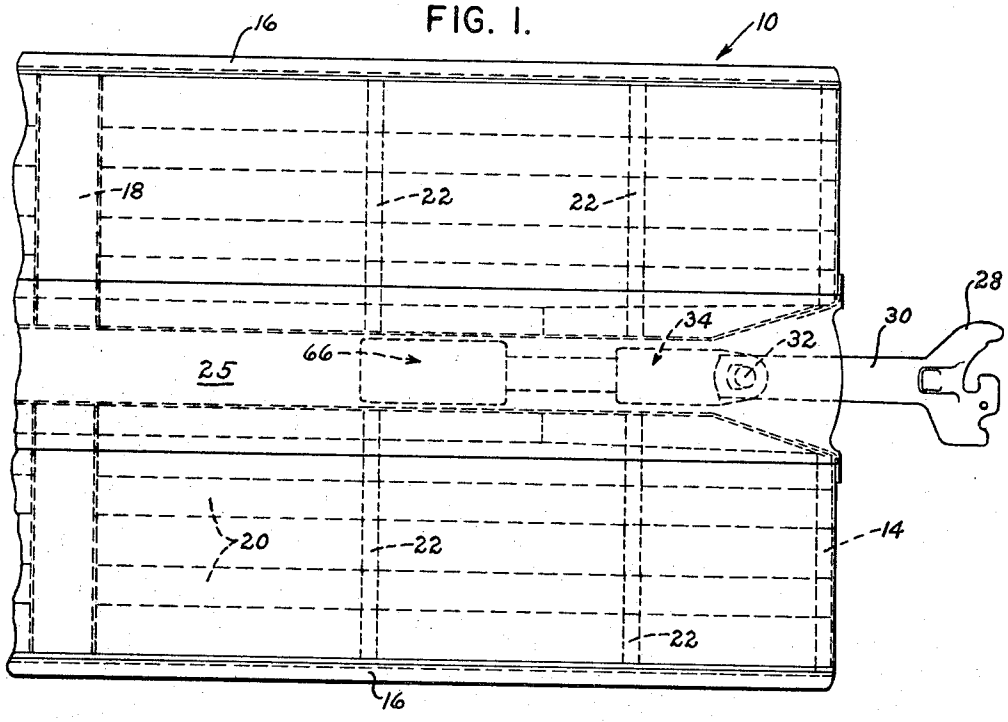
Oct. 22, 1968 R. M. COOK 3,406,835

CUSHIONING STRUCTURE FOR END OF RAILWAY CAR

Original Filed Oct. 20, 1965 5 Sheets-Sheet 1

FIG. 1.



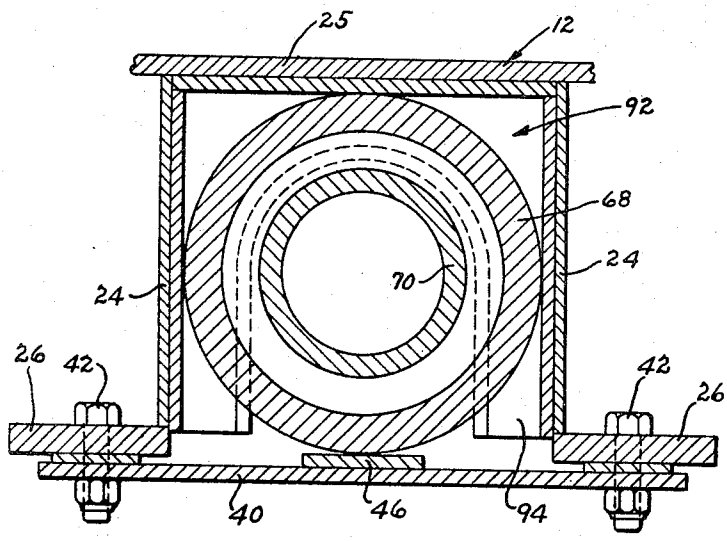


FIG. 4.

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CUSHIONING STRUCTURE FOR END OF RAILWAY CAR

Original Filed Oct. 20, 1965 5 Sheets-Sheet 2

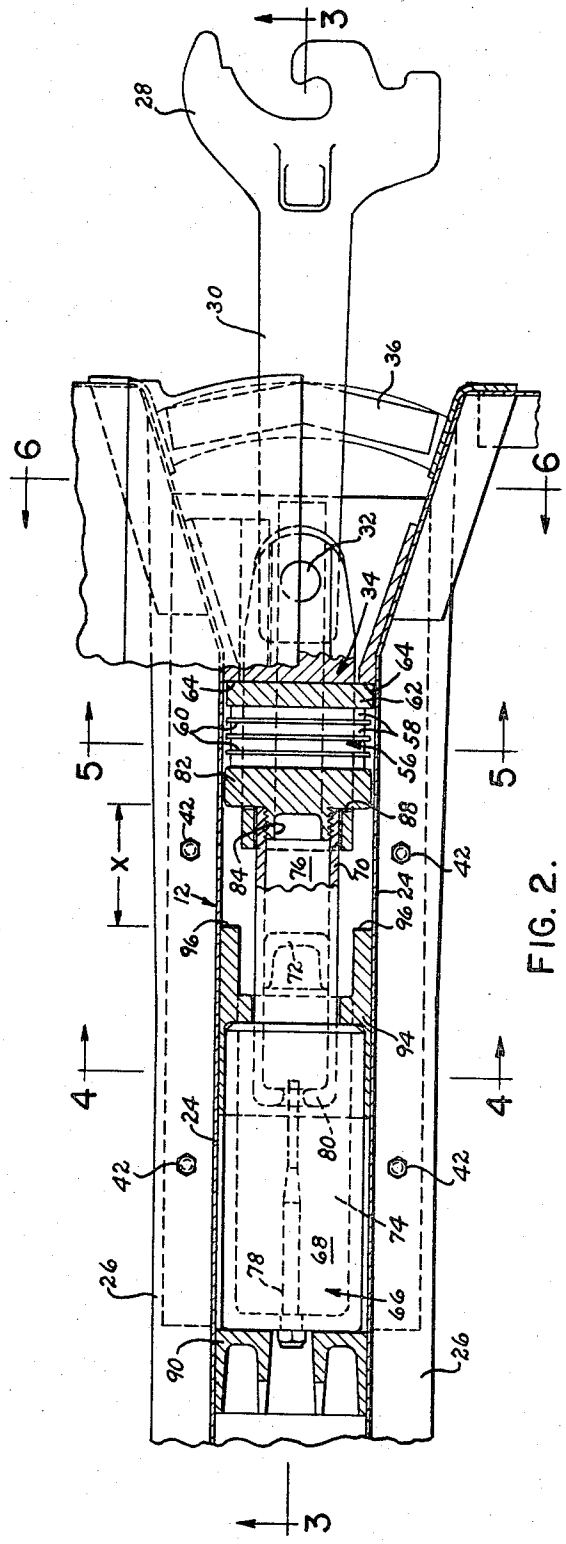


FIG. 2.

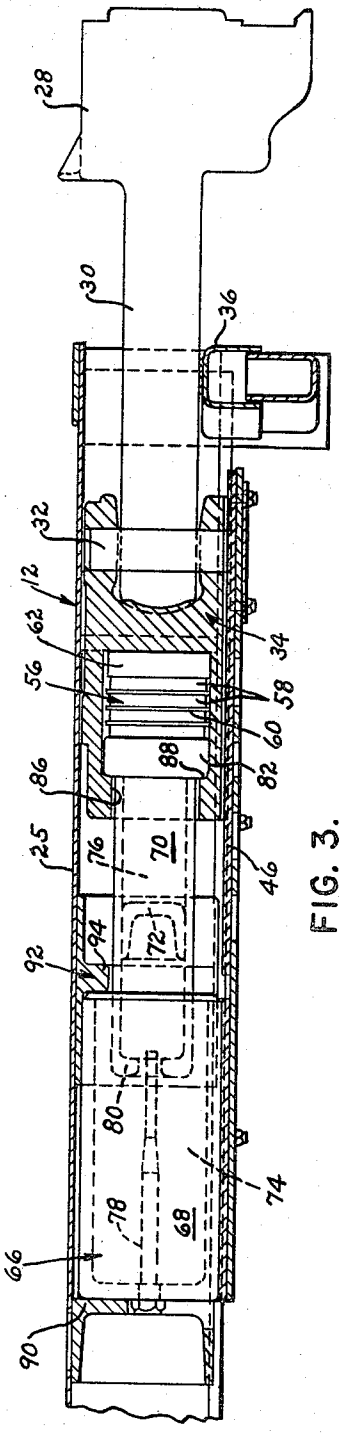


FIG. 3.

CUSHIONING STRUCTURE FOR END OF RAILWAY CAR

Original Filed Oct. 20, 1965 5 Sheets-Sheet 3

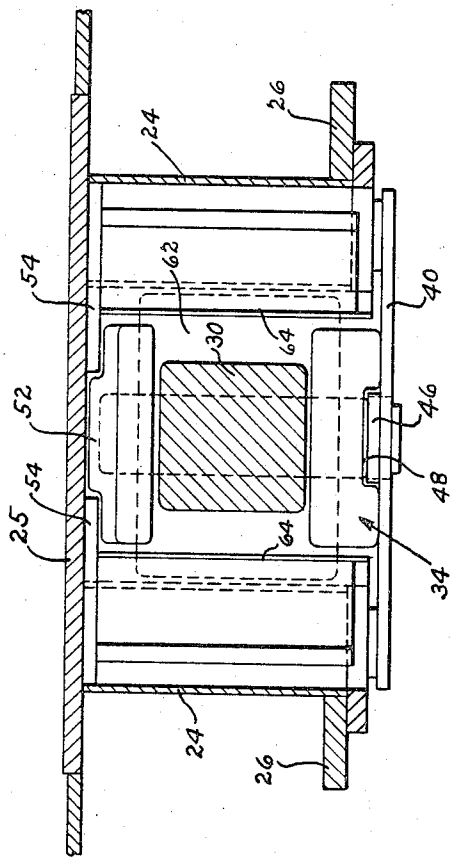


FIG. 6.

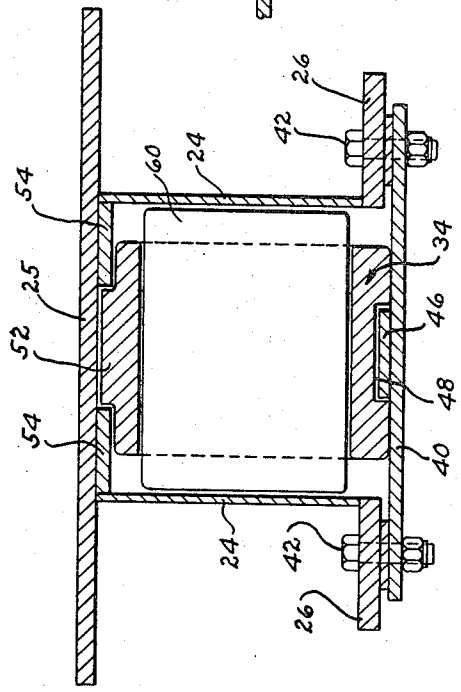


FIG. 5.

CUSHIONING STRUCTURE FOR END OF RAILWAY CAR

Original Filed Oct. 20, 1965 5 Sheets-Sheet 4

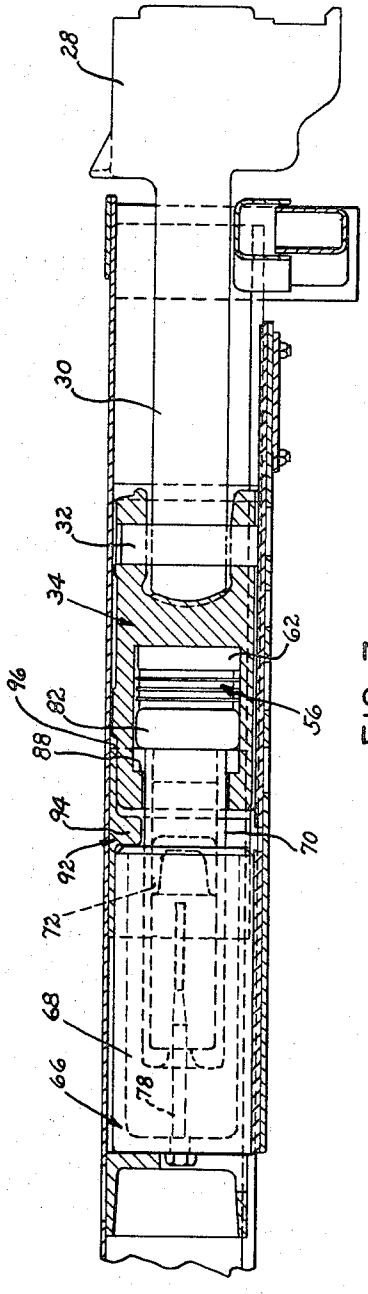


FIG. 7.

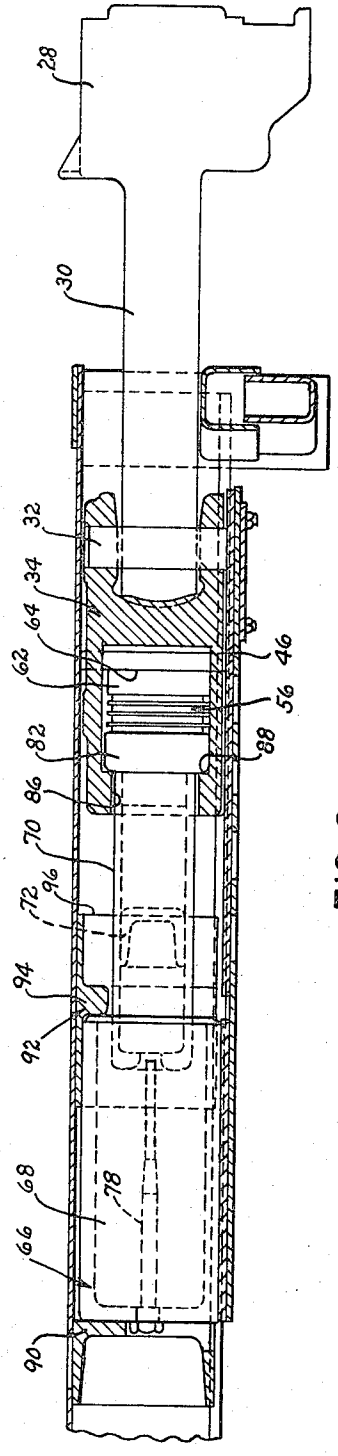


FIG. 8.

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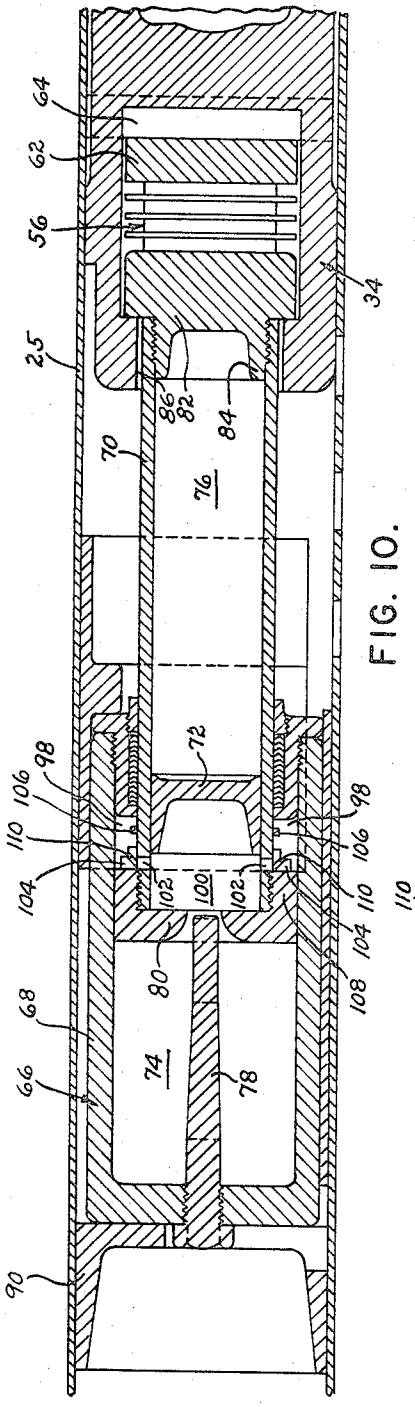


FIG. 10.

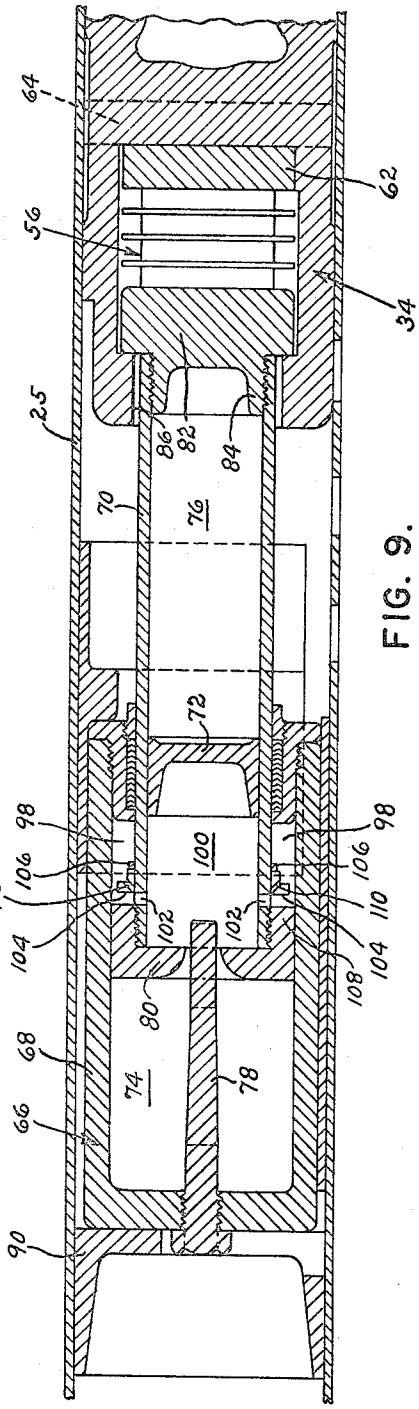


FIG. 9.

United States Patent Office 3,406,835 Patented Oct. 22, 1968

3,406,835

CUSHIONING STRUCTURE FOR END OF RAILWAY CAR

Robert M. Cook, St. Charles, Mo., assignor to ACF Industries, Incorporated, New York, N.Y., a corporation of New Jersey

Continuation of application Ser. No. 498,463, Oct. 20, 1965. This application May 1, 1967, Ser. No. 642,624
8 Claims. (Cl. 213—8)

ABSTRACT OF THE DISCLOSURE

A cushioning arrangement for the end of a railway car comprising the combination of a resilient draft gear and a hydraulic cushioning unit. The hydraulic cushioning unit acts in draft from a neutral position simultaneous with the compression of the resilient draft gear to aid in cushioning the draft forces from a neutral position. In buff, the resilient draft gear and hydraulic cushioning unit act in series with additional travel of the resilient draft gear permitted after the buff travel of the hydraulic cushioning unit has been stopped.

This application is a continuation of application Ser. No. 498,463 filed Oct. 20, 1965, and now abandoned.

Background and description of invention

Resilient draft gear comprising a plurality of elastomeric pads has been employed heretofore in series with hydraulic cushioning units. Normally, the resilient draft gear has acted solely in draft while, in buff, the hydraulic cushioning unit has acted in series with the resilient draft gear. The resilient draft gear is normally housed within a yoke connected to the coupler and upon draft forces being exerted against the coupler, the yoke moves forwardly to compress the resilient draft gear for the absorption of the draft forces. Heretofore, the hydraulic cushioning unit has remained in place during compression of the draft gear and a forward movement of the yoke in draft. Then, if an impact force occurs before return of the resilient draft gear and yoke, the yoke moves rearwardly to strike the face of the adjacent hydraulic cushioning unit. At times, a moment is created by uneven contact of the yoke with the face of the hydraulic cushioning unit which might result in a malfunctioning of the hydraulic unit.

The present invention provides a cushioning structure in which the hydraulic cushioning unit moves with the yoke in draft and is extended thereby to provide an additional cushioning action in addition to eliminating any striking action between the yoke and hydraulic unit. An end cap of the hydraulic cushioning unit forms the rear follower block of the draft gear and is in a face-to-face contact with a resilient or rubber pad of the draft gear. This minimizes or eliminates any moment or eccentric loading on the hydraulic cushioning unit from the yoke and coupler.

It is an object of the present invention to provide an end of car cushioning arrangement in which a hydraulic cushioning unit is employed in combination with a resilient draft gear with the resilient draft gear being active in both buff and draft under substantially all conditions of operation.

An additional object of this invention is the provision of such and end of car cushioning arrangement in which the hydraulic cushioning unit acts in draft simultaneous with the compression of resilient draft gear.

A further object is the provision of such a cushioning arrangement in which the hydraulic cushioning unit acts as the rear follower block of the resilient draft gear.

Another object is the provision of an end of car cushioning structure in which any moment or eccentric loading exerted against the hydraulic cushioning unit from the coupler is practically eliminated.

The invention accordingly comprises the constructions hereinafter described, the scope of the invention being indicated in the following claims.

In the accompanying drawings in which one of various possible embodiments of the invention is illustrated;

FIGURE 1 is a fragmentary top plan of a railway car underframe embodying the present end of car cushioning structure;

FIGURE 2 is a top plan sectional view of the end of car cushioning structure of FIGURE 1 with the cushioning being illustrated in a neutral position;

FIGURE 3 is a longitudinal section taken generally along line 3—3 of FIGURE 2, certain parts being shown in elevation;

FIGURE 4 is a section taken generally along line 4—4 of FIGURE 2;

FIGURE 5 is a section taken generally along line 5—5 of FIGURE 2;

FIGURE 6 is a section taken generally along line 6—6 of FIGURE 2;

FIGURE 7 is a sectional view similar to FIGURE 3 but showing the cushioning arrangement in a full buff position;

FIGURE 8 is a sectional view similar to FIGURE 3 but showing the cushioning arrangement in a full draft position;

FIGURE 9 is an enlarged sectional view similar to FIGURE 3 but showing the hydraulic cushioning unit in section and illustrating the neutral position of the cushioning unit; and

FIGURE 10 is an enlarged sectional view similar to FIGURE 8 but showing the hydraulic cushioning unit in section and illustrating the draft position of the hydraulic cushioning unit.

Referring to the drawings for a better understanding of my invention, a railway car underframe is indicated generally **10** and includes a center sill structure designated generaly **12**, an end sill **14**, and side sills **16**. Extending between side sills **16** is a bolster cover plate **18**. Stringers **20** extending longitudinally of underframe **10** and crossbearer members **22** extend between each side sill **16** and the center sill structure **12**.

Center sill structure **12** is hat-shaped forming vertical webs **24** connected by an upper horizontal web **25** which also forms at least a portion of the deck plate, and lower outwardly extending flanges **26**. The open outer end of center sill structure **12** is flared to receive a coupler **28** having a shank **30** connected by a vertical pin **32** to a yoke **34**. A coupler carrier **36** is biased upwardly and supports shank **30**. While coupler **28** has been shown as a type F coupler (Association of American Railroads designation) mounted about a vertical pin, it is to be understood that the present invention may, if desired, be employed with a type E coupler connected to a horizontal key.

Referring to FIGURE 5, a draft gear support or carrier is illustrated comprising a support plate **40** secured by nut and bolt combinations **42** to outwardly extending flanges **26** of fixed center sill structure **12**. A wear plate **46** is secured to support **40**. To guide the movement of yoke **34**, a groove or guideway **48** is formed on the underside of yoke **34** and receives wear plate **46**. The upperside of yoke **34** has a key **52** fitting between guides **54** secured to center sill structure **12**.

Mounted within yoke **34** is a resilient draft gear generally indicated **56** comprising a plurality of rubber pads **58** separated by metal plates **60**. A front follower block

62 engages front stops 64 secured to the inner surface of fixed center sill structure 12.

Forming an important part of this invention, a hydraulic fluid cushioning unit generally designated 66 is positioned rearwardly of draft gear 56. Hydraulic cushioning unit 66 comprises an outer cylinder 68 and an inner cylinder 70. Mounted in inner cylinder 70 is a floating piston 72. A fluid chamber 74 formed within outer cylinder 68 on one side of floating piston 72 contains a relatively incompressible liquid, such as hydraulic fluid. A fluid chamber 76 formed within inner cylinder 70 on the other side of floating piston 72 contains a relatively compressible fluid, such as air or dry nitrogen gas. A metering pin 78 secured to outer cylinder 68 is received by an orifice plate 80 on the inner end of inner cylinder 70.

Upon a contraction of cushion unit 66 from neutral position shown in FIGURES 2 and 3, fluid in chamber 74 is pressurized and floating piston 72 moves toward chamber 76 with liquid flowing from chamber 74 through the orifice plate 80 as inner cylinder 70 moves inwardly. After contraction of the unit and absorption of energy, the differential in pressure between chambers 74 and 76 effects a movement of floating piston 72 toward chamber 74 under influence of the pressurized gas in chamber 76 to return the cylinder 70 to its original neutral position. For further details of cushioning unit 66, reference is made to Patent No. 2,994,442 issued Aug. 1, 1961, and entitled Kinetic Energy Absorbing Device, the entire disclosure of which is incorporated by this reference.

Inner cylinder 70 has an end cap 82 thereon having an externally threaded inner extension 84 engaging internal screw threads within inner cylinder 70 as shown in FIGURE 2. Inner cylinder 70 extends through an opening 86 in yoke 34 and end cap 82 engages a peripheral shoulder or rim 88 formed inwardly of yoke 34. Thus, upon forward movement of yoke 34, shoulder 88 in engagement with end cap 82 extends inner cylinder 70 which moves with yoke 34.

Outer cylinder 68 abuts a rear support 90 secured to the fixed sill structure 12. A U-shaped rear follower stop generally designated 92 has a lug 94 which engages a portion of the front face of outer cylinder 68 as shown in FIGURE 3 to hold outer cylinder 68 in position. Rear abutment surfaces 96 on rear follower stop 92 engage end cap 82 to limit the rearward travel of inner cylinder 70 through a distance X shown in FIGURE 2 upon exertion of impact forces against coupler 28.

As shown in aforementioned U.S. Patent No. 2,994,442 and referring particularly to FIGURES 9 and 10, an annular chamber 98 is formed between inner cylinder 70 and outer cylinder 68 and communicates with chamber 100 through a plurality of openings 102 extending through the wall of inner cylinder 70. Chamber 98 expands during a contraction of cushioning unit 66 with fluid entering chamber 98 through openings 102. A snubbing device or ring 104 is slidably mounted about inner cylinder 70 and is moved against a stop 106 during expansion of chamber 98 to allow a relatively free fluid flow within chamber 98 upon contraction of cushioning unit 66. Upon an extension or elongation of cushioning unit 66, ring 104 seats upon annular wall 108 threaded on the end of inner cylinder 70 to close openings 102 as shown in FIGURE 10. Ring 104 has a plurality of small openings 110 which snub or cushion the extension of cushion unit 66. Upon a draft load being applied from the neutral position shown in FIGURE 9, ring 104 moves against annular wall 108 as shown in FIGURE 10 to block openings 102 with fluid exhausted from chamber 98 being forced through the small openings 110 in ring 104 thereby to restrain extension of cushioning unit 66 and to aid in cushioning upon extension of cushioning unit 66 from neutral position.

In operation, and referring particularly to FIGURE 7, upon exertion of an impact or buff force against coupler 28, draft gear 56 is compressed slightly to move end cap 82 away from rim 88, front follower block 62 remaining in contact with yoke 34 and moving with yoke 34 rearwardly upon a rearward movement of coupler 28. After a slight compression of the rubber draft gear 56, such as ¼ inch to ½ inch, inner cylinder 70 moves inwardly to contract hydraulic cushioning unit 66. Cushioning unit 66 is contracted until end cap 82 engages abutment surfaces 96 at the end of travel distance X thereby to limit the rearward travel of inner cylinder 70. However, in this position, yoke 34 remains spaced from stop 92 and may move rearwardly an additional amount to further compress draft gear 56. Thus, the rubber draft gear 56 remains active after the hydraulic cushioning unit 66 has gone solid or has reached its innermost position as shown in the full buff position of FIGURE 7. After absorption of the buff or impact loads, the gas pressurized within chamber 76 returns floating piston 72 and inner cylinder 70 to its original position. Yoke 34 and coupler 28 are likewise returned by the extension of inner cylinder 70.

In operation, referring particularly to FIGURES 8–10, upon a draft force being exerted against coupler 28, yoke 34 is moved in a forwardly direction with shoulder 88 engaging end cap 82 to extend inner cylinder 70, lug 94 restraining movement of outer cylinder 68. Front follower block 62 is retained by stops 64 and rubber draft gear 56 is compressed between end cap 82 and follower block 62 for a maximum of around two inches. The extension of inner cylinder 70 provides an additional cushioning action and acts simultaneously with the rubber draft gear 56 in draft.

Since end cap 82 is in face-to-face contact with a rubber pad 58, any eccentric loading applied against coupler 28 and yoke 34 will not be transmitted to inner cylinder 70 thereby minimizing any moment or eccentric loading of inner cylinder 70 and minimizing malfunctioning of cushioning device 66. The rubber pad 58 in contact with end cap 82 tends to distribute the forces exerted from coupler 28 and yoke 34 to eliminate any moment which might be transmitted to inner cylinder 70.

From the foregoing, it will be understood that a cushioning arrangement has been provided in which the rubber draft gear 56 and hydraulic fluid cushioning unit 66 act in combination in both draft and buff. The hydraulic cushioning unit 66 is extended in draft to provide an additional cushioning action and forms the rear follower for the draft gear. In buff, rubber draft gear 56 remains active after the positive stopping or going solid of inner cylinder 70.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above construction without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A railway car having a center sill structure with an open outer end, a coupler mounted for movement within said open outer end, a resilient draft gear adjacent the inner end of said coupler and having a plurality of rubber-like pads, a yoke connected to said coupler and extending rearwardly therefrom about the resilient draft gear for compression of the pads upon draft forces being exerted against the coupler from a neutral position, a hydraulic cushioning unit mounted within said center sill structure rearwardly of said resilient draft gear, means connecting said hydraulic cushioning unit to said yoke to move said hydraulic unit in a cushioned draft stroke from said neutral position simultaneous with the draft movement of said yoke and to permit an independent cushioned buff stroke for said hydraulic unit, the draft stroke of said hydraulic cushioning unit from said neutral position being simultaneous with the compression of the resilient draft gear thereby to aid in cushioning the draft forces from a neutral position, means to limit the buff movement of said hydraulic unit, and means permitting additional buff

movement of said resilient draft gear after the rearward movement of said hydraulic unit has been limited so that additional cushioning is obtained from said resilient draft gear after the full buff movement of the hydraulic unit.

2. A railway car having a center sill structure with an open outer end, a coupler mounted for movement within said center sill structure, a resilient draft gear adjacent the inner end of said coupler having a plurality of rubber-like pads, a yoke connected to said coupler and extending rearwardly about said resilient draft gear for compression of said pads upon draft forces being exerted against the coupler from a neutral position, a hydraulic cushioning device mounted within said center sill structure rearwardly of said draft gear, said hydraulic cushioning device comprising an outer fluid cylinder and an inner fluid cylinder movable relative to each other, and an end cap on the extending end of said inner cylinder positioned within said yoke and connecting the inner cylinder to the yoke for forward movement therewith from neutral position upon the exertion of draft forces against the coupler, said forward movement of said inner cylinder being simultaneous with the compression of the draft gear to aid in cushioning the draft forces, said end cap being the rear follower block for the draft gear and positioned in face-to-face contact with an adjacent rubber-like pad of the draft gear to permit a limited initial rearward movement of the yoke relative to the inner cylinder thereby permitting a limited compression of said draft gear relative to said hydraulic cushioning device upon the initial exertion of buff forces against the coupler.

3. A cushioning structure adapted to be mounted within a center sill structure of a railway car for absorbing buff forces applied to a coupler, comprising, a draft gear adjacent the inner end of said coupler and having a plurality of resilient pads, a yoke connected to said coupler and extending rearwardly about said resilient pads for compression of said pads upon draft forces being exerted against the coupler from a neutral position, a hydraulic cushioning device mounted within said center sill structure rearwardly of said draft gear, said cushioning device comprising an outer fluid cylinder and an inner fluid cylinder movable relative to each other, an end cap on said inner cylinder forming the rear follower block for said draft gear, said inner cylinder being extended simultaneous with the compression of the draft gear upon forward movement of the yoke from neutral position when draft forces are exerted against the coupler thereby to aid in cushioning the draft forces, said yoke and resilient draft gear moving rearwardly upon the exertion of buff forces against said coupler to contract said cushioning device for a cushioned travel, a rear stop engaging said cap to limit the rearward travel of the inner cylinder at a predetermined position, and means permitting additional travel of said yoke and front follower block of the draft gear after the rearward travel of the inner cylinder has been limited whereby additional cushioning is obtained from said draft gear.

4. A cushioning structure adapted to be mounted within a center sill structure of a railway car for absorbing draft forces applied to a coupler, comprising, a draft gear adjacent the inner end of said coupler having a plurality of resilient pads, a yoke connected to said coupler and extending rearwardly about said resilient pads for compression of said pads upon draft forces being exerted against the coupler from a neutral position, a hydraulic cushioning device mounted within said center sill structure rearwardly of said draft gear, said cushioning device comprising an outer fluid cylinder and an inner fluid cylinder movable relative to each other, and an end cap on said inner cylinder positioned within said yoke and forming the rear follower block for said draft gear, said cap being in engagement with said yoke upon the exertion of draft forces against the coupler from a neutral position and movable forwardly with said yoke simultaneously with the compression of the resilient pads thereby resulting in an extension of said cushioning device for aiding the cushioning of the draft forces from a neutral position, the exertion of impact forces immediately after the exertion of draft forces resulting in an initial limited rearward movement of the yoke and draft gear relative to the inner cylinder of the cushioning device thereby to permit a limited initial compression of the draft gear relative to said hydraulic cushioning device.

5. A cushioning structure as set forth in claim 4 wherein a resilient pad of said draft gear is in face-to-face contact with the end cap of said cylinder thereby to minimize any moment exerted against the hydraulic cushioning device from the coupler.

6. A cushioning structure as set forth in claim 5 wherein the upper and lower surfaces of said yoke and the adjacent surfaces of said center still structure have coacting guides to restrain and guide the movement of said yoke within the center sill structure upon the exertion of buff and draft forces.

7. A railway car having a center sill structure with an open outer end, a coupler mounted for movement within said center sill structure, a resilient draft gear adjacent the inner end of said coupler having a plurality of rubber-like pads, a yoke connected to said coupler and extending rearwardly about said resilient draft gear for compression of said pads upon draft forces being exerted against the coupler from a neutral position, a hydraulic cushioning device mounted within said center sill structure rearwardly of said draft gear, said hydraulic cushioning device comprising an outer fluid cylinder and an inner fluid cylinder movable relative to each other, means on the extending end of said inner cylinder connecting the inner cylinder to said yoke for forward movement therewith from neutral position upon the exertion of draft forces against the coupler, said forward movement of the inner cylinder being simultaneous with the compression of the draft gear to aid in cushioning the draft forces, said means permitting a limited rearward movement of the yoke relative to the inner cylinder thereby permitting a limited compression of said draft gear relative to said hydraulic cushioning device upon the exertion of buff forces against the coupler, said yoke and resilient draft gear moving rearwardly upon the exertion of buff forces against said coupler to contract said cushioning device after the limited compression of the draft gear, a rear stop engaging said inner cylinder to limit the rearward travel of the inner cylinder, and means permitting additional travel of said yoke and front follower block of the resilient draft gear after the rearward travel of the inner cylinder has been limited whereby additional cushioning is obtained from said resilient draft gear.

8. A cushioning structure adapted to be mounted within a center sill structure of a railway car for absorbing buff and draft forces applied to a coupler, comprising, a self-restoring draft gear adjacent the inner end of said coupler adapted to be contracted for cushioning buff and draft forces, a yoke connected to said coupler and extending rearwardly about said draft gear to contract said draft gear for cushioning draft forces exerted against the coupler from a neutral position, a self-restoring hydraulic cushioning device mounted within said center sill structure rearwardly of said draft gear, connecting means operatively connecting the hydraulic cushioning device to said yoke to move the hydraulic cushioning device in a draft stroke simultaneously with the contraction of the draft gear thereby resulting in an extension of the hydraulic cushioning device upon draft forces being exerted from a neutral position, said connecting means providing buff movement of the hydraulic cushioning device with the buff forces exerted against said hydraulic cushioning device from the coupler being transmitted to the hy-

draulic cushioning device through the yoke and draft gear, means to limit the buff movement of said hydraulic cushioning device, and means to permit additional buff movement of said draft gear after the rearward movement of said hydraulic cushioning device has been limited so that additional cushioning is obtained from said draft gear after the full buff movement of the hydraulic cushioning device.

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