

- [54] **FLOATING ROOF DECK CONSTRUCTION**
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- [52] U.S. Cl..... 52/376, 52/463, 52/469,
 52/471
 [51] Int. Cl..... E04b 7/00
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 52/584, 272, 281, 393, 394, 547, 573, 627,
 748, 399, 1, 494, 370, 372, 469, 467, 465,
 52/461, 542

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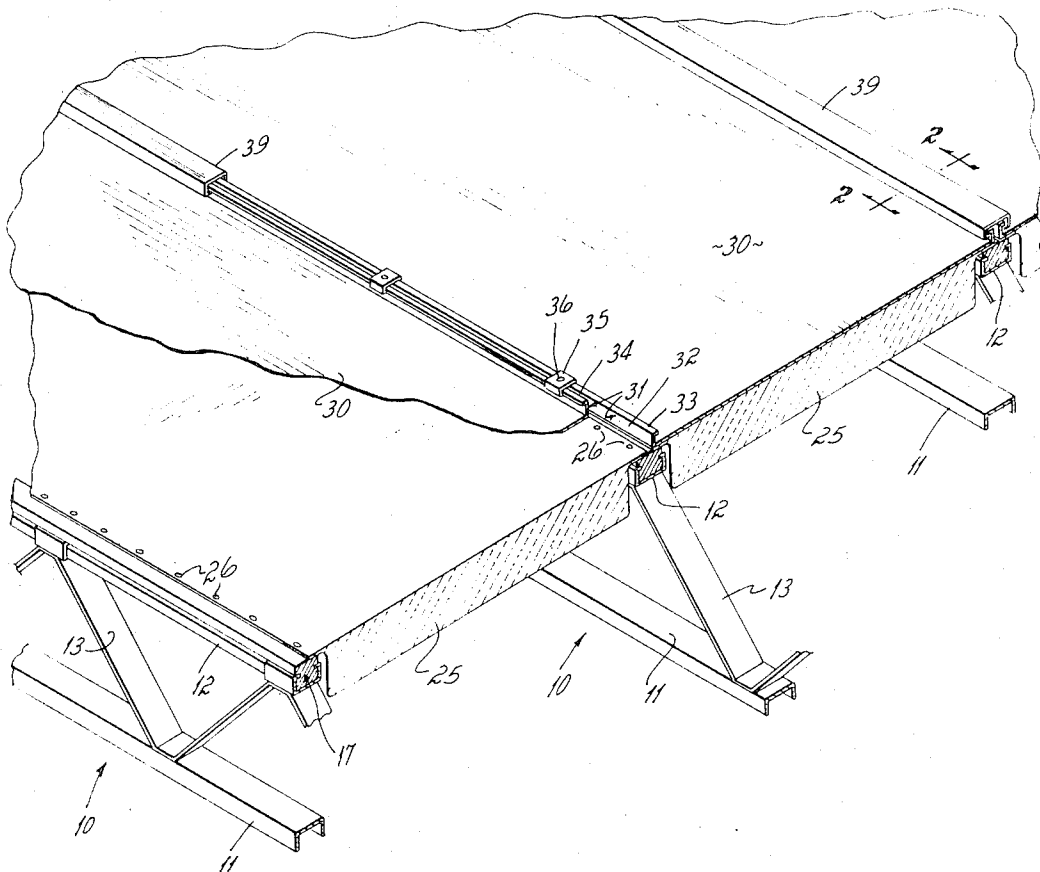
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[57] ABSTRACT

A roof deck construction in which a plurality of spaced beams having wooden nailers on their upper surfaces receive elongated metal sheets parallel to the beams with the edges of the sheets being joined together along the nailers. The adjacent edges are joined by connectors and the connectors are in turn secured to the nailers by driving nails or equivalent fasteners through the connectors, between adjacent edges, to the nailer.

3 Claims, 6 Drawing Figures



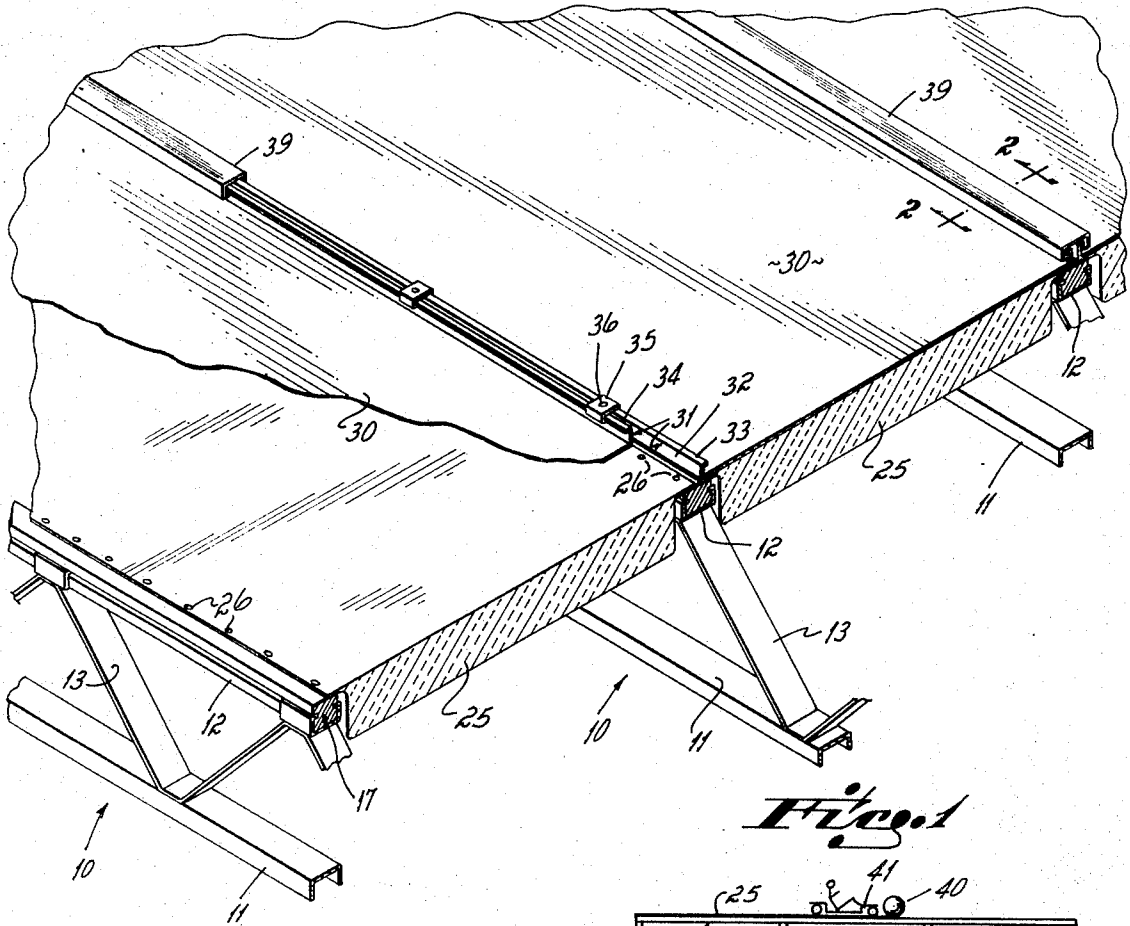


Fig. 1

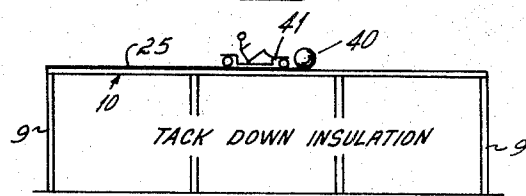


Fig. 3

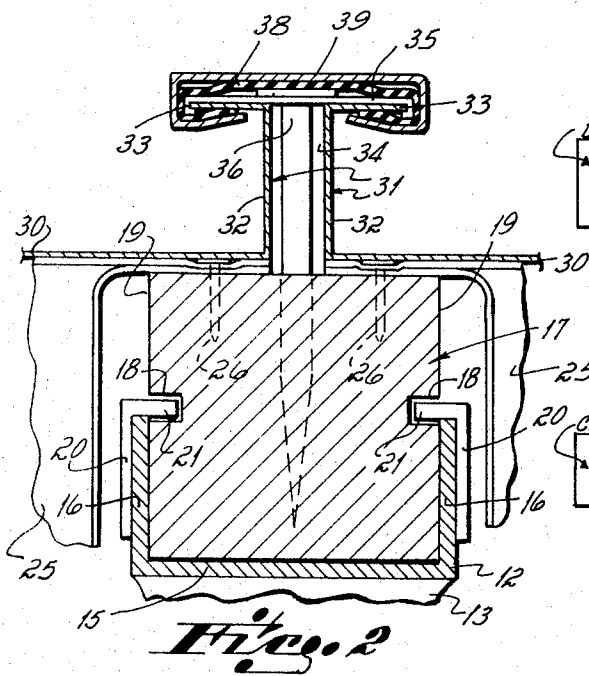


Fig. 2

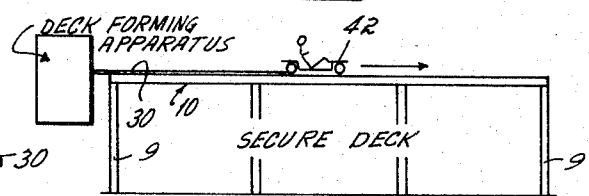


Fig. 4

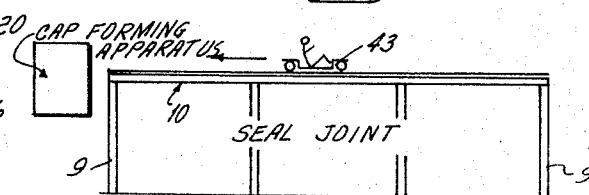


Fig. 5

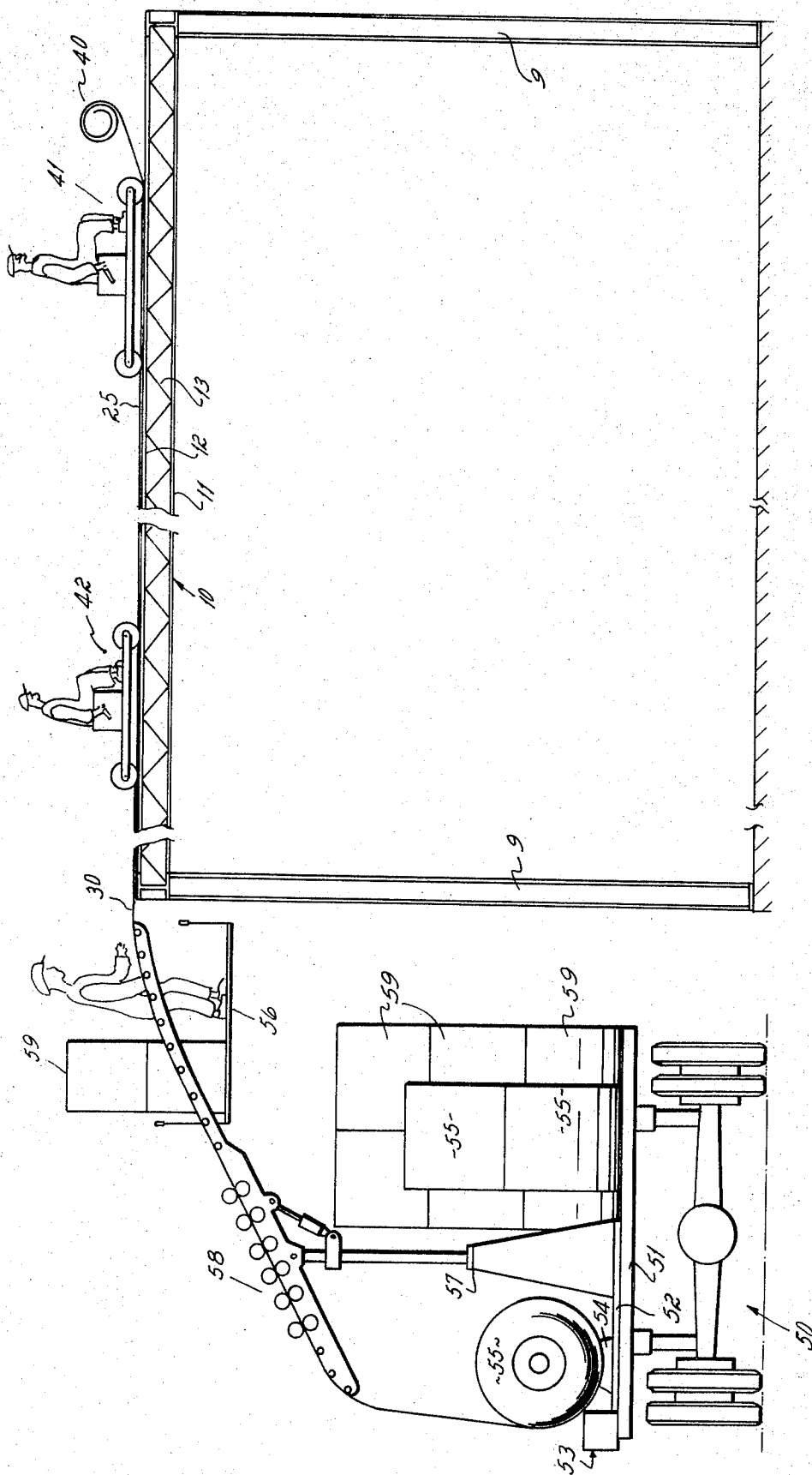


Fig. 6

FLOATING ROOF DECK CONSTRUCTION

This invention relates to a roof deck construction wherein elongated sheets are secured to joists.

In conventional exposed metal roof deck structures of this type, beams or joists are mounted on columns or wall structure on a minimum of four foot centers, and elongated sheets of steel are laid on top of the joists crosswise or perpendicular to the length of the joists. The steel sheets are secured to the joists by metal screws.

While there are a number of advantages of the present invention over that conventional construction, there are two major deficiencies in conventional construction which the present invention eliminates. First, the requirement of securing the sheets directly to the joists by metal screws requires the sheets to be punctured, each puncture constituting a possible source of leakage, the probability of leakage being enhanced as rust develops around the screws causing the holes created by the screws to be enlarged.

Another deficiency arises from the rigid crosswise construction of the sheets to the joists, for as the temperature of the sheets changes, they will elongate and contract causing unsightly buckling and additional stresses around the screw joints, further enhancing the probability of leakage.

An objective of the present invention has been to provide a new approach to roof deck construction wherein elongated sheets of steel are laid parallel to the joists and are secured to wooden nailers without having screws or nails passing through the sheets themselves.

More specifically, the joists are provided on their upper surfaces with elongated wooden nailers preferably carried in channels which form the upper surfaces of the joists. Further, the nailers are preferably secured to the joists in such a way as to admit of longitudinal movement of the nailers with respect to the joists.

The metallic sheets have upturned, preferably L-shaped, flanges at their longitudinal edges, which flanges overlie the nailers with flanges of adjacent sheets running adjacent each other. Connector clips spaced along the length of adjacent flanges secure the flanges together against lateral movement with respect to each other and the clips are secured to the joists by driving nails through the clips, between the flanges, and into the nailers. Construction is completed by laying an asphalt impregnated felt strip along the tops of adjacent flanges and enclosing the strips by an elongated C-shaped cap. By coating the felt strip as it is applied with mastic, a watertight joint is created. This prevents leakage from wind pressure and permits the deck to be laid with a minimum of slope for drainage. By using painted turn plated steel sheets, a lower cost and more reliable replacement has been devised for the built up asphalt roofs.

It can be seen that the structure described completely eliminates the puncturing of the metallic sheets by fastening means such as screws and hence gives no rise to the probability of leaking through the sheets. Further, the nailers are capable of longitudinal expansion and contraction with respect to the joists upon which they are mounted, and the metallic sheets are capable of expansion and contraction in longitudinal and transverse directions with respect to the nailers upon which they are mounted, for they are not directly secured to the

nailers. Thus, the total structure is capable of "floating" biaxially with respect to the joists. Thus, the two major deficiencies in conventional construction as described above have been eliminated.

The invention further admits of the preliminary securing of insulative blankets extending longitudinally between joists, the blankets being tacked or stapled to the joists. The combination of thick insulative blankets which are, for example, three to six inches thick, and the interposition of wooden nailers between the steel sheets and steel joists provide greatly improved thermal and noise insulative properties over conventional construction.

The structure of the present invention admits of improved methods of installation, including the mechanization of the installation. For example, by running the insulation and metal sheets parallel to the joists, as contrasted to crosswise of the joists, it is possible to employ vehicles designed to be supported on the joists, using the joists as rails, to lay the insulation and to pull the elongated sheets of steel across the span of the roof into position overlying the joists. Still further, the invention admits of apparatus including a vehicle having an elongated platform and a support for a roll of steel sheeting, the support being capable of being indexed along the length of the platform in two foot increments. The sheeting is fed through edge forming rolls and drawn as by a vehicle as described above across the roof span until the span between two joists is covered. Thereafter, the support for the roll is indexed to the next adjacent joists and the operation is repeated. A great economic advantage is obtained completely eliminating the cost of factory manufacturing and shipping the fixed formed deck sheets.

The several features and objectives of the invention will become more readily apparent from the following detailed description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a fragmentary perspective view of a roof deck assembly employing the invention;

FIG. 2 is a cross-sectional view taken along lines 2—2 of FIG. 1;

FIGS. 3, 4 and 5 are diagrammatic illustrations of the method of assembling the roof deck; and

FIG. 6 is a diagrammatic illustration of apparatus and method and assembling the roof deck.

The deck illustrated in FIG. 1 preferably is supported on beams or joists 10 formed as trusses of the type disclosed in U.S. Pat. No. 3,447,278. While the specific truss element of my U.S. Pat. No. 3,447,278 is illustrated and preferred, it should be understood that the invention is applicable to any type of joist or beam upon which a nailer can be mounted. The truss element 10 will be hereinafter referred to as a beam or joist. The joists 10 are preferably on 24 inch centers. While this is a closer spacing than is customary in roof deck construction of the type described above, the utilization of the patented truss element as a joist, being much less expensive than conventional beams, makes the close spacing economically feasible.

The joist 10 comprises a lower chord 11, an upper chord 12 and a zigzag U-formed web 13 interconnecting the two chords. The upper chord is channel-shaped having a horizontal section 15 and two upwardly projecting legs 16. A nailer 17 is disposed in the channel-shaped chord 12 and is slidable with respect to the chord 12. The nailer is illustrated as being wooden, but

could as well be metallic as, for example, an inverted channel-shaped element or tube mounted in the chord 12. While the invention is not restricted to any particular dimensions, by way of example the nailer would be 1 ½ inches × 1 ½ inches in cross-sectional dimension and extending the full length of the truss.

The nailer 17 has two longitudinally extending grooves 18 in its side walls 19. A plurality of inverted L-shaped retainer clips 20 are welded to the legs 16 of the chord 12. The retainer clips 20 have horizontal flanges 21 projecting into the grooves 18 of the nailer 17, thereby securing the nailer 17 within the channel-shaped chord 12 while permitting relative longitudinal movement between nailer 17 and joists 10.

A two to 6 inch thick paper or foil face insulative blanket 25 extending between adjacent joists is preferably tacked or stapled as at 26 along its edges 27 to the nailer 17. By supporting the insulation below the steel deck, it is possible to attain the maximum thermal and sound insulation efficacy of an uncompressed blanket, as contrasted to conventional methods of laying comparatively thin board insulation on the top of the steel deck.

The steel deck is formed of a series of steel sheets 30 which are generally channel-shaped, each sheet having its longitudinal edges formed as L-shaped flanges 31, each flange having a vertical leg 32 and terminating in a horizontal leg 33. The sheets preferably arrive at the site as a roll of steel, the sheet steel being withdrawn from the roll and pulled through forming rollers as the steel is applied to the roof, all as will be described below. Each sheet is mounted between adjacent joists 10 to be supported in a floating relationship with respect to the joists 10. The dimensions of each sheet are slightly less than the joist centers so that adjacent sheets are spaced from each other to leave a small gap 34 between adjacent flanges 31.

The joists are secured to the nailer 17 by a plurality of spaced inverted U-shaped connector clips 35 which straddle the adjoining flanges 31. One or more fasteners 36 such as screws or the like are inserted through each clip and into the nailer, thereby securing the clip to the nailer. Thus, the sheets 30 are secured to the nailer with freedom to expand in the longitudinal and transverse directions.

The joint between adjacent flanges 31 is covered by a strip of insulative material—for example, a 45 lb. mastic coated asphalt felt indicated at 38. A C-shaped cap 39 overlies the felt and completely covers the joint between adjacent flanges. The cap 39 is preferably formed in situ, being a flat strip which is clinched about the horizontal legs 33 of the respective flanges, as illustrated in FIG. 2, to form a leakproof covering between the adjacent flanges. In clinching the cap around the flanges, the connector clips 35 too are bent to a C-shaped configuration as illustrated in FIG. 2.

The steps for forming the floating deck are illustrated in FIGS. 3-5. In the step illustrated in FIG. 3, a strip of the insulative material 25 from a supply roll 40 is laid down between adjacent joints. Because the structure runs parallel to the joists, the method admits of the use of a vehicle 41 riding along the joists and using the joists as rails to support and track the vehicle.

After the insulative material is applied and stapled to the nailers 17, the steel sheets 30 forming the deck are drawn across the joists by a similar vehicle 42, the sheets preferably being drawn from a supply roll

through forming rollers to form the L-shaped flanges 31 as the sheets are drawn from the supply roll and laid between adjacent joists 10. On the return of the vehicle 41, the operator applies the U-shaped clips 35 and fastens them to the nailer 17.

The felt strip is then laid across the joint between adjacent flanges 31 and the cap 39 is clinched around the felt and flanges to form the joint, this clinching being accomplished by another vehicle 43 or the same vehicle on its return trip.

As indicated above, the deck construction of the present invention admits of the use of installation methods and apparatus which could not be employed with the crosswise construction of the prior art. By laying the principal components parallel to the joists, the joists can be used to support component laying vehicles as has been described in connection with FIGS. 3, 4 and 5.

Still additional apparatus is exemplified by FIG. 6. There, a vehicle 50 having a long bed 51 which may be, for example, forty feet, supports a carriage 52 which is movable along the length of the bed by an indexing mechanism diagrammatically illustrated at 53. The indexing mechanism is capable of moving the carriage 52 in two foot increments. The carriage supports a mount 54 for a supply roll 55 of sheet steel. The carriage also supports the roll and cut off operator 56 supported on a base 57. The base 57 also carries forming rollers 58. There is sufficient area on the bed to carry additional rolls of insulation 59 and additional supply rolls 55 of steel. In the operation of the apparatus, the components are applied to the joists 10 shown supported on columns 9 in the manner described in connection with FIGS. 3, 4 and 5. More specifically, however, the sheet steel is fed from the supply roll 55 through the forming rolls 58 and onto the joists. In passing through the forming rolls, the inverted L-shaped flanges 31 are formed and the thus formed channel-shaped sheet is drawn across the web by the vehicle 42. On the return, the operator of the vehicle 42 applies the U-shaped clips 35 and inserts the fasteners 36 through the clips into the nailer. As the vehicle makes its return pass, it crimps or clinches the cap 39 around the joint formed between the adjacent flanges 31.

The deck, when mounted to the joists via the wooden nailer, is, for the purpose of compensating for contraction/expansion due to temperature variations, freely floating with respect to the joists. The sheet steel can obviously expand longitudinally with respect to the joists for there is nothing restraining it. It is also capable of expanding transversely with respect to the joists due to the expansion joints created between adjacent flanges 31. Further, the nailers themselves are capable of longitudinal expansion with respect to the joist channels in which they are mounted. Thus, the sheets have more of a diaphragm relationship with respect to the joists than a rigid structural relationship as in the case of crosswise mounted sheets which are secured directly to the joists.

I claim:

1. A deck structure comprising,
 - a plurality of longitudinally extending spaced parallel beams,
 - elongated nailers secured for longitudinal sliding movement on top of said beams,
 - a plurality of elongated, flat sheets of steel extending longitudinally between said beams,

5

upwardly projecting L-shaped flanges at the longitudinal edges of said sheets, said flanges terminating in inwardly projecting horizontal legs,
a plurality of longitudinally spaced clips straddling the edges of adjacent flanges and having portions extending downwardly and under the edges of said legs,
a fastener projecting through each clip into said nailer,
a watertight strip of felt overlying adjacent flanges, said strip being wrapped downwardly around said legs,
and a longitudinally extending cap overlying said

6

strip and clinched around said legs.

2. A deck structure according to claim 1 in which each said beam is a truss type joist having a channel-shaped upper chord to slidably receive said nailer, said chord having flanges projecting inwardly into said nailer, said nailer having longitudinally extending grooves in opposed side walls to receive said flanges.

3. A deck structure according to claim 1 further comprising,
an elongated strip of insulative material extending between joists.

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