March 6, 1956 G. G. GREULICH 2,737,093

SHEET METAL AIRFIELD DECK MATS

Filed Dec. 3, 1952 3 Sheets-Sheet 1

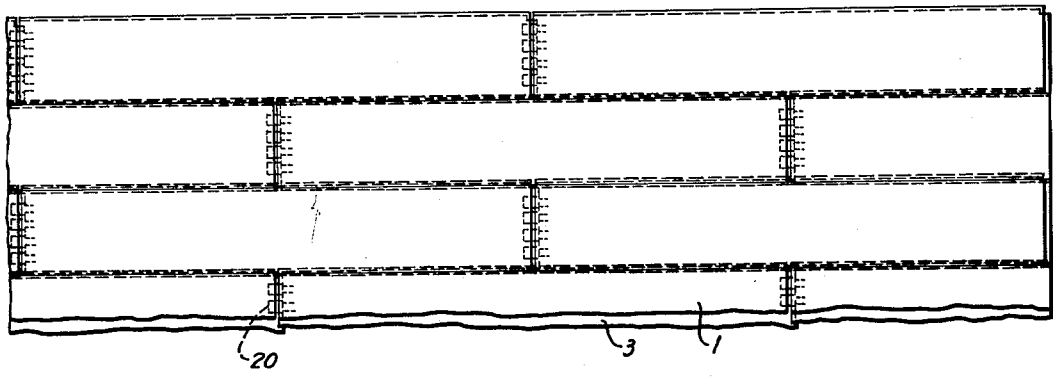


Fig. 1

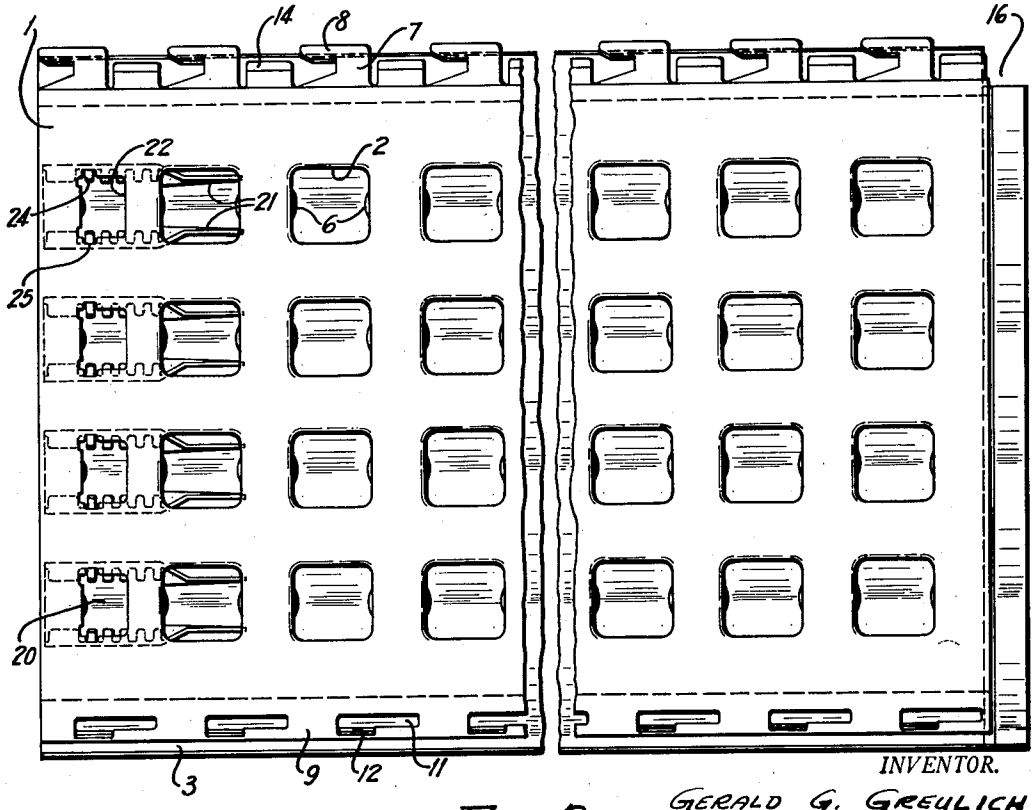


Fig. 2

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Filed Dec. 3, 1952 3 Sheets-Sheet 2

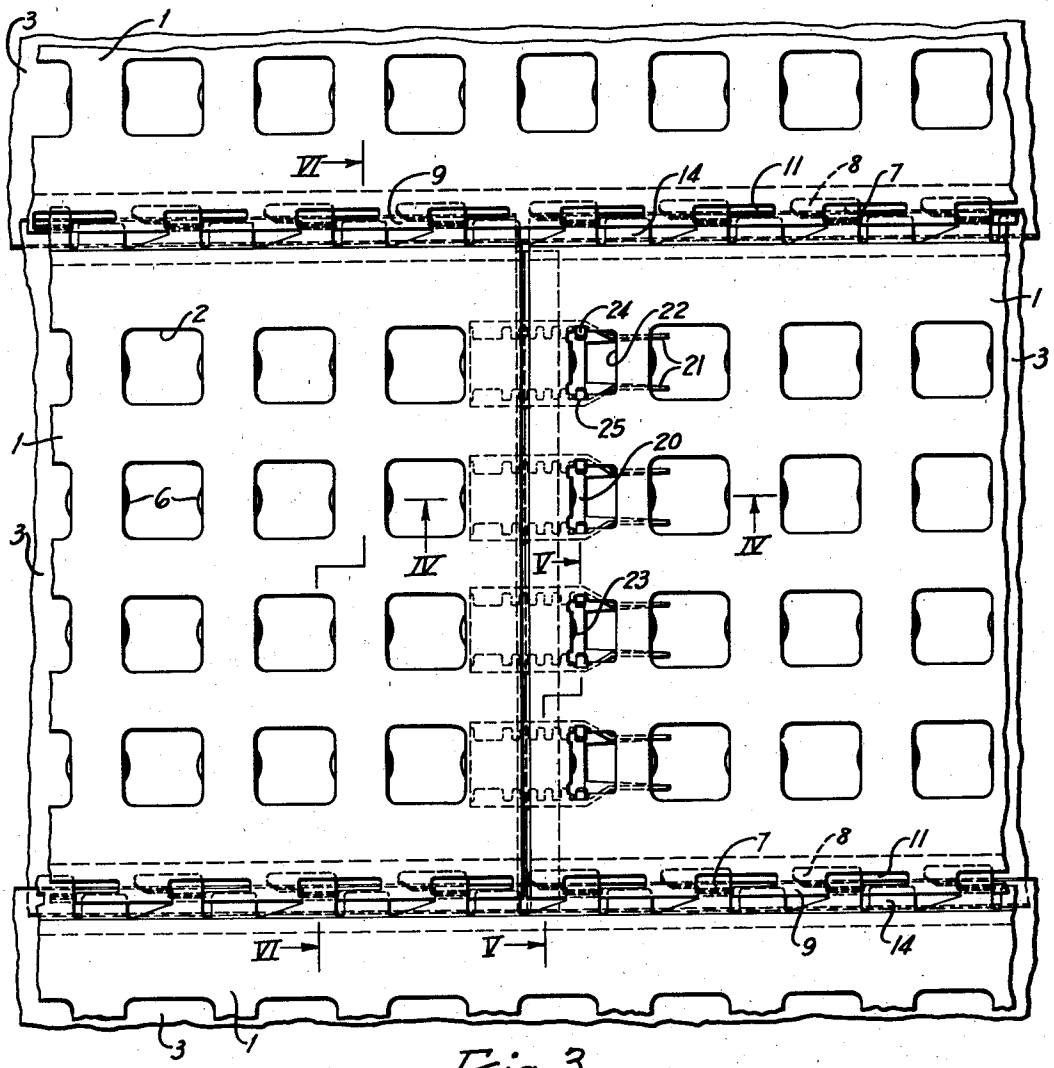


Fig. 3

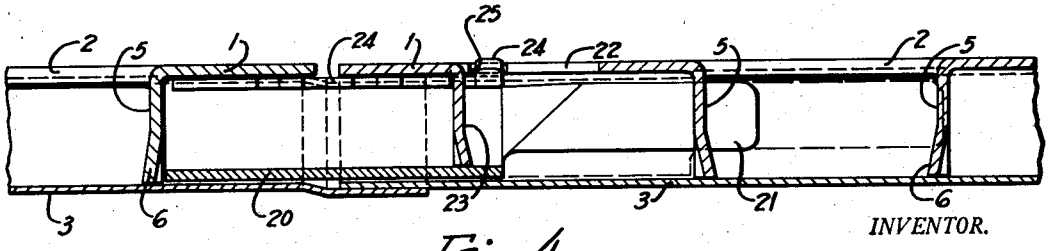


Fig. 4

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SHEET METAL AIRFIELD DECK MATS

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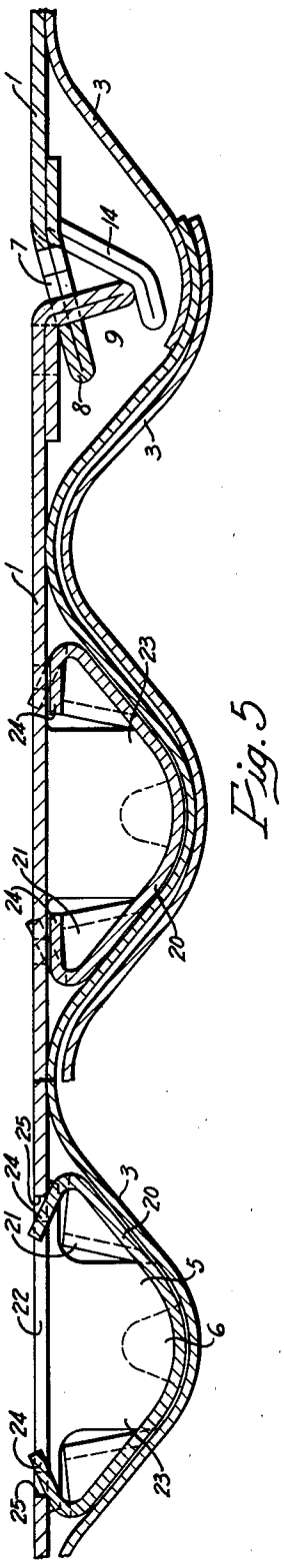

Fig. 5

Fig. 7



Fig. 6

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# SHEET METAL AIRFIELD DECK MATS

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Application December 3, 1952, Serial No. 323,810

5 Claims. (Cl. 94—13)

This invention relates to sheet metal mats which are assembled to form airfield decks, and more particularly to a mat that is formed from a substantially flat top plate supported by a corrugated bottom plate.

Airfield deck mats of this type are disclosed in my co-pending patent application, Serial Number 275,969, filed March 11, 1952, now Patent No. 2,728,276. The present invention is an improvement on the mats shown in that application.

It is among the objects of this invention to provide airfield deck mats of the type just referred to, which will support heavier loads than the earlier mats without an increase in thickness of the plates, in which the connected edges of adjoining top plates are prevented from being bent downward a material amount under load, and in which the members that connect adjoining mats end to end are located inside of the mats.

In accordance with this invention, the airfield deck is formed from a plurality of sheet metal mats which are laid with overlapping sides and ends. Each mat is formed from a substantially flat top or deck plate secured to the top of a bottom or ground plate that has corrugations extending lengthwise of it. The corrugations form laterally spaced troughs. Each trough has a plurality of vertical struts in its which space the deck plate and the bottom of the troughs apart, and thereby keep the corrugated plate from tending to flatten when the mat is supporting a heavy load.

One side of the deck plate is provided with downwardly inclined fastening members, and the opposite side portion of the plate is turned downward to form a flange, along the top of which the plate is provided with slots for receiving the fastening members on an adjoining mat. The side of the deck plate is provided between its fastening members with inclined lugs that extend downward nearly to the underlying side portion of the ground plate. The lower edge of the down-turned flange of the adjoining deck plate rests on these lugs. The lugs thereby help support the edge of the deck plate to which they are joined, and also help support the edge portion of the adjoining deck plate. Due to the way in which the lugs engage the adjoining flange, they also push the connected deck plates away from each other to avoid loose play between adjoining mats.

To connect the mats end to end, trough-like connecting members are slidably disposed in the ends of the troughs of the ground plates. Each of these members is adapted to be slid part way out of its trough and into an aligned trough of another mat to connect the adjoining ends of the two mats. The connecting member may be provided with one or more lugs that can be bent up through an opening in the deck plate above it to lock the connecting member wholly within a mat or in its projecting position when it extends into an adjoining mat.

The invention is illustrated in the accompanying drawings, in which—

Fig. 1 is a plan view, somewhat diagrammatic, of a portion of an airfield deck formed from my mats;



Fig. 2 is an enlarged fragmentary plan view of a single mat;

Fig. 3 is an enlarged fragmentary plan view of a portion of the deck shown in Fig. 1;

Fig. 4 is a still further enlarged longitudinal vertical section of an end connecting detail, taken on the line IV—IV of Fig. 3;

Fig. 5 is an enlarged vertical transverse section taken on the line V—V of Fig. 3;

Fig. 6 is an enlarged vertical transverse section, with its central portion broken out, taken on the line VI—VI of Fig. 3; and

Fig. 7 is a fragmentary longitudinal section through a ground plate trough and deck plate, showing a modified form of strut.

All of the sheet metal mats shown connected together in staggered relation in Fig. 1 are made in the same way. All of the mats are the same width, and all but half length end mats are the same length. One of them is illustrated in detail in Fig. 2. It is of general rectangular shape with a rectangular notch at one corner, so that one end portion is narrower than the rest of it. Each mat is formed from relatively thin upper and lower metal sheets that are secured together rigidly, such as by spot welding. The upper sheet forms a flat deck plate **1** provided with rectangular holes **2** for a purpose that will soon be explained. The lower sheet forms a ground plate **3** that can rest directly on the ground. It is provided with corrugations that extend lengthwise of the mat to give it strength and depth. The corrugations form laterally spaced troughs, and the deck plate is fastened to the top of the ground plate between the troughs. The corrugated plate will not flatten under moderate loads, even though it is made of thin stock, because the straight deck plate forms a tension member between the tops of the corrugations. By combining these two plates, great bending strength and toughness is provided at a practical weight.

However, to permit the mat to support satisfactorily even greater loads without flattening the corrugated ground plate, a plurality of vertical struts **5** are disposed in each trough of the ground plate for positively spacing the deck plate from the bottoms of the troughs. These struts serve as posts that support the deck plate, and hereby hold the corrugated plate in shape. Preferably, the struts are integral with and struck down from the deck plate, and can conveniently be made from the metal that is punched out of holes **2** when those holes are formed. It is desirable to bend a pair of struts down from two opposite sides of each hole. The struts extend transversely of the troughs and have their upper ends connected by integral bends to the sides of the holes. The lower end of each strut is curved to engage and fit the contour of the underlying trough. To strengthen these struts, the lower portion of each one may have a laterally offset central area **6** which serves as a strengthening rib. This offset can be formed in the same operation that punches the holes in the deck and bends the strut down into vertical position.

In order to connect adjoining mats side by side, one side of each deck plate is cut to provide it with fastening members, preferably hooks that extend lengthwise of the plate. The hooks also are bent downward a short distance, so that they are inclined relative to the top of the plate, generally not more than 15 degrees. Each of the hooks has a neck portion **7** which connects its head portion **8** to the rest of the plate. The opposite edge portion of the deck plate is bent downward at a steep angle to form a flange **9** perpendicular to the hooks on the mat beside it. The top of the deck plate along the top of this flange is provided with slots **11** that extend horizontally lengthwise of the plate. They are positioned to receive the hooks on an adjoining mat

of like construction. In order to insert the hooks into such slots, the mat having the hooks that are to be inserted has to be inclined rather steeply, as indicated in the upper broken line position in Fig. 6, so that the hooks can be pushed down through the slots in the mat resting on the ground. The raised mat then is moved lengthwise to slide the head portions of its hooks under the adjoining deck plate between its slots to interconnect the plates. Following this, the raised mat is allowed to swing down to the ground beside the first one. This occurs without bending the hooks, because the flange 9 of the first deck plate is provided near one end of each of its slots and directly opposite to the neck portion of a hook on the opposite side of the same deck plate, with a notch 12 that opens into the adjoining side of the slot for receiving the neck portion of the hook in that slot after the hook has been moved lengthwise into locking position. When the neck portions of the hooks are disposed in these notches, the adjoining horizontal mats cannot be moved lengthwise to unlock them. The depth of the notches is such that the hooks in them engage their lower walls and also the bottom of the deck plate at the upper end of the flange. This prevents the hooks from moving up and down in the slots and notches and thereby virtually eliminates slap between adjoining mats.

Since it is highly desirable to keep the ground beneath the deck from being softened by rain water, and to prevent jet engine exhaust from raising clouds of dust or blowing sloppy mud from beneath the deck, the mats are constructed so that they will completely cover the underlying ground with a continuous unbroken metal surface. For this purpose, one side of each corrugated ground plate 3 projects laterally from beneath an edge of the overlying deck plate, preferably the slotted and flanged edge. The projecting portion of the ground plate should be the lower part or trough of one of its corrugations, so that it will present a curved surface to the ground. The opposite edge portion of the ground plate should be curved in the same manner to nest with the projecting portion of an adjoining ground plate in overlapping engagement with it, most suitably with its upper surface. It will be seen that the overlapping curved portions of adjoining ground plates are located beneath the joints between the sides of the mats, and form a complete trough.

The hook side of each deck plate is provided with downwardly inclined lugs 14 located between the hooks. These lugs are bent downwardly much more sharply than the hooks and, as shown in Figs. 5 and 6, extend down substantially to the underlying ground plate at a point beyond the opposite or inner side of the flange 9 of the adjoining mat. The lower portions of these lugs are bent upward slightly, so that they extend across the lower edge of the flange in a plane substantially perpendicular to the plane of the flange. The lower edge of the flange is received in the bends of the lugs. The relation of each lug and flange to each other is such that they push against each other in a more or less horizontal direction and thereby force the two mats apart until the hooks tightly engage the inner surface of the flange. In fact, the hooks are put under tension by the pressure of the lugs against the adjoining deck plate flange. The lugs also prevent the flange from being bent upward by the pull of the hooks against its inner surface. Due to the only slight inclination of the hooks from the horizontal, the interconnected deck plates exert a substantially straight line pull on one another, which does not bend the hooks upward and thereby create slack. In case the load on the mat tends to bend the sides of the deck plates down, the lower ends of lugs 14 will engage the underlying ground plate and support the deck plate to which they are joined, as well as the flange engaging the upper surface of the lugs. Under these circumstances the lugs serve the same purpose as the struts 5 in the mat.



To keep the weight and cost of the mat as low as possible, the deck plate is made of thin stock but it is stiffened by the corrugated ground plate which supports it. The hooks, lugs and slotted and flanged portions of the deck plate are greatly strengthened, and the life of the mat as a whole is increased materially, by providing the deck plate with side portions having double thickness, thereby making the hooks and lugs double thickness. As shown in Figs. 5 and 6, this is done by folding the opposite marginal portions of the sheet, from which the deck plate is made, down and back under the sheet and then welding them to its lower surface. These welded double thickness side portions have substantially the same strength as a solid plate of like thickness. They also provide bearing surfaces of increased area, which help prevent the hooks from tearing out of the slots.

Each ground plate also projects a short distance from one end of the overlying deck plate for supporting the end of an adjoining mat. To allow all ground plates to lie in the same plane, the projecting end of each ground plate is offset downward the thickness of the metal, as shown in Fig. 4. Also, the side of this offset end at the hook side of the mat is cut away to form a corner notch 16 (Fig. 2), so that it will not press downward the third ground plate which spans the end joint at that side.

The deck is strengthened and made more of an integral unit by fastening the overlapping ends of adjoining mats together. For this purpose there are longitudinally sliding connecting members at one end of each mat, preferably one connector in each of its troughs. As shown in Fig. 5, each connecting member 20 is trough shape and conforms to the shape of the ground plate trough in which it is disposed. The length of the connector can be increased by providing its inner end with an integral fork 21 that straddles the adjoining strut 5 so that the connecting member can be slid back and forth without interference from the strut. An additional row of holes 22 are punched in the deck plate near the end of the mat that houses the end connectors, and a strut 23 can be bent down in forming each hole. In such a case the strut is shorter than the other struts 5 so that it will project down into a connecting member and allow the latter to slide beneath it, as shown in Fig. 4.

When two mats are placed end to end, the connecting members 20 at their adjoining ends are slid part way out of the mat that houses them and into the aligned troughs of the other mat. The connectors thus bridge the end joint and keep the end of either mat from moving vertically relative to the other mat. The connecting members can be locked in their outer position by providing the top of the opposite sides of each member with inturned flanges that are notched to provide a row of ears 24 extending along each side of the connecting member. As shown in Figs. 3 and 4, a pair of ears which are located below notches 25 in opposite sides of the overlying hole 22 are bent up into those notches to prevent the connecting member from moving lengthwise. When the connector before field installation of the mats is in its inner shipping position completely inside the mat that carries it, as shown in Fig. 2, another pair of the ears are bent up through the notches to hold the connector retracted. It will be seen that in either position the connecting members are always below the top of the deck plate, and therefore cannot offer obstructions to walking personnel or to equipment on the deck.

In case it is not desired to punch holes in the deck plates, struts can be provided nevertheless by fastening them to the bottoms of those plates. A pair of such struts 30 are shown in Fig. 7. Each strut is bent down from a horizontal plate 31 which can connect two struts. This plate is welded or otherwise connected to the bottom of the deck plate 32. The bottoms of the struts

substantially engage the upper surface of the corrugated ground plate 33.

According to the provision of the patent statutes, I have explained the principle of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. A metal mat adapted to be laid side by side with like mats to form an airfield deck, said mat comprising a ground plate having corrugations extending lengthwise thereof and forming laterally spaced troughs, a deck plate secured to the top of the ground plate between the troughs, cooperative connecting means on the opposite sides of the deck plate for connection to the deck plate of an adjoining mat to interlock the mats, the deck plate being provided with a plurality of longitudinally spaced openings above troughs of the ground plate, vertical struts extending downward from the deck plate to the bottoms of the troughs for spacing the deck plate and the bottoms of the troughs apart when the mat is supporting a load, the struts extending transversely of the troughs with their upper ends connected by integral bends to the sides of said openings, and a trough-like connecting member slidably disposed in one end of a trough and adapted to be slid part way out of said trough and into an aligned trough of another mat to connect the adjoining ends of the two mats, the upper part of said connecting member being provided with a bendable ear, and the deck plate being provided with an opening for receiving the ear when it is bent upward to lock the connecting member against longitudinal movement.

2. A metal mat adapted to be laid side by side with like mats to form an airfield deck, said mat comprising a ground plate having corrugations extending lengthwise thereof and forming laterally spaced troughs, a deck plate secured to the top of the ground plate between the troughs, a plurality of vertical struts in troughs of the ground plate extending downward from the deck plate, one side of the deck plate being provided with downwardly inclined integral fastening members, the opposite side portion of the deck plate being turned downward to form a flange, the deck plate being provided with slots extending horizontally along the top of said flange adapted to receive fastening members on an adjoining mat, and the side of the deck plate being provided between its fastening members with lugs extending downward substantially to the underlying ground plate, the lower portions of said lugs extending outward relative to their upper portions to position the upper surfaces of said lower portions for engagement with the lower edge of the flange of an adjoining deck plate.

3. An airfield deck comprising a plurality of metal mats laid side by side on the ground, each mat comprising a ground plate having corrugations extending lengthwise thereof and forming laterally spaced troughs, a deck plate secured to the top of the ground plate between the troughs, one side of the deck plate being provided with downwardly inclined integral fastening members, the opposite side portion of the deck plate being turned downward to form a flange, the top of the deck plate being provided with slots extending horizontally along the top of said flange for receiving the fastening members on an adjoining mat when it is inclined, said flange being provided with notches that open at the top into the slots above them, the notches receiving the fastening members on said adjoining mat lying on the ground, and on side of each deck plate being provided between its fastening members with integral spacing lugs inclined downwardly more steeply than said members and extending down substantially to the underlying ground plate, the lower portions of said lugs extending beneath the flange of an adjoining deck plate and having their upper surfaces in engagement with the lower edge of said flange.



4. A metal mat adapted to be laid side by side with like mats to form an airfield deck, said mat comprising a ground plate having corrugations extending lengthwise thereof and forming laterally spaced troughs, a deck plate secured to the top of the ground plate between the troughs, cooperative connecting means on the opposite sides of the deck plate for connection to the deck plate of an adjoining mat to interlock the mats, the deck plate being provided with a plurality of longitudinally spaced openings above troughs of the ground plate, vertical struts extending downward from the deck plate to the bottoms of the troughs for spacing the deck plate and the bottoms of the troughs apart when the mat is supporting a load, the struts extending transversely of the troughs with their upper ends connected by integral bends to the sides of said openings, and a trough-like connecting member slidably disposed in one end of a trough and adapted to be slid part way out of said trough and into an aligned trough of another mat to connect the adjoining ends of the two mats, the deck plate being provided above said connecting member with an opening, and the top of the connecting member being provided with an ear projecting up into said opening to lock the connecting member in its inner position until the mat is laid, the ear being bendable downwardly to release the connecting member.

5. A metal mat adapted to be laid side by side with like mats to form an airfield deck, said mat comprising a ground plate having corrugations extending lengthwise thereof and forming laterally spaced troughs, a deck plate secured to the top of the ground plate between the troughs, cooperative connecting means on the opposite sides of the deck plate for connection to the deck plate of an adjoining mat to interlock the mats, the deck plate being provided with a plurality of longitudinally spaced openings above troughs of the ground plate, vertical struts extending downward from the deck plate to the bottoms of the troughs for spacing the deck plate and the bottoms of the troughs apart when the mat is supporting a load, the struts extending transversely of the troughs with their upper ends connected by integral bends to the sides of said openings, and a trough-like connecting member slidably disposed in one end of a trough and adapted to be slid part way out of said trough and into an aligned trough of another mat to connect the adjoining ends of the two mats, the upper part of said connecting member having a row of ears along one side projecting toward the opposite side, and the deck plate having an opening above said row to receive any one of the ears when it is bent upward, whereby the connecting member can be locked in both its inner and projecting positions.

**References Cited** in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| 1,241,685 | Van Dorn | Oct. 2, 1917 |
| 1,433,232 | Rogers | Oct. 24, 1922 |
| 2,105,280 | Bass | Jan. 11, 1938 |
| 2,212,680 | Brickman | Aug. 27, 1940 |
| 2,299,670 | Westcott | Oct. 20, 1942 |
| 2,316,569 | Dornier | Apr. 13, 1943 |
| 2,353,398 | Greulich | July 11, 1944 |
| 2,359,548 | Cushwa | Oct. 3, 1944 |
| 2,391,997 | Noble | Jan. 1, 1946 |