

[54] SHELTER STRUCTURE
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[22] Filed: Mar. 1, 1972

[21] Appl. No.: 230,884

[52] U.S. Cl. 52/71, 46/21, 52/64, 52/82

[51] Int. Cl. E04b 1/343, E04h 1/12

[58] Field of Search 52/71, 82, 79, 86, 52/64, 81; 46/19, 21; D13/1 E

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Primary Examiner—Frank L. Abbott

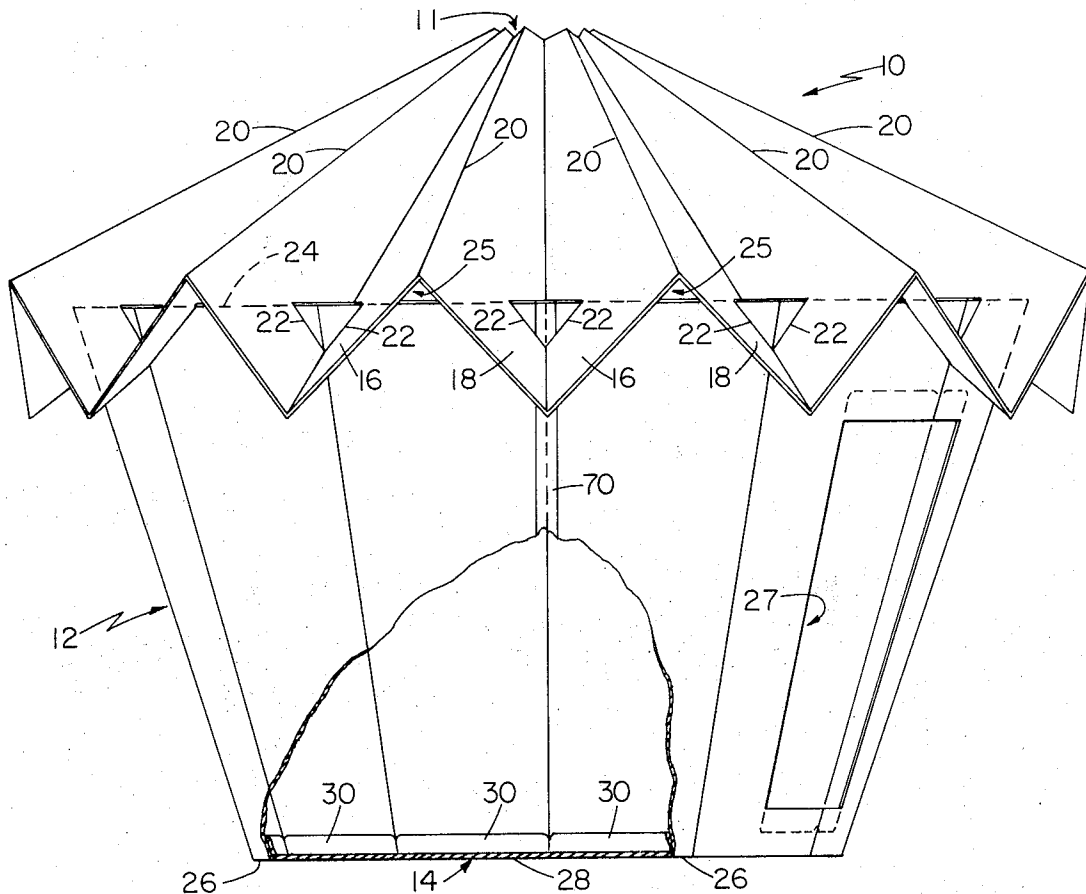
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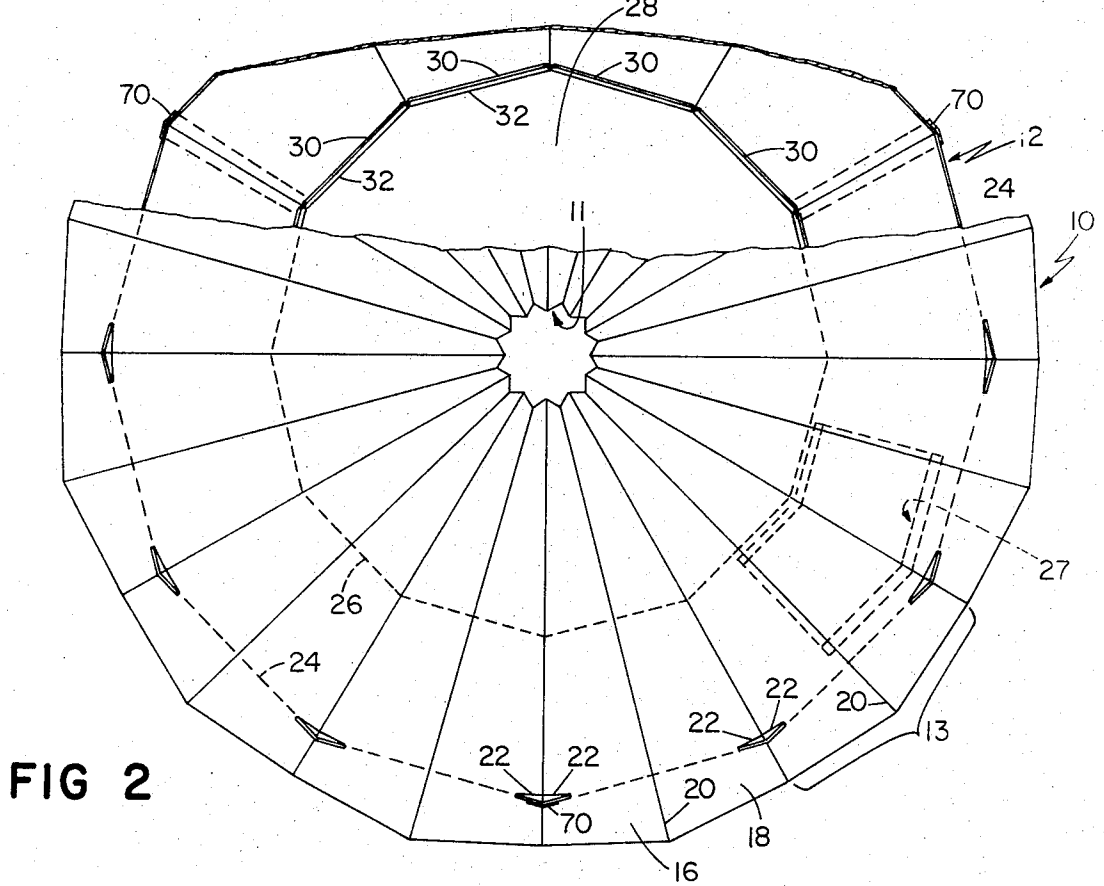
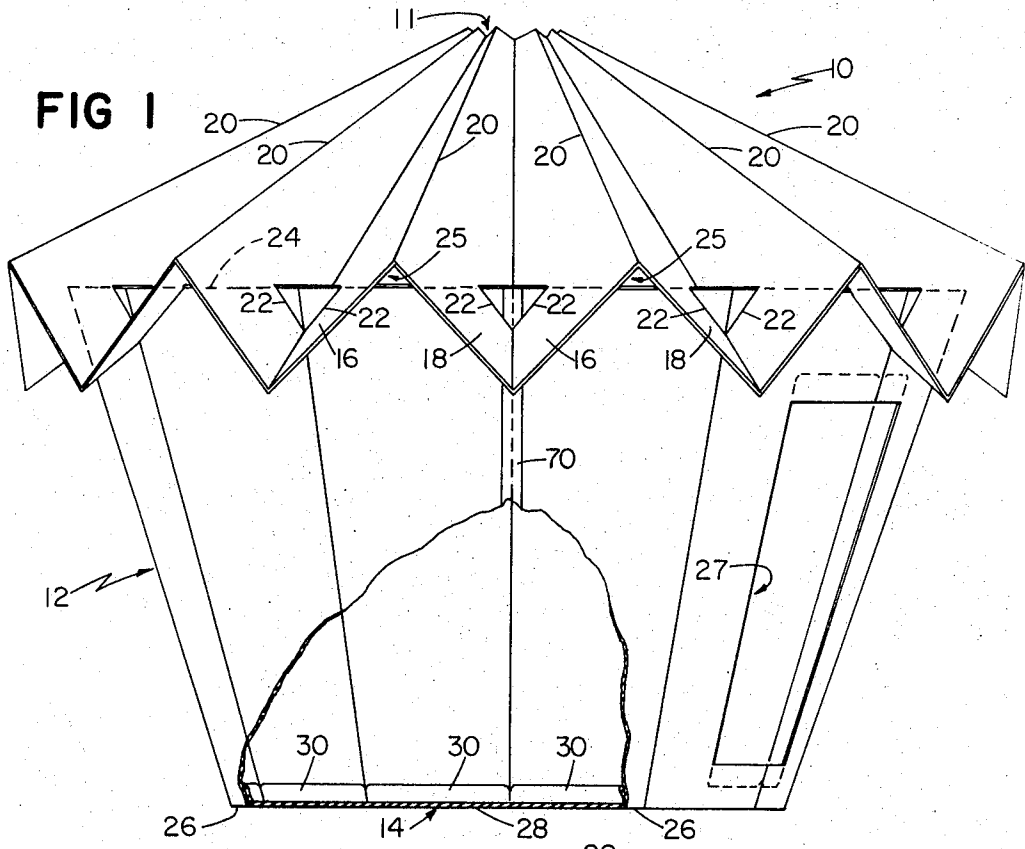
[57] ABSTRACT

A shelter structure comprising a wall unit and a roof unit, the wall unit having an upper edge which forms a polygon having a predetermined number of sides, and the roof unit subunit a like predetermined number of subunits, each roof subunit having a peripheral edge and two lateral edges which extend from opposite ends of the peripheral edge and converge, each sub being folded along a fold line which extends perpendicularly from the peripheral edge intermediate the lateral edges, each subunit including an opening in the material thereof on each side of the fold line, and each opening having a portion of the wall unit upper edge extending therethrough.

17 Claims, 8 Drawing Figures



4 Sheets-Sheet 1



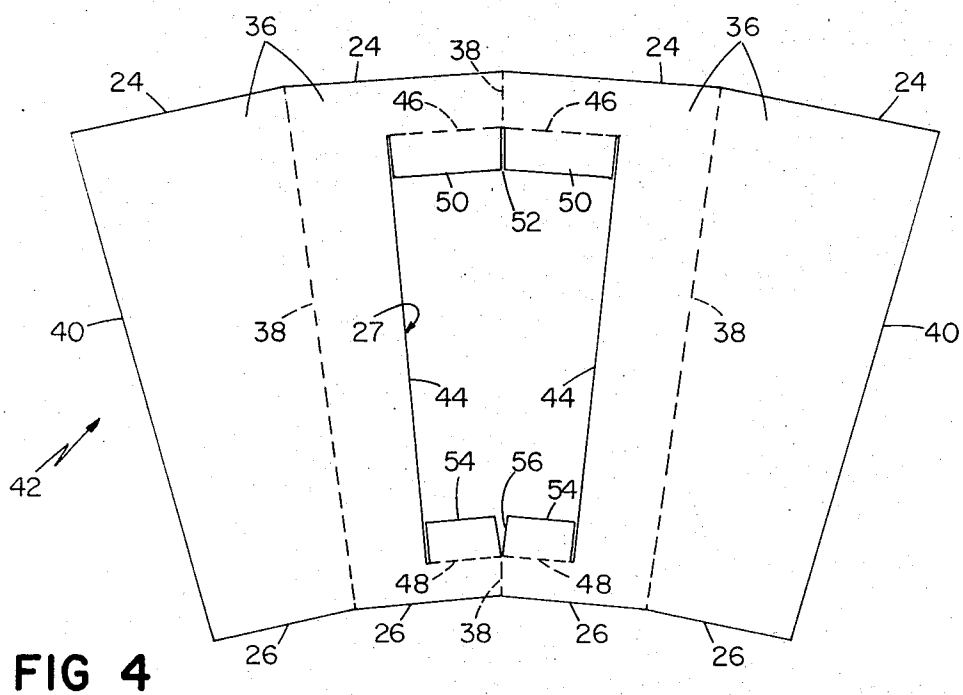
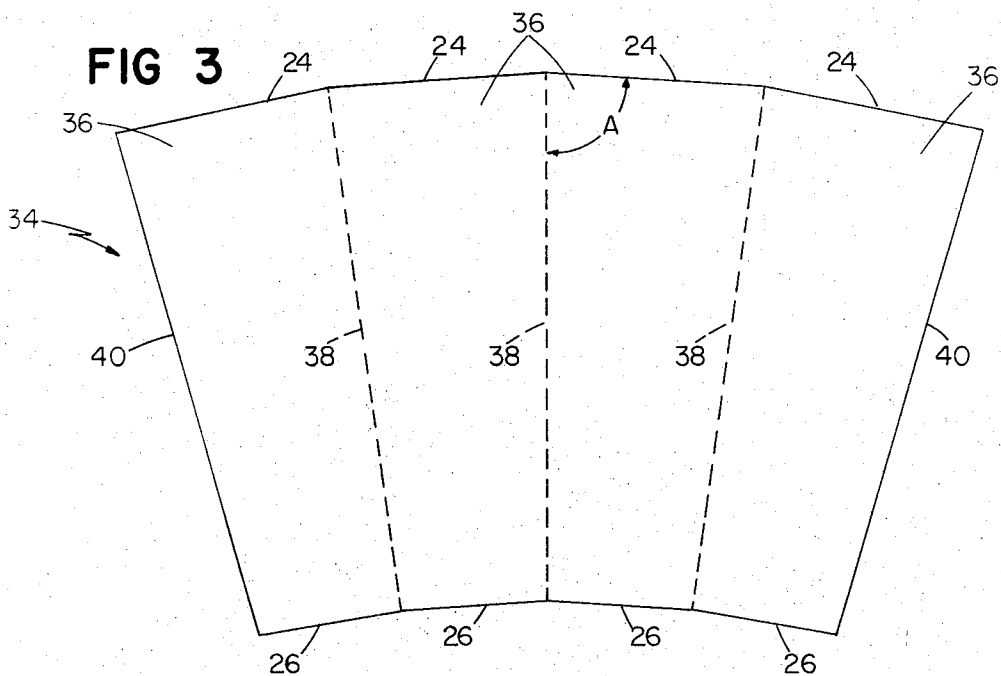


FIG 5

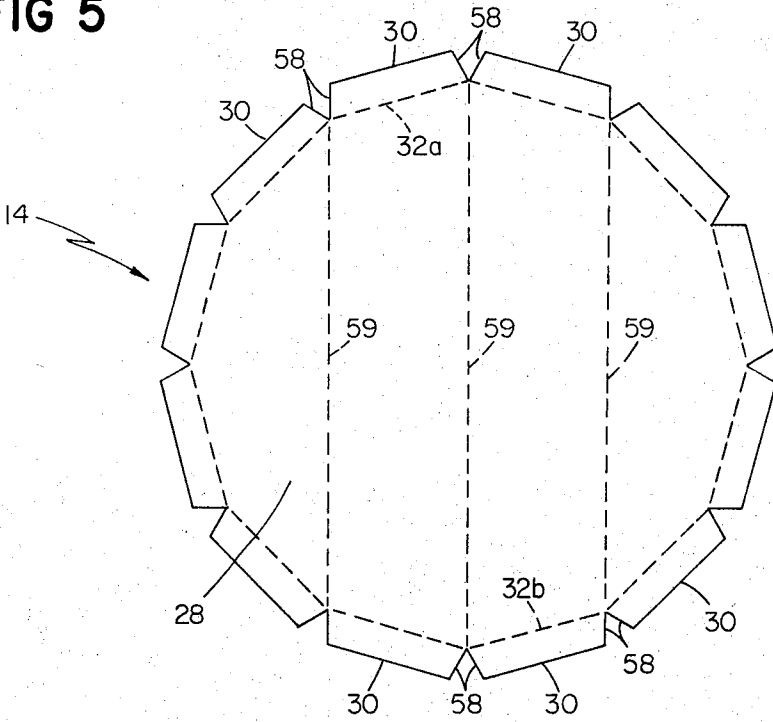
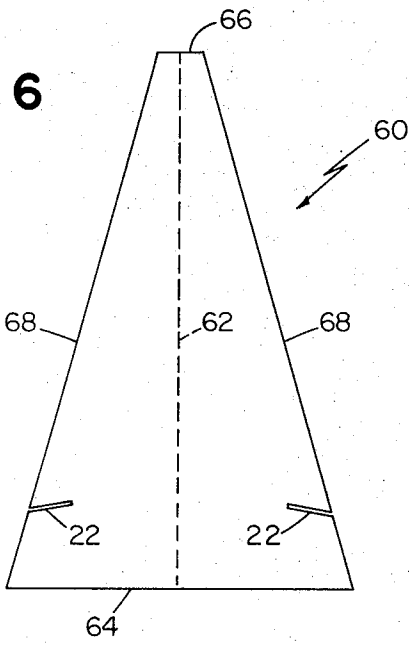


FIG 6



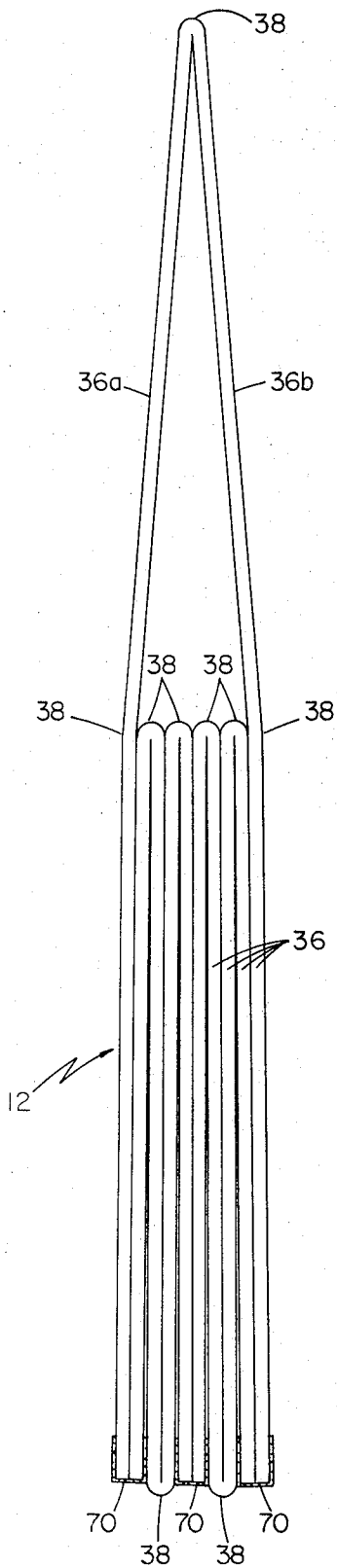


FIG 7

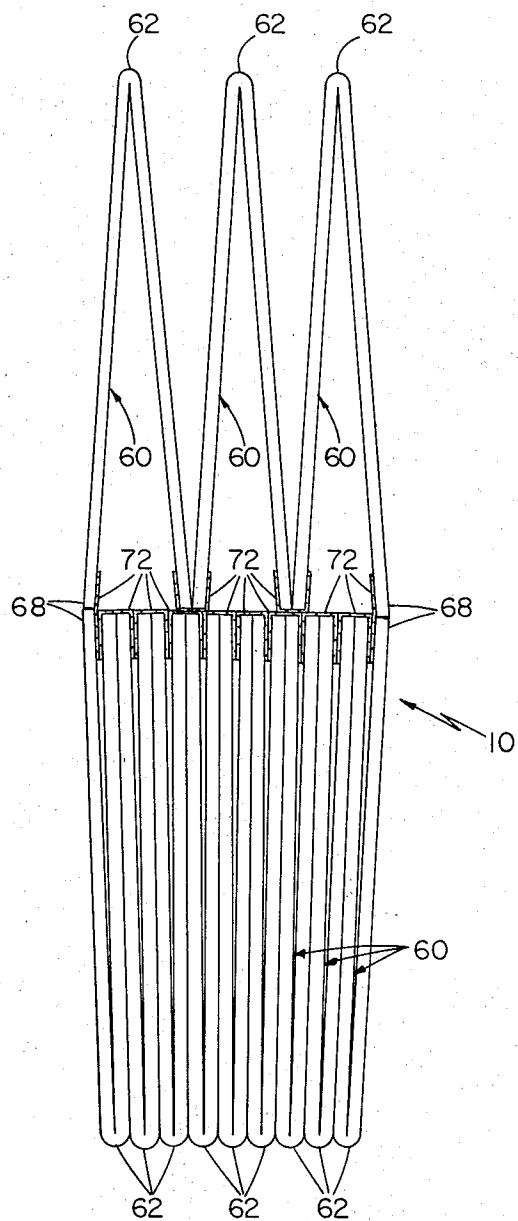


FIG 8

SHELTER STRUCTURE

This invention relates to shelter structures.

It is a principal object of the present invention to provide a shelter structure of lightweight and inexpensive materials that is easily assembled and disassembled, is useful indoor and out, and is of such design that it has the rigidity required for heavy use and to withstand jostling.

It is a more particular object of the present invention to provide an inexpensive shelter structure of the type described which will be suitable for use within a larger building in an educational situation to provide a visually and aurally separated space. It is a further object to provide such a structure which is extremely light in weight so as to be easily movable within the larger building and which is easily disassembled and is collapsible for efficient storage.

The invention features a shelter structure comprising a wall unit and a roof unit, the wall unit having an upper edge which forms a polygon having a predetermined number of sides, and the roof unit comprising a like predetermined number of subunits, each roof subunit having a peripheral edge and two lateral edges which extend from opposite ends of the peripheral edge and converge, each subunit being folded along a fold line which extends perpendicularly from the peripheral edge intermediate the lateral edges, each subunit including an opening in the material thereof on each side of the fold line, and each opening having a portion of the wall unit upper edge extending therethrough. In preferred embodiments in which the structure is of corrugated cardboard, the wall unit comprises a plurality of panels each having upper, lower and two side edges, the panel upper and lower edges define similar regular polygons, the polygon defined by the upper edge being larger than that defined by the lower edge, a floor unit comprising a regular polygon is secured to the wall unit, the roof unit defines an opening extending through the center thereof and the wall unit defines an access opening extending therethrough, and the wall and roof unit each comprise respective subunits connected to each other by pressure sensitive tape.

Other objects, features, and advantages of the invention will appear from the following description of a preferred embodiment taken together with the accompanying drawings. In the drawings:

FIG. 1 is a partially broken away front elevation of a shelter structure constructed according to the invention;

FIG. 2 is a partially broken away plan view of the structure of FIG. 1;

FIG. 3 is a plan view of a segment of the wall unit of the shelter of FIG. 1 prior to assembly;

FIG. 4 is a plan view of a segment of the wall unit which includes a door opening;

FIG. 5 is a plan view of floor unit of the structure of FIG. 1;

FIG. 6 is a plan of a subunit of the roof unit of the structure of FIG. 1;

FIG. 7 is an end elevation of the wall unit as folded for storage; and

FIG. 8 is an end view of the roof unit as folded for storage.

Referring to FIGS. 1 and 2, the shelter structure comprises a roof unit 10, a wall unit 12, and a floor unit 14. The roof unit 10 defines a central opening 11 there-

through and consists of twelve identical subunits. Each subunit has planar portions 16 and 18 joined along a fold line 20 and a slot 22 in each of portions 16 and 18 which engage the wall unit 12 as further described below.

The wall unit 12 comprises twelve equal sized panels. Each panel has an upper edge 24 which is longer than lower edge 26. The panels are secured to one another with the side edges of neighboring panels in abutting relation. Because of their shape, the panels slope outwardly from lower to upper edge. The twelve upper edges 24 of the twelve panels in the assembled shelter structure form a regular polygon having twelve sides (i.e., a "dodecagon"). The twelve lower edges 26 of the panels form a second regular polygon also having twelve sides but being smaller in size. Door opening 27 is provided in a pair of adjacent panels.

The floor unit 14 consists of a dodecagon 28 of the same size as the second regular polygon formed by edges 26. Flaps 30 project from polygon along score lines 32 which define its twelve edges.

FIG. 3 illustrates the presently preferred form of a subunit 34 of wall unit 12. The subunit 34 is made from corrugated cardboard and consists of four identical panels 36. The upper edge 24 of each panel 36 is approximately 15 inches long and lower edge 26 is approximately 10 inches long. The four panels 36 are constructed from a single piece of material (e.g., corrugated cardboard). Score lines 38 extend from the intersections of neighboring pairs of edges 24 to the associated intersections of neighboring pairs of edges 26. Each score line 38 makes an angle A of approximately 94° with the adjacent lower edge 26 and is approximately 36 inches long. Each panel 36 has a pair of side edges which connect the upper edge 24 and the lower edge 26. For the two interior panels of subunit 34, the side edges will coincide with the appropriate score lines 38. The outer two panels 36 will have side edges comprising a single score line 38 and an edge 40.

FIG. 4 illustrates a wall subunit 42 which, like subunit 34 includes four identical panels 36, but includes additionally a door opening 27. The opening 27, half of which is provided by each of a pair of adjacent panels 36, is defined by side edges 44, upper score lines 46, and lower score lines 48. A pair of flaps 50 project downwardly from score lines 46 and are separated by slit 52. A pair of flaps 54 project upwardly from score lines 48 and are separated by a notch 56.

FIG. 5 illustrates the floor unit 14 prior to assembly of the shelter structure. The distance between opposed score lines 32 (e.g., score lines 32a and 32b), or, alternatively, the diameter of a reference circle (not shown) inscribed within dodecagon 28 tangent to each score line 32, is approximately 37 inches. Flaps 30 are integral with polygon 28 and project therefrom along score lines 32 for a distance of approximately 2 and ½ inches. Flaps 30 are trapezoidal in shape with score line 32 being the longer of the two parallel edges. This shape provides notches 58 between adjacent flaps 30 when those flaps lie in the plane of polygon 28. Floor unit 14 is formed from corrugated cardboard and includes score lines 59 extending across polygon 28. Score lines 59 provide for convenient storage of the floor unit, as described below.

FIG. 6 illustrates a single element 60 of the roof unit 10 prior to folding for assembly in the shelter structure. The element 60 is made from corrugated cardboard

and includes a score line 62 which defines fold line 20 (see FIG. 1) in the assembled structure. Element 60 is trapezoidal in shape having a peripheral edge 64 which is approximately 22 inches long and a central edge 66 which is approximately 3 inches long. Lateral edges 68 extend between edges 64 and 66. The score line 62 extends from the center of edge 64 to the center of edge 66 and has a length of approximately 36 inches. Slots 22 are cut into the material of subunit 60 and communicate with the lateral edges 68. At edge 68 the slot 22 is approximately four and $\frac{3}{4}$ inches from peripheral edge 64 and the slot is angled in a direction away from edge 64 so that other portions of the slot are further removed from the peripheral 64. The length of the slot 22 is approximately 2 and $\frac{1}{4}$ and its width is approximately $\frac{1}{8}$ inch.

The components of the shelter structure are assembled as follows. The wall unit is first assembled by bending back flaps 50 and 54 and adhering them (e.g., as by pressure sensitive tape) to the immediately adjacent material of the respective panels 36. This provides a strengthened frame adjacent door opening 27. Two wall subunits 34 and one wall subunit 42 are assembled into a configuration as shown in FIG. 1 by adhering each subunit to the other two such that its side edges 40 are abutted against a side edge 40 of each of the other two subunits. For this purpose pressure sensitive plastic tape 70 (see FIG. 1) may be used.

With the assembled wall unit resting on lower edges 26 of panels 36, the floor unit is lowered into the wall unit from above with each flap 30 being aligned with a single panel 36. As the floor unit 14 is lowered into the wall unit 12 the flaps 30 will be bent upwardly along score lines 32 because of the dimensional limitations previously discussed. When the floor unit 14 has been lowered to the point where polygon 28 is substantially in the plane of the polygon formed by edges 26, the flaps 30 are adhered to the adjacent panels 36. The structure, assembled to that point, may be then inverted and the floor unit taped to the wall unit from the outside of the structure.

Subunits 60 of roof unit 10 are assembled into the roof unit by folding each subunit 60 along its score line 62 and, sequentially, aligning each subunit 60 with its neighboring subunit 60 such that the adjacent edges 68 are in abutting relation and slots 22 are aligned, and adhering one subunit to the other. Peripheral edges 64 of subunits 60 define the outer edge of the assembled roof unit; center edges 66 define opening 11. In practice, the adjacent subunits are secured together by two pieces of pressure sensitive tape; one piece extending along the abutting edges 68 from the center edges 66 up to the slot 22 and a second from the slot 22 to the peripheral edge 64.

After the assembly of roof unit 10, it is lifted above and lowered onto the wall unit 12. The angles or corners of the regular polygon defined by upper edges 24 of wall unit 12 are inserted through each communicating pair of aligned slots 22. The assembly is now complete for most purposes. If unusual drafts or wind conditions are anticipated, or if it is contemplated that the structure may be moved by lifting it by the roof, the roof unit 10 may be further secured to the wall unit 12 in any conventional fashion (e.g., pegs or nails extending through the portions of panels 36 which project above the slots 22, tape, etc.). The particular roof unit configuration provides openings 25 (see FIG. 1) in the

eaves beneath each fold line 20. These openings cooperate with central opening 11 to provide excellent ventilation for the shelter structure permitting it, for example, to remain comfortably cool inside even when the structure is in direct sunlight.

For disassembling and sorting the shelter structure, the tape securing flaps 30 to panels 36 (and, additionally, any "extra" means for securing roof unit 10 to wall unit 12, such as mentioned in the preceding paragraph), must be removed. The roof unit 10 is then lifted off the wall unit 12 and the floor unit 14 lifted out of the wall unit 12.

Floor unit 14 may be placed into a configuration which is much more convenient for handling and storage by folding it along score lines 59. The wall unit 12 is folded into a configuration shown in the end view of FIG. 7. By folding the panels of wall unit 12 in an accordian-like fashion along each score line 38 and each tape joint 70, a configuration is achieved with ten panels 36 aligned in a stacked relation and two panels 36a and 36b projecting outwardly from the stack. An even more compact storage configuration can be achieved, of course, if the tape 70 from a single tape joint is removed or cut. In that case, a single, integral stack of the 12 panels 36 is achieved. An analogous accordian-like folding and stacking of roof subunits 60 is illustrated in FIG. 8. Strips of tape 72 which join neighboring pairs of subunits 60 are disposed on the under sides of the subunits 60 and thus not visible in FIGS. 1 or 2.

Although it is presently preferred to form all component portions of the structure from corrugated cardboard, it will be apparent that most any variety of building material would be suitable. Regardless of the material used in their construction, structures such as have been described are useful for a multitude of purposes. Thus, for example, they may provide temporary shelter, storage, dog houses, play houses, etc. It has been found, however, that these structures are particularly useful in an educational situation, where they provide an inexpensive way of providing visually and aurally segregated spaces within a larger classroom or other school unit. Such segregated spaces are increasingly being found to be useful, and even necessary, for such purposes as individual instruction, individual projects, enclosure of special equipment (e.g., a computer terminal), etc.

The use of corrugated cardboard or other lightweight materials, as is preferred, in forming the shelter structure is facilitated by the design in which many of the forces present counterbalance each other rather than being borne fully by the building material. Furthermore, the opening 11 in the center of the assembled roof unit 10 provides for a measure of flexibility to accommodate stress in the shelter structure.

Other embodiments within the scope of the following claims will occur to those skilled in the art.

What is claimed is:

1. A shelter structure comprising:

a wall unit; and,

a roof unit detachably secured to said wall unit,

said wall unit comprising a plurality of panels secured to each other along the side edges thereof,

the upper edges of said panels forming a first polygon having a predetermined number of sides,

the lower edges of said panels forming a second polygon similar to said first polygon having sides which

are shorter than the respective sides of said first polygon,
 said roof unit comprising a like predetermined number of subunits,
 each roof subunit having a peripheral edge, two lateral edges which extend from opposite ends of said peripheral edge and converge, and a central edge disposed at the opposite ends of said lateral edges from said peripheral edge,
 each subunit being folded along a fold line which extends from said peripheral edge to said central edge intermediate said lateral edges,
 each subunit including an opening in the material thereof on each side of said fold line,
 each said opening having a portion of said wall unit upper edge extending therethrough, and said central edges of said subunits defining an opening in the center of said roof unit,
 said opening providing flexibility for accommodation of stress in said roof unit.

2. A shelter structure as claimed in claim 1 wherein said fold line extends perpendicularly from the center of said peripheral edge.

3. The shelter structure as claimed in claim 1 wherein said openings comprise slots cut into the material of each said subunit from each said lateral edge.

4. The shelter structure as claimed in claim 3 wherein portions of said slot adjacent said lateral edge are closer to said peripheral edge than portions of said slot removed from said lateral edge.

5. The shelter structure as claimed in claim 4 wherein each said slot has a length which is approximately ten percent of the length of said peripheral edge.

6. The shelter structure as claimed in claim 1 wherein neighboring pairs of said subunits are secured to each other.

7. The shelter structure as claimed in claim 6 wherein neighboring pairs of said subunits are secured by means of tape bearing a pressure sensitive adhesive.

8. The shelter structure as claimed in claim 1 wherein one of said panels includes an opening which can serve as an entrance into the shelter structure.

9. The shelter structure as claimed in claim 1 wherein said polygons are similar, regular polygons.

10. The shelter structure as claimed in claim 1 wherein the number of said panels is equal to said predetermined number, each said panel has an upper edge and a lower edge which is shorter than the said upper edge thereof, and adjacent side edges of neighboring pairs of panels are uniformly spaced throughout their entire lengths.

11. The shelter structure as claimed in claim 1 wherein said polygons are regular, similar polygons, adjacent side edges of neighboring pairs of panels are in

abutting relation throughout their entire length and said lower edges form said second polygon, each said side of said second polygon being shorter than the sides of said first regular polygon.

12. A shelter structure as claimed in claim 11 including a floor unit secured to said wall unit.

13. A shelter structure as claimed in claim 12 wherein said floor unit comprises a polygon having the same number of sides as said second polygon.

14. A shelter structure as claimed in claim 13 wherein said floor unit comprises a plurality of flaps attached to said floor unit polygon at a like plurality of sides thereof.

15. A shelter structure comprising a wall unit comprising a predetermined number of panels each having upper and lower edges and a pair of side edges, said upper edges being longer than said lower edges, neighboring pairs of panels having their adjacent sides in abutting relation and being secured to each other, said upper edges of said panels forming a first regular polygon and said lower edges of said panels forming a second regular polygon similar to but smaller than said first regular polygon, and said panels defining an opening which can serve as an entrance into the shelter structure; a roof unit detachably secured to said wall unit and comprising a like predetermined number of subunits, each subunit having a peripheral edge of one length, a central edge of lesser length and two lateral edges, each subunit being folded along a fold line which extends between the center points of said peripheral and central edges thereof, each subunit including a slot cut into the material thereof spaced from lateral edge thereof, neighboring pairs of subunits being secured to each other with the adjacent lateral edges thereof in abutting relation, each said slot having a portion of a wall unit panel extending therethrough, and the distance from each of said slots to the central edge of the subunit thereof being such that said central edges of said subunits define an opening in the center of said roof unit to provide flexibility for accommodation of stress therein; and,

a floor comprising a regular polygon similar to and substantially the same size as said second regular polygon, and a flap extending from each side of said floor unit polygon, said flaps being secured to said wall unit.

16. A shelter structure as claimed in claim 15 wherein there are twelve said panels.

17. A shelter structure as claimed in claim 15 wherein said wall unit, said roof unit, and said floor unit are each formed from corrugated cardboard.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,766,693 Dated October 23, 1973

Inventor(s) Sumner F. Richards and Charles S. Biechler

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the Abstract, line 4, change "subunit" to --comprising--;
line 7, change "sub" to --subunit--;

Column 2, line 26, after "and" insert --the--;

Column 4, line 6, change "sorting" to --storing--;

Column 6, line 9, change "smae" to --same--;
line 44, after "floor" insert --unit--.

Signed and sealed this 26th day of March 1974.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents