A door stabilizer such as an auto rack car door stabilizer which substantially reduces or eliminates the undesired horizontal or substantially horizontal movement of the door and particularly the movement of the lower end of the door including the guide bracket. This substantially reduces or eliminates the wear on the horizontally disposed bearing member of the lower door tracks on the railroad cars. The door stabilizer generally includes an engaging member connected to a supporting body. The body is adapted to be mounted to the frame of the railroad car adjacent to the door and particularly adjacent to the end guide bracket when the door is in the closed position. The engaging member engages and limits the movement or vibration of the guide bracket thereby reducing or eliminating wear on the bearing member.
FIG. 31A

FIG. 31B
AUTO RACK RAILROAD CAR END DOOR STABILIZER

PRIORITY

[0001] This application is a non-provisional application of and claims the benefit of U.S. Provisional Application Serial No. 60/370,998, filed on Apr. 8, 2002.

BACKGROUND OF THE INVENTION

[0002] The railroad industry employs a variety of railroad cars for transporting products. Many of these cars, such as boxcars and auto rack railroad cars, are enclosed to protect the products or vehicles being transported. The enclosed railroad cars generally include one or more sliding or slideable doors to provide access to the interior of the cars. The doors are generally mounted on upper and lower tracks which are attached to the frames of the cars. As described in more detail below in relation to auto rack railroad cars, guide brackets are attached to the lower end of the doors to facilitate the sliding of the doors. The guide brackets have wheels or rollers which engage and roll along the tracks. In certain circumstances, these guide brackets and particularly the wheels of the guide brackets tend to wear out the lower tracks.

[0003] Auto rack railroad cars which transport newly manufactured vehicles including automobiles, vans and trucks, provide a prime example of this wear problem. Auto rack railroad cars, known in the railroad industry as auto rack cars, often travel thousands of miles through varying terrain. The typical auto rack car is compartmented, having two or three floors, a frame, two side walls, a roof and a pair of doors at each end of the car. The doors inhibit illegal or unauthorized entry into the auto rack cars to prevent theft or vandalism of the vehicles being transported in the auto rack cars. The doors also prevent flying objects from entering the auto rack cars and damaging the vehicles. The doors can be unlocked and moved between closed and open positions to provide access to the vehicles in the auto rack cars.

[0004] Examples of such doors for auto rack cars are generally illustrated in U.S. Pat. Nos. 3,995,563, 4,077,330, 4,917,021 and 6,142,082. The bottom of each door includes two guide brackets with wheel or roller assemblies attached thereto. Each roller assembly includes a wheel or roller which engages the upper surface of the horizontally disposed bearing member of the lower door track (which is attached to the frame of the auto rack car) to facilitate movement of the door along the track. The guide bracket also includes a hook which engages the inner surface of the vertically disposed guide member of the lower door track to prevent the door from falling off the track. The guide bracket and the track are both made of a suitable metal such as steel. When the door is moved between open and closed position, the roller engages and rolls along the upper surface of the horizontally disposed bearing member and the hook engages and slides along the inner surface of the guide member, thereby guiding the movement of the door on the track. U.S. Pat. No. 6,142,082 discloses a guide bracket for doors on railroad cars which reduces the wear on lower door tracks, and particularly on the vertically disposed guide member of the lower door track.

[0005] In auto rack cars, the majority of the weight of the door tends to rest on the centermost guide bracket, and in particular, the roller of the guide bracket in the center of the door. The majority of the weight of the door does not rest on the guide bracket at the end of the door. Because substantial weight is not on the guide bracket or roller disposed at the end of the door and is on the guide bracket or the roller in the center of the door, the door tends to pivot back and forth about the roller in the center of the door and causes the roller of the guide bracket on the end of the door to continuously engage and disengage the horizontally disposed bearing member of the door track. This construction also allows the roller and bracket at the end of the door track to vibrate or move in a substantially horizontal direction. This causes the roller to wear the door track and particularly the upper surface of the horizontally disposed member of the door track. This wear is continuous when the train moves on the rails which causes the door to vibrate. This vibration causes the roller to continuously engage and disengage the upper surface of the bearing member and results in the wear on the bearing member. The wear on the bearing member is exponentially increased as the auto rack car travels at high speeds and through varying terrain. On certain auto rack cars, the roller wears a groove or indentation in the bearing member. The roller then rests in this indentation which tends to inhibit movement of the door. In such cases, the roller must disengage the indentation before moving. This makes the door more difficult to open. Although grease may be applied to the track to reduce this wear problem, grease is rarely used or correctly applied in the field.

[0006] When the door track is sufficiently worn or completely worn out, the door track must be repaired. To replace the door track, the entire track can be cut off the frame (i.e., using a torch) and a new door track attached (i.e., welded) to the frame of the auto rack car. Alternatively, the track can be repaired with a piece of steel which is welded to the track and ground smooth. This replacement or repair of the track on an auto rack car which includes four tracks (i.e., one for each door) is relatively expensive. Moreover, revenue may be lost from having the auto rack car out of service to repair the tracks.

[0007] In the majority of auto rack cars, an additional metal such as hardened steel wear plate has been mounted on top of the upper surface of the bearing member to reduce the wear on the bearing member due to wheel or roller contact and vibration. However, this changes the surface level of the track and is relatively expensive to employ. It should be appreciated that the roller is harder than the track and still wears the wear plate.

[0008] Some in the railroad industry also believe that the horizontal or outward movement and vibration of the lower portion of the door affects the mounting of the door on the roof. In particular, one commercially available construction of auto rack cars includes an auto rack door pivotally connected to the roof of the auto rack car. The Association of American Railroads has issued warning letters regarding cracks in the top end door guide (often referred to as a door hood or door canopy) of certain auto rack cars. These cracks may be at least partially caused by the horizontal movement of the lower end of the door relative to the door track. Accordingly, there is a need for an apparatus which reduces or eliminates the wear on the track or reduces or eliminates the cracking door hood.
SUMMARY OF THE INVENTION

[0009] The present invention solves the above problems by providing a door stabilizer such as an auto rack door stabilizer which substantially reduces or eliminates the undesired horizontal or substantially horizontal movement of the door and particularly the lower end of the door including the guide bracket. This substantially reduces or eliminates the wear on the horizontally disposed bearing member of the lower door track. The door stabilizer of the present invention generally includes a guide bracket engaging member connected to a supporting body. The body is adapted to be mounted to the frame of the railroad car adjacent to the door and particularly adjacent to the end guide bracket when the door is in the closed position. The engaging member engages and limits the movement or vibration of the guide bracket thereby reducing or eliminating wear on the bearing member.

[0010] In one general embodiment of the present invention, the body of the stabilizer is an L-shaped bracket with a horizontally extending support plate or member. The bracket is suitably attached to the frame of the car adjacent to the position of the end guide bracket when the door is in the closed position. The engaging member is bonded or otherwise suitably connected to the engaging member support. The engaging member is adapted to engage and direct the outer surface of the guide bracket.

[0011] In another general embodiment of the present invention, the end door stabilizer includes an engaging member in the form of a horizontally or substantially horizontally disposed roller rotatably connected or otherwise suitably connected to a body or supporting body which is mounted to the frame of the railroad car adjacent to the position of the end guide bracket when the door is in the closed position. This embodiment enables the roller to engage and direct the guide bracket of the railroad car door to reduce the movement of and vibration of the guide bracket while allowing the guide bracket to easily move relative to the roller as the door is opening and closing, thereby preventing any damage to the roller of the end door stabilizer of the present invention.

[0012] In one alternative embodiment, the end door stabilizer of the present invention includes a body or supporting body and an engaging member in the form of an engaging pad attached to the body and particularly to a pad support member. The end door stabilizer is mounted to the frame of the railroad car adjacent to the interior side of each door. The engaging pad contacts or engages the interior side of the door when the door is in the closed position to reduce the horizontal movement of the guide bracket and the overall vibration of the door.

[0013] In a further alternative embodiment of the present invention, the end door stabilizer is adjustable. More specifically, in one embodiment, the engaging member is adjustably mounted to the supporting body. In an alternative embodiment the supporting body is adjustably mounted to the frame of the railroad car. It should thus be appreciated that any of the embodiments of the present invention can be adapted to be adjustable.

[0014] In one embodiment, the end door stabilizer includes an adjustment mechanism. The adjustment mechanism can be any suitable mechanism. In one embodiment, the adjustment mechanism is positioned adjacent to the body of the end door stabilizer and biases the body and the engaging member towards the door. In another embodiment, the adjustment mechanism is positioned adjacent to the engaging member and biases the engaging member towards the door. It should be appreciated that the adjustment mechanism may be attached to or connected to the body or the engaging member using any suitable connectors or connecting methods.

[0015] In one such embodiment, the adjustment mechanism of the end door stabilizer is positioned adjacent to and is suitably attached to the body of the end door stabilizer. In this embodiment, the adjustment mechanism includes a bracket which defines two bracket openings on opposing side walls of the bracket and a third opening defined on a base wall of the bracket, an adjusting member which slidably engages the third opening in the base wall of the bracket and is attached to the body, and a biasing member which biases the adjusting member and thereby the body and engaging member towards the railroad car door so that the engaging member operably maintains steady contact and pressure on the door. In one embodiment, the bracket openings on the side walls are substantially aligned and are adapted to receive a connector such as pin which secures the adjustment mechanism to the body. It should be appreciated that the bracket may be any suitable type of bracket and may be made using any suitable type of metal or other suitable material.

[0016] In another alternative embodiment, the adjustment mechanism is positioned adjacent to the engaging member of the end door stabilizer. In this embodiment, the end door stabilizer includes a body having a first and second end, an engaging member slidably received in the first end of the body and an adjustment mechanism positioned in the body between the engaging member and the second end of the body. The end door stabilizer and particularly the body is suitably attached to the frame of the railroad car and positioned so that the engaging member is positioned adjacent to the door. The adjustment mechanism biases the engaging member towards the door to maintain steady contact and pressure between the engaging member and the door or guide bracket thereof. Therefore, the adjustment mechanism adjusts and maintains the position of the engaging member with respect to the door to maintain the contact and pressure of the engaging member with the door or guide bracket thereof. This enables the end door stabilizer to compensate for any wear or erosion of the engaging member and/or the door due to the vibration and other forces generated by the movement of the rail car.

[0017] It should be appreciated that the end door stabilizer of the embodiment described above may be positioned adjacent to the outside surface of the door, the inside surface of the door, the guide bracket associated with the door or in any suitable location on the frame which stabilizes the door.

[0018] It should thus be appreciated that the end door stabilizer or stabilizer of the present invention does not interfere with the movement of the door, allows the door to roll along the lower door track, and can be relatively easily and quickly installed on the frame of the car. The present invention thereby provides a relatively inexpensive solution to the wear problem of the bearing member of the lower door track, eliminates the need for the relatively expensive repairs
of the lower door track, improves movement of the door, and reduces the time the railroad cars are out of service for repairs. Additionally, by limiting the movement of the roller and the whole door including the guide bracket and the bottom of the door, the door hood is less likely to develop cracks.

[0019] It is therefore an advantage of the present invention to provide an auto rack railroad car end door stabilizer.

[0020] Other objects, features and advantages of the invention will be apparent from the following detailed disclosure, taken in conjunction with the accompanying sheets of drawings, wherein like numerals refer to like parts, elements, components, steps and processes.

BRIEF DESCRIPTION OF THE FIGURES

[0021] FIG. 1 is a perspective view of a railroad car illustrating the right and left hand end doors at one end of the car.

[0022] FIG. 2 is a fragmentary perspective view of the end of a railroad car, the left hand door in the open position and the lower door track for the left hand door.

[0023] FIG. 3 is a fragmentary perspective view of the end of a railroad car with the guide brackets mounted on the bottom of the left hand door.

[0024] FIG. 4A is a fragmentary perspective view of the end of a railroad car and the end door stabilizer of FIG. 5 mounted on the frame adjacent to the end guide bracket on the left hand door.

[0025] FIG. 4B is an enlarged fragmentary perspective view of the end door stabilizer of FIG. 5 mounted on the frame adjacent to the end guide bracket on the door of the railroad car.

[0026] FIG. 5 is a perspective view of the end door stabilizer of one embodiment of the present invention.

[0027] FIG. 6 is a top plan view of the end door stabilizer of FIG. 5.

[0028] FIG. 7 is a front view of the end door stabilizer of FIG. 5 illustrating part of the bracket in phantom.

[0029] FIG. 8 is a plan view of the end door stabilizer of FIG. 5 illustrating part of the bracket in phantom.

[0030] FIG. 9 is a perspective view of an alternative embodiment of the end door stabilizer of the present invention which includes a curved engaging member.

[0031] FIG. 10 is a top plan view of the alternative embodiment of the end door stabilizer of FIG. 9.

[0032] FIG. 11 is a front plan view of the alternative embodiment FIG. 9.

[0033] FIG. 12 is a perspective view of a further alternative embodiment of the end door stabilizer of the present invention which includes a curved engaging member mounted over a body.

[0034] FIG. 13 is a top plan view of the alternative embodiment of the end door stabilizer of FIG. 12 illustrating the body in phantom.

[0035] FIG. 14 is a front plan view of the alternative embodiment of the end door stabilizer of FIG. 12.

[0036] FIG. 15 is a perspective view of a further alternative embodiment of the end door stabilizer of the present invention which includes a rotating engaging member which is adapted to engage the guide bracket and illustrating a portion of the body and engaging member in phantom.

[0037] FIG. 16 is a side view of the alternative embodiment of the end door stabilizer of FIG. 15 illustrating a portion of the body in phantom.

[0038] FIG. 17 is a top plan view of the alternative embodiment of the end door stabilizer of FIG. 15 illustrating a portion of the body in phantom.

[0039] FIG. 18 is a front plan view of the alternative embodiment of the end door stabilizer of FIG. 15 illustrating a portion of the body in phantom.

[0040] FIG. 19 is a perspective view of a further alternative embodiment of the end door stabilizer of the present invention which includes a rotating engaging member rotatably mounted in a C-shaped bracket.

[0041] FIG. 20 is a side view of the alternative embodiment of the end door stabilizer of FIG. 19 illustrating a portion of the body in phantom.

[0042] FIG. 21 is a top plan view of the alternative embodiment of the end door stabilizer of FIG. 19 illustrating a portion of the rotating engaging member and a portion of the body in phantom.

[0043] FIG. 22A is a front plan view of the alternative embodiment of the end door stabilizer of FIG. 19 illustrating a portion of the body in phantom.

[0044] FIG. 22B is an enlarged fragmentary perspective view of the end door stabilizer of FIG. 19 mounted on the frame adjacent to the end guide bracket on the door of the railroad car.

[0045] FIG. 23 is a perspective view of another alternative embodiment of the end door stabilizer of the present invention which includes a horizontal support member, a vertical support member, a support plate, and an engaging pad.

[0046] FIG. 24 is a top plan view of the alternative embodiment of the end door stabilizer of FIG. 23.

[0047] FIG. 25 is a front plan view of the front surface of the end door stabilizer of FIG. 23.

[0048] FIG. 26 is a side plan view of the end door stabilizer of FIG. 23.

[0049] FIG. 27 is an enlarged fragmentary perspective view of the end door stabilizer of FIG. 23 mounted on the frame adjacent to the interior side of the door of the railroad car.

[0050] FIG. 28 is perspective view of an alternative embodiment of the end door stabilizer of the present invention which includes an adjustment mechanism.

[0051] FIG. 29 is a side view of the embodiment of FIG. 28.

[0052] FIG. 30 is a cross-section view of the embodiment of FIG. 28 taken generally along line XXX-XXX in FIG. 28.
FIG. 31A is an enlarged perspective view of an alternative embodiment of the end door stabilizer of the present invention which includes an alternative adjustment mechanism.

FIG. 31B is an enlarged cross-section view of the embodiment of FIG. 31A taken generally along the line XXXIB-XXXIB in FIG. 31A.

DETAILED DESCRIPTION OF THE INVENTION

The door stabilizer of the present invention reduces or eliminates wear on the bearing member of the lower door tracks for enclosed railroad cars and also reduces or eliminates cracking or breakage of the door hoods for enclosed railroad cars. The door stabilizer of the present invention is described in detail below in relation to auto rack cars, although it should be appreciated that the present invention is also suited for box cars and other enclosed railroad cars.

Referring now to the drawings, and particularly to FIGS. 1, 2, 34A and 4B a typical auto rack railroad car 10 includes a frame 12 supported by tracks 14, each of which have several wheels 16 which roll along railroad tracks 18. The frame 12 supports two side walls 20 and a roof 22. The auto rack car 10 includes a pair of coacting clamshell doors 24 and 26 mounted on each end of the car. These doors are opened to facilitate the loading and unloading of vehicles into and out of the auto rack car and are closed during transport or storage of the vehicles. The right hand door 24 and the left hand door 26 (when viewed from the outside of the car) are shown in closed position in FIG. 1, and the left hand door 26 is shown in open position in FIG. 2 and in closed position in FIGS. 3 and 4A.

The doors 24 and 26 are supported and guided at their bottom ends by lower door tracks or rails 28 mounted on the frame 12 and are guided at their upper ends by upper door tracks or rails (not shown). While only the lower door track 28 for the left-hand door 26 is shown, it should be appreciated that a corresponding lower door track for the right-hand door is mounted on the frame on the right hand side of the car for supporting and guiding the right hand door 24. The track 28 which is made of a suitable metal such as steel includes a substantially horizontally disposed bearing member 30 and a substantially vertically disposed guide member 32 integrally formed with the outer edge of the bearing member 30. The bearing member is welded to an L-shaped support 34 which is welded to the frame 12. One or more angled supports or gussets (not shown) also support the lower door track 28 on certain auto rack cars. The bottom of each door includes two guide brackets 36 with wheel or roller assemblies attached thereto (not shown). Each roller assembly includes a wheel or roller which engages the horizontally disposed bearing member of the lower door track attached to the frame of the auto rack car to facilitate movement of the door along the track as described above.

Referring now to FIGS. 4A, 4B, 5, 6, 7 and 8, one embodiment of the end door stabilizer of the present invention, generally designated by numeral 40, includes a body or supporting body 42 and an engaging member 44 connected and in this embodiment bonded to the support member or plate 50. The body includes a L-shaped bracket 42 having a mounting member 48 welded or otherwise suitably attached to the frame 12 and an upstanding supporting member 46 integrally connected to and extending transversely at a substantially right angle from the mounting member 48. In this embodiment, the body 42 and particularly the supporting member 46 includes a horizontally or substantially horizontally extending support plate 50 welded or otherwise suitably connected to the upper portion of the supporting member 46. The support plate 50 includes a central section 52 attached to the supporting member 46 of the L-shaped body 42 and two angled shoulder sections 54a and 54b. The engaging member or engaging pad 44 is bonded to the support member or plate 50. The engaging member 44 is similar in shape to the support plate and includes a central section 56 and two angled shoulder sections 58a and 58b. The sections of the engaging member 44 generally correspond and are aligned with the sections of the support plate 48.

The body of the end door stabilizer is preferably made of a suitable metal such as steel, although it could be made of other suitable materials such as plastics, ceramics or composites. To form the steel body a suitably sized blank steel plate is laser cut, burned or die cut to the desired profile. Prior to installation, the steel body is preferably primed and painted with a suitable rust preventing primer and paint. It should be appreciated that the body of the present invention could be formed in any suitable alternative manner and could be formed in any suitable alternative shape.

While any suitable material having a low coefficient of friction to steel, a high compressive strength and a high resistance to wear may be used, the engaging member is preferably made of a suitable polymer, such as ultra-high molecular weight polyethylene. The engaging member is also preferably UV stabilized, self-lubricating, and has non-hygroscopic characteristics. In one embodiment, the engaging member is simultaneously molded and bonded to the body of the end door stabilizer, which has been prepared in a suitable manner prior to molding for enhancing the bonding function.

As illustrated in FIGS. 4A, 4B and 4C, the end door stabilizer 40 of the present invention is adapted to be mounted to the upper surface 12a of the frame 12 of the auto rack car 10 near the left end of the bottom of the left hand door 26 adjacent to the position of the end guide bracket 36a when the left hand door 26 is in the closed position. While only the door stabilizer 40 for the left-hand door 26 is shown, it should be appreciated that a corresponding door stabilizer for the right-hand door is adapted to be mounted on the upper surface of the frame on the right-hand side of the car adjacent to the position of the end guide bracket on the right hand door 24 when the right-hand door 24 is in the closed position for stabilizing the right-hand door 24. Specifically, the mounting member 48 of the L-shaped body 42 is mounted to the frame 12 at a position to allow the end guide bracket 36a to contact the central section 56 of the engaging member 56 when the door is in the closed position. When the door is being closed, if the guide bracket 36a engages the shoulder sections 58a or 58b of the engaging member, the shoulder sections direct guide bracket and door inwardly toward the central section 56 of the engaging member 44. It should thus be appreciated that the end door stabilizer does not interfere with the movement of the door. This arrangement reduces the horizontal movement or vibration of the end guide bracket 36a by limiting the space available for the end guide bracket 36a to move or vibrate.
in a horizontal direction. This limits the horizontal vibration or movement of the roller of the end guide bracket 36a which engages the upper surface of the horizontally disposed bearing member 30 of the track 28. By reducing the amount of movement and vibration of the roller, the end door stabilizer reduces the amount of wear on the bearing member 30 caused by excess vibration of the roller.

[0062] Referring now to FIGS. 9 through 11, in an alternative embodiment of the present invention, the end door stabilizer, generally designated by numeral 60, includes a horizontally or substantially horizontally disposed semi-circular body 62 and a horizontally disposed semi-circular engaging member 64 bonded to the body 62. The semi-circular configuration allows the door, and particularly the end guide bracket, to slide along the engaging member as the door is opened or closed, thus reducing wear on the engaging member 64. The body 62 of the stabilizer is adapted to be mounted to the upper surface of the frame 12a of the auto rack co-adjacent to the position of the end guide bracket as described above. It should be appreciated that the engaging member and body are made preferably from the same material and same manner as described above.

[0063] Referring now to FIGS. 12 through 14, in an alternative embodiment of the present invention, the end door stabilizer generally designated by numeral 70, includes a horizontally disposed curved engaging member such as the semi-circular engaging member 74 mounted on or over and substantially encapsulating a horizontally disposed curved body such as the semi-circular body 72. It should be appreciated that the body and engaging member may be formed with any suitable curve, arch or shape. The construction of this embodiment allows the guide bracket to smoothly engage the engaging member 74, thus reducing any wear on the engaging member 74 that may occur as the door is repeatedly opened or closed. Additionally, by encapsulating the body of the stabilizer, this embodiment prevents the engaging member from being easily separated from the body 72 by repeated contact with and forces from the guide bracket. In an alternative embodiment, the engaging member is removable and replaceable. The body of the stabilizer is adapted to be mounted to the upper surface of the frame 12a of the auto rack car adjacent to the position of the end guide bracket as described above. Although not shown, the body may include a wider surface for attachment to the frame similar to the embodiment of FIG. 5. It should be appreciated that the engaging member and body are made preferably from the same material and same manner as described above; however, it should also be appreciated that the engaging member of this embodiment is preferably molded.

[0064] Referring now to FIGS. 15 through 18, an alternative embodiment of the end door stabilizer of the present invention, generally designated by numeral 90, includes an engaging member or roller 92 rotatably connected or otherwise suitably connected to a body 94. In this embodiment, the body 94 of the end door stabilizer 90 includes a substantially horizontally disposed mounting member 96 and a vertically disposed supporting member 98 integrally connected to and extending transversely from the horizontal mounting member 96. In this embodiment, the horizontally disposed engaging roller 92 is rotatably connected to the vertical supporting member 98. The horizontally disposed engaging roller 92 extends transversely or outwardly from the supporting member 98. The horizontally disposed engaging roller 92 is adapted to engage and direct the end guide bracket 36. The engaging roller 92 may rotate clockwise or counterclockwise. Guiding devices, such as circular caps or 100a and 100b, are preferably connected to the supporting member 98 slightly above and slightly below the engaging roller 92 to prevent the vertical movement of the engaging roller 92 while allowing the roller to freely rotate around the vertical supporting member 98. The body 94 of this embodiment is adapted to be mounted to the upper surface of the frame 12a of the auto rack car adjacent to the position of the end guide bracket as described above. It should be appreciated that the engaging roller and body are made preferably from the same material as described above and in any conventional manner.

[0065] In this embodiment, the engaging member or roller 92 rotates as the guide bracket 36 of the auto rack car door engages and slides past it. When the door is opening or closing, the engaging roller 92 is adapted to rotate in the same direction of the moving door. Furthermore, the engaging roller 92 is in contact with the end guide bracket 36, limiting the vibration and horizontal movement of the end guide bracket and the door. This embodiment reduces wear that may occur from the guide bracket repeatedly engaging against a fixed engaging member as described in the above embodiments as the door is opening and closing.

[0066] Referring now to FIGS. 19, 20A, 22A and 22B, a further alternative embodiment of the present invention includes an end door stabilizer 110 having an engaging roller 112 which is mounted in a substantially C-shaped body 114. More specifically, the body 114 includes a substantially C-shaped bracket having a bight portion or side wall 116 and spaced-apart upper and lower top and bottom walls 118 and 120, respectively, integrally connected to and extending transversely from the side wall 116. The end walls include suitably sized aligned circular apertures, 122a and 122b, respectively. The horizontally disposed engaging member or roller 112 having a suitably sized circular aperture 124 is positioned or mounted in the space between the upper end wall 118 and the lower end wall 120 of the C-shaped bracket. In one embodiment, horizontally disposed upper and lower bushings 130a and 130b, respectively, are positioned in the space between the engaging roller 112 and the top and bottom end walls 118 and 120 respectively, of the C-shaped bracket. The bushings 130a and 130b keep the engaging roller 112 in position, thus preventing any friction between the engaging roller 112 and the top and bottom walls 118 and 120, respectively. In another embodiment, the bushings are internally formed with the engaging roller 112. The circular apertures of the C-shaped bracket 122a and 122b are aligned with the circular aperture of the engaging roller to allow a fastening device, such as a pin 126, to rotatably connect the engaging roller 112 and the C-shaped bracket. It should be appreciated that the circular engaging member 112 may rotate clockwise or counterclockwise. A plurality of mounting plates 128 are attached to and extend downwardly from the lower wall 120 of the bracket. The mounting plates 128 are adapted to be mounted to the upper surface of the frame 12a of the frame 12 auto rack car adjacent to the position of the end guide bracket 36 as described above. It should be appreciated that the engaging roller and body are made preferably from the same material as described above and in any conventional manner.
As with the previous embodiment, the engaging roller 112 is adapted to rotate as the guide bracket 36 of the auto rack car door engages and slides past it. When the door is opening or closing, the engaging roller 112 is adapted to rotate in the same direction as the moving door. When the door is in the closed position, the engaging roller 112 is in contact with the end guide bracket, limiting the vibration and movement of the end guide bracket. By rotating, the engaging roller 112 is more resilient to wear that may occur as the end guide bracket moves back and forth. This embodiment thereby prevents wear on the engaging member of the present invention.

Referring now to FIGS. 23 through 27, in another alternative embodiment of the present invention, the end door stabilizer generally designated by the numeral 132, includes a body 133 having a horizontal support or mounting member 134 integrally formed with a vertical support member 136. A pad support member 138 is attached to the upper portion of the vertical support member 136. The pad support member 138 may be attached to the vertical support member 136 using any suitable attachment means. An engaging member which is in the form of an engaging pad 140 is attached to the front surface of the pad support member 138. The end door stabilizer 132 is in one embodiment attached to the frame 12 on the second level of deck of the auto rack car as shown in FIG. 27. However, it should be appreciated that the end door stabilizer 132 may also be attached to any suitable part of the auto rack car that is adjacent to the interior of the doors such as on the first level or any other level or deck of the auto rack car. The end door stabilizer 132 is preferably made from a durable material such as steel. The engaging pad 140 is preferably bonded to the support member 138 (but could be removable and replaceable) and is made of the same durable material as described above. It should also be appreciated that the engaging member could be a roller as described above.

Unlike the other embodiments, the end door stabilizer 132 of this embodiment is mounted to the frame 12 adjacent to the interior of the doors 36. Preferably, the end door stabilizer 132 is mounted adjacent to each door so that each door engages a single end door stabilizer. The interior side of the doors 36 engage the respective engaging pads 140 on each end door stabilizer 132 to substantially reduce the stress from the opening and closing of the doors 26 and the horizontal movement of the guide brackets. It should be appreciated that this alternative embodiment may be used alone or in combination with any of the other engaging member embodiments.

In an alternative embodiment of the present invention, the end door stabilizer of the above embodiments is adjustable. Generally, in one embodiment, the engaging member is adjustably mounted to the supporting body or body to adjust to varying door positions and styles. In another alternative embodiment, the supporting body is adjustably mounted to the frame of the railroad car. In one such embodiment, an adjustment mechanism is attached to the body or engaging member of the end door stabilizer. The adjustment mechanism can be any suitable adjustment mechanism or other similar mechanism. Preferably, the adjustment mechanism biases the body and/or the engaging member toward the door to maintain contact and pressure between the engaging member and the door or guide bracket thereof. It should thus be appreciated that the end door stabilizer including the adjustment mechanism may be positioned adjacent to the guide bracket associated with the door or any other suitable component of the railcar to stabilize the door.

Referring now to FIGS. 28, 29 and 30, in one alternative embodiment, the end door stabilizer 200 includes an adjustment mechanism 201, a body 204 which is adjustably attached to the adjustment mechanism and an engaging member or engaging roller 206 which is rotatably attached to the body. The adjustment mechanism 201 includes a bracket 202 having opposing side walls which define first and second bracket openings 203a and 203b and a base wall which defines a third bracket opening 207. The adjustment mechanism also includes an adjusting guide 210 which is slidable received in the opening 207 and is attached to the body 204, and an adjusting biasing member 212 journaled about the adjusting guide. It should be appreciated that the adjustment mechanism may be manufactured using a suitable metal such as steel or any other suitable material. The first and second bracket openings 203a and 203b are substantially aligned and are positioned such that the first and second openings substantially align with corresponding openings (not shown) on the body 204 and the engaging member 206 when the bracket 202 of the adjustment mechanism is positioned about the body 204. The first and second openings 203a and 203b and the openings in the body and engaging member are adapted to receive a connector such as pin 208 when all of these openings are substantially aligned.

In one embodiment, the adjusting guide 210 includes a cylindrical member such as a rod integrally formed with the body 204. In another embodiment, the adjusting guide 210 is attached to the body 204 using a suitable attachment device or attachment method. It should be appreciated that the guide may be any suitable shape. The adjusting guide 210 generally slides forward or backward within the third opening 207 in bracket 202. The body and the engaging member move forward or backward based on the amount of tension or force exerted against the body 204 by the adjusting or biasing member 212. As shown in FIGS. 28, 29 and 30, the adjusting or biasing member 212 includes a suitable spring which biases the body and/or the engaging member towards the railroad car door. It should be appreciated that the biasing member may include any suitable type of spring or any suitable biasing or tensioning device capable of producing suitable forces to cause the desired engagement and stability of the door.

In the illustrated embodiment of FIGS. 28, 29 and 30, the body 204 includes a C-shaped bracket which is seated within the bracket 202 of the adjustment mechanism 201. The body 204 defines two openings 209a and 209b on opposing side walls of the body which are substantially aligned with the first and second bracket openings 203a and 203b of the bracket 202. In one embodiment, the engaging member 206 includes a roller which defines an opening substantially therethrough. It should be appreciated that the engaging member may be any suitable engaging member such as those described above. The engaging member or roller 206 is seated or positioned between the opposing side walls of the body 204 and the opening of the engaging member is substantially aligned with the openings 209a and 209b of the body 204 and the first and second openings of the bracket 202. A connector 208 such as a pin or other suitable connecting device is inserted through the aligned
openings of the adjustment mechanism, the body and the engaging member. The connector 208 is secured in place using a fastening device or devices such as a washer and nut or any other suitable fastening devices.

[0074] The adjustable end door stabilizer 200 described above is attached to the frame of a railroad car where the engaging member is positioned adjacent to a door or guide bracket of a door on the railroad car. The end door stabilizer 200 and specifically the biasing member 212 biases the body 204 and the engaging member 206 towards the door and thereby adjusts the position of the body and/or engaging member in relation to the guide bracket and/or door. The adjustment mechanism 201 therefore causes the end door stabilizer to adjust to the changing positions of the door as the door moves during the movement of the railroad car and maintains contact between the engaging member 206 and the door. Additionally, the adjustment mechanism enables the end door stabilizer to compensate for wear or erosion of the engaging member and/or the guide bracket or door caused by the vibration, friction and other forces generated during movement of the rail car.

[0075] In this embodiment, the adjustment mechanism enables the body 204 to move towards the frame thereby compressing the biasing member when the door pushes or moves against the engaging member. This movement causes the adjusting guide 210 to slide through the second opening 207 of the bracket 202 and towards the frame. If the door moves away from the engaging member, the adjustment mechanism 201 causes the engaging member to move towards the door and thereby maintain contact and pressure with the door. Specifically, the adjusting or biasing member or spring 212 expands and pushes against the body 204, which causes the guide to slide forward through the opening 207 and away from the frame, and moves the engaging member 206 forward towards the door to maintain contact between the engaging member and the door. In this manner, the adjustment mechanism 201 of the end door stabilizer 200 enables the end door stabilizer to maintain contact and pressure with the door by adjusting the position of the end door stabilizer with respect to the varying positions of the door caused by the movement of the door and/or the guide bracket during movement of the railroad car. In one embodiment, the adjustment mechanism 201 of the end door stabilizer 200 is attached to the body 204 as shown in FIG. 28. In another embodiment, the adjustment mechanism is attached to the engaging member 206.

[0076] Referring now to FIGS. 31A and 31B, an alternative embodiment of the end door stabilizer of the present invention is illustrated where the end door stabilizer includes an alternative adjustment mechanism. The end door stabilizer includes a body 302 having a first end 303a and a second end 303b, an engaging member 306 slidably received in the first end 303a of the body, and an adjustment mechanism 308 such as a spring positioned in the body and between the engaging member 306 and the second end 303b of the body. The body includes flange members 304a and 304b attached to the first end 303a and the second end 303b, respectively. The flange member 304b on the second end 303b of the body is attached to the frame or other suitable location on the rail car using suitable fasteners or a suitable fastening method, and positioned so that the engaging member 306 is adjacent to the guide bracket of the door or the door of the rail car. The adjustment mechanism 308 biases the engaging member 306 towards the door to maintain contact and pressure between the engaging member and the guide bracket or door. It should be appreciated that the engaging member may be any suitable engaging member. It should also be appreciated that the adjustment mechanism may be any suitable mechanism or tensioning device. It should further be appreciated that the engaging member may include a suitable stopping member which prevents the engaging member from being disconnected or dislodged from the body.

[0077] While the present invention is described in connection with what is presently considered to be the most practical and preferred embodiments, it should be appreciated that the invention is not limited to the disclosed embodiments, and is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the claims. Modifications and variations in the present invention may be made without departing from the novel aspects of the invention as defined in the claims, and this application is limited only by the scope of the claims.

The invention is hereby claimed as follows:

1. In a railroad car having a frame, a door movably connected to the frame, a guide bracket connected to the door, and a door stabilizer, said door stabilizer comprising:
   a. a body mountable to the frame adjacent to the position of the guide bracket when the door is in a closed position; and
   b. an engaging member connected to said body, said engaging member engaging the guide bracket when the door is in the closed position to reduce the horizontal movement of the guide bracket during movement of the railroad car.

2. The door stabilizer of claim 1, wherein the body includes a mounting member, and a supporting member integrally connected to and extending transversely from said mounting member.

3. The door stabilizer of claim 2, which includes a support plate extending substantially horizontally from the supporting member.

4. The door stabilizer of claim 3, wherein the support plate includes a central section attached to the supporting member and two angled shoulder sections, each of said shoulder sections extending from said central section.

5. The door stabilizer of claim 1, wherein the engaging member includes a pad attached to the body.

6. The door stabilizer of claim 1, wherein the engaging member includes a polymer material.

7. The door stabilizer of claim 6, wherein the polymer material is ultra-high molecular weight polyethylene.

8. The door stabilizer of claim 1, wherein the engaging member includes a roller attached to the body.

9. The door stabilizer of claim 1, wherein the body includes a substantially horizontally disposed curved shape and the engaging member includes a substantially horizontally disposed curved shape.

10. The door stabilizer of claim 1, wherein the body includes a substantially horizontally disposed curved shape and the engaging member includes a substantially horizontally disposed curved shape, and wherein the engaging member substantially encapsulates said body.

11. The door stabilizer of claim 10, wherein engaging member is removable from the body for replacement.
12. The door stabilizer of claim 1, wherein the body includes a substantially horizontally disposed mounting member and a substantially vertically disposed supporting member connected to and extending transversely from said mounting member.

13. The door stabilizer of claim 12, wherein the engaging member includes an engaging roller rotatably connected to said vertically disposed supporting member.

14. The door stabilizer of claim 1, wherein the body includes a substantially C-shaped bracket and the engaging member includes an engaging roller, said engaging roller defining an aperture extending therethrough.

15. The door stabilizer of claim 14, wherein the C-shaped bracket includes a side wall, a top wall connected to and extending transversely from an upper end of the side wall and a bottom wall connected to and extending transversely from a lower end of the side wall.

16. The door stabilizer of claim 15, wherein the top and bottom walls of the C-shaped bracket each define an aperture which are aligned with the aperture defined by the engaging roller.

17. The door stabilizer of claim 16, which includes means for rotatably securing the engaging roller between the top and bottom walls of the C-shaped bracket.

18. The door stabilizer of claim 1, wherein the body is adjustable relative to the frame.

19. The door stabilizer of claim 18, which includes an adjustment mechanism attached to said body.

20. The door stabilizer of claim 19, wherein the adjustment mechanism includes a biasing adjusting member.

21. The door stabilizer of claim 19, wherein the engaging member moveable relative to the body and the adjustment mechanism is positioned in the body between one end of the body and the engaging member.

22. The door stabilizer of claim 1, wherein the engaging member is adjustable relative to the body.

23. The door stabilizer of claim 22, which includes an adjustment mechanism attached to said engaging member.

24. The door stabilizer of claim 23, wherein the adjustment mechanism includes a biasing adjusting member.

25. In a railroad car having a frame, a door movably connected to the frame, and a door stabilizer said door stabilizer comprising:

   a body a mountable to said frame adjacent to the door when the door is in a closed position; and
   an engaging member connected to said body, said engaging member engaging the door when the door is in the closed position to reduce the horizontal movement of said door during movement of the railroad car.

26. The door stabilizer of claim 25, wherein the body includes a mounting member and a supporting member integrally connected to and extending transversely from said mounting member.

27. The door stabilizer of claim 26, which includes a support plate extending substantially horizontally from the supporting member.

28. The door stabilizer of claim 27, wherein the support plate includes a central section attached to the supporting member and two angled shoulder sections, each of said shoulder sections extending from said central section.

29. The door stabilizer of claim 25, wherein the engaging member includes a pad attached to the body.

30. The door stabilizer of claim 25, wherein the engaging member includes a polymer material.

31. The door stabilizer of claim 30, wherein the polymer material is ultra-high molecular weight polyethylene.

32. The door stabilizer of claim 25, wherein the engaging member includes a roller attached to the body.

33. The door stabilizer of claim 25, wherein the body includes a substantially horizontally disposed curved shape and the engaging member includes a substantially horizontally disposed curved shape.

34. The door stabilizer of claim 25, wherein the body includes a substantially horizontally disposed curved shape and the engaging member includes a substantially horizontally disposed curved shape.

35. The door stabilizer of claim 25, wherein engaging member is removable from the body for replacement.

36. The door stabilizer of claim 25, wherein the body includes a substantially horizontally disposed mounting member and a substantially vertically disposed supporting member connected to and extending transversely from said mounting member.

37. The door stabilizer of claim 36, wherein the engaging member includes an engaging roller rotatably connected to said vertically disposed supporting member.

38. The door stabilizer of claim 25, wherein the body includes a substantially C-shaped bracket and the engaging member includes an engaging roller, said engaging roller defining an aperture extending therethrough.

39. The door stabilizer of claim 38, wherein the C-shaped bracket includes a side wall, a top wall connected to and extending transversely from an upper end of the side wall and a bottom wall connected to and extending transversely from a lower end of the side wall.

40. The door stabilizer of claim 39, wherein the top and bottom walls of the C-shaped bracket each define an aperture which are aligned with the aperture defined by the engaging roller.

41. The door stabilizer of claim 40, which includes means for rotatably securing the engaging roller between the top and bottom walls of the C-shaped bracket.

42. The door stabilizer of claim 25, wherein the body is adjustable relative to the frame.

43. The door stabilizer of claim 42, which includes an adjustment mechanism attached to said body.

44. The door stabilizer of claim 42, wherein the adjustment mechanism includes a biasing adjusting member.

45. The door stabilizer of claim 42, wherein the engaging member moveable relative to the body and the adjustment mechanism is positioned in the body between one end of the body and the engaging member.

46. The door stabilizer of claim 25, wherein the engaging member is adjustable relative to the body.

47. The door stabilizer of claim 46, which includes an adjustment mechanism attached to said engaging member.

48. The door stabilizer of claim 47, wherein the adjustment mechanism includes a biasing adjusting member.

49. In a railroad car having a frame, a door movably connected to the frame, a door stabilizer mounted to the frame for engaging the door to reduce the horizontal movement of the door during movement of the railroad car, the improvement being in the door stabilizer which comprises:

   a body mountable to said frame adjacent to the door when the door is in a closed position; and
an engaging member connected to said body, said engaging member engaging the door when the door is in the closed position.

50. The door stabilizer of claim 49, wherein the body includes a mounting member and a supporting member integrally connected to and extending transversely from said mounting member.

51. The door stabilizer of claim 50, which includes a support plate extending substantially horizontally from the supporting member.

52. The door stabilizer of claim 51, wherein the support plate includes a central section attached to the supporting member and two angled shoulder sections, each of said shoulder sections extending from said central section.

53. The door stabilizer of claim 49, wherein the engaging member includes a pad attached to the body.

54. The door stabilizer of claim 49, wherein the engaging member includes a polymer material.

55. The door stabilizer of claim 54, wherein the polymer material is ultra-high molecular weight polyethylene.

56. The door stabilizer of claim 49, wherein the engaging member includes a roller attached to the body.

57. The door stabilizer of claim 49, wherein the body includes a substantially horizontally disposed curved shape and the engaging member includes a substantially horizontally disposed curved shape.

58. The door stabilizer of claim 49, wherein the body includes a substantially horizontally disposed curved shape and the engaging member includes a substantially horizontally disposed curved shape, and wherein the engaging member substantially encapsulates said body.

59. The door stabilizer of claim 58, wherein the engaging member is removable from the body for replacement.

60. The door stabilizer of claim 49, wherein the body includes a substantially horizontally disposed mounting member and a substantially vertically disposed supporting member connected to and extending transversely from said mounting member.

61. The door stabilizer of claim 60, wherein the engaging member includes an engaging roller rotatably connected to said vertically disposed supporting member.

62. The door stabilizer of claim 49, wherein the body includes a substantially C-shaped bracket and the engaging member includes an engaging roller, said engaging roller defining an aperture extending therethrough.

63. The door stabilizer of claim 62, wherein the C-shaped bracket includes a side wall, a top wall connected to and extending transversely from an upper end of the side wall and a bottom wall connected to and extending transversely from a lower end of the side wall.

64. The door stabilizer of claim 63, wherein the top and bottom walls of the C-shaped bracket each define an aperture which are aligned with the aperture defined by the engaging roller.

65. The door stabilizer of claim 64, which includes means for rotatably securing the engaging roller between the top and bottom walls of the C-shaped bracket.

66. The door stabilizer of claim 49, wherein the body is adjustable relative to the frame.

67. The door stabilizer of claim 66, which includes an adjustment mechanism attached to said body.

68. The door stabilizer of claim 66, wherein the adjustment mechanism includes a biasing adjusting member.

69. The door stabilizer of claim 66, wherein the engaging member moveable relative to the body and the adjustment mechanism is positioned in the body between one end of the body and the engaging member.

70. The door stabilizer of claim 49, wherein the engaging member is adjustable relative to the body.

71. The door stabilizer of claim 70, which includes an adjustment mechanism attached to said engaging member.

72. The door stabilizer of claim 71, wherein the adjustment mechanism includes a biasing adjusting member.