

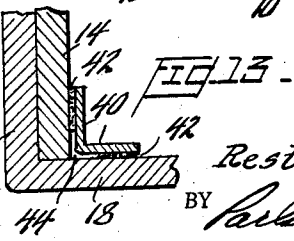
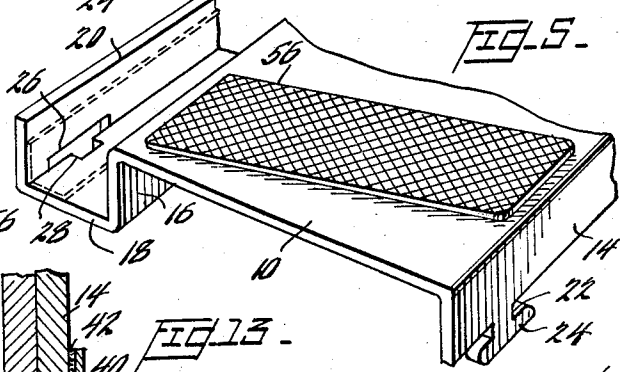
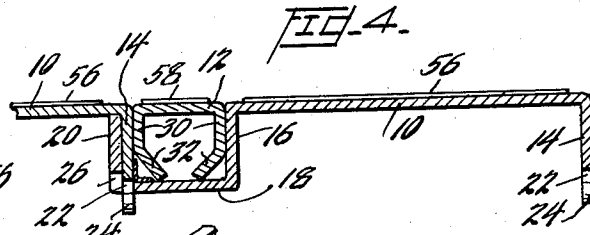
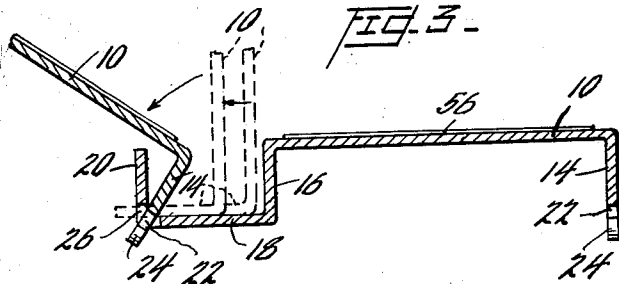
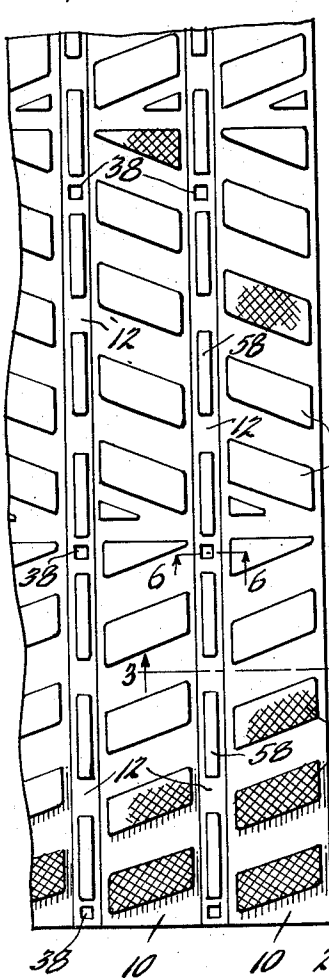
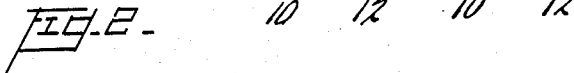
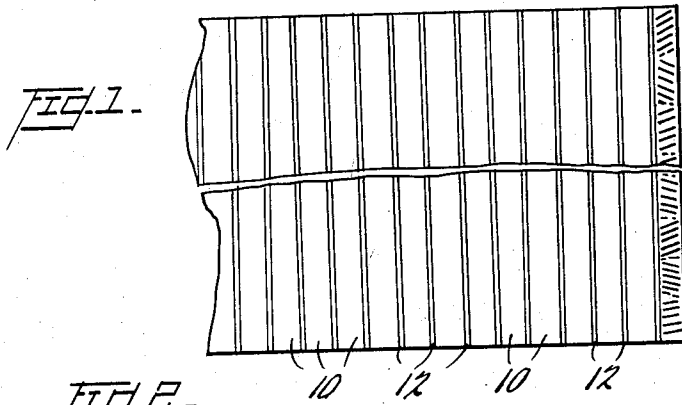
Aug. 11, 1964

R. S. GREGOIRE
LANDING MAT STRUCTURE

3,143,939

Filed Aug. 14, 1961

2 Sheets-Sheet 1



Inventor
Resta S. Gregoire,
 BY *Parker and Walsh,*
 ATTORNEYS

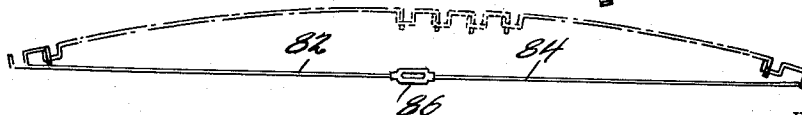
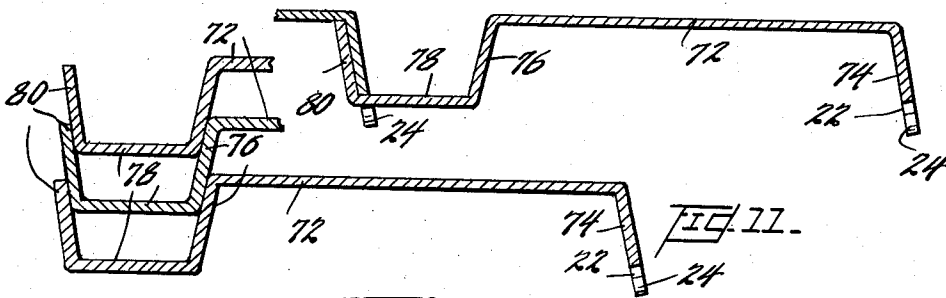
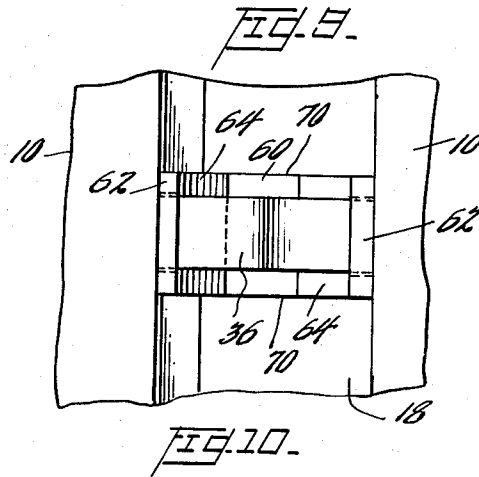
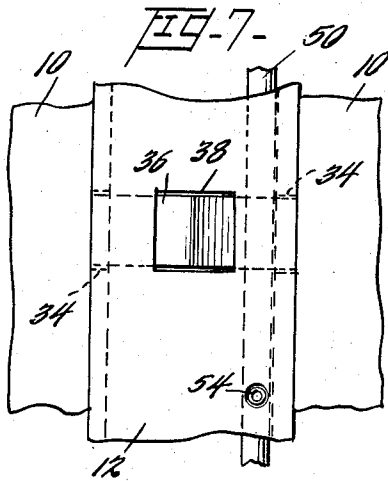
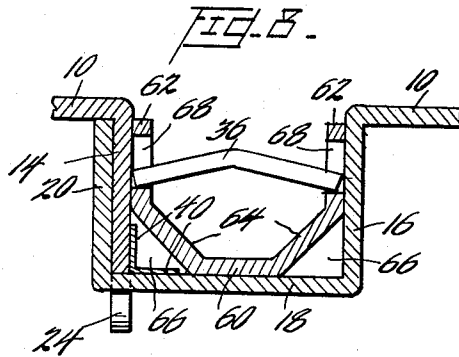
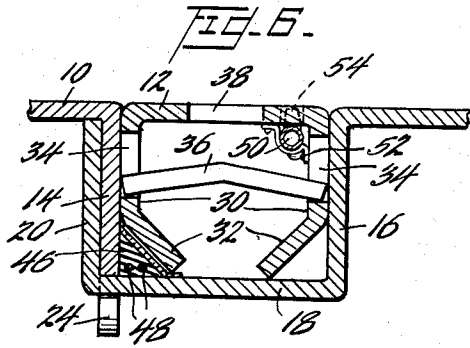
Aug. 11, 1964

R. S. GREGOIRE
LANDING MAT STRUCTURE

3,143,939

Filed Aug. 14, 1961

2 Sheets-Sheet 2



INVENTOR

Resta S. Gregoire,

BY *Parker and Walsh*

ATTORNEYS

1

3,143,939

LANDING MAT STRUCTURE

Resta S. Gregoire, Washington, D.C., assignor to Gregoire Engineering and Development Company
 Filed Aug. 14, 1961, Ser. No. 131,123
 7 Claims. (Cl. 94-13)

This invention relates generally to prefabricated sheet metal panels for assembly into structures, and in particular to components for landing mats used on airfields. In modern military operations it is imperative that airfields be selected, prepared, and placed in operational status in a minimum of time, and this has given rise to the practice of laying plank-type covers over the site, in preference to conventional surfacing procedure. The panel assembly method imposes certain demands, among which are the need for: interchangeability, minimum weight with maximum strength, ease of assembly and disassembly, without complex tools and excess manpower, and security of interlock, with minimum lateral play. The element of cost, while not paramount in military considerations, is nevertheless a factor which is not ignored. Another important factor which has become apparent is the need for sealing against water passing through the mat, both downward into the ground, and upward from the ground, and proposed solutions have entailed undue increase in weight, bulk, cost, and time for assembly.

It is therefore an object of the invention to provide a panel of simplified structure for assembly in a mat composed of identical panels.

A further object is to provide a panel capable of assembly in multiple, by a simple movement, joining interlocking parts and without the need for special tools.

A particular object is to provide an interlocking means which is free of any appreciable lost motion, or play, in the plane of the mat.

A still further object is to provide a simple, locking means for the interlocked parts, which also contributes to the over-all rigidity of the mat.

It is also an important object of the invention to provide a system with an interlocking feature which permits easy and complete sealing of the system against passage of water transversely therethrough.

Yet another object is to provide identical panels which are nestable in stacks, for compactness in storage and shipment.

These and other ends, which will be readily apparent, are attained by the present invention, a preferred form of which is described in the following specification, as illustrated in the drawings, in which:

FIGURE 1 is a top plan view of a portion of an assembled runway mat, at one end thereof, and broken away along a longitudinal line, to foreshorten the width;

FIGURE 2 is an enlarged view of a corner portion of a mat as in FIGURE 1;

FIGURE 3 is a sectional view taken through one panel, on the line 3-3 of FIGURE 2, and showing a fragment of the adjacent panel, in an initial stage of engagement of the interlock;

FIGURE 4 is a view similar to FIGURE 3, showing the added panel in final position in the interlock, and the lock, filler, or keeper element, in place;

FIGURE 5 is a perspective view of one of the panels, viewed from above;

FIGURE 6 is an enlarged sectional view, taken on the line 6-6 of FIGURE 2;

FIGURE 7 is a top plan view of FIGURE 6;

FIGURE 8 is a view similar to FIGURE 6, showing a modified filler;

FIGURE 9 is a top plan view of FIGURE 8;

FIGURE 10 is a view similar to FIGURE 4, showing a modified panel;

2

FIGURE 11 is a view similar to FIGURE 10, showing panels stacked and nested;

FIGURE 12 is a side elevation of an assembled mat, having a tensioning means constraining the mat to arch form; and

FIGURE 13 is an enlarged, fragmentary view of a corner of the panel, showing the water seal.

Referring to the drawings by characters of reference, there is shown, generally, in FIGURE 1, a portion of a runway mat, made up of a series of elongate panels 10, interlocked along their side edges, and having intermediate, filler pieces 12, later to be described. The long dimension of the panels is directed transversely of the runway, and the desired length of runway is attained by connecting the appropriate number of panels. Obviously the panels may vary in length for different runways, but for illustrative purposes, a length of the order of 70 feet may be considered as within the possible range, especially if the panels are made of aluminum. The panels 10 are all identical in size, shape and form, as are the fillers 12, and the panels have complementary features on the respective side edges, which permits of their connection, chain-wise, with a mating interlock, of which the details are evident from an inspection of FIGURES 2 to 5.

Thus, as seen in FIGURE 3, panel 10 has a general S form, with downwardly and upwardly open channels connected by a common wall. The main body of the panel has the downwardly open channel, defined by a pair of vertical walls 14, 16, and the upwardly open channel, which is narrower than the channel in the main body, and functions as one of the complementary connecting elements, shares wall 16 with the other channel, and has a bottom 18, and an upstanding outer wall 20, which may be integral with the bottom, or welded thereto. In assembly of the panels chain-wise, the depending wall 14 of one panel is received in the narrower channel 16-18-20 of the adjacent panel.

The interlocking feature on the panels comprises a series of extensions on wall 14 of the panels engageable in a series of openings in wall 20 and bottom 18 of an adjacent panel. In the embodiment shown, the extension on wall 14 is in the form of an inverted T, depending from the lower edge of wall 14, and having a stem or shank 22, and a lower, cross arm 24, the latter preferably having rounded, outer ends for ready insertion in the receiving opening of the neighboring panel. The T projections are received, initially in an elongate slot 26, opening in the lower edge of wall 20, and in final position of the coupled panels, shank 22 is received in a slot 28 in channel bottom 18 at the outer corner thereof, the slot being of a length and depth just sufficient to mate with the shank. The sequence of connection is shown in FIGURES 3 and 4. In FIGURE 3, the panel 10 to the right has been laid, and the panel 10 to the left is in the process of being connected, with three successive positions illustrated. In the broken line showing of panel 10, the position at the right shows how the end wall 14 is laid in the channel, with the panel extending vertically. In the next movement, the panel is moved to the left, as shown in the other position illustrated in broken lines, so that the arm 24 of the T moves through slot 26. With arm 24 beyond the end of bottom 18, the panel is tilted, as shown in solid lines, so that arm 24 is swung to engage the underside of bottom 18 of the channel, as shown in FIGURE 4, where the full swing has been completed, and the tops of the two panels 10 lie in a common plane. It will be noted that wall 20 is shorter than wall 16 by an amount equal to the thickness of the sheet. In this position, arm 24 securely locks the panels against vertical separation, and shank 22 holds them against lateral, horizontal movement.

In order to lock the assembly against retrograde swing at the interlock, the keeper or filler 12 is tightly fitted in the interlock channel. As seen in FIGURE 4, the filler is of generally channel section, inverted, with depending walls 30, with downwardly converging, inwardly bent, lower edges 32. At spaced intervals, the side walls 30 of the filler, have aligned windows 34 (FIGURE 6) for reception of the ends of a lock bar 36, which is bent at its middle through a small angle, and which, in bent condition, just makes end contact with, or is closely adjacent to the wall 16 of the channel, and the end wall 20 of the next panel. This provides a toggle action, wherein a relatively small force applied from above, at the middle bend in the bar, will result in a relatively large end thrust by the bar, which results in a thorough lodgment within the channel, and since the bar engages the lower edges of the windows, the filler bar is locked solidly against all movement. For access to the toggle rod 36, the fillers are provided with suitable openings 38 in their top walls, coinciding in location with the pairs of side windows 34. For unlocking the system, the bent bar 36 may be engaged by a prying tool, inserted through top window 38. Thus, the only tools necessary for the locking and unlocking are a hammer and a crowbar. While bar 36 is shown in the form of a dihedral angle, it could have other forms, such as arcuate for instance, with a large radius of curvature. The essential thing is that it be non-linear so as to produce a magnification of applied force. Therefore, the bar may be loosely referred to as bowed, or as concave on one side and convex on the other.

In the matter of seepage of water, the only vulnerable region is the inner corner, where the bottom edge of end wall 14 of the panel meets the channel bottom 18. This is easily corrected by a suitable water-impermeable seal, and in the form shown this is accomplished by means of a strip of impermeable tape 40, folded at 90° to engage the two meeting walls, and being secured by a suitable cement 42, which may be separately applied, or may be carried by the tape. Preferably, the coating of cement will stop short of the actual corner, as shown by the empty space 44 in FIGURE 13, so that minor movements, due to shocks and vibration will not affect the water-tightness of the joint. Except under flood conditions the sealed joint will not be subject to serious water pressure, since the water is free to drain from the ends of the channels, and therefore does not accumulate.

The interlock channel also serves as a convenient housing for service lines, such as electric wires for lighting and controls, and for fire-extinguishing apparatus and de-icing systems. Thus, FIGURE 6 shows a cable 46 enclosing a pair of electric wires 48, located in the hollow corner of the channel, beneath one of the bent tabs 32 of the filler. A pipe 50 is also shown as suspended from the underside of the top wall of filler 12, being supported at intervals by straps 52, depending from the top wall. Conventional foam or other fire-extinguishing fluid may be supplied through the pipes 50 and discharged to the surface of the mat in any convenient manner as by means of spaced nozzles 54 extending through the panels.

For improved traction, the top surfaces of panels 10 are coined or embossed, to provide projecting areas 56, which constitute the major units of the tread, and these preferably have a roughened surface to enhance the non-skid qualities. As shown, the coined areas are lozenge shaped, and in order to avoid bias in any one lateral direction, the treads are arranged in groups along the panel, with the angular disposition of the treads alternating in direction, from one group to the next. The fillers 12 also have a series of rectangular treads 58, which, comporting with the proportions of the filler are elongate in the longitudinal direction, and the orienta-

tion of these treads serves to further randomize the overall tread pattern.

In FIGURE 10, the panel 72 has a depending end wall 74 analogous to end wall 14, but which is slightly bent so as to extend outwardly in a downward direction. Likewise, the opposite wall 76, corresponding to wall 16, also slants outwardly in a downward direction, and at the outer end of channel bottom 78, the outer, upstanding wall 80, corresponding to wall 20, slants outwardly in an upward direction. As in the case of the FIGURE 5 modification, the bottom 78 and end wall 80 have suitable slots for accommodating the T member 22-24. As seen in FIGURE 11, the panels 72 are adapted for close nesting, which enables stacking in a minimum of space, for storage, handling or shipment.

Although the assembled mat is relatively rigid in ground-supported position, due to the close-fitting, and efficient interlock, the system is nevertheless capable of a bending deformation over a range of panels, so that, if deemed necessary or desirable, the runway may be brought into an arch form, as shown in FIGURE 12, in which case the main body of the mat is off the ground, and self-supported, with the ground reactions located at or near the ends. As shown the arch form is achieved by a pair of tension rods 82, 84, attached to end panels of the runway, and connected by a turnbuckle 86, through which the bending force is applied. In this form, the mat may also be employed as a bridge, to span small streams, and for this use the panels may be supplied in special, shorter lengths to comport with a reasonable bridge width for any given tactical purpose.

Generally speaking, whereas a certain, preferred modification has been shown and described, modifications will be apparent, in the light of this disclosure, and the invention should not, therefore, be deemed as limited, except insofar as shall appear from the spirit and scope of the appended claims.

I claim:

1. A unit for assembly in multiple, to form a mat, comprising a panel of sheet material with oppositely opening channel sections having a common, inner wall between said sections, the section opening downwardly having a lug of inverted T-form depending from its outer side, the other of said sections having a first slot in its outer wall adjacent the bottom corner thereof, adapted to freely receive the cross arm of the T lug of an adjacent panel in the mat, and a slot in its bottom communicating at right angles with and shorter than said first slot, and adapted to receive the leg of said T lug, the outer wall of said other of said sections having a height less than the inner wall thereof by an amount equal to the thickness of said material, a filler element of generally rectangular channel form, adapted to be snugly received in said other of said sections in inverted relation thereto, between the common inner wall and the outer side of the downwardly opening section of an adjacent panel when assembled therewith, said element having aligned and oppositely disposed pairs of windows in its side walls, and a window in its bottom adjacent each of said pairs of windows, and a bowed locking bar with ends extending into each of said pairs of windows and being adapted to be locked in frictional engagement with the opposite walls outside of said windows to lock said panels and filler element in assembled relation.

2. An assembly of units having overlapping outer side walls, forming a mat, each unit comprising a panel of sheet material with oppositely opening channel sections having a common inner wall between them, one of said sections normally opening downwardly having a lug of inverted T-form depending from its outer side wall, the other of said sections having a first slot in its outer side wall adjacent a bottom corner thereof, to receive and pass therethrough the cross arm of the T lug of an adjacent panel in the mat, and a slot in its bottom communicating at right angles with and shorter than said first

5

slot, and receiving the leg of said T lug, a filler element of generally rectangular channel form snugly mounted in said other of said sections of each panel between the common inner wall and the outer side wall of the downwardly opening section of the adjacent panel, said element having aligned and oppositely disposed pairs of windows in its side walls, and a bowed locking bar with ends extending into each of said pairs of windows and locked in frictional engagement with the opposite walls outside of said windows to hold said panels and filler element assembled in the mat.

3. A mat assembly comprising a plurality of interlocked panels as defined in claim 2, and a tensioning member on the under side of said mat, end-connected to said mat, and spanning a plurality of said panels.

4. An assembly of units having overlapping outer side walls, forming a mat, each unit comprising a panel of sheet material having oppositely opening channel sections with a common inner wall between the sections, one of said sections normally opening downwardly having a lug of inverted T form depending from its outer side, the other of said sections having a first slot in its outer wall adjacent the bottom corner of said other section, receiving the cross arm of the T lug of the adjacent panel in the mat during assembly, and a slot in its bottom communicating with said first slot, medially thereof and receiving the leg of said T lug, a filler element of generally rectangular channel form snugly mounted and locked in the other of said sections between the common inner wall and the outer side wall of said other section of the adjacent panel, said filler element having aligned pairs of windows in its side walls, and a toggle-action wedge bar with its ends extending into each pair of said aligned windows, frictionally engaging with the opposite walls outside of the corresponding pair of windows.

5. An assembly as defined in claim 4, said wedge bar being normally bowed upwardly before assembly for straightening out the bow to provide a high pressure wedging force between the opposite walls to lock said filler element and adjacent panels in place.

6. A unit for assembly in multiple to form a mat, comprising a generally S-form panel, with oppositely opening channel sections having a common inner wall, said channel sections having outer walls extending normally from the outer corners thereof respectively, and complementary interlocking means at opposite sides of the panel comprising

6

ing an inverted T-form extension on the outer wall edge of one of said sections and a T-form slot across the outer corner of the other of said sections, the cross part of the T-form slot being in the outer wall side of said corner and the leg part thereof in the channel bottom side of said corner, said slot being adapted for interlocking engagement with the extension on the outer wall of an adjacent panel.

7. A landing mat panel assembly, comprising a mosaicly connected series of interchangeable panels, each panel consisting of a formed sheet strip defining oppositely opening channels relative to the plane of the panel, having a common intermediate wall and substantially parallel bottom walls extending in opposite directions therefrom to outer walls at the sides of said strip, and complementary interlocking T-lug and T-slot linkage means formed integrally at the outer edge of one of the side walls and at the inner corner of the outer wall respectively, said outer side walls overlapping each other to form a common wall between the oppositely opening channels in adjacent strips, said linkage means comprising a plurality of said headed T-lugs formed along the outer edge of said one side wall of each strip, and complementary T-slots having their cross portions in one wall of the outer corner of the channel at the other side of the adjacent strip for receiving the head portions of said T-lugs and the shank portions of the slots in the other wall of said outer corner receiving the shanks of corresponding T-lugs along the outer edge of the side wall of the adjacent strip in said mosaic series.

References Cited in the file of this patent

UNITED STATES PATENTS

1,178,756	Scott	Apr. 11, 1916
1,706,924	Kane	Mar. 26, 1929
2,004,198	Fall	June 11, 1935
2,121,213	Small	June 21, 1938
2,180,504	Bradfield	Nov. 21, 1939
2,180,904	Jorgensen	Nov. 21, 1939
2,294,550	Greulich	Sept. 1, 1942
2,352,892	Greulich	July 4, 1944
2,359,548	Cushwa	Oct. 3, 1944
2,742,116	Fitzgerald	Apr. 11, 1956
2,942,535	Sprangler	June 28, 1960
FOREIGN PATENTS		
1,089,249	France	Sept. 29, 1954

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,143,939

August 11, 1964

Resta S. Gregoire

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 6, line 18, before "outer", first occurrence, insert -- other --.

Signed and sealed this 19th day of January 1965.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents