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Webster

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[54] **ROAD CONSTRUCTION AND PANEL FOR MAKING SAME**

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[52] **U.S. Cl.** **404/41**, 14/27, 14/73, 52/588, 52/589, 404/45

[51] **Int. Cl.** **E01c 5/22**

[58] **Field of Search** 404/41, 44, 45, 73, 18, 404/29; 52/579, 580, 588, 589, 590, 601, 404/610, 619; 14/27, 73

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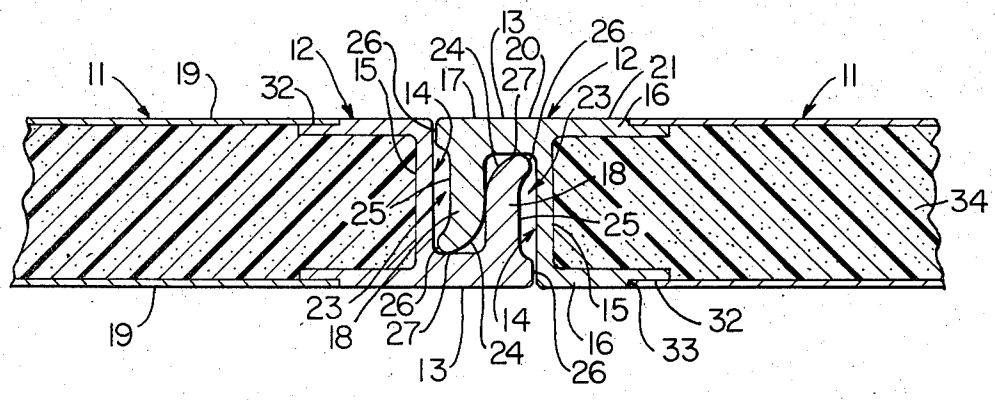
Assistant Examiner—Thomas J. Holko

[57] **ABSTRACT**

A road construction comprised of a plurality of identical invertible polygonal panels with each panel comprising a plurality of single piece peripheral frame members fixed together to define a polygonal configuration and each of the members having a roughly L-shaped projection extending therefrom which is adapted to be interlocked with an identical projection of an associated member. Each panel also has a pair of load-carrying sheets fixed on opposite sides of its frame members.

18 Claims, 7 Drawing Figures



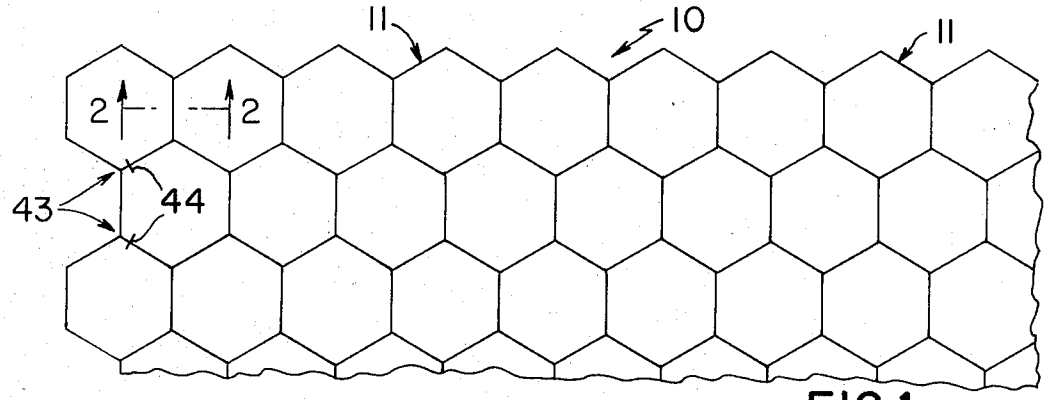


FIG.1

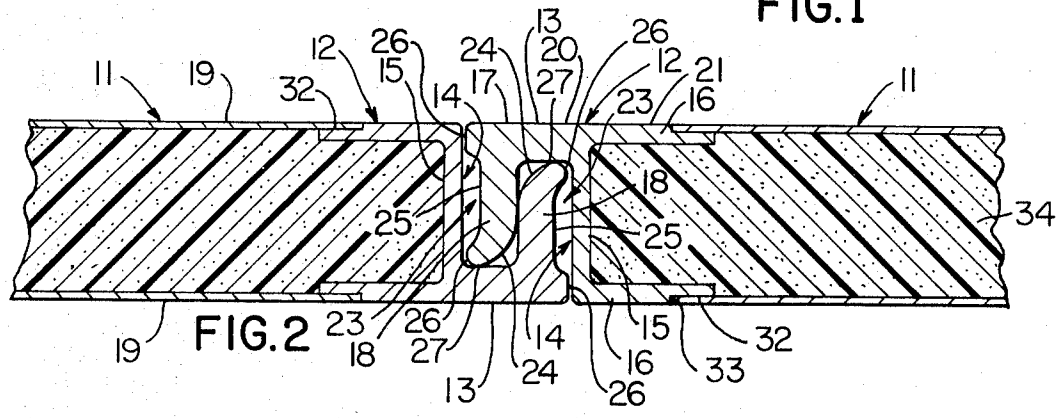


FIG.2

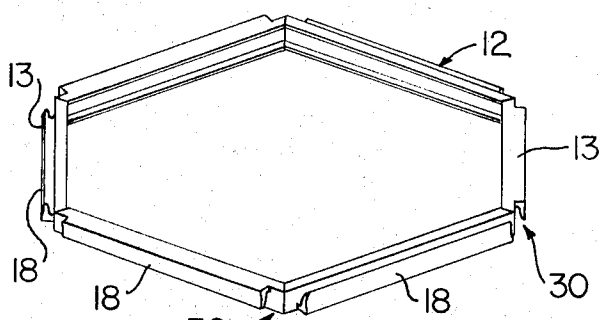


FIG.3

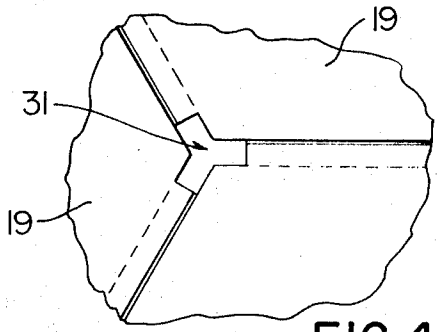


FIG.4

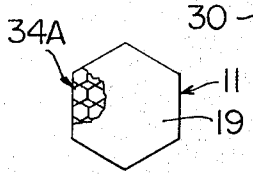


FIG.6

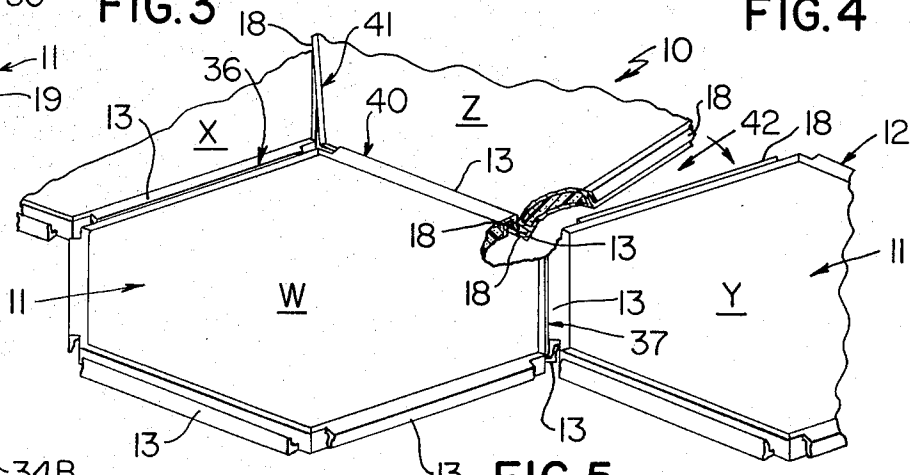


FIG.5

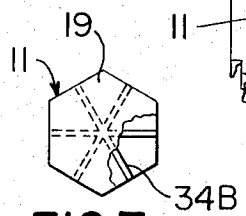


FIG.7

ROAD CONSTRUCTION AND PANEL FOR MAKING SAME

BACKGROUND OF THE INVENTION

There is a need for economical portable aircraft runways, floating roadways capable of being used as bridges, floating piers, and the like, which are easy to install and are capable of withstanding reasonable service usage. Numerous constructions comprised of interlocked panels have been proposed heretofore for use as portable floor constructions; however, such previous constructions are generally deficient because many employ panels which are not capable of withstanding the required usage while others use panels which are too complicated and expensive.

SUMMARY

This invention provides an improved road construction and a comparatively low cost high-strength panel for use in such a road construction which overcomes the deficiencies of previous panels. Each panel is comprised of a minimum number of component parts and includes a plurality of single piece peripheral frame members fixed together to define a polygonal configuration with each member having a roughly L-shaped projection extending therefrom which is adapted to be interlocked with an identical projection of an associated member, and each panel has a pair of sheets fixed on opposite sides of the frame members and the sheets define the bottom and top surfaces of the panels.

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

BRIEF DESCRIPTION OF THE DRAWING

The accompanying drawing shows present preferred embodiments of this invention, in which:

FIG. 1 is a fragmentary plan view of one exemplary embodiment of a road construction of this invention defined by a plurality of interlocked identical invertible hexagonal panels;

FIG. 2 is an enlarged view taken essentially on the line 2—2 of FIG. 1;

FIG. 3 is a perspective view illustrating a plurality of peripheral frame members fixed together to define a hexagonal configuration and prior to fixing a pair of sheets on opposite sides of the frame members and reinforcing means between the sheets to define a typical hexagonal panel of FIG. 1;

FIG. 4 is a fragmentary plan view illustrating the junction of a plurality of three hexagonal panels;

FIG. 5 is a fragmentary perspective view illustrating the manner in which hexagonal panels are interlocked in position to define the road construction of FIG. 1;

FIG. 6 illustrates another embodiment of a hexagonal panel with a portion of its top sheet broken away to show reinforcing means in the form of a honeycomb structure between the sheets; and

FIG. 7 illustrates still another embodiment of a hexagonal panel with parts broken away and such panel uses girder beams as reinforcing means between its opposed sheets.

DESCRIPTION OF ILLUSTRATED EMBODIMENTS

Reference is now made to FIG. 1 of the drawing which illustrates one exemplary embodiment of a road construction of this invention which is designated generally by the reference numberal **10** and is comprised of a plurality of identical interlocked panels **11.** The panels **11** are invertible, i.e., they may be turned upside down, so that either side or surface thereof may be used as a top surface and such panels may be used to define a road construction such as a portable landing strip for aircraft, for example. By proper selection of the materials used to make the panel, the panels **11** may be used to make floating bridges, floating piers, or similar constructions.

Each typical panel **11** is comprised of a plurality of peripheral frame members **12** (see FIG. 3) suitably fixed together, as by welding or the like, at their associated ends to define a polygonal configuration; and, in this example of panels **11,** such polygonal configuration is a hexagonal configuration. Each member **12** has a roughly L-shaped interlock or projection **13** extending therefrom and such projection is adapted to be interlocked with an identical projection of an associated member comprising an adjoining panel so that a plurality of panels **11** may be suitably interlocked in the manner illustrated in FIGS. **1** and **5** to define a road construction **10.**

Each member **12,** see FIG. **2,** is preferably an extruded member made as a unitary single piece construction and is comprised of a U-shaped portion **14** having a bight **15** and a pair of parallel extensions or legs **16** extending from opposite ends of the bight **15.** The U-shaped portion **14** is adjoined by the previously mentioned L-shaped projection or portion **13** and such L-shaped projection **13** has a pair of adjoining legs **17** and **18** with the leg **17** having an outside surface **20** which is arranged coplanar with an outside surface **21** of an associated extension **16** of U-shaped portion **14.** A pair of hexagonal sheets **19** define opposite sides or surfaces of panel **11** and such sheets may be suitably fixed in position by welding, threaded screws, or similar means.

The L-shaped projection **13** comprising each member **12** has a substantial thickness when compared to the roughly equal thicknesses of the bight **15** and extensions **16** of U-shaped portion **14** and in this example the legs **17** and **18** are roughly two times greater than such roughly equal thicknesses. This substantial thickness provides optimum strength for the panel interlocks and assures that once a plurality of panels **11** are interlocked they will be held firmly together even under severe operating conditions.

Each leg **18** of L-shaped projection **13** defines what may be referred to as a tongue with the volume between the inside surface of each leg **18** and the outside surface of an associated bight **15** defining what may be referred to as a groove **23.** The interlocking action is provided by a leg or tongue **18** of one projection being received within a groove **23** of an adjoining panel **11.**

Each leg **18** of the projection **13** has an arcuate inside surface **24** which extends in a generous arc and surface **24,** in essence, serves as a cam surface to assure a smooth interlocking action. In addition, to assure smooth interlocking without binding tendencies, it will be seen that leg **18** also has a cutout **25** in the central

portion of its outside surface thereby defining surface portion **26** at opposite ends of the cutout which assure a comparatively tight interlocking fit yet provide comparatively large bearing surfaces preventing horizontal movements.

Each tongue or leg **18** has a height which is precisely controlled so that its terminal edge **27** engages the inside surface of an associated leg **17** of a projection **13** of an adjoining panel **11** and is correlated with the thickness of such associated leg to assure that adjoining interlocked panels have their top and bottom surfaces arranged substantially coplanar.

Each L-shaped projection **13** extends from the central portion of its member **12** along substantially the entire length of such member, see FIGS. **3** and **5**, whereby once a plurality of panels **11** are interlocked, support is provided along substantially the full length of their adjoining sides due to the extended lengths of the interlocked L-shaped projections **13**. With this construction the opposite ends of each projection **13** are spaced inwardly of the opposite ends of their associated member **12** as illustrated at **30** in FIG. **3**. This enables interlocking of adjoining panels **11** substantially without interference and at the junction of three panels, a small space or volume exists as illustrated at **31** in FIG. **4**.

As will be apparent from FIG. **2** of the drawing, each member **12** has a stepped outer surface portion **32** at the terminal outer end of each of its extensions **16**. The stepped outer surface **32** has a depth which is correlated with the thickness of each sheet **19** so that once a sheet **19** is placed in position in substantially nested relation within stepped surfaces **32** of its associated members **12** its outside surface is arranged substantially coplanar with the outermost coplanar surfaces of extensions **16** supporting such sheet.

Inasmuch as the frame members **12** comprising each panel **11** are arranged in a hexagonal configuration, the sheet **11** also has a hexagonal configuration corresponding thereto, and the dimensions of each sheet **11** are such that each outer edge thereof is confined by a vertical edge **33** of stepped surface **32** whereby each sheet **11** is held against horizontal movements. Once each sheet **11** is nested within its stepped surfaces **32** it may be fixed in position as previously mentioned; however, it will be appreciated that reinforcing means is provided between the sheets to prevent collapsing thereof and as will now be described.

Any suitable reinforcing means may be provided between the sheets **11** to prevent inward collapse and in the example illustrated in FIG. **2**, such reinforcing means is shown as a rigid foamed elastomeric plastic material and designated by the reference numeral **34**. However, it will be appreciated that any suitable elastomeric material such as a suitable plastic or a natural or synthetic rubber may be used. By making the reinforcing means **34** of a light-weight bouyant elastomeric material and selecting a suitable lightweight material for frame members **12** and sheets **19** the density of the panels may be made such that they may be readily used as floating bridges, piers, and the like.

The reinforcing means may be of any suitable construction which provides support between the sheets **11** and frame members **12**. Another example of reinforcing means is illustrated in FIG. **6** of the drawing, which shows a panel provided with reinforcing means in the form of a honeycomb structure **34A**. The honeycomb structure may be made using any suitable technique known in the art and may be fixed in position between the sheets **11** in any suitable manner.

It will also be appreciated that the reinforcing means between sheets **11** may be in the form of a more conventional reinforcing structure and as shown in FIG. **7** may comprise a plurality of girder beams **34B**. The girder beams may be made using conventional techniques and fixed in position in any suitable manner known in the art.

The panel illustrated in FIG. **6** with its honeycomb reinforcing structure **34A** and the panel illustrated in FIG. **7** with its plurality of girder beams **34B** may be used to define the road construction **10** of FIG. **1** for use as a portable landing strip, for example. Further, a particular road construction may be comprised of one or more of these different types of panel constructions.

The reinforcing means whether in the form of foamed elastomeric material such as plastic **34**, honeycomb **34A**, or girder beams **34B** may be suitably fixed in position following fixing of one of the sheets **19** against the members **12**. The other sheet **19** may then be fixed in position using any suitable technique.

The members **12** are preferably made by extrusion process as previously mentioned and are preferably made of a lightweight high strength material such as an aluminous material which also has optimum corrosion resistance. In addition, the sheets **19** are also preferably made of an aluminous material.

As will be apparent particularly from FIGS. **3** and **5**, each panel **11** has its L-shaped projections **13** provided thereon so that each pair of adjoining members **12** have their projections **13** extending in opposite directions, i.e., toward opposite surfaces of the entire panel. Stated another way, and going either clockwise or counterclockwise around a panel **11** the projection **13** extends in one direction for the first member **12**, in an opposite direction for the second member **12**, back in the first direction for the next member, etc. in an alternating manner about the entire periphery of the panel. This arrangement with a hexagonal panel assures optimum support for the panels **11** once the panels are interlocked to define a road construction **10** and the manner in which the particular road construction is defined will now be described in detail in connection with FIG. **5** of the drawings, which illustrates a fragmentary view of a plurality of four panels **11** which are designated by the reference numerals W, X, Y, and Z.

The building of a road construction **10** may be achieved, for example, simply by placing panel W on a horizontal surface. Panels X and Y are then placed in position so that downwardly extending projections **13** thereof interlock with upwardly extending projections **13** of panel W as indicated at **36** and **37** respectively.

Panel Z is then locked in position by tilting it about one edge at an angle of approximately 60° so that the upturned tongue or leg **18** of an associated L-shaped projection **13** may be inserted beneath the downturned leg **18** of panel W as indicated at **40**. Panel Z is then lowered into its horizontal position and it will be seen that L-shaped projections **13** adjoining panels X and Y are turned with the leg portions **18** thereof extending downwardly whereby these leg portions are interlocked with panels X and Y as indicated at **41** and **42**. This operation is repeated for each additional panel **11** until the desired length and width of the roadway **10** is provided.

Each internally arranged panel 11 of a roadway is completely supported and interlocked in position so that it cannot be moved either upwardly or downwardly relative to adjoining panels 11 due to the unique interlocking action provided by its L-shaped projections 13. However, those outer panels 11 defining outer edge portions of a roadway, are not completely supported about their entire peripheries. To restrict movement of the free or unsupported portions of the outer panels a simple clamping or holding arrangement such as shown at 43 in FIG. 1 may be used. The clamping arrangement may be of any suitable construction and may be a simple metal screw or nut and bolt arrangement.

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 road construction comprising a plurality of substantially identical invertible interlocked panels, each of said panels comprising, a plurality of single-piece peripheral frame members fixed together to define a polygonal configuration, each of said members having a single roughly L-shaped projection extending therefrom which is adapted to be independently interlocked with an identical projection of an associated member free of additional locking means, each of said members having a U-shaped portion comprised of a bight having a pair of parallel extensions extending from opposite ends of the bight, said U-shaped portion being adjoined by its associated L-shaped projection, said L-shaped projection having a pair of legs with one of said legs being arranged perpendicular to said bight and having an outside surface arranged coplanar with the outside surface of an associated extension and the other of each of said legs being arranged roughly parallel to said bight and having a height which is precisely controlled and extends over the major part of the height of said bight so that the terminal outer edge of said other leg engages the inside surface of an associated perpendicular leg of said associated member to assure that adjoining interlocked panels have their top and bottom surfaces arranged substantially coplanar, said other leg having a cutout therein in the central portion of its outside surface defining surface portions at opposite ends of the cutout which assure a comparatively tight interlocking fit and provide comparatively large bearing surfaces preventing horizontal movements, each of said legs of said L-shaped projection having a thickness which is roughly twice the thickness of siad bight, said U-shaped portion and L-shaped projection being made of a metallic material and having a solid cross section throughout, and a pair of sheets fixed on opposite sides of said frame members and defining bottom and top surfaces of said panel.

2. A road construction as set forth in claim 1 in which each L-shaped projection extends from the central portion of its member and along substantially its entire length.

3. A road construction as set forth in claim 2 and further comprising reinforcing means between said sheets and within said frame members.

4. A road construction as set forth in claim 3 in which said reinforcing means is a foamed elastomeric material.

5. A road construction as set forth in claim 3 in which said reinforcing means is a honeycomb structure.

6. A road construction as set forth in claim 3 in which said reinforcing means is a plurality of girder beams.

7. A road construction as set forth in claim 3 in which said polygonal configuration is a regular polygon and said members are extruded metal members.

8. A road construction as set forth in claim 3 in which said polygonal configuration is a hexagonal configuration and said members are extruded members which are welded together at their associated ends with the L-shaped projections of each pair of adjoining members facing in opposite directions.

9. A road construction as set forth in claim 8 wherein each extruded member is made of an aluminous material.

10. A road construction as set forth in claim 1 in which each of said members has a recess which is adapted to receive a terminal edge portion of an associated sheet therewithin so that the outside surface of each associated sheet is substantially coplanar with a plane adjoining a side of each of said members.

11. A road construction as set forth in claim 10 in which each of said sheets is made of an aluminous material and has a polygonal outer configuration corresponding and having a smaller area than the polygonal configuration defined by said members.

12. An invertible hexagonal panel for a road construction comprising, a plurality of single-piece peripheral frame members fixed together to define a hexagonal configuration, each of said members having a single roughly L-shaped projection extending therefrom which is adapted to be independently interlocked with an identical projection of an associated member free of additional locking means, each of said members having a U-shaped portion comprised of a bight having a pair of parallel extensions extending from opposite ends of the bight, said U-shaped portion being adjoined by its associated L-shaped projecition, said L-shaped projection having a pair of legs with one of said legs being arranged perpendicular to said bight and having an outside surface arranged coplanar with the outside surface of an associated extension and the other of each of said legs being arranged roughly parallel to said bight and having a height which is precisely controlled and extends over the major part of the height of said bight so that the terminal outer edge of said other leg engages the inside surface of an associated perpendicular leg of said associated member to assure that adjoining panels interlocked with said panel have their top and bottom surfaces arranged substantially coplanar, said other leg having cutout therein in the central portion of its outside surface defining surface portions at opposite ends of the cutout which assure a comparatively tight interlocking fit and provide comparatively large bearing surfaces preventing horizontal movements each of said legs of said L-shaped projection having a thickness which is roughly twice the thickness of said bight, said U-shaped portion and L-shaped projection of each of said frame members being made of a metallic material and having a solid cross section throughout, and a pair of sheets having a hexagonal configuration and fixed on opposite sides of said frame members, said sheets defining bottom and top surfaces of said panel.

13. A panel as set forth in claim 12 in which each L-shaped projection extends from the central portion of its member and along substantially its entire length and

further comprising reinforcing means between said sheets and within said frame members.

14. A panel as set forth in claim **13** in which said reinforcing means is a foamed elastomeric material.

15. A panel as set forth in claim **13** in which said reinforcing means is a honeycomb structure.

16. A panel as set forth in claim **13** in which said reinforcing means is a plurality of beams.

17. A panel as set forth in claim **13** in which said members are extruded metal members which are welded together at their associated ends with the L-shaped projections of each pair of adjoining members facing in opposite directions.

18. A panel as set forth in claim **12** in which said members and sheets are made of an aluminous material and each of said members has a recess which is adapted to receive a terminal edge portion of an associated sheet therewithin so that the outside surface of each associated sheet is substantially coplanar with a plane adjoining a side of each of said members.

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