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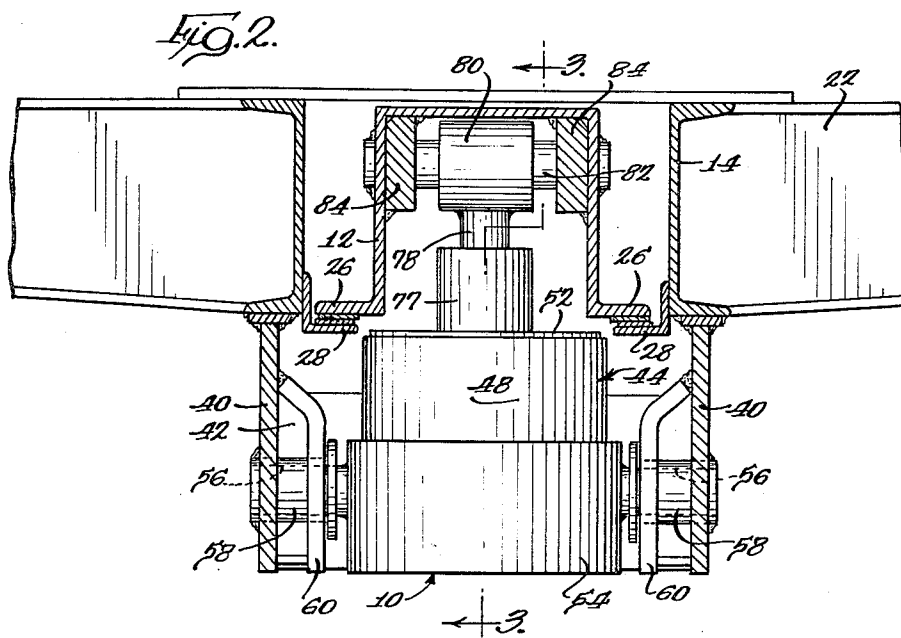
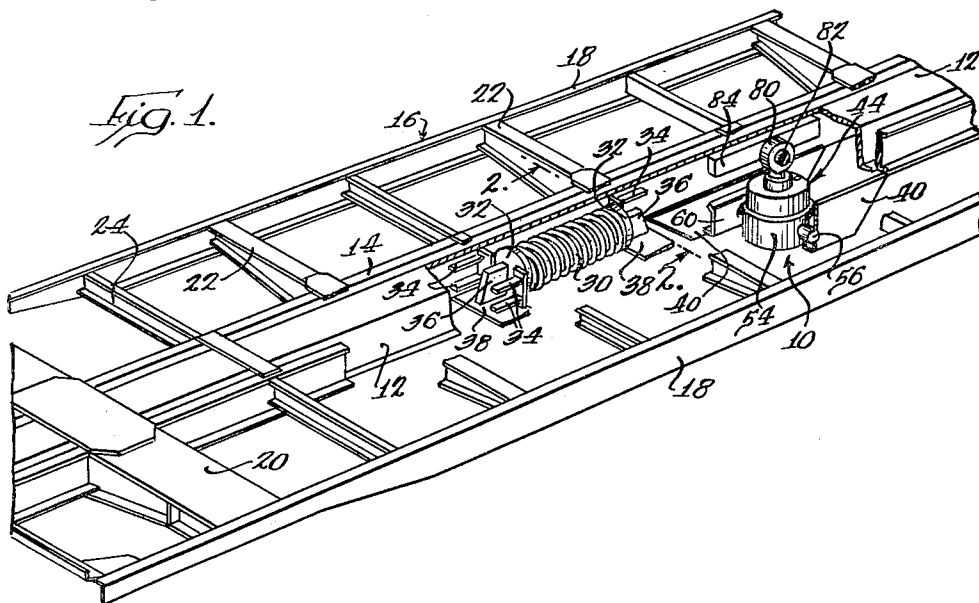
J. T. SMITH ET AL

3,168,201

IMPACT ABSORBING APPARATUS

Filed Sept. 10, 1964

2 Sheets-Sheet 1



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Fig. 3.

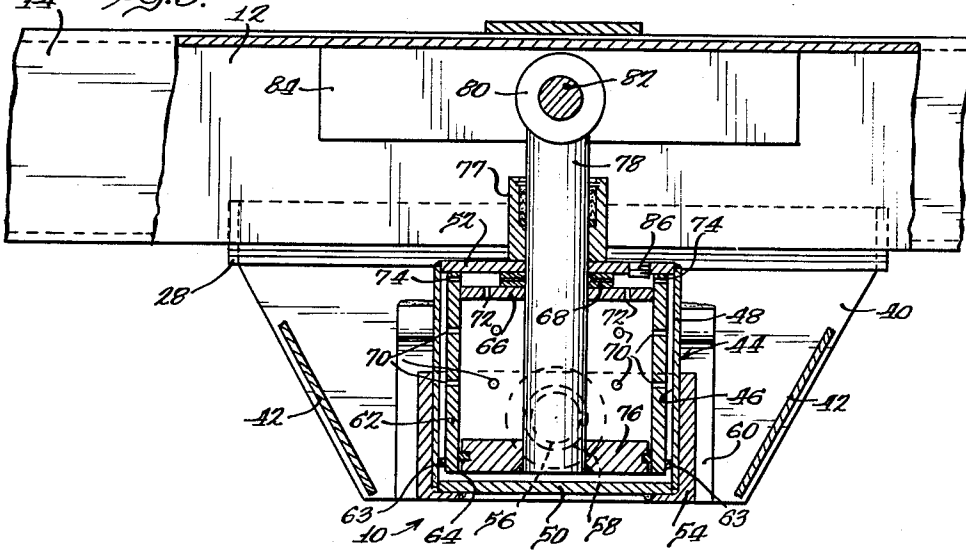
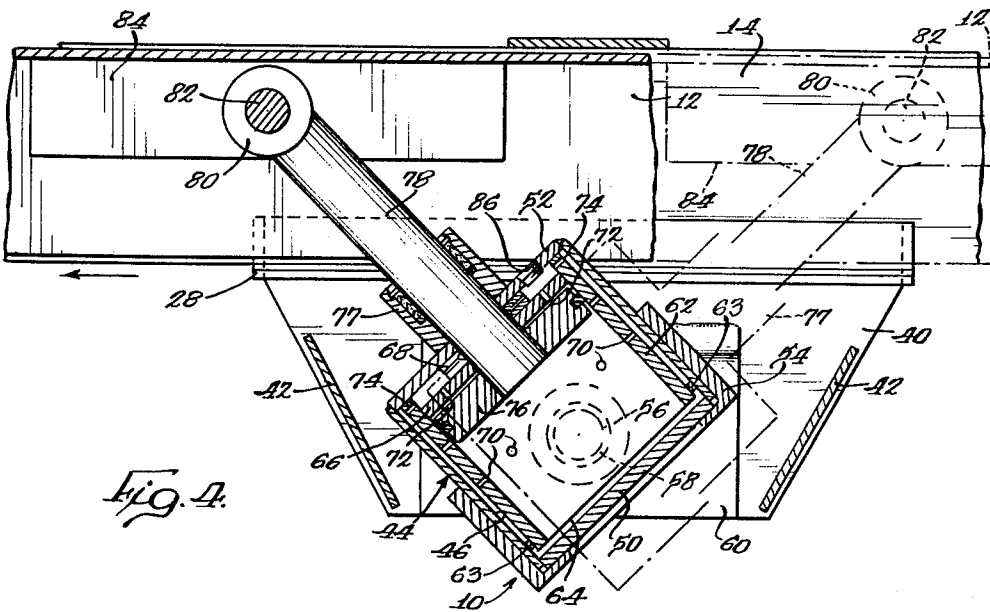


Fig. 4.



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IMPACT ABSORBING APPARATUS

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5 Claims. (Cl. 213—8)

The present invention relates to an impact absorbing apparatus, and in particular to an improved impact absorbing apparatus for railway rolling stock.

Railway rolling stock, particularly freight cars, is subject to appreciable impacts in switch and classification yards where the trains are both broken up and made up. It is customary to attempt to limit the speed of the free rolling cars so that at the time of impact with another car the speed is not more than three or four miles per hour. However, this is not always possible and speeds as high as ten, twelve, or more miles per hour are known. Also coupling speeds of ten, twelve, or more miles per hour are not uncommon in making up the train or picking up cars from sidings, loading docks, and the like.

Tremendous thought, study, and research have been given to the problem of protecting the load or lading against damage from the impacts given to a fully or partially loaded freight car during coupling. The character of the lading itself usually dictates the best way it should be secured in a car. Some of the securing techniques provide for a controlled and limited movement of the load within the car to absorb the coupling or similar impact without damage to the load.

The draft gear connected to the coupler absorbs a part of the shock, but its effectiveness is limited by the severe limitation on the movement of the coupler relative to the remainder of the car. This movement is about two and three-quarter inches so as to minimize the amount of slack in a train that has to be taken up on starting and absorbed on stopping.

It has been proposed to interpose an impact absorbing cushion in the car between the draft gear and the lading which will permit the lading to move up to a certain distance on impact and thereafter be restored to its original or normal position. Alternatively, the impact absorbing cushion is interposed between the center sill for buff and draft and the underframe of the railway car. These cushions are of various designs and permit maximum movement from as little as eight inches up to as much as 40 inches. It is thought by some that the longer the cushion movement the greater the protection afforded to the lading. A principal difficulty with long cushion movement is the projection of the center sill for buff and draft beyond the end of the car a distance of 40 inches more than normal. This of course projects the coupler 40 inches greater beyond the end of the car than theretofore. When cars of this type are coupled into a train, particularly when coupled to each other, difficulties are encountered in sharp curves and it has been found necessary to prevent the routing of such cars over trackage which has such curves. This long projecting sill also makes coupling of these cars extremely difficult unless the coupling is done on straight track.

The present invention is concerned with improvements in impact absorbing cushions whereby whatever advantages exist in long movement may be retained with a cushion movement which is appreciably shorter.

It is therefore a principal object of the present invention to provide a hydraulic impact absorbing cushion between the draft gear and the lading in a freight car, having a movement less than half the maximum movement of long movement devices now available while retaining the load protecting advantages of such devices.

Another object is to provide a hydraulic impact absorb-

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ing cushion between the draft gear and the lading in a freight car, wherein the maximum lading movement is less than 20 inches.

Another object is to provide a hydraulic impact absorbing cushion incorporating a hydraulic cylinder mounted within a fluid reservoir which is pivotally mounted on the underframe of the car with the projecting piston rod pivotally connected to the center sill for buff and draft.

Other objects and advantages will become apparent from the following description taken in conjunction with the accompanying drawings wherein

FIG. 1 is a fragmentary perspective view of the underframe of a railway car partly broken away to illustrate the mounting of the impact absorbing apparatus of the present invention;

FIG. 2 is a fragmentary vertical sectional view on an enlarged scale taken along the line 2—2 of FIG. 1 looking in the direction of the arrows showing the impact absorbing apparatus of the present invention in elevation;

FIG. 3 is a vertical sectional view of the impact absorbing apparatus of the present invention taken along the line 3—3 of FIG. 2 looking in the direction of the arrows and showing the apparatus in the normal position, that is, the position wherein no impact has been given to the railway car; and

FIG. 4 is a sectional view similar to FIG. 3 showing in full lines one extreme position of the impact absorbing apparatus and indicating in phantom lines the opposite extreme position.

Referring to FIG. 1 it can be seen that an impact absorbing device 10 is interposed between a slidable center sill 12 for buff and draft and an underframe center sill 14 within which it is mounted. Underframe 16 includes the conventional side sills 18, bolsters 20, cross bearers 22 and other transverse bracing 24. The bolsters are mounted on the conventional trucks which ride on the rails, and the underframe 16 supports the conventional box or other lading containing structure. Conventional couplers and draft gear (not shown) are carried by the slidable center sill 12.

The slidable center sill 12 as best seen in FIG. 2 has an inverted channel shaped configuration with side flanges 26 which slide on gibs or other guides 28 carried by the underframe center sill 14 and the cross bracing.

The center sill for buff and draft 12 is mounted within the underframe center sill 14, and the two are relatively movable but are biased toward a normal centered position by a heavily loaded spring 30 (6000 pounds, for example) which is confined between a pair of heads 32. The spring 30 biases the heads 32 against stop lugs 34 carried on the movable center sill 12 and against underframe stops 36 which are carried on the underframe structure, such as plates 38 crossing under the movable center sill 12 between the two side portions of the underframe center sill 14. When the center sill 12 is in its normal position with respect to the underframe center sill 14, the heads 32 are abutted at either end of the spring 30 against the stop lugs 34 and the underframe stops 36. When an impact occurs from one end or the other of the car, the spring 30 will be compressed and the center sill 12 will be moved within the frame center sill 14 thereby moving the respective head 32 away from the underframe stop 36 and the center sill lugs 34 away from the other head 32, but they are restored thereto as soon as the effect of the impact has been absorbed by the impact absorbing apparatus 10.

Adjacent the middle of the underframe are a pair of parallel spaced depending plates 40 which are welded to the underside of the underframe center sill 14 and arranged generally vertically and longitudinally of the underframe. As seen in FIGS. 3 and 4 they are trapezoidal in configuration and at their forward and trailing edges are interconnected by cross plates 42 which serve not only

to brace the depending plates 40 but serve as shields for the impact absorbing apparatus.

The impact absorbing apparatus 10 is positioned between the plates 40 and includes a casing 44 defining a reservoir 46 therewithin. The reservoir casing 44 is formed of a cylindrical portion 48 having a bottom 50 and a top 52. The casing components are welded together into the casing 44 and the whole is supported within a trunnion casting 54 to which it is welded.

The trunnion casting 54 has a pair of sidewardly extending trunnions 56 which are fitted into sleeve bearings 58 carried in the depending plates 40 and parallel bracing plates 60 which are spaced inwardly from the plates 40 at their lower ends and in the area of the sleeve bearing 58 but are turned and bent outwardly to be welded at their upper edges to the plates 40. The reservoir casing 44 and therefore the impact absorbing apparatus 10 is pivotally mounted below the center sills 12 and 14 on the depending plates 40.

A cylinder 62 is mounted within the reservoir 46 and has one end welded to the inside of the top plate 52 and spacers 63 adjacent its opposite end to position it within the reservoir. The opposite end is open at 64 to provide free communication with the reservoir. The cylinder is fitted with a head 66 which is spaced slightly from the top plate 52 by a lubricating spacer 68. A plurality of angular and longitudinally spaced holes 70 measuring about three-sixteenths to one-quarter inch in diameter are formed in the side wall of the cylinder 62 and communicate the interior thereof with the reservoir 46. Additional holes 72 and 74 are provided in the cylinder head and that portion of the cylinder which lies between the cylinder head and the top 52 of the reservoir casing which provide additional communication between the interior of the cylinder and the reservoir. The holes 72 and 74 are somewhat smaller in diameter than the holes 70 and may be as much as one-half the size of the other holes. These holes all have flow restricting characteristics, the importance of which will become apparent hereinafter.

A piston 76 is slidable in the cylinder and is fitted with a piston rod 78 which projects away from the open end 64 of the cylinder and through the cylinder head 60, the spacer 68, the top 52 of the reservoir casing 44, and a stuffing box or similar packing 77 which is secured to the top plate of the reservoir to prevent leakage therefrom.

The free end of the piston rod 78 is formed as a circular bearing 80 which rotates on a shaft 82 extending between a pair of support plates 84 which are welded to the inner faces of the side walls of the channel forming the buff and draft center sill 12. The shaft 82 as seen from FIG. 2 is also welded to this structure so that it does not rotate. The hydraulic fluid is charged into the unit 10 through a suitable filler fitting 86 in the reservoir top 52.

The impact absorbing apparatus 10 is illustrated in its normal position in FIGS. 1, 2 and 3, that is, with the piston rod 78 positioned vertically and the reservoir casing 44 in upright position. The spring 30 holds the heads 32 against the center sill lugs 34 and the underframe stops 36. If an impact occurs from the right end of the car as seen in FIGS. 1, 3 and 4, the slidable center sill 12 for buff and draft will move leftwardly thereby swinging the impact absorbing device on its trunnions 56 in the bearings 58 in the counterclockwise direction toward or to the full line position shown in FIG. 4 to extend the piston rod 78 and moving the right head 32 away from the underframe stop 36 at the right end of the spring. The maximum travel of the slidable center sill 12 with respect to the underframe center sill 14 preferably is not over twenty inches, and it has been found that this travel is sufficient for the purpose of absorbing the impacts at normal switching speeds and even those switching speeds which may be two or three times the normal low switching speeds of three to four miles an hour. After the impact the spring 30 restores the impact ab-

sorbing device 10 to the position shown in FIGS. 1, 2 and 3.

The impact is absorbed by the piston 76 being pulled upwardly in the cylinder 62 to expel the hydraulic fluid through the flow restricting openings 70, 72 and 74 to the reservoir 46. Since the bottom of the cylinder 64 is open, it is free to take in any fluid that is necessary to compensate for the upward movement of the piston. As the piston moves upwardly, it closes some of the orifices 70 thereby diminishing the rate of fluid outflow from the rod end of the cylinder to the reservoir and increasing the resistance to piston movement, thus increasing the impact absorbing characteristics of the device. The space between the cylinder head 72 and reservoir head 52 provides an air space to compensate for the extra reservoir and cylinder volume created by the piston rod 78 being pulled outwardly.

When the impact has been absorbed, the spring 30 will return the center sills 12 and 14 to their normal positions thereby rotating the impact absorbing device in the clockwise direction to the position shown in FIG. 3, restoring the piston 76 to the bottom of the cylinder during the course of which fluid is taken in through the orifices 70, 72 and 74 to the rod end thereof.

If the impact occurs from the left end of the car as seen in FIGS. 1, 3 and 4, the impact absorbing device will be rotated to the position shown in the dot-dash lines in FIG. 4.

From the foregoing description it will be seen that the objectives which have been set forth for this apparatus at the outset of this specification have been fully attained.

While a preferred embodiment of the invention has been shown and described, it will be apparent that numerous modifications and variations thereof may be made therein without departing from the underlying principles of the invention. It is therefore desired, by the following claims, to include within the scope of the invention all such variations and modifications by which substantially the results of the invention may be obtained through the use of substantially the same or equivalent means.

What is claimed as new and desired to be secured by United States Letters Patent is:

1. In an impact absorbing apparatus for interposition between the draft gear and the lading in a railway car of the type having a buff and draft center sill and a lading supporting frame mounted for movement relative to each other, the apparatus having a pair of heads normally abutted against lugs carried on the center sill and force transmitting stops carried on the lading supporting frame, and a spring urging the heads toward normal position, the improvement comprising, a fluid reservoir pivotally mounted on the underframe, a cylinder mounted within said reservoir so that a clear space is provided between the exterior wall of the cylinder and the interior wall of the reservoir, a plurality of fluid flow restricting orifices in the wall of the cylinder communicating with said reservoir and spaced longitudinally of the cylinder, a piston slidable in said cylinder, a piston rod connected to said piston and projecting from said cylinder and said reservoir, and means pivotally connecting the outer end of said piston rod to the center sill.

2. In an impact absorbing apparatus for interposition between the draft gear and the lading in a railway car of the type having a buff and draft center sill and a lading supporting frame mounted for movement relative to each other, the apparatus having a pair of heads normally abutted against lugs carried on the center sill and force transmitting stops carried on the lading supporting frame, and a spring urging the heads toward normal position, the improvement comprising, supporting means depending from the underframe, a fluid reservoir pivotally mounted on said supporting means, a cylinder mounted within said reservoir so that a clear space is provided between the exterior wall of the cylinder and the interior wall of the reservoir, a plurality of fluid flow restricting orifices in

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the wall of the cylinder communicating with said reservoir and spaced longitudinally of the cylinder, said cylinder having a head spaced from the head of the reservoir with orifices in said cylinder head, a piston slidable in said cylinder, a piston rod connected to said piston and projecting from said cylinder and said reservoir, and means pivotally connecting the outer end of said piston rod to the center sill.

3. In an impact absorbing apparatus for interposition between the draft gear and the lading in a railway car of the type having a buff and draft center sill and a lading supporting frame mounted for movement relative to each other, the apparatus having a pair of heads normally abutted against lugs carried on the center sill and force transmitting stops carried on the lading supporting frame, and a spring urging the heads toward normal position, the improvement comprising, supporting means depending from the underframe, a fluid reservoir pivotally mounted on said supporting means, a cylinder mounted within said reservoir so that a clear space is provided between the exterior wall of the cylinder and the interior wall of the reservoir, said cylinder having one end in free communication with the reservoir, a plurality of fluid flow restricting orifices in the wall of the cylinder communicating with said reservoir and spaced longitudinally thereof away from said one end, a piston slidable in said cylinder and normally positioned adjacent said one end, a piston rod connected to said piston and projecting from said cylinder and said reservoir, and means pivotally connecting the outer end of said piston rod to the center sill.

4. In an impact absorbing apparatus for interposition between the draft gear and the lading in a railway car of the type having a buff and draft center sill and a lading supporting frame mounted for movement relative to each other, the apparatus having a pair of heads normally abutted against lugs carried on the center sill and force transmitting stops carried on the lading supporting frame, and a spring urging the heads toward normal position, the improvement comprising, a pair of vertical spaced plates depending from the underframe, a fluid reservoir, a pair of bearing means pivotally mounting said reservoir on and between said plates, a cylinder mounted within said reservoir so that a clear space is provided between the exterior wall of the cylinder and the interior wall of the reservoir, said cylinder having one end open to communicate freely with the reservoir, a plurality of fluid

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flow restricting orifices in the wall of the cylinder communicating with said reservoir and spaced longitudinally thereof away from the open end of the cylinder, a piston slidable in said cylinder and normally positioned adjacent the open end thereof, a piston rod connected to said piston and projecting from said cylinder and said reservoir in a direction away from the open end of said cylinder, and means pivotally connecting the outer end of said piston rod to the center sill.

5. In an impact absorbing apparatus for interposition between the draft gear and the lading in a railway car of the type having a buff and draft center sill and a lading supporting frame mounted for movement relative to each other, the apparatus having a pair of heads normally abutted against lugs carried on the center sill and force transmitting stops carried on the lading supporting frame, and a spring urging the heads toward normal position, the improvement comprising, a pair of vertical spaced plates depending from the underframe, a fluid reservoir, a pair of bearing means pivotally mounting said reservoir on and between said plates, a cylinder mounted within said reservoir so that a clear space is provided between the exterior wall of the cylinder and the interior wall of the reservoir, said cylinder having one end open to communicate freely with the reservoir, a plurality of fluid flow restricting orifices in the wall of the cylinder communicating with said reservoir and spaced longitudinally thereof away from the open end of the cylinder, said cylinder having a head spaced from the head of the reservoir to define a volume compensating air space, orifices in said cylinder head communicating the cylinder with said last named space, a piston slidable in said cylinder and normally positioned adjacent the open end thereof, a piston rod connected to said piston and projecting from said cylinder and said reservoir in a direction away from the open end of said cylinder, and means pivotally connecting the outer end of said piston rod to the center sill.

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