Dec. 10, 1968 F. W. HUGHES ET AL 3,415,203

DAMPENING MEANS BETWEEN THE CHASSIS AND TRUCK OF A RAILROAD CAR

Original Filed Jan. 19, 1966 3 Sheets-Sheet 1

FIG. 1

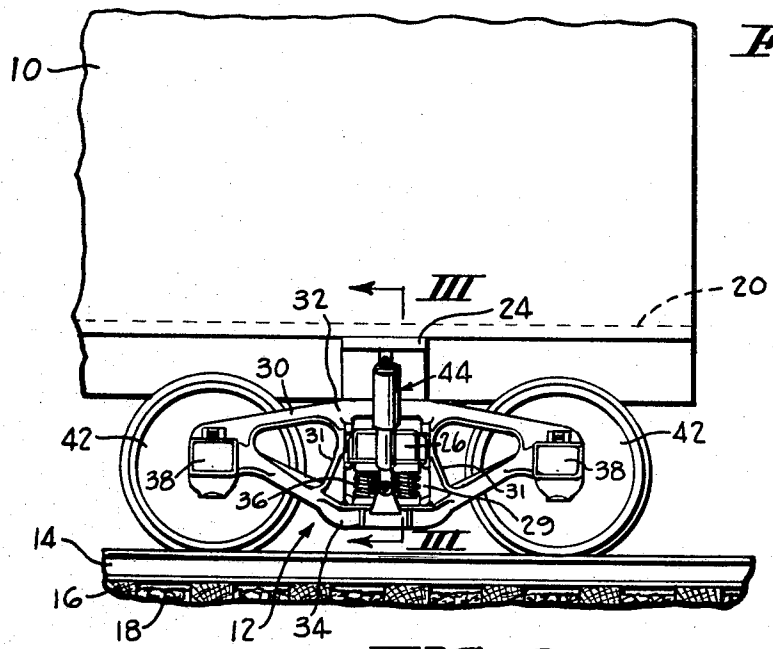
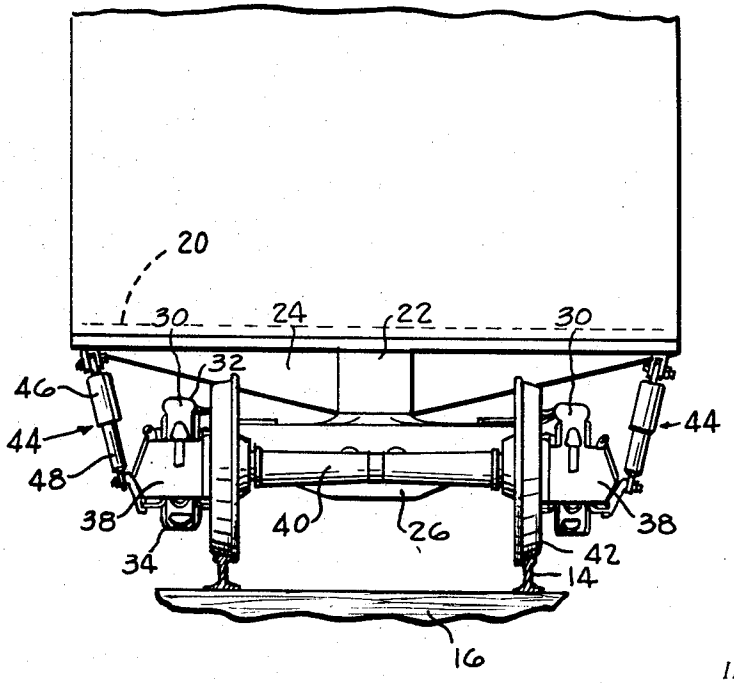


FIG. 2



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Original Filed Jan. 19, 1966 3 Sheets-Sheet 2

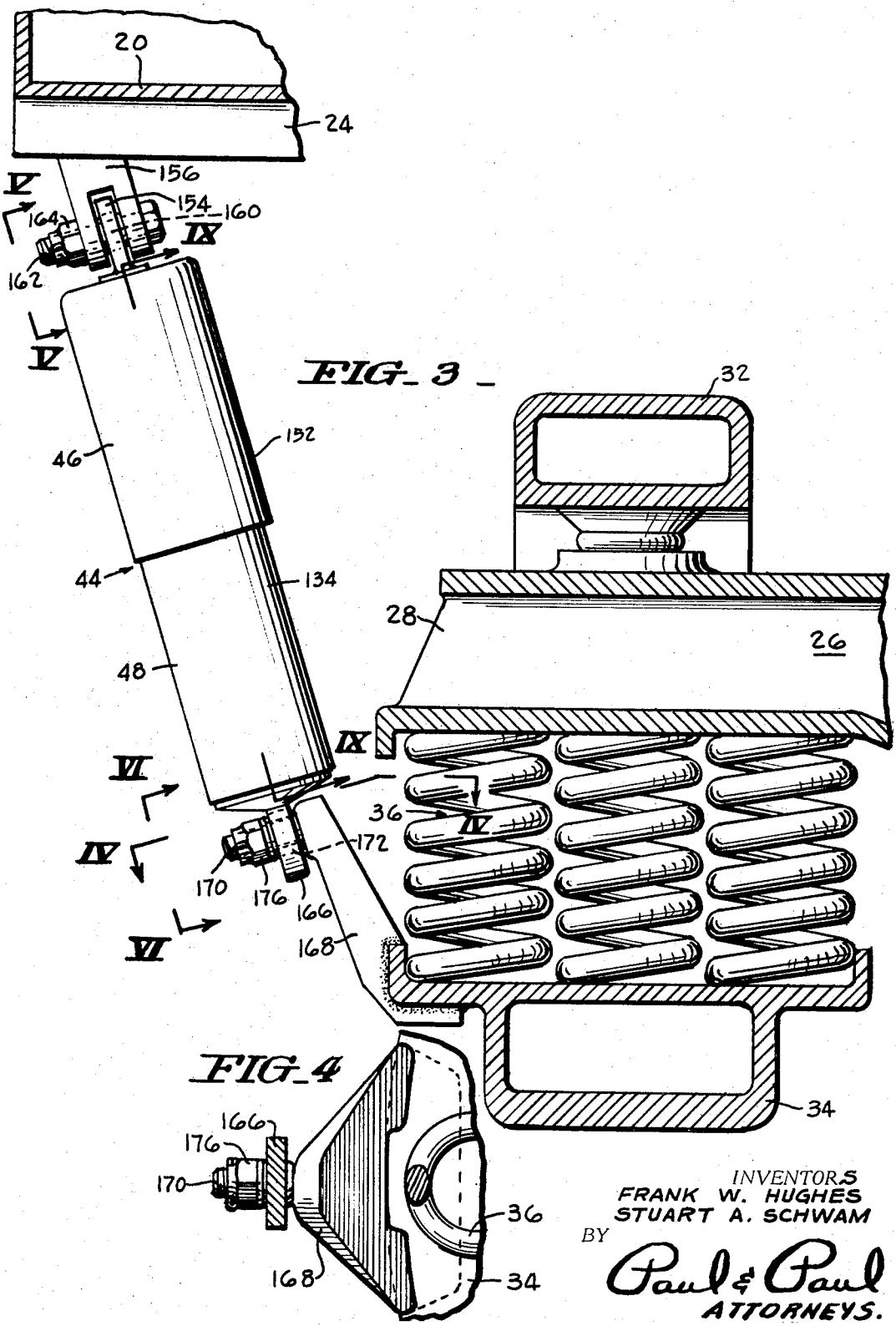


FIG. 3

FIG. 4

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Original Filed Jan. 19, 1966 3 Sheets-Sheet 3

FIG. 9

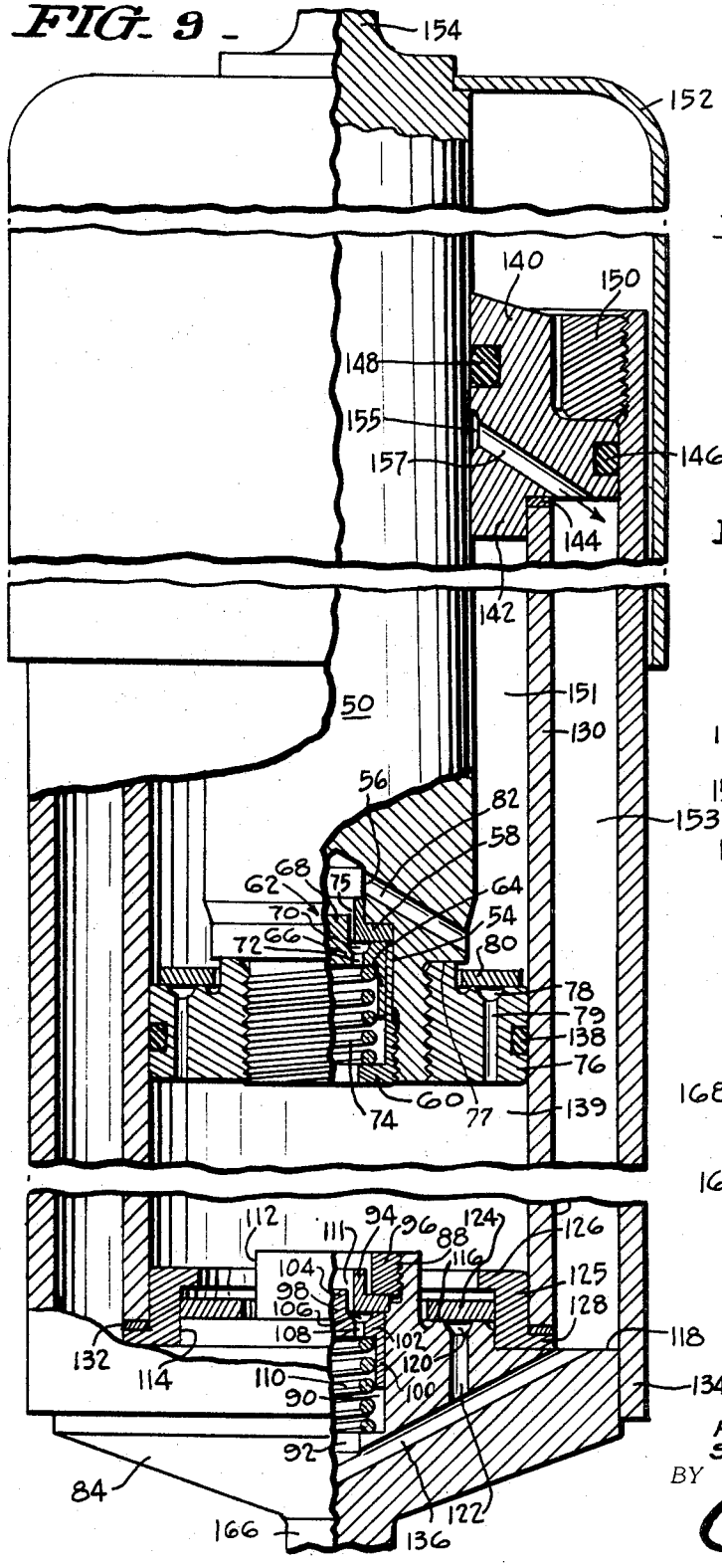


FIG. 5

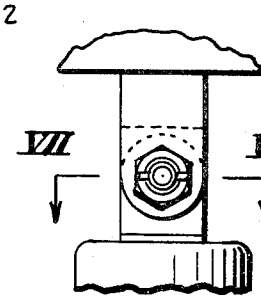


FIG. 6

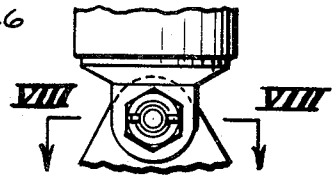


FIG. 7

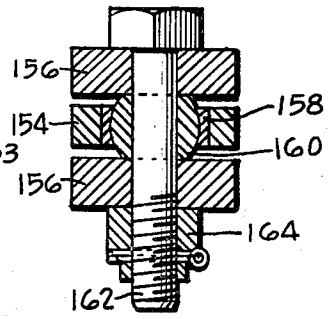
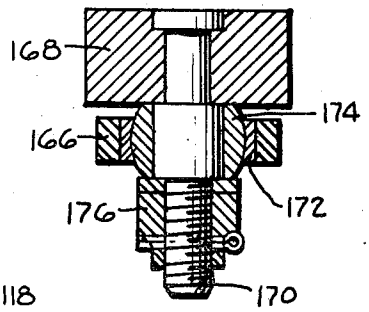


FIG. 8



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3,415,203

DAMPENING MEANS BETWEEN THE CHASSIS AND TRUCK OF A RAILROAD CAR

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Continuation of application Ser. No. 521,603, Jan. 19, 1966. This application Sept. 11, 1967, Ser. No. 670,010
6 Claims. (Cl. 105—199)

ABSTRACT OF THE DISCLOSURE

A damper is disposed on the outboard side of each side frame of a truck underlying the body of a railroad car. The connection of each damper to the associated side frame is by a ball-and-socket joint located at the bottom of the side frame. The damper extends upwardly and outwardly from its connection to the side frame for connection by a ball-and-socket joint to the body of the car.

This application is a continuation of our copending application, Ser. No. 521,603, filed Jan. 19, 1966, now abandoned.

The body of a railroad car normally is seated upon the wheeled trucks which support it without being rigidly affixed thereto. As the car moves over a track, the dynamic forces to which the trucks are subjected cause the body of the car to sway, rock or roll from side to side. The amplitude of body roll tends to increase as the speed of the car approaches a critical speed, and tends to decrease as the speed of the car recedes from or surpasses these critical speeds. When the speed approximates the critical speeds, the forces which are at resonance cause excessive sway, rock or roll, as a consequence of which lading damage and damage to the car may ensue. Accordingly, a principal object of the invention is to provide a railroad car with means for reducing body roll to a tolerable level at all speeds.

Another object is to provide a railroad car with energy dissipating means in the form of hydraulic dampers, interposed between the body of the car and the trucks upon which it is supported and operative not only to reduce body roll and the consequent wheel lift-off, but also pitch and vertical motion.

Other objects of the invention will become apparent when the following description is read with reference to the accompanying drawings, in which:

FIGURE 1 is a fragmentary side elevation of a railroad car constructed in accordance with the invention;

FIGURE 2 is a fragmentary end elevation of the railroad car shown in FIGURE 1;

FIGURE 3 is an enlarged section on line III—III in FIGURE 1;

FIGURE 4 is a section on line IV—IV in FIGURE 3;

FIGURE 5 is a view of the chassis and the damper connection indicated by lines V—V in FIGURE 3;

FIGURE 6 is a view of truck side frame and damper connection indicated by lines VI—VI in FIGURE 3;

FIGURE 7 is an enlarged section on line VII—VII in FIGURE 5;

FIGURE 8 is an enlarged section on line VIII—VIII in FIGURE 6; and

FIGURE 9 is an elevation of the hydraulic damper, part being shown in section.

The following description is directed to the specific form of the invention shown in the drawings. It is not addressed to the scope of the invention, which may be practiced in various forms.

Referring to the drawings, a body **10** of a railroad car

is supported upon a pair of trucks **12** which travel over rails **14** carried by ties **16** nested in a bed **18**.

The body **10** of the car is typical. It includes a chassis having a horizontally extending floor **20**, a center sill **22** extending longitudinally of the car and underlying the floor **20** and body bolsters **24** extending transversely of the car, as shown.

The trucks **12** are typical. Each includes a truck bolster **26** with opposite end portions **28** respectively extending into central bolster openings or windows **29** formed in a pair of laterally spaced side frames **30**. Each side frame **30** comprises an upper member **32** over the opening **29**, a lower member **34** under the opening **29** and bolster guide columns **31** respectively on opposite sides of the opening **29**. Each end portion **28** of the bolster **26** extending into an opening **29** is seated upon a group of compression springs **36**. Each end portion of each side frame **30** mounts a journal **38**. Each pair of corresponding journals **38** respectively receive opposite end portions of an axle **40** carrying wheels **42**, which engage the heads of the rails **14**.

Associated with each truck are a pair of hydraulic motion dampening mechanisms **44**, one on each side of the truck. Each of the mechanisms **44** includes an upper section **46** and a lower section **48**. The upper section **46** includes a piston rod **50** having in the lower extremity thereof a central bore **54** and a counterbore **56**. Fitted into the bores **54** and **56** is a valve seat **58**, and threaded into the bore **54** is a sleeve **60** which serves to secure the valve seat in position. Slidably fitted into the sleeve **60** is a valve **62** including a hollow cylindrical part **64** closed at its upper end by a wall **66**. Extending upwardly from the wall **66** is a reduced diameter portion **68**, slightly tapered axially, and extending about the base of the portion **68** in an angular groove **70** and a series of circumferentially spaced holes **72**. The valve **62** is biased upwardly against the seat **58** by a compression spring **74** suitably housed within the valve part **64** and the sleeve **60**. Extending about the axially tapered reduced diameter portion **68** of the valve, within the valve seat **58**, is an annular orifice **75**, which orifice communicates with the groove **70** and the series of holes **72**. The lower extremity of the piston rod **50** is reduced in diameter to form a circumferentially extending shoulder **77**. Threaded onto the lower extremity of the piston rod **50** is a piston head **76**. Extending about the upper surface of the piston head **76** is a groove **78** and a series of circumferentially spaced holes **79**. Overlying the groove **78** is a flapper valve **80**, the inner marginal area of which underlies the shoulder **77**.

The lower section **48** of the hydraulic damper **44** includes a base **84** having in the upper surface thereof a bore **88**, a first counterbore **90** and a second counterbore **92**. Received by the bore **88** is a valve seat **94** secured in position by an annulus **96** threaded into the bore **88**. Underlying the valve seat **94** and slidably fitted into the counterbore **90** is a valve **98** including a hollow cylindrical part **100** closed at its upper end by a wall **102**. Extending upwardly from the wall **102** is a reduced diameter portion **104** slightly tapered axially, and extending about the base of the portion **104** is an annular groove **106** and a series of circumferentially spaced holes **108**. The valve **98** is biased upwardly against the seat **94** by a compression spring **110** suitably housed within the valve part **100** and the counterbore **90**. Extending about the axially tapered reduced diameter portion **104** of the valve, within the valve seat **94**, is an orifice **111**, which orifice communicates with the groove **106** and the series of holes **108**.

The upper end of the base **84** is reduced in diameter, as at **112** and **114**, these reduced diameter portions forming annular shoulders **116** and **118**. Formed in the annular shoulder **116** is a groove **120** and a series of circum-

ferentially spaced holes **122**. Overlying the groove **120** is a flapper valve **124** fitted within an annular member **125** having at the top thereof a radially inwardly extending flange **126**, and having at the base thereof a radially outwardly extending flange **128** seated upon the shoulder **118**. Interposed between the flange **128** and the lower extremity of a cylindrical member **130** fitted over the annular member **125** is packing **132**. Fitted over the base **84** is a cylindrical member **134**. The piston head **76** is provided with an O-ring **138** which engages the inner surface of the cylindrical member **130**. The space between the lower extremity of the piston rod **50** and the base **84** within the cylindrical member **130** affords a compression chamber **139**.

Fitted into the upper end portion of the cylindrical member **134** is a gland member **140** having a reduced diameter lower end portion **142** extending downwardly into the upper end portion of the cylindrical member **130**. Interposed between the gland **140** and the upper extremity of the cylindrical member **130** is packing **144**. The gland **140** is fitted over the piston rod **50** and is provided with O-rings **146** and **148**. Threaded into the upper end portion of the cylindrical member **134** is a gland nut **150** which serves to secure the gland **140** in position. The annular space between the gland **140** and the piston head **76** and between the piston rod **50** and the cylindrical member **130** affords an extension chamber **151** which is in communication with the counterbore **56** via a series of radially extending passages **82**. The annular space between the gland **140** and the base **84** and between the cyindrical members **130** and **134** affords a reservoir **153** which is in communication with the counterbore **92** and holes **122** via a series of radially extending passages **136** and with an annular oil groove **155** extending about the inner surface of the gland **140** via a radially extending passage **157**. Mounted on the piston rod **50** and extending downwardly over the cylindrical member **134** is a shroud **152**, as shown.

The upper end portion of the piston rod **50** is provided with a tongue **154** extending upwardly between the arms of a clevis **156**, which clevis is affixed to the body bolster **24**. The tongue **154** is fitted with a bushing **158** which receives a spherical element **160**. A bolt **162** extends through the arms of the clevis and the spherical element **160**, and a nut **164** is threaded on the end of the bolt.

The lower end of the base **84** is provided with a tongue **166** which tongue extends downwardly alongside the upper end portion of a bracket **168** from which there extends a pintle **170**. The tongue is fitted with a bushing **172** which receives a spherical element **174**. The pintle **170** extends through the spherical element **174**, and a nut **176** is threaded on the end of the pintle.

In the use of the hydraulic dampers **44**, normally extension chamber **151** and compression chamber **139** are filled with oil, and reservoir **153** is partially filled with oil. When the body of the car rolls to one side, the damper **44** on that side contracts, and when the body rolls to the other side, said damper is extended. When the damper **44** contracts, the compressive forces cause the piston rod **50** to move farther into the cylindrical member **130**, reducing the size of the compression chamber **139** and increasing the size of the extension chamber **151**. Thereupon, the flapper valve **80** opens, and an unrestricted flow of oil passes from the compression chamber **139**, through the series of holes **79** into the extension chamber **151**. A restricted flow of oil passe from the compression chamber **139**, through the series of holes **72**, annular orifice **75** and the several passages **82** into the extension chamber **151**. The flapper valve **124** remains closed. Furthermore, since all the oil displaced from the compression chamber **139** cannot be accommodated by the extension chamber **151**, fluid pressure forces the valve **98** downwardly against the influence of spring **110**. Initially a restricted flow of the excess oil occurs from the compression chamber **139**, through the annular orifice **111**, the series of holes **108** and the several passages **136** into the reservoir **153**. When the fluid pressure becomes great enough to force the whole of the valve **98** below the valve seat **94** against the influence of spring **110**, a free flow of the excess oil occurs from the compression chamber **139**, through the valve seat **94**, the series of holes **108** and the several passages **136** into the reservoir **153**.

When the damper **44** is etxended, the tension forces cause the piston rod **50** to move outwardly in cylindrical member **130** increasing the size of the compression chamber **139** and decreasing the size of the extension chamber **151**. The flapper valve **80** remains closed. Oil is forced out of the extension chamber **151** through the several passages **82**. Fluid pressure forces the valve **62** downwardly against the influence of spring **74**. Initially a restricted flow of oil passes from the extension chamber **151**, through the several passages **82**, the annular orifice **75** and the series of holes **72** into the compression chamber **139**. When the fluid pressure becomes great enough to force the whole of the valve **62** below the valve seat **58**, a free flow of the oil passes from the extension chamber **151**, through the several passages **82**, the valve seat **58** and the series of holes **72** into the compression chamber **139**. Furthermore, since the volume of oil displaced from the extension chamber is less than that which can be accommodated by compression chamber **139**, the flapper valve **124** opens and an unrestricted flow of oil passes from the reservoir **153** through the several passages **136** and the series of holes **122** into the compresion chamber **139**.

The passages through which the oil flows from the compression chamber **139** to the reservoir **153** when the damper **44** contracts, and through which the oil flows from the extension chamber **151** to the compression chamber **139** when the damper **44** is extended, are of a size to restrict the flow so that considerable force is required at low velocity to contract or extend the damper **44**. Thus some of the energy tending to cause the body **10** to roll relative to the rail head is dissipated, resulting in a dampening action which affords a stable car at all speeds.

It will be noted that the dampers **44** are double action devices, and that not only are they effective to reduce body roll, but also pitch and vertical movement. When the body of the car pitches forwardly, the dampers **44** associated with the front truck tend to contract and those associated with the rear truck tend to be extended. When the body of the car pitches rearwardly, the dampers **44** associated with the rear truck tend to contract and those associated with the front truck tend to be extended. When the body of the car moves vertically, all of the dampers **44** are either contracted or extended, depending upon whether the body of the car moves downwardly or upwardly.

Irrespective of the degree of loading, in the absence of roll and pitch, each damper **44** is in a neutral position, the neutral position being a predetermined position within a range of positions, depending upon the degree of loading.

What is claimed is:

1. In a railroad car, the combination comprising:

(A) a truck having
  (1) side frames provided with bolster windows,
  (2) a truck bolster with opposite end portions extending respectively into said windows, and
  (3) springs supporting said truck bolster on said frames,

(B) a chassis including
  (1) a body bolster pivotally mounted on said truck bolster, and

(C) motion dampening means on each side of said truck disposed generally along the vertical longitudinally extending median plane of said truck bolster and pivotally connected to said chassis and to the associated side frame below the bolster window.

2. The combination according to claim **1** wherein a damper is disposed on the outboard side of each side frame, and the dampers diverge upwardly for connection to opposite end portions of the body bolster.

3. The combination according to claim **2** wherein

the dampers are double action hydraulic devices connected to the side frames and the body bolster by ball-and-socket type joints.

4. In a railroad car, the combination comprising:

(A) a truck having

(1) side frames provided with bolster windows,

(2) a truck bolster with opposite end portions extending respectively into said windows, and

(3) springs supporting said truck bolster on said frames,

(B) a chassis including

(1) a body bolster pivotally mounted on said truck bolster,

(C) motion dampening means on each side of said truck proximate the vertical longitudinally extending median plane of said truck bolster, and

(D) ball-and-socket type joints connecting each of of said motion dampening means to the associated side frame in the vicinity of the bolster window opening and to said chassis thereby to provide for movement of said motion dampening means to accommodate every possible rotary and translatory movement of said chassis relative to said side frame.

5. The combination according to claim 4 wherein each ball-and-socket type joint comprises

(A) a pair of parts, and

(B) means interconnecting said pair of parts including

(1) an element having a spherical outer surface area and movably captured in a socket formed in one of said parts, and

(2) a pin extending from the other of said parts and through said spherical element, said pin being disposed cross-axially of the motion dampening means, and said spherical element being secured against shifting movement axially of said pin.

6. The combination according to claim 5 wherein one part of the pair thereof is a clevis, the other part of the pair thereof is a tongue received between the arms of said clevis and of a thickness substantially less than the clear distance between the arms of said clevis, the spherical element is captured by said tongue and projects outwardly in opposite directions from the sides thereof, being also captured between the arms of said clevis, and said pin extends through the arms of said clevis.

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U.S. Cl. X.R.

105—453; 188—83