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Anderson et al.

[11] **3,726,419**

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[54] **RAILWAY CAR HYDRAULIC CUSHIONING UNIT WITH SPRAY TYPE DISCHARGE PORTS**

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[52] **U.S. Cl.** .....**213/43,** 188/298, 188/315, 188/322, 267/64 A

[51] **Int. Cl.** **B61g 9/16,** B61g 11/12

[58] **Field of Search**.....213/8.43; 267/64 R, 267/64 A, 65 R; 188/269, 298, 315, 322

[56] **References Cited**

UNITED STATES PATENTS

3,275,164	9/1966	Peterson	213/43
3,334,757	8/1967	Peterson	213/43
3,307,842	3/1967	Ellis, Jr.	267/64 A
2,222,844	11/1940	Johnson	188/269

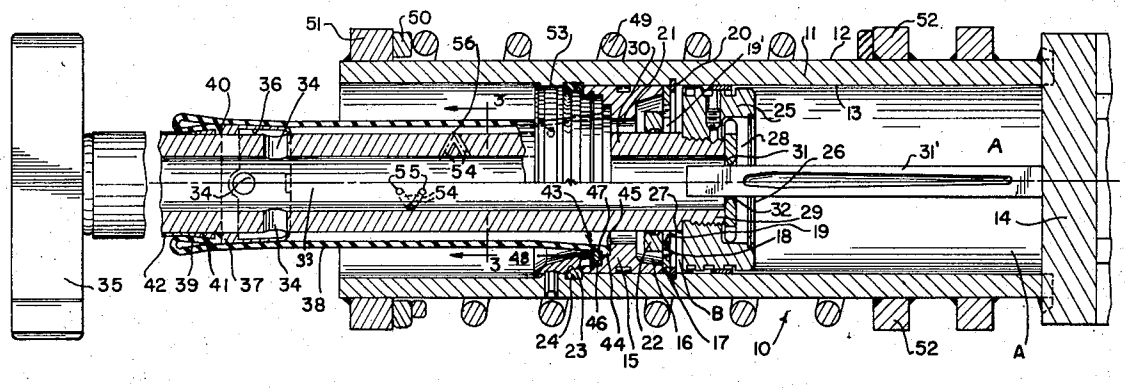
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[57] **ABSTRACT**

A railway car cushioning unit comprises a cylinder and piston and piston rod assembly reciprocally positioned therein. The cushioning unit is provided with a high pressure chamber and a draft chamber both of which are in communication with a flexible boot type reservoir. The piston rod moves through a bore provided in the cylinder head and the boot type reservoir also provides a dynamic seal for the chambers. A piston is provided with an elongated passage which communicates with the high pressure chamber through a metering orifice. Ports are provided for communicating the passageway with the flexible boot for the passage of fluid therebetween. The ports are of a configuration which provides a dispersed spray during the movement of the fluid between the passageway and chambers to the reservoir.

4 Claims, 3 Drawing Figures



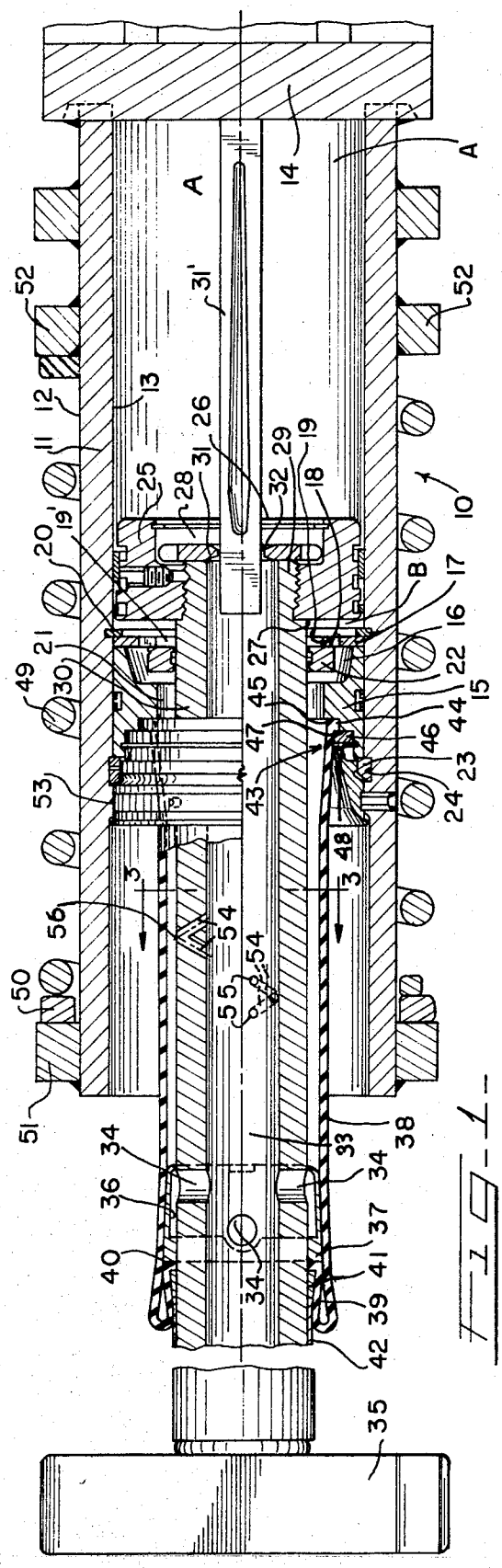


FIG-1

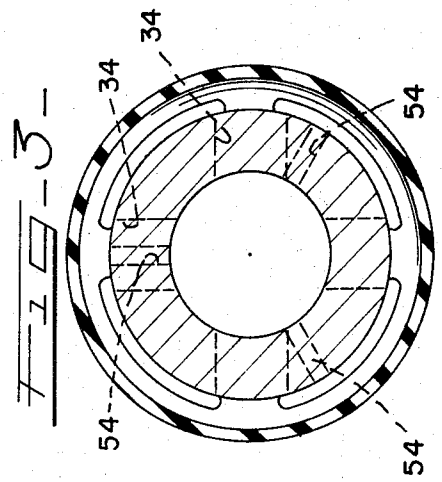


FIG-3

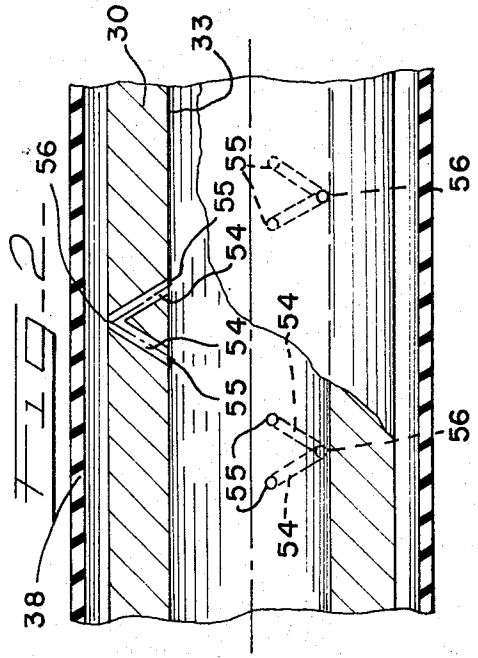


FIG-2

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RAILWAY CAR HYDRAULIC CUSHIONING UNIT WITH SPRAY TYPE DISCHARGE PORTS

CROSS REFERENCES TO RELATED APPLICATIONS

Willis H. Knippel — U.S. Pat. No. 3,568,856, dated Mar. 9, 1971.

Knippel et al. — U.S. Pat. No. 3,651,953, dated Mar. 28, 1972.

Spence et al. — Ser. No. 116,049 filed Feb. 19, 1971.

Shaver et al. — Ser. No. 116,048 filed Feb. 17, 1971.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The field of invention is in the art of railway cushioning devices of a type used either with a sliding sill or in a stationary sill at opposite ends of the car. More specifically, the present invention relates to end-of-car cushioning devices which are connected to a suitable coupler and provide for energy dissipation through hydraulic means.

2. Description of the Prior Art

The prior art is well disclosed in the Peterson U.S. Pat. No. 3,275,164 patented Sept. 27, 1966 and U.S. Pat. No. 3,334,757 patented Aug. 8, 1967, which relate primarily to cushioning devices wherein the reservoir or low pressure chamber comprises a flexible boot which is connected at one closed end to the piston rod and is also connected at the other open end to a cylinder head through which the piston slides. The boot also eliminates the need of a sliding seal on the cylinder head.

SUMMARY

It is a primary object of the present invention to provide an improved cushioning unit including a flexible boot or dynamic seal and reservoir assembly wherein fluid is directed between high pressure and draft chambers through a passage within a piston rod. The piston rod includes an improved porting arrangement. The piston rod is provided with a plurality of diverging bores which intersect one another within the wall of the piston rod. The porting arrangement which is provided by the intersecting bores functions to provide a metered draft control during train operation. The ports provide for a dispersed plurality of sprays of fluid into the boot thus eliminating potential damage which could occur due to the high velocity forces. Non-dispersed fluid flow could result in jet impingement against the said boot structure thereby damaging the same.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross-sectional view through a hydraulic cushioning arrangement;

FIG. 2 is an enlarged cross-sectional view of a porting arrangement provided in a piston rod; and

FIG. 3 is a cross-sectional view taken along the line 3—3 of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now particularly to FIG. 1, a hydraulic cushioning unit particularly well-adapted for railway cars is designated by the reference character **10**, and includes a hydraulic cylinder **11** comprising an outer peripheral wall **12** and an inner peripheral wall **13**. One end of the cylinder **11** is closed by a cylinder head **14** and a second cylinder head **15** is disposed within the cylinder **11** toward its other end. The second cylinder head **15** also includes a cavity or pocket **16** in which a valve retainer plate **17** is positioned. THe plate **17** includes inwardly extending projections **18** which are circumferentially spaced to provide a plurality of openings **19** communicating with opening **19'**. A snap ring **20** secures the retainer plate **17** in position in the cavity **16**. The cylinder head **15** also comprises an axially extending bore or passage **21**. A valve plate **22** is positioned within the cavity **16** and is axially movable therein.

A retainer ring **23** is supported within an annular groove **24** formed in the inner walls **13** and projects inwardly into engagement with one end of the second cylinder head **15** for retaining the same against snap ring **20**.

A piston **25** includes opposite sides **26** and **27**. The side **26** faces a high pressure chamber A and the side **27** faces a draft chamber B. The piston **25** is reciprocally positioned within the cylinder **11** and includes a cavity **28**. A threaded end portion **29** of a piston rod **30** is rigidly secured to the piston **25** and a metering valve plate **31** is disposed in the cavity **28** and movable axially therein. The valve plate **31** includes a metering orifice **32** adapted to meter fluid to a passageway **33** provided in the piston rod **30**. A fluted metering pin **31'** is connected to the cylinder head **14** and projects through the metering orifice **32** to provide for the metered flow of fluid from chamber A into the passageway **33**. A plurality of ports **34** are provided near the opposite end of the piston rod **30** to which is connected a base plate **35**. The rear ports **34** are suitably shielded by means of a deflector **36** including openings (not shown) to deflect fluid flowing through the ports **34** into a flexible boot or reservoir **38**. The deflector **36** also includes a shoulder **37** which is adapted to engage a reversely folded end portion **39** of the flexible reservoir **38** to rigidly and sealingly secure the same to the piston rod **30**. The deflector **36** is more specifically described in above patent application, Ser. No. 116,047, filed Feb. 17, 1971. The folded end portion **39** is provided with a flange **40** which is clamped between the shoulder **37** and a collar **41** rigidly connected to the piston rod **30** and thereby securely and sealingly connects the end of the flexible boot **38** to the piston rod **30**.

The other end of the flexible reservoir **38** is provided with an open end portion **43** which also includes a peripheral flange **44** which is clamped against a shoulder **45** of the second cylinder head **15**. A securing ring **46** engages one side of the flange **44** and is held against a shoulder or step portion **47** of the intermediate cylinder head **15**. A snap ring **48** secures the ring **46** in position.

The cylinder **11** and piston and piston rod assembly may be returned to the position shown in FIG. 1 from a former closed position by means of a coil spring **49** which is disposed about the outer wall **12** of the cylinder **11**. A slide ring **50** is disposed between one end of the spring **49** and stops **51** provided on the cylinder **11**. The other end of the spring **49** is retained by means of stops **52** provided on the outer wall **12** of the cylinder **11**.

As best shown in FIGS. 2 and 3, an improved porting arrangement is shown by means of a plurality of converging bores **54** which are in communication at laterally spaced points with the passageway **33** by means of openings **55**. The converging bores **54** meet or intersect within the wall of the piston rod **30** and provide a single opening **56** for each of the sets of converging bores **54** to communicate with the interior of the flexible boot **38** and draft control chamber.

THE OPERATION

The hydraulic cushioning unit disclosed in FIG. **1** may be utilized as an end-of-car cushion disposed at opposite ends of a conventional center sill of a railway car. Each cushioning unit has its cylinder head **14** suitably connected to a yoke and coupler arrangement and the base plate **35** is suitably rigidly connected against longitudinal movement within the center sill. The cylinder **11** is movable relative to the piston **25** and the sliding ring **50** may be suitably engageable with stops provided on the center sill so that during movement of the cylinder **11** the spring **49** is thereby compressed and which later again returns the cylinder **11** to its open position. Upon an impact on the cylinder the same moves to the left as shown in FIG. **1** whereupon fluid in the high pressure chamber A is metered through the metering orifice **32** into the passageway **33**. Fluid flows through the ports **34** and through the deflector **36**, as best described in the aforementioned related applications, Ser. Nos. 116,047 and 116,048. Fluid also flows from the passageway **33** through the converging bores **54** and outwardly through the openings **56**. By virtue of the converging relation of the bores **54** a finely divided spray results as it emerges through the openings **56** into the boot **38**. This eliminates jet impingement which would be effected by a single bore against the boot **38**, and thus cause possible damage. By virtue of the arrangement, fine spray streams prevent damage to the boot and assures long maintenance-free life. During the impact stroke fluid flows through the bore **21** past the valve retainer plate **17** and to the draft chamber B on the side **27** of the piston **25**. The operation of the valve plate **22** is not described in detail since this is clearly disclosed in the above referenced related applications. The primary function of the intersecting bores **54** and related openings or ports **55–56** is to control draft motion of the two-way end-of-car cushioning unit disclosed. These ports during draft provide a metered flow of fluid from the draft chamber B into chamber A through the passageway **33**. The invention resides in the intersection of the bores **54** within the wall of the piston rod to thereby decrease the velocity flow of fluid from the ports **56** during the buff forces, at which time these ports have moved into boot or reservoir and direct impingement of high velocity could be damaging to the wall of the flexible reservoir.

During train operations wherein the piston of the end-of-car cushioning units are constantly reciprocating, there is thus continued movement in buff and draft directions. The piston may be positioned in a manner wherein the ports **56** are all disposed in the draft chamber B. As the piston moves back and forth there is constant metered flow through the ports **56** and upon a sudden sustained buff impact these ports **56** may be within the boot reservoir and fluid flow from the passage **33** now is outwardly of the ports **56** into the boot reservoir. It is at this time that the dispersed lower velocity flow which is provided by the invention is effective to reduce possible boot damage. The number of the ports **56** and bores **54** is determined by the draft control requirements. Thus more or less may be utilized.

Thus the primary objective of the invention has been achieved by the converging arrangement of the bores which provide for a very well dispersed spray of fluid when fluid is going from the passageway **33** to the flexible reservoir **38**.

What is claimed is:

1. In a hydraulic cushioning device for railway cars including:
- a hydraulic cylinder including a first cylinder head adjacent one end thereof,
- a second cylinder head disposed within said cylinder between an opposite open end of said cylinder and said first cylinder head,
- said second cylinder head having a longitudinal opening therethrough,
- a piston slidingly positioned between said cylinder heads and providing on one side of said piston a high pressure chamber,
- a piston rod connected to said piston and positioned for sliding movement through said longitudinal opening,
- said rod having a passageway,
- metering means between said piston and said high pressure chamber providing for the metered flow of fluid from said chamber through said passageway during a buff impact,
- a flexible tubular reservoir having an open end portion,
- means sealingly connecting the other end of said tubular reservoir to said piston rod,
- second means connecting the open end portion of said reservoir to said second cylinder head, to provide for communication between said reservoir through said longitudinal opening with a draft chamber disposed on an opposite side of said piston, the improvement comprising:
- diffusing means including first and second bores intersecting within said piston rod and communicating with said passageway and said reservoir to convey fluid from said draft chamber and to disperse the same to said reservoir in a spray configuration.

2. The invention in accordance with claim **1**,
- said bores having openings laterally spaced at their point of communication with said passageway and at their point of communication with said reservoir providing a single opening.

3. The invention in accordance with claim **1**,
- with said bores at their point of communication with said passageway being laterally spaced and providing a pair of openings, and
- said bores converging and intersecting each other in said piston rod at a point providing a single opening communicating directly with said reservoir.

4. The invention in accordance with claim **1**,
- said bores being disposed in relative converging relation.

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