The present invention relates to a hydraulic mechanism in association with railway vehicle bodies and more specifically pertains to liquid cushioning means in association with the couplers and draft riggings of railway freight cars to provide means for absorbing and dissipating the kinetic energy inherent in collisions which occur during coupling operations between cars, in train operations, and in switching and humping operations, or in any type of collisions.

The railroad industry has been growing for many years past been paying out large sums to shippers for merchandise damaged in transit. There is evidence to indicate that the majority of this damage is a result of end impact forces developed between cars in transit and in switching and shunting operations wherein cars are often reassembled in coupled relationship in humping operations. The speed of freight trains and the rate at which switching and humping operations are carried out have increased in recent years which results in increased damage to fragile merchandise.

In any collision between two bodies such as railway freight cars there is a definite quantity of kinetic energy which must be absorbed during the collision. This quantity of kinetic energy depends only on the weights of the moving bodies and the square of their initial speed of approach. Some of the draft gears in use in freight service are of the spring type provided with a mechanism for developing friction to increase both the energy absorption and dissipation capacities of the car. Such draft gears do not have adequate capacity to absorb the energy of collisions at initial speeds of approach greater than four to five miles per hour. Another conventional type of draft gear is provided with rubber to impart resilient character thereto and has somewhat increased the capacity for absorbing impact energy. The spring and friction type of devices and the draft gear having rubber therein both close to a solid condition when the speed of collision is high and the energy to be absorbed is greater than the capacity of the draft gears. When the draft gear attains a solid condition any excess unabsorbed energy may cause forces to be developed between the cars which are large enough to produce damage to the load carried by either car, and also to the cars themselves.

An object of the present invention is to provide an energy absorbing mechanism in association with a conventional draft rigging and with the conventional center sill structure of a railway freight car wherein liquid forms a part of the mechanism and its flow through an orifice during collision is metered to cushion movement of the coupler and elements making up the invention relative to the center sill structure whereby substantially all of the kinetic energy of the collision is absorbed by the motion of the liquid and thereafter dissipated as heat from the liquid.

Another object of the invention is to provide a mechanism for absorbing impact energy of colliding railway vehicles with the mechanism so designed as to avoid recoil action of the absorbed energy and to provide an energy absorbing mechanism which will avoid damage to loads when loaded cars may move in to engagement with each other at speeds of approach several times greater than four to five miles per hour.

A more specific object of the invention is to provide an auxiliary center sill structure which may be mounted within the conventional double Z center sill of existing or new cars with the auxiliary sill structure adapted to move longitudinally of the standard sill structure with the hydraulic means incorporated within the sill assembly and actuated upon movement of the auxiliary sill structure relative to the fixed sill structure to cushion impacts in either direction and to substantially reduce the magnitude of the forces transmitted to the vehicle body compared to those transmitted by present types of draft gears.

Other and further objects and features of the invention will be appreciated and become apparent to those skilled in the railway draft appliance art as the present disclosure proceeds and upon consideration of the accompanying drawings and the following detailed description wherein an exemplary embodiment of the invention is disclosed.
forms a part of the underframe of the railway car body 21. The center sill structure 22 is attached to the car body and may be regarded as the fixed sill structure. In carrying out the invention an auxiliary sill structure 23 is arranged within the fixed sill structure 22 so that the auxiliary sill structure may be longitudinally movable as a frame of the car body within and relative to the fixed sill structure 22. The slideable sill structure 23 consists of a pair of spaced channel members 20 with top and bottom plates joining the channel members at spaced intervals along the length of the car body. The auxiliary sill structure 23 is extended continuously throughout the length of the railway vehicle and project beyond each end of the fixed sill structure as shown in FIG. 1. The auxiliary sill structure 23 extends beyond the ends of the fixed sill structure a predetermined distance in order to accommodate relative sliding movements of the sill structures during a collision with other vehicles. The normal or neutral position of the auxiliary sill structure 23 as it projects beyond the ends of the railway car body 21 is shown in FIG. 1.

A striker casting 24 is provided at each end of the auxiliary sill structure 23 having a coupler carrier 26 thereon for supporting the stem 27 of a railway coupler 28 of the knuckle type. The auxiliary sill structure carries front draft legs 29 and rear draft legs 31. Each coupler 28 is provided with a conventional type of draft rigging which includes a yoke 32 and a resilient draft gear 33 supported by a phantom link 34 and the usual front and rear followers 34 and 36. The coupler and the yoke and the draft gears are assembled and arranged in each end of the auxiliary sill structure 23 and cooperate in the usual manner with the coupler carrier 26 and the front draft legs 29 and the rear draft legs 31. The inner ends of the rear draft legs are joined by a centrally disposed element 37 which serves to limit the total relative movement of the auxiliary sill structure 23 relative to the fixed sill structure 22 as will be appreciated as the present disclosure proceeds.

The wheels of the trucks for the vehicle body are diagrammatically represented in FIG. 1. A body center plate 38 is provided at the truck center which is secured to the fixed sill structure 22 as best illustrated in FIGS. 2 and 7. The center plate 38 includes lateral portions 35 which extend under the sill structure 22 and under the body bolster bottom cover plate 39 which extends under the fixed sill structure and the horizontal flanges of the double center sill structure 22. The body center plate 38 and its lateral portions 35 are reinforced by a pair of transversely extending beams 41 and 42 which extend under the flanges of the sill structure 22 and are secured thereto. The center post is formed of two parts 43 and 44 for convenience in application to the sill structure. The lower part 44 of the center post may be formed integral with the center plate 38 while the upper part 43 may be attached by any suitable means such as welding to the top plate of the fixed center sill structure 22. The forward vertical face 46 as provided by the upper and lower parts of the center post structure forms a stop which cooperates with the element 37 forming a part of the rear draft legs 31 to limit the relative movement of the fixed and sliding sill structures. The rear vertical face 47 as provided on the upper and lower parts 43 and 44 of the center post structure in the normal position cooperates with a follower 48 for operation of the hydraulic mechanism. At each side of the center post the auxiliary sill structure 23 is provided with a lug 49 (FIG. 7) having aligned vertical faces which cooperate with the vertical face of the follower 48 when the sill structure is in the normal position.

One hydraulic mechanism is positioned inwardly of the follower 48. Another hydraulic mechanism of similar construction is associated with the auxiliary sill structure 23 for the coupler and draft rigging at the other end of the railway vehicle. Each hydraulic mechanism is of identical construction and the structural characteristics of one is shown in FIGS. 3 and 8. Each hydraulic mechanism includes a cylinder 51 and a piston 52 mounted for reciprocating movements in the bore of the cylinder 51. The cylinder 51 is of rugged construction and still fits within the more lengthwise movable frame of the car body within and relative to the fixed sill structure 22. A piston rod 53 extends from the piston 52 and is desirably formed integral therewith. A disc-shaped member 54 (FIG. 3) closes the open end of the cylinder 51 and the piston rod 53 extends there-through. The motion of the cylinder 51 is seen to be controlled by liquid in the draft legs. Suitable means is provided for sealing the piston rod 53 relative to the disc shaped member 54 so as to prevent leakage of liquid from the cylinder under the pressures required for absorbing the impact energy. A cap member 56 (FIG. 2) is secured to the outer end of the piston rod 53 by means of a bolt or the like 57. A recoil spring 58 of a helical type surrounds the piston rod 53 and in the normal condition or neutral position of the parts is compressed a predetermined extent between the disc-shaped member 54 and the cap member 56.

A metering rod 59 is carried by the closed inner end of the cylinder 51 and extends along the axis of the cylinder. A cavity 61 is provided in the piston 52 which extends into a portion of the piston rod 53 as best shown in FIG. 11 for receiving the metering rod 59 during closure of the hydraulic device or during endwise movement of the auxiliary sill structure 23 relative to the fixed sill structure 22. The inner end of the metering rod 59 is joined by a centrally disposed element 60 which is secured to the piston at the zone of the section line 12—12 in FIG. 11. The net effective orifice for the flow of liquid is the area shown in the annular opening 63 (FIG. 12) between the circumference of the orifice 62 and the periphery of the metering rod 59. As the device closes the tapered metering rod 59 reduces the net area of the orifice in a manner calculated to produce the desired closure force of the mechanism.

The piston 52 is provided with a plurality of ports 64 and in the embodiment illustrated four such ports or passages are provided. These ports or elongated passages are spaced axially along the cylinder 51 and is secured to the body bolster and immediately outward of the orifice 62. The total area of the four ports or passages 64 is considerably greater than the area of the orifice 62 so that the liquid which flows through the orifice 62 with a certain velocity will also flow through the ports 64 without an increase in velocity. Accordingly the ports 64 do not act as orifices but merely as ducts to conduct the liquid from the vicinity of the orifice 62 through the piston to the other end of the cylinder 51. Additional ports or passages 66 are provided in the piston rod 53 in communication with the cavity 61 which act to relieve liquid from the cavity 61 for movement into bore portion 60 of the cylinder without serving as restrictive orifices.

In the normal or neutral position of the auxiliary sill structure 23 relative to the fixed sill 22 and consequently the neutral position of the hydraulic mechanism there is a closed circuit 80 and 83 of the cylinder 51 as shown in FIGS. 3 and 5. This is for the purpose of providing for liquid displacement and a reservoir 67 (FIGS. 3 and 15) is arranged above the level of the bore of the cylinder 51 and above the normal level of the liquid therein. This reservoir is provided to accommodate the liquid displaced by the piston rod 53 and the orifice 62 during closure of the hydraulic mechanism and to provide for thermal expansion of the liquid. All energy absorbed by the mechanism is dissipated as heat thereby producing a rise in the temperature of the liquid with resulting thermal expansion and the reservoir 67 accommodates such...
an increase in the volume of the liquid. A filling opening 68 for the cylinder is provided which is in communication with the reservoir 67 (FIGS. 5 and 15) at the level of the top of the cylinder 51 so that the cylinder cannot be overfilled to reduce the volume of the liquid displacement reservoir below that necessary for accommodating expansion resulting from temperature increases and for accommodating the liquid displaced by the piston rod 53 entering the cylinder 51. Opposite sides 63 are provided in the fixed sill structure 22 and in the channel 20 of the auxiliary sill structure 23 which are aligned with the opening 68 when the sills are in a normal position. A threaded plug 71 is provided for closing the opening 68 in the cylinder 51.

The closed inner end of the cylinder 51 engages a follower 72 as shown in FIGS. 3 and 8. The follower 72 in a normal or neutral position of the parts bears against stop members 73 which are secured to the fixed sill structure 22. The follower 72 in the normal or neutral position also bears against draft lugs 74 (FIG. 8) which are respectively secured to the channel members 20 of the auxiliary sill structure 23. It is the stop members 73 which apply any end thrust of the cylinder 51 to the fixed structure of the vehicle body. A similar hydraulic mechanism and associated parts are provided within the sill assembly to the right of the center of the car body 21 shown in FIG. 1 and in association with the coupler 28 and its draft rigging at this end of the vehicle.

The forward outer end portions of the channel members 20 are joined by a top plate 76. This plate 76 terminates at 75 (FIG. 2) and the channel members 20 in the vicinity of the center post structure are devoid of a top plate to permit sliding movement of the auxiliary sill structure relative to the center post. Another top plate 77 (FIGS. 3 and 6) joins the inwardly directed flanges of the channel members 20 and this plate serves to reinforce the upper portion of the auxiliary sill structure. The top plate 77 terminates at 78 and forward of the stop members 73 of one of which is attached to the top web of the fixed double Z center sill structure 22. The outer end of the top plate 77 is indicated at 81 and it terminates at this point to avoid engagement with the rear vertical face 47 of the upper part 43 of the center post during actuation of absorbing mechanism. Another top plate 78 (FIG. 10) joins the channel members 20 over an area of the center of the car with the outer end spaced from the upper stop member 73 so as to reinforce the center portion of the auxiliary sill structure and permit the upper stop member 73 to be attached to the fixed sill structure 22.

A bottom plate 79 connects the outer ends of the lower flanges of the channel member 20 of the auxiliary sill for strength purposes. The plate 79 also serves to support the yoke 52 and the draft gear 33. The inturned flanges at the top of the auxiliary sill structure are shaped as indicated at 82 (FIG. 7) to permit the yoke 52 to swivel during horizontal angling of the coupler. The bottom flanges of the channel members 20 are removed entirely in the regions 83 and 85 to permit application and removal of the yoke 52 and the draft gear from the bottom of the sill assembly.

The top web of the fixed double Z center sill structure 22 is continuous throughout the length of the railway car body. A bottom plate 84 is provided connecting the lower portion of the fixed sill structure near the outer end of the railway car body. The plate 84 supports the overlying end of the auxiliary sill structure 23 and also supports the draft rigging and assembled equipment thereof. Another plate 86 joins the lower portions of the fixed double Z sill structure 22 and provides partial support for the cylinder 51. Another plate 87 provides further support for the hydraulic mechanism including the cylinder 51. This plate 87 is attached to the fixed sill structure and the lower stop member 73 (FIGS. 3 and 8) is secured thereto by welding. The plate 87 acts in assisting in carrying the forces applied to the cylinder onto the fixed sill structure. A plate 88 (FIGS. 21 and 10) joins the flanges of the fixed sill structure over the central portion of the car.

As hereinabove indicated the auxiliary sill structure and the couplers and their draft riggings are identical at both ends of the car body. The hydraulic mechanism described in association with the left hand end portion of the railway car body is also provided within that portion of the sill structure to the right of the center of the car body shown in FIG. 1. Such an assembly prevents any end force being exerted on the body of the car except as metered through the hydraulic mechanism. The arrangement operates to control the magnitude of the buffing forces and pulling forces and the conventional draft equipment at each end of the auxiliary sill structure functions to protect the auxiliary sill assembly from high impact forces. While the conventional draft gears as employed in connection with the present assembly assist the hydraulic mechanism in absorbing the energy of collisions such draft gears are not significantly helpful in connection with high velocity collisions because of the low capacity of the conventional type resilient draft gears.

In operation and upon the application of force in the direction of the arrow 91 (FIG. 13) the auxiliary sill structure 23 is displaced to the right relative to the fixed sill structure 22. Such a condition may develop as a result of a collision at the left hand coupler 28 in FIG. 1 as shown in FIGS. 14 and 15. In a coupling operation or upon application of a sudden pull applied to the coupler 28 at the right end of the car body in FIG. 1. FIG. 13 shows the mechanism with the auxiliary sill displaced the full amount to the right relative to the fixed sill structure or the car body. The draft gear 53 compresses an amount consistent with the force developed and follower 54 moves this distance to the right of its normal position. The transversely disposed element 37 then moves into contact with the vertical face 46 of the center post thereby preventing further relative motion of the auxiliary sill structure 23 relative to the fixed sill structure 22. The lugs 49 carried by the auxiliary sill structure and the follower 48 have thus forced the piston 52 into the cylinder 51. The force developed by the hydraulic mechanism is delivered through the closed inner end of the cylinder 51 onto the follower 72 and the stop members 73 and transferred to the fixed sill structure 22 and onto the car body. At the right end of the car lugs 74R (FIG. 16) carried by the auxiliary sill structure are held against the follower 72R and close the cylinder 51R over the piston 52R. The piston rod 53R, cap member 56R and follower 48R transmit the force developed by this hydraulic mechanism to the vertical face 47R of the center post at the right end of the car body thereby delivering the cylinder force at this end of the car onto the body at this point. Both springs 58 and 59R are compressed at this stage and will recoil the auxiliary sill structure 23 to its initial or neutral position after the collision.

The mechanism operates the same for relative movement between the auxiliary sill structure 23 and the fixed sill structure 22 in either direction. The two cylinders acting simultaneously make it possible to design each cylinder small enough to permit their application within the space available in a standard Association of American Railroads double Z center sill structure which is in use on existing freight cars and applied to new cars now being built. The orifices in the cylinders and the mutating rods may be designed to produce as nearly as possible a rectangular force closure curve for substantially all car loads and at all speeds of approach producing an optimum condition of maximum energy ab-
sorption with minimum force and minimum closure. The structure disclosed in the present application provides the advantage that it can be metered to absorb the energy of collisions between cars of weights varying from an empty car up to a fully loaded one hundred tons or more without developing forces which are destructive to either the lading or the car structure. The force which the hydraulic mechanism must be metered to develop in order to absorb the energy of a given collision is inversely proportional to the maximum relative longitudinal movement which it is practical to provide between the auxiliary sill structure and the fixed sill or body. As an example it has been found practical to meter the mechanism disclosed in the present application to absorb the energy of a collision between two fully loaded fifty ton cars at an initial speed of approach of about twelve miles per hour with the resulting maximum acceleration of about three times the acceleration of gravity whereas existing resilient draft gears will close to a solid condition in collisions resulting from speeds of approach of four to five miles per hour and tests have shown that at speeds of twelve miles per hour accelerations as high as thirty times the acceleration of gravity have been produced in the car bodies equipped with the usual type of resilient draft gears.

What invention has been described with reference to a particular type of railway vehicle provided with a conventional type of center sill structure it will be appreciated that the invention is adaptable to other types of railway vehicles and in connection with other types of draft riggings and sill structures. Such modifications and others may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

What I claim and desire to secure by Letters Patent is:

1. A mechanism for absorbing the energy of an impact applied to the coupler of a railway vehicle having a body comprising, a center sill structure extending longitudinally of said body and secured thereto, an auxiliary sill structure including transversely spaced members extending lengthwise within said center sill structure and throughout the length of the vehicle body and projecting beyond the ends thereof in the neutral position of the auxiliary sill structure, a coupler and a stem extending into a first end of the auxiliary sill structure, a second coupler and a stem extending into the second end of the auxiliary sill structure, a first center post structure secured to the center sill structure and positioned between said members, a cylinder arranged with its axis longitudinally of said vehicle body and positioned between said members, liquid within said cylinder, a piston mounted for movements within said cylinder, step means secured to the center sill structure extending between said members and positioned to engage said cylinder, a piston rod carried by said piston extending from the cylinder with its free end in abutting relationship with said center post structure, a second center post structure secured to the center sill structure and positioned between said members, a second cylinder arranged with its axis longitudinally of said vehicle body and positioned between said members, liquid within the second cylinder, a second piston mounted for movements within the second cylinder, step means secured to said center sill structure extending between said members and positioned to engage the second cylinder, means coupling the respective stems to the auxiliary sill structure to move the auxiliary sill structure longitudinally relative to the center sill structure upon application of an impact to either or both couplers, a piston rod carried by the second piston extending from the second cylinder with its free end in abutting relationship with the second center post structure, means including lugs carried by the auxiliary sill structure for moving the first piston relative to the first cylinder during relative movement of the auxiliary sill structure and the center sill structure, means including lugs carried by the auxiliary sill structure for moving the second piston relative to the second piston upon relative movement of the auxiliary sill structure relative to the center sill structure, lugs carried by said auxiliary sill structure in abutting relationship with the first cylinder, means including lugs carried by the auxiliary sill structure for moving the second piston relative to the second cylinder during opposite relative movement of the auxiliary sill structure and center sill structure, and means metering movement of the liquid within each cylinder during relative movement of the respective piston and cylinder.

2. A mechanism for absorbing the energy of an impact applied to the coupler of a railway vehicle having a body comprising, a center sill structure extending longitudinally of said body and secured thereto, an auxiliary sill structure including transversely spaced members extending lengthwise within said center sill structure and throughout the length of the vehicle body and projecting beyond the ends thereof in the neutral position of the auxiliary sill structure, a coupler and a stem extending into a first end of the auxiliary sill structure, a second coupler and a stem extending into the second end of the auxiliary sill structure, a cylinder arranged with its axis longitudinally of said vehicle body and positioned between said members, liquid within said cylinder, a piston mounted for movements within said cylinder, stop means secured to the center sill structure extending between said members and positioned to engage said cylinder, a center post structure secured to the center sill structure and positioned between said members, a second cylinder arranged with its axis longitudinally of said vehicle body and positioned between said members, liquid within the second cylinder, a second piston mounted for movements within the second cylinder, means coupling the respective stems to the auxiliary sill structure to move the auxiliary sill structure longitudinally relative to the center sill structure upon application of an impact to either or both couplers, a piston rod carried by the second piston extending from the second cylinder, means including lugs carried by the auxiliary sill structure for moving the first piston relative to the first cylinder during relative movement of the auxiliary sill structure and the center sill structure, means including lugs carried by the auxiliary sill structure for moving the second piston relative to the second piston upon relative movement of the auxiliary sill structure relative to the center sill structure, lugs carried by said auxiliary sill structure in abutting relationship with the first cylinder, means including lugs carried by the auxiliary sill structure for moving the second piston relative to the second cylinder during opposite relative movement of the auxiliary sill structure and center sill structure, and means metering movement of the liquid within each cylinder during relative movement of the respective piston and cylinder.

3. A mechanism for absorbing the energy of an impact applied to the coupler of a railway vehicle having a body comprising, a center sill structure extending longitudinally of said body and secured thereto, an auxiliary sill structure including transversely spaced members extending lengthwise within said center sill structure and throughout the length of the vehicle body and projecting beyond the ends thereof in the neutral position of the auxiliary sill structure, a coupler and a stem extending into a first end of the auxiliary sill structure, a second coupler and a stem extending into the second end of the auxiliary sill structure, a first center post structure secured to the center sill structure and positioned between said members, a first cylinder arranged with its axis longitudinally of said vehicle body and positioned between said members, liquid within the first cylinder, a first piston mounted for movements within the first cylinder, a piston rod carried by the first piston extending from the first cylinder, a second center post structure secured to the center sill structure and positioned between said members, a second cylinder arranged with its axis longitudinally of said vehicle body and positioned between said members, liquid within the second cylinder, a second piston mounted for movements within the second cylinder, means coupling the respective stems to the auxiliary sill structure to move the auxiliary sill structure longitudinally relative to the center sill structure upon application of an impact to either or both couplers, a piston rod carried by the second piston extending from the second cylinder, means including lugs carried by the auxiliary sill structure for moving the first piston relative to the first cylinder during relative movement of the auxiliary sill structure and the center sill structure, means including lugs carried by the auxiliary sill structure for moving the second piston relative to the second piston upon relative movement of the auxiliary sill structure relative to the center sill structure, lugs carried by said auxiliary sill structure in abutting relationship with the first cylinder, means including lugs carried by the auxiliary sill structure for moving the second piston relative to the second cylinder during opposite relative movement of the auxiliary sill structure and center sill structure, and means metering movement of the liquid within each cylinder during relative movement of the respective piston and cylinder.
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stop means carried by the center sill structure extending between said members positioned to engage the inner end of the second cylinder, means coupling said stem to the auxiliary sill structure to move the auxiliary sill structure longitudinally relative to the center sill structure upon application to said coupler, a piston rod carried by the second piston extending from the second cylinder with its free end in abutting relationship with the second center post structure, means including lugs carried by the auxiliary sill structure for moving the first piston relative to the first cylinder during relative movement of the auxiliary sill structure including lugs carried by the auxiliary sill structure for engaging the inner end of and moving the second cylinder relative to the second piston upon relative movement of the auxiliary sill structure relative to the center sill structure, means metering movement of the liquid within each cylinder as the associated piston moves relative to its cylinder, and transversely disposed element carried by the auxiliary sill structure for engaging the first center post structure and limiting relative movements of said structures.

4. A mechanism for absorbing the energy of an impact applied to the coupler of a railway vehicle having a body comprising, a center sill structure extending longitudinally of said body and secured thereto, an auxiliary sill structure extending lengthwise within said center sill structure, a coupler and a stem extending into one end of the auxiliary sill structure, a cylinder arranged with its axis longitudinally of said vehicle body and within said auxiliary sill structure, liquid within said cylinder, a piston mounted for movements within said cylinder, means coupling said stem to said auxiliary sill structure whereby it is moved longitudinally relative to the center sill structure upon application of an impact to said coupler, stop means carried by the center sill structure for engaging an end of said cylinder, a second cylinder arranged with its axis longitudinally of said vehicle body within said auxiliary sill structure, liquid within the second cylinder, a second piston mounted for movements within the second cylinder, means metering movement of the liquid within each cylinder during relative movements of the respective pistons and cylinder, means including lugs carried by the auxiliary sill structure for moving the first piston relative to the first cylinder during relative movement of the auxiliary sill structure and the center sill structure, means including a center post structure secured to the center sill structure serving as abutment for the second piston, and means including lugs carried by the auxiliary sill structure for moving the second cylinder relative to the second piston upon movement of the auxiliary sill structure relative to the center sill structure.

5. A mechanism for absorbing the energy of an impact applied to the coupler of a railway vehicle having a body comprising, a center sill structure extending longitudinally of said body and secured thereto, an auxiliary sill structure extending lengthwise within said center sill structure, a coupler and a stem extending into one end of the auxiliary sill structure, a cylinder arranged with its axis longitudinally of said vehicle body and within said auxiliary sill structure, liquid within said cylinder, a piston mounted for movements within said cylinder, means coupling said stem to said auxiliary sill structure whereby it is moved longitudinally relative to the center sill structure upon application of an impact to said coupler, stop means carried by the center sill structure for engaging an end of said cylinder, a second cylinder arranged with its axis longitudinally of said vehicle body within said auxiliary sill structure, liquid within the second cylinder, a second piston mounted for movements within the second cylinder, means metering movement of the liquid within each cylinder during relative movements of the respective pistons and cylinder, means including lugs carried by the auxiliary sill structure for moving the first piston relative to the first cylinder during relative movement of the auxiliary sill structure and the center sill structure, means including a center post structure secured to the center sill structure serving as abutment for the second piston, and means including lugs carried by the auxiliary sill structure for moving the second cylinder relative to the second piston upon movement of the auxiliary sill structure relative to the center sill structure.

6. A mechanism for absorbing the energy of an impact applied to the coupler of a railway vehicle having a body comprising, a center sill structure extending longitudinally of said body and secured thereto, a piston rod carried by the second piston extending from the second cylinder, means including a center post structure secured to the center sill structure in abutting relationship with the piston rod.

7. A mechanism for absorbing the energy of an impact applied to the coupler of a railway vehicle having a body comprising, a center sill structure extending longitudinally of said body and secured thereto, transversely spaced vertical webs forming a part of said center sill structure, an auxiliary sill structure extending lengthwise within the center sill structure having an end projecting beyond an end of the vehicle body and the corresponding end of the center sill structure in the neutral position of the auxiliary sill structure, said auxiliary sill structure including a pair of transversely spaced members each having an outer face arranged along an inner face of one of said webs which guide the auxiliary sill structure for lengthwise movements relative to the center sill structure, a coupler and a stem therefrom extending into said end of said auxiliary sill structure, a cylinder arranged with its axis longitudinally of said vehicle body and between said members, liquid within said cylinder, a piston mounted for axial movement within the cylinder, means coupling said stem to said auxiliary sill structure whereby the auxiliary sill structure moves longitudinally relative to the center sill structure upon application of an impact to said coupler, stop means carried by the center sill structure positioned to engage the cylinder, means including a member carried by the auxiliary sill structure for engaging the piston relative to the cylinder during relative movement of the auxiliary sill structure and the cylinder, means metering movement of said liquid during relative movement of the piston and the cylinder, said cylinder having a chamber therein above the periphery of said piston into which liquid may flow after metering, and one of said webs and one of said members and said cylinder each having an access opening to said chamber.

8. A mechanism for absorbing the energy of an impact applied to the coupler of a railway vehicle having a body comprising, a center sill structure extending longitudinally of said vehicle body and secured thereto, transversely spaced vertical webs forming a part of said center sill structure, an auxiliary sill structure extending lengthwise within the center sill structure having an end projecting beyond an end of the vehicle body, said auxiliary sill structure consisting of a pair of transversely spaced channel members with flanges thereon confronting each other and top and bottom edges of said flanges joining said flanges at spaced intervals along the length of the channel members, plates joining lower portions of said webs at spaced intervals along the length of said center sill structure, said center sill structure guiding the auxiliary sill structure for lengthwise movements relative to the center sill structure, a coupler and a stem therefrom extending into said end of said auxiliary sill structure, a cylinder arranged with its axis longitudinally of said vehicle body and between said channel members and the flanges thereon, liquid within said cylinder, a piston mounted for axial movements within the cylinder, means coupling said stem to said auxiliary sill structure whereby it is moved longitudinally relative to the center sill structure upon application of an impact to said coupler, stop means carried by the center sill structure between said confronting flanges in position to engage said cylinder, means moving the piston relative to the cylinder upon relative movement of the auxiliary sill structure and the cylinder, and means metering movement of said liquid during relative movement of the auxiliary sill structure upon application of an impact to said coupler, stop means carried by the center sill structure between said confronting flanges in position to engage said cylinder, means moving the piston relative to the cylinder upon relative movement of the auxiliary sill structure and the cylinder, and means metering movement of said liquid during relative movement of the auxiliary sill structure upon application of an impact to said coupler.

9. A mechanism for absorbing the energy of an impact applied to the coupler of a railway vehicle having a body comprising, a center sill structure extending longitudinally of said body and secured thereto, transversely spaced vertical webs forming a part of said center sill structure, an auxiliary sill structure extending lengthwise within the center sill structure having an end projecting beyond an end of the vehicle body, said auxiliary sill structure consisting of a pair of transversely spaced channel members with flanges thereon confronting each other and top and bottom edges of said flanges joining said flanges at spaced intervals along the length of the channel members, plates joining lower portions of said webs at spaced intervals along the length of said center sill structure, said center sill structure guiding the auxiliary sill structure for lengthwise movements relative to the center sill structure, a coupler and a stem therefrom extending into said end of said auxiliary sill structure, a cylinder arranged with its axis longitudinally of said vehicle body and between said channel members and the flanges thereon, liquid within said cylinder, a piston mounted for axial movements within the cylinder, means coupling said stem to said auxiliary sill structure whereby it is moved longitudinally relative to the center sill structure upon application of an impact to said coupler, stop means carried by the center sill structure between said confronting flanges in position to engage said cylinder, means moving the piston relative to the cylinder upon relative movement of the auxiliary sill structure and the cylinder, and means metering movement of said liquid during relative movement of the auxiliary sill structure upon application of an impact to said coupler, stop means carried by the center sill structure between said confronting flanges in position to engage said cylinder, means moving the piston relative to the cylinder upon relative movement of the auxiliary sill structure and the cylinder, and means metering movement of said liquid during relative movement of the auxiliary sill structure upon application of an impact to said coupler.
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A mechanism for absorbing the energy of an impact applied to the coupler of a railway vehicle having a body comprising, a center sill structure extending longitudinally of said vehicle body throughout the length thereof and secured to said body, an auxiliary sill structure extending longitudinally of said vehicle body and between said members, liquid within said cylinder, a piston mounted for axial movements within the cylinder, meanscoupling said stem to said auxiliary sill structure whereby the auxiliary sill structure moves longitudinally relative to the center sill structure upon application of an impact to said coupler, stop means carried by the center sill structure in position to engage the cylinder, means moving the piston relative to the cylinder during relative movement of the auxiliary sill structure and the cylinder, and means metering movement of said liquid during relative movement of the piston and the cylinder.

A mechanism for absorbing the energy of an impact applied to the coupler of a railway vehicle having a body comprising, a center sill structure extending longitudinally of said vehicle body throughout the length thereof and secured to said body, an auxiliary sill structure extending longitudinally of said vehicle body and between said members, liquid within said cylinder, a piston mounted for axial movements within the cylinder, means coupling said stem to said auxiliary sill structure whereby the auxiliary sill structure moves longitudinally relative to the center sill structure upon application of an impact to said coupler, means carried by the center sill structure and spaced longitudinally thereof to engage the cylinder and the piston rod means, means carried by the auxiliary sill structure and spaced longitudinally thereof to engage the cylinder and the piston rod means to produce relative movement between the piston and the cylinder during relative movement of the auxiliary sill structure and the center sill structure, and means metering movement of said liquid during relative movement of the piston and the cylinder.

A mechanism for absorbing the energy of an impact applied to the coupler of a railway vehicle having a body comprising, a center sill structure extending longitudinally of said vehicle body throughout the length thereof and secured to said body, an auxiliary sill structure extending longitudinally of said vehicle body and between said members, liquid within said cylinder, a piston mounted for axial movements within the cylinder, means coupling said stem to said auxiliary sill structure whereby the auxiliary sill structure moves longitudinally relative to the center sill structure upon application of an impact to said coupler, means carried by the other of the sill structures to engage said piston rod means to produce relative movement between the piston and the cylinder during relative movement of the auxiliary sill structure and the center sill structure, and means metering movement of said liquid during relative movement of the piston and the cylinder.

A mechanism for absorbing the energy of an impact applied to the coupler of a railway vehicle having a body comprising, a center sill structure extending longitudinally of said vehicle body throughout the length thereof and secured to said body, an auxiliary sill structure extending longitudinally of said vehicle body and between said members, liquid within said cylinder, a piston mounted for axial movements within the cylinder, means coupling said stem to said auxiliary sill structure whereby the auxiliary sill structure moves longitudinally relative to the center sill structure upon application of an impact to said coupler, means carried by the center sill structure and spaced longitudinally thereof to engage the cylinder and the piston rod means to produce relative movement between the piston and the cylinder during relative movement of the auxiliary sill structure and the cylinder, and means metering movement of said liquid during relative movement of the piston and the cylinder.
extending lengthwise within said center sill structure and having an end portion projecting beyond an end of the vehicle body and the corresponding end of the center sill structure in the neutral position of the auxiliary sill structure, said auxiliary sill structure having lateral portions along inner portions of said sill structure which guides the auxiliary sill structure for lengthwise movements relative to the center sill structure, a coupler and a draft rigging carried by said end portion of the auxiliary sill structure, means coupling said draft rigging to said auxiliary sill structure for moving the auxiliary sill structure relative to said center sill structure, means coupling said draft rigging to said auxiliary sill structure whereby the auxiliary sill structure moves longitudinally relative to the center sill structure upon application of an impact to said coupler, a hydraulic device including a cavity cavitated in said cylinder, a piston mounted for axial movement within the cylinder, piston rod means projecting beyond an end of said cylinder, means carried by one of said sill structures in abutting relation with the hydraulic device, means carried by the other of the sill structures in abutting relation with said piston rod means to produce relative movement between the piston and the cylinder during relative movement of the auxiliary sill structure and the center sill structure, and means metering movement of said liquid during relative movement of the piston and cylinder.

16. A mechanism for absorbing the energy of an impact applied to the coupler of a railway vehicle having an underframe comprising, a center sill structure extending longitudinally of said underframe throughout the length thereof and secured thereto, an auxiliary sill structure extending lengthwise within the center sill structure and having an end projecting beyond an end of the center sill structure in the neutral position of the auxiliary sill structure, said auxiliary sill structure including transversely spaced members arranged for guided longitudinal movement by the center sill structure, a coupler and a stem therefor extending into each end of said auxiliary sill structure, a cylinder arranged with its axis longitudinally of said vehicle body and between said members, liquid within said cylinder, a piston mounted for axial movement within the cylinder, piston rod means projecting beyond an end of said cylinder, means carried by one of the sill structures in abutting relation with the hydraulic device, means carried by the other of the sill structures in abutting relation with said auxiliary sill structure and the fixed sill structure in inter-abutting relationship to limit movement of the auxiliary sill structure relative to the center sill structure.

17. A mechanism for absorbing the energy of an impact applied to the coupler of a railway vehicle having an underframe comprising, a center sill structure extending longitudinally of said underframe throughout the length thereof and secured thereto, an auxiliary sill structure extending lengthwise within the center sill structure and having an end projecting beyond an end of the center sill structure in the neutral position of the auxiliary sill structure, said auxiliary sill structure moves longitudinally relative to the center sill structure upon application of an impact to either coupler, a hydraulic device including a cavity cavitated in said cylinder, a piston mounted for axial movement within the cylinder, piston rod means projecting beyond an end of said cylinder, means carried by one of the sill structures in abutting relation with the auxiliary sill structure and the fixed sill structure in inter-abutting relationship to limit movement of the auxiliary sill structure relative to the center sill structure.
auxiliary sill structure relative to the center sill structure.

18. A mechanism for absorbing the energy of an impact applied to the coupler of a railway vehicle having an underframe structure with a guideway extending lengthwise therethrough, an auxiliary sill structure within the guideway slidably supported from said underframe structure for longitudinal movements relative thereto, a hydraulic mechanism disposed within said guideway including a cylinder containing liquid arranged lengthwise within the auxiliary sill structure with a piston and piston rod assembly slidably in the cylinder to develop hydraulic fluid pressure therein, means within said hydraulic mechanism metering movement of the liquid between opposite sides of the piston for developing fluid frictional resistance to relative lengthwise movement between the cylinder and the piston rod assembly, means on one of said structures in abutting relationship with said cylinder at one end thereof, means on the other of said structures in abutting relationship with said piston rod assembly whereby the mechanism resists relative lengthwise movement between the structures by developing hydraulic fluid friction under hydraulic pressure, means on each of said structures in inter-abutting relationship limiting relative movements therebetween, and spring means associated with said structures reacting lengthwise of said guideway opposing relative movements of said structures.

References Cited by the Examiner

UNITED STATES PATENTS

2,220,101 11/40  Hall  213—8
2,590,406 3/52  Haas  213—8
2,671,356 3/54  Jurasevich  213—8 X
2,726,773 12/55  Fitz John  213—43 X
2,737,301 3/56  Thornhill  213—43
2,752,048 6/56  Fillion  213—8
2,764,299 9/56  Meyer  213—8
2,818,982 1/58  McCafferty et al.  213—8

FOREIGN PATENTS

661,107 9/28 France.

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