DRAFT SILL ARRANGEMENT FOR HIGH CAPACITY CAR

Inventors: Tung H. Yang; John H. Spence, both of Munster, Ind.
Assignee: Pullman Incorporated, Chicago, Ill.
Filed: March 25, 1971
Appl. No.: 127,981

ABSTRACT

This invention relates to an improved lug arrangement used in a draft sill of a railway vehicle for transmission of coupler draft forces to the center sill. Vertical lug members are welded to both a key slot reinforcing member and to reinforcing ribs in such a manner as to more evenly distribute coupler draft forces from the vertical lugs through the reinforcing ribs and into the center sill. Sharp corners in the area of the elongated slot through which the coupler key may move have been eliminated to provide a draft gear key slot and front stop configuration capable of withstanding high forces.

10 Claims, 13 Drawing Figures
FIG. 4

FIG. 5

FIG. 6

FIG. 7

FIG. 8

FIG. 9

Inventors
Tung Han Yang
John H. Spence

Patent Agent
1

DRAFT SILL ARRANGEMENT FOR HIGH CAPACITY CAR

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention pertains to a railway vehicle underframe construction and in particular to that portion of the center sill which receives direct coupler draft forces.

2. Description of Prior Art

Coupler draft forces generated upon initial movement of railway vehicles occasionally reach such a magnitude as to damage the draft sill and pull the coupler from the railway car. A typical draft sill configuration aimed at reinforcing a portion of the center sill to resist draft forces is illustrated in Shaver U.S. Pat. 2,122,159. This configuration has met with wide spread success and acceptance in the industry; however, with the introduction of high capacity cars producing higher coupler forces occasional failures occur in the area where the key slot abuts the vertical member which receives draft forces. The present invention provides for an improved draft force dissipation through the web of the center sill by elimination of sharp corners in key slot opening in the web of the center sill and also by providing for an improved method of positioning the impact absorbing members alongside the web of the center sill and by elimination of welds on the center sill perpendicular to the direction of stress with such improvements reducing stress concentrations and more effectively transmitting coupler draft forces to the center sill.

SUMMARY

This invention relates to an improved front lug arrangement for use in a draft sill wherein the method of fabricating together the force transferring members has eliminated areas of high stress concentration and has provided for improved force distribution resulting in a stronger draft sill. By eliminating sharp corners in the draft key slot cut in the web of the center sill, one area of high stress concentration has been eliminated. Also, by eliminating the heavy weld which was formerly used to attach the vertical lugs to the web of the center sill, an area of stress concentration has been removed and the lugs are better able to distribute forces to the lug reinforcing ribs and consequently into the center sill. This improved attaching method has eliminated an area of failure along the weld which has caused occasional brittle fractures in the past.

In operating to distribute coupler draft forces to the center sill, the improved front lug arrangement contemplates attaching of the vertical lug primarily to the vertically spaced horizontally extending reinforcing ribs rather than primarily attached to the web of the center sill, as done in the past. This results in a more even distribution of forces through the lug reinforcing ribs and to the center sill. Also, by eliminating the sharp corners in the slot used to permit movement of the draft key, a second area of high stress concentration has been eliminated.

It is the object of the present invention to provide an improved draft sill arrangement wherein a front lug configuration eliminates former areas of high stress concentration caused by stresses induced during fabrication and stresses due to draft forces.

It is another object of the present invention to provide an improved draft sill arrangement wherein the front lug improvement may be adapted to present designs with only slight modifications.

It is a further object of the invention to achieve an improved draft sill arrangement wherein a coupler key slot includes an improved reinforcing member which functions as a bearing for the coupler key and also as a lug reinforcing rib member.

Another object is to provide a coupler key slot reinforcing member having a portion extending beyond the key slot opening in the web of the center sill and which reinforcing member aids in preventing peeling of the vertical lug from the web of the center sill.

These and other objects of the invention will become apparent from reference to the following description, attached drawings and appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of a railway car underframe showing one of its end portions; FIG. 2 is a side elevational section view taken substantially along line 2—2 of FIG. 1; FIG. 3 is a top plan section view taken substantially along line 3—3 of FIG. 2; FIG. 4 is a sectional view taken substantially along line 4—4 of FIG. 2; FIG. 5 is a sectional view taken along line 5—5 of FIG. 2; FIG. 6 is a sectional view taken substantially along line 6—6 of FIG. 2; FIG. 7 is an end view taken along line 7—7 of FIG. 2; FIG. 8 is an exploded perspective view of the draft sill assembly illustrated in FIG. 2; FIG. 9 is a partial exploded perspective view of the cut off end portion and front lug assembly of the draft sill illustrated in FIG. 8; FIG. 10 is a perspective view of a modified form of the front draft lug arrangement of the present invention; FIG. 11 is a side elevational view of the end of a draft sill employing the modified form of the present invention; FIG. 12 is a sectional view taken substantially along line 12—12 of FIG. 11; and FIG. 13 is a top plan sectional view taken along line 13—13 of FIG. 11.

DETAILED DESCRIPTION OF THE INVENTION

The invention relates to a center sill construction designed to develop more uniform resistance to draft and buffing loads, and formed of two rolled members 10 of Z-shaped configuration forming a hat-shaped center sill structure 11. Each member 10 includes an upper, inwardly directed, flange portion 12 joined at their inner margins by a welded seam portion 14. Extending downward from the flanges 12 are vertically extending web portions 16 having lower flange portions 18 outwardly directed from their lower margins. Bolsters 20 and end sills 22 extend transversely of the center sill 11 and are connected at their outer margins to a side sill 24 thus completing the car. Supporting structure. Diagonal braces 26 function to further rigidly the car and supporting structure. The present invention is not limited to the railway vehicle construction shown in the illustrations and can be used with other constructions.

At the ends of the underframe, the center sill 11 terminates in a striking plate assembly 28 having abutment against the sill ends and designed to unite the sill members 10 to stiffen the sill column against distortion under impact. The striking plate assembly 28 comprises top, side and bottom portions 29, 30 and 31, respectively, to provide buffing, guide, and carrier elements for the coupler.

Directly rearward of the striking plate assembly 28 is the front draft lug assembly designated generally by the numeral 32. The lug assembly is positioned generally about an elongated draft key slot 33 in the web of each center sill member 10. The elongated slot is a generally oval configuration having rounded forward and aft portions 35, 36 respectively. A key slot bearing plate 37 having portions 37a extending beyond the slot 33 is inserted into the elongated slot 33 to provide a bearing surface for a coupler draft key (not shown) which moves within the confines of the slot 33. The lug assembly 38 extend vertically substantially the entire height of the web 16 and are positioned slightly forward of the rounded portion 36 of the slot 33 in the preferred embodiment illustrated in FIGS. 1-9. Extending from the lug 38 in the direction of the striking plate assembly 28 are upper and lower tapered reinforcing ribs 40, 41, respectively. The bearing plates 37 also function as reinforcing ribs.
Rearward of the front draft lug assembly 32 is a rear lug assembly 42 including spaced lugs 44 positioned alongside the web portion 16 of the spaced center sill members 10. Extending rearward and vertically spaced are reinforcing ribs or plates 46. The reinforcing ribs 46 may also include extension portions 47 which extend beyond the front wall plates 48 of the bolster filler assembly 50. Bottom cover plate 51a supports a draft gear of cushioning device. The reinforcing bottom plate 51b, having a cutout 51c, provides clearance for a cushioning device or draft gear, and rigidifies the draft sill rearward of the lugs 44.

The bolster filler assembly 50 includes front wall plates 48 welded to the sill webs 16, to the upper flanges 12 of the center sill members 10, and to the center filler bottom cover plate 52. Plate 53 is utilized to insure a sound connection between abutting front wall plates 48 and plate 56. Rearward of the front wall plates 48 is the rear wall plate 54 similarly welded to the center sill and center filler bottom cover plate 52. Intermediate of the front and rear wall plate are longitudinally extending plates 56 and transversely extending plates 58 comprising the spider brace frame and welded together to utilize the center sill bolster filler wall plates 48, 54 and the bottom cover plate 52 intended to rigidify the bolster structure and brace the underlying bolster center bearing plate 60 and receive the truck center pin (see FIG. 2).

Referring now more particularly to the front portion of the draft sill assembly for a more complete understanding of the invention, the distinct features of the present invention will be identified. To achieve the prime object of any draft lug assembly, the design embodied in a particular draft sill must effectively transmit impact forces to the center sill for their effective dissipation through the center sill supporting members which are generally relatively large structural beams generally of Z-shaped or channel shaped cross section. In the present invention the front lugs 38, which receive the initial draft or pulloff impact from a cushioning unit or draft gear, have been welded at top portion to the flange 12 and at the bottom portion to the web 16 of the center sill 10 at weld w to prevent an occurrence known as "peeling" which occurs on impact wherein the lug tends to be lifted (peeled) off the web, resulting in subsequent misalignment of the two spaced lugs. A distinct feature of the present method of fabricating the lug 38 to the web 16 of the center sill is the absence of a large weld on both sides of the vertically extending edge of the lug 38 which is adjacent to the web 16. It has been found that this weld can result in a welding stress or a metallurgical change occurring in the web which results in a residual stress being present and/or a weakening of the metal, consequently lowering the strength of the center sill at the point of weldment. Therefore, to eliminate this condition, welding along the vertical edges of the lugs 38 has been substantially curtailed, almost to the point of elimination. This eliminating of weldment not only results in a structurally sound center sill at this point but also increases the load dissipating qualities of the front lug assembly. Upon impact, forces transmitted to the lug 38 are now transmitted more directly to the ribs 40, 41 and through the key slot bearing plates 37. It is noted that because of the absence of a weld along the lug 38 it has a greater degree of movement although relatively small, thus permitting it to transmit applied forces more efficiently and evenly to the reinforcing members.

The elongated slot 33 is reinforced by slot bearing plates 37 which conform generally to the outline of the slot following the contour in the forward portion of the slot; however, rearward of the slot the bearing plates 37 extend inward and to contact the front lugs 38 and extend beyond the lugs on the outside of the web 16 of the center sill 11. Thus, it is noticed that by contacting the front lugs 38, the bearing plates 37 also function as reinforcing ribs for the transmission and dissipation of impacted forces from the lug 38 into the web 16 of the center sill 11. The bearing plate 37 also permits movement of a draft key (not shown). The portions of the bearing plate 37 designated generally at 37a are welded to the web of the center sill and function to prevent movement of the bearing plate when impact forces are transferred from the lug 38 to embed the slot bearing plates 37. When forces are transmitted from the front draft lug 38 to the bearing plate 37 a moment or tendency to turn is created which tends to move the portion of the bearing plate 37 which is adjacent the forward rounded portion 35 of the slot 33 outward of the center sill. This outward movement of the forward rounded portion 35 is accompanied by an inward movement of the lugs 38 which has been described previously and called peeling. To counteract this tendency, the rear portions 37a of the bearing plate 37 are welded onto the web 16 of the center sill members 10, thus tending to counterbalance the turning tendency or moment produced upon force transmission from the lug 38 into the web portion 16.

Referring now to FIGS. 10-13, where there is illustrated a modified form of the present invention, it is noted that the elongated slot 33 has been retained. However, the slot bearing member referred to as 37 has been modified to conform around its entire periphery with the contour of the slot. In this modified version, the bearing member 37 extends through the web 16 of the center sill to form a bearing surface for movement of the draft key (not shown). The bearing plate 37 is tapered, having a thin forward portion 64 and a wider rear portion 66. Bearing plate 37 is adjacent the front lug 38 for transmission of forces therefrom into the center sill 11. It is noted that the bearing plate 37 includes a cutout or flat portion 68. The cutout portion 68 permits a greater area of the bearing plate 37 to be in contact with the front lug 38 for reinforcement and also effects easier attachment of the bearing plate 37 to the lug 38 by a weldment since not as much filler metal is required to fill the opening between the round end of the bearing plate 37 and the front lug 38 as would be required if the cutout 68 was omitted. Thus, in the modified form of the invention illustrated in FIGS. 10-13 it is noticed that sharp corners have been eliminated from the key slot area to eliminate areas of stress concentrations. Also, the cutout flat portion 68 of the bearing and reinforcing plate 37 facilitates attachment of the draft lug 38. Since the cutout 68 has eliminated the need for a relatively large amount of filler metal, as explained previously, residual stresses and metallurgical damage caused by welding have been reduced.

The foregoing description and drawings merely explain and illustrate the invention and the invention is not limited thereto, except insofar as the appended claims are so limited, as those skilled in the art who have the disclosure before them will be able to make modifications and variations therein without departure from the scope of the invention.

What is claimed is:
1. In a railway vehicle an underframe having a center sill to absorb coupler forces with spaced web portions and two opposed coupler key slots having both forward and aft rounded portions in the web portions, a draft gear front stop arrangement including:

   a vertical lug positioned alongside each spaced web portion and said lug adjacent the aft rounded portion of each key slot;

   the vertical lugs having a face portion to initially receive the coupler forces;

   a key slot liner bearing plate reinforcing each key slot; said key slot liner bearing plate having a flat abutting portion reinforcing the associated vertical lug and fixedly attached thereto by a weld of filler metal between the vertical lug and the abutting flat portion;

   reinforcing ribs spaced above and below each key slot liner bearing plate and fixedly attached to the associated vertical lug and to the associated web of the center sill so as to reinforce the vertical lug.

2. The invention according to claim 1, and each of said vertical lugs positioned adjacent and inboard of the associated aft rounded portion of each key slot and between the forward and aft rounded portions;
each key slot liner bearing plate conforming to the contour of the associated key slot in the portion between the vertical lug and the forward rounded portion.

3. The invention according to claim 1, and said vertical lug positioned adjacent the aft rounded portion;

each of said key slot liner bearing plates having forward and aft rounded portions fitting within the associated key slot, and the aft rounded portion of the liner bearing abutting and reinforcing the associated adjacent vertical lug.

4. The invention according to claim 1, and the reinforcing ribs and key slot liner bearing plates having tapered portions and having a wide portion contacting the vertical lug and said taper extending away from the lug to direct coupler forces into the web of the center sill.

5. The invention according to claim 2, and a key slot liner bearing plate extension portion extending beyond the aft rounded portion of the key slots and welded to the associated web portion of the center sill.

6. In a railway vehicle underframe having welded plate members including a sill member having webs spaced apart and upper and lower flanges vertically spaced about the web to define a web depth, a striker plate assembly connecting the sill member at its ends, a front stop lug configuration including:

horizontally extending opposed cutouts in the webs;
vertical lugs positioned normal to the cutouts in the webs and extending the length of the web depth;
a cutout reinforcing plate positioned in the cutout and welded to the associated web and including an abutting portion welded to an associated vertical lug;
reinforcing ribs having an abutting portion adjacent the associated vertical lug and positioned above and below the opposed cutouts and welded to the associated web and to the associated vertical lug;
said vertical lug attached to the sill member by welds along the web adjacent the upper flange and adjacent the lower flange to prevent the lug from peeling away from the associated web during draft impact.

7. In a railway car underframe construction including a coupler carrying sill means having upper and lower flanges and web portions spaced apart, bolster members extending from opposite sides of said sill means, draft gear front and rear lug stops integrally connected to said webs, longitudinally extending opposed slot portions in the web portions and: said slot portions each having a front rounded portion and a rear rounded portion;
each front lug stop being positioned adjacent the associated rear rounded portion;
a slot liner bearing positioned in the slot portions and having an abutting and reinforcing portion welded to the associated front lug stop; and reinforcing rib members having abutting portions adjacent the associated front lug stop and welded to both the front lug stop and to the associated web portion.

8. The invention according to claim 7, and:
said slot liner bearing having a forward rounded section flush with the front rounded portion of the slot and having a rear portion extending beyond the aft rounded portion of the slot and welded to an associated web portion;
said front lug stop spaced from the rear rounded portion of the slot toward the front rounded portion of the slot.

9. The invention according to claim 7, and:
said liner bearing positioned within the associated slot portion and having forward and rear rounded sections matching the contour of the slot portion;
said abutting and reinforcing portion including a flat section of the liner bearing adjacent the front lug in contacting and supporting relationship for force transmission between the front lug and the slot liner bearing.

10. The invention according to claim 7, and:
said reinforcing rib members spaced above and below the associated slot liner bearing; said front lug stop extending between the upper and lower flanges and attached to the associated web of the sill means by a weld extending from each upper and lower reinforcing rib member to the upper and lower flanges respectively.