

United States Patent

Shaver et al.

[15] 3,679,069

[45] July 25, 1972

[54] **FLEXIBLE BOOT TYPE HYDRAULIC CUSHIONING UNIT WITH BOOT PROTECTOR**

3,458,054 7/1969 Thompson.....213/43
3,568,856 3/1971 Knippel.....213/43

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[21] Appl. No.: **116,048**

[57] **ABSTRACT**

[52] U.S. Cl.....213/43, 188/269, 188/298, 188/315

[51] Int. Cl.....B61g 9/12

[58] Field of Search.....213/8, 43; 267/64 R, 64 A, 267/65 R; 188/269, 298, 315, 322

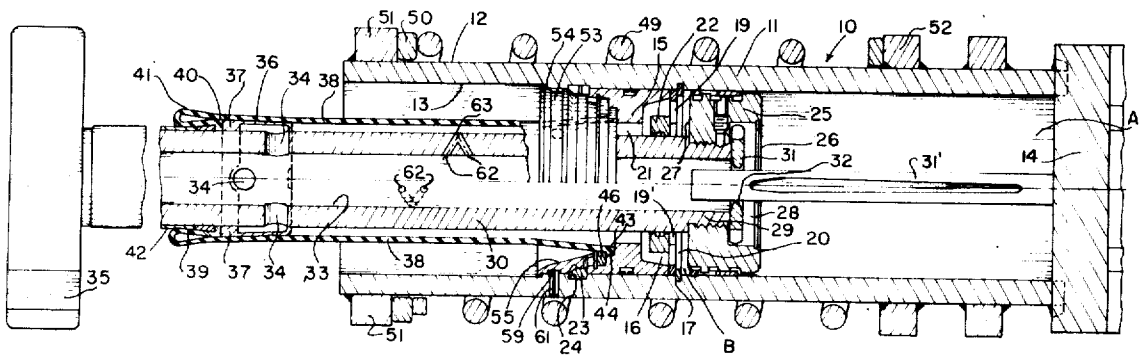
A railway car hydraulic cushioning unit includes a cylinder and piston assembly wherein a low pressure reservoir comprises a flexible boot which is constructed to eliminate sliding seals between the piston rod and an intermediate cylinder head. The boot is connected at one closed end to the piston rod and is connected at its other open end to an intermediate cylinder head. Adjacent the point of connection of the open end portion of the boot to the cylinder head a boot protector is provided which during reciprocation of the piston and piston rod assembly protects the flexible boot adjacent its point of connection against possible damage and rupture.

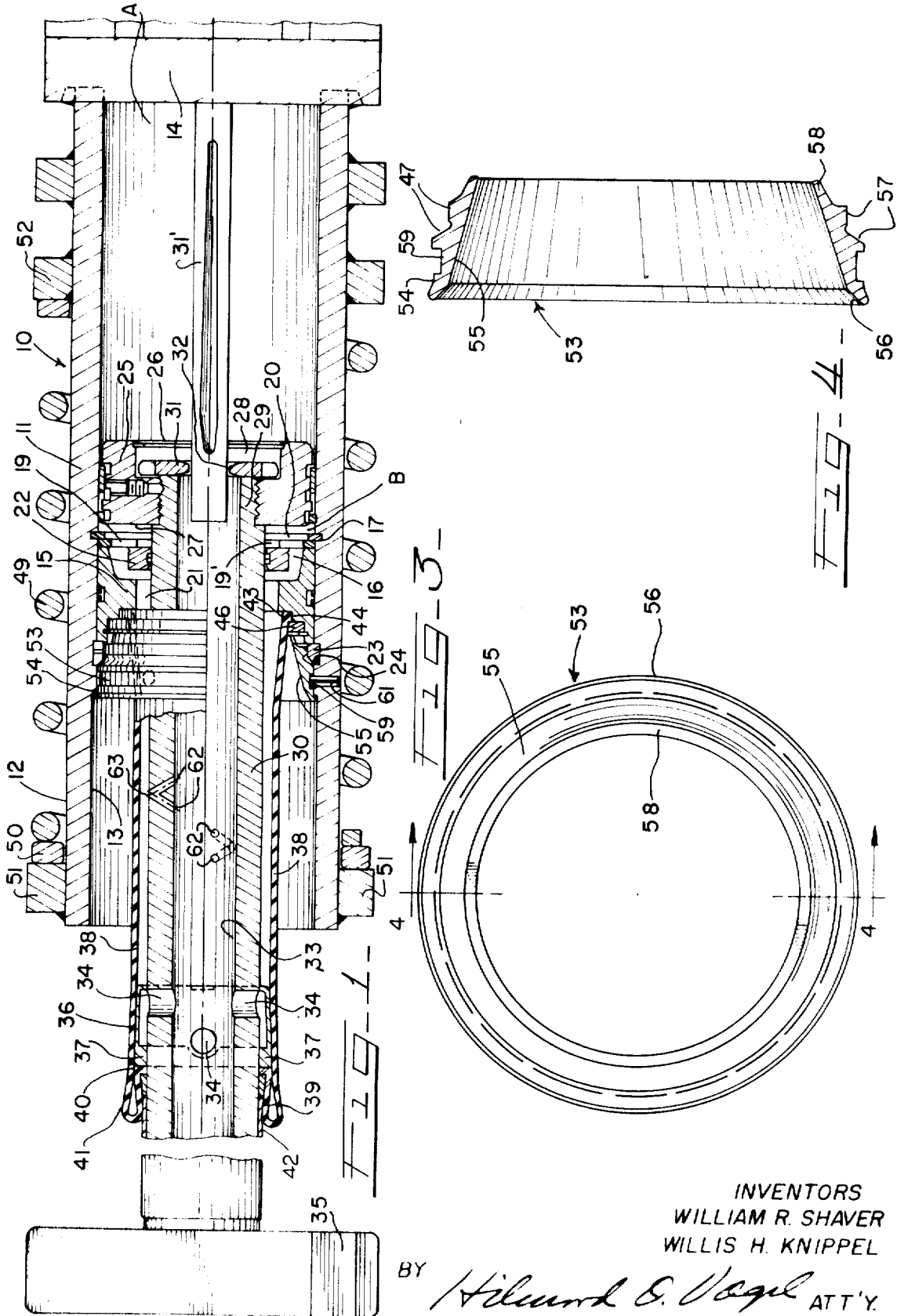
[56] **References Cited**

UNITED STATES PATENTS

3,275,164 9/1966 Peterson.....213/43
3,334,757 8/1967 Peterson.....213/43

5 Claims, 4 Drawing Figures





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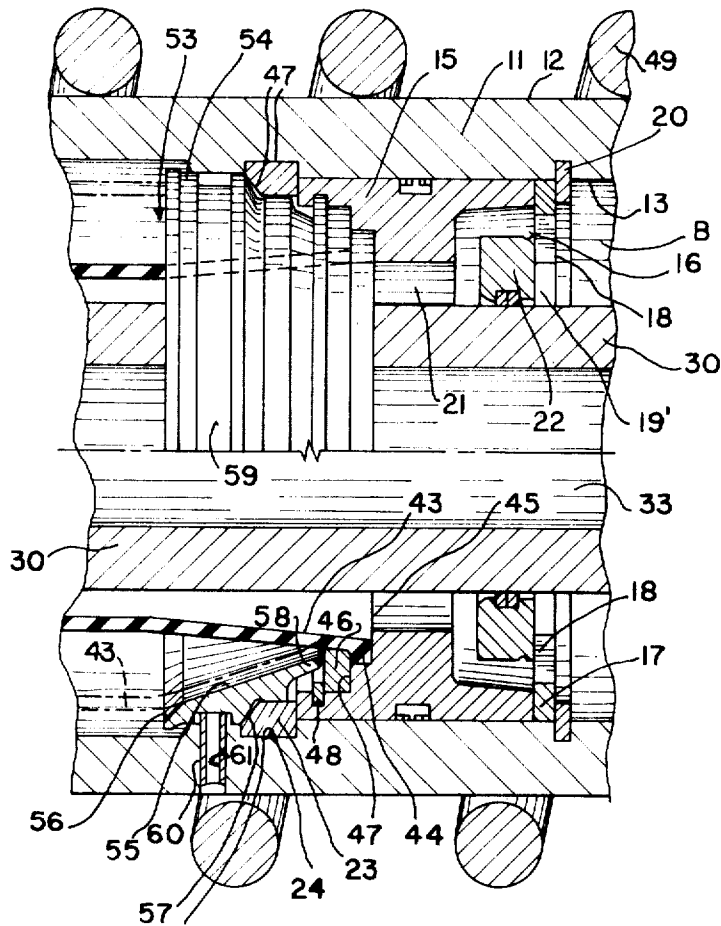


FIG. 2

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FLEXIBLE BOOT TYPE HYDRAULIC CUSHIONING UNIT WITH BOOT PROTECTOR

CROSS REFERENCES TO RELATED APPLICATIONS

Willis H. Knippel—Ser. No. 843,429, Filed July 22, 1969 now U.S. Pat. No. 3,568,856
 Knippel et al.—Ser. No. 42,109, Filed June 1, 1970 now U.S. Pat. No. 3,651,953
 J. H. Spence et al.—Ser. No. 116,047 Filed Feb. 17, 1971
 S. A. Anderson et al.—Ser. No. 116,186 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. Nos. 3,275,164 patented Sept. 27, 1966 and 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 prime object of the present invention to provide an improved protective device which will prevent damage to the flexible boot or reservoir of a hydraulic cushioning unit. The type of device to which the present invention pertains includes an open end which communicates with a low pressure chamber at one side of a reciprocating piston and is connected at said open end to a cylinder head provided at one end of a hydraulic cylinder. The connecting means for the open end portion of the flexible reservoir or boot is particularly susceptible to damage which might occur if the boot comes into contact with edges of connecting elements or portions thereof contained within the cylinder for suitably connecting the open end of the boot in position. During operation flexible reservoirs of this type have a tendency to enlarge or expand by virtue of the large volume of fluid and high pressure which occurs from movement of the fluid from a high pressure chamber through the reservoir and to a low pressure chamber. To prevent damage to the flexible boot a boot protector is provided in the form of a sleeve which is secured within the cylinder adjacent a cylinder head and point of connection of the open boot portion to said cylinder head. The protector includes an inner cylindrical surface which is smooth and which extends circumferentially in a manner wherein any sharp edge portions of suitable connecting means for the boot are covered and damage to the flexible boot is eliminated.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side sectional view of a hydraulic cushioning unit;
 FIG. 2 is an enlarged cross-section through a cylinder and intermediate cylinder head having a boot protector connected thereto;
 FIG. 3 is an end elevational view of a boot protector; and
 FIG. 4 is a cross-sectional view taken along the lines 4—4 of FIG. 3.

DETAILED DESCRIPTION

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 a front or high pressure side 26 and a rear or low pressure side 27. 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 a high pressure 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 U.S. Pat. application, Ser. No. 116,047. 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.

A boot protector element 53, as best shown in FIGS. 1 and 2 includes an outer wall 54 and an inner tapering wall 55 provided at one end with a circumferential flange 56. The outer wall 54 is provided with an undercut or annular portion 57 within which a portion of the retainer ring 23 is seated and retained therein. The deflector is also provided with a peripherally extending edge 58 axially spaced from flange 56. The edge 58 is disposed at a point radially inwardly spaced from the snap ring 48. As best indicated in FIG. 2 in the broken lines, the open end portion 43 of the boot 38 during operation will assume the position shown against the inner tapering wall 55 which is substantially smooth and uninterrupted and thereby the wall 55, the flange 56, and the edge 58 are disposed over the points of potential damage, namely, the snap ring 48, the retainer ring 23, etc. In other words, the surface 55 protects the open end portion 43 of the flexible boot 38.

The outer wall 54 is also provided with a circumferentially extending groove 59 within which one or more tubular pins 60 may be positioned by inserting the same through bores 61. In addition to the ports 34 converging bores 62 are provided in the piston rod 30 and these also direct the flow of fluid from the passageway 33 into the reservoir 38 by means of single spray openings 63 which are described in more detail in the aforementioned related U.S. Pat. application, Ser. No. 116,186.

THE OPERATION

In the operation, the cushioning unit shown in FIG. 1 is suitably disposed at opposite ends within the stationary center sill of a railway car. The cylinder head 14 may be connected to a suitable car coupler and during impact the cylinder head 14 moves toward the base plate 35 which is rigidly positioned on a center sill in conventional fashion. The impact against the coupler and cylinder head 14 causes the flow of fluid from the chamber A through the metered opening 32 into the passageway 33 and outwardly through the ports 34 and 62 into the boot or reservoir 38 whereupon the flow of fluid is through the opening 21 of the intermediate cylinder head 15 and through the opening 19 into the low pressure chamber B disposed on the side 27 of the piston 25. Thus the impact is absorbed and upon the completion of the buff stroke the spring 49 suitably returns the cylinder 11 to the position shown in FIG. 3. Suitable stops 51 and 52 are provided on the center sill in conventional fashion so that the ring 50 may be secured and upon movement of the cylinder 11 through the ring 50 the spring 49 is compressed and the stored compressive force also returns the cylinder 11 to its original position. The operation of the valve plate 22 is described in the aforementioned patent application and need not be further described herein. The present invention residing in the particular type of deflector 53 clearly disclosed as providing for protection of the open boot end to minimize danger of damage to the boot which might occur during ballooning of the boot or expansions against rough edges which may be present on the retainer ring 23 or other securing parts associated with the second cylinder head 15.

Thus the objective of the invention has been fully achieved. 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 slidably 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 low pressure chamber disposed on an opposite side of said piston,
- said piston rod having aperture means extending substantially radially to provide for the flow of fluid to said reservoir from said high pressure chamber during a buff impact, the improvement comprising:
- protector means for the open end portion of said flexible reservoir including:
 - a cylindrical sleeve having an outer circumferential wall connected within said cylinder, and
 - an inner circumferential wall extending axially and having a smooth surface engageable by said open end portion of said reservoir during operation of said device.
- 2. The invention in accordance with claim 1,
- said inner wall diverging from said second connecting means and overlapping said open end portion.
- 3. The invention in accordance with claim 2,
- said connecting means including a retainer ring disposed on said second head to clampingly retain said open end portion, and
- said inner wall diverging from a position disposed radially inwardly and in substantially vertical alignment relative with respect to an inner circumferential edge of said retainer ring.
- 4. The invention in accordance with claim 3,
- including a clamping ring disposed in an annular groove within the inner surface of said cylinder,
- said clamping ring projecting inwardly from said surface and engaging and retaining said second head within said cylinder,
- said sleeve having an outer circumferential wall including an annular undercut within which said clamping ring is disposed to retain said sleeve against longitudinal movement within said cylinder.
- 5. The invention in accordance with claim 4,
- said outer wall including a circumferentially extending groove longitudinally spaced from said undercut, and
- removable securing means extending through said cylinder and engaging said groove.

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