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Wagner et al.

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[54] HYDRAULICALLY SNUBBED TRUCK

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[52] **U.S. Cl.** .... **105/197 DH,** 105/193, 188/321, 267/8 R, 267/9 A, 267/9 C

[51] **Int. Cl.** **B61f 5/12,** B61f 5/50, F16f 9/32

[58] **Field of Search**...... 105/197 DH, 193; 188/321, 188/322; 267/8 R, 9 A, 9 C; 308/2 R

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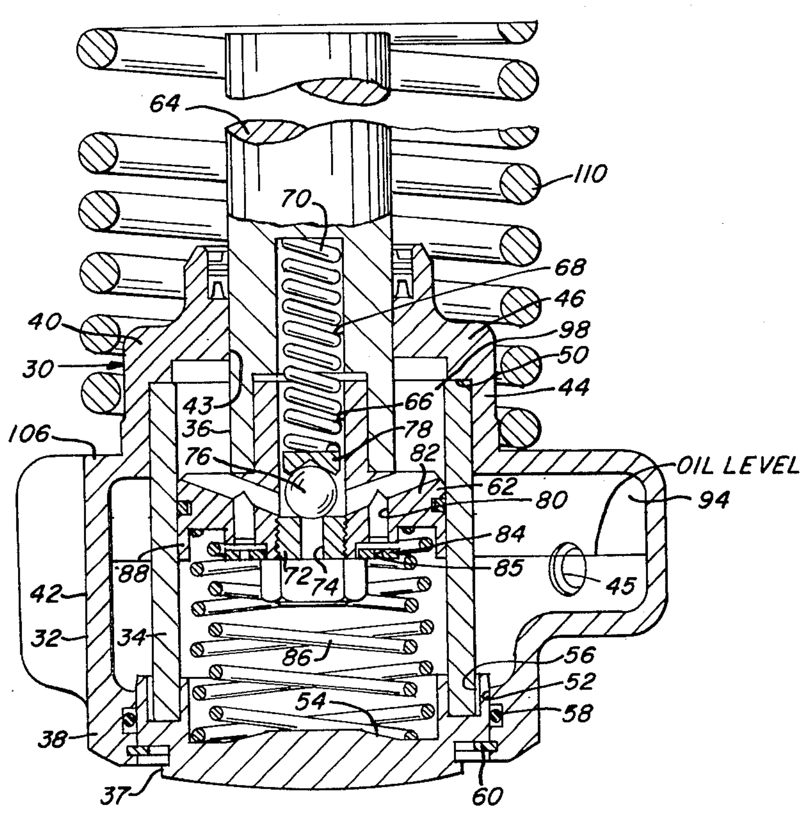
[57] ABSTRACT

A hydraulic snubber device for railroad car trucks and more particularly a hydraulic snubber of an improved configuration which is disposed intermediate a bolster and side frame and which includes a circumferential reservoir outside the piston stroke area thereby permitting a minimum height snubber for a given useful stroke.

14 Claims, 7 Drawing Figures



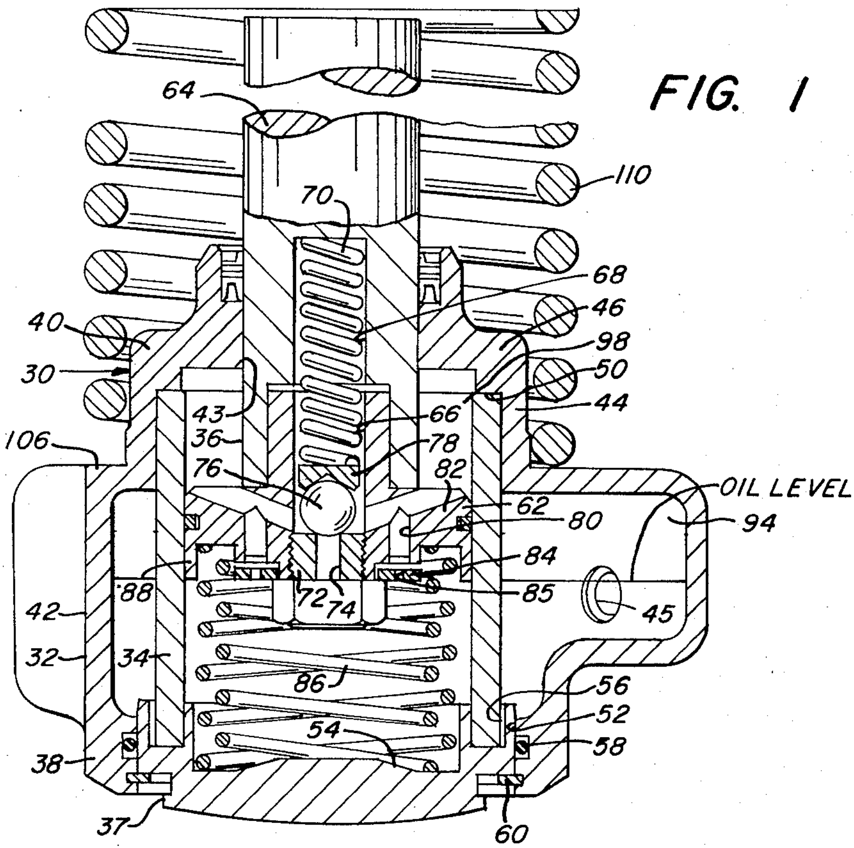

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FIG. 1

FIG. 2

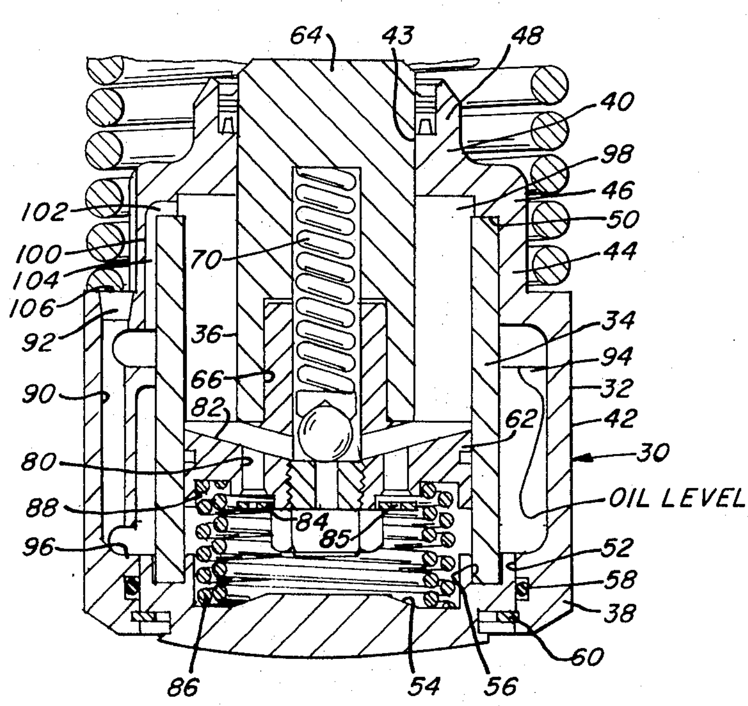
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FIG. 3

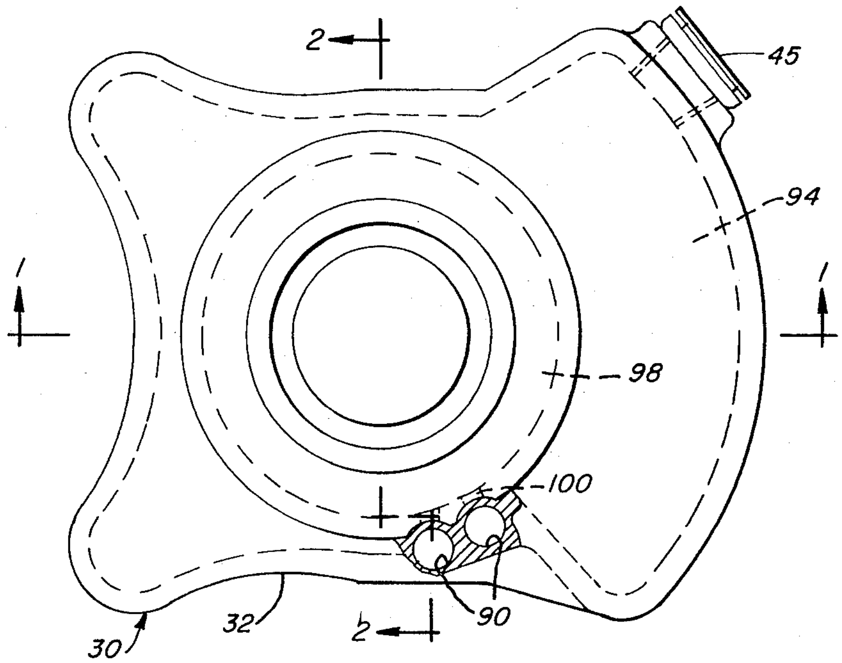


FIG. 4

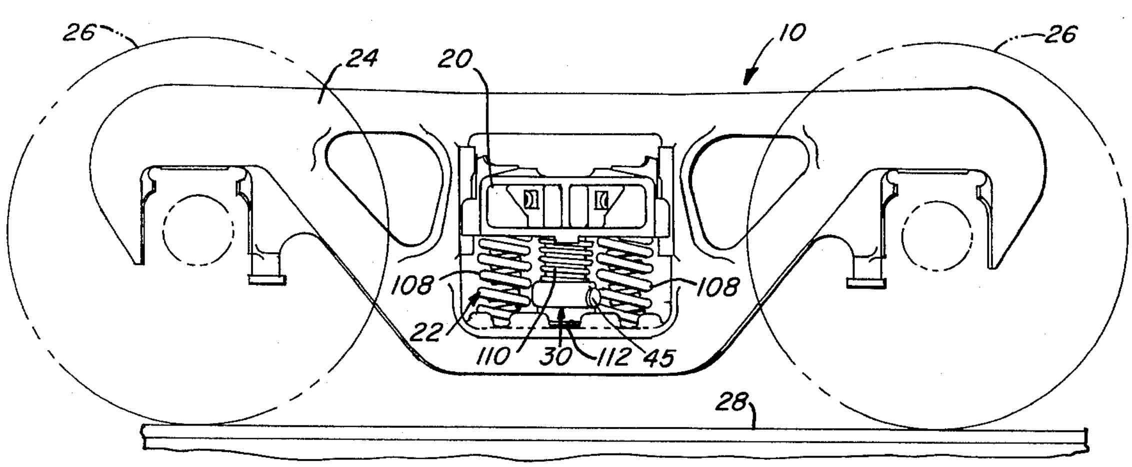


FIG. 5

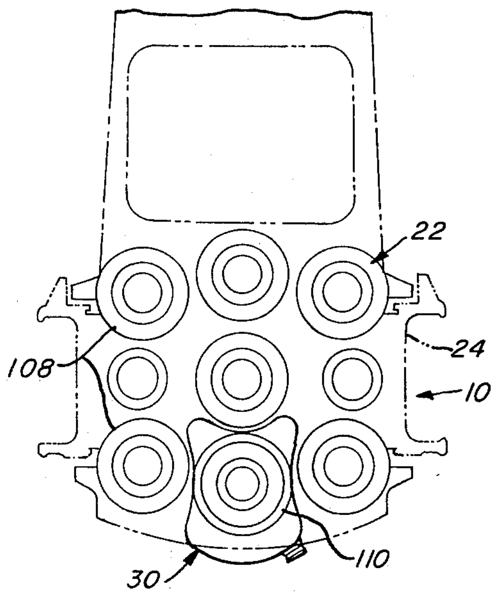


FIG. 7

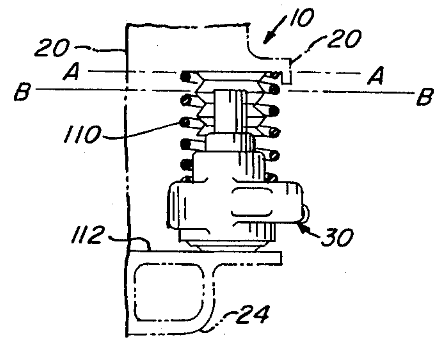
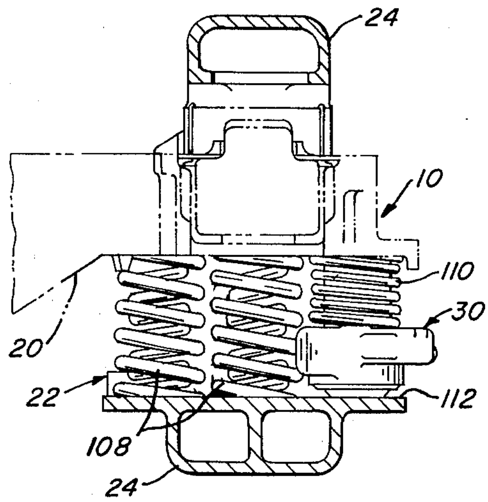


FIG. 6



HYDRAULICALLY SNUBBED TRUCK

As is known, in the normal travel of railway cars over a railbed, various differences in the vertical profile of the laterally spaced trucks resulting from such causes as staggered rail joints and super elevation of the outside track on curves gives rise to a tendency of lateral tilting or swaying of the car body. In modern cars with heavy load capacity and a relatively high center of gravity the energy involved in the swaying can be a significant part of the total energy available in the drawbar force from the locomotive while the forces applied to the running or gear of the car become so large at times that a variety of effects may develop such as:

1. Unequal weight distribution which in extreme cases results in complete unloading of the wheels on one side of the truck to the extent of lifting the unloaded wheels off the rail with a high potential of derailment;
2. The imposition of extreme stresses on the car body and truck members; and
3. Cumulative damage and misalignment of track, ties and roadbeds through pounding action.

Various means have been developed to alleviate the above mentioned problem of swaying including the hydraulic snubbing devices described in U.S. Pat. Application Ser. No. 134,126, filed Apr. 15, 1971, and assigned to the same assignee as is this invention. Such application illustrates a frequency responsive hydraulic snubber which is disposed intermediate a side frame and bolster and provided with an external reservoir for hydraulic fluid which cooperates with the snubber cylinder space to virtually eliminate the dead space or ullage volume normally necessary within a closed hydraulic cylinder to provide for the volume of hydraulic liquid which is displaced by the piston rod on the down stroke. By use of such a snubber as described in the aforesaid patent application a high energy absorption rate is available at slow car speeds and large amplitude motions and a low rate of energy absorption is available at high car speeds and relatively smaller amplitude motions thereby controlling the frictional temperature rise of the hydraulic snubbing fluid within an acceptable range. While simultaneously providing an arrangement wherein the snubber is effective over substantially the full stroke thereof with substantially zero ullage volume within the piston cylinder.

The present invention is an improvement over snubbers of a type described in said copending U.S. Patent Application Ser. No. 134,126 and offers several advantages thereover, for example:

1. By providing a circumferential reservoir outside of the piston stroke area: a more compact snubber assembly is possible; snubber eccentricity is substantially reduced thereby resulting in reduced stress on the snubber components; and in certain circumstances the decrease in snubber eccentricity alleviates the necessity for a centering plate for the snubber on the bolster or side frame;
2. The snubber of the present invention when disposed in a spring group of an existing railway car truck can be positioned with none or only minor alterations to the structure of the adjacent side frame or bolster;
3. The construction of a nodular iron cast body with a steel sleeve for receiving the piston therewithin alleviates the necessity for a bearing assembly intermediate the adjacent peripheries of the piston stem and the body bore through which it reciprocates; and
4. The improved snubber configuration requires no closure welds and the snubber can be readily assembled and disassembled.

These and other objects and advantages will become more readily apparent upon a reading of the following description and drawings in which:

FIG. 1 is a cross sectional view of a snubber constructed in accordance with the principles of the present invention and taken on lines **1—1** of FIG. **3**;

FIG. **2** is a cross sectional view of the snubber of FIG. **1** taken on line **2—2** of FIG. **3**;

FIG. **3** is a plan view, partially in section, of the snubber illustrated in FIGS. **1** and **2**;

FIG. **4** is a fragmentary side elevational view of a freight car truck incorporating the snubber of this invention;

FIG. **5** is a top plan schematic view of a spring group incorporating the snubber of this invention;

FIG. **6** is a fragmentary partially sectional and elevational view of the freight car truck illustrated in FIGS. **4** and **5** and incorporating the snubber of this invention; and

FIG. **7** is a view similar to FIG. **6** illustrating loaded and unloaded conditions of the freight car incorporating the snubber of this invention.

FIG. **4** illustrates a fragmentary portion of a four wheel railway freight truck, generally illustrated at **10**, which comprises a center plate and suitable side bearings (not shown) cooperating with a bolster **20** to support the car body (not shown); spring groups **22** mounted in side frame **24** (only one being shown) to support the bolster **20**; and suitably journaled wheels **26** supporting each side frame **24** and nesting on tracks **28.** A snubber of the present invention best illustrated in FIGS. **1-3** and generally indicated at **30**, is shown as being disposed in the spring group **22.**

Inasmuch as the invention herein is primarily directed at snubber **30** and the balance of the elements set forth hereinabove are well known in the art further description of such elements will not be set forth hereinafter except where necessary to describe snubber **30.**

The snubber **30** comprises: a hollow body member **32**; a hollow cylindrical sleeve **34** received within snubber **32**; a piston assembly **36** axially reciprocable within sleeve **34**; and a closure and bearing member **37** releasably carried by member **32** adjacent the lower end thereof. Body member **32** includes; a bearing and sleeve retaining portion **38** adjacent the lower end of member **32**; an upper portion **40**; and a radially outwardly expanded reservoir portion **42** located intermediate portions **38** and **40.** It is to be noted that reservoir portion **42** as illustrated in FIG. **1** includes a sight glass **45** intergral therewith for purposes of visual verification of the liquid level within portion **42.**

Upper portion **40** of body member **32** includes a circular opening **43** therethrough. Opening **43** has a stepped cylindrical periphery surface and includes: a lower peripheral surface **44** having a diameter thereof substantially equal to the outer diameter of sleeve **34**; an intermediate peripheral surface **46** having a diameter thereof less than the diameter of portion **44**; and an upper piston rod bearing and sealing peripheral surface **48** having a diameter thereof less than the diameter of portion **46.** A transversely extending sleeve seating surface 50 is formed at the juncture of surfaces 46 and 48. In final assembly of snubber 30 the uppermost end of sleeve 34 is firmly seated on seating surface 50.

Portion 38 of body member 32 includes a lower circular opening 52 therethrough. As shown opening 52 is coaxially aligned with opening 43 and has a diameter thereof substantially equal to the outer diameter of closure and bearing member 37. The lower surface of member 37 has a downwardly extending convex configuration and the upper surface thereof includes a central circular depression 54 and a downwardly extending annular groove 56 therein. Groove 56 is located intermediate the periphery of depression and the outer periphery of member 37.

In final assembly member 37 is releasably and sealingly received within opening 52 in any suitable manner. As shown the sealing relationship between member 37 and opening 52 is established by an O-ring 58 disposed in an outwardly extending peripheral groove in opening 52. The releasable retention of member 37 within opening 52 is shown as being accomplished by means of snap ring 60.

Prior to final assembly, sleeve 34 with piston assembly 36 therewith is received within body member 32. The lowermost end of sleeve 34 is captively received within the annular groove 56 of member 37 and the upper end thereof engages the annular sleeve seating surface 50.

Piston assembly 36 comprises a piston head 62, and a cylindrical piston rod 64 suitably secured at the lower end thereof to piston head 62 and extending coaxially upwardly therefrom. Piston head 62 is provided with a central bore 66 therethrough which is in coaxial alignment with a blind central bore 68 in the piston rod 54. In final assembly a spring 70 is captively mounted in a compressed condition within the blind bore 68 and a plug 72 with a central bore 74 therethrough is threadedly received within bore 66. A ball valve 76 is biased into seating engagement with bore 74 by spring 70. Assembly 36 additionally includes a ball valve seating member 78 disposed in bore 66 intermediate spring 70 and valve 76 to provide a seating and centering means for ball valve 76. The piston head 62 is also provided with a plurality of circumferentially spaced bores 80 which extend from the bottom surface of piston head 62 and open into a plurality of bores 82 which extend diagonally from bore 66 to the upper surface of piston head 62.

In the position shown in FIG. 2 the bores 80 are substantially closed at the lower ends thereof by means of an annular flapper or ring valve 84 which covers the lower ends of bores 80 whenever pressure below the piston head is substantially greater than pressure above the piston head 62. The valve 84 is free to move downwardly with respect to the bottom of piston head 52 a limited distance and is prevented from moving further in the axial direction by a nut head depending downwardly from plug 72. Valve 84 includes a plurality of circumferentially spaced openings 85 therethrough which openly communicate with respective bores 80 in piston head 62. A compression spring set 86 is disposed within the sleeve 34 intermediate the piston head 62 and the closure and bearing member 37 in a manner that the lower end thereof is captively received within the cylindrical depression 54 and the upper end thereof is captively received in a downwardly open annular groove 88 within piston head 62. Compression spring set 86 biases piston head 62 upwardly away from member 37.

Body member 32 includes a pair of blind passageways 90 (see FIG. 2) therein having axes parallel to the axis of the piston assembly 36 and extending from the top of reservoir portion 42 downwardly to a point upwardly adjacent the lower end of portion 42. Plugs 92 are sealingly received within the respective upper ends of passageways 90. An annular fluid reservoir 94 is defined between the outermost periphery of sleeve 34 and the innermost periphery of body member reservoir portion 42. A lateral passageway 96 communicates between reservoir 94 and passageways 90 adjacent the respective lowermost ends thereof. The open portion of body member 32 interiorly of sleeve 34 and adjacent thereto defines the piston chamber 98. Passageways 90 communicate with chamber 98 by means of passageways 100. Passageways 100 include a lower portion 102 which extends transversely inwardly from passageway 90 downwardly adjacent the upper end thereof and a generally vertically extending groove portion 104 having the lower end thereof in communication with portion 102. The upper end of portion 104 extends transversely inwardly upwardly adjacent the upper end of sleeve 34 and at the inner end thereof openly communicates with chamber 98 adjacent the upper end of chamber 98.

Body member 32 includes an annular upwardly facing transverse spring seating surface 106 which is formed on the outer periphery thereof at the intersection of portions 40 and 42. As shown, spring group 22 includes a plurality of standard springs 108 and a body spring 110 which replaces a standard spring 108 and positions, retains and cooperates with snubber 30 in a manner as described hereinafter. In position the upper end of spring 110 engages the standard bolster 20 and the lower end thereof engages the spring seating surface 106 in a manner that snubber 30 is biased into position with the lower radially downwardly extending surface of closure and bearing member 37 engaging the top surface 112 of the bottom member of the standard side frame 24. It is to be noted that the structure and passageway configuration of snubber 32 permits the captive and frictional retention thereof without any alteration to the standard bolster 20 and the standard side frame 24 and without any direction connection between the snubber 30 and the side frame 24 and/or bolster 20. Still further the annular configuration of reservoir 94 reduces snubber eccentricity and alleviates the necessity of a snubber retention or centering plate on the side frame or bolster as was required in the aforementioned copending U.S. Patent Application Ser. No. 134,126. Furthermore, it is to be noted that the portions of the outer periphery of snubber 30 having springs from spring group 22 adjacent thereto have a radially inwardly extending arcuate configuration thereby providing clearance for the standard springs 108 while simultaneously providing maximum utilization of available space for the volume of the reservoir 94. In the embodiment of snubber 30 illustrated the snubber 30 releases an outside spring in the spring group 22, thus only the three sides thereof having standard springs 108 adjacent thereto have an arcuate configuration; however, it is contemplated that a snubber constructed according to the principles of this invention can be utilized to replace an internal spring in a spring group 22 and hence all four sides thereof would have a radially inwardly extending arcuate configuration to provide clearance for the springs laterally adjacent thereto.

When the snubber **30** is assembled with the body spring **110** it extends between the side frame **24** and the bolster **20** as seen in FIG. **6.** Also, as seen in FIG. **7** when the snubber **30** is in position in an unloaded car the engaging surface of bolster **20** will be spaced upwardly at line A—A out of engagement with respect to the uppermost extent of piston rod **64.** Hence, there would be very little or no action of the snubber **30** even if the car should bounce somewhat or rock slightly as it was being propelled along the rails. The next horizontal line, namely B—B, represents the normal position of the engaging surface of bolster **20** with respect to the uppermost extent of piston rod **64** wherein piston rod **64** is in engagement with the engaging surface of bolster **20** adjacent thereto. It is seen that at this time the heretofore fully upwardly extended piston assembly **36** will be forced downwardly into the chamber **98.**

Snubber **30** is filled by turning it upside down removing member **37** and pouring in a sufficient quantity of suitable hydraulic snubbing fluid such that chamber **98** will be completely filled and reservoir **94** will be filled with hydraulic snubber fluid to the level shown FIG. **1** when the snubber **30** is operational and fully extended. When snubber **30** is operational and compressed the level of hydraulic snubber fluid in reservoir **94** will be substantially as shown in FIG. **2.** It is to be noted that the level of hydraulic snubber fluid in reservoir **94** when the snubber is fully extended will be above lateral passageway **96.** In other words lateral passageway **96** will be continuously below the level of hydraulic fluid in reservoir **94** regardless of the position of piston assembly **36.**

With snubber **30** filled with hydraulic fluid as described hereinabove the operational parameters and characteristics are essentially the same as those described in the aforesaid U.S. Patent Application Ser. No. 134,126. Accordingly, for a detailed description of the operational data of snubber **30** reference is hereby made to said Application Ser. No. 134,126.

An additional feature of the present invention resides in the fact that body member **32** is cast as a unitary piece of nodular iron. Accordingly, no welds are necessary in the assembly of snubber **30.** The assembly and disassembly of snubber **30** is accomplished by the mere insertion and removal of snap ring **30.** Furthermore, casting the body member **32** in nodular iron alleviates the necessity of having a bearing assembly intermediate opening **43** and the piston rod **64** which is reciprocable therein.

A preferred embodiment constructed according to the principles of this invention having hereinbefore been described it is to be realized that variations in the structure embodying the principles of this invention are possible without departing from the scope of such principles, for example, the fit between member **37** and opening **52** can be tight thereby providing for the sealing retention of member **37** within opening **52** solely by frictional engagement with no requirement for additional retention means such as snap ring **60.** It is thereby respectfully requested that this invention be interpreted only in accordance with the scope of the claims appended hereto.

What is claimed is:

1. A snubber device comprising: a hollow housing; an annular cylindrical member releasably and rigidly received within said housing; a circumferential fluid reservoir defined by the inner periphery of said housing and substantially the entire outer periphery of an upstanding portion of said cylindrical member which is spaced therefrom; a piston assembly axially reciprocable within said cylindrical member; passageway means communicating between said reservoir and the interior of said cylindrical member adjacent the uppermost portion of said cylindrical member; said interior of said cylindrical member, said passageway means and said reservoir defining a closed hydraulic system for retaining a hydraulic fluid therein; and said passageway means being in communication with said reservoir below the operating level of the hydraulic fluid in said reservoir.

2. A snubber device as specified in claim **1** wherein said passageway means is formed within the wall of said housing.

3. A snubber device as specified in claim **2** wherein a portion of said passageway means comprises a radially inwardly and vertically extending groove within the wall of said housing.

4. A snubber device as specified in claim **3** wherein a portion of the outer periphery of said cylindrical member is adjacent said groove.

5. A snubber device as specified in claim **1** including means disposed within said housing intermediate the lower end thereof and said piston assembly which biases said piston assembly upwardly.

6. A snubber device as specified in claim **1** wherein the lower end of said housing sealingly receives a housing closure member therein.

7. A snubber device as specified in claim **6** wherein said closure member includes an upwardly open annular seating groove therein, said seating groove being adapted to seat the lower end portion of said cylindrical member therein.

8. A snubber device as specified in claim **1** wherein said housing closure member is solely frictionally retained within the lower end of said housing.

9. A snubber device as specified in claim **1** wherein said piston assembly comprises a piston head and a piston rod and said housing includes an inner peripheral seal adjacent the upper end thereof, and said peripheral seal maintains the hydraulic fluid within said housing by maintaining a seal between said housing and said piston rod which is reciprocal through the upper end of said housing.

10. A snubber device as specified in claim **1** which is adapted to be interposed in a spring group intermediate a bolster member and a side frame member and said housing includes a peripheral portion concaved inwardly to provide clearance for the springs of such a spring group which are adjacent thereto.

11. In a railway truck assembly in which a fluid snubber assembly having a pair of elongated sections telescopically movable with respect to each other along a longitudinal axis thereof is interposed in the spring group intermediate a bolster member and a side frame member, the improvement comprising: said snubber assembly including a radially outwardly and circumferentially extending fluid reservoir; and said reservoir including at least one peripheral portion which is concaved radially inwardly to provide clearance for the springs of said spring group which are transversely adjacent thereto.

12. A railway truck assembly as specified in claim 11 wherein said reservoir has a generally annular configuration.

13. A railway truck assembly as specified in claim 12 wherein said snubber assembly is a hydraulic snubber assembly.

14. In a fluid snubber assembly having a pair of elongated sections telescopically movable with respect to each other along a longitudinal axis thereof and adapted to be interposed in the spring group of a railway truck assembly intermediate a bolster member and a side frame member, the improvement comprising: said snubber assembly including a radially outwardly and circumferentially extending fluid reservoir; and said reservoir including at least one peripheral portion which is concaved radially inwardly to provide clearance for the springs of such a spring group which are transversely adjacent thereto when said snubber assembly is interposed in such a spring group.

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