April 12, 1966 E. H. NATSCHKE 3,245,552

SELECTIVE TRAVEL DRAFT GEAR ARRANGEMENT

Filed June 22, 1964 2 Sheets-Sheet 1

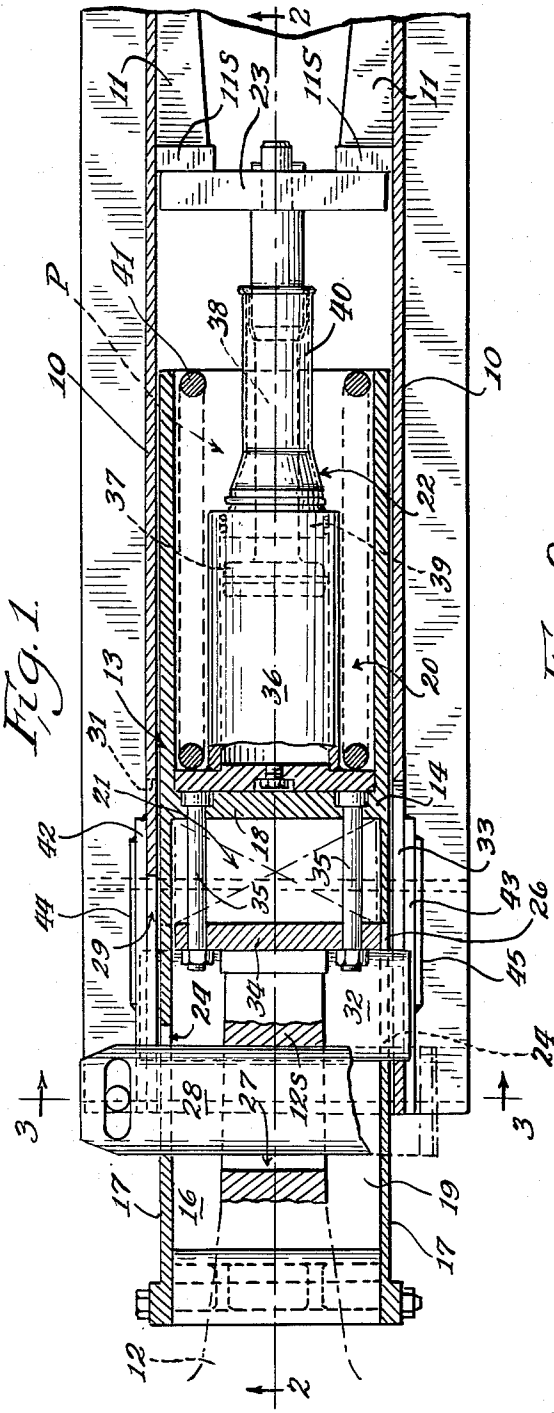


Fig. 1.

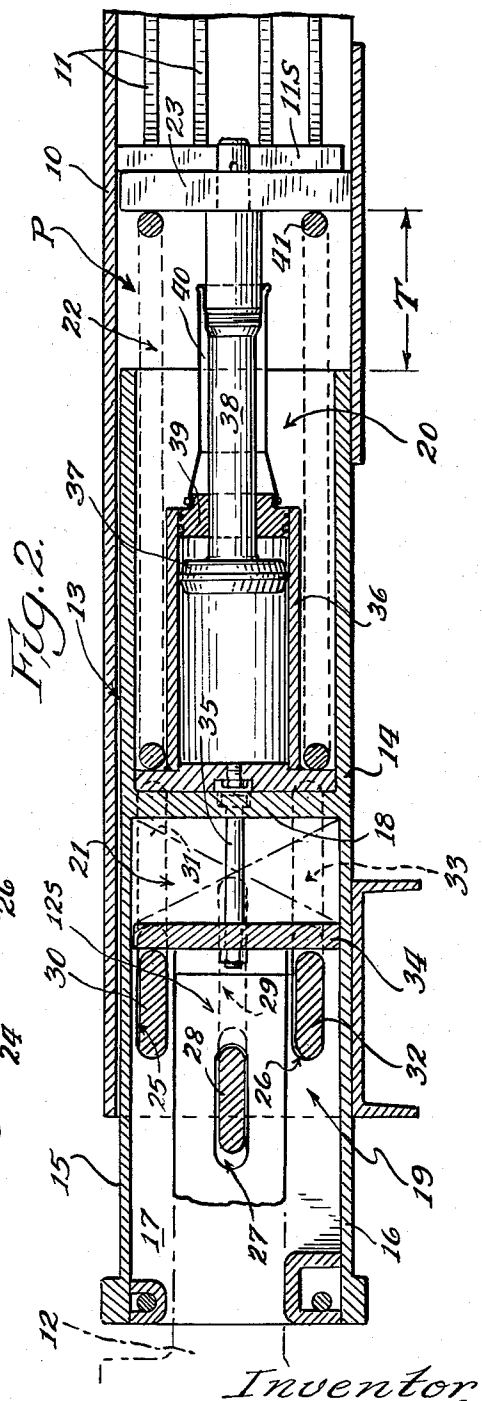


Fig. 2.

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Fig. 3.

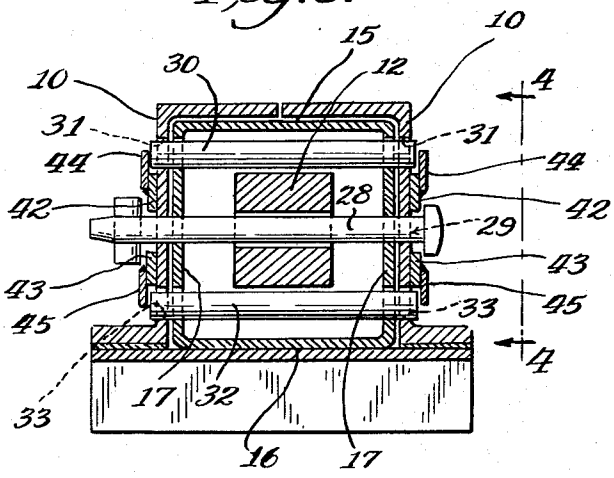
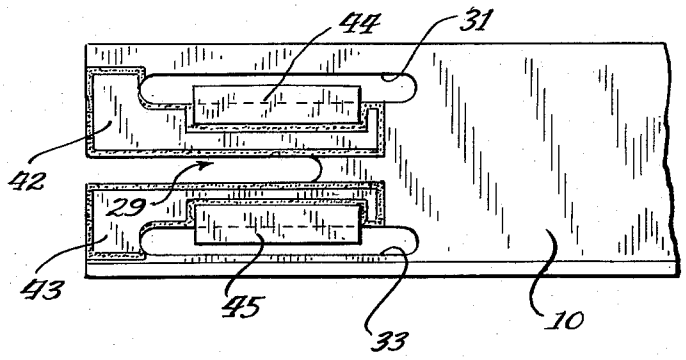


Fig. 4.



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United States Patent Office 3,245,552 Patented Apr. 12, 1966

3,245,552

SELECTIVE TRAVEL DRAFT GEAR ARRANGEMENT

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Filed June 22, 1964, Ser. No. 376,767
5 Claims. (Cl. 213—46)

This invention relates to selective travel draft gear arrangements for application to the draft pocket of a railroad car frame, and has for its principal object the provision of a draft gear arrangement that incorporates a hydraulic fluid throttling type cushioning unit that is operable only in buff, and a positive resistance type of spring cushioning unit that is operable during both buff and draft, with the combined travel of the two units in buff being several times greater than the travel of the positive resistance unit in draft.

The dydraulic units have important features that are highly desirable for draft gear application, such as offering high capacity and offering increasing resistance and energy absorption at the higher impact speeds. Hydraulic units also have a number of disadvantages which limit their desirability for draft gear applications. One difficulty with hydraulic units arises from the fact that they can be operated through their full range of travel in response to a light force constantly applied. Draft loads of this nature are frequently encountered during train operation, and objectionable train run-in and run-out can result when the hydraulic units are applied for handling draft loads.

Accordingly, another object of the invention is to provide a draft gear arrangement incorporating a hydraulic cushioning unit that is operable only under buff loading.

Another disadvantage of hydraulic units arises from the fact that the hydraulic unit undergoes some delay immediately following impact before effective cushioning action is developed. For this reason, hydraulic units at the shorter ranges of travel, on the order of 3 inches, have an unduly large travel portion that is ineffective.

Accordingly, another object of the invention is to provide an arrangement wherein the hydraulic unit may operate over a substantially greater travel range to enable a higher percentage of its closure stroke to offer effective cushioning action.

Generally speaking, the draft gear arrangement of this invention includes a housing located in a draft pocket defined outwardly of the bolster center filler, with the housing projecting beyond the car frame and serving as a movable carrier for the usual coupler which must be spaced a distance great enough to accommodate the required travel.

In accordance with this invention, the housing mounts a hydraulic type cushioning unit within a chamber at its rear end and a positive resistance type cushioning unit within a chamber at its front end. An important feature of the arrangement resides in the fact that the selective travel characteristics and the greatly increased buff travel as compared with draft travel, are achieved without requiring substantial modification of the center sills.

Accordingly, a further object of the invention is the provision of a selective travel draft gear arrangement for use in a car having a basically standard center sill construction and wherein a hydraulic type cushioning unit functions only in buff to provide a buff travel several times greater than the draft travel which is afforded by a positive resistance unit that also is operable in buff.

Other and further objects of the present invention will be apparent from the following description and claims, and are illustrated in the accompanying drawings which show structure embodying preferred features of the present invention and the principles thereof and what is now

considered to be the best mode in which to apply these principles.

In the accompanying drawings forming a part of this specification and in which like numerals are employed to designate like parts throughout the same:

FIG. 1 is a horizontal section through familiar parts of a freight car underframe showing the draft gear arrangement applied in the draft pocket;

FIG. 2 is a vertical section of the same;

FIG. 3 is a transverse section taken as indicated on the line 3—3 of FIG. 1; and

FIG. 4 is a fragmentary side elevational view of the end region of a center sill and is taken as indicated by the 4—4 of FIG. 3.

Referring now to the drawings, the selective travel draft gear arrangement of this invention is disclosed as applied in a conventional railway car underframe that includes lengthwise extending fixed center sills **10**, a bolster center filler structure **11**, mounted between the sills in the usual fashion and having rigid stops in the form of integral extensions **11S** bordering and defining rear lateral extremities of a draft pocket P that extends from the location of the stops **11S** to the end of the car frame. A coupler **12** is illustrated projecting into and movable lengthwise in the pocket to apply buff and draft loads.

The draft gear arrangement of this division is designated generally at **13** and it is mounted in the pocket to undergo selective closure travel for developing cushioning of buff and draft loads. The draft gear arrangement includes a housing **14** having a top wall **15**, a bottom wall **16**, and side walls **17** and including a fixed transverse abutment wall **18** that defines separate front and rear chambers **19** and **20** in the housing. The wall **18** is approximately centrally located along the housing, with the front chamber **19** being only slightly longer than the rear chamber **20**.

The housing **14** has its front end projecting forwardly from the draft pocket P defined by the center sills **10** and has its rear end extending deep into the pocket and terminating in forwardly spaced facing relation to the stops **11S** to accommodate movement of the housing towards the stops **11S** under buff loads. The front chamber **19** of the housing is open forwardly and defines a space large enough to receive the shank **12S** of the coupler. The rear chamber of the housing opens rearwardly towards the bolster center filler structure **11**.

A cushioning unit **21** is mounted in the front chamber **19** to react between the intermediate abutment wall **18** and the butt end of the coupler shank **12S** and a cushioning unit **22** is mounted in the rear chamber **20** and extends rearwardly therebeyond to react between the abutment wall and the rear stops **11S**. A rear follower **23** is located immediately forwardly of the rear stops to transmit reaction between the rear cushioning unit **22** and the rear stops.

Adjacent the front end of the housing **14** its side walls **17** are provided with a central set of aligned slots **24** (sometimes hereinafter referred to as a second set of slots) and upper and lower sets of aligned slots **25** and **26** respectively, (sometimes hereinafter referred to as a first set of slots) flanking the center set and spaced rearwardly along the housing walls to overlap only partially with the center set of slots **24**. The coupler **12** has the usual horizontal slot **27** to receive a horizontal draft key **28**, the ends of which project through the center set of slots **24** in the housing and through open ended slots **29** provided in the center sills for transverse alignment with the center set of housing slots **24**. An upper stop key **30** is located above the coupler shank **12S** and extends through the upper set of housing slot **25** and through a corresponding upper set of closed-end center sill slots **31**. Simi-

larly, a lower stop key 32 underlies the coupler shank 12S and extends through the lower set of housing slots 26 and through a lower set of closed-end center sill slots 33.

The cushioning unit 21 in the front chamber of the housing is preferably in the form of an aligned stack of rubber mats mounted as a bolted assembly within the housing 14. For this purpose a front follower 34 is located at the front of the unit 21 to abut the coupler shank and is slidable relative to bolts 35 which are anchored in countersunk relation in the intermediate abutment wall 18 that functions as an intermediate follower operating between the two cushioning units 21 and 22. One type of rubber mat draft gear arrangement that may be utilized in the front chamber 19 is shown in Tucker Patent No. 2,705,569. Alternative arrangements contemplated for use in the front chamber are shown in Peterson Patent No. 3,025,974, in which case the walls of the housing would be provided with appropriate cut-outs to accommodate locking facilities.

Since the cushioning unit 22 utilized in the rear chamber 20 is a fluid throttling type of hydraulic mechanism, it is desirable that a rubber draft gear unit be employed in the front chamber, but the invention need not be thus limited as it is contemplated that the cushioning unit 21 in the front chamber might alternatively be in the form of coil springs or a combination of rubber and coil springs and might, in addition, include a friction clutch mechanism. All such types of cushioning units are prescribed herein under the phrase "a positive resistance type of cushioning unit," and it will be apparent that each of these is also self-restoring in that it returns to its initial release configuration upon removal of the load.

In the preferred practice of the invention, the hydraulic cushioning unit for the rear chamber may be of the type shown in co-pending application of Campbell and Natschke, Serial No. 278,952, filed May 8, 1963. The principal components of this hydraulic cushioning unit are illustrated herein and include a cylinder 36 fixed within the rear chamber 20 in abutting relation to the intermediate abutment wall 18, a piston 37 slidably operable in the cylinder, a piston rod 38 projecting through the rear of the cylinder and connecting to the rear follower, an end cap 39 at the rear of the cylinder, and a rubber-like bellows diaphragm 40 sealed to the rod 38 and to the end cap 39 for preventing leakage of hydraulic fluid from the low pressure side of the hydraulic system. The particular hydraulic unit has its piston 37 equipped with an automatically variable orifice arrangement responsive to pressure conditions to vary the orifice size, and the details of its construction and action are fully disclosed in the aforesaid Campbell and Natschke application, and are specifically incorporated herein by reference.

While a particular hydraulic unit is referred to herein, the invention contemplates the use of other hydraulic arrangements, particularly those which produce a constant reaction force throughout their travel range. It should also be apparent that the relationship of the piston rod to the cylinder may be reversed, in that the piston rod may be adjacent and connected to the intermediate abutment wall, and the cylinder may be external of the rear chamber of the housing and connected to the rear follower.

The parts of the draft gear arrangement are shown in their release position in FIGS. 1 and 2. The hydraulic cushioning unit includes a large coil return spring 41 which encircles the cylinder 36 and piston rod 38 and reacts against the rear follower 23, to cause the housing 13 to be urged forwardly to hold the stop keys 30 and 32 against the forward ends of the center sill slots 31 and 33, thus presenting a positive stop against which the front follower 34 of the front cushioning unit 21 may react.

Under draft loads, the coupler 12 moves forwardly and acts through the draft key 28 to draw the housing 14 forwardly, causing its intermediate abutment wall 18 to move in compressing relation towards the now stationary

front follower 34. The cushioning unit 21 in the front chamber 19 may have a closure travel on the order of 1 inch, or more, if desired, but it is usually unnecessary to provide more than two inches of travel for this unit.

Under buff loads, the coupler shank 12 moves rearwardly to transmit forces serially through the front follower 34, through the front cushioning unit 21, through the intermediate abutment wall 18, and through the hydraulic cushioning unit 22 and rear follower 23 and then into the stops 11S. The rear cushioning unit 22 undergoes a closure equal to the travel clearance of the housing 14 relative to the rear follower 23 as indicated at T in FIG. 2. Ultimately the housing 14 goes solid through the follower 23 and the rear stops 11S to limit pressure built-up in the hydraulic cushioning unit, but at this time the rubber cushioning unit 21 is still active. In its release position the rear of the housing is spaced nine inches forwardly of the rear follower 23 to provide a nine-inch closure travel for the hydraulic cushioning unit.

Thus, the arrangement affords a hydraulic cushioning unit travel (9 inches) that is several times greater than the rubber cushioning unit travel (1 inch) under buff loads. Moreover, the hydraulic unit is subjected to a closure speed closely approaching the coupler speed and this insures higher efficiency cushioning as the hydraulic unit is more effective at higher closure speeds. The reserve capacity of the rubber unit 21 protects against excessive impact loads while satisfying all requirements for cushioning of draft loads.

At their outer ends, the sills 10 are equipped with cheek plates 42 and 43 bordering the slots 29, 31, and 33 to reinforce the structure against which the stop keys 30 and 32 react. Outboard shields 44 and 45 are applied to the cheek plates after insertion of the stop keys to retain the keys against accidental escape.

Thus, while preferred constructional features of the invention are embodied in the structure illustrated herein, it is to be understood that changes and variations may be made by those skilled in the art without departing from the spirit and scope of the appended claims.

What is claimed is:

1. In combination with car underframe structure that includes lengthwise extending fixed sills defining a draft pocket, a coupler projecting into and movable lengthwise in said pocket, a bolster center filler between said sills and having rigid stops bordering and defining rear lateral extremities of said pocket, a selective travel draft gear combination comprising a housing projecting forwardly from said sills and extending lengthwise rearwardly into said pocket to terminate in forwardly spaced facing relation to said stops to move towards said stops in buff, said housing having a rear chamber opening towards said center filler, a front chamber opening endwise oppositely of said rear chamber and rigid internal abutment wall structure dividing said chambers, a follower in said pocket to abut said rear stops, a cushioning unit mounted in said rear chamber to operate only in buff and including means projecting rearwardly therefrom and engaged to said follower to transmit buff reaction to said stops, said cushioning unit being a self restoring hydraulic fluid throttling type and having a coil type return spring encircling said means and reacting between said follower and said intermediate abutment wall structure, a positive resistance type cushioning unit mounted within said front chamber between said coupler and said intermediate abutment wall structure, to operate in both buff and draft, said housing and said sills having first and second sets of slots aligned transversely of said pocket, transverse stop key means projecting through said sets of slots and connecting said housing for limited lengthwise movement relative to said sills, said housing and coupler having slots aligned transversely of said pocket, and transverse draft key means projecting into the last named slots and connecting said coupler and housing.

2. In combination with car underframe structure that includes lengthwise extending fixed sills defining a draft pocket, a coupler projecting into and movable lengthwise in said pocket, a bolster center filler between said sills and having rigid stops bordering and defining rear lateral extremities of said pocket, a selective travel draft gear combination comprising a housing projecting forwardly from said sills and extending lengthwise rearwardly into said pocket to terminate in forwardly spaced facing relation to said stops to move towards said stops in buff, said housing having a rear chamber opening towards said center filler, a front chamber opening endwise oppositely of said rear chamber and rigid internal abutment wall structure dividing said chambers, said housing and said sills having first and second sets of slots aligned transversely of said pocket, transverse stop key means projecting through said sets of slots and connecting said housing for limited lengthwise movement relative to said sills, said housing and coupler having slots aligned transversely of said pocket, transverse draft key means projecting into the last named slots and connecting said coupler and housing, a cushioning unit comprised of an aligned stack of rubber pads mounted within said front chamber to react in buff between said coupler and said intermediate abutment wall structure and to react in draft between said stop key means and said intermediate abutment wall structure, a follow in said pocket to abut said rear stops, and a cushioning unit mounted in said rear chamber and including means projecting rearwardly therefrom and engaged to said follower to transmit buff reaction to said stops, said cushioning unit being a self-restoring hydraulic fluid throttling type and having a coil type return spring encircling said means and reacting between said follower and said intermediate wall structure to establish a release position for the draft gear combination wherein said housing is biased forwardly to hold the first named cushioning unit against said stop key means and provide clearance for rearward housing travel to enable a closure travel of the second named cushioning unit in buff in an amount several times greater than closure travel of the first named cushioning unit in draft.

3. In combination with car underframe structure that includes lengthwise extending fixed sills defining a draft pocket, a coupler projecting into and movable lengthwise in said pocket, a bolster center filler between said sills and having rigid stops bordering and defining rear lateral extremities of said pocket, a selective travel draft gear combination comprising a housing projecting forwardly from said sills and extending lengthwise rearwardly into said pocket to terminate in forwardly spaced facing relation to said stops to move towards said stops in buff, said housing having a rear chamber opening towards said center filler, a front chamber opening endwise oppositely of said rear chamber and rigid internal abutment wall structure dividing said chambers, said housing and said sills each having first and second sets of slots at flanking locations above and below said coupler and aligned transversely of said pocket, transverse stop keys means projecting through said sets of slots and connecting said housing for limited lengthwise movement relative to said sills, said housing and coupler having slots aligned transversely of said pocket, transverse draft key means projecting into the last named slots and connecting said coupler and housing, a positive resistance type cushioning unit mounted within said front chamber to react in buff between said coupler and said intermediate abutment wall structure and to react in draft between said stop key means and said intermediate abutment wall structure, and a cushioning unit mounted in said rear chamber and including means projecting rearwardly therefrom and connected to transmit buff reaction to said stops, said cushioning unit being a self restoring hydraulic fluid throttling type and having a coil

type return spring encircling said means and reacting between said stops and said intermediate wall structure to establish a release position for the draft gear combination wherein said housing is biased forwardly to hold the first named cushioning unit against said stop key means and provide clearance for rearward housing travel to enable a closure travel of the second named cushioning unit in buff in an amount several times greater than closure travel of the first named cushioning unit in draft.

4. In a railway car underframe of the type having fixed center sills carrying fixed stops defining rear lateral extremities of a draft pocket that opens endwise forwardly from said sills and having a coupler movable into and out of said pocket in response to buff and draft loads, respectively; a selective travel draft gear arrangement mounted in said pocket and comprising a housing having front and rear chambers separated by a fixed intermediate abutment wall in said housing, said front and rear chambers opening forwardly and rearwardly, respectively, said housing having a rear end terminating in forwardly spaced facing relation to said stops and having a front end projecting forwardly from said sills and providing an opening large enough to receive said coupler in said front chamber, said housing being mounted in said pocket for movement in either lengthwise direction from a normal release position, front and rear cushioning units in line in said housing on opposite regions of said intermediate wall, with adjacent ends of said units reacting against said intermediate wall, said housing and said sills having first and second sets of slots aligned transversely of said pocket, transverse stop key means projecting through said sets of slots and connecting said housing for limited lengthwise movement relative to said sills, said housing and coupler having slots aligned transversely of said pocket, transverse draft key means projecting through said sets of slots and connecting said coupler and housing, said front cushioning unit being operable in both buff and draft and being of a positive resistance type having its forward end reacting against said stop key means in draft and reacting against said coupler in buff, and said rear cushioning unit being operable only in buff and being a self-restoring hydraulic fluid throttling type that includes means projecting rearwardly from said housing and connected to transmit buff reaction to said stops.

5. In a railway car underframe of the type having fixed center sills carrying fixed stops defining rear lateral extremities of draft pocket that opens endwise forwardly from said sills and having a coupler movable into and out of said pocket in response to buff and draft loads, respectively; a selective travel draft gear arrangement mounted in said pocket and comprising a housing having front and rear chambers separated by a fixed intermediate abutment wall in said housing, said front and rear chambers opening forwardly and rearwardly, respectively, said housing having a rear end terminating in forwardly spaced facing relation to said stops and having a front end projecting forwardly from sills and providing an opening large enough to receive said coupler in said front chamber, said housing being mounted in said pocket for movement in either lengthwise direction from a normal release position, front and rear cushioning units in line in said housing on opposite regions of said intermediate wall, with adjacent ends of said units reacting against said intermediate wall, said housing and said sills having first and second sets of slots aligned transversely of said pocket, transverse stop key means projecting through said sets of slots and connecting said housing for limited lengthwise movement relative to said sills, said housing and coupler having slots aligned transversely of said pocket, transverse draft key means projecting into the last named slots and connecting said coupler and housing, said front cushioning unit being operable in both buff and draft and being of a

positive resistance type having its forward end reacting against said stop key means in draft and reacting against said coupler in buff, and said rear cushioning unit being a self-restoring hydraulic fluid throttling type that includes rearwardly projecting means reacting against said stops to establish a release position for the draft gear arrangement wherein said housing is biased forwardly to hold the first named cushioning unit against said stop key means and provide clearance for sufficient rearward housing travel to enable a closure travel of said rear cushioning unit in buff in an amount several

times greater than closure travel of the front cushioning unit in draft.

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