Feb. 28, 1956 G. G. GREULICH 2,736,248

SHEET METAL AIRFIELD DECK PLANKS

Filed May 25, 1951 3 Sheets-Sheet 1

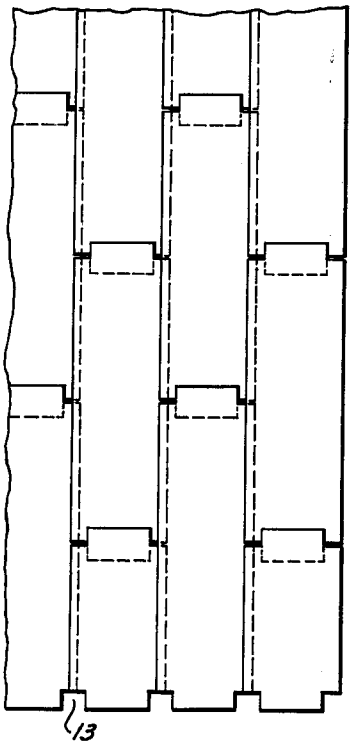


Fig. 1

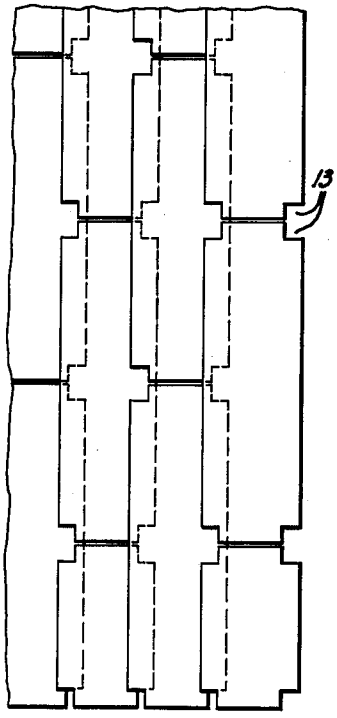


Fig. 2

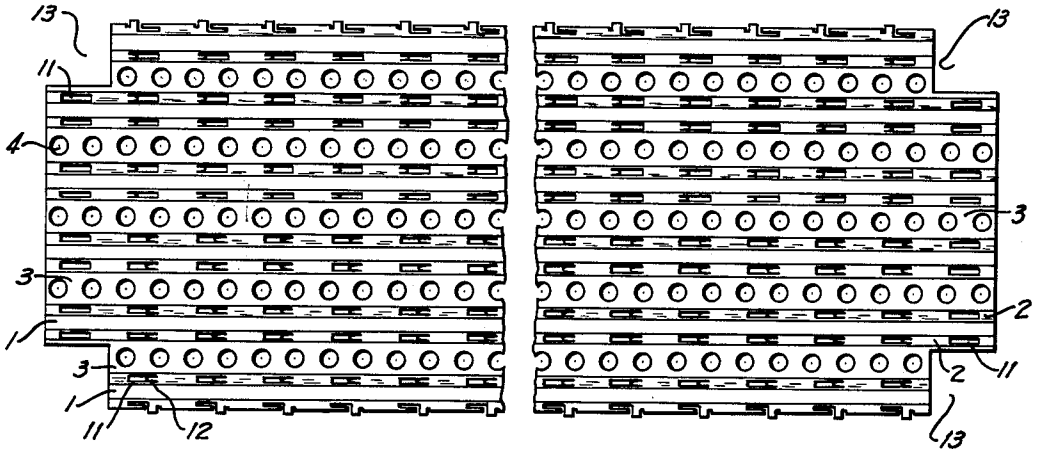


Fig. 3

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SHEET METAL AIRFIELD DECK PLANKS

Filed May 25, 1951 3 Sheets-Sheet 2

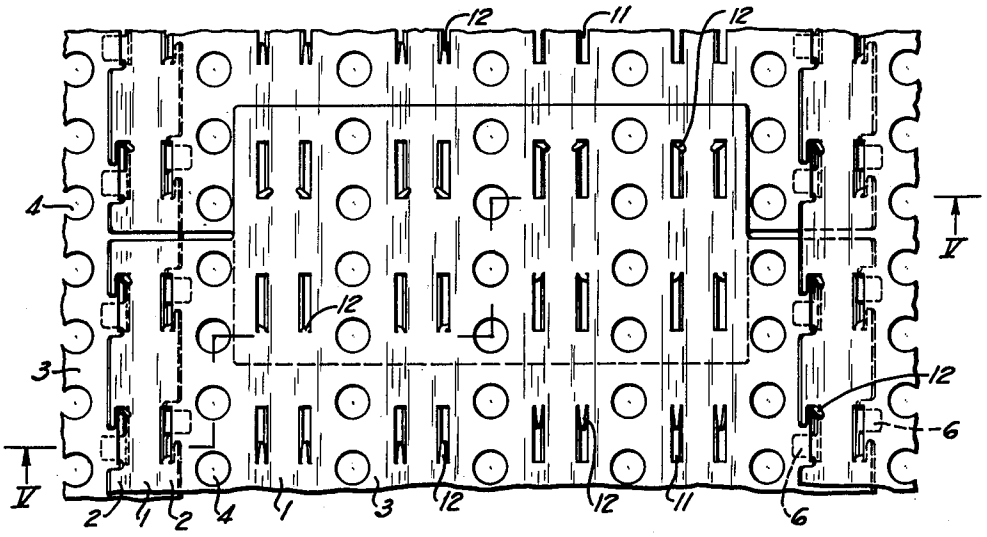


Fig. 4

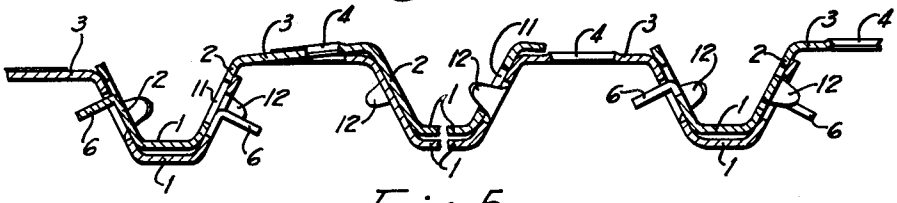


Fig. 5

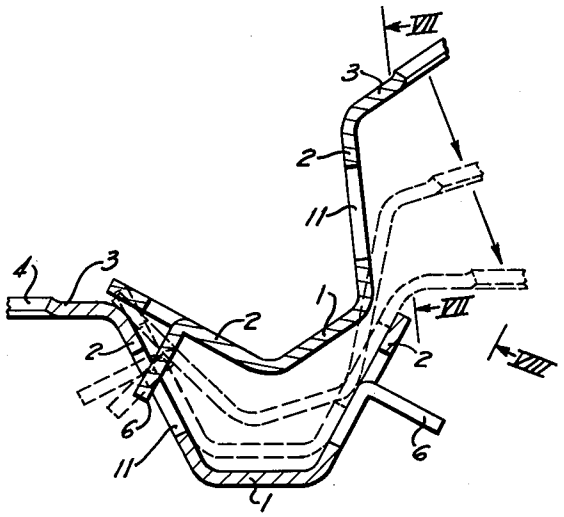


Fig. 6

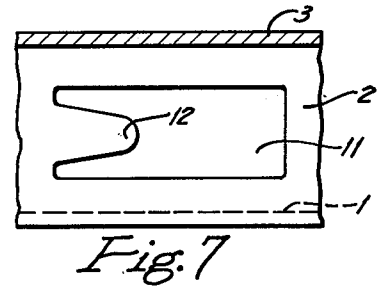


Fig. 7

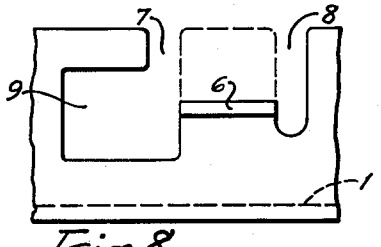


Fig. 8

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Feb. 28, 1956 G. G. GREULICH 2,736,248

SHEET METAL AIRFIELD DECK PLANKS

Filed May 25, 1951 3 Sheets-Sheet 3

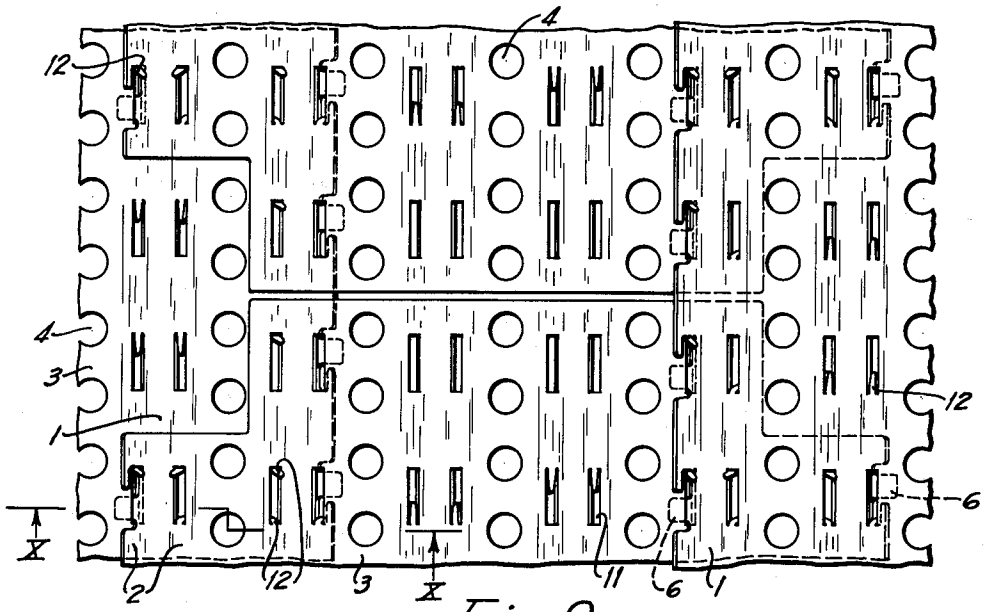


Fig. 9

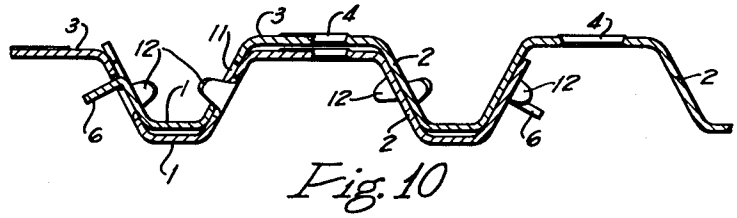


Fig. 10

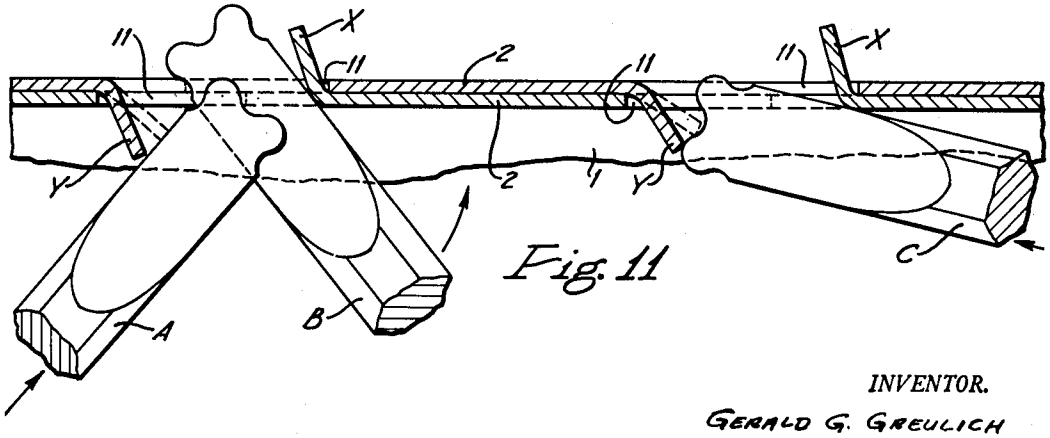


Fig. 11

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SHEET METAL AIRFIELD DECK PLANKS

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Application May 25, 1951, Serial No. 228,190

4 Claims. (Cl. 94—13)

This invention relates to sheet metal airfield decks, and more particularly to the planks from which such decks are made.

Airfield decks or runways are used principally in war time to cover unstable soil so as to form firm foundations for the landing, taxiing and standing of airplanes. They generally are formed from sheet metal planks which are connected together in such a way as to form a continuous metal mat. Airfield decks of this character are shown in a number of my patents, including Patent No. 2,352,892, and were widely used during the last war. However, constantly increasing airplane sizes and wheel loads demand more and more strength for satisfactory decks, but for reasons of portability or military logistics it is desirable to avoid increasing deck weights in proportion to increases in airplane weights.

It is among the objects of this invention to provide airfield deck planks which have greatly increased beam strength with only a slight increase in weight, which can be turned end for end without affecting their ease of assembly or the pattern or appearance of the finished deck, which have a maximum amount of solid metal surface but also sufficient openings for vegetation to grow through and for drying out of the supporting soil, which can be made of harder and stiffer steel than heretofore, which are low in cost, which require a minimum of space for storage and shipment, which are easy to lay rapidly with unskilled labor, and which require no separate connecting members.

Other objects of this invention are to provide an airfield deck in which the ends of the planks can be overlapped and firmly fastened, in which the sides of the planks can be overlapped different amounts, in which hinge action between the sides of the planks is greatly reduced, in which only part of the integral fastening members ordinarily need to be used, in which the planks can be laid in several arrangements to produce corresponding variations in strength or supporting capacity, in which any loose play that may develop at the joints between the planks can be taken up easily at any time, and which can be readily dismantled and transported to another location for reassembly.

In accordance with this invention the airfield deck is formed from a plurality of sheet metal planks which are laid with overlapping sides. Each plank has its opposite sides bent to form longitudinally extending channels provided with upwardly diverging side walls so that the overlapping portions of the planks can nest together. The side walls of each channel are provided with integral fastener members and with openings for receiving like members on the adjoining plank. In this way the planks can be locked together. The fastener members are formed from integral bendable lugs, while along the edges of the plank there are laterally projecting tongues. The lugs may be tapered so that the nested channels will be drawn into tight engagement when the lugs in one channel are bent through the openings in the adjoining channel. Furthermore, the lugs at one side of the longitudinal

center line of each plank extend toward one end of the plank, and the lugs at the opposite side of the center line extend toward the opposite end of the plank, thereby permitting the plank to be turned end for end without affecting its connection to the adjoining planks. The opposite ends of each plank are provided only with fastener receiving openings to receive the fastening members that are spaced inwardly of the end openings in the adjoining end plank when the ends of the planks are overlapped. To permit the ends of the planks to be overlapped and yet not be too bulky, each plank is provided with a notch at each corner which extends transversely of the plank past the adjacent outermost channel. Each notch of the upper of two overlapping planks extends lengthwise thereof beyond the end of the underlying portion of the plank whose end it overlies. The notch should extend lengthwise of the plank a distance greater than half the amount of end overlap. By having the lug slots extend along the neutral axes of the planks, they interfere the least with the strength of the planks. The lugs do not project above the channels, so they do not interfere with the wheels of a plane rolling over the planks.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which Fig. 1 is a plan view of a portion of an airfield deck with the planks overlapped at their ends; Fig. 2 is a similar view of a deck with the planks not overlapped at their ends; Fig. 3 is an enlarged fragmentary plan view of a single plank; Fig. 4 is a still further enlarged fragmentary plan view of a portion of the deck shown in Fig. 1; Fig. 5 is an enlarged vertical transverse section taken on the line V—V of Fig. 4 with the central part broken out; Fig. 6 is an enlarged detail showing how the planks are connected together; Fig. 7 is a fragmentary detail, showing a lug and slot in the side of a channel, taken on the line VII—VII of Fig. 6; Fig. 8 is a further detail, taken on the line VIII—VIII of Fig. 6 to show how the tongues are formed; Figs. 9 and 10 are views similar to Figs. 4 and 5, respectively, showing a portion of the deck disclosed in Fig. 2; and Fig. 11 is a fragmentary longitudinal section illustrating a way in which the lugs can be bent into locking positions.

All of the sheet metal planks shown in the sections of airfield decks illustrated in Figs. 1 and 2 are made in the same way. One of these planks is illustrated in detail in Fig. 3. It is of general rectangular shape with substantially square notches at its four corners, so that its end portions are narrower than the rest of it. All of the planks are the same width and all but the half-length end planks are the same length. Each plank is corrugated to provide it with a plurality of parallel channels extending lengthwise of it. As shown in Figs. 5 and 6, the bottom 1 of each channel preferably is flat and its side walls 2 diverge upward, preferably at an angle of between 25 and 30 degrees to the vertical. The tops of the channels are spaced uniform distances apart by horizontal tread plates 3 integral with their side walls. These plates are the parts of the planks that are engaged by the wheels of airplanes on the deck. The tread plates may be provided at suitable intervals with circular holes 4 which serve the triple purpose of decreasing the weight of the planks, allowing the soil beneath the planks to dry out, and permitting vegetation to grow up through the planks to camouflage them. The edges of the holes preferably are turned upward to increase the anti-skid properties of the deck. Due to the uniform spacing of the channels in each plank and to their inclined side walls, the sides of adjoining planks can be overlapped one or more channels with their channels nested together. The amount of overlap will depend upon the loads that the deck must support. Ordinarily, a single channel overlap

will be sufficient. Single channel overlaps are shown in Fig. 1, while two channel overlaps are shown in Fig. 2.

In order to position the different planks correctly relative one to the other when they are assembled into a deck, and also to lock them together, each plank is provided with tongues and lugs and with openings for receiving the tongues and lugs on adjoining planks. The tongues and lugs are integral with the rest of the plank and are the only positioning and fastening means required. The tongues 6 are spaced uniformly along the opposite edges of the plank and in such positions that if the plank is turned end for end they will still occupy the same relative positions. The tongues are bent down out of the outer side walls of the two outermost channels of the plank when the plank is made at the factory and are not intended to be disturbed thereafter. As indicated in Fig. 8, each tongue is formed by providing a channel side wall with a pair of downwardly extending parallel notches 7 and 8 and then bending down out of the plane of that wall the piece of metal between the notches. This bent-down piece forms the tongue, which preferably extends away from the channel side wall at a right angle to it. At one side of the tongue the side wall also is provided with a rectangular recess 9 for receiving one of the locking lugs on an adjoining plank, as will be described presently.

The rest of the channel side walls of each plank are each provided with a series of longitudinally spaced slots 11 that extend lengthwise of those walls midway between the top and bottom of the planks. The slots in the various series also are aligned in rows extending across the plank in line with the tongues and recesses at the sides of the plank. As shown in Figs. 4 and 5, the tongues at one side of any given plank extend through the slots in the adjoining side wall of the underlying channel of the plank which it overlaps, and thereby hold the nested channels together. The tongues also position the overlapping planks lengthwise relative to each other. In order to insert the tongues of a plank into slots in a plank lying on the ground, the first plank has to be held at an angle of about 45 degrees, as illustrated in Fig. 6. Its tongues then can be inserted in the slots and then the upper plank allowed to swing down onto the ground. This causes its side channel to nest into the underlying side channel of the other plank. Rapid laying of the deck is made possible by the large clearance provided in the slots for the entry of the tongues.

To lock the overlapping planks together so that they will neither come apart nor have a hinging action along their overlapping sides, series of internal lugs 12 are provided. Preferably, for convenience of manufacture, they originally project lengthwise into slots 11 from one end of each slot, with the exception that the rows of slots across the narrow ends of the planks are not provided with any such lugs. Also, at the time the planks are first brought together the lugs are still contained within the side walls of the channels. At one side of the longitudinal center line of each plank all of the lugs are located at the same end of the slots, which is the end more nearly in alignment with the tongues at that side of the plank. At the opposite side of the center line all of the lugs are at the opposite end of the slots. This arrangement permits any plank to be turned end for end without interfering with its connection to adjoining planks. Also, it assures each lug being located beside a recess 9 or at the lugless end of the slot that falls beside it in any overlapping channel, so that the lug can be bent through that recess or slot. Each lug preferably is tapered toward its free end so that it will have a drawing action when it is bent through a recess or slot beside it and thus clamp the nested channels tightly together. This drawing action occurs because the slots in the upper of a pair of nested channels will necessarily be slightly higher than those in the lower channel; i. e., out of vertical register an amount equal to approximately twice the thickness of the metal. Therefore, when the lugs on the upper channel are bent outward away from it, their upper edges will engage the upper edges of the lower slots, while any lugs on the lower channel that are bent up through slots in the upper channel will engage the lower edges of the upper slots. As the lugs are forced through the slots their taper will pull the two nested channels vertically toward each other and wedge them together. This tight wedging of the nested channels is an important factor in preventing movement between adjoining planks, so that thinner metal may be used than is adequate where loose connections and joints are used. It also eliminates the necessity for bedding down the deck into the soil with heavy rollers or vehicles.

Each plank is provided with many slots and lugs, but only part of the lugs need be used under ordinary conditions, the rest remaining in reserve. If in use the plank connections become loose, some of the reserve lugs can be bent through adjoining slots to tighten them. To disassemble the planks, it is only necessary to bend the locking lugs back as far as the plane of their side wall and then lift the free edges of the planks so that their tongues can be withdrawn from the adjoining planks. If any lugs are broken off by repeated reverse bending, there will be other lugs in reserve that can be used in their place when the planks are assembled again.

When the planks overlap only one channel at each side, as shown in Figs. 1, 4 and 5, the ends of the planks also are overlapped to add strength to the deck. To avoid triple thickness where the sides and ends of the overlapping planks come together at the corners of the planks, which would give undesirable bulk and thickness to the deck in those areas, the corners are provided with rectangular notches 13 that extend inward across the planks past the side channels and preferably past the holes 4 in the outermost tread plates 3. Each notch also extends lengthwise of its plank a distance slightly greater than half the amount of end overlap, so that the opposed ends of any two planks do not overlap each other in the areas where they overlap the sides of the planks at their opposite sides. Therefore, at no point is the deck more than two planks thick and there is no difficulty in fastening the planks together. When a new plank is attached to the side of a pair of planks already installed, it will spring the overlapped corners of the pair into line. The notches need extend along a plank only to a point between the last two rows of slots at either end of the plank. The endmost rows of slots not having any lugs in them, they are free to receive lugs bent into them from the adjoining planks. The overlapping ends of the planks thus are locked together by the lugs.

The deck disclosed herein may be made of relatively light metal thickness for heavy loads because all fastening members are located below the upper surface of the deck and thus are protected in the channels. Also, the elimination of both deep and shallow drawing in corrugating the planks permits the use of thinner, stiffer, higher elastic limit steels that have nearly as much strength as the thicker steels that had to be used heretofore. The planks shown herein have a beam strength, when laid with single channel side layers and with end laps, of over 300% more than my earlier planks and yet with an increase in weight of only about 5%. In the present planks the bottoms of the channels, the lower and upper portions of the channel sides, and the portions of the tread plates between the tops of the channels and holes 4, are all solid metal available to give exceptionally high beam strength to the planks. The tight nesting of channels at side and end laps prevents slap and play, so any tendency of the locking lugs to tear out or to cut or chew into the sides of channel side wall openings is minimized. The slope of the channel sides gives maximum strength for maximum degree of nesting. When the planks are stacked for storage or shipment, each additional plank only increases the height of the stack a little over twice

the thickness of the metal sheets used for the planks. Consequently, a considerable number of planks can be stacked in a small space.

Where soils are very soft, plane loads extremely heavy, or where for any other reason extra strength may be required, the sides of these planks may be overlapped for two or three channels, thereby increasing the width of double thickness areas of the deck and decreasing the width of single thickness areas. Where multiple channel side laps are used, no end lap is used, since the sides of the ends are supported by the adjoining side planks and the transverse space between the planks at the opposite sides of any plank is reduced in width. This is shown in Figs. 2, 9 and 10. The sides of the narrow ends of the planks are locked against the underlying and overlying side planks by locking lugs **12** bent through their slots **11**. Transition between this manner of deck laying and the arrangement shown in Fig. 1 can be made in a deck at will as conditions require increased or decreased support.

In Fig. 11, there is illustrated a tool and a manner of bending the locking lugs through the slots with such a tool. Of course, other types of tools or even makeshift devices could be used for bending the lugs. The tool shown at position A was used to drive the lug X through the adjoining slot. Then the tool was swung around to position B and used to pry lug Y out through the slot to the inclined dotted line position. Then the tool is moved to a position corresponding to position C and driven against the end of lug Y to bend it still farther through the slot, as shown in full lines.

According to the provisions 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 plurality of sheet metal planks laid with overlapping sides to form an airfield deck, each plank being corrugated lengthwise to provide it with a plurality of parallel channels spaced apart uniformly and connected at their tops by integral tread plates, the channels having upwardly diverging side walls so that overlapping planks nest together, overlapping side walls of nesting channels in the deck being provided with registering lugs and lug-receiving openings, the lugs having upper and lower side edges, at least some of the lugs being bent through the openings registering with them to lock the planks together, the outer side wall of an outermost channel of each plank being provided with integral tongues extending down out of the plane of that wall and through the lug-receiving openings in the underlying channel wall of an overlapped plank, each tongue having horizontally spaced side edges, and said outer side wall also being provided with openings registering with the lugs on said underlying channel wall.

2. A plurality of sheet metal planks laid with overlapping sides to form an airfield deck, each plank being corrugated lengthwise to provide it with a plurality of parallel channels spaced apart uniformly and connected at their tops by integral tread plates, the channels having upwardly diverging side walls so that overlapping planks nest together, overlapping channel side walls in the deck being provided with registering lugs and lug-receiving openings, the lugs normally extending lengthwise of said walls but at least some of the lugs being bent through the openings registering with them to lock the planks together, and the outer side wall of an outermost channel of each plank being provided with integral tongues lying substantially in a common plane and extending down out of the plane of that wall and through the lug-receiving openings in the underlying channel wall of an overlapped plank.

3. A plurality of sheet metal planks laid with overlapping sides to form an airfield deck, each plank being corrugated lengthwise to provide parallel channels connected at their tops by integral tread plates, the channels having upwardly diverging side walls so that overlapping planks nest together, and overlapping channel side walls in the deck being provided with registering longitudinally extending slots having tapered lugs integral with an end wall of the slots, the lugs at one side of each plank extending toward one end of the plank, the lugs at the opposite side of that plank extending toward the opposite end of the plank, and said lugs being bent through the slots registering with them to lock the planks together, each bent lug engaging a longitudinal wall of the registering slot to press the overlapping planks together.

4. A plurality of sheet metal planks laid with overlapping sides to form an airfield deck, each plank being corrugated lengthwise to provide parallel channels connected at their tops by integral tread plates, the channels having upwardly diverging side walls so that overlapping planks nest together, the inner side wall of each outer channel in each plank being provided with longitudinally extending slots having lugs integral with an end wall of the slots, the outer side wall of each of said outer channels being provided with openings receiving lugs projecting into them from the adjoining plank, said outer side walls each being provided with integral laterally projecting tongues lying substantially in a common plane, the tongues at one side of each plank projecting through the slots in the adjoining overlapped planks, whereby each pair of overlapping planks are fastened together along both sides of their nesting channels.

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