Sept. 3, 1968 A. L. ZANOW 3,399,787

CAR DRAFT-RIGGING WITH SWIVEL-JOINT STRUCTURE

Filed Dec. 9, 1966 2 Sheets-Sheet 1

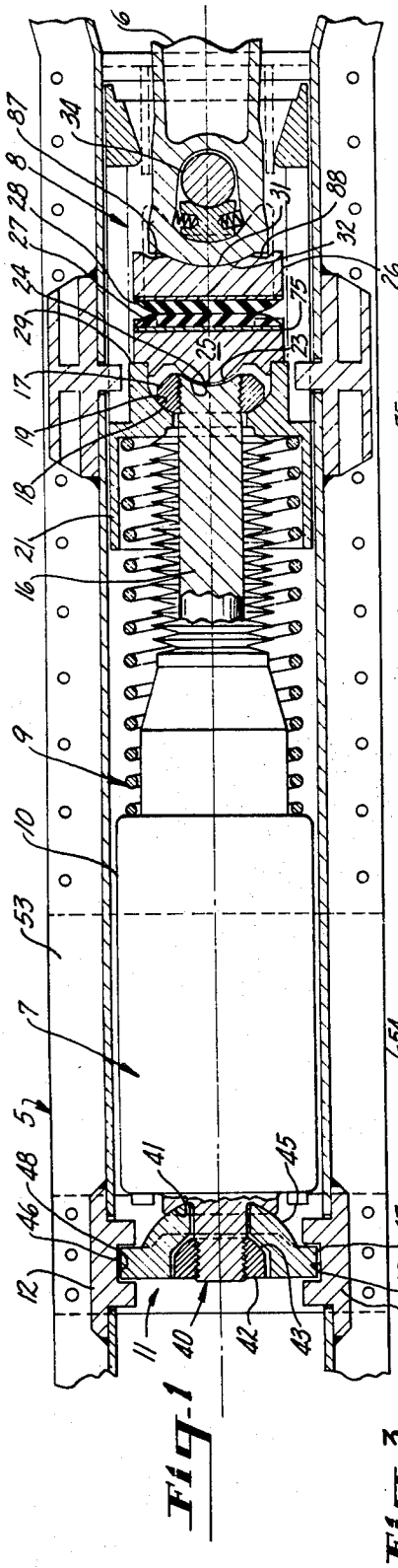


Fig-1

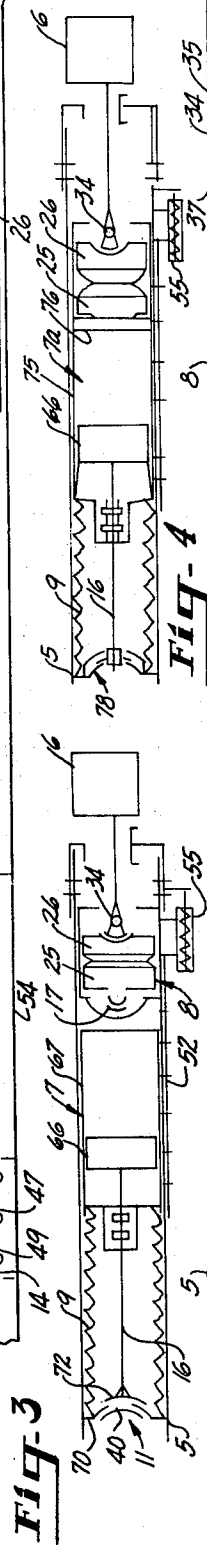


Fig-3

Fig-4

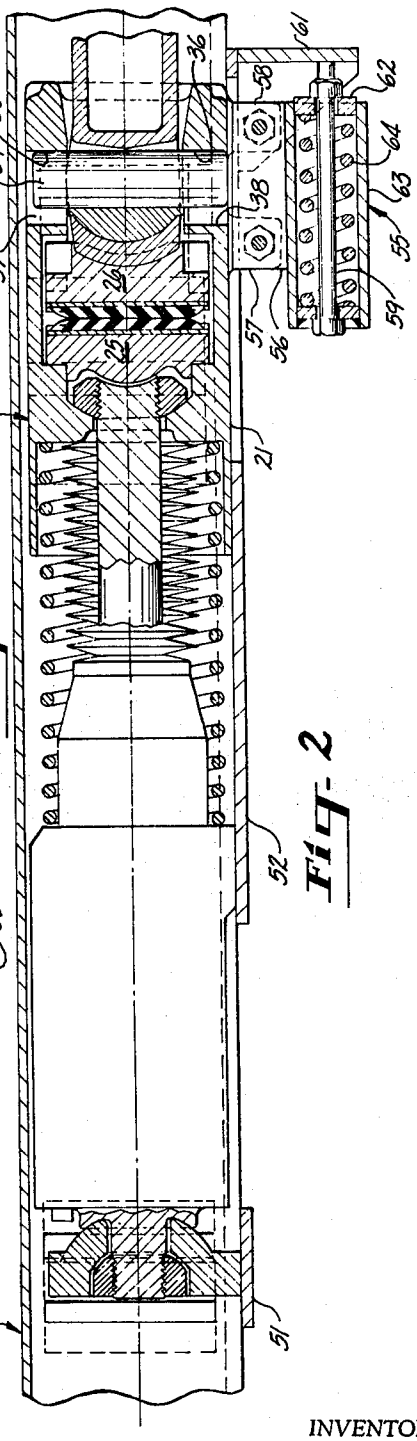


Fig-2

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CAR DRAFT-RIGGING WITH SWIVEL-JOINT STRUCTURE

Filed Dec. 9, 1966 2 Sheets-Sheet 2

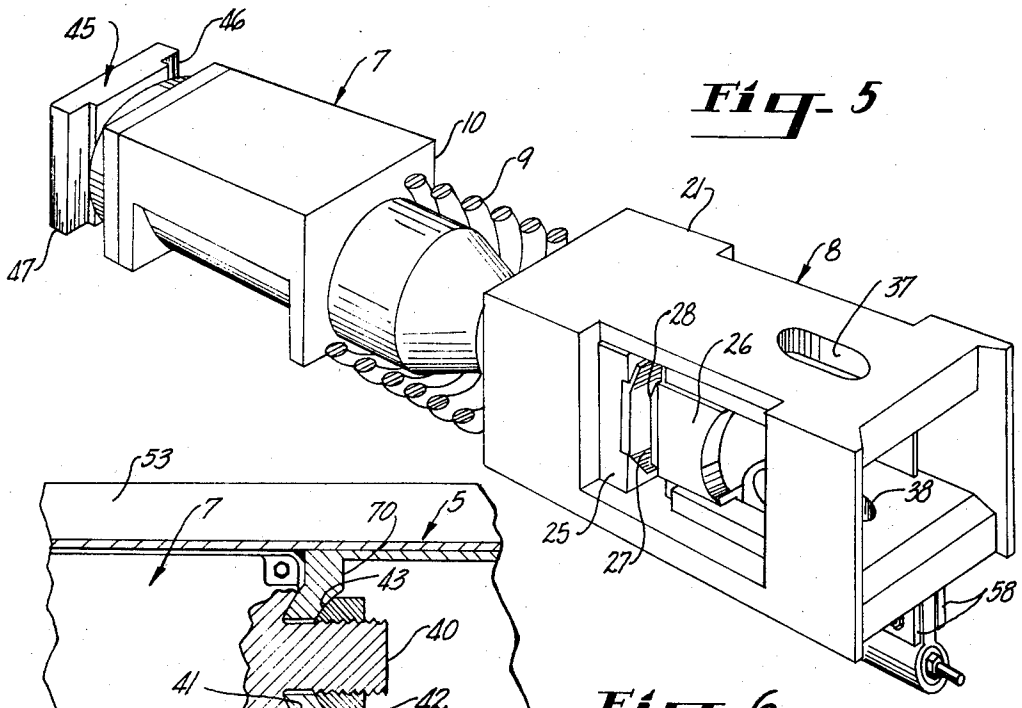


Fig. 5

Fig. 6

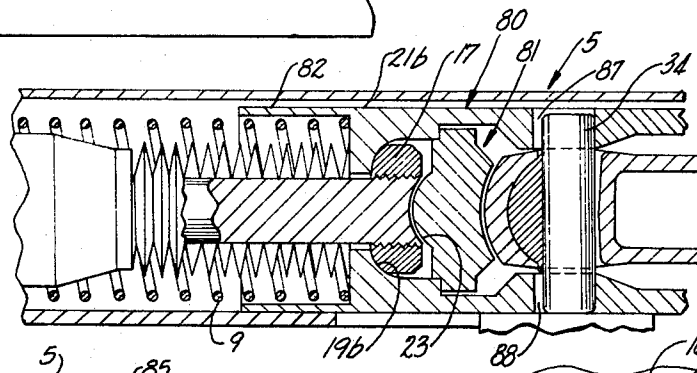


Fig. 7

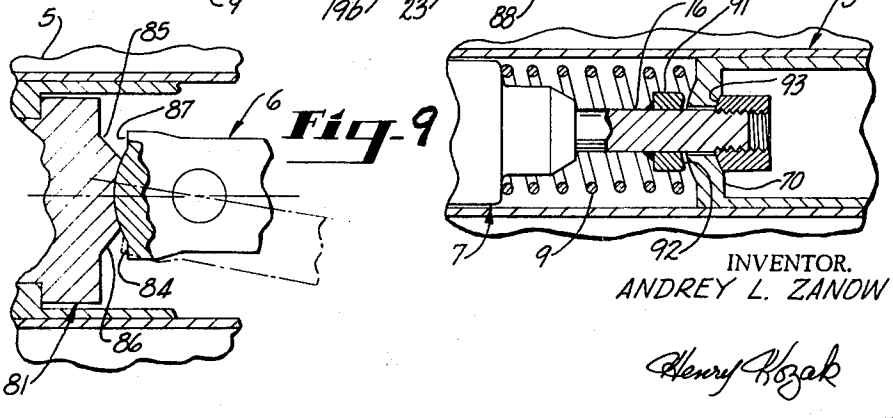


Fig. 8

Fig. 9

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CAR DRAFT-RIGGING WITH SWIVEL-JOINT STRUCTURE

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ABSTRACT OF THE DISCLOSURE

Railway car draft rigging including a draft gear, a car coupler, and structure for connecting the draft gear to the coupler and the car body. The draft gear is of the double-acting type requiring one end to be anchored to the car body and the other end attached to the coupler butt whereby it elongates or shortens in response to draft or buff forces, respectively. The invention is concerned particularly with a configuration of swivel connections at opposite ends of the draft gear which are spacesaving in a manner to minimize the length of the draft rigging.

Draft gears, whether they be of a friction, hydraulic, or resilient cushion types, it is advantageous to subject the draft gear portion of the draft rigging to forces which are merely linear in the longitudinal direction of the vehicle. In the use of hydraulic draft gears, it is particularly desirable to insulate the draft gear from lateral or twisting forces since such devices must necessarily incorporate seals between relatively moving parts for liquid retention. Such seals are notoriously a source of maintenance difficulty and their breakdown is greatly accelerated when a cylinder and a piston rod thereof are subjected to relative lateral forces. This is particularly true in railway use because of its heavy duty nature and the great need to have railway vehicles free to travel great mileages over an interchange railway system without servicing.

Railway vehicles are subjected continually to draft and buff forces which are in more or less angular relation with their longitudinal axes thereby producing lateral force components which must be absorbed in some manner by respective draft rigging. In fact, it is nearly impossible to push one railway vehicle by another without producing some angling of forces within the draft rigging. In a train of cars this effect is only increased. Moreover, when the draft rigging is of the type providing alignment control through cooperating specially-constructed coupler butts and draft gear followers, lateral force components are exerted by the angled coupler on the cushioning mechanism which should not be transmitted to, e.g., the piston rod of a hydraulic shock absorber.

Accordingly, a primary object of the invention is to provide draft rigging or other shock absorbing mechanism capable of receiving buff forces in angled relation with its longitudinal axis wherein a cushioning unit, such as a hydraulic cylinder-piston type device is subjected to merely linear forces directed along its axis of longitudinal compression or extension.

Another object is to provide connecting mechanism at either end of the cushioning unit which places the cushioning unit in swiveling relation with a force-opposing object, such as a coupler, and structure to be protected from excessive force, such as a car body, with such mechanism being designed to achieve nearly maximum utilization of space in the linear direction of the draft rigging.

In achieving the foregoing object, a necessary object is to provide a type of connecting mechanism yielding bearing areas of adequate size for the large forces entailed in the use of railway vehicles.

Objects such as the above are achieved in a cushioning

system, such as a draft rigging for a railway car, wherein a cushioning unit thereof is insulated from lateral forces incident to buffing action imposed on the mechanism. For example, a draft rigging according to the invention includes a housing which may be a portion of a center sill fixed within the car underframe having its front end approximately coinciding with an end of the car and extending inwardly and rearwardly from such car end; a cushioning unit, such as a hydraulic cylinder-piston-piston-rod assembly received in the housing and having front and rear portions in relatively movable relationship along a longitudinal axis extending lengthwise of the car; and connecting mechanism of the type herein disclosed at either or both ends of the cushioning unit for connecting the unit to either or both the housing and an instrument for imposing a buff force on the unit, such as a car coupler.

The invention is essentially concerned with the nature of the connecting mechanism at either end of hte cushioning unit. Such connecting mechanism comprises a bowl-shaped member providing an inner concave surface and an outer convex surface cooperating with structure providing spaced convex and concave surfaces in substantially complementary and engageable relation with the bowl surfaces. The bowl-shaped member may be attached to the unit and the receiving complementary structure therefor may be attached to the housing at one end of the unit, or the force-imposing instrument at the other end of the unit, or these relationships may be reversed at either end of the unit.

In the drawing with respect to which this invention is described:

FIG. 1 is a fragmentary plan view partially in cross-section of draft rigging and portions of car structure and a coupler connected therewith;

FIG. 2 is a fragmentary side elevation, partially in section, of the draft rigging in FIG. 1 and associated coupler and car structure;

FIG. 3 is a fragmentary diagrammatic view in elevation of the draft gear, car underframe parts, and a coupler in different arrangement than found in FIG. 1;

FIG. 4 is a fragmentary diagrammatic view in elevation of still another modification wherein the draft rigging is differently constituted than found in FIGS. 2 and 3;

FIG. 5 is a perspective view of the draft rigging of FIGS. 1 and 2 separated from the coupler and the car underframe;

FIG. 6 is a fragmentary plan view in section of a modified arrangement for connecting the rear end of a hydraulic cylinder in swiveling relation with car frame parts;

FIGS. 7 and 8 are fragmentary top and elevation views, partly in section, of a modified arrangement for connecting the piston rod of a hydraulic cushioning unit with a coupler; and

FIG. 9 is a fragmentary plan view showing an arrangement for connecting the piston rod to the car underframe in the manner shown in FIG. 4 wherein a cushioning unit is reversed with respect to its orientation, as shown in FIGS. 1 and 2.

FIGS. 1 and 2 are different views of the same embodiment illustrated in somewhat greater detail than found in later-described embodiments which relate primarily to modifications of connecting structure at one end of the cushioning unit or the other. Shown in FIGS. 1 and 2 is a center sill **5** which opens downwardly and defines a housing in which is received a rear portion of a coupler **6** and draft rigging which includes a hydraulic cushioning unit **7**, a crosshead **8**, a return spring **9** standing between the housing **10** of the cushioning unit and the crosshead **8**, and a swivel-joint **11** functioning to pivotally connect the housing **10** of the unit **7** to the center sill **5** at stops **12** and **14** fixed to the sill.

At the other end of the unit 7, the unit is in swiveling relation with the crosshead 8 by means of the end portion of the piston rod 16 terminating at its distal end in a head defined primarily by a nut 17 in threaded relation with an end portion of a piston rod. The nut 17 has an annular spherically-contoured convex rear surface 18 normally seating on a complementary concave surface or seat 19 of the casing 21 of the crosshead 8. The surfaces 18 and 19 are rear facing and front facing respectively for transmitting draft forces to the unit 7 from the coupler 6.

For transmitting buff forces from the coupler 6 to the unit 7, the front facing end surface 23 of the head of the piston rod, formed primarily by the end of the piston rod 16 itself, is spherically concave to engage the front facing complementarily spherically convex surface 24 of a follower 25 received within the casing 21.

Under neutral or draft condition of the rigging the internal components of the crosshead are maintained in a state of tight engagement by a pair of resilient pads 27 and 28. These pads maintain the follower 25 in seating relation with a seat 29 in the rear portion of the casing 21 and an abutment block 26. The front concave spherical surface 31 of the abutment block is maintained against the rear spherical convex surface 32 of the shank of coupler 6. The coupler is limited in forward motion relative to the casing 21 through engagement of the pin 34 for connecting the crosshead and coupler by upper and lower front and rear facing surfaces 35 and 36 of openings 37 and 38, respectively, in top and bottom walls of the casing 21. The openings 37 and 38 are elongate in the longitudinal direction of the draft rigging to permit relative movement of the coupler and the pin 34 lengthwise of the casing 21 upon compression of the pads 27 and 28 under buff action. In buffing, the casing is moved by the follower 25 out of seating relation with the piston rod head 17 at surfaces 18 and 19 to allow engagement of surfaces 23 and 24, whereupon the full force imposed by the coupler is transmitted through the abutment block 26, the pads 27 and 28 and the follower 25 into the piston rod of the unit 7. However, any lateral components of buffing forces are transmitted to casing 21 and expended herethrough on the center sill 5.

The predominantly longitudinal component of a buffing force is transmitted by the cushioning unit 7 to the frame or center sill 5 through elements of the pivotal joint 11. Considering this joint in detail, the housing 10 of the unit 7 provides a stud 40 at its rear end having a rear-facing annular spherically-concave surface 41 surrounding the base of the shaft of the stud. The shaft portion of the stud is threaded toward its rear end to receive a nut 42 having a front facing spherically convex surface 43. Surfaces 41 and 43 are thus fixed with respect to the unit 7 and it is through them that buff or draft forces are transmitted to a bowl-shaped member 45 which has side flanges 46 and 47 received in vertically elongate grooves or recesses 48 and 49, respectively, of the stops 12 and 14. The flange and groove arrangement is provided for easy attachment of the draft rigging with the center sill by lifting the draft rigging into place from underneath the car. When raised to proper position the draft rigging is secured in the sill by horizontal plates 51 and 52 riveted or otherwise attached to rear horizontal flanges 53 and 54 of the sill.

With the exception that a spring unit 55 should be removed, the draft rigging as shown in FIG. 5 is assembled for elevation into the pocket provided by the center sill 5. For installation, the draft rigging excludes the unit 55 so that the plate 52 may be attached. With plate 52 in place the draft rigging is completed by attachment of the unit 55 for establishing the neutral condition of the draft rigging.

The unit 55 attaches to the lower side of the crosshead casing 21 by bolting its upstanding lug 56 to depending lugs 57 and 58 of the casing. At neutral condition, the plunger 59 of the unit stands against a downwardly extending bracket 61 of the plate 52. As the crosshead is pulled forwardly from neutral position in draft action, the plunger carries a collar 62 inwardly of the casing 63 of the unit to compress the spring 64. The draft travel of the crosshead is essentially the length of that space existing between the rear side of the bracket 61 and the front end of the casing 63. The neutral position of the piston within the cylinder head is approximately depicted by FIG. 3 wherein the piston 66 of the unit is shown at a position between opposite end walls of the cylinder 67 that is closer to the rear end of cylinder 67 than the front end.

FIG. 6 illustrates an alternate arrangement for connecting the rear end of the draft rigging of a type such as that illustrated in FIGS. 1 and 2 providing swivel-joint structure of simplified design. The stops 12 and 14 attached to the center sill 5 and the bowl-shaped bearing No. 45 of the earlier described embodiment are supplanted by a single piece of bowl-shaped wall 70 welded or otherwise attached to the side walls of the center sill. This type of construction changes the manner of installation of the draft rigging, simply by requiring that the draft rigging will be assembled without a member 45 or the nut 42 in place on the stud 40. Instead, the rear end of the cushioning unit is lifted into the center sill to a position wherein the stud 40 may pass through the central aperture of the wall 70. The nut 42 is then placed on the stud and screwed into the proper position to allow free pivotal movement without looseness of the cushioning unit 7 relative to the spherically shaped concave and convex surfaces of the wall.

FIG. 3 is a diagrammatic illustration of draft rigging arrangement differing primarily from that illustrated in FIGS. 1 and 2 by the orientation of the cushioning unit 7. As compared with the previously described embodiment, the cushioning unit is merely turned end-for-end so that the distal end of the piston rod will become the rear end of the rigging and to be connected with the center sill by way of an intermediate agency, i.e., preferably the wall 70 such as described with respect to FIG. 6. As additional structure, the piston rod has fixed on it a stop 72 presenting a rear-facing spherically concave surface engageable with a front-facing spherically convex surface of the wall 70. In the arrangement of FIG. 3, the surface 41 shown in FIGS. 1 and 2 may be dispensed with. The function and manner of operation of the crosshead and the spring unit 55 are similar in this case to that already described.

FIG. 4 illustrates further simplification and modification in that the crosshead and cushioning unit are carried in a single housing 75, but the elements thereof are separated by a transverse wall 76 of the casing. This arrangement results in a relatively long casing which has the effect of concentrating lateral forces imposed on the casing by the coupler 6 at the end of which is, in effect, a relatively long lever which has its fulcrum in the rear connection 78 of the draft rigging with the center sill 5. The arrangement of FIG. 4, while not as effective in attaining complete elimination of lateral forces between the casing and piston rod represents a compromise design in achieving simplicity and more economical construction. The spring unit 55 is mounted on the underside of the casing 75 and functions in the manner hereinbefore described with respect to the crosshead 8.

FIGS. 7 and 8 represent a modification in crosshead construction and deal only with that portion of the draft rigging comprising a crosshead 80 and parts which effect connection between the piston rod head and the coupler butt. The primary difference between crosshead 80 and the previously described crosshead 8 is that the crosshead 80 is shorter due to the substitution of a non-resilient bearing block 81 for the follower 25, the pads 27, 28 and the abutment block 26 of the previously-described crosshead 8. The block 81 is thus disposed within the casing of the crosshead 80 between the coupler butt and

the front end surface **23** of the piston rod. The rear portion of the crosshead **80**, particularly the casing **21***b* thereof is shorter but otherwise similar to that described in connection with FIGS. 1 and 2, since it is provided with a rear flange **82** and a seating surface **19***b* for the nut **17** similar to the rear flange and seat **19** of casing **21**. The bearing block **81** is shown seated against the piston rod surface and inner shoulders of the casing in the same manner as the follower **25** of crosshead **8**.

The crosshead **80** is shown receiving a typical F standard coupler butt providing shoulders **83** and **84** which are designed for cooperating with a follower having a front face similar to that of the abutment block **26** of crosshead **8**. However, the absence of resilient pads in crosshead **8** renders the draft rigging in which it is used incapable of alignment control. Hence, as the bearing block cannot yield in a rear direction within the casing **21***b* of the crosshead in buff operation, the coupler **6**, the block **81**, and the piston rod are in solid series abutting relationship with the casing **21***b* carried along by virtue of its seating relation with the block **81** while acting on the spring **9** to compress it. The pin **34** is received in openings **87** and **88** which are slightly elongated in the longitudinal direction of the center sill to allow the contact with the coupler butt with the block **81**.

Viewing the bearing block **81** by plan view in FIG. 8, its surfaces **85** and **86** are relieved with respect to shoulders **87** and **88** of the abutment block **26** of crosshead **8**. Such relation of surfaces **85** and **86** enables the shoulders **83** and **84** of the standard F coupler butt to move without interference during normal angling movements of the coupler.

FIG. 9 illustrates details of an arrangement for connecting the rear end of the draft rigging to the center sill when the cushioning unit **7** is oriented within the center sill with its piston rod pointing rearwardly from the casing of the unit, as illustrated diagrammatically in FIG. 3. In FIG. 9 the piston rod **16** has a collar **91** welded or otherwise secured thereto providing an annular spherically concave rear facing surface in spaced relation with the front facing spherically concave surface of the nut **93** secured to the piston rod. In a manner already described, the bowl-shaped centrally apertured portion of the wall **70** secured to the center sill **5** is received between the surfaces **92** and **93**.

The terms and expressions which have been employed are used as terms of description and not of limitation and there is no intention of excluding such equivalents as fall within the scope of the claims.

What is claimed is:

1. In a draft rigging for a railway car wherein a cushioning unit thereof may be isolated from lateral forces incident to buffing action transmitted thereto from a coupler thereof:

(A) a housing fixed with the car underframe having its front end in an end portion of the car, the housing extending longitudinally inwardly and rearwardly of the car;

(B) a cushioning unit received in the housing and having front and rear relatively movable portions arranged generally along a longitudinal axis aligned lengthwise of the car;

(C) means for pivotally connecting said rear portion to the housing;

(D) means for pivotally connecting said front portion to said coupler, said coupler being disposed forwardly of said unit;

(E) one of said connecting means comprising:

(1) first structure on said unit providing oppositely-facing concentric spherically-concave and spherically-convex surfaces in generally radial alignment with a common center and spaced along said axis in concentric relation therewith; and

(2) second structure mating in pivotal relation therewith providing a spherically-concave surface in opposed juxtaposed complementary relation with said convex surface of the first structure, and a spherically-convex surface in opposed juxtaposed complementary relation with said concave surface of said first structure.

2. In a draft rigging according to claim **1** wherein:

said one connecting means connects said rear portion to the housing, said surfaces of the first structure facing each other and said second structure comprising a bowl-shaped element attached to the housing having a central aperture, and said element is disposed between said surfaces of the first structure.

3. In draft rigging according to claim **2** wherein:

said element tapers frontwardly and attached to opposite sides of the housing in vertically slidable, longitudinally interlocked relationship.

4. The draft rigging according to claim **3** wherein:

said portion comprises a rearward extending stem end and a nut in threaded relation with the stem, and the forward facing side of said nut defines said convex surface of the first structure.

5. In draft rigging according to claim **1** wherein:

said one connecting means connects said front portion to the coupler.

6. In draft rigging according to claim **5** wherein:

said front portion includes a forwardly extending stem terminating in a head longitudinally interlocking with said surfaces of the second structure.

7. In draft rigging according to claim **6** wherein:

said second structure comprises a cross-head member received by said housing in longitudinal guide relation therewith and a pin connecting the coupler to said member.

8. In draft rigging according to claim **7** wherein:

said second structure includes follower means received between the rear end surface of the coupler and said head, the follower means defining one of said surfaces of the second structure; and

said cross-head has a transverse wall providing the other surface of said structure.

9. In draft rigging according to claim **8** wherein:

said head is a nut in threaded relation with said stem and the rear side of the nut defines said convex surface of the front unit portion and said concave surface thereof is defined by the end of said stem and the front side of the nut.

References Cited

UNITED STATES PATENTS

2,889,939	6/1959	Metzger	213—64
3,017,038	1/1962	Cope et al.	213—64
3,224,600	12/1965	Gierlach	213—67

DRAYTON E. HOFFMAN, *Primary Examiner.*