



(43) International Publication Date
9 January 2014 (09.01.2014)

- (51) International Patent Classification:
B60R 19/00 (2006.01) *B60R 21/36* (2011.01)
B61F 19/06 (2006.01)
- (21) International Application Number:
PCT/BR2013/000243
- (22) International Filing Date:
5 July 2013 (05.07.2013)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
US 61/668,745 6 July 2012 (06.07.2012) US
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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: A SAFETY DEVICE FOR RAILWAY VEHICLES

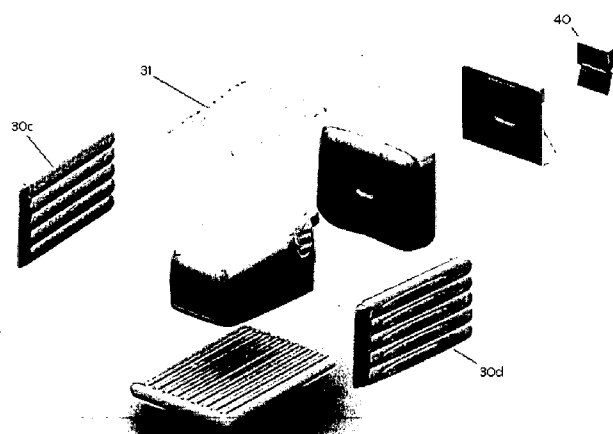


FIG. 13

(57) Abstract: The present invention relates to a safety device for railway vehicles, more specifically to a safety device that reduces the negative consequences resulting from collisions or pedestrian accidents involving railway vehicles. As such, the railway vehicle safety device (10, 20, 30) consists of a main impact dampening area (10a, 20a, 30a) and at least one secondary support and resistance area (10b, 10c, 20b, 20c, 20d, 30b, 30c, 30d), with the safety device being installed on the railway vehicle's front end (1), so that the main impact dampening area (10a, 20a, 30a) dampens the force of the impact caused by a collision between the vehicle (1) and a pedestrian (3).

"A SAFETY DEVICE FOR RAILWAY VEHICLES"

The Field of the Invention

The present invention refers to a safety device for railway vehicles, more specifically to a safety device that reduces the negative consequences resulting from collisions or pedestrian accidents involving railway vehicles.

Background

The accidents involving railway vehicles (i.e. locomotives, wagons) often have serious consequences, since material damage to the equipment until serious injury or death of those involved.

Generally, the efforts to prevent railway accidents have been focused on their prevention: collision sensors, alarms, planning escape routes, and other types of preventive methods or devices. If the prevention of this kind of accident fails the results are disastrous.

Considering the most common railway accidents, running over is particularly worrisome and dangerous. The dimensions and weight of the railroad car cause a fatality as a consequence of this type of impact. Other equally tragic, yet common injuries include serious injuries such as mutilation or generalized fractures.

Even if impact is only partial, the shock of collision between railroad cars and people results in consequences as disastrous as those mentioned above.

Objectives of the invention

One of the objectives of this present invention, therefore, is to provide a safety device capable of reducing the negative consequences resulting from collision or running over involving railway vehicles.

Another objective of this present invention is to provide a safety device capable of reducing the impact from the collision between a railroad car and a pedestrian.

BRIEF SUMMARY OF THE INVENTION

This present invention meets the aforementioned objectives by means of a safety device for railway vehicles consisting of a main impact dampening area and at least one secondary support and resistance area. The safety device is installed on front of the railroad car so that the main impact dampening area dampens the force generated by the collision between the vehicle and a pedestrian.

In the preferred embodiment of the invention, the main impact dampening area and the secondary support and resistance area consist of inflatable bags, in which the main impact dampening area's internal pressure is less than that of the secondary support and resistance area. The safety device can work with pressures that vary between 1Pa – 1MPa.

Still in a preferred embodiment, the device further comprises a tilting mechanism that tilts the device's body laterally in relation to the direction in which the vehicle is moving.

In one embodiment of the invention, the device comprises two secondary support and resistance areas, with the first one consisting of an inflatable bag extending in a plane parallel to the front of the vehicle and the second one consisting of a portion of an inflatable bag sticking out from the lower end of the first secondary area.

In another embodiment, the safety device comprises three secondary resistance and support areas, with the first one consisting of an inflatable bag extending in a plane parallel to the vehicle's front end, and the second and third areas consisting of inflatable side bags sticking out the first secondary area. In this embodiment, the inflatable side bags preferably extend at an inclined angle in relation to a plane that runs parallel to the rails. The device further consists of a support area formed by an inflatable bag that sticks out from the lower end of the first secondary area. The device may further comprise a mesh or elastic net that joins the three secondary areas together.

In the invention's preferred embodiment, the device further consists of a casing installed on the vehicle's front end that is capable of stowing the impact dampening and support and resistance areas when the device is not activated.

5 In another embodiment of the present invention, the main impact dampening area consists of a mesh or elastic net. The device further comprises two supporting and resistance areas made up of inflatable side bags. In this embodiment, the safety device may further comprise an upper mesh or elastic net that joins the inflatable side bags, and a direction area formed by a crossbar connected to the side bags. Preferably, the inflatable bags are made of polymeric materials, natural
10 or synthetic.

Brief description of the drawings

In order to describe the manner in which the above-recited and other advantages and features of the invention can be obtained, a more particular description of the invention briefly described above will be rendered by reference to
15 specific embodiments thereof which are illustrated in the appended drawings. Understanding that these drawings depict only typical embodiments of the invention and are not therefore to be considered to be limiting of its scope, the invention will be described and explained with additional specificity and detail through the use of the accompanying drawings in which:

20 Figure 1 shows a schematic view of a railroad car fitted with the safety device according to the first preferable embodiment of the present invention, with the device shown after being actuated;

Figure 2 shows a schematic view of the front of a railroad car fitted with the safety device according to the first preferable embodiment of the present invention,
25 with the device shown while not actuated;

Figure 3 shows a side view of a railroad car fitted with the safety device according to the first preferable embodiment of the present invention, with the

device shown after being actuated;

Figure 4 shows a top view of a railroad car fitted with the safety device according to the first preferable embodiment of the present invention, with the device shown after being actuated;

5 Figures 5a and 5b are schematic illustrations of the safety device in operation according to the first embodiment of the present invention during impact between the railroad car and a pedestrian;

10 Figure 6 shows a schematic view of a railroad car fitted with the safety device according to the second embodiment of the present invention, with the device shown after being actuated;

Figure 7 shows a schematic view of the front a railroad car fitted with the
safety device according to the second embodiment of the present invention, with the device shown as being deactivated;

15 Figure 8 is a schematic illustration of the safety device in operation according to the second embodiment of the present invention during impact between the railroad car and a pedestrian;

Figure 9 shows a schematic view of a railroad car fitted with the safety device according to the third embodiment of the present invention, with the device shown after being actuated;

20 Figure 10 shows a top view of a railroad car fitted with the safety device according to the third embodiment of the present invention, with the device shown after being actuated;

25 Figure 11 shows a front view of a railroad car fitted with the safety device according to the third embodiment of the present invention, with the device shown after being actuated;

Figure 12 shows a schematic view of the front of a railroad car fitted with the

safety device according to the third embodiment of the present invention, with the device shown as being deactivated; and

Figure 13 shows an exploded view of the safety device.

Detailed description of the preferred embodiments

5 The present invention shall be further detailed based on the execution example depicted in the drawings.

Figures 1 - 5 show a preferred embodiment of the safety device.

Figure 1 shows a railroad car (locomotive) 1 moving along the tracks 2. A pedestrian 3 is shown on the tracks at risk of being struck, and the safety device 10
10 is shown after being actuated/inflated.

As shown in the figures, the safety device is intended to be installed on the vehicle's front end 1.

In the preferred embodiment, the device 10 consists of an inflatable body with a main impact dampening area 10a and two secondary resistance and support
15 areas 10b and 10c.

The main impact dampening area 10a consists of an inflatable bag whose pressure is less than that of the secondary resistance and support areas 10b and 10c. Therefore, impact dampening area 10a is suitable for dampening the impact with pedestrian 3 at the time of collision, whereas areas 10b and 10c provide the
20 needed resistance to the device 10 and stability to absorb the impact. Figure 2 shows the deactivated device 10. As can be seen, the device 10 is preferably installed on the locomotive's head piece, centrally attached below the base of the catwalk. This position is chosen as it does not interfere with the operation or use of locomotive's equipment or the vehicle's coupling connections.

25 It should be emphasized, however, that the safety device could be installed on any other suitable position provided it allows the device to be activated and inflated

in time to absorb the impending impact.

The connection between the components of the safety device is performed through pipes, hoses, valves and nozzles that are part of a filling system (not shown) which allows inflating the said bags with fluids such as oxygen, nitrogen, carbon dioxide, helium, ozone or compressed air originated from a electrochemical and/or chemical reaction. The gases may be transformed by compression, vaporization and sublimation effects. The velocity of gas flow within the device can vary between 1L/m - 200 m³/s.

In this present invention's preferred embodiment, for the safety device to be installed, the inflatable body is wrapped into an enclosure 40 in a box-like format (see Figure 2), which opens when actuated, thereby allowing the body to burst out when inflated. The said enclosure 40 may be done by metallic or polymeric material.

The activation of the safety device may be performed by a manual or automatic system. The device is inflated in two stages: first by means of a chemical reaction and then by compressed air from a cylinder. The inflation process should take no more than 5 seconds.

Figures 3 and 4 respectively show a side view and top view of the device installed on the railroad car 1 (with only its front being shown).

As better shown in Figure 4, which is the preferred embodiment of the invention, the device 10 further includes a tilting mechanism that enables it to tilt in the direction of the arrows shown in the figure. The purpose of this mechanism is to direct the pedestrian off the tracks after the device 10 has dampened impact.

Figures 5a and 5b illustrate how the device 10 initially operates. These figures show a time immediately after impact between the vehicle and a pedestrian 3.

During impact, the pedestrian 3 is flung against the inflatable device's impact dampening area 10a. As the pressure in this area is lower, the pedestrian's

body 3 presses against the bag, the collision impact is dampened, and the pedestrian's body is supported by the dampening area 10a.

Next, the device 10 tilts to one side (see Figure 5b) and remove the pedestrian 3 from the tracks. As the inflatable bag is resilient, when it returns to its normal condition, the pedestrian 3 is pushed out of the device 10, and off the tracks.

In this present invention's preferred embodiment, the device 10 is activated by the driver. Upon realizing the risk of colliding with a person, the driver presses a button that opens the casing and inflates the device.

Figures 6 to 8 show an alternative embodiment of the present invention's device.

~~In this embodiment, the safety device 20 consists of an impact dampening area 20a made up of a mesh or elastic net and two support and resistance areas 20b made up of the inflatable side bags.~~

The safety device 20 may also include an upper mesh or elastic net 20c that joins the side bags 20b, a secondary inflatable bag 20d, and a direction area 20e.

The direction area 20e preferably consists of a crossbar 20e connected to the side bags. This bar 20e is positioned on the lower front of the device 20, so that, at the time of impact between the vehicle 2 and pedestrian 3, the bar 20e makes contact with the pedestrian's lower body 3.

After contact has been made between the bar 20e and pedestrian 3, the pedestrian's body 3 is flung against the impact dampening mesh 20a (see Figure 8).

Unlike the preferred embodiment shown in Figures 1 through 5, in the second embodiment, the present invention's device is not activated only at the time of impact. As such, the device 20 remains activated while the vehicle is moving, unless intentionally deactivated.

Figure 8 shows a deactivated device 20. As can be seen, when deactivated, the device 20 can be placed in a retracted position, with the inflatable bags not inflated.

5 Figures 9-12 show other alternative embodiment of the present invention's device.

In this embodiment, the safety device 30 consists of a main impact dampening area, three secondary resistance and support areas 30b, 30c, and 30d, and one support area 30e.

10 The main impact dampening area 30a consists of an inflatable bag whose pressure is less than that of the secondary areas 30b-30d and support area 30e.

~~The first secondary region 30b is an inflatable bag that, when inflated, is~~
parallel to the vehicle's front end, and the second and third secondary regions 30c and 30d consist of inflatable side bags 30c and 30d that stick out from the first secondary region 30b.

15 The inflatable side bags 30c and 30d shall preferably be placed at an inclined angle in relation to a plane that runs parallel to the rails. This inclination, which may be about 6° toward the rails' center, causes close to a 90% reduction in the force of the impact with a pedestrian 3 walking along the rail's outer edge (see Figure 10).

20 The device 30 may further include an upper mesh or elastic net 31 that joins the three secondary resistance and support areas 30b, 30c, and 30d.

Figure 12 shows the deactivated device 30. As can be seen, the device 30 is preferably installed on the locomotive's head piece, centrally attached below the base of the catwalk 1e. This position is chosen because it does not interfere with the locomotive's equipment or the vehicle's coupling connection.

25 In the Figure 13, the separated portions of the safety device are illustrated in an exploded view.

It should be emphasized, however, that the safety device could be installed in any other suitable position, provided this position allows for driving and inflating the device in time to the proper absorption of the impending impact. The activation of the safety device may be performed by a manual or automatic system.

5 Further, the distance between the upper face of the rail head and the lower face of the safety device should be kept to a minimum. It may vary about 0 to 2 meters.

10 Obviously, those skilled in the art shall understand that the impact dampening area of the safety device may be comprised by many inflatable bags or may be integrally formed as part of a unitary, one-piece construction.

Finally, it should be understood that the figures show this invention safety system's preferred embodiment, with the actual scope of the invention being defined in the attached claims.

CLAIMS

1. A safety device for railway vehicles to reduce the negative consequences resulting from collisions or pedestrian accidents in railways, the device comprising:

a main impact dampening area (10a, 20a, 30a); and

5 at least one secondary support and resistance area (10b, 10c, 20b, 20c, 20d, 30b, 30c, 30d);

the safety device is installed on the front of the railway vehicle (1) in such a way that the main impact dampening area (10a, 20a, 30a) dampens the force of the impact created by the vehicle (1) colliding with a pedestrian (3).

10 2. The safety device according to claim 1, wherein the main impact dampening area (10a, 30a) and the secondary support and resistance area include inflatable bags, and the internal pressure in the main impact dampening area (10a, 30a) is less than that of the secondary support and resistance area (10b, 10c, 30b, 30c, 30d).

15 3. The safety device according to claim 1 or 2, wherein it further consists of a tilt mechanism that tilts the device's body laterally in relation to the direction in which the vehicle is traveling.

4. The safety device according to claim 2 or 3, wherein it consists of two secondary support and resistance areas (10b, 10c), with the first secondary area (10b) comprising an inflatable bag that extends in a plane that runs parallel to the vehicle's front end (1) and the second secondary area (10c) comprising a part of an inflatable bag that sticks out from the lower end of the first secondary area (10b).

25 5. The safety device according to claim 2 or 3, wherein it consists of three secondary resistance and support areas (30b, 30c, and 30d), with the first secondary area (30b) comprising an inflatable bag that extends in a plane parallel

to the vehicle's front end (1) and the second and third secondary areas (30c and 30d) comprising inflatable side bags (30c and 30d) sticking out from the first secondary area (30b).

5 6. The safety device according to claim 5, wherein the inflatable side bags (30c and 30d) extend at an inclined angle in relation to a plane that runs parallel to the rails.

7. The safety device according to claim 5 or 6, wherein it further consists of a support area (30e) that sticks out from the lower end of the first secondary area (30b), and the support area (30e) comprising an inflatable bag.

10 8. The safety device according to any one of the claims 5-7, wherein it further consists of a mesh or elastic net (31) that joins the three secondary resistance and support areas (30b, 30c and 30d).

15 9. The safety device according to any one of the claims 1-8, wherein the device includes a casing that is installed on the vehicle's front end (1) and which is used to stow the impact dampening and support and resistance area when the device is not activated.

10. The safety device according to claim 1, wherein the main impact dampening area (20a) consists of a mesh or elastic net (20a) and two support and resistance areas (20b) made up of inflatable side bags.

20 11. The safety device according to claim 10, wherein it further consists of an upper mesh or elastic net (20c) that joins the inflatable side bags (20b).

12. The safety device according to claim 10, wherein it further consists of a direction area (20e) made up of a crossbar (20e) connected to the side bags (20b).

25 13. The safety device, according to any one of claims 1 to 12, wherein it comprises an mechanism filling which allow inflating the said bags with fluids such as oxygen, nitrogen, carbon dioxide, helium, ozone or compressed air originated from a electrochemical and/or chemical reaction; the gases may be transformed by

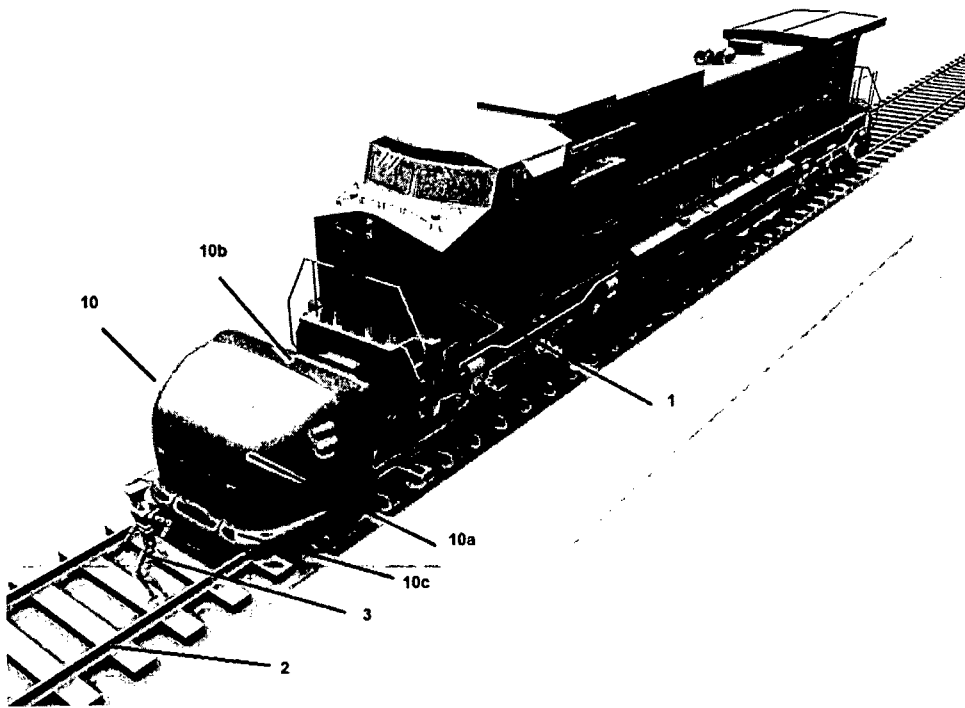


FIG. 1

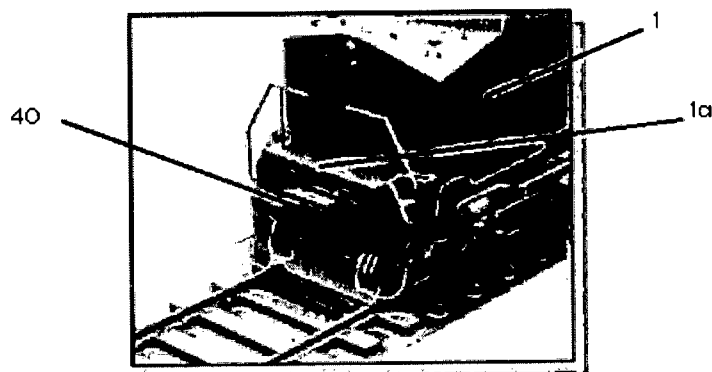


FIG. 2

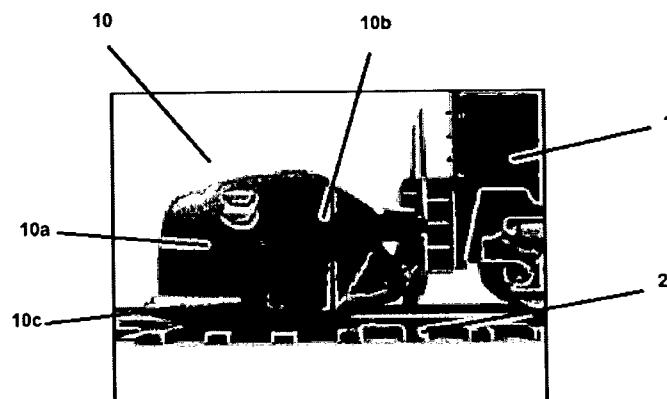


FIG. 3

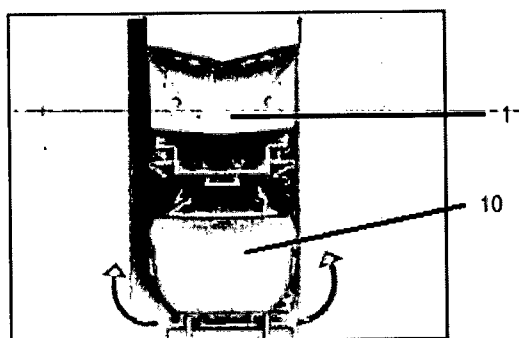


FIG. 4

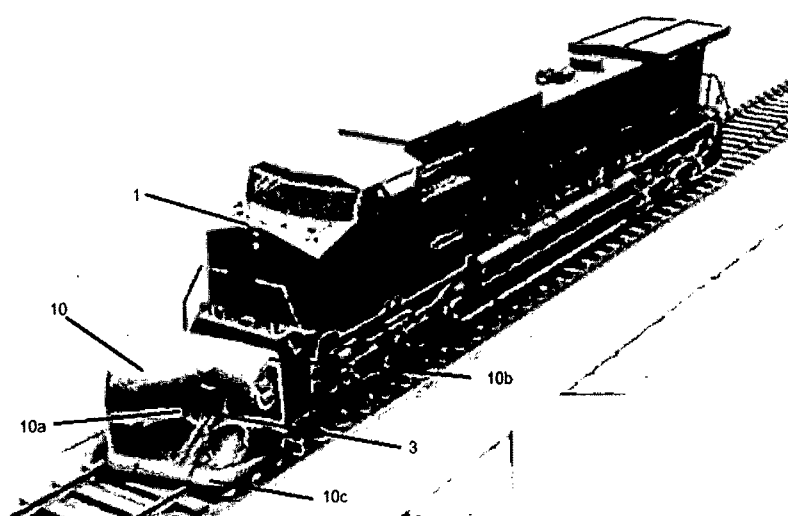


FIG. 5a

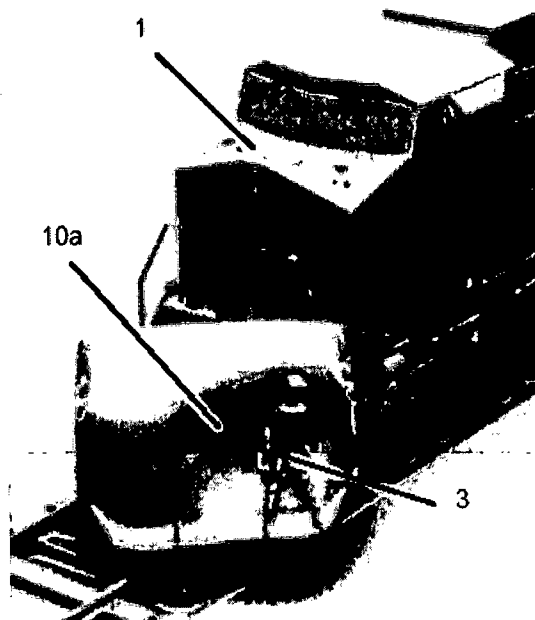


FIG. 5b

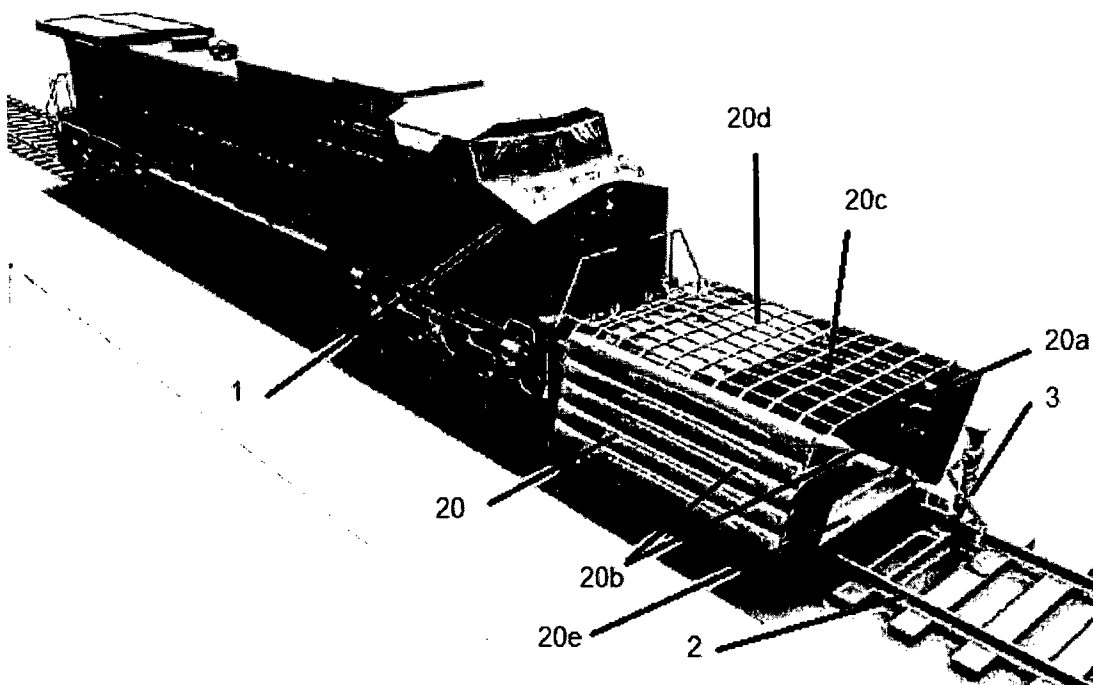


FIG. 6

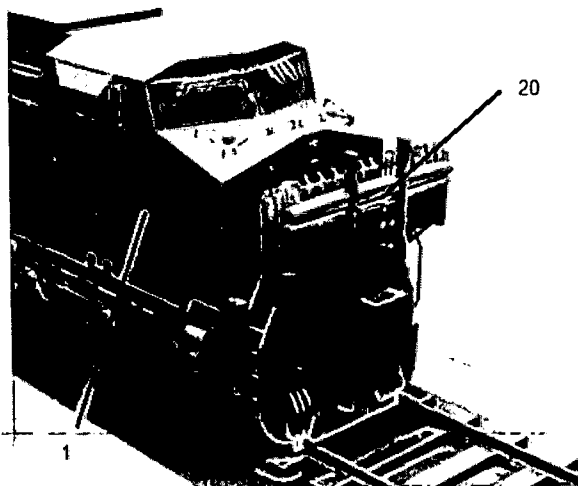


FIG. 7

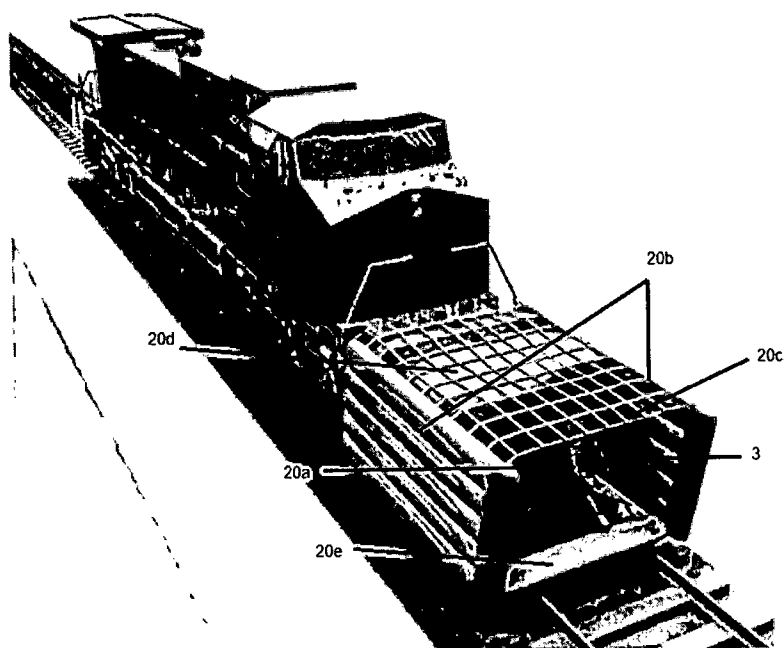


FIG. 8

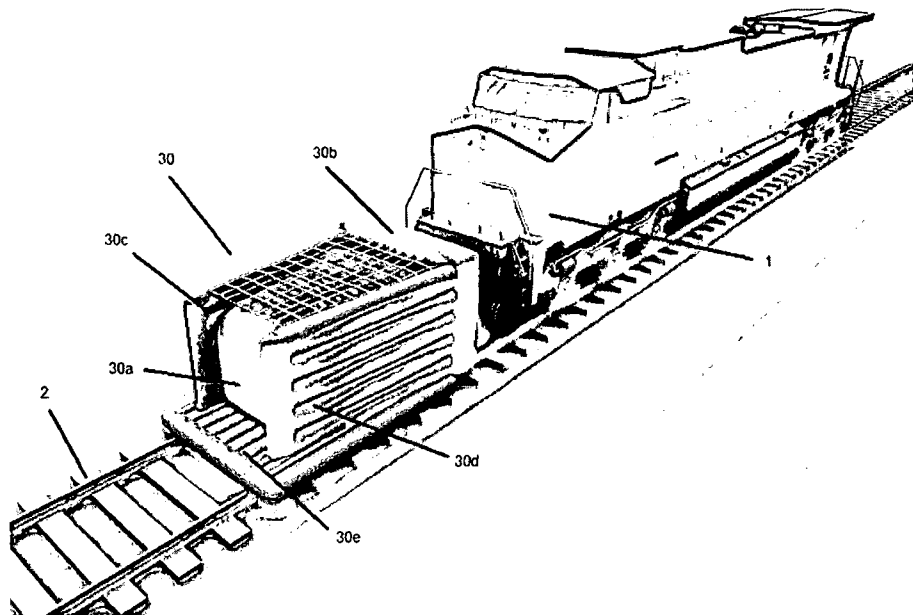


FIG. 9

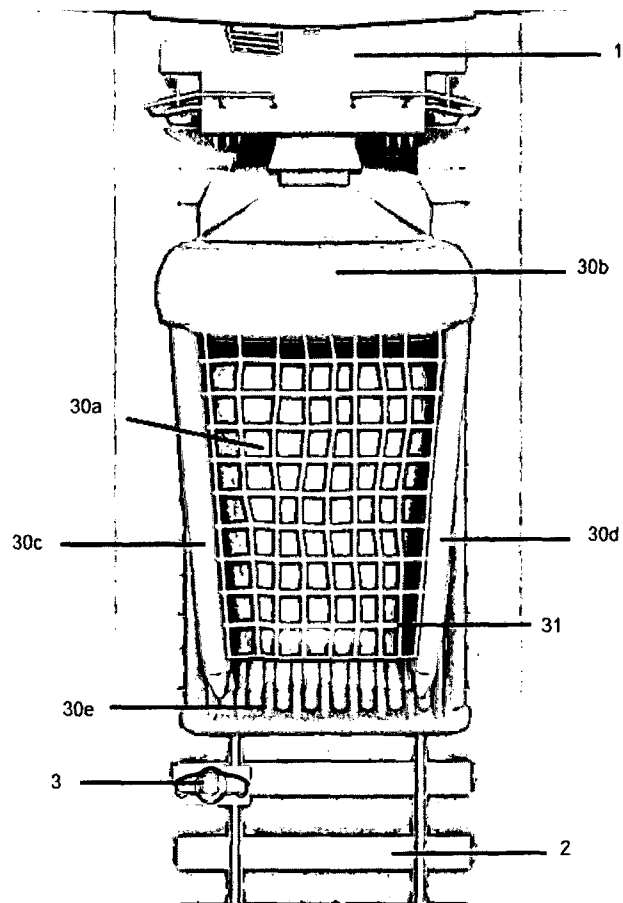


FIG. 10

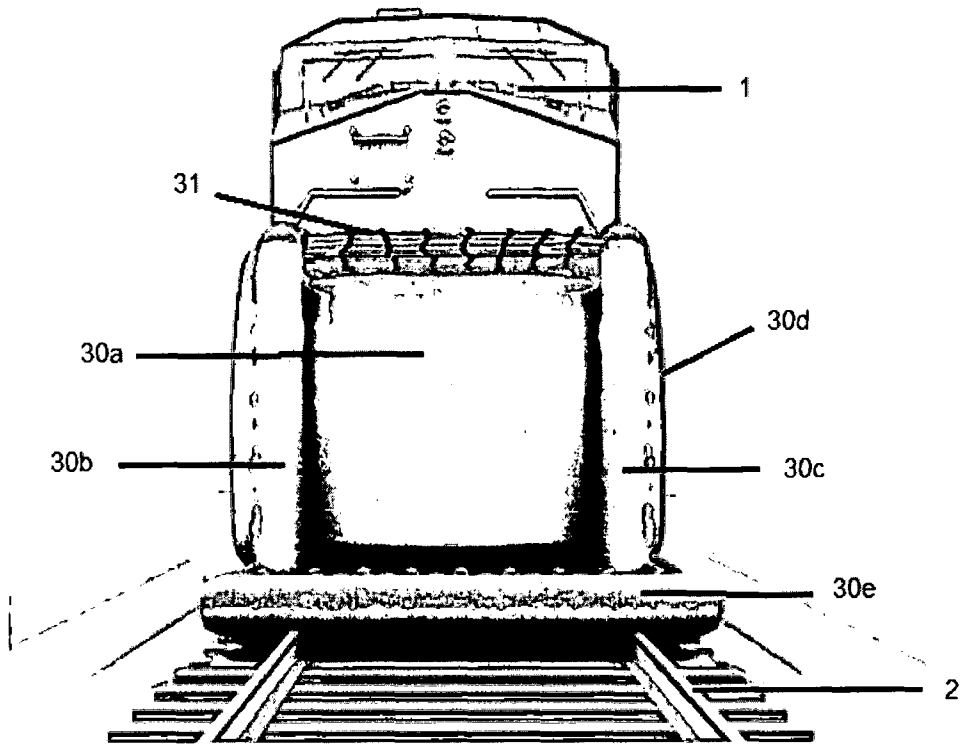


FIG. 11

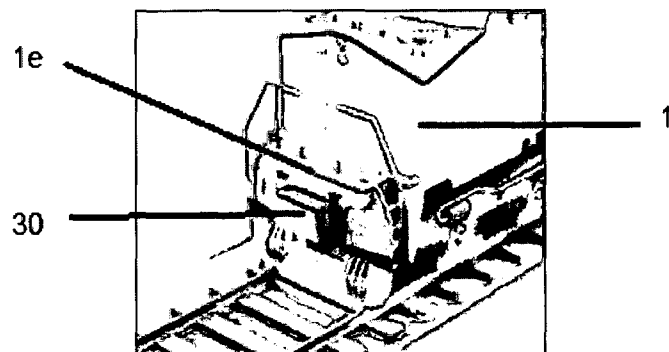


FIG. 12

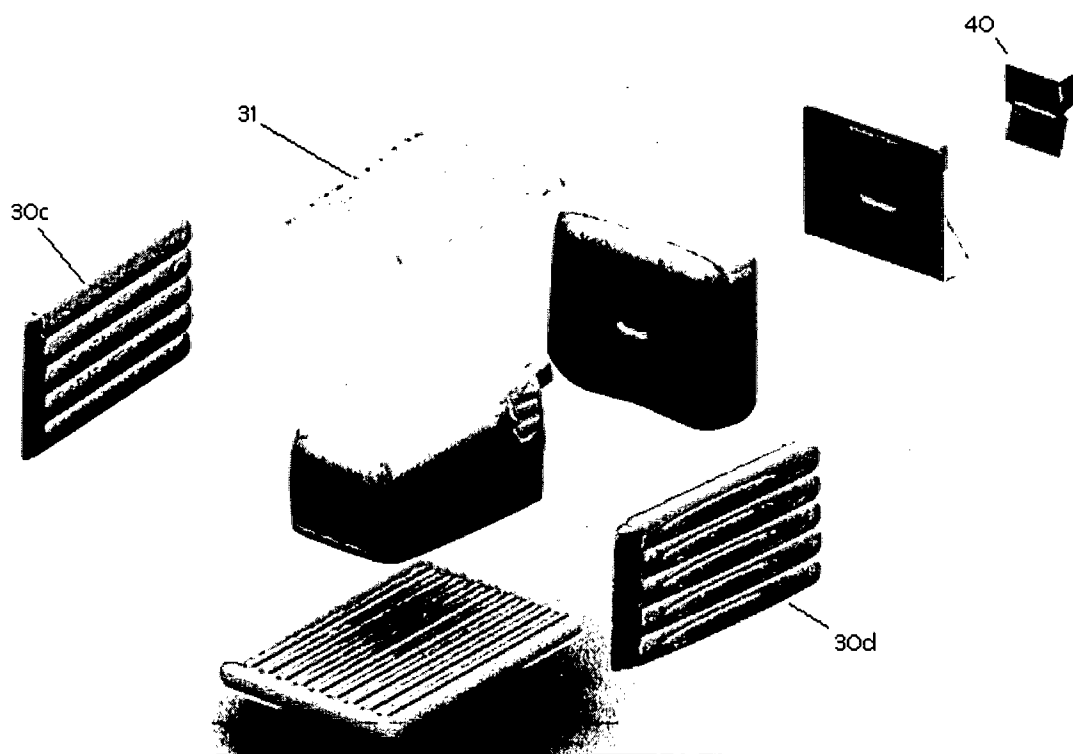


FIG. 13

INTERNATIONAL SEARCH REPORT

International application No

PCT/BR2013/000243

A. CLASSIFICATION OF SUBJECT MATTER

INV. B60R19/00 B61F19/06 B60R21/36
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B60R B61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2001/007316 A1 (PAYNE THOMAS S [US] ET AL) 12 July 2001 (2001-07-12)	1,2,4,9,13
Y	the whole document	3
Y	US 2004/020888 A1 (PAYNE THOMAS S [US] ET AL) 5 February 2004 (2004-02-05)	3
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A	US 1 173 389 A (ROSS THOMAS CLYDE [US]) 29 February 1916 (1916-02-29)	1-13
	the whole document	
A	US 1 174 947 A (KEIZUR MARCUS L [US]) 7 March 1916 (1916-03-07)	1-13
	the whole document	



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

15 October 2013

Date of mailing of the international search report

22/10/2013

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/BR2013/000243

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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