Aug. 25, 1964 J. H. SPENCE ETAL 3,145,666

RAILWAY CAR CENTER SILL

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FIG. 1

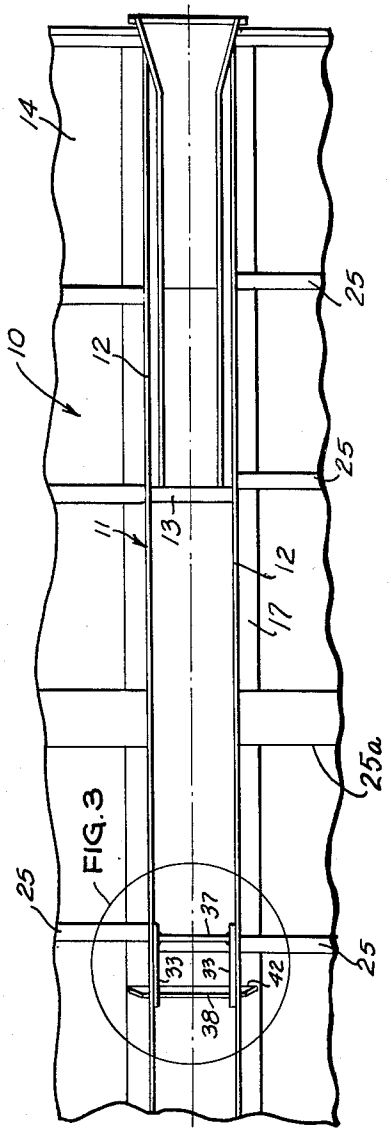
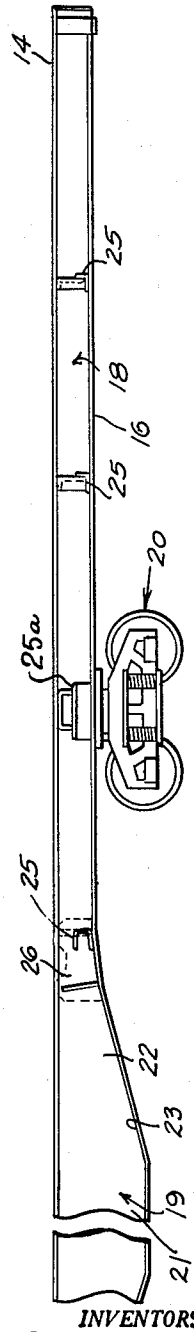


FIG. 3

FIG. 2



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FIG. 3

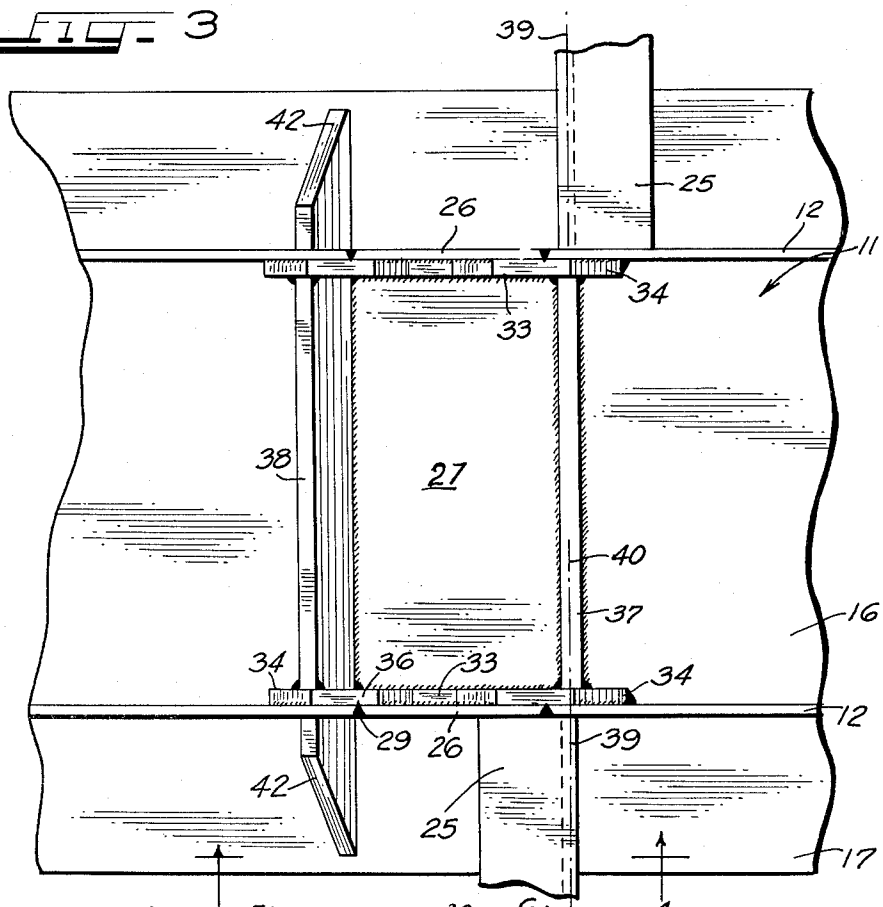


FIG. 4

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FIG. 5

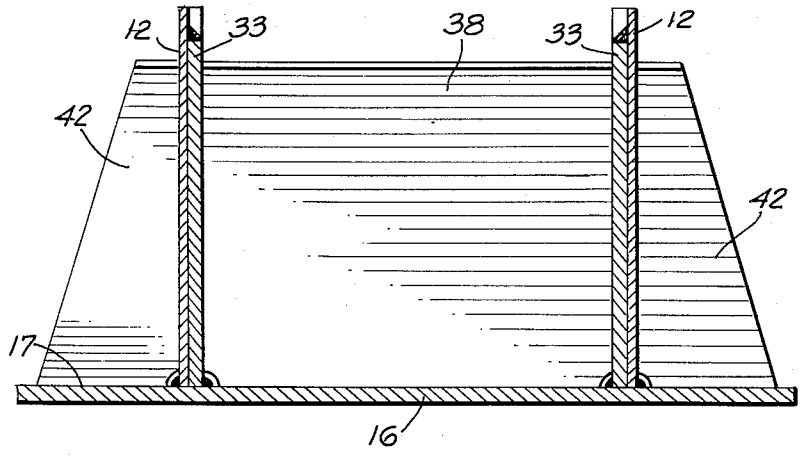
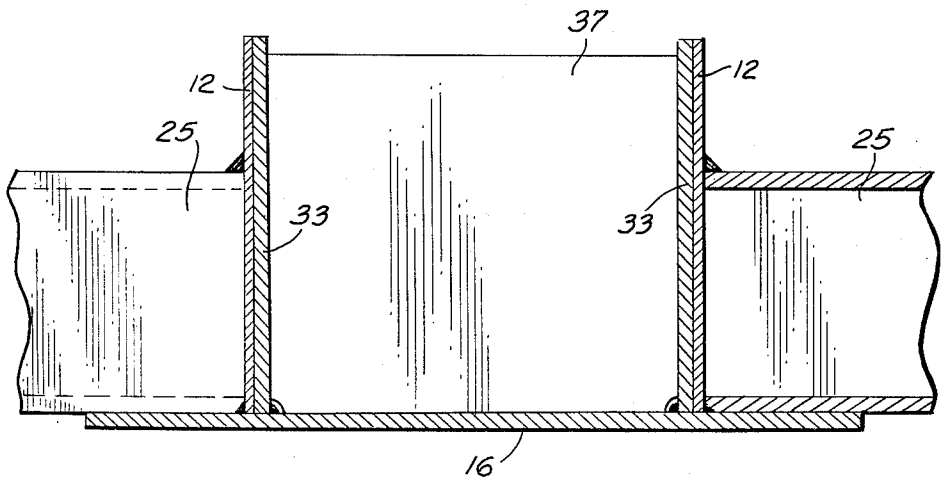


FIG. 6



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RAILWAY CAR CENTER SILL

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6 Claims. (Cl. 105—416)

The present invention relates to railway car underframes and, more particularly, to an underframe having a center sill of the fishbelly type.

It is an object of the present invention to provide a new and novel fishbelly center sill constructed and arranged to relieve heavy concentrated bending stresses at a localized bending line in the vicinity of the juncture of the end portions of the center sill with the fishbelly portion thereof.

It is another object to provide a fishbelly center sill constructed and arranged to provide a plurality of different angles of slope along the bottom edge of the center sill in the vicinity of the juncture of the narrow end and fishbelly portions thereof so as to provide a plurality of bending lines having stress concentration in which the bending stresses in each of the bend lines is of lower magnitude than the single bend line stress concentration encountered heretofore.

It is a further object to provide a fishbelly center sill constructed and arranged to provide a plurality of different angles of slope of a magnitude to provide a plurality of bend lines in the bottom plate and in which the bending stresses are of lesser magnitude than a single bend line and to provide reinforcing means arranged relative to the point of change of slope to minimize the local stresses occurring at the different bend lines.

Further objects and features will hereinafter appear.

In the drawings:

FIG. 1 is a fragmentary top plan view of an underframe embodying a center sill constructed in accordance with the present invention;

FIG. 2 is a fragmentary side elevational view of the underframe;

FIG. 3 is an enlarged view taken generally in the encircled portion of FIG. 1;

FIG. 4 is a view taken substantially along the lines 4—4 of FIG. 3;

FIG. 5 is a view taken substantially along the lines 5—5 of FIG. 4; and

FIG. 6 is a view taken substantially along the lines 6—6 of FIG. 4.

Referring now to the drawings, there is illustrated an underframe 10 of a railway car including a center sill 11 embodying the stress-relieving arrangement of the present invention. The center sill 11 includes a pair of transversely spaced webs 12 held spaced by lengthwise positioned bracing members 13 and may include a top deck or floor 14 suitably secured to the top thereof. A bottom plate 16 having a width greater than the transverse spacing of the webs, so as to provide ledges or flange areas 17, is secured as by welding to the bottom edges of the webs 12. The center sill 11 is formed with end portions 18 of relatively narrow depth overlying the trucks and extending to the ends of the car. A fishbelly portion 19 is disposed between the trucks 20, including a rectangular section 21 of greater depth than the end portions, and a traditional section 22 having a sloping bottom 23 of gradually increasing depth joins each end portion 18 to the center fishbelly portion 19.

Transversely extending from the center sill 11 are the usual crossbearers 25 and bolsters 25a to the outer ends of which there may be fixed the usual side sills (not shown). The above described underframe structure is of more or less conventional design.

Heretofore it has been common practice to slope the bottom 23 of the transitional section 22 joining the deeper rectangular section 21 with the end portions 18 at a constant slope to obtain a maximum fishbelly section between the trucks. When so sloped, as to be expected, there is a bend line in the vicinity of the juncture of the intermediate fishbelly section and the narrow end section wherein the bending and direct stresses occurring therein during normal use of the railroad car are localized so that the center sill is subject to failure as by metal fatigue or fracture.

In accordance with the present invention, there is incorporated into the center sill 11 an arrangement for relieving the bending and direct stresses so as ot preclude a localized concentration of the stresses whereby failure of the center sill is prevented. As shown in particular in FIGS. 3–6, the stress-relieving arrangement includes a web plate or web insert 26 spliced as by welding between the transitional fishbelly sections 22 and the end portions 18 at each of the four points of juncture of the end portions 18 with the transitional fishbelly sections 22 of which two of the opposing junctures are shown. The bottom cover plate section 27 of the spliced web plates 26 is flat and its margins define angles *a* and *c* with adjacent bottom cover plate portions 16 and 23 respectively. The angles approach a straight line relation and are substantially greater than the overall angular change in direction between the plate portions 16 and 23, such overall change being the supplementary angle of angle *b*. Thus, in effect, the plate section 27 provides two marginally distinct and transverse continuous bend lines on the bottom plate along which the center sill tends to bend. The overall slope is made transitional with distinct bend areas of reduced severity defined for stress concentration.

The edge 28 of each of the splice web plates 26 fixed to the end section 18 is normal to the bottom edge of the web plate 26 while the opposite edge 29 is arranged normal to the upper horizontal edge 30 of the web plate 26. The opposite edges 28 and 29 are longitudinally spaced suffciently to provide two distinct bending angles or bending lines about which the bottom plate tends to bend when subject to bending or direct stresses. The lower corner 31 of the edge 28 is arranged to lie at the apex of the angle *a* and the lower corner 32 of the opposite edge 29 is arranged to lie at the apex of the angle *c*.

On the inner surfaces of each of the spaced webs there is fastened a back-up plate 33 which is sized such that the respective vertical edges 34 thereof extend beyond the edges of 28 and 29 of the splice web plate 26. The back-up plate 33 is fixed to the center sill web 12 as by welding and to assure a maximum weld area, the upper edge is contoured to provide a pair of spaced ears 36 of substantially trapezoidal contour. The back-up plate 33 is also fixed to the splice plate 26 by way of the penetrating welds which join the latter into the web 12.

For reinforcing the center sill 11 at the bend lines of the bottom plate, there are provided center sill separator plates 37 and 38 which are fastened along their vertical edges to the inner side of the opposing back-up plates 33 and along their bottom edges to the bottom plate section 27. The separator plate 37 is positioned so that its vertical neutral axis 40 lies coincident with the center line 39 of the intermediate crossbearer 25 which, as mentioned above, lies on the apex of the angle *a*. The separator plate 38 is positioned so that its vertical neutral axis 41 and the lower end thereof lies on the apex of the angle *c*. To further reinforce the center sill 11 at the web splice at the angle *c*, there are provided braces 42 fixed to the ledge 17 and the web 12 as by welding. The braces 42 are positioned coplanar with the reinforcing separator plate 38.

With the above arrangement, it is readily apparent

that upon the creation of a bending and direct stress in the center sill resulting from the load carried by the car and the impact at the couplers (not shown) conventionally carried on each end of the center sill, the bending stresses are concentrated at the bend lines defined by angles *a* and *c* located at the web splice. The crossbearers and separator plate **37** lying on the bend line of the angle *a* enable the bottom plate to withstand the stresses occurring therein and transmitted therethrough without buckling, and the separator plate **38** and braces **42** lying on the bend line of the angle *c* perform the same function. In this manner the bending and direct stresses in the bottom plate section **27** are accommodated and distributed without undesirable plate distortion.

Variations and modifications may be made within the scope of the claims and portions of the improvements may be used without others.

What is claimed is:

1. A center sill for a railway car comprising a center portion, opposite end portions, and transition portions between said center and end portions, each of said portions including laterally spaced vertical webs and top and bottom cover plates fixed to said webs, said center portion being of greater depth than said end and transition portions with said bottom cover plate extending horizontally along said center portion and sloping upwardly from said center portion through said transition portions and continuing horizontally outwardly along said end portions, said bottom cover plate in each of said transition portions including a flat section which is inclined relative to adjacent bottom cover plate portions and which joins the bottom cover plate portion of said transition portion with the bottom cover plate portion of the adjacent end portion, opposite transverse margins of said flat section defining relatively distinct angles with the adjacent bottom cover plate portions for localization of stress applied to said section, and transverse plate means fixed to said webs and margins of said section and extending transversely of said section between said webs continuously fixed to said margins at said angles to rigidify said section.

2. A center sill for a railway car comprising a center portion, opposite end portions, and transition portions between said center and end portions, each of said portions including laterally spaced vertical webs and top and bottom cover plates fixed to said webs, said center portion being of greater depth than said end and transition portions with said bottom cover plate extending horizontally along said center portion and sloping upwardly from said center portion through said transition portions

and continuing horizontally outwardly along said end portions, said bottom cover plate in each of said transition portions including a flat section which is inclined relative to adjacent bottom cover plate portions and which joins the bottom cover plate portion of said transition portion with the bottom cover plate portion of the adjacent end portion, opposite transverse margins of said flat section defining relatively distinct angles with the adjacent bottom cover plate portions for localization of stress applied to said section, and transverse separator plate means fixed to said webs and margins of said section and extending transversely of said section between said webs continuously fixed to said margins at said angles to rigidify said section, said plate means extending between said webs and substantially vertically upwardly from said section.

3. The center sill of claim 2 wherein at least one of said plate means substantially bisects the angle at which the margin of said section to which said plate means is fixed joins the bottom cover plate portion adjacent thereto.

4. The center sill of claim 2 wherein said bottom cover plate projects outwardly of said webs and defines bottom flange areas, said plate means including portions outwardly of said webs in fixed rigidifying engagement with the margins of the flange areas of said section.

5. The center sill of claim 2 wherein back-up plates are fixed to said webs in face-to-face relation overlying said section and fixed thereto to locally reinforce said webs.

6. The center sill of claim 2 wherein back-up plates are fixed to the inner surfaces of said webs in face-to-face relation overlying said section and fixed thereto to locally reinforce said webs, said back-up plates extending longitudinally beyond the margins of said section and said separator plates being fixed in end abutment with said back-up plates, the portion of each web extending upwardly from said section being a web insert fixed in said web, the vertical margins of each web insert extending at least substantially from adjacent margins of said section in at least close association with the vertical ends of said separator plate means to provide for at least substantially direct fixing of a back-up plate with said web along continuous vertical paths which are closely associated with said separator plate means.

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