# United States Patent [19]

**Watkins**

[11] **3,859,769**

[45] **Jan. 14, 1975**


[54] **INTERLOCKING MODULES**


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[22] Filed: **Dec. 11, 1972**

[21] Appl. No.: **313,961**

[52] **U.S. Cl.** ..... **52/588,** 46/25
[51] **Int. Cl.** ..... **E04c 1/10,** E04c 1/30, A63h 33/08
[58] **Field of Search** ..... 52/608, 609, 586, 591, 52/582, 589–595; 46/25, 31; 404/40, 41, 27



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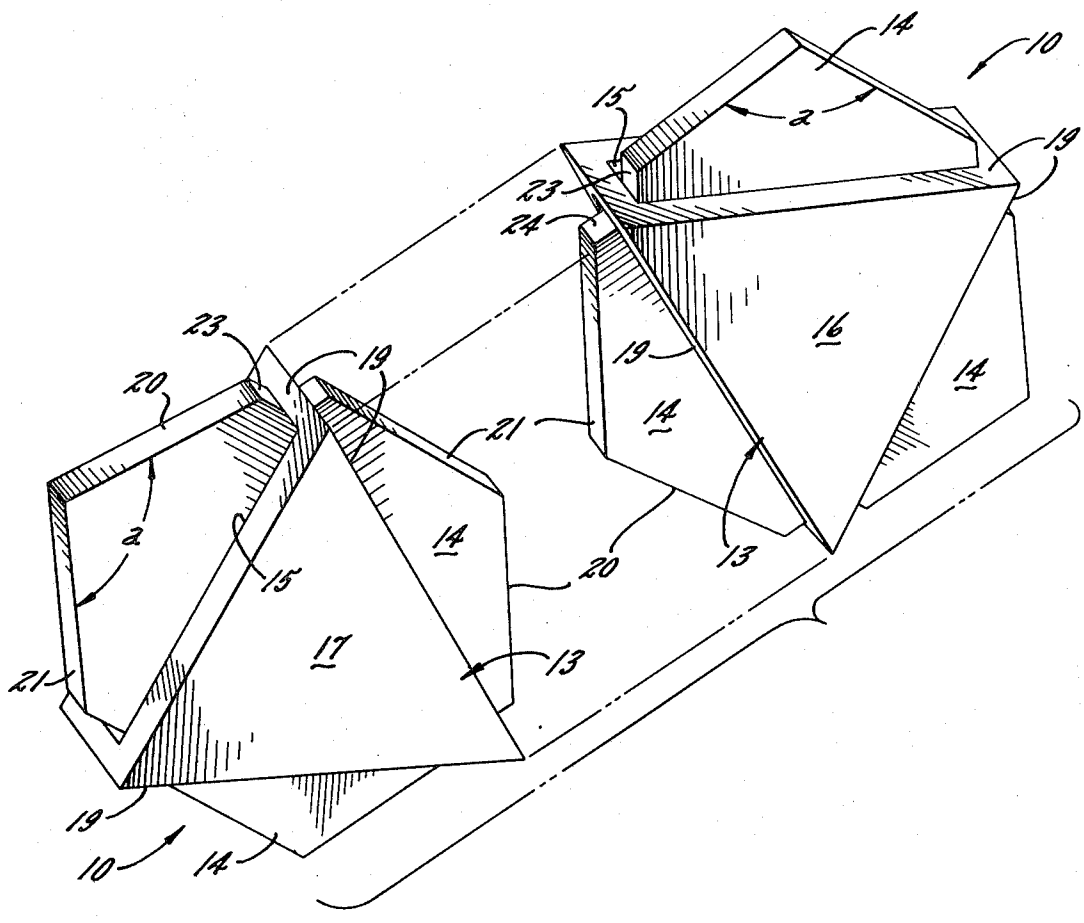
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*Attorney, Agent, or Firm*—Wolfe, Hubbard, Leydig, Voit & Osann, Ltd.



[57] **ABSTRACT**

A module includes a body shaped as regular polygon such as an equilateral triangular block and is adapted to interlock with other similar modules to form a structure. Projecting outwardly from each edge of the triangular body is a generally triangular tongue having an area not greater than one-third the area of the body, and adjacent each tongue is a slot whose size and shape is similar to the size and shape of the tongue. The slot extends into the body so that, when assembling a structure from several modules, the tongues of each module interfit with the slots of the adjacent modules to hold the modules together in an abutting edge-to-edge relationship. In other forms of the invention, the body may be shaped as a square or the tongue may be formed separately of the body in the shape of a diamond whose opposite ends telescope into the slots of adjacent bodies to hold the adjacent edges of the bodies in abutment with each other.


**7 Claims, 12 Drawing Figures**



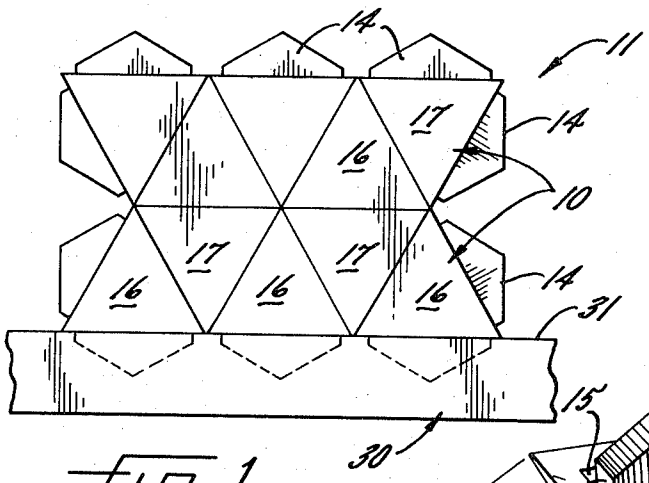



Fig. 1.

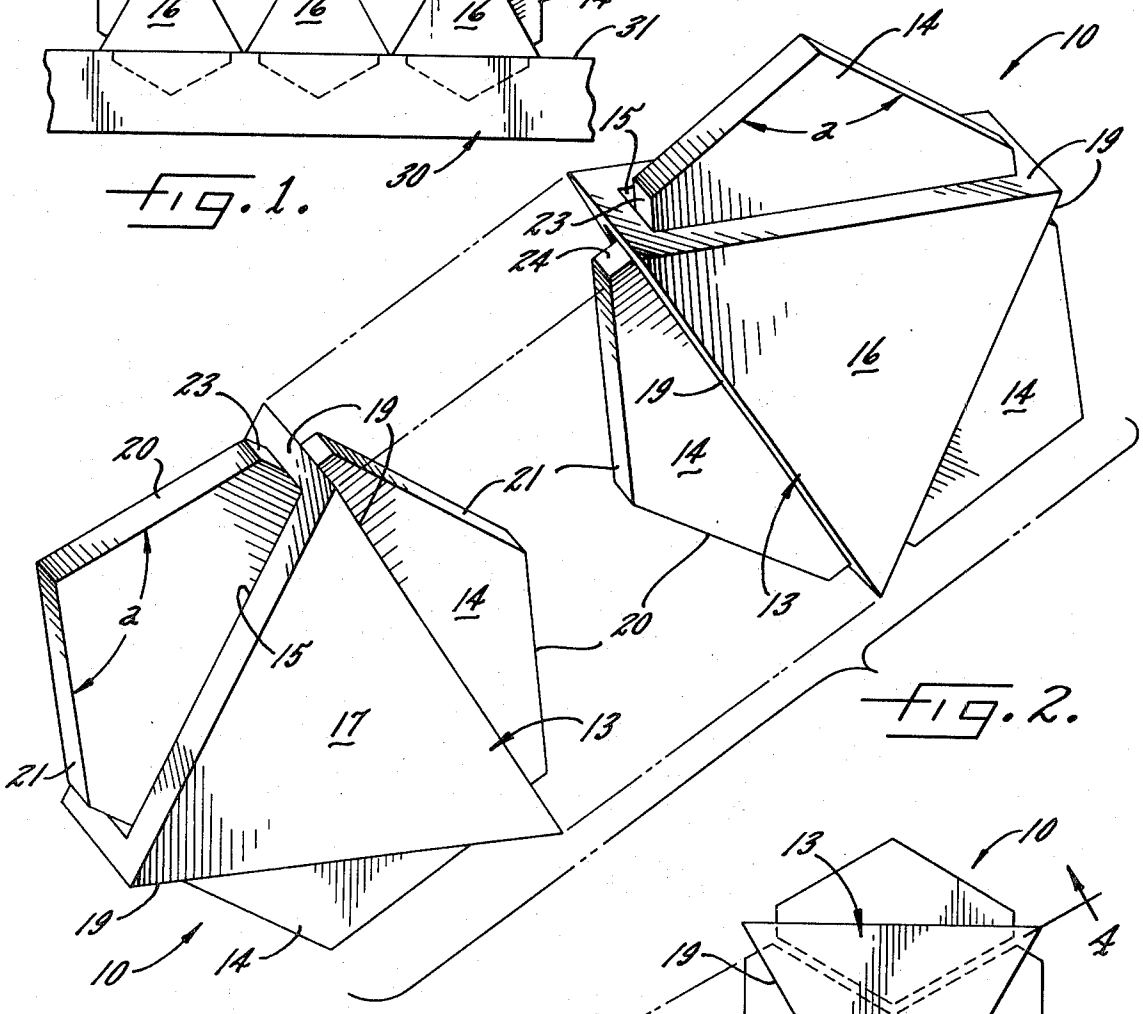



Fig. 2.

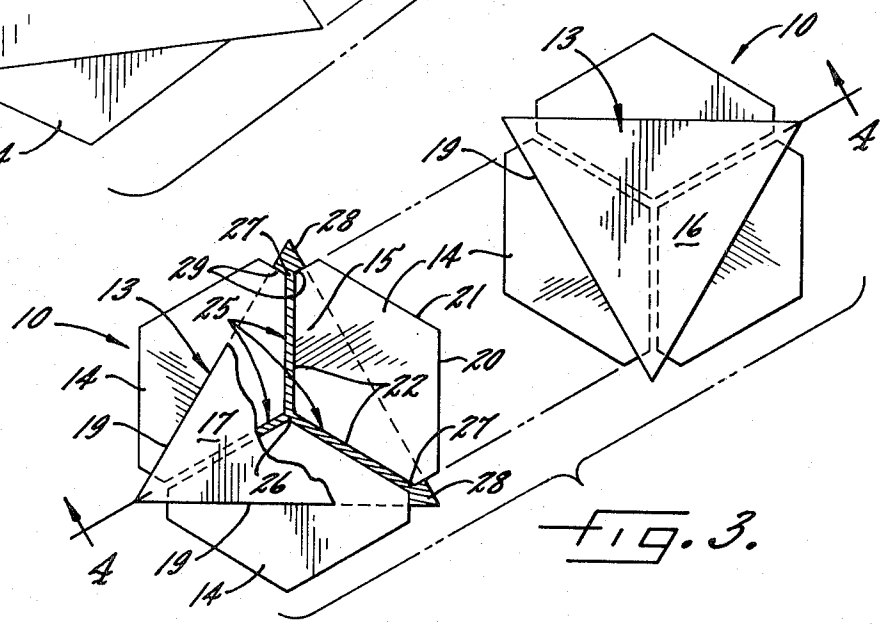



Fig. 3.

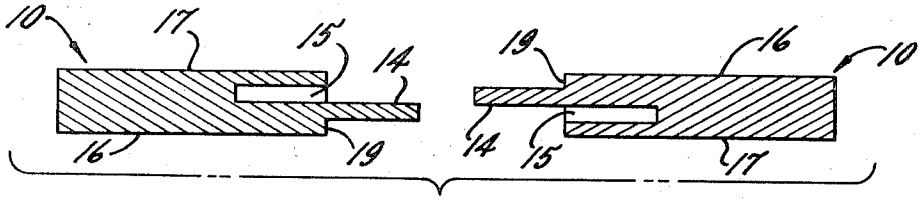



Fig. 4.

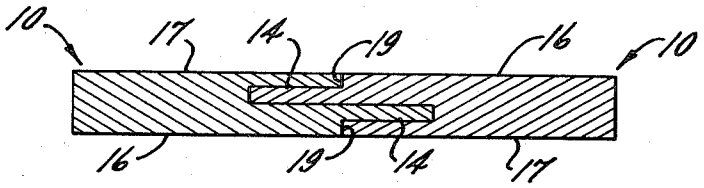



Fig. 5.

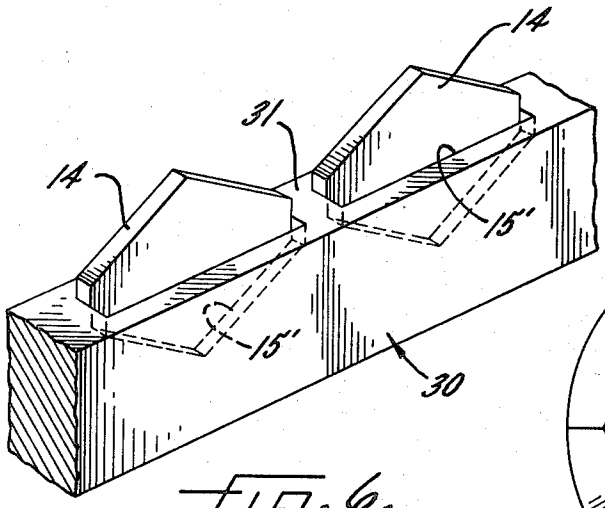



Fig. 6.

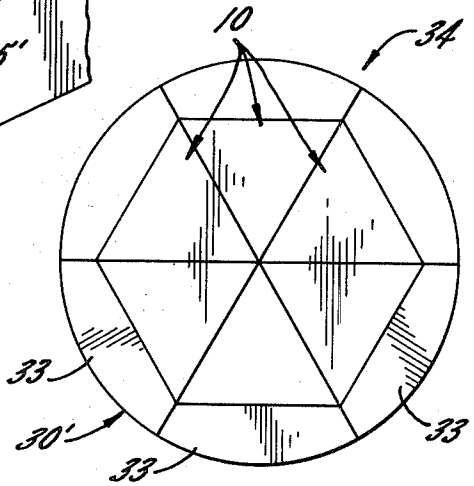



Fig. 7.

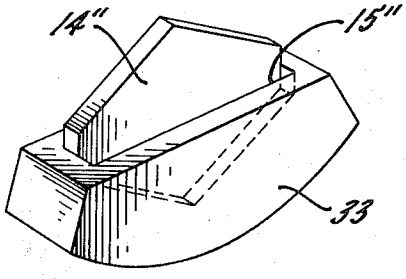



Fig. 8.

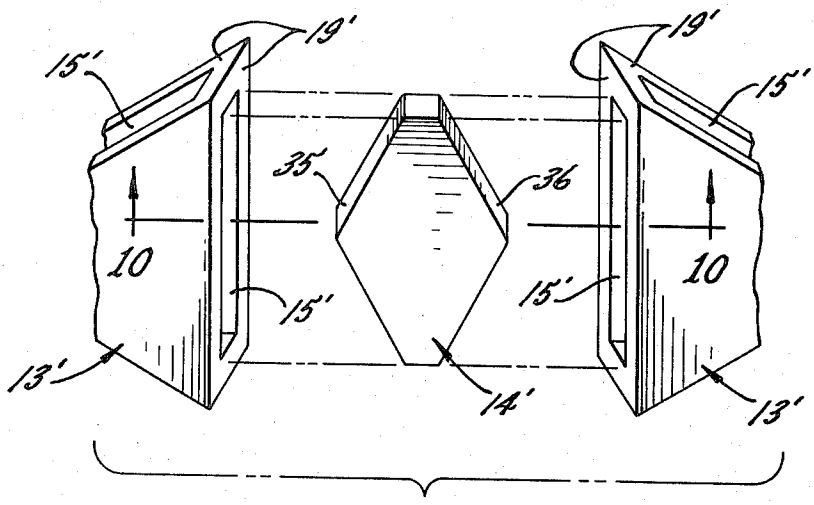



Fig. 9.

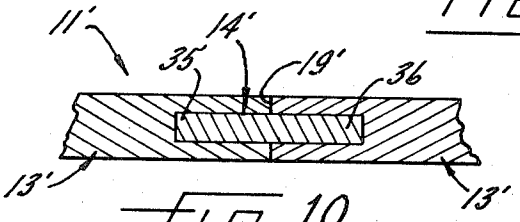



Fig. 10.

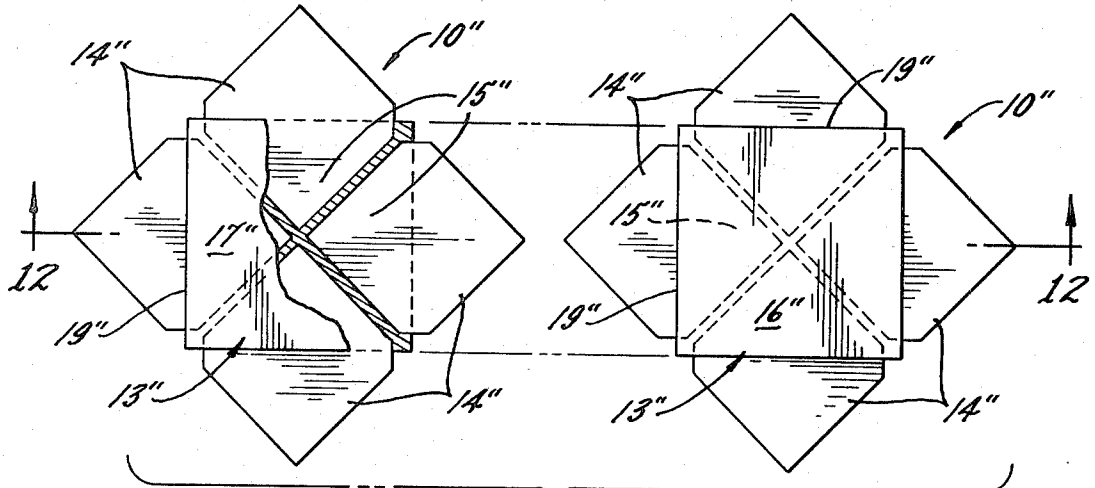



Fig. 11.

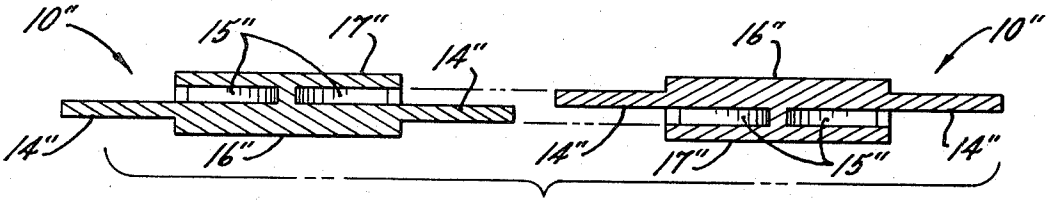



Fig. 12.

# INTERLOCKING MODULES

## BACKGROUND OF THE INVENTION

This invention relates generally to an interlocking member such as is used with other similar members to build a structure and, more particularly, to an interlocking member having a generally planar body with a tongue projecting from each edge thereof adjacent a slot also formed in the edge and having a size and shape similar to the size and shape of the tongue. In use, several of the members or modules are assembled together with the tongues and slots of adjacent modules interlocking with each other to form the desired structure. Interlocking modules of this general type are disclosed in Sterns U.S. Pat. No. 2,115,936 and Worthington et al U.S. Pat. No. 3,657,852.

## SUMMARY OF THE INVENTION

The primary object of the present invention is to provide a new and improved interlocking module of the above general character which is easier to assemble with other interlocking modules and which, when assembled with the other modules, forms a virtually self-supporting structure which is stronger and more durable than similar structures formed of prior modules. A further object is to accomplish the foregoing by providing a module having a body with the shape of an equilateral triangle whose edges include tongues and slots having generally the same size and shape for interlocking with adjacent modules to accurately position the modules relative to each other and to hold the assembled modules against relative sliding between their edges.

The invention also resides in the provision of unique framing adapted to interfit with the modules to form the edges of the assembled structure and other edges such as framing for a door or a window or the like.

These and other objects and advantages of the present invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary front elevation of a portion of a wall constructed of modules embodying the novel features of the present invention.

FIG. 2 is an exploded perspective view of two modules prior to being joined together.

FIG. 3 is an elevational view of the two modules of FIG. 2 with parts broken away and shown in cross section.

FIG. 4 is a cross-sectional view taken substantially along line 4—4 of FIG. 3.

FIG. 5 is a view similar to FIG. 4, but with the two modules interlocked with each other.

FIG. 6 is an enlarged perspective view of the framing used in conjunction with the modules.

FIG. 7 is an elevational view of another structural arrangement formed of the modules and showing use of alternative framing.

FIG. 8 is an enlarged perspective view of a segment of the framing illustrated in FIG. 7.

FIG. 9 is a fragmentary exploded perspective view of still another structural arrangement of the present invention.



FIG. 10 is a fragmentary cross-sectional view taken substantially along line 10—10 of FIG. 9 but showing the parts assembled.

FIG. 11 is a plan view of an additional modified form of the invention with parts broken away and shown in cross-section.

FIG. 12 is a cross-sectional view taken substantially along line 12—12 of FIG. 11.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in the drawings for purposes of illustration, the present invention is embodied in a member **10** particularly adapted to interlock in edgewise relation with other similar members to form a structure such as a wall **11**. As shown in FIG. **2**, each member comprises a substantially planar body **13** with a plurality of appendages in the form of tongues **14** projecting from the edges of the body, and adjacent each tongue in the edge of the body is a corresponding slot **15** (see FIG. **4**). As in the aforementioned patents, the tongue and slots are generally the same size and shape so that the tongues and slots of adjacent members interfit with each other to form the structure or wall **11**.

In accordance with the primary aspect of the present invention, the member **10** is a module whose body **13** is shaped as an regular polygon and whose tongues **14** and slots **15** are generally triangular, each preferably having an area not greater than one-third the area of the body. With this unique arrangement, the tongues and slots of adjacent modules interlock with each other when two or more modules are joined together to form a virtually self-supporting structure which is far stronger and more durable than prior similar structures and, in addition, the structure is much easier to assemble.

In the present instance, the body **13** of the module **10** is shaped as an equilateral triangular block which may be formed of any desired material such as concrete, wood, metal, plastic, ceramic, or the like, depending on the structure to be built. More particularly, the body is defined by two parallel faces **16** and **17** and, by three edges **19**, the latter being of equal length and connected together end to end to define the equilateral shape of the body. The tongues **14** project outwardly from each edge, being spaced a predetermined distance from the face **16** and all lying in a common plane extending parallel to such face. Herein, each of the tongues is generally triangular in shape and includes outer margins **20** and **21** which converge toward each other upon progressing outwardly from the edge of the body. Adjacent the juncture of the tongue with the edge of the body, the marginal portions **23** and **24** are formed at right angles with respect to the edge and extend perpendicular thereto for a short distance before joining the converging margins **20** and **21**. Preferably, the margins **20** and **21** intersect each other at an angle *a* of about **120** degrees so that the area defined by the tongue approaches one-third the area of the faces **16** and **17** to maximize the area of interlocking between adjacent modules.

As shown in FIG. **2**, the three slots **15** are located in the edges **19** of the body **13**, one slot being formed in each edge adjacent one of the tongues **14**. Each of the slots is similar in size and shape to the size and shape of the tongues so that the tongues of one module may fit within any of the slots of a second identical module. More particularly, the slots in each module all lie in a

common plane which is adjacent the face **17** and extends parallel thereto, the distance between the face **17** and the slots being equal to the distance between the tongues and the face **16**. The slots extend inwardly from the edges of the body with the opposite sides **22** (see FIG. **3**) of each slot converging as the sides progress toward the center of the triangular shaped body.

Preferably but not necessarily, the inner ends of the slots **15** are separated from each other by three internal reinforcing ribs **25** (FIG. **3**) having inner ends **26** integrally joined together and outer opposite ends **27**. Each rib extends from its inner end at the center of the body outwardly toward one of the corners of the body **13** so that each two ribs define the sides **22** of one of the slots. As further shown in FIG. **3**, the outer end of each rib is connected integrally with one of the corner portions **28** of the body and, preferably, the corner portion includes two walls **29**. Each of these walls extends inwardly from the edge **19** a short distance at an angle of about ninety degrees relative to the edge so that the size and shape of each slot **15** is generally equal to the size and shape of the adjacent tongue so as to approach one-third the area of the body. With this arrangement, once one module **10** is joined together with another, the perpendicular marginal portions **23** and **24** of the tongues abut the walls **29** to block the tongue **14** from sliding toward either side of the slot **15** and thus hold the modules against relative edgewise movement.

Each module **10** is joined with other modules in essentially the same manner and, prior to joining two modules together, one of the modules is turned as shown in FIGS. **2** to **5** so that the face **17** of the body **13** is in the same plane as the face **16** of the other module. This aligns the tongues **14** and slots **15** of adjacent modules with each other so they can fit together (see FIG. **4**). Then, as the modules are pushed together, the margins **20** and **21** of the tongues slide relative to the side walls **22** of the slots to guide the modules into abutting edge to edge relationship. Thus, the modules are assembled together very quickly and easily without having to be aligned precisely in position before they are slid together. Moreover, the faces on each side of adjacent modules are in common planes so that each side of the structure is defined by a single flat surface because the tongues and slots are spaced from the adjacent faces of the body by equal distances. Advantageously, both faces of the modules are finished so that both sides of the wall appear smooth and finished when the wall is assembled.

Once joined together, the modules **10** provide a very strong and durable wall **11** because of the relatively large area of interlocking between the modules, the area of interlocking for each completely surrounded module nearly equalling the area of either face of the body **13**. As a result of this interlocking, the wall is virtually self-supporting, and particularly so when there is tight fit or close tolerance between the tongues **14** and the slots **15**. When desired, however, a bond such as cement, glue or the like may be used to hold the tongues in the slots. With or without the bond, it is unnecessary in most structures to provide a backing or other transverse support such as a beam or brace to hold the modules together and in position. Thus, by virtue of the novel shape of the body and the unique triangular shape of the tongue and slots, far stronger structures can be built up from the modules than was possible heretofore. Moreover, the structure can be assembled much more easily because the modules are kept from sliding edgewise relative to each other by virtue of the perpendicular marginal portions **23** and **24** abutting the walls **29**.

In view of the foregoing, it will be appreciated that the present invention provides a unique module **10** formed in the basic shape of an equilateral triangular block for interlocking with similar modules and framing to form a strong, virtually self-supporting structure which is very easy to build. It will be appreciated further that, while the invention has been described and illustrated in conjunction with the flat wall **11**, corners in the wall may be formed with modified versions of the module in which the body **13** is bent to define a portion of the corner being built.

The present invention further contemplates the provision of unique framing **30** which interfits with the peripheral modules **10** of a structure to provide further support for the structure and to form straight edges for the structure. As shown in FIG. **1** with respect to the wall **11**, the framing **30** serves as a base upon which the wall is built and includes a plurality of tongues **14'** (FIG. **6**) projecting upwardly from the top edge **31** of the frame for insertion into the modules. The tongues **14** from the modules interfit with similarly shaped slots **15'** formed in the frame adjacent the tongues. With this arrangement, it will be appreciated that the framing can be used not only as the base for the wall as illustrated but also for window and doorway frames. Moreover, with slight modifications, the framing can be used to outline virtually any shape. For instance, FIGS. **7** and **8** show framing **30'** comprising curved sections **33** which each includes a tongue **14''** and and a corresponding slot **15''** so that, when the sections are assembled with a number of modules, they form a wheel **34**.

In another form of the invention, parts corresponding to those described above are indicated by primed reference numerals. As shown in FIGS. **9** and **10**, this form includes a body **13'** whose edges **19'** are formed with slots **15'** of predetermined thickness, the slots being adapted to receive tongues **14'**. Herein, the tongues are generally diamond-shaped and include opposite end portions **35** and **36** sized and shaped to fit within the slots in adjacent edges of adjacent bodies. In contrast to the embodiment shown in FIGS. **1** through **5**, the tongues **14'** are formed separately of the body. This has been found to be of particular advantage when the body **13'** is formed of a material such as concrete or the like because the tongues are less likely to be broken during handling. With this arrangement, a structural unit **11'** is formed by joining one end portion **35** of the tongue with one body, the end portion being received telescopically in one of the slots and being secured therein by means of a binder (not shown) e.g., cement if the body is formed of concrete. Then, a second body may be telescoped on and secured to the other end portion **36** of the tongue so the adjacent edges **19'** of the two bodies abut each other as shown in FIG. **10**.

A still further form of the present invention is illustrated in FIGS. **11** and **12** wherein a module **10''** is defined by a square body **13''** having a plurality of tongues **14''** which are formed integrally with the edges **19''** of the body and project outwardly therefrom. Adjacent each tongue in the edge of the body is a corresponding slot **15''**. As in the first embodiment, the four tongues are each formed in a common plane spaced in-

wardly a predetermined distance from one of the faces **16''** and **17''** of the body and the slots are formed in a second common plane spaced inwardly a distance equal to the predetermined distance from the other one of the faces. The tongues and slots are generally the same size and shape as each other, each preferably having an area greater than the area of one of the faces divided by the number of edges **19''**. In this embodiment, the area of each slot and each tongue is equal to slightly less than one-fourth the area of one of the faces. The modules **10''** of this arrangement may be assembled in the same manner as the modules **10** of the first embodiment with the tongue **14''** being telescoped into the slot **15''** of an adjacent module until the edges **19''** of the two modules abut each other.

I claim as my invention:

**1.** An interlocking module comprising a substantially planar body shaped as an equilateral triangle providing side edges and having first and second generally flat and parallel faces, a generally flat and substantially triangular tongue of predetermined thickness integrally formed with and projecting outwardly from each side edge of said body, each of said tongues extending substantially along the entire length of its associated edge and having an area approaching but not greater than one-third the area of one of said faces, a slot opening out of each edge of said body and each of said slots lying in a second common plane spaced between and extending generally parallel with said first plane and said first face and being generally the same size, shape and thickness as one of said tongues, and an internal reinforcing member extending generally between said faces.

**2.** A structural unit formed of a series of interlocking modules of the type defined in claim **1**, said structural unit comprising a frame having one edge facing said modules, a plurality of second tongues projecting from said edge, a plurality of second slots formed in said edge adjacent said second tongues, said second tongues and slots being similar in size and shape to the tongues and slots of said modules and interfitting with the adjacent tongues and slots of the modules adjacent said one edge of said frame.

**3.** An interlocking module comprising a body shaped generally as a regular polygon providing side edges and having first and second generally parallel faces, a generally flat tongue projecting outwardly from each side edge of said body adjacent said first face, each of said tongues being joined to its associated edge substantially along the entire length thereof, a slot opening out of each side edge of said body between said tongue and said second face, each of said tongues and said slots being generally triangular in shape and of the same general thickness and having an area approaching but not larger than the area of one of said faces divided by the number of edges of said body, all of said tongues lying in a first common plane extending parallel to and spaced inwardly a predetermined distance from said first face, all of said slots lying in a second common plane spaced from and extending parallel with said first plane, said second plane further being spaced inwardly from said second face by a distance equal to said predetermined distance, and an internal reinforcing member extending generally between said faces.

**4.** An interlocking module as defined by claim **3** wherein said predetermined distance that said tongues and said slots, respectively, are spaced inwardly from said first and second faces is substantially equal to the thickness of said tongue.

**5.** A module as defined by claim **3** wherein each of said tongues includes opposing margins converging toward each other upon progressing outwardly from the edge of said body associated with said tongue, a marginal portion associated with each of said margins and extending outwardly of said associated edge a predetermined short distance in a direction generally perpendicular relative to said associated edge to join with the margin associated with said marginal portion, a wall in said internal reinforcing member defining each end of said slot and extending inwardly of the edge associated with said slot in a direction generally perpendicular to said associated edge.

**6.** A module as defined by claim **5** wherein said body is shaped generally as a square.

**7.** A module as defined by claim **5** wherein said body is shaped generally as an equilateral triangle.

* * * * *