Oct. 7, 1969 N. M. SZALA 3,470,829

REINFORCED HOPPER CAR CONSTRUCTION

Filed July 24, 1967 3 Sheets-Sheet 1

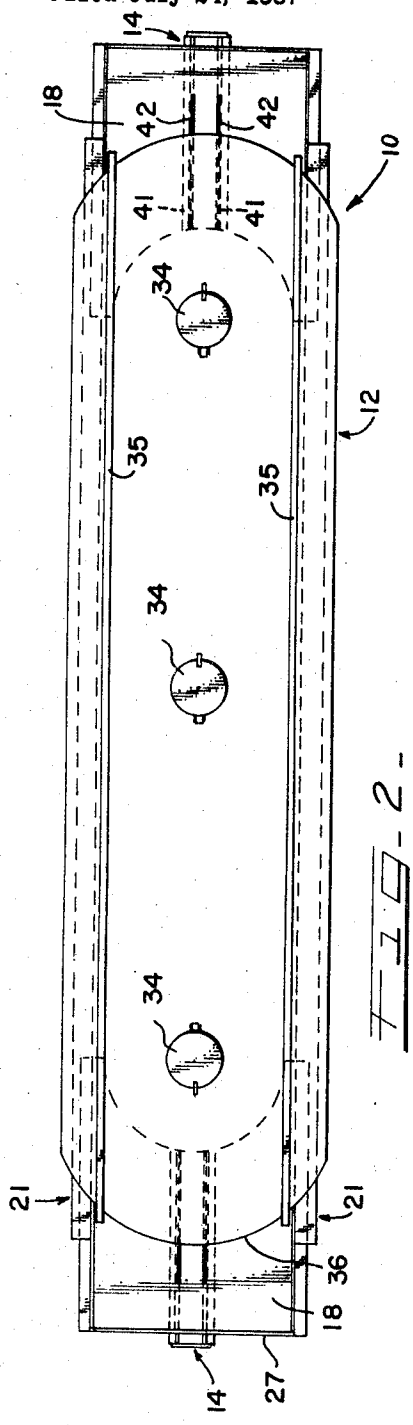


FIG. 2

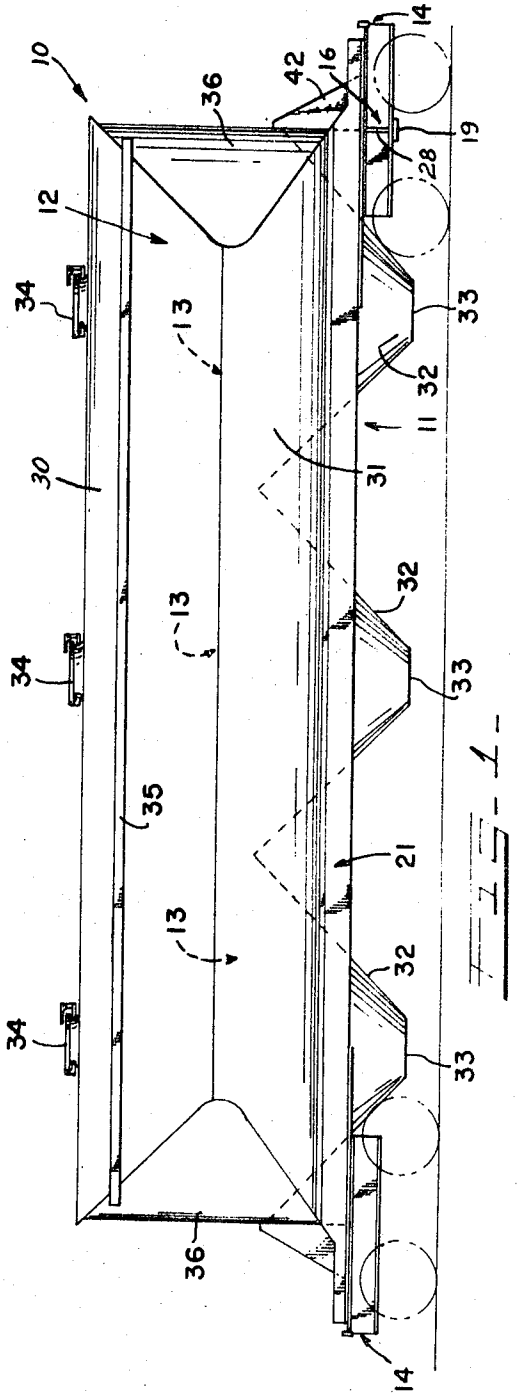


FIG. 1

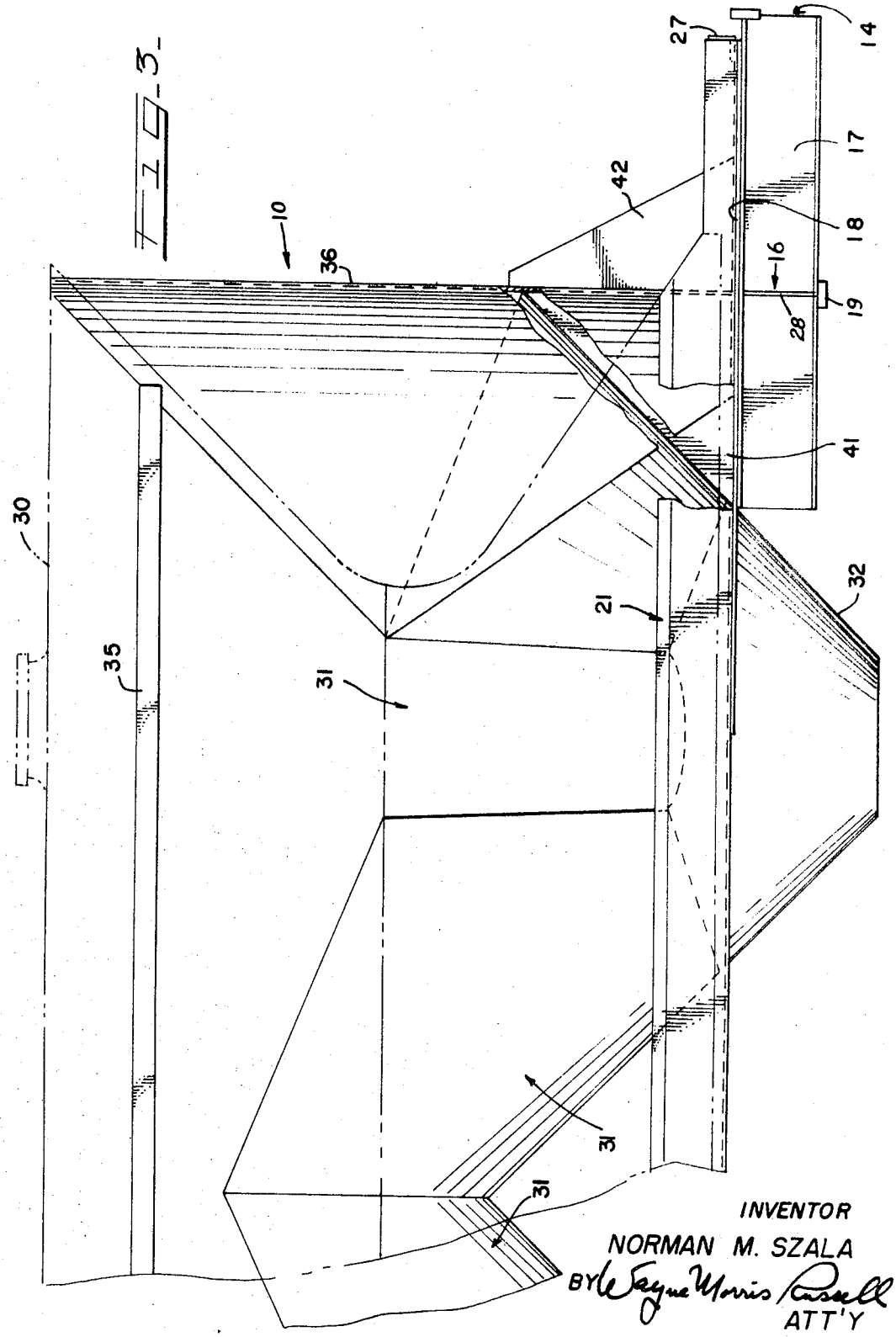
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FIG. 3



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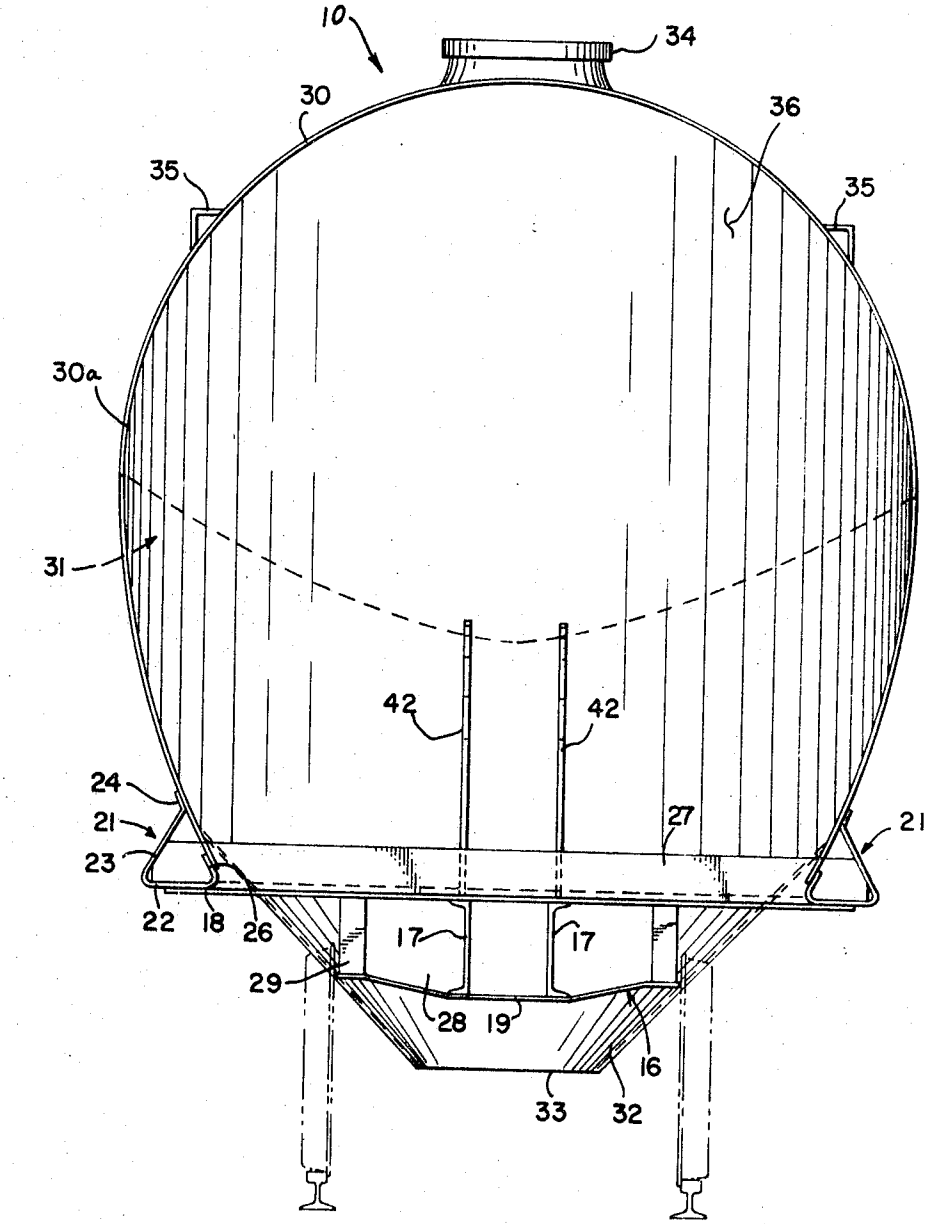


FIG. 4

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REINFORCED HOPPER CAR CONSTRUCTION

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Int. Cl. B61d 7/02, 7/14
U.S. Cl. 105—248 6 Claims

ABSTRACT OF THE DISCLOSURE

A reinforced railway vehicle of the hopper car type including a car body having a plurality of lengthwise spaced hoppers formed with curved surfaces with each hopper having a hopper discharge section depending therefrom. The hopper discharge sections are formed as an inverted frustum of a cone. An underframe supports the hopper body and comprises side sills fixed to the sides of the car and two stub or draft sills at each end of the underframe. Connecting the side sills to the draft sills is a shear plate. Fixed to the respective shear plates and extending upwardly therefrom between the side sills is a bolster web. For transferring the pitching moment to the car body resulting from an end impact on the draft sills is a torsion box arrangement including two pairs of gussets disposed on opposite sides of the bolster web and in substantially vertical alignment with the side webs of the respective draft sills.

Summary of the invention

It is an object of the present invention to provide an improved torsion box construction for the hopper car of the general type described above.

The torsion box assembly comprises generally an inboard and an outboard pair of gusset plates which are disposed on opposite sides of a vertically upwardly projecting bolster web fixed to the respective draft sills. The inboard and outboard pairs of gusset plates are arranged so that the total length thereof fixed to the shear plate is sufficient to assume the stresses imposed by the pitching moment resulting from an impact on the draft sill. An inboard gusset plate adjacent the hopper discharge sections is shaped so as to conform to the slope of the latter and be in contact therewith to facilitate the transfer of the stresses to the hopper body.

Brief description of the drawings

FIG. 1 is a side elevational view of the hopper railway vehicle embodying the structure of the present invention;

FIG. 2 is a top plan view of the railway vehicle shown in FIG. 1;

FIG. 3 is a fragmentary side elevational view of the railway car showing one end of the car incorporating the torsion box construction of the present invention; and

FIG. 4 is an end elevational view of the railway vehicle.

Description of the preferred embodiment

Referring now to the drawings, there is shown a railway vehicle **10** of the hopper car type embodying the torsion box structure of the present invention and comprising generally an underframe **11** on which there is mounted a hopper body **12** including a plurality of lengthwise spaced hoppers **13**.

The underframe **11** comprises generally a pair of lengthwise spaced draft sills **14** at each end of the vehicle **10** on which there is mounted the bolster **16** to which the trucks **15** are attached in the more or less standard manner. The draft sills **14** may each be formed of generally box-like section including a pair of transversely spaced channel members forming side webs **17** and fixed across the upper ends there may be fastened a top cover plate in the form of a shear plate **18**. Across the bottom ends of the side webs there may be fixed a bottom cover plate **19**. Fixed to the outer longitudinal edges of the shear plate **18** are transversely spaced side sills **21**.

As shown in FIG. 4, the side sills each comprise generally a formed section including a horizontal web **22** which is fixed to the shear plate **18** and from which there extends upwardly an inwardly inclined web **23** from the upper end of which there extends an outwardly inclined flange **24**. Extending from the inboard end of the horizontal web **22** is an outwardly inclined flange **26**. Across the end of each of the shear plates there extends an end sill member **27** which may be in the form of an angle section and is fixed to the respective shear plates **18** and the side sills **21**.

The bolsters **16** may be of substantially conventional construction including lengthwise spaced vertical webs **28** to the outer ends of which there is fixed an end plate **29** to form a substantially enclosed box-like structure.

The car or hopper body **12** may be in the form of a plurality of hoppers **13** of substantially identical volume. As shown, the hoppers **13** are formed with a common roof **30** spanning side plates **35** and extending lengthwise of the car. The roof sheet is transversely curved to form a convex top enclosure and extends downwardly to the side sills **21** to form a smooth uninterrupted side surface **30A**. Depending from the underside of the roof **30** and side **30A** and merging therewith are hopper sections **31** which may be formed from circular sections as shown and from each of which there extends hopper discharge portions **32** which are in the form of an inverted frustum of a cone. Covering the open discharge ends of the discharge portions **31** of the cone may be a suitable gravity gate or pneumatic discharge arrangement (not shown). The upper ends of the hopper sections **31** merge, as shown in FIG. 1, to provide a partition between the hoppers **13**. The roof **30** of the car may be provided with a plurality of hatch arrangements **34** into which the cargo is introduced.

The hopper body **12** is supported between the lengthwise spaced draft sills and the fixed side sills **21** at the flanges **24** and **26**. The shear plates **18** along the respective inboard edges are cut out to conform to the curvature of the outboard hoppers **13** and fixed thereto as by welding. It is to be noted that each of the draft sills **14** terminates at the inboard end adjacent the outboard hoppers **14**.

For transferring the pitching moment resulting from impacts applied on the respective ends of each of the draft sills **14** to the car body, there is provided at each end a vertical bolster web **36**. As shown, each of the vertical bolster webs **36** is convexly curved transversely of the car **10** and extends between the side sills **23** and is fixed thereto and to the shear plate **18** along the lower edge thereof. At the upper end the bolster web **36** is fixed to the roof **29**. It is to be noted that the upper portion extending above the conical hopper section forms an end enclosure for the outboard hoppers **13**.

To transfer the pitching moment which occurs in a clockwise direction, as shown in FIG. 3, there is fixed between the shear plate **18** and bolster web **36** two pairs of torsion box ribs or gussets **41—41** and **42—42**. The inboard gussets **41—41** are more or less triangular of which the hypotenuse abuts along its length against the respective curved surface of the conical hopper section and is fixed thereto as by welding. The base of each of the gussets **41—41** is fixed to the shear plate and the vertical edge fixed to the inboard face of the bolster web **36**. On the opposite side of the bolster web the out-

board gussets 42—42 may also be of substantially right triangular contour and are fixed to the shear plate 18 at the base and to the bolster web 36 along the vertical edge. The sum of the lengths of the base of the inboard gussets 41 and the base of the outboard gussets 42 is such that the weld fixing the latter to the base is adequate to withstand the stresses imposed thereon.

I claim:

1. A railway vehicle of the hopper type including a plurality of contiguous hoppers extending lengthwise of the vehicle with each of the outboard hoppers having a hopper discharge section formed as a frustum, a draft sill extending outboard from respective ones of said outboard frustums, a pair of transversely spaced side sills extending lengthwise of said vehicle and fixed to respective ones of said frustums, a shear plate fixed to respective ones of said draft sills and said side sills at the respective ends of said car, said shear plate being contoured complementary to said respective frustums and fixed thereto, a bolster web fixed to and extending between said side sills and fixed to said respective shear plates, said bolster web extending vertically upward from said respective shear plates, and a pair of inner gusset plate members at each end of the vehicle, and each pair extending between, and secured to a respective shear plate, end hopper and bolster web, each one of a respective pair of inner gusset plates being in vertical and longitudinal alignment with a respective side web portion of a respective draft sill, a pair of outer gusset plates at each end of the vehicle, each pair of outer plates extending outwardly from a respective bolster web and being secured to said bolster web and said shear plate, each one of a respective pair of outer gusset plates being in vertical and longitudinal alignment with a respective side web portion of a respective draft sill.

2. The invention as defined in claim 1 wherein said bolster web extends substantially full height of said vehicle and forms the end closure thereof.

3. The invention as defined in claim 2 wherein said end closure is convexly curved transversely of the vehicle continuously between the side sills.

4. The invention as defined in claim 1 wherein certain of said gusset plate means at one side of said bolster web are contoured complementary to the respectively adjacent frustums and extending between and secured to said frustums, shear plates and bolster webs.

5. The invention as defined in claim 1 wherein said outer pair of gusset plates at opposite sides of the bolster web extend vertically substantially less than the height of said bolster web.

6. A railway vehicle of the hopper type including a plurality of contiguous hoppers extending lengthwise of the vehicle, a draft sill having vertical side web portions extending outwardly from respectively adjoining hoppers adjacent opposite ends of the vehicle, a pair of side sills spaced transversely and extending lengthwise of said vehicle, a horizontally extending shear plate fixed to each of said draft sills and to said spaced side sills at the respective ends of said vehicle, a bolster web adjacent each end of the vehicle fixed to and extending between said side sills and fixed to each of said shear plates, said bolster web extending vertically upward from each shear plate, and a pair of inner gusset plate members at each end of the vehicle, and each pair extending between, and secured to a respective shear plate, end hopper and bolster web, each one of a respective pair of inner gusset plates being in vertical and longitudinal alignment with a respective side web portion of a respective draft sill, a pair of outer gusset plates at each end of the vehicle, each pair of outer plates extending outwardly from a respective bolster web and being secured to said bolster web and said shear plate, each one of a respective pair of outer gusset plates being in vertical and longitudinal alignment with a respective side web portion of a respective draft sill.

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