NAILABLE STEEL FLOOR PLANKING FOR FREIGHT VEHICLES

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ABSTRACT

A steel floor plank having supporting webs at opposite edges of the top plate thereof and one or more supporting webs medially of the plate. The plank is composed of two or more sections which are welded together and the medial web is integral with one of the plate sections. A method for making such floor plank including forming a blank for the plank, slitting the blank into two or more parts, and then reforming the parts into a complete plank.

4 Claims, 8 Drawing Figures
NAILABLE STEEL FLOOR PLANKING FOR FREIGHT VEHICLES

This invention relates to a plank fabricated of sheet steel and adapted for installation as the floor of a vehicle with a plurality of identical planks in spaced apart relation so that a nail receiving slot is defined between each pair of adjacent planks. This invention also relates to a method for making such a plank.

Steel planks having certain similarities to that described in detail hereinafter are disclosed in such prior art references as U.S. Pat. Nos. 2,907,417 and 2,667,243. Such planks typically include a planar plate that forms a part of the vehicle floor surface and a plurality of webs that extend downward from the plate to reinforce the plate and to afford mounting of the plank to joists or like frame members in the vehicle. Although such planks are fabricated of relatively thin sheet material (e.g., 10-gauge steel sheet), they have adequate strength adjacent to the webs since the webs are loaded in a direction generally along or parallel to the plane of the sheet material. The plates, however, are loaded perpendicularly to the plane of the sheet material and are subject to bending or distortion unless supported. In planks having a width in excess of about 4 inches, an additional web intermediate the end webs is required and the prior art discloses various central supporting webs that are welded or otherwise secured to the underside of the planar plate.

An object of the present invention is to provide a plank having a central supporting web in which the web is integral with at least a portion of the plate. The principal advantages of this form of construction are ease of fabrication of the plank plus the attainment of superior strength at a lesser expenditure of material.

Another object of the present invention is to provide a method for making a plank of the type referred to above. By employment of the method of the present invention, the plank can be shaped by one, and only one, pass through a rolling forming mill. Such is the case because there are no severe angle bends on the shape formed in the rolling mill.

An advantage flowing from achievement of the above stated objects is that planks produced according to the present invention are uniform, thereby expediting installation of the plank and improving the symmetry and flatness of the resulting floor.

Other objects, features and advantages will be more apparent after referring to the following specification and accompanying drawings in which:

FIG. 1 is a perspective view of a blank for a plank according to the present invention in an intermediate stage of fabrication;
FIG. 2 is a perspective view showing a plank according to the present invention in the final stage installed as a portion of a vehicle floor;
FIG. 3 is a perspective view of a blank having an alternate configuration to that shown in FIG. 1;
FIG. 4 is a perspective view of still another form of blank for a plank according to the present invention;
FIG. 5 is a blank fabricated from the blank of FIG. 4;
FIG. 6 is a cross-sectional view of an alternate form from that of FIG. 4;
FIG. 7 is a fragmentary view of the blank of FIG. 4, showing the blank at a further stage of fabrication; and,

FIG. 8 is a block diagram illustrating the method of the present invention.

Referring more particularly to the drawings, reference numeral 12 indicates one form of improved plank of the present invention. The plank includes a planar upper surface defined by two coplanar plates or segments 14 and 16. Extending downward from the outer or free edge of plate 14 is a web 18 that is composed of a vertical section defining a concavity or groove 20 and a lower horizontal mounting flange 22. Web 18 also includes a plurality of spacer protuberances 23 which space two adjacent planks from one another to define a nail receiving slot. Flange 22 extends inward of web 16 so that groove 20 is accessible. The plank is installed by fastening flange 22 to a joist or framing member exemplified in FIG. 2 by an I-beam 24. On the edge of plate 14 opposite web 18 is a web 26 which includes a vertical portion and a flange 28 also connected to I-beam 24. Webs 18 and 26 are integral with plate 14 and are preferably of the same vertical extent so that plate 14 is supported parallel to the upper surface of joist 24.

The inner edge of plate 16 is secured in coplanar relation to plate 14 by welding the edge 28 thereof at 30, plate 14 having along the edge thereof adjacent web 26 a marginal shoulder 32 for supporting plate 16 coplanar with plate 14. The opposite edge of plate 16 is supported by an integral web 33 having a vertical portion that defines a convexity or tongue 34 and a flange 36 for effecting attachment to joist 24. As can be seen in FIG. 2 and as is conventional in steel planks of the type described herein, two adjacent planks are mounted so that a sinus slot is defined by tongue 34 of one plank and groove 20 of the adjacent blank. In FIG. 2, a nail N is shown in such groove for holding a wooden strip W in place.

Referring now to FIG. 1, it will be noted that the blank from which plank 12 is formed includes the elements described above. During or after formation of the blank, it is slit or sheared along a line designated by reference character 29a which coincides with the edge 29 of plate 16. It will also be noted, in FIG. 1, that the only bends in the sheet material of which the plank is made that exceed 90° are at the edges of the blank (flanges 22 and 36), a condition that permits use of conventional roll forming apparatus. After the blank is formed and plate 16 is slit or sheared along line 29a, plate 16 is welded to plate 14 within marginal shoulder 32 to produce the structure shown in FIG. 2.

The plank of FIG. 2 can also be formed from a blank as shown in FIG. 3. Because the blank of FIG. 3 is composed of portions that correspond in structure and function to those of FIG. 1, identical reference characters which are primed are employed in FIG. 3. Thus, the web that defines tongue 34' extends from plate 16' in a direction opposite from web 26'. The other elements of the blank of FIG. 3 are a plate 14', a web defining a groove 20' and a flange 22', and a marginal shoulder 32' in which the edge of plate 16', formed by slitting along 29a', fits during final fabrication of the plank. Accordingly, a reformed plank structure identical to that shown in FIG. 2 is provided.

The present invention can also be employed to provide a double support for the medial regions of the plate. Double support is desirable in wider planks, for example, those having a width of from 6 to 12 inches. It is also desirable when extraordinarily heavy loads are
to be encountered. A plank having double medial supports is shown in FIG. 5 at 40. This plank is formed from the blank shown in FIG. 4. Plank 40 includes a planar upper surface formed by a central plate 42 and copeplanar side plates 44 and 46 on opposite sides of the central plate. The upper surface of the plank is supported, in parallelism, to the upper surface of joists or like framing members by four webs 48, 50, 52, and 54. Webs 48 and 50 are substantially identical and are integral with plate 42 and extend from opposite edges thereof. Each web includes a substantially vertical section at the bottom of which is a flange 56 for effecting attachment of the respective webs to the vehicle frame. Plate 42 adjacent the upper extremities of each web 48, 50 includes a marginal shoulder 58 to provide for connection therewith of the free edges 60, 62 of the plates 44 and 46, respectively. Web 52 is integral with the plate 44 and includes a concavity for defining a groove 64. Web 52 also includes a plurality of spacer protruberances 65. Web 54 is integral with plate 46 and includes a convexity for defining a tongue 66. The lower extremities of webs 52 and 54 are formed with mounting flanges 68 and 70, respectively, which lie in copeplanar relation to flanges 56 so that the plank can be secured to the framing members of the vehicle of which it is a part.

The blank from which the plank of FIG. 5 is constructed (See FIG. 4) includes central plate 42 which is joined via webs 48 and 50 to and in substantial parallelism with lateral plates 44 and 46. During fabrication, plates 44 and 46 and their respective webs 52 and 54 are separated from the central section along slit lines 60a and 60b. The slit lines are parallel with the edges of plates 44 and 46 from which the webs extend and are spaced from central webs 48 and 50 by an amount sufficient to form flanges 56. After slitting the central section comprised of plate 44 and webs 48 and 50, this section is inverted relative to the lateral sections, and plates 44 and 46 are joined in marginal shoulders 58 by welds, as at 72, to form the completed plank.

The cross-sectional configuration of the plank of FIG. 4 is such that it can be formed in a conventional single pass roll mill. This can be appreciated by observing that the sole locations, where bends exceeding 90° exist, are at the edges of the plank so that roll forming can proceed in a single pass. Although the blank of FIG. 4 is symmetrical about its centerline, a preferable condition, it will be obvious that one or the other of plates 44 and 46 can be made longer than the other to adapt the present invention to such special situations as may arise.

The plank of FIG. 5 can also be formed from a blank having the cross-sectional shape shown in FIG. 6. The FIG. 6 blank is substantially identical in component elements to the blank of FIG. 4 except that the webs associated with the side plates extend in a direction away from the central plate rather than toward the central plate. The reference characters used to identify the parts of the blank of FIG. 6 correspond to those employed in FIG. 4 with the respective numerals primed. Thus, the central plate 42′ has, at its opposite edges, marginal shoulders 58′ from which extend webs 48′ and 50′. The parts of plates 44′ and 46′ that become flanges 56′, after slitting along 60a′ and 62a′, extend outward from the webs. At the outer edges of plates 44′ and 46′ are webs 52′ and 54′, respectively. The former defining a groove 64′ and the latter defining a complementary tongue 66′. Flanges 68′ and 70′ complete the blank of FIG. 6.

The method of forming a plank according to the present invention can be understood in connection with FIG. 8. The shape of the blanks shown in FIGS. 1, 3, 4 and 6 can be formed by one pass through a multi-stand roll forming line. The configuration of the rolls in the various stands in the line are such as to achieve the cross-sectional shape of one of the blanks enumerated in the next preceding sentence. In FIG. 8, block 80 schematically represents one or more roll stands having dies configured to form some or all of the elements of the blank. Coiled strip is fed to the line along a path 82. The line includes a slitter 84 at which the blank is slit, e.g., along line 29a. If all forming operations have been performed in the roll stands represented by the block 80, the blank is conveyed along a path 86 to a reforming station 88 at which fabrication of the plank is completed. If only some of the forming operations are performed in the roll stands represented by the block 80, the partially formed strip is transported along a path 90 to additional roll stands 92 from which the blank is transported along a path 94 to reforming station 88. The present invention also comprehends slitting before the forming operations are performed, in which event the strip is introduced into the line along a path 95 and all forming occurs in roll stands 92. Accordingly, the sequence of the forming and slitting steps may be varied.

After the blank is formed or partially formed, it is slit or sheared along one of the lines identified above, the slit in each case being in one of the plates and spaced from a central web sufficient to form a mounting flange. When slitting or shearing has been effected, further forming steps can be efficiently performed because separation of the parts of the blank along the slit line or lines permits relative lateral movement of the parts as occurs when the steel strip at the center is robbed to form the outer webs. At the outlet of the single roll forming line, a flying shear cuts all parts of the blank simultaneously into the desired lengths. Thereafter, the blank is formed by welding the free edge at the shear or slit line to the marginal shoulder so that the top surface of the plank is formed of two or more copeplanar plate sections and so that the central region of such resulting plank is supported at one or more locations. Because the welding procedures employed to reform the plank are conventional, a specific detailed description of the reforming procedure is deemed unnecessary.

In slitting or shearing along the slit lines (identified hereinabove at 29a, 29a′, 60a, 62a, 60a′, and 62a′), it is virtually inevitable that the sheet material adjacent the slit line will be distorted and will form a knife-like edge. See FIG. 7. In order that such knife-like edge does not protrude from the upper surface of the plank and create a hazard to personnel and to cargo, it is preferred that the slitting or shearing take place in an appropriate direction as shown in FIG. 7. Referring to the edges formed by slit line 60a, it will be noted that a knife edge 96 is formed at the edge of plate 44 and a knife edge 97 is formed at the edge of flange 56. It is desirable that knife edge 96 extend away from the upper surface of plate 44, as shown in FIG. 7, so that the edge does not protrude above the surface of the floor on which cargo is placed. By shearing or slitting so as to achieve the downwardly extending knife edge
96, the knife edge in the reformed plank resides within marginal shoulder 58 and is not exposed to the upper cargo supporting surface. To assure that knife edge 96 extends opposite or downward from the cargo supporting surface of plate 44, the shearing or slitting apparatus is arranged so that the shear force is applied to opposite sides of the slit line in directions as indicated at arrows 98 and 99 in FIG. 7. It will be noted that the shearing force 98 on the side of the slit line corresponding to plate 44 is in an upward direction with respect to the blade and that the shearing force applied to the side of the slit line corresponding to flange 56 is in the downward direction. In other words, the relative direction of movement of the shear blade with respect to plate 44 is in the downward direction or the same direction that web 52 extends from plate 44. This technique of shearing assures that the knife edge 96 formed at the edge of plate 44 remote from web 52 extends in a direction downward or away from the upper surface of plate 44. Although the shearing technique is shown only in connection with the blank of FIG. 4, it is equally applicable in forming the other blanks.

It will be seen that the present invention provides an improved nailable steel floor plank in which the strength of the material of which the plank is made is optimally exploited. The method by which the plank is formed contributes to this and also expedites production of the planks and assures uniformity in planks made according to the invention. These advantageous features are achieved, in large part, because the parts of the plank are formed into a blank and then are reformed after slitting of the blank.

Although several embodiments of the invention have been shown and described, it will be obvious that other adaptations and modifications can be made without departing from the true spirit and scope of the invention.

I claim:

1. A plank for a nailable floor comprising a first sheet steel member having a first planar plate and first and second vertical webs disposed on opposite edges of said first plate integral therewith, said first and second webs remote from said first plate having respective first and second flanges that are parallel to and equally spaced from said plate, said first flange projecting outward of the edge of said first planar plate from which said first web extends, a second sheet steel member having a second planar plate and a third web integral therewith, said second planar plate having an edge remote from said third web, means including a weldment joining said edge to said first member adjacent said first web so that said second plate is substantially coplanar with said first plate and overlies said first flange, said first web constituting the sole support to one edge of each of said plates, said third web remote from said second plate having a third flange that is parallely spaced from said second plate by an amount equal to the space between said first flange and said first plate, said third flange extending from said third web in a direction so as to underlie said second plate.

2. A plank according to claim 1 including a third sheet steel member having a third planar plate and a fourth web integral therewith, said fourth web remote from said third plate having a fourth flange that is parallely spaced from said third plate by an amount equal to the space between said first flange and said first plate, said fourth flange extending from said fourth web in a direction so as to underlie said third plate, said third planar plate having an edge remote from said fourth web means including a weldment joining said last mentioned edge to said first member adjacent said second web so that said third plate is substantially coplanar with said first and second plates, said second web constituting the sole support for said edge of said third plate.

3. A plank according to claim 1 including a marginal shoulder at the edge of said first plate adjacent said first web, said shoulder defining a surface substantially parallel to said first plate and spaced below the surface thereof by an amount equal to the thickness of said second plate, said edge of said second plate being supported on and joined to said surface of said shoulder.

4. A plank according to claim 1 wherein said second web defines a discontinuity and said third web defines a complemental discontinuity so that two said planks when juxtaposed define therebetween a sinuous nail retaining path.  

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