

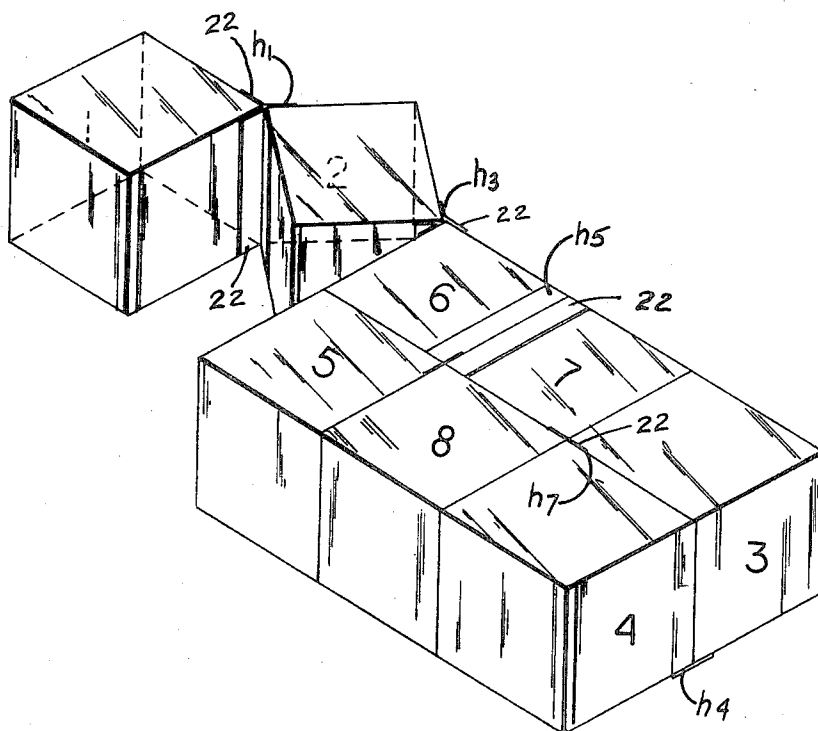
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 [22] Filed **Apr. 23, 1969**
 [45] Patented **Aug. 3, 1971**
 [73] Assignee **Geometric Industries Inc.**

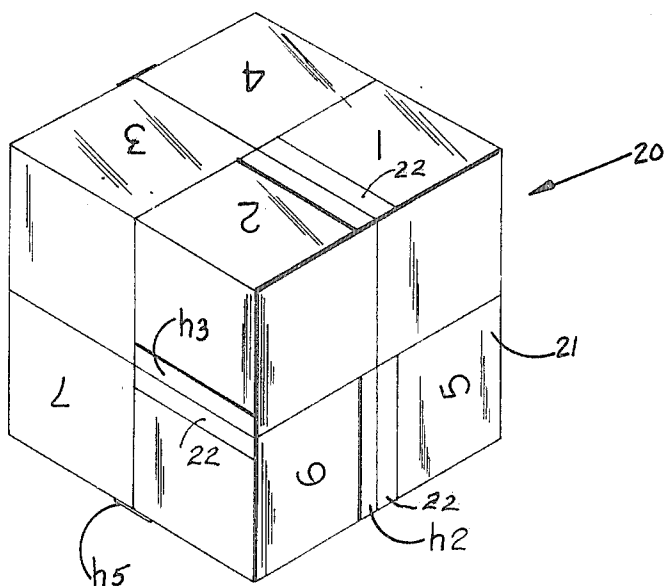
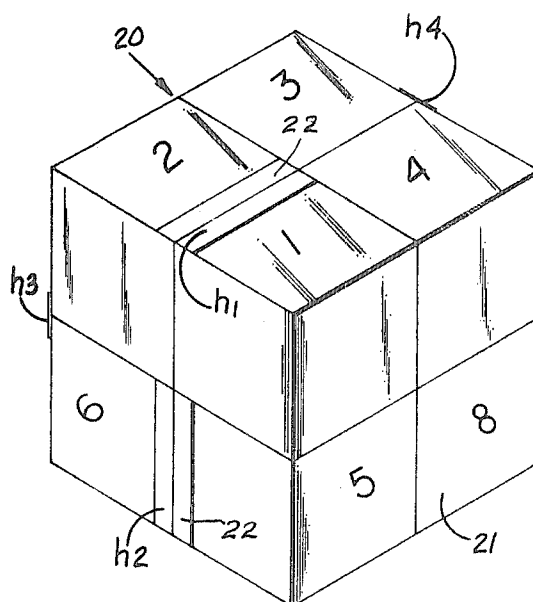
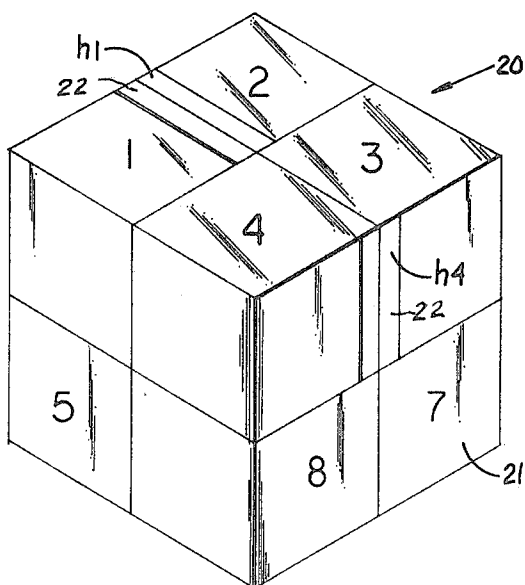
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[54] **SYSTEM OF HINGED POLYGONIC SHAPES**
9 Claims, 10 Drawing Figs.

[52] U.S. Cl..... 46/1 R,
 46/24
 [51] Int. Cl..... A63h 33/00
 [50] Field of Search..... 46/1, 25,
 24, 23

ABSTRACT: This disclosure is directed to a system of hinging a plurality of distinct similar polygonic shapes for movement between an enlarged modular unit shape composed of the respective plural shapes and a variety of alternate nonmodular shapes. The arrangement is such that one or more of the respective shapes may be pivoted individually or in groups about their respective axis of rotation independent of the remainder shapes. The respective polygonic shapes are hinged so as to pivot or rotate about perpendicularly disposed axis.





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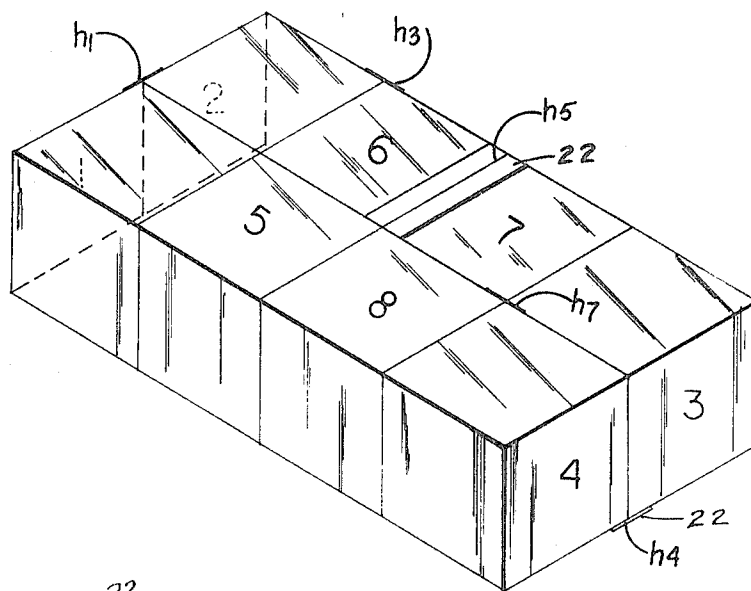


FIG. 4

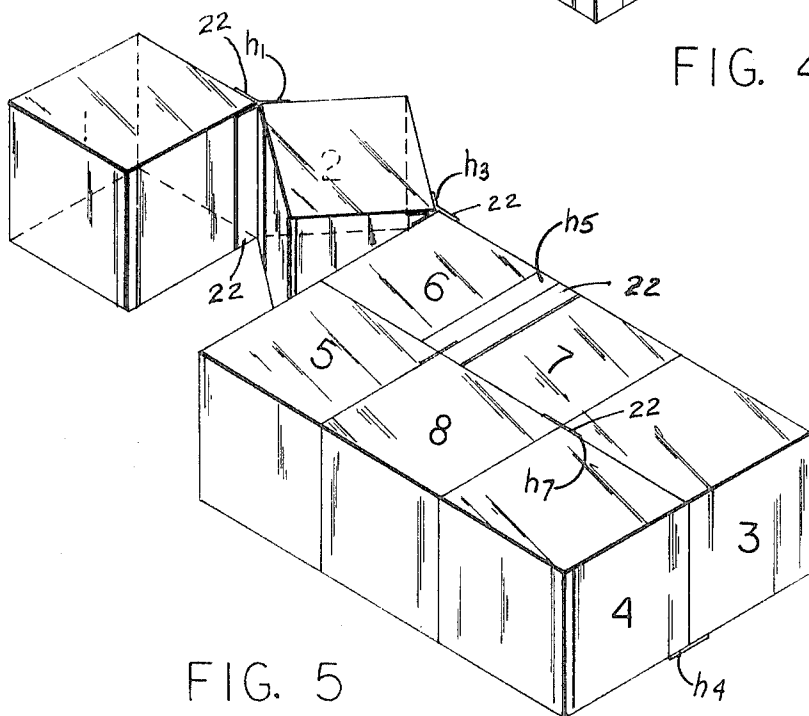


FIG. 5

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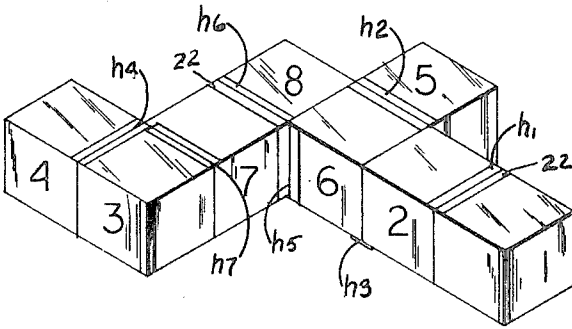


FIG. 6

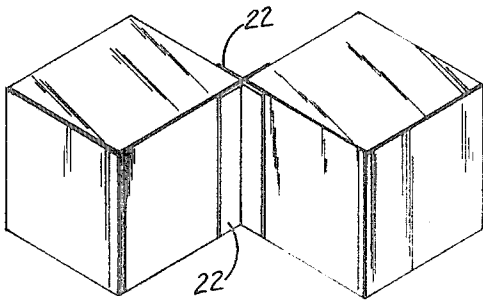


FIG. 7

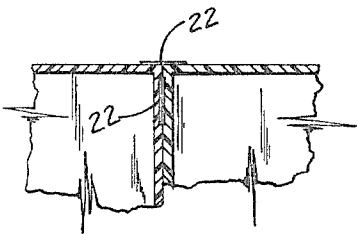


FIG. 8

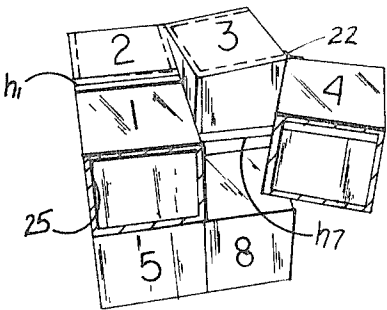


FIG. 9

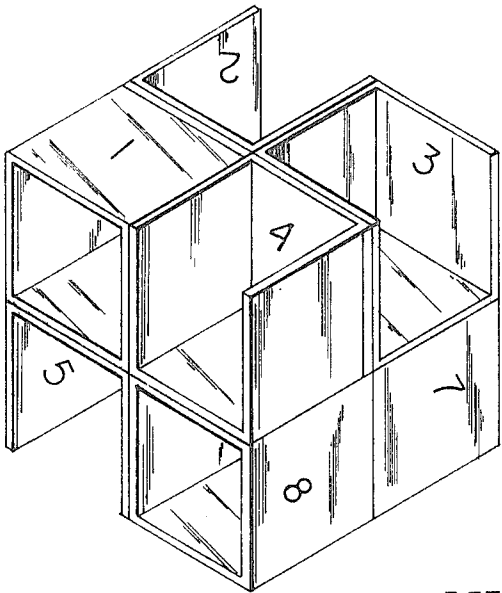


FIG. 10

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SYSTEM OF HINGED POLYGONIC SHAPES

OBJECTS

An object of this invention is to provide a plurality of polygonic shapes serially hinged for movement between a plurality of alternate geometric configurations.

Another object is to provide a system of hinging similarly constructed polygonic shapes in a predetermined series whereby the number of hinging axis is one less than the number of connected shapes and in which the hinging axis are perpendicularly disposed.

Another object is to provide a system of hingedly connecting a plurality of similarly constructed polygonic shapes for movement between a unit modular assembled from the plurality of shapes and a plurality of alternate nonmodular shapes.

Another object is to provide a system of hingedly connecting a plurality of distinct similarly constructed shapes to define various-shaped modular configurations.

Another object is to provide a system of hingedly connecting a plurality of multisided ploygoniclike shapes into various geometric patterns of connected polygons.

Another object is to provide a system of hingedly connecting a plurality of polygonic shapes whereby depending upon the construction of the particular polygonic shapes can be used for a variety of disassociated uses, e.g. modular furniture, tables, chairs, a display stand or shelves, or a game, a puzzle or amusement.

The foregoing objects, features and advantages are attained by a system of serially hinging a plurality of similar polygonic shapes in which the respective shapes can be rotated about their respective axis of rotation to define a plurality of alternate geometric forms. For example the polygonic shapes may include cubes, parallelograms, trapezoidals, or other forms. The respective shapes or polygons are suitably hinged along at least one of their adjacent edges so that the hinged shapes may rotate about its respective axis independently, or in unison with one or more, but less than all of the connected shapes. Preferably the joined polygonic shapes are hinged so that the plurality of connected shapes define in one position thereof a modular unit similar in configuration as the sum of its respective connected polygonic shapes. If desired respective polygonic shapes may be formed as opened sided figures so as to permit such shapes to receive other articles and things, thereby rendering the alternately formed geometric shapes to be used for stands, displays and/or as modular pieces of furniture. In miniature form the structure may be used as a puzzle, game or novelty.

A feature of this invention resides in the provision wherein the serially connected shapes, depending on the size and structure thereof may be utilized in a variety of dissimilar applications.

Other features and advantages will be more readily apparent when considered in view of the drawings and description in which:

FIG. 1 is a perspective view illustrating the system of hinged polygonic shapes folded into their unit modular position.

FIG. 2 is a perspective view similar to that of FIG. 1 with the modular unit of FIG. 1 rotated counterclockwise 90°.

FIG. 3 is a perspective view similar to that of FIG. 2 with the modular unit rotated counterclockwise another 90°.

FIG. 4 is a perspective view of the invention in which the respective shapes have been moved to one of its nonmodular positions.

FIG. 5 is a perspective view of the invention illustrated in another of its nonmodular positions.

FIG. 6 is a perspective view of the invention in yet another of its nonmodular positions.

FIG. 7 is a detail perspective view of a particular hinge construction.

FIG. 8 is a detail sectional view of the hinge construction of FIG. 7.

FIG. 9 illustrates a modular unit construction utilizing an open-sided polygonic shape.

FIG. 10 is a perspective view of another form of the invention utilizing another polygonic construction.

Referring to the drawings, there is shown in FIGS. 1 to 3 a system 20 for hinging polygonic shapes or forms 1 to 8 in a manner whereby the respective shapes or forms 1 to 8 can be rotated about a hinged axis $h1$ to $h7$ between a modular unit construction as shown in FIGS. 1 to 3 and a plurality of alternate nonmodular positions, e.g. illustrated in FIGS. 4, 5, 6 and other arrangements not shown, but readily apparent upon an understanding of the illustrated constructions. The polygonic shapes 1 to 8 in the illustrated form of the invention consists of similarly shaped cubic structures, which may be of solid or hollow construction, and/or may be provided with one, two or more open sides, as shown for example in FIGS. 9 and 10. The system of hinging 20 to be herein described may be employed also with other polygonic shapes, such as parallelograms, trapezoidals and the like.

In the illustrated form of the invention each system 20 is preferably composed of eight similar-constructed forms 1 to 8, e.g. cubes wherein the respective cubes 1 to 8 are serially connected so that one cube or form is hingedly connected to another one of the cubes or forms. The arrangement is such that in the folded position as noted in FIGS. 1 to 3 the respective forms or cubes 1 to 8 can be readily disposed relative to one another to define a larger modular unit or cube 21 in which one or more of the smaller cubes or forms 1 to 8 may be rotated about their respective axis $h1$ to $h7$ to define nonmodular shapes as shown in FIGS. 4, 5 and 6, it being understood that FIGS. 4, 5 and 6 are merely illustrative alternate forms, and not conclusive of all of the nonmodular shapes possible by the described system 20.

Basically for an eight unit modular 21 of FIGS. 1 to 3, seven hinging axis $h1$ to $h7$ are required. In other words the number of hinging axis h required to form the system is one less than the number of forms or cubes 1 to 8 comprising the modular 21. Also the invention contemplates that two or more modulars 21 (not shown) may be hinged together to increase the number of possible variations of nonmodular shapes. In such case two modular units, such as 21 may be joined by hinging connecting the adjacent edges of at least one block in each unit 21—21.

The hinging means by which adjacent blocks or forms 1 to 8 may be pivotally connected may be of any suitable hinge connection. However in the illustrated form, the cubes or forms 1 to 8 comprising the modular unit 21 the hinge means comprises an adhesively backed strip 22 which may be formed of any suitable material, e.g. leather, fibrous, mylar or other strong, flexible materials, depending upon the particular application to which the system is to be used. Also mechanical, metallic hinge constructions may be used when the system is used as a piece of furniture as will be herein described.

For purposes of description only, the respective forms or cubes 1 to 8 making up the basic eight cube modular unit 21 have been individually identified by numerals 1 to 8, which numbering has been maintained throughout the various views. Referring particularly to FIG. 6, the respective forms of cubes 1 to 8 are serially connected along hinge or fold axis h identified as $h1$, $h2$, $h3$, $h4$, $h5$, $h6$ and $h7$. With the construction illustrated, cube or form 1 is hingedly connected to the adjacent edge of form 2 so as to be pivoted relative thereto about hinge axis $h3$. Cube 5 is hinged to cube 6 about axis $h2$. Cube 6 is also hinged to adjacent edge of block 7 about hinge axis $h5$. Cube 7 is hinged to adjacent block 8 about hinge axis $h6$. Cube 3 is hinged to block 7 about hinge axis $h7$ and cube 4 is hinged to adjacent edge of cube 3 about hinge axis $h4$.

As shown in FIGS. 7 and 8 the respective hinge construction $h1$ to $h7$ defining the respective hinge axis or axes rotation comprises an adhesive strip 22, 22 secured to the adjacent hinged blocks. Thus it will be noted that two strips 22, 22 define each hinge construction.

It will be understood that the respective forms or cubes 1 to 8 can be made of any suitable material, e.g. glass, plastic, metal, wood etc.; the type of material being dependent upon the particular use and styling desired.

In the described construction, the arrangement is such that one or more cubes or forms 1 to 8 can be rotated about its particular axis or rotation without effecting the displacement of the remaining blocks. Accordingly, one or more of the respective cubes may be rotated out of the basic modular unit position 21. The system of hinging similarly shaped forms thus enables one to create various nonmodular designs and shapes.

The system of joining various shapes as herein described thus renders the same to be utilized as a novelty, i.e. a toy, puzzle or a variable cubiclike design form, or in larger forms may be utilized for more utilitarian needs, e.g. modular modern furniture designs such as table and chair groups, lounges and the like, or the unit construction may be used as shelves, display stands or the like.

Referring to FIG. 9, the respective forms or shapes 1 to 8 may be defined as cubes having an open side as indicated at 25, thereby permitting various articles to be placed therein for storage or display. As hereinbefore described, the arrangement of the respective open-sided forms of FIG. 9 may be rotated about their respective hinged axis so that various, nonmodular shapes may be formed in the same manner as hereinbefore described.

In FIG. 10, the cubiclike forms 1 to 8 may be provided with two or more open sides as shown. In this construction the arrangement can provide for various novel readily adjustable pieces of furniture. For example as shown, back-to-back chairs can be formed. Also depending upon the arrangement of the respective cubic forms, various nonmodular arrangements can be made simply by rotating the respective cubiclike forms about their respective axes or rotation.

The system of hinging the cubiclike forms of FIGS. 9 and 10 is similar to that described with respect to FIGS. 1 to 3. Therefore the cubiclike forms of FIGS. 9 and 10 can be rotated into the same nonmodular arrangements in which the forms or shapes 1 to 8 of FIGS. 1 to 3 may be placed.

The respective forms, hinged as herein described thus rotate through right angles and/or about perpendicular disposed axes.

From the foregoing it will be apparent that the described system for hinging geometric shapes such as cubes, or the like, depending upon dimension, can be utilized for a host of diverse applications. Therefore it will be readily understood and appreciated that variations and modifications may be made without departing from the spirit or scope of the invention.

What I claim is:

1. An article of manufacture comprising a plurality of polygonic shapes,

means for hingedly connecting said polygonic shapes to an adjacent polygonic shape in open series whereby at least one of said shapes may be rotated about its hinged connection independently of any of the other of said shapes, said shapes being adapted to fold between a unit modular formation which is geometrically similar in shape to the shape of the individual shape of said plural polygonic shape and comprising a multiple of said shapes, and a series of different geometric patterns in which said unit modular shape is disrupted, and

the number of said hinge means interconnecting adjacent blocks being equal to one less than the number of shapes making up said modular unit,

and the axis of said hinge means being angularly disposed whereby the respective blocks are rotated either individually or in selected groups in different planes about the respective axis of said hinge means.

2. The invention as defined in claim 1 wherein said axis of rotation about which said shape may rotate is disposed in relative perpendicular relationship.

3. The invention as defined in claim 1 wherein said shapes may comprise solid parallelogram shapes.

4. The invention as defined in claim 1 wherein said shapes may comprise hollow parallelogram shapes.

5. The invention as defined in claim 4 wherein said shapes may have an open side whereby said opened sided shape may be utilized as a receiver.

6. The invention as defined in claim 3 wherein said shapes are cubic.

7. The invention as defined in claim 1 wherein said means for hingedly connecting said shapes comprises an adhesive strip of material.

8. The invention as defined in claim 1 wherein certain of said shapes are hingedly connected to at least two adjacent blocks along their respective adjacent edges, and the remainder shapes connected to only one adjacent block along adjacent edges.

9. The invention as defined in claim 8 wherein said shapes include eight cubes,

at least two of said cubes being hingedly connected to three adjacent cubes along their respective adjacent edge portions,

at least two of said cubes being hingedly connected to at least two adjacent cubes along their adjacent edges, and the remaining cubes being hingedly connected to a single adjacent cube, along one adjacent edge only.