RAILWAY CAR CUSHIONING DEVICE


Assignee: Pullman Incorporated, Chicago, Ill.

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References Cited

UNITED STATES PATENTS

3,534,871 10/1970 Rumsey 213/43

2,984,113 5/1961 Ransom 151/24

Primary Examiner—Drayton E. Hoffman

Attorney—Hilmont O. Vogel and Wayne Morris Russell

ABSTRACT

A cushioning device includes a cylinder open at one end and closed at the other by means of a cylinder head to which a coupler yoke is connected. An intermediate head within the cylinder is provided with a bore through which a piston rod reciprocates. The piston rod is of hollow construction and with the intermediate cylinder head and a flexible boot provides a low pressure accumulator chamber. The piston rod is threaded into a bore provided in a piston. The piston includes a radial threaded bore which contains an expandable plug rigidly engaging the threads of the rod to lock the piston against rotation. A set screw applies pressure to the plug. The radial bore opens outwardly into an annular recess in the piston circumference which contains a nonmetallic piston ring.

The cushioning cylinder also includes a coil return spring which is held captive at one end by a collar and actuating ring adjacent the cylinder head connected to the yoke. The other end of the spring is held captive by a sliding sleeve having an improved spring seat arrangement. The collar and the first cylinder head are provided with aligned bores which contain pins reciprocably positioned so as to compress the spring and secure cushioning in a draft stroke in which the pins are moved into engagement with stops provided on a center sill.

5 Claims, 4 Drawing Figures
RAILWAY CAR CUSHIONING DEVICE

SUMMARY

The present invention is an improvement of co-applicant's patent applications Ser. No. 843,429, filed July 22, 1969, now U.S. Pat. No. 3,568,585 and Ser. No. 799,176 filed Feb. 14, 1969, now U.S. Pat. No. 3,559,618. The primary object of the present invention is to provide an improved cushioning unit for railway cars wherein the piston and rod assembly are removably connected together by means of a locking connection which prevents any possibility of the piston head becoming loosened in assembly during the high pressures to which a railway car cushion unit is subjected during buff and draft impacts. A further provision is an improved return spring arrangement for returning a piston and rod assembly to an original neutral position relative to its cylinder after buff or draft impact operation.

The present improved design is achieved by means of a cylinder having an open end and a closed end with a hollow piston rod and piston assembly projecting outwardly from the open end of the cylinder. The cushion unit is of a type wherein fluid is discharged from a high pressure chamber of the cylinder through the piston head and metering orifice into a flexible accumulator which is connected at one end to the hollow piston rod and at its other end to an intermediate cylinder head through which the piston rod is reciprocated. The piston is securely threaded to a reduced threaded end portion of the piston rod and includes a radially extending opening which contains a suitable plastic deformable plug which is in tight locking engagement with the external thread of the threaded portion of the cylinder rod and is held in said position by means of a set screw disposed in a threaded portion of the bore. The threaded bore is disposed immediately beneath a recess extending peripherally about the piston and containing a non-metallic piston ring which cooperates with an adjacent bronze ring to provide an effective sealing arrangement between the piston and the internal peripheral wall of the cylinder.

A coil spring is held captive and encircles the outer wall of the cylinder. A rigid collar is secured about the cylinder at one end thereof and includes a slidable ring which is displaced during draft impacts by means of pins which extend through the collar and through a cylinder head member for engagement with stops which are normally mounted on the center sill of a railway car and which assembly functions to move the plate or ring into engagement with one end of the coil spring for compressing the same during draft impacts. The other end of the coil spring is seated upon a sliding collar having an improved spring seat arrangement and including a plastic inner ring which during movement of the sliding collar prevents damage to the outer wall of the cylinder.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross-sectional view, with certain portions in elevation, of an improved cushioning unit for railway cars;
FIG. 2 is an enlarged cross-sectional view through a portion of the cushioning unit shown in FIG. 1;
FIG. 3 is a cross-sectional view taken along the line 3—3 of FIG. 1; and
FIG. 4 is a cross-sectional view taken along the line 4—4 of FIG. 1.

DETAILED DESCRIPTION

Referring now to FIGS. 1 and 2, a railway car cushioning device is generally designated by the reference character 10 and includes a cylinder 11 having an outer peripheral surface 12 and an inner cylindrical surface 13. The cylinder 11 is provided with an open end 14 and at its opposite end is closed by a cylinder head plate 15. The cylinder head plate 15 has connected thereto a pair of coupler yoke members 16 to which a conventional railway coupler (not shown) may be connected. The cylinder also is provided with an inner cylinder head 17 which includes a bore 18 extending therethrough. The cylinder head 17 is of a design disclosed in the aforementioned patent applications. A piston rod 19 is reciprocal through the bore 18 and has connected thereto at one end a base plate 21. One end of the piston rod 19 has connected thereto in threaded relation a head member 22 which is disposed in a socket 23 provided within the base plate 21. The threaded head member 22 is connected to the base plate 21 so that the base plate 21 and rod 19 may pivot relatively angularly during use of the cushioning unit.

The piston rod 19 has one end of a rubber or flexible type accumulator boot 24 connected thereto, which in effect provides a low pressure chamber 25. The piston rod 19 is provided with a plurality of passages 26 which provide for communication with the bore 20, the accumulator boot 24 and the low pressure chamber 25. One end of the piston rod 19 is also provided with a reduced diameter threaded portion 27 provided with screw threads 28 and to which a piston 29 is connected. The piston 29 is also provided with a threaded bore 29' within which the reduced diameter portion 27 is secured.

The cylinder 11 also includes a high pressure chamber 30 formed to the right of the piston 29, as indicated in FIG. 1. An annular chamber 31 formed in the piston 29 faces the high pressure chamber 30 and includes a metering valve plate 32 provided with outer apertures 33 permitting for the passage of fluid from the high pressure chamber 30 into the annular chamber 31 and onto the bore 20 of the piston rod 19. The valve plate 32 is also provided with a metering orifice 34, the said plate being confined within the annular chamber 31 by means of a snap ring 35.

The piston 29 is also provided with a radially extending threaded bore 36 opening outwardly onto an inner circumferential surface 37 formed at the bottom of a circumferential recess 38. A piston ring 39 of suitable plastic or other non-metallic material is contained within the recess 38. During assembly when the piston 29 has been threaded onto the reduced diameter portion 27, a cylindrical plug 40 of a non-metallic and resilient material such as plastic, phenolic, etc. is dropped into the bore 36 and the set screw 42 is tightly secured in said bore against the plug to force the lower end of the plug 41 into tight engagement with the threads 28 which may penetrate said lower end 41 to firmly prevent the piston 29 from relative rotation with respect to the piston rod. The upper end 43 of the plug 40 may be suitably apertured and the lower end of the set screw 42 may include a complemental portion which provides for interengagement in a manner to more effectively secure the plug 40 within the bore. In this manner, the piston is effectively secured against rotation.

As best shown in FIG. 2, the plastic piston ring 39 which also may be of a suitable phenolic plastic material is in sliding engagement with the inner surface 13 of the cylinder. A ring 44 of bronze material is also positioned in the recess 38 in engagement with a peripherally extending portion of the piston 29 and one side of the piston ring 39. The plastic material is effective to provide an excellent seal during sliding movement of the piston 29, without any scoring of the inner surfaces of the cylinder. The bronze ring 44 serves the purpose of providing a backup support for movement of the piston ring 39 when high force impacts are applied to the coupler yoke 16 and the cylinder 11. The bronze ring 44 thus prevents the possibility of the plastic material from being, in effect, extruded between the peripheral surface of the piston 29 and the cylinder 11 due to the high pressure forces involved. It has been found that this combination effectively provides for proper sealing, long wear life of the piston ring 39 and the elimination of scoring.

As best shown in FIG. 2, a metering pin 45 is adapted to meter the flow of fluid through the metering orifice 34. The metering pin 45 passes through the head portion 46 suitably secured to the cylinder head 15 by means of screws 47. A collar 48 is rigidly secured about the outer peripheral surface 12 of the cylinder 11. The collar 48, as best shown in FIGS. 2, 3, and 4, is provided with a plurality of longitudinally extending bores 49 in which pins 50 are reciprocally positioned. An actuating
ring 51 enircles the cylinder and is in proximity to the collar 48. The actuating ring 51 is adapted to be engaged by the pins 50 which are adapted to project outwardly from the collar 48. As best shown in FIG. 2, the cylinder head 15 is provided with enlarged bores 52 in which heads 53 connected to the pins 50 are adapted to reciprocate. Pin end portions 54 are connected to the heads 53 and are adapted to project outwardly to the right of the cylinder head 15 as shown in FIG. 2.

The collar 48 and the actuating ring 51 form one end of a spring retaining means on the cylinder and another retaining means in the form of a retaining sleeve or ring 55, as best shown in FIG. 1, is positioned at the other end of the cylinder 11. The sleeve 55 also includes an inner peripheral recess 57 in which a non-metallic slide ring 58 is positioned. The slide ring 58 also permits the sleeve 55 to reciprocate on the outer surface of the cylinder without causing undue wear or scoring of the same. A ring 59 is effective as a stop at the end of the cylinder 11 and a coil spring 60 is held captive between the slide ring 55 and the fixed collar 48.

**THE OPERATION**

In the operation of the cushion unit of the present invention, the same may be inserted at the opposite ends of a conventional railway car under the center sill, schematically designated at 61 in FIG. 3. As shown in FIG. 1, the center sill may have internal stops 64 and 65 so engageable with the base plate 21 as to secure the piston rod and assembly against longitudinal movement with respect to the center sill. Stops 63 are also suitably provided on the internal surfaces of the center sill 61 and are adapted to be engaged by the sliding sleeve 55. The forward opposite ends of the center sill are also provided with inwardly extending stop members, schematically shown at 62 in FIG. 3, which are adapted to be engaged by the ends of the pins 54 during draft impact operation of the cushioning unit. During a buff impact on the yoke members 16, the cylinder 11 is moved to the left in FIG. 1, whereupon the spring 60 is compressed and the metering pin 45 moves through the metering orifice 34 into the hollow piston rod 19. Fluid flows from the high pressure chamber 30 through the metering orifice 34 through the openings 26 into the accumulator chamber and the force of the impact is thus cushioned. In the buff stroke of the unit the valve 32 is moved against the wall of the annular chamber 31 and the apertures 33 are covered. Simultaneously, fluid will flow through the inner cylinder head 17 to a space provided on the left-hand side of the piston 29 as is more fully described in the detailed description of the above mentioned patent applications. Upon cessation of the buff impact, the reverse movement of the cylinder 11 takes place and it returns to the neutral or normal position shown in FIG. 1 in response to the forces created by the spring 60.

In the event of a draft impact, the cylinder 11 is moved to the right of the position shown in FIG. 1 and the fluid provided in the space between the left-hand side of the piston 29 and the right-hand side of the cylinder head 17, is moved through the cylinder head 17 and suitable ports (not disclosed but shown in more detail in the aforementioned patent applications), thus providing for cushioning of a draft impact. The valve plate 32 in the draft stroke is in the position shown in FIG. 2. During a draft impact, the pin ends 54 engage the stop 62 whereupon the engagement of the other ends of the pins 50 cause movement of the actuating ring 51 to compress the spring 60. Upon cessation of the draft impact, the spring returns the piston to its neutral position shown in FIG. 1.

The arrangement of the non-metallic slide ring 58 prevents scoring of the outer surface of the cylinder and the flange 56 of the slide ring 55 prevents the spring also from scoring the outside surface of the cylinder 11.

As best shown in FIG. 2, the phenolic or plastic plug 40 provides an effective clamping means for preventing rotation of the piston 29 relative to the piston rod 19. The tight adjustment of the set screw 42 thus effectively causes the securing action. Also the location of the bore beneath the surface 37 is desirable since the phenolic piston ring 39 is so disposed over the set screw 42 that in no manner can the set screw be effective to cause scoring of the inner wall of the cylinder. The advantage of the bronze ring 44 has been described in that it prevents, during a high pressure stroke, the possibility of the plastic piston ring 39 from being extruded between the outer peripheral surface of the piston and the inner surface of the cylinder.

Thus it is believed that improvements of the invention have been fully disclosed and described. What is claimed is:

1. A cushioning arrangement for a railway car underframe including:

   a. a hydraulic cylinder having an open and a closed end,

   b. a piston and piston rod assembly relatively reciprocal with respect to said cylinder, said rod projecting outwardly through said open end and having one end portion adapted to be rigidly connected to said car underframe,

   c. a flexible fluid accumulator having one end connected to said piston rod,

   d. a cylinder head rigidly positioned within said cylinder and including an opening through which said piston rod reciprocates,

   e. said cylinder on one side of said piston having a high pressure chamber,

   f. said other end of said flexible accumulator being connected to said cylinder head and on the other side of said piston providing a low pressure chamber,

   g. metering means on said piston providing for the metered flow of fluid between said high pressure chamber and said low pressure chamber,

   h. a coupler yoke connected to the closed end of said cylinder for moving said cylinder relative to said piston during impacts, the improvement comprising:

      i. a threaded opposite end portion on said piston rod,

      j. a threaded bore on said piston in which said rod end portion is disposed,

      k. said piston including a radially extending second threaded bore,

      l. a cylindrical plug disposed in said second bore,

      m. screw means within said second bore in engagement with one end of said plug, whereas said other end of said plug is/is engaged against said threaded rod end to rigidly lock said piston and rod against relative rotation,

      n. said piston having a circumferentially extending recess including a circumferentially recessed surface, said second bore opening on said surface, and said piston ring disposed in said recess over said screw means.

2. The invention in accordance with claim 1,

   a. said piston ring being of a plastic material, and

   b. a metallic ring disposed in said recess and engaging one side of said piston ring.

3. The invention in accordance with claim 1,

   a. including a collar connected about the outer peripheral surface of said cylinder substantially adjacent said yoke, an actuating ring on said cylinder adjacent said collar,

   b. a movable retainer sleeve adjacent the open end of said cylinder,

   c. a coil spring held captive between said sleeve and said collar,

   d. stop means on said cylinder head for retaining said sleeve thereon, and

   e. a non-metallic ring carried by an inner peripheral surface of said sleeve and engaging said cylinder in relative sliding relation.

4. The invention in accordance with claim 3,

   a. said sleeve having an undercut annular surface providing a spring seat for one end of said coil spring.

5. The invention in accordance with claim 4,

   a. said closed end of said cylinder including a cylinder head plate having a plurality of longitudinally extending bores registering with longitudinal bores provided in said collar,
actuating pins slidingly disposed in said last longitudinal bores adapted to engage stops provided on the car underframe, and said pins engaging said actuating ring for compressing said spring during a draft impact on said coupler yoke.