Jan. 6, 1970 G. K. GLAZA ET AL 3,487,756

STRUCTURAL UNIT

Filed March 6, 1968 2 Sheets-Sheet 1

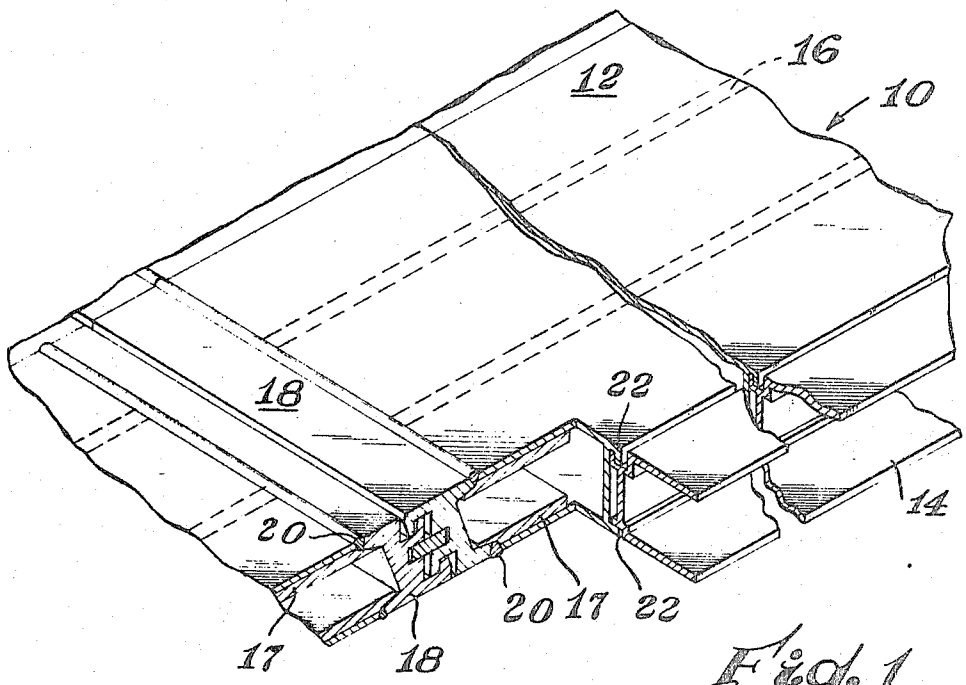


Fig. 1

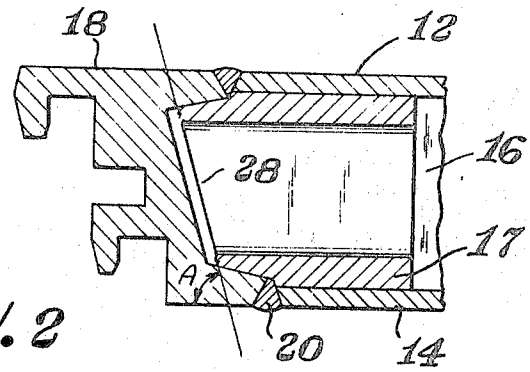


Fig. 2

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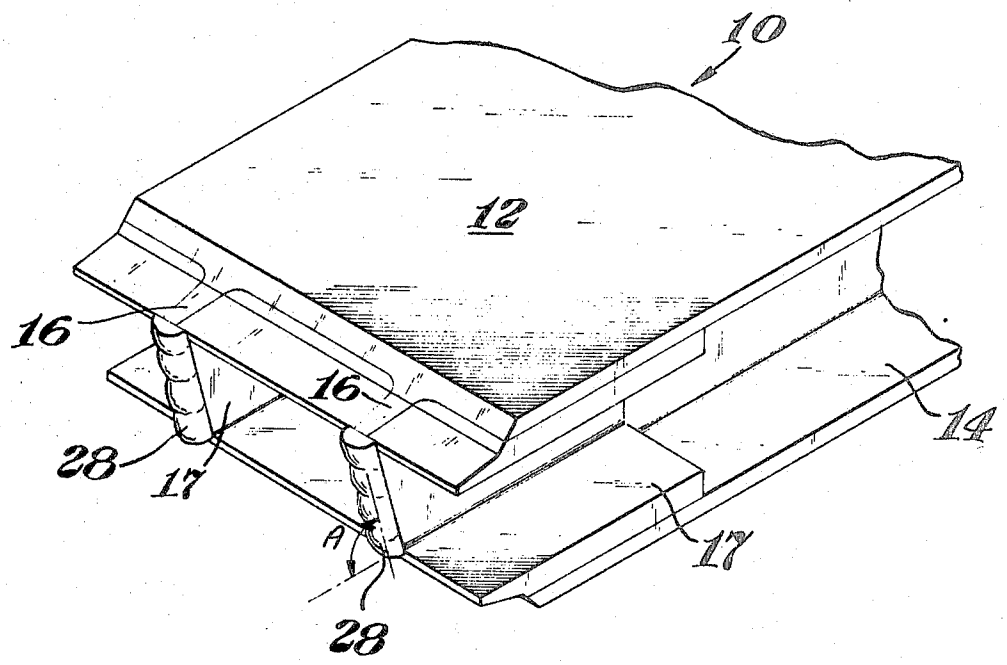


Fig. 3

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3,487,756

STRUCTURAL UNIT

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U.S. Cl. 94—13 3 Claims

ABSTRACT OF THE DISCLOSURE

An improved integral structural unit having top and bottom surface members, spaced apart by web members with tubular elements fitting within the space defined by the top, bottom, and web elements, and an end connector. The ends of the tubular elements and web members are slanted through a critical angle to the horizontal. The slanted ends of the web member and the adjacent walls of the tubular element are welded to each other and to the top and bottom parts then tapered to receive the end connector which is welded thereon.

PRIOR ART

Many flat, detachably interlocking structures are known which may be formed into floors, decks, boating docks or bridges, roadways or aircraft runways. Such structures, however, particularly when used to withstand frequent high impact such as in temporary aircraft runways, have a relatively short useful life due to the formation and propagation of cracks.

It is an object of this invention to provide an improved structural unit useful, in combination with other such units, as a temporary aircraft landing strip. A further object is to provide such a structure having a long useful life without materially increasing the weight or cost of such unit. These and other objects and advantages of the present invention will become apparent from a reading of the following detailed description.

THE INVENTION

To achieve the objects of this invention, a basic structural unit is provided having top and bottom planar surfaces, plurality of spaced apart joining web members, and tubular elements having a cross-sectional configuration to slidably fit within the space between the top, bottom and adjacent web members of each structural unit. The tubular elements and web members are welded together at their adjacent ends; the end of the units are machined (tapered) to form a receptor for an end connector to be welded to the basic unit. Conventionally, prior to the improved structural unit of the present invention, the configuration of the receptor is such that the end is perpendicular, i.e., 90° to the horizontal, to the top and bottom parts of the basic structural unit. Such a unit is described in U.S. Patent No. 3,319,543. A suitable end part may, for example, be of the type claimed in U.S. Patent No. 3,172,508.

The improvement provided by this invention is that of having the receptor end slanted at a critical angle less than 90° from the horizontal to provide an improved structural unit when the end connector is welded to the slanted receptor.

FIGURE 1 is an isometric view, partially broken away, showing a manner in which the structural units of this invention may be joined together.

FIGURE 2 is a sectional view of the slanted receptor improvement.

FIGURE 3 is an isometric view of a partial structural unit showing the slanted receptor improvement.

Referring to the drawings, there is shown in FIGURES 1, 2 and 3 a preferred structural unit indicated generally by the numeral **10**, which has an upper surface **12**, a lower base surface **14**, a plurality of longitudinal web stiffeners **16** and slidable tubular inserts **17**. The end of the tubular members **17** is welded to the adjacent web ends by weld **28**, then machined to form a beveled tongue which acts as a receptor for the end connector **18** which is attached by welds **20**. The tubular member and adjacent webs have been cut prior to welding so as to provide a vertically dispersed welded receptor edge which is an angle of from about 65 degrees to about 85° from the horizontal, i.e., angle A depicted in FIGURE 2, preferably from about 70 to about 75 degrees, and most desirably about 73 degrees for the particular embodiment of the invention described herein. The end connector may be shaped in a similar slanted fashion, as shown in FIG. 2, to better fit the slanted receptor. Side connectors **22** are extruded extensions of upper surface **12** and lower surface **14**, respectively.

The upper and lower surfaces of the structure are preferably elongated rectangles but other shapes may be employed. Likewise, it is usually desirable, from the standpoint of light weight and high strength, for the structure to be made of aluminum or its alloys, but other metals may be used. In general, any basic structure of this type is useful herein if it is substantially hollow or filled with passages and is provided with means for attaching such unit to other similar units to form a larger structure of desired size and shape.

While the invention has been described in connection with a specific coupling assembly by way of example, other end coupling devices may be used, such as connectors which are adapted to be bolted together, for example.

The present invention provides an improved practical, light weight means for transfer of high shear loads from one structural unit through the end connectors and thence to the end part of the next adjoining structural unit.

This particular structure is well adapted for use in aircraft landing mats where the function is to distribute the wheel load over a much greater area of ground than would be true if the wheel contacted the ground directly. When a wheel is at the very end of a "plank" or structural unit, the adjacent plank can provide support to the loaded plank only to the extent that the joints between the planks can transfer a shearing type of load. The improved structural unit of the present invention employing the slanted end receptor has increased ability to transfer a higher shear load from one plank to another than conventional structural units using the straight, i.e., perpendicular, receptor previously mentioned, without increased weight or cost.

The following example is illustrative of the present invention and it is understood that the invention is not limited thereby.

EXAMPLE

Structural units with the improved slanted receptor with an angle of 73 degrees 15 minutes to the horizontal were connected to form a 24′ x 40′ rectangular section of matting. The center 10 feet of this test area was divided into 12 strips.

The rear wheels of a truck chassis were replaced by a single aircraft type wheel and a stabilizing out-rigger. Weights over the single wheel provided a load of 25,000 pounds.

The center test area of 12 strips was subjected to a roll test pattern of the following manner:

1st coverage—pass once over strips **1–12**;
2nd coverage—pass once over strips **2–11**;
3rd coverage—pass once over strips **2–11**;
4th coverage—pass once over strips **2–11**;
5th coverage—pass once over strips **4–9**.

The above pattern was repeated until failure, e.g., projections form tire hazard or matting excessively rough, of the matting occurred.

For comparison a matting of conventional structural units of similar construction employing the perpendicular receptor, as disclosed and described in U.S. Patent No. 3,319,543, was roll tested in a manner similar to the improved structural units described above.

The table below reports the results of the roll test in terms of the number of coverages before failure adjusted to a subsoil having a bearing strength of four (4) California Bearing Rating, a standard bearing rating system.

Table

	Coverages
Slanted receptor	1100
Conventional unit—control	670

The improved structural units produce a matting with nearly double the capacity to withstand loads such as would be encountered in temporary landing strips and the like. This substantial increase in useful life is made without material increase in weight or cost.

Various modifications can be made in the present invention without departing from the spirit or scope thereof for it is understood that the invention is limited only as defined in the appended claims.

What is claimed is:

1. In a structural unit comprising elongated plate-like top and bottom members joined by spaced apart longitudinally extending web members which run from end-to-

end of said top and bottom members, said top and bottom members and said web members defining a plurality of channels when viewed in transverse cross-section, a plurality of tubular elements, each of said tubular elements being dimensioned to fit closely but slidably into one of said channels, the length of said tubular elements being a minor fraction of the length of said unit, said tubular elements being disposed within said channels with an end of each of said tubular elements being coextensive with the end of one of said web members, said end of said tubular elements and said end of said web members being welded together, the end parts of said top and bottom members and said tubular elements being beveled, and an elongated end coupling element being received on said beveled surfaces, said coupling element being welded to said top and bottom members, the top and bottom parts of said tubular elements, and the top and bottom parts of said web members, the improvement which comprises having the end of the tubular element and the end of the corresponding web member slanted at an angle of from about 65 degrees to about 85 degrees to the horizontal, prior to welding.

2. The improvement of claim **1** wherein the slanting angle is from about 70 to about 75 degrees to the horizontal.

3. The improvement of claim **2** wherein the slanting angle is about 73 degrees to the horizontal.

References Cited

UNITED STATES PATENTS

3,319,543 5/1967 Braeuninger et al. ..... 94—13

JACOB L. NACKENOFF, Primary Examiner

U.S. Cl. X.R.

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