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Webster

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[54] **FOLDABLE PORTABLE STRUCTURE**

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[52] **U.S. Cl.** ..... **52/70,** 52/71, 135/1 R, 135/4 R

[51] **Int. Cl.** **E04b 1/344**

[58] **Field of Search** ..... 52/71, 69, 64, 70, 66; 135/1 R, 4 R, 3 R

[56] **References Cited**

UNITED STATES PATENTS

2,835,931	5/1958	Sterkin	52/70 X
2,701,038	2/1955	Mooney	52/69
3,442,057	5/1969	Derr	135/1 R X
3,084,667	4/1963	Felhofer et al.	135/4 R X
3,324,831	6/1967	Onge	52/71 X
2,296,358	9/1942	Morinsky et al.	135/1 R
3,474,804	10/1969	Gellert	135/3 R
2,420,898	5/1947	Miner	135/4 R X
3,083,418	4/1963	Reams	52/69 X
3,617,086	11/1971	King	52/69 X
3,454,020	7/1969	Grossman	52/70 X
3,332,178	7/1967	Foster	52/70
2,980,124	4/1961	Atchison	135/1 R
3,280,796	10/1966	Hatcher	52/70 X R
3,193,973	7/1965	Lee et al.	52/90 X R
2,845,663	8/1958	Harr	52/70 X R

FOREIGN PATENTS OR APPLICATIONS

1,103,558	5/1961	Germany	135/4 R

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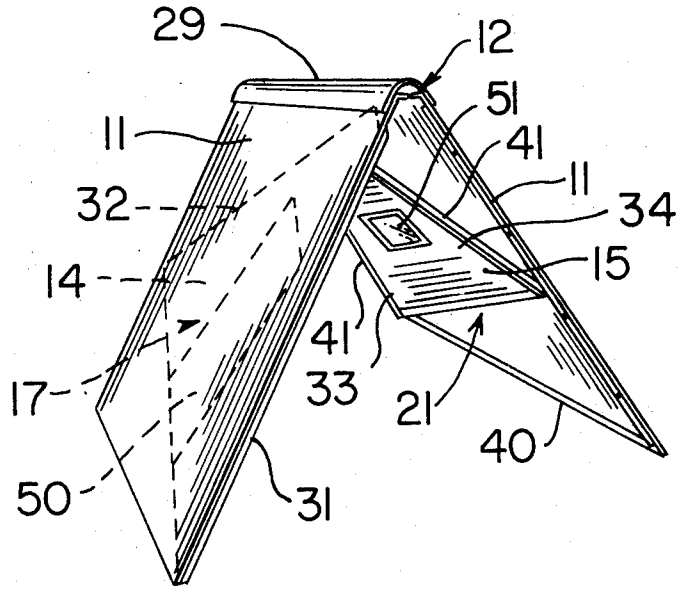
[57] **ABSTRACT**

A portable structure which is readily assembled and disassembled is provided and comprises a pair of rectangular panels fastened together in a hinged manner along associated edges by fastening means which enable the rectangular panels to be hingedly folded toward each other and arranged in parallel relation to define a space therebetween and away from each other to define an inverted V-shaped structure. The structure includes a pair of triangular panels hingedly attached to the rectangular panels; and, the triangular panels are adapted to be folded inwardly and received within such space once the rectangular panels are folded in parallel relation and adapted to be folded outwardly and fastened in position once the rectangular panels are folded outwardly.

5 Claims, 9 Drawing Figures



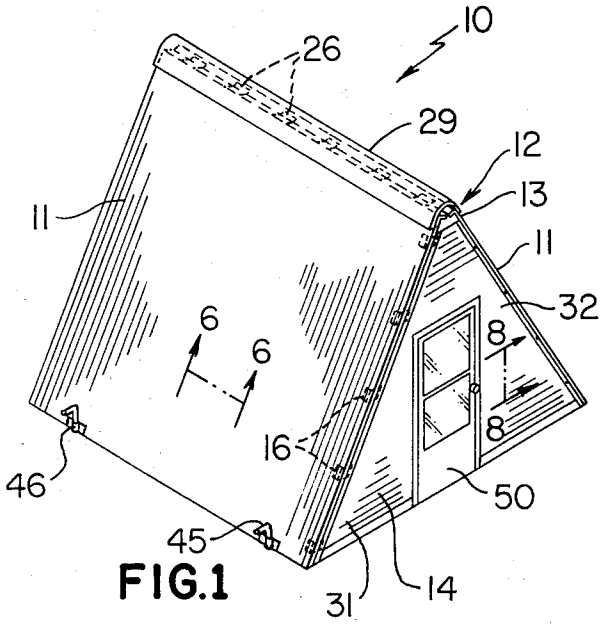


FIG. 1

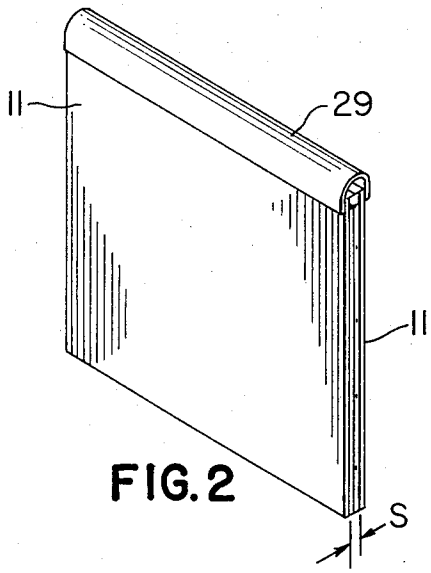


FIG. 2

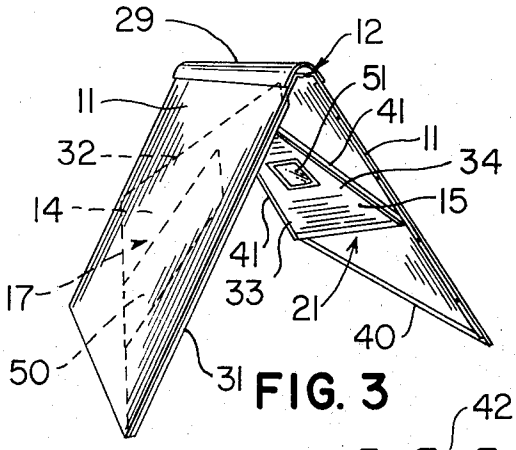


FIG. 3

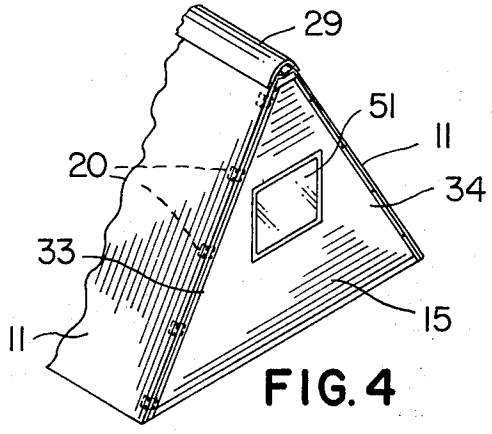


FIG. 4

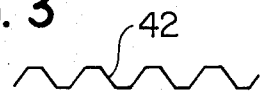


FIG. 6

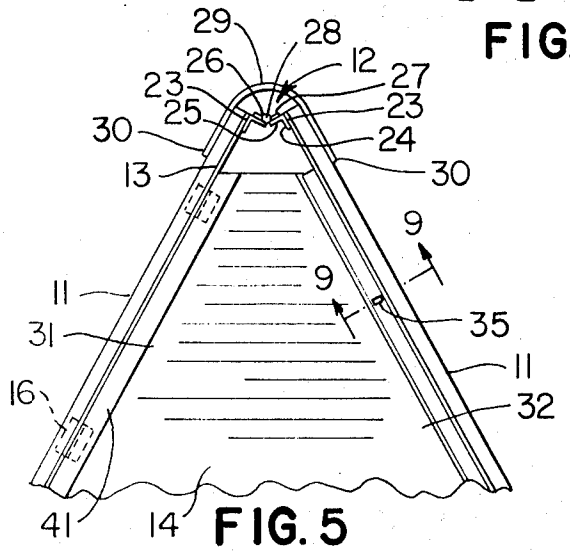


FIG. 5

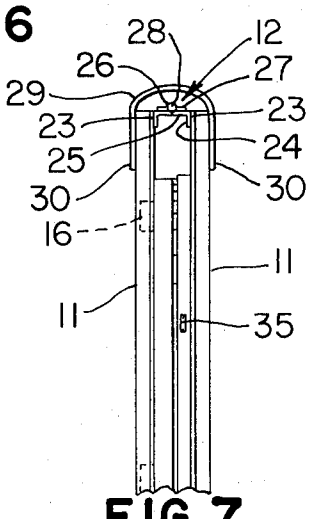


FIG. 7

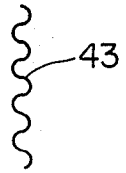


FIG. 8

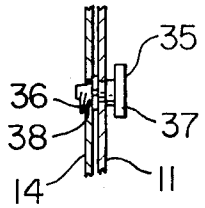


FIG. 9

FOLDABLE PORTABLE STRUCTURE

BACKGROUND OF THE INVENTION

There is a need throughout the world for weather-tight temporary portable shelters which may be readily assembled and used as dwellings, hospitals, schools, etc., to replace permanent structures destroyed by natural causes such as earthquakes and floods, for example, as well as structures destroyed by man-made causes such as riots and war.

SUMMARY

This invention provides an improved substantially weather-tight portable structure which is self-contained and defined by a few simple panels whereby such structure is readily transported and assembled.

Other details, uses, and advantages of this invention will become apparent as the following description of the exemplary embodiment thereof presented in the accompanying drawing proceeds.

BRIEF DESCRIPTION OF THE DRAWING

The accompanying drawing shows a present preferred embodiment of this invention, in which

FIG. 1 is a perspective view looking toward what will be considered the front of one exemplary embodiment of the self-contained structure of this invention;

FIG. 2 is a perspective view showing the structure of this invention in its collapsed condition prior to assembly thereof;

FIG. 3 is a perspective view illustrating the manner in which rectangular panels comprising the structure of FIG. 1 are spread apart to define an inverted V-shaped structure and particularly illustrating the manner in which hingedly attached triangular end panels comprising such structure are positioned against the inside surfaces of the rectangular panels to enable collapsing of the structure to define the configuration of FIG. 2;

FIG. 4 is a fragmentary perspective view looking toward the rear of the structure of FIG. 1;

FIG. 5 is an enlarged fragmentary end view showing the top portion of the front of the structure of FIG. 1;

FIG. 6 is a fragmentary cross-sectional view taken essentially on the line 6—6 of FIG. 1;

FIG. 7 is an enlarged fragmentary end view showing the upper portion of the structure as illustrated in FIG. 2;

FIG. 8 is a fragmentary cross-sectional view taken essentially on the line 8—8 of FIG. 1; and

FIG. 9 is an enlarged fragmentary cross-sectional view taken essentially on the line 9—9 of FIG. 5.

DESCRIPTION OF ILLUSTRATED EMBODIMENT

Reference is now made to FIG. 1 of the drawing which illustrates one exemplary embodiment of a portable structure or shelter of this invention which is often popularly referred to as an A-frame structure and such structure is designated generally by the reference numeral **10**. The structure **10** is readily collapsed for transportation and storage into the configuration illustrated in FIG. 2 and is a self-contained structure in that it does not require additional components or parts to enable assembly thereof to the configuration illustrated in FIG. 1.

The structure **10** comprises a pair of rectangular panels each designated by the same reference numeral **11** and has fastening means designated generally by the reference numeral **12** fastening associated top edge portions **13** of the rectangular panels together in a hinged manner. The fastening means **12** enables the rectangular panels to be hingedly moved or folded inwardly, i.e., toward each other, and arranged in substantially parallel relation so as to define a space S therebetween and such fastening means enables the panels **11** to be hingedly folded outwardly, i.e., away from each other, to define an inverted substantially V-shaped structure, as illustrated in FIG. **3** of the drawing.

The structure **10** also comprises a pair of triangular panels **14** and **15** hingedly attached to the rectangular panels **11.** In particular, the triangular panel **14** is hingedly attached to one of the rectangular panels **11** using a plurality of spaced hinges **16** and in a manner enabling panel **14** to be folded against the inside surface of its rectangular panel **11** and as shown at **17** in FIG. **3.** The triangular panel **15** is hingedly attached to the other rectangular panel **11** by a plurality of spaced hinges **20** in a manner which enables the panel **15** to be folded against the inside surface of its rectangular panel **11** and as shown at **21** in FIG. **3.** Thus, once the rectangular panels **11** with panels **14** and **15** held against their inside surfaces are hingedly folded inwardly about the fastening means **12** to define the configuration illustrated in FIG. **2,** the triangular panels **14** and **15** are received within the space S. However, as the rectangular panels **11** are hingedly folded outwardly, the triangular panels **14** and **15** are also hingedly folded outwardly about their respective hinges **16** and **20** to define the configuration illustrated in FIG. **1.**

As will be apparent from FIGS. **5** and **7** of the drawing, the fastening means **12** comprises a pair of substantially identical L-shaped brackets **23** and each bracket has legs **24** and **25** which diverge from a common junction. The leg **24** of each bracket **23** is fixed to an associated rectangular panel **11** with its leg **25** extending transverse, perpendicular in this example, the leg **24** whereby each leg **25** extends substantially perpendicular its associated panel **11.** The fastening means **12** also comprises at least one hinge device connecting the brackets **23** together and in this example a plurality of conventional hinges **26** are provided in spaced relation and hingedly connect the leg portions **25** of brackets **23** together to thereby hingedly connect the top portions **13** of the rectangular panels **11** together. Each hinge **26** has a pair of leaves **27** suitably fixed to the leg portions **25** and the leaves have knuckles which receive a pin **28** therethrough in a known manner.

The structure **10** also has a flexible cap **29** made of a suitable metallic material and the cap has lower edge portions **30** arranged beneath the vertical level of the fastening means **12** and such portions are suitably fixed to the rectangular panels **11** whereby the cap **29** shields the top edge portions of the panels **11, 14,** and **15** and, hence, the top of the structure **10** against the elements. The cap **29** has an arcuate configuration when viewed from an end thereof and, thus, is easily flexed from the configuration shown in FIG. **2** to the configuration shown in FIG. **1** without damage thereto.

The triangular panel **14** has a side edge portion **31** which is hingedly attached by hinges **16** to one panel **11** and has an oppositely arranged unattached or swinging

side portion **32.** Similarly, the triangular panel **15** has a side edge portion **33** hingedly attached by hinges **20** to the other panel **11** and has an oppositely arranged swinging side portion **34.** Each swinging portion **32** and **34** is detachably fastened in position against an associated panel by a plurality or set of quick fasteners **35** of conventional construction, see FIGS. **5** and **9.** Each fastener **35** is constructed so that it is normally carried in its fastening position on an associated rectangular panel **11** and has suitable fastening means which may be in the form of a helical thread **36** which is threaded through an associated opening **38** in a triangular panel and upon turning the head portion **37** of such a fastener **35** through an angular increment of approximately 90° the thread **36** engages portions of the triangular panel adjoining its opening **38** to fasten the triangular panel in position.

To assure that the structure **10** has optimum structural integrity, each rectangular panel **11** is provided with peripheral beams **40** at its bottom and ends while the bracket **23** also serves as a top beam. Similarly, each triangular panel **14** and **15** is provided with peripheral beams **41.**

The panels **11, 14,** and **15** may be made of any suitable material; however, each panel is preferably made of metallic materials containing aluminum thereby assuring that these panels have a high strength to weight ratio. In this example each rectangular panel **11** is made of corrugated aluminum sheets **2,** see FIG. **6,** while each triangular panel **14** and **15** is made of corrugated aluminum sheets **43,** as illustrated in FIG. **8.**

A typical structure **10** having a floor measuring **11** feet by **12** feet and a height of roughly 10 feet may be readily erected by as few as three men by first placing the structure illustrated in FIG. **2** with one of its rectangular panels **11** on the ground and then lifting vertically upwardly using one or more ropes, as required, attached to the cap **29** while simultaneously spreading the rectangular panels **11** apart, as shown in FIG. **3.** The triangular panels **14** and **15** are then allowed to swing vertically into position whereupon the fasteners **35** are quickly fastened in the manner described previously to complete the structure. The structure **10** may be anchored to the ground using metal stakes **45** and each of these stakes may be slidably carried within one or more brackets **46** fixed to an associated panel **11** or each stake may be carried separately.

The structure **10** may be provided with one or more windows and at least one door and, in this example, a door **50** is provided in the triangular panel **14** and a window **51** is provided in the triangular panel **15.** The door is suitably framed and provided with hinges and a latch whereby it is ready for normal use.

The structure **10** may be modified to fit particular requirements. For example, the end panel **14** may be divided into two unequal portions along a vertical line slightly to the right of the door **50** as shown in FIG. **1.** The two portions may be used in different ways, as follows: (*i*) The two portions may be hinged together so that the smaller portion may be folded against the larger portion when the panel **14** is swung against the panel **11,** and corresponding portions of the opposite panel **15** may be similarly divided, hinged and folded against the other panel **11**; (*ii*) the two portions of each of the end panels **14** and **15** may be hinged not to each other but rather to the adjacent ends of the two rectangular panels **11.** In a modification, which may be independent of or in combination with the first mentioned modifications, especially modifications (*ii*), the two rectangular panels **11** may be subdivided, such as by separating the structure **10** illustrated in FIGS. **1–4** into two separate halves, with the plane of division passing through the middle of the structure parallel to and half way between the end panels **14** and **15.** The two halves can thus be transported separately, assembled on the site, and joined by any means suitable for use in the field.

While present exemplary embodiments of this invention, and methods of practicing the same, have been illustrated and described, it will be recognized that this invention may be otherwise variously embodied and practiced within the scope of the following claims.

What is claimed is:

1. A portable structure comprising, a pair of rectangular panels each having inside surfaces and having upper, lower, and first and second side edge portions, means fastening associated upper edge portions of said rectangular panels together in a hinged manner, said fastening means being in its fastened condition and enabling said rectangular panels to be hingedly folded toward each other with said inside surfaces facing each other and arranged in parallel relation to define a space therebetween and away from each other to define an inverted V-shaped structure, said fastening means comprising a pair of roughly L-shaped brackets each having one leg fixed to an associated rectangular panel adjacent its upper portion and another leg extending transverse said one leg and its rectangular panel toward the other of said pair of rectangular panels, at least one hinge device hingedly connecting the transverse legs of said brackets together to define said space, a first and a second triangular panel, said first triangular panel being hingedly attached to the first side edge portion of one of said rectangular panels, said second triangular panel being hingedly attached to the second side edge portion of the other of said rectangular panels, each of said triangular panels being adapted to be folded inwardly against the inside surface of an associated rectangular panel and received within said space once said rectangular panels are folded in parallel relation and adapted to be folded outwardly and locked in position once said rectangular panels are folded away from each other to thereby completely define said structure, attaching means on the second edge portion of said one rectangular panel for locking said second triangular panel in position, and attaching means on the first edge portion of said other rectangular panel for locking siad first triangular panel in position.

2. A structure as set forth in claim **1** and further comprising a flexible cap fixed to at least one of said rectangular panels at a vertical level below said fastening means, said cap shielding the top edges of said rectangular panels along their entire lengths.

3. A self-contained portable shelter made of only four high-strength rigid panels and comprising, a pair of rectangular panels having inside and outside surfaces, means fastening associated top edge portions of said rectangular panels together in a hinged manner, said fastening means being in its fastened condition and enabling said rectangular panels to be hingedly folded toward each other with said inside surfaces facing each other and arranged in parallel relation to define a space therebetween and away from each other to define an inverted V-shaped structure, said fastening means com-

prising a pair of roughly L-shaped brackets each fixed to an associated one of said rectangular panels and each having a transverse portion extending away from the inside surface of its panel and at least one hinge device hingedly connecting said transverse portions of said brackets together to define said space, a pair of triangular panels hingedly attached to said rectangular panels, one of said triangular panels being adapted to be folded against the inside surface of one of said rectangular panels and the other of said triangular panels being adapted to be folded against the inside surface of the other of said rectangular panels enabling said triangular panels to be received within said space once said rectangular panels are folded in parallel relation, said triangular panels being adapted to be folded outwardly and locked in position once said rectangular panels are folded away from each other to thereby define said shelter, and attaching means on the rectangular panels for locking the triangular panels when folded out to define said shelter.

4. A structure as set forth in claim **3** and further comprising a flexible cap fixed to each of said rectangular panels at a vertical level below said fastening means, said cap shielding the top edges of said rectangular panels along their entire lengths and said cap being easily flexed yet remaining structurally intact regardless of the positions of said rectangular panels.

5. A structure as set forth in claim **4** in which said attaching means comprises a set of quick fasteners carried by each of said rectangular panels along a vertical edge portion thereof, each set of quick fasteners being adapted to lock an associated triangular panel in position against the rectangular panel carrying the set of fasteners.

* * * * *