panels that form load bearing components of a building structure.

The joint construction in which this invention is embodied comprises, generally, a joining system that is adapted to be mounted in adjacent surfaces of building elements in order to receive, support and retain the building elements in predetermined and precise location relative to each other. The system includes a longitudinal recess formed in one of the building elements, such recess having an outwardly directed angular surface extending from below the mouth of the recess. A rib is disposed on the adjacent building element, extending outwardly from the element and being receivable in the recess formed in the first building element. The rib is provided with a transverse slot to receive and support a slider member, such member being actuated when the rib enters the recess, to engage the outwardly directed angular surface on the recess. The rib is thus locked in the recess. Also disposed in the recess and oppositely located from the angular surface, is an actuating member which has an angular surface that is engageable by the slider member when the rib is moved into the recess. Such angular surface on the actuating member causes the slider to move in its transverse slot into locking engagement with the angular surface on the recess. A slot may be disposed in the actuating member, interrupting the angular surface thereof, and being of such dimension as to receive the slider member. Such slot permits the slider member to be withdrawn from engagement with the angular surface on the recess, to unlock the joint and to permit disengagement of the building elements. The recess and the rib may extend the entire length of the building elements, in which case a plurality of slider elements are disposed in slots spaced along the element. Alternatively, the rib may be intermittent along the length of the building elements with one or more slider members disposed in each individual rib section. In such event the recess in the first building element may be either continuous or intermittent and spaced in accordance with the rib sections. The mouth of the recess in the first building element may be tapered inwardly and the rib may be correspondingly tapered, to serve as dimensional and locational control for one building element relative to the other and thus properly position the building elements in their respective relative positions. By providing a plurality of such recesses and ribs in various adjacent building elements, a plurality of such building elements may be secured together with ease and facility.

Such a system solves many of the problems heretofore encountered in joining systems for securing building elements together. The system is economical to manufacture and is easily assembled in the panel during the formation thereof. The system provides a rapid mounting of the building elements in their assembled relation, provides a great deal of flexibility in building element assembly, easily bears the loads necessary for building element joint constructions and provides desirable tension and compression force transfer between the building elements. Dimension control and tolerance take-up is provided in the recess and rib arrangement so that when the building elements are assembled they will more closely approach proper alignment in the building structure. When assembled, the joint is securely locked to prevent any inadver-

tent disassembly, and at the same time and with positive action, the joint may be easily disengaged for disassembly and/or relocation of the building elements.

These and other features and advantages will become more apparent from the following description, used to illustrate a preferred embodiment of the invention when taken with the accompanying drawings in which:

FIG. 1 is a perspective view, with parts broken away and in section, of a building element assembly utilizing the joint construction embodying the present invention;

FIG. 2 is an enlarged perspective view, with parts broken away and in section, of a portion of the structure shown in FIG. 1;

FIG. 3 is a partial elevational view, with parts broken away and in section, of a portion of the structure shown in FIG. 1, illustrating the location of the parts in one position of operation;

FIG. 4 is a partial elevational view, with parts broken away and in section, of a portion of the structure shown in FIG. 1, illustrating the location of the parts in another position of operation;

FIG. 5 is a partial elevational view, with parts broken away and in section, of a portion of the structure shown in FIG. 1, illustrating the location of the parts in yet another position of operation; and

FIG. 6 is a partial elevational view, with parts broken away and in section, of a portion of the structure shown in FIG. 1, illustrating the location of the parts in still another position of operation.

Referring more particularly to the drawings, where the showings are for the purpose of illustrating a preferred embodiment of the invention only, and not for the purpose of limiting same, FIGS. 1 and 2 best illustrate the invention as used in connection with a plurality of building elements. While the following description relates to the use of the joint construction in connection with horizontal and vertical panels, it is to be understood at the outset that the system embodying the invention is applicable to any other building elements, such as posts, beams or the like. It is to be further understood that although the following description and the drawings relate to the various parts of the joining system in a particular orientation and location, that such orientation and location may be altered, reversed or otherwise changed to suit the building elements and the stresses and strains in the joint construction and associated building elements.

The building structure illustrated in the drawings is, for convenience, shown to be a juncture of four concrete panels, including a lower vertical panel, indicated generally by the numeral **10**; an upper vertical panel, indicated generally by the numeral **12**; and first and second horizontal panels, indicated generally by the numerals **14** and **16** respectively. Such a construction might occur at a corner of a building structure, where the vertical panels **10** and **12** form walls and the horizontal panels **14** and **16** form floors and/or ceilings. In the overall joint construction illustrated in FIG. 1, there are four separate joint assemblies, indicated generally by the numerals **18**, **20**, **22** and **24**, each of which is identical in construction, although differently arranged in accordance with its individual position relative to the other building elements. Since these assemblies are identical, the following description relates to only one such assembly and like reference numerals relate to like parts throughout.

In the formation of panel **14**, an end cap or skin, indicated generally by the numeral **26**, is provided. Skin **26** is of any suitable material, such as steel, plastic or the like, so as to permit easy formation of the parts of the joint assembly. The bulk material **28** of the panel **14** may be concrete, foam or any other suitable material from which panels are normally constructed in the trade. Formed in the skin or end cap **26** is a recess, indicated generally by the numeral **30**, which may extend longitudinally of the panel **14** and which is so formed as to provide an outwardly and downwardly directed angular surface **32**. The

mouth of the recess **30** is provided with tapered side edges **34** and **36**, for purposes to become hereinafter more apparent. Since there are like recesses **30** at the top and bottom of the panel **14**, and the like recesses may be conveniently oppositely spaced, a strengthening plate **38** of any suitable material is disposed between the recesses **30** to carry the tensile stress in the joint construction. Plate **38** may be provided with spaced apertures **40** to permit convenient flow of the bulk material **28** into the end portion of the panel upon manufacture.

Considering next the vertical panel **12**, which may be provided with an end plate or skin **42**, such panel has extending downwardly therefrom and secured thereto in any suitable manner, a rib, indicated generally by the numeral **44**. Rib **44**, at a position adjacent the panel **12**, is provided with inwardly tapered surfaces **46** and **48** of corresponding angularity to the mouth surfaces **34** and **36** of the recess **30**. for purposes to become hereinafter more apparent. Below the tapered surfaces **46** and **48** are a series of transverse slots **50** that are spaced along the length of the rib **44**. The slots are so located that when inserted in the recess **30**, they will open adjacent the angularly outwardly directed surface **32** of the recess **30**.

Disposed in each of the transverse slots **50** is a slider member, indicated generally by the numeral **52**, which is generally of a lateral dimension similar to the narrow part of the tapered portion of the rib **44**, and is provided with an outwardly directed angular surface **54**. Surface **54** is generally of the same angularity as the outwardly directed surface **32** on the recess **30**, and is adapted to engage such surface in a manner to become hereinafter more apparent.

Also disposed in the recess **30** is an actuating member, indicated generally by the numeral **56**, and oppositely disposed in the recess **30** from the angular surface **32**. Actuating member **56** includes an upper angular surface **58** which is engageable by the corner of the slider member **52** and along which such corner will slide to drive the slider member **52** toward and into engagement with the angular surface **32** as the rib **44** is moved into the recess **30**. A vertical surface **60** on the actuating member **56** is engaged by the rearward surface of the slider member **52** when it is positioned in full engagement with the angular surface **32**, thus effectively blocking movement of the slider member in a disengaging direction. The actuating member **56** is also provided with a plurality of slots **62**, as best illustrated in FIG. 2, which interrupt the angular surface **58** on the actuating member. The actuating member may be indexed so that the slots **62** become located behind the slider members **52** when the slider members are moved in a disengaging direction. Thus, as will be hereinafter more particularly described, the actuating member **56** is slidable in the recess from a first position in blocking engagement with the slider members to a second position which clears reverse movement of the slider members. Alternatively, the actuating member **56** may be completely withdrawn from the recess **30** to clear the slider members, thus eliminating the slots **62**.

With reference now to FIGS. 3–6, the operation of the joining system will be described. It shall be assumed that the upper vertical panel **12** is to be joined to the horizontal panels **14** and **16**, which are disposed in end-to-end abutting relation, and each of which is provided with a recess **30** in properly spaced relation. The slider members **52** are disposed in the transverse slots **50** so as to clear the mouth of the recess **30**, and the panel **12** may be lowered into engagement with the surfaces of the panels **14** and **16**. As the panel **12** is lowered, the rib **44** enters the recess **30**, the lower portion **45** thereof clearing the mouth of the recess and clearing the actuating member **56** disposed in the recess. As the lower corner of the slider member **52** engages the angular surface **58** on the actuating member **56**, the slider member is driven toward the left, as viewed in FIG. 3, so that the angular surface **54** on the slider member moves into locking engagement with the

outwardly directed angular surface **32** formed in the recess **30**. As the panel **12** continues downwardly, the tapered surfaces **46** and **48** of the rib **44** engage the tapered surfaces **34** and **36** at the mouth of the recess **30**, properly positioning the panel **12** relative to the panel **16**. Since this also occurs at the similar joint assembly in panel **14**, it will be apparent that proper location of the panel **12** relative to both horizontal panels **14** and **16** will be accomplished and minor dimensional tolerances will be taken up at the same time. The slider members **52** will have been moved completely into engagement with the surface **32**, and the rearward faces of the slider members **52** will abut the vertical face **60** of the actuating member **56**, thus blocking rearward movement of the slider members **52**. The final secured position of the assembly is illustrated in FIG. 4.

Should it now be desired to disassemble the joint construction, so that the panel **12** may be separated from horizontal panels **14** and **16**, the actuating member **56** is indexed so that the transverse slots formed therein are aligned with the rearward edges of the slider members **52**. Raising the panel **12**, and the consequent action of the surfaces **34** and **54** at the nose of the slider members **52** and the recess **30**, will cause the slider members to be moved toward the right, as viewed in FIG. 5, into the clearing slots **62** in the actuating member **56**. As the panel **12** continues its upward movement, the slider members will be moved to their original positions in the transverse slots **50** in the rib **44**. When in such position, the slider members **52** will clear the mouth of the recess **30** and the panel **12** may be completely removed. Should difficulty be encountered in causing the slider members **52** to move toward the right, an elongated tool of some suitable nature may be inserted in the recess **30** to force the slider members in the disengaging direction and into the clearing slots **62**. As illustrated in FIG. 6, the panel **12** is in its upward vertical movement relative to the panel **16**, and the slider members **52** are illustrated as being partially withdrawn into the clearing slots.

Thus, a joint construction is provided for adjacent building elements which is extremely efficient and economical to manufacture and produce, and is rapid in its operation to permit quick and positive joining of one element to another. The construction creates a great deal of flexibility in the use of the building elements, permitting readjustment and realignment as necessary within the building structure. The joint system is simple to locate in various locations in the building elements, and provides great flexibility for positive joint connections.

The present invention has been described in connection with certain structural embodiments; however, it is to be appreciated that various changes can be made in the structure without departing from the intended spirit and scope of the present invention as defined by the appended claims.

Having thus described the invention, I claim:

1. A joint construction for first and second building elements comprising:

a recess in said first building element and having an outwardly extending angular surface spaced from the opening thereof;

a rib extending from said second building element and receivable in said recess, said rib having a slot formed therein;

a slider member received in said transverse slot in said rib and being slidable therein to locking engagement with said angular surface in said recess;

and means for moving said slider member into engagement with said angular surface.

2. The joint construction set forth in claim **1** wherein said rib is provided with a plurality of transverse slots disposed in spaced relation along the length of said rib.

3. The joint construction set forth in claim **2** and further including a plurality of slider members slidable in said plurality of transverse slots and into locking engagement with said angular surface in said recess.

4. The joint construction set forth in claim **1** wherein said means for moving said slider member includes an actuating member disposed in said recess and oppositely spaced from said angular surface, said actuating member having an angular surface thereon such that engagement of said slider member with said last named angular surface and movement relative thereto will move said slider member into engagement with said first named angular surface.

5. The joint construction set forth in claim **4** wherein said actuating member is slidable in said recess to permit removal thereof from said recess and disengagement of said slider member from said angular surface in said recess.

6. The joint construction set forth in claim **5** wherein said actuating member is provided with a slot adjacent said angular surface thereon, said actuating member being moveable in said recess to position said slot to receive said slider member when said slider member is disengaged from said angular surface in said recess.

7. A joint construction for building elements comprising:

a first building element;

a second building element adapted to be secured at an angle to said first building element;

a third building element adapted to be secured at an angle to said first building element and in abutting relation to said second building element;

a recess formed in each of said second and third building elements and spaced from the abutting surfaces thereof, each of said recesses having a surface thereon and disposed outwardly from said recess and away from the adjacent surface of said abutting building element;

a pair of spaced ribs extending from said first building element and received in said recesses, each of said ribs having a transverse slot therein;

a slider member disposed in each of said transverse slots and moveable into locking engagement with said surfaces in said recesses;

and means in each of said recesses for moving said slider members into said locking engagement with said surfaces.

8. The joint construction set forth in claim **7** wherein said ribs on said first building element and the openings of said recesses in said second and third building elements are inwardly tapered.

9. The joint construction set forth in claim **7** wherein said means includes an actuating member disposed in each of said recesses and oppositely spaced from said surfaces thereof, each of said actuating members having an angular surface thereon engageable by said slider members upon assembly of said building elements.

10. The joint construction set forth in claim **9** wherein said actuating members are slidable in said recesses.

11. The joint construction set forth in claim **10** wherein each of said actuating members is provided with a transverse slot adapted to be aligned with and receive said slider members when said slider members are disengaged from said surfaces on said recesses.

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U.S. Cl. X.R.

52—264; 582