July 30, 1957 D. WILLISON 2,801,010

CUSHIONING MECHANISM FOR RAILWAY VEHICLES

Filed April 21, 1951 3 Sheets-Sheet 1

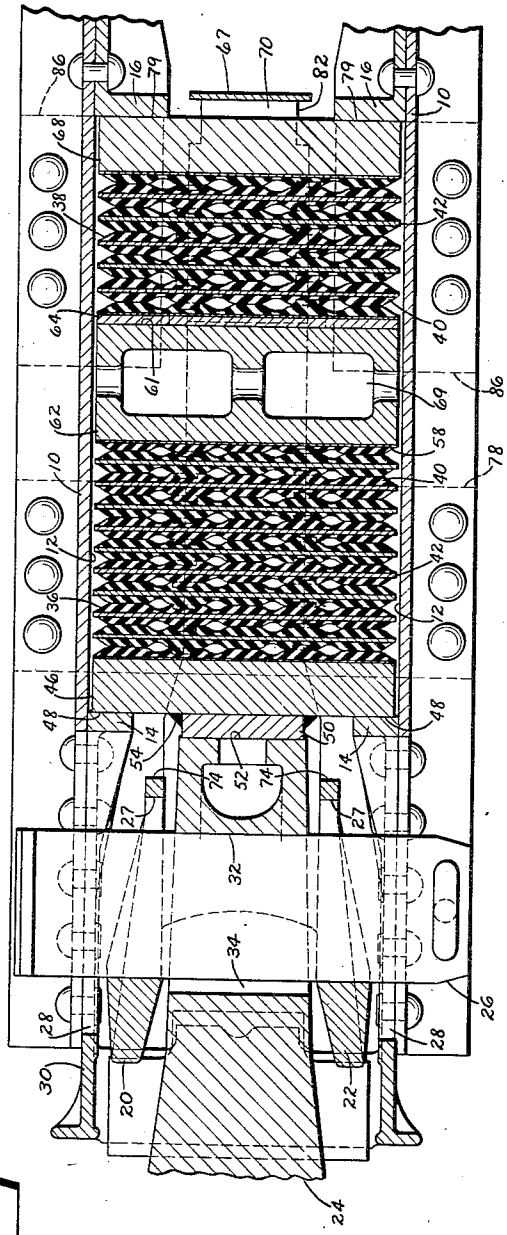

Fig. 1

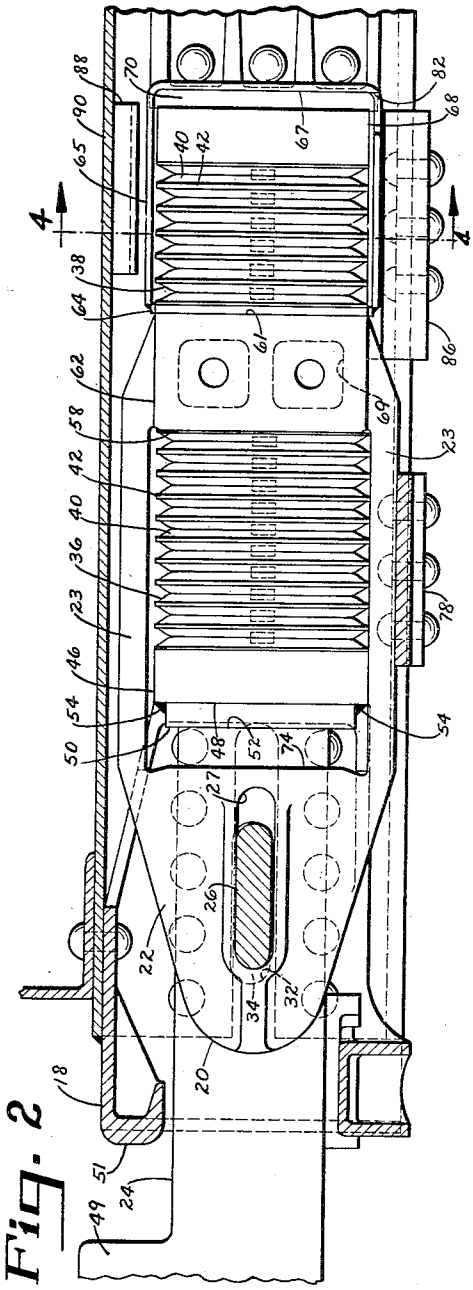

Fig. 2

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CUSHIONING MECHANISM FOR RAILWAY VEHICLES

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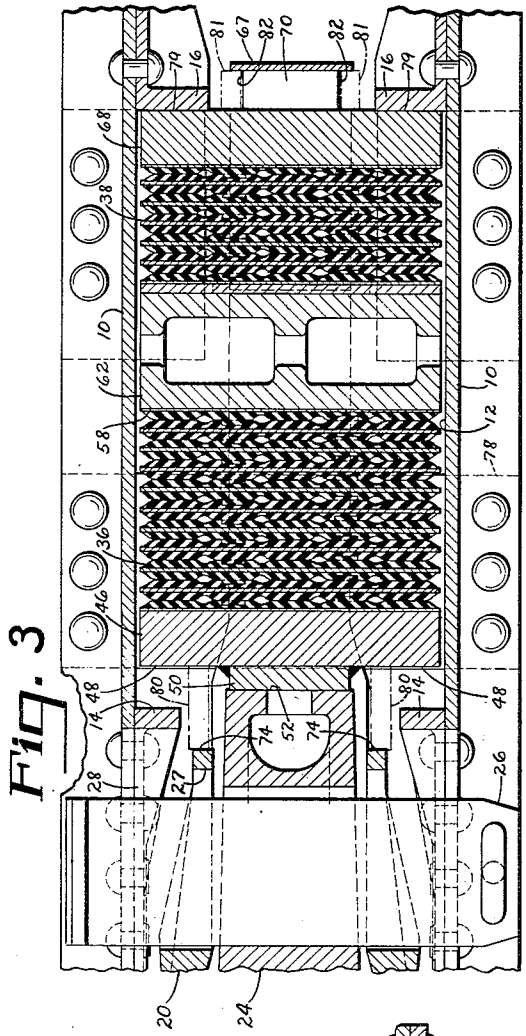

Fig. 3

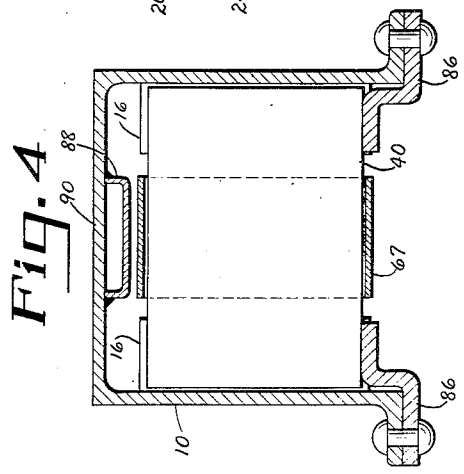

Fig. 4

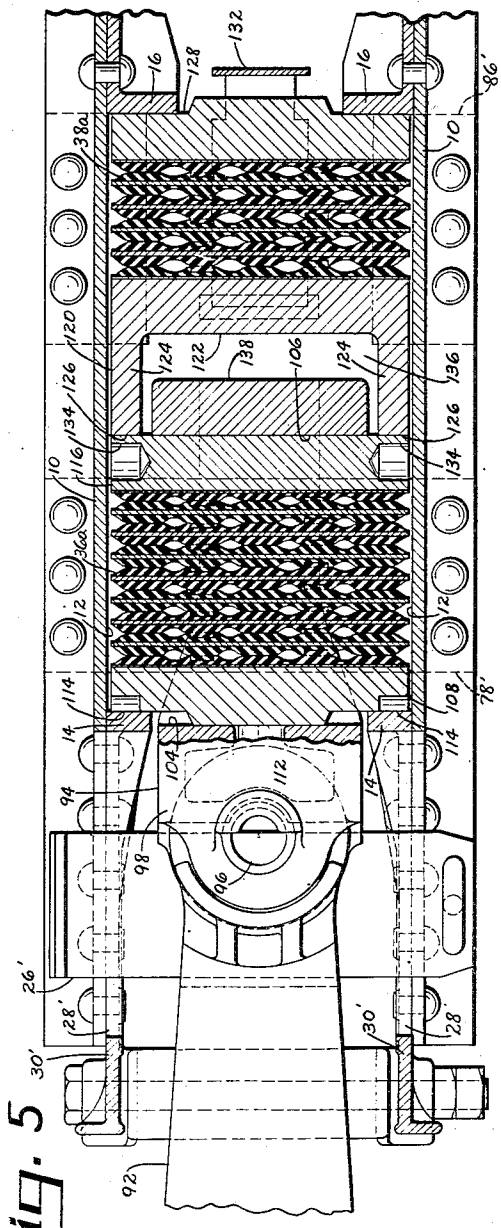

Fig. 5

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CUSHIONING MECHANISM FOR RAILWAY VEHICLES

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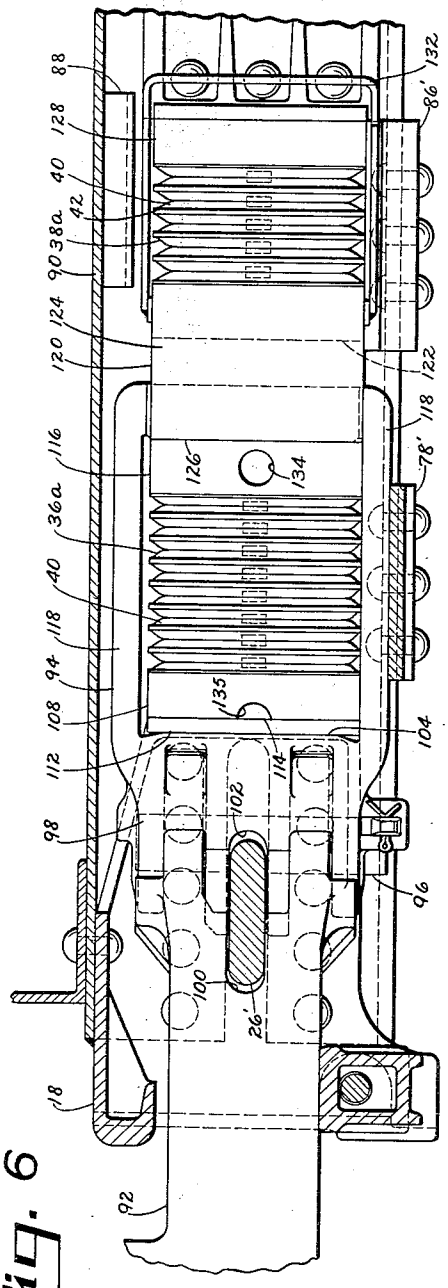

Fig. 6

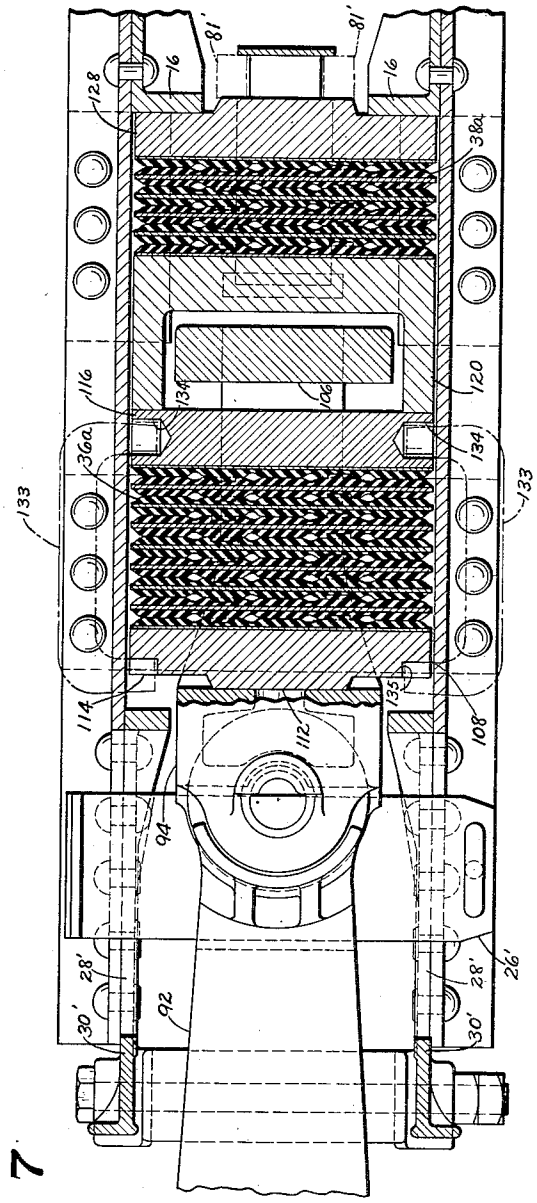

Fig. 7

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CUSHIONING MECHANISM FOR RAILWAY VEHICLES

Donald Willison, Maple Heights, Ohio, assignor to National Malleable and Steel Castings Company, Cleveland, Ohio, a corporation of Ohio

Application April 21, 1951, Serial No. 222,218

3 Claims. (Cl. 213—45)

My invention relates to cushioning mechanism for use on railway vehicles, and more particularly to a draft gear of the compensating type, in which all free slack between the draft gear and draft gear yoke, and between the draft gear and the draft gear pocket, is eliminated.

This invention pertains to a draft gear comprising a pair of cushioning units, one of which is encircled and carried by a draft gear yoke, and the other of which is disposed rearwardly of the yoke and within the confines of the draft gear pocket, the units being so constructed and arranged as to be compressed in series under buffing loads, while under draft loads only one of the units is compressed.

A feature of this construction is that my draft gear provides for greater travel and capacity in buff than in draft, this being desirable in view of the fact that buffing loads are generally of greater intensity than draft loads.

Other various features and advantages of my invention will be set forth in the accompanying description taken in conjunction with the drawings, in which:

Fig. 1 is a sectional plan view of a draft gear of the compensating type embodying my invention, the mechanism being applied to a freight car of conventional construction.

Fig. 2 is a side elevational view of my draft gear shown in Fig. 1.

Fig. 3 is a sectional plan view of my draft gear partially compressed in buff.

Fig. 4 is a cross-sectional view taken along line 4—4 of Fig. 2.

Fig. 5 is a sectional plan view of a modified form of my invention.

Fig. 6 is a side elevational view of the modification shown in Fig. 5.

Fig. 7 is a sectional plan view of the modified form of my draft gear partially compressed in buff.

Referring to the drawings, and more particularly to Figs. 1 and 2, I have shown the spaced center sills **10** of a railway car and a draft gear pocket **12** formed by the sills, the front draft lugs or stops **14**, and the rear buffing lugs or stops **16**. The conventional striking casting **18** is secured to sills **10**, the inner ends of the casting forming the front stops **14** of the draft gear pocket. The yoke **20** comprises head **22**, horizontal straps **23** and transversely extending end portion **62** joining straps **23**. Portion **62** preferably extends the full width of the spacing between center sills **10**. It will be noted that yoke head **22** is similar in construction to the head of the Association of American Railroads (A. A. R.) standard vertical plane horizontal key yoke as the Y–40.

The shank **24** of the car coupler is connected to the yoke by the horizontal key **26**, of conventional construction, which extends laterally through slot **27** in the yoke head and through aligned slots **28** in center sills **10** and in side walls **30** of the striking casting. Slots **28** are of sufficient length that the ends thereof are at no time engaged by key **26** during draft and buffing movements of the coupler and yoke. Slot **32** in the coupler shank is

preferably of slightly greater length than the width of key **26**, leaving a clearance as at **34** between the key and the forward end of the slot when the mechanism is in neutral position, as in Fig. 1.

My draft gear comprises a pair of cushioning units **36** and **38** arranged in longitudinal alignment, each unit being formed of a group of compression pads **40**, preferably of the type disclosed and claimed in the copending application of Donald Willison and Hubert L. Spence, Serial No. 138,614, filed January 14, 1950, now Patent Number 2,686,667, issued August 17, 1954. Each pad, except the end pad of each group, consists of a metal plate **42** with a cushion of resilient material, such as rubber, bonded to each face. The surface of the rubber is corrugated, as I have found that a cushioning pad of that type combines very desirable compression qualities with a high degree of durability and sturdiness. The end pads of each group have rubber bonded to one face only, thus avoiding any rubber to metal contact at the working faces of the end pads.

Cushioning unit **36** has a forward follower **46** for engagement with draft lugs **14**. Follower **46** comprises a forwardly extending abutment portion **50** for engagement with the end surface **52** of the coupler shank. Thus buffing loads are transmitted from the coupler shank to follower **46** and thence to cushioning units **36** and **38**. It is to be noted that the abutment portion **50** may comprise a separate piece secured to the follower as by welds **54**, or it may be formed integral with the base portion. The purpose of abutment **50** is to move the coupler forwardly to allow greater clearance between the coupler horn **49** and front surface **51** of the striking casting so as to utilize the greater travel of the draft gear in buff.

It will be observed that forward cushioning unit **36** and follower member **46** are encircled and carried by the yoke **20**, the rear end of the cushioning unit engaging abutment surface **58** on end portion **62** of the yoke. It will be apparent that in draft, as the yoke is pulled forwardly by the coupler through key **26**, unit **36** is compressed between follower **46** and surface **58** on the yoke. With this arrangement the forward abutment within the yoke, for cushioning unit **36**, is provided by end surface **52** of the coupler shank, while the rear abutment is provided by surface **58** on the yoke. End portion **62** of the yoke may be cored, as at **69**, to lighten the mechanism and yet maintain adequate strength.

Compressed between end portion **62** of the yoke and rear abutment member **68** is rearward cushioning unit **38**. In effect, rearward unit **38** reacts between forward unit **36** and member **68** to urge front follower **46** into engagement with stops **14** and member **68** in engagement with rear stops **16**. Unit **38** is preferably encircled by a retaining band **65** comprising a plate **64**, to which is affixed a U-shaped portion **67**. It will be observed that a clearance as at **70** exists between member **68** and the rearward end of the band to allow the unit to expand in draft from its initial precompressed condition, as will be hereinafter explained. It will be clear that member **68**, which engages rear stops **16**, serves as a base of resistance against which unit **38** is compressed in buff. The primary function of the band is to aid in the assembly of my draft gear and to maintain the rear cushioning unit in alignment during operation of my draft gear. It will be noted that during the actual operation of my draft gear, plate member **64** acts merely as a shim between the front of cushioning unit **38** and the abutment surface **61** on the yoke.

The draft gear is assembled as follows: The forward follower **46** is inserted between the yoke straps **23** and moved forwardly into engagement with rear edges **74** of the yoke head. Next, the forward group **36** of pads **40** is

inserted into the yoke between follower **46** and abutment surface **58**. Then the yoke is placed upright in a press, supported on surface **61** of end portion **62** of the yoke. Pressure is applied to the draft lug engaging faces **48** of the follower to compress the cushioning unit, thus permitting the insertion of metallic slugs **80** or other suitable fillers between rear edges **74** of the yoke hood and follower **46** as shown in dot-dash in Fig. 3. The yoke assembly may now be removed from the press and placed into position in the draft gear pocket in the car, with follower **46** in engagement with front stops **14**, after which the front support plates **78** are secured to the center sills **10**. The coupler shank **24** is then inserted into position within the yoke head, and the yoke connecting key **26** is applied. It is to be noted that the length of the metallic slugs **80** should be such as to position follower **46** sufficiently rearwardly in the yoke to allow key **26** to be freely applied.

Next, abutment member **68**, together with the rearward group **38** of cushioning pads **40**, is placed into position within retaining band **65**. The assembly is then placed upright in a press supported on the buffing plate member **64** and pressure is applied to the buffing lug engaging face **79** of the abutment member **68** to compress the cushioning unit, thus permitting the insertion of metallic slugs **81** or other suitable fillers between member **68** and the adjacent portion of band **65**, as illustrated in Fig. 3. Recesses **82** are provided in the lower strap of retainer **65**, through which slugs **81** are inserted. It is to be observed that slugs **81** should be of sufficient length so as to protrude downwardly through the recesses **82**, thus facilitating subsequent removal of the slugs, as will be hereinafter explained. The assembly is now removed from the press and placed into position in the draft gear pocket of the car. It is to be noted that the thickness of the slugs which hold unit **38** under compression should be sufficient to permit the assembly to be moved freely into position between end surface **61** of the yoke and rear stops **16**. Thereafter the rear support plates **86** are secured to center sills **10**.

After the assembly of the draft gear into the draft gear pocket has been completed, both forward and rearward slugs **80** and **81**, respectively, may be removed by applying a buffing load to the gear sufficient to exceed the initial compression of forward cushioning unit **36**. Such a load in buff will release the slugs, allowing slugs **80** to fall freely from their position between the yoke head and the follower member and allowing slugs **81** to fall freely through the recesses **82** in retaining band **65**.

As will be seen in Figs. 2 and 4, a channel-shaped aligning member **88** is provided directly above retaining band **65** and is affixed, preferably by welds, to the inner surfaces of the top web **90** of the center sills **10**. The purpose of the aligning member **88** is to preclude any undue vertical displacement of cushioning unit **38** of my draft gear in service.

The various elements of the draft gear are so dimensioned and arranged that upon assembly thereof in the draft gear pocket of the car, the forward cushioning unit **36** is placed under a substantial compressive load of about 20,000 pounds, for example, while the rearward cushioning unit **38** is placed under a compressive load of about 10,000 pounds. The 20,000-pound load on the forward unit reacts at one end against rearward abutment surface **58** in the yoke, and at the other end through follower **46** against surface **52** on the coupler shank, and thence through key **26** to the head **22** of the yoke. The 10,000-pound load on the rearward unit reacts directly against the rear buffing lugs **16** and against end surface **61** of end portion **62** of the yoke, thereby urging forward cushioning unit **36**, including follower **46**, against front stops **14**. It is to be noted that the yoke and unit **36** are urged forwardly as a unit by rear cushioning unit **38**, thus assuring tight engagement between follower **46** and its associated stop lugs **14** and between abutment member **68** and its associated rear stop lugs **16**. It will also be apparent that end portion **62** of the yoke is held tightly between the adjacent ends of units **36** and **38**. It will thus be seen that my invention automatically eliminates all free slack between the cushioning mechanism and the draft gear yoke, and between the cushioning mechanism and the draft gear pocket in the car.

The operation of my draft gear under a buffing load is as follows: The buffing load is transmitted by the coupler shank **24** to forward follower **46** and thence to cushioning units **36** and **38**. It will be apparent that upon the application of the buffing load the gear will begin to compress after the initial compression of 10,000 pounds applied to rearward unit **38** is overcome. As the load exceeds 10,000 pounds rearward unit **38** alone will be compressed from its original assembled position, as shown in Figs. 1 and 2. Thus the buffing load is transmitted through forward unit **36** and end portion **62** of the yoke to unit **38** and the latter alone is compressed until the buffing load equals the initial compression load of 20,000 pounds on forward unit **36**. Thereafter as the coupler continues to move in buff both cushioning units compress in series and in effect act as a single unit during the remainder of the buffing travel. All of the cushioning pads are therefore effective in cushioning buffing loads. This action constitutes a feature of the invention.

In Fig. 3 the gear is shown subjected to a buffing load which exceeds the initial compression applied to forward unit **36** so that both units are shown compressed from their initial assembled position. All of the pads in each group are compressed the same amount and all act in series to resist the load. It will be observed that during the application of buffing loads to the draft gear, yoke **20** is inactive so far as the transmission of such loads is concerned. Therefore, neither the yoke head **22** nor yoke straps **23** carry any buffing forces. End portion **62** of the yoke, which is interposed between units **36** and **38**, serves to pull the yoke rearwardly in buff, and it will be apparent that the yoke will move rearwardly the same amount that rearward unit **38** is compressed during the application of the buffing load. As the coupler is subjected to a buffing load it carries key **26** rearwardly, after clearance **34** between the key and the key slot in the shank has been taken up. It will be observed that slot **27** in the yoke and slots **28** in the striking casting and center sills allow for unrestricted rearward movement of the key in buff.

Under a pulling or draft load the coupler shank transmits the load through key **26** to yoke head **22** and straps **23** to end portion **62** of the yoke, causing it to move forwardly and compressing the forward cushioning unit **36** against follower **46**. At the same time, because of the forward movement of yoke portion **62**, rearward cushioning unit **38** expands from its initial assembled position. It will be observed that the expansive force of unit **38** acts to urge the yoke forwardly so that the pulling force required to start compression of the forward cushioning unit **36** is equal to the difference in the initial compression loadings applied to the forward and rearward cushioning units during assembly. Thus utilizing the compression values given heretofore, an initial force of 10,000 pounds in draft is required before the forward cushioning unit begins to compress. As the pulling load increases it causes the forward cushioning unit to continue to compress until the entire pulling load has been dissipated.

An important feature of my draft gear resides in the elimination of all metal-to-metal stops for limiting travel of the draft gear, such as are required in friction type draft gears. Thus the normal running shocks of draft and buff as well as the shocks resulting from abnormal operations are at all times cushioned by rubber.

While the forward cushioning unit **36** contains more pads than rear unit **38**, it will be understood that the parts of the gear may be so proportioned as to allow a

greater or lesser amount of pads than have been shown in the forward unit. Any variation in the number of pads in the forward unit affects only the characteristics of the gear in draft, the buffing characteristics remaining the same so long as the total number of pads in the gear is constant.

The modification shown in Figs. 5, 6, and 7 is for use with a swivel butt type of coupler shank and yoke connection. In this arrangement the shank **92** is shown connected to the yoke **94** by means of swivel pin **96**. The yoke **94** comprises head **98** which is similar in construction to the yoke head of the A. A. R. standard vertical plane swivel yoke, known as the Y–30. As usual, in this type of connection, horizontal key **26'** extends laterally through slots aligned **28'** in center sills **10** and in side walls **30'** of the striking casting and through coextending slots **100** and **102** in the coupler shank and in the yoke head, respectively.

It will be noted that horizontal key **26'** serves no other purpose in this construction than that of an emergency alternate connection to prevent the coupler shank from being pulled free of the car in case of failure of yoke straps **118**. Slots **28'** are of sufficient length that the ends thereof are at no time engaged by key **26'** during normal operation of the draft gear. Also, it will be observed that the coupler shank **92** and the yoke **94** move longitudinally as a unit during the application of draft and buffing forces to the mechanism.

In engagement with the front abutment **104** in the yoke is the follower **108** comprising a yoke-engaging abutment portion **112**, and draft lug-engaging portions **114**. In engagement with the rear abutment **106** in the yoke is another follower **116**. It will be observed that the cushioning followers **108** and **116** are of lesser height than the spacing of the yoke straps **118** so that they can be assembled directly into the yoke in a lateral direction. Compressed between followers **108** and **116** is a group of rubber pads **40** which form the forward cushioning unit **36***a* of the gear.

Disposed rearwardly of follower **116** and in engagement therewith is an abutment member **120** which bridges the end of the yoke. Member **120** is U-shaped and comprises a transversely extending wall or base portion **122** spaced from the end of the yoke, and forwardly extending side wall portions **124** which are spaced laterally of the yoke end and have abutment surfaces **126** at the forward extremities thereof in engagement with follower **116**. In engagement with the rear buffing lugs **16** is a transversely extending abutment member **128**. Compressed between member **120** and member **128** is a group of rubber pads **40** which form the rearward cushioning unit **38***a* of the gear. It will be observed in Fig. 6 that the pads of unit **38***a* are encircled by a U-shaped retaining band **132** which is preferably secured by means of welding to abutment member **120**. The lower strap of band **132** is provided with recesses **82'** for receiving assembly slugs **81'** as in the previous form of the invention. As in the previous embodiment, channel-shaped aligning member **88** is provided directly above band **132** to preclude any undue vertical displacement of rearward unit **38***a* in service.

The modified form of my draft gear is assembled in much the same manner and sequence as is my preferred form of draft gear, the main exception being that in assembling the modified form the forward cushioning unit **36***a* is compressed between its associated followers and is held compressed by a pair of C-type clamps **133**, as illustrated in dot-dash in Fig. 7. A drilled hole **134** on each side of follower **116** is provided for receiving one arm of each clamp while the other arm of the clamp is received in a notch **135** in follower **108**. The cushioning unit, thus compressed, is placed into position within the yoke and the C-clamps removed with pry bars. The yoke is next raised into place between the car sills with follower **108** in engagement with front stops **14** and then support plate **78'** is applied. Rear cushioning unit **38***a*, which is held compressed between members **120** and **128** by slugs **81'** and band **132** is next raised into position and support plate **86'** is then applied. Slugs **81'** will be released upon the application of a buffing load sufficient to compress unit **38***a* beyond that which it is compressed for assembly purposes. After slugs **81'** have been released the expansion of unit **38***a* between members **126** and **128** urges forward unit **36***a* forwardly so that follower **108** engages front stops **14**.

The amount of precompression maintained in the cushioning units may be the same as that used for purposes of illustration in my previous form of draft gear, namely, 20,000 pounds in the forward cushioning unit and 10,000 pounds in the rearward cushioning unit. Thus upon assembly of the gear in the car, unit **36***a* will be tight between the front and rear abutments in the yoke and also front follower **108** will be in tight engagement with stop **14** while member **128** will be in tight engagement with rear stops **16**. As may be readily seen, the operation in draft of my modified form is exactly the same as in my preferred form.

The operation of my modified form of draft gear under a buffing load is the same as that of the previous form, so far as concerns the compression of units **36***a* and **38***a*, although the functioning of the yoke is somewhat different. In buff the coupler shank **92** transmits the load to the yoke head **98** which transmits the load through the forward cushioning unit **36***a* to abutment member **120** and thence to the rearward cushioning unit **38***a*. It will be observed that the yoke straps **118** are free of any buffing loads by reason of the clearance **136** provided between the end portion **138** of the yoke and base portion **122** of member **120**. This clearance is preferably of an amount greater than the distance that follower **108** moves toward follower **116** under the maximum buffing load encountered in service. In other words, clearance **136** is such that end portion **138** of the yoke will not engage base portion **122** even under the severest service conditions. Therefore, upon the application of a buffing load to the draft gear, rearward cushioning unit **38***a* alone is compressed until its resistance equals the initial compression of forward cushioning unit **36***a*. Thereupon any additional increase in the buffing load will cause the forward cushioning unit and the rearward cushioning unit to compress in series until the buffing load has been completely dissipated. It will be clear that when both units are being compressed, all of the pads in the gear are compressed equally. In this form of the invention the yoke moves rearwardly an amount equal to the total compression or travel of cushioning units **36***a* and **38***a*, whereas in the previous form the yoke moves in buff only an amount equal to the compression of the rearward cushioning unit.

In draft the action of the gear is the same as that of the previous embodiment, with only forward unit **36***a* being compressed by the yoke as it is pulled forward by the coupler. As before, the load in draft at which unit **36***a* begins to compress is equal to the difference between the initial compression applied to the front and rear units after assembly of the gear in the car. As unit **36***a* is compressed rear unit **38***a* expands a corresponding amount until the pads **40** in unit **38***a* have expanded to their unloaded thickness.

While I have mentioned certain figures which I believe are desirable for the initial compression of the forward and rearward cushioning units, it should be understood that these particular values are not essential to the proper functioning of the draft gear. The various parts of this draft gear, the yoke and the draft gear pocket, are subject to manufacturing tolerances, and certain of these variations affect the space available for the rubber pads, and necessarily result in deviations from the particular

compression values specified above. An essential requirement for my draft gear is that under the loosest condition allowed by any combination of tolerances, and variations in the rubber pads, the forward cushioning unit should be under an amount of compression that is greater than the compression in rearward unit. This will assure that the draft gear will be tight in the yoke and tight between the front and rear stops of the draft gear pocket in the car, thereby eliminating all free slack.

The terms and expressions which I have employed are used in a descriptive and not a limiting sense and I have no intention of excluding such equivalents of the invention described or of the portions thereof, as fall within the purview of the claims.

I claim:

1. In a draft gear for assembly between the front and rear stop lugs of a draft gear pocket, the combination of a forward cushioning unit and a rearward cushioning unit arranged in longitudinal alignment, said forward unit engaging said front stop lugs and said rearward unit engaging said rear stop lugs, a yoke encircling the forward one of said units and having an end portion interposed between and in engagement with the confronting faces of said units, a coupler shank operatively connected to said yoke to allow movement of said shank rearwardly relative to said yoke, the end of said shank forming a forward abutment within said yoke and being in engagement with the front end of said forward unit when said gear is in neutral position in said pocket, said forward unit being assembled under predetermined initial compression in said yoke, the rearward one of said units being assembled under predetermined initial compression against said end portion of said yoke and said rear stop lugs, said initial compression of said forward unit being greater than said initial compression of said rearward unit, said end portion of said yoke in response to movement of said coupler in draft compressing said forward unit and allowing said rearward unit to expand, said coupler shank upon movement thereof in buff transmitting all buffing loads to said units in series, only said rear unit being initially compressed upon application of a buffing load to the draft gear until the compression of said rearward unit equals said initial compression of said forward unit whereupon said forward and rearward units are further compressed in series.

2. In a draft gear for assembly between the front and rear stop lugs of a draft gear pocket, the combination of a forward cushioning unit engaging said front stop lugs and a rearward cushioning unit engaging said rear stop lugs, a yoke encircling said forward unit and having an end portion interposed between said units, front and rear abutments associated with said yoke, said rear abutment engaging the rear end of said forward unit, follower means interposed between and in engagement with the confronting faces of said forward unit and said front abutment to place said forward unit under predetermined initial compression between said front and rear abutments when said gear is in neutral position in said pocket, the rearward one of said units being assembled under predetermined initial compression between said end portion of said yoke and said rear stop lugs, said initial compression of said forward unit being greater than said initial compression of said rearward unit, said follower means being moved rearwardly upon application of a buffing force through said front abutment to transmit all of said force in series through both of said units, only said rearward unit being initially compressed upon application of said force until the compression of said last-mentioned unit equals said initial compression of said forward unit whereupon said forward and rearward units are further compressed in series.

3. In a draft gear assembly in accordance with claim 2 wherein an abutment member is interposed between and in engagement with said units, said member bridging said end portion of said yoke and being spaced longitudinally therefrom to allow rearward movement of the latter relative to said member in buff, and a U-shaped retaining band encircling the rearward one of said units and being secured to said member.

References Cited in the file of this patent

UNITED STATES PATENTS

466,348	Hinson	Jan. 5, 1892
1,807,345	Schmidt	May 26, 1931
2,039,266	Barrows et al.	Apr. 28, 1936
2,186,267	Page	Jan. 2, 1940
2,203,542	Page	June 4, 1940
2,640,603	Willison et al.	Jan. 2, 1953
2,743,821	Dean	May 1, 1956