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(71) Applicants:
• **SITFA S.p.A.**
10121 Torino (IT)

• **ACERBI-VIBERTI S.p.A.**
15053 Castelnuovo Scrivia (AL) (IT)

(72) Inventors:
• **Chiaraviglio, Alberto**
10123 Torino (IT)
• **Chiaraviglio, Alessandro**
10123 Torino (IT)

(74) Representative: **Quinterno, Giuseppe et al**
Jacobacci & Partners S.p.A.
Corso Emilia, 8
10152 Torino (IT)

(54) **System for the combined transportation of goods by rail and road**

(57) The system for the combined transportation of goods comprises:

- a plurality of semi-trailers (10) each comprising a front portion (12a), able to be connected to a traction unit, and a rear portion (12b) having an axle provided with wheels (20);
- a plurality of railway wagons (24) each having a chassis comprising a respective first end bogie (28a) and second end bogie (28b; 60), between which a middle support structure (30) able to receive the wheels (20) of the semi-trailer (10) is arranged; and

- a transfer apparatus for loading/unloading the semi-trailer (10) onto/from the railway wagon (24).

The transfer apparatus comprises a lift truck with forks. Each semi-trailer (10) has a plurality of receiving seats (22) which can be engaged with the forks of the lift truck. Each railway wagon (24) is able to be coupled with a semi-trailer (10) arranged with the front portion (12a) resting equally well on the first end bogie (28a) or on the second end bogie (28b) of the railway wagon (24).

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Description

[0001] The present invention relates to a system for the combined transportation of goods by rail and road.

[0002] More specifically, the present invention relates to a system for combined transportation according to the preamble of the independent claim.

[0003] Certain problems arise in most combined transportation systems of the known type.

[0004] One problem consists in the fact that the present-day transfer equipment for moving the intermodal semi-trailers away from/towards the railway wagons typically require movable or fixed structures which are bulky, in particular heightwise. This situation results in problems with moving the intermodal semi-trailers, in particular when they must be loaded onto or unloaded from railway wagons arranged underneath the overhead wires.

[0005] A further problem arises in that, generally speaking, the intermodal semi-trailer must be oriented in a predetermined manner exclusively towards the front or the rear of the railway wagon, in order for it to be coupled with the structure of the latter. This operation often does not prove to be easy, owing to the dimensions of the intermodal semi-trailers and the small amount of space available for loading and unloading these semi-trailers onto/from the railway wagon. Moreover, the structure of the railway wagons for combined transportation according to the prior art is such that the operations for loading/unloading the intermodal semi-trailers must be performed on one side only of these railway wagons.

[0006] An object of the present invention is to provide a combined transportation system which solves these and other problems of the prior art, provides an easier way of loading/unloading the intermodal semi-trailers onto/from the railway wagons, ensures a high speed of transportation (140 km/h) and a reduction in the railway transportation noise in compliance with future European standards and is easy and inexpensive to implement.

[0007] This and other objects are achieved according to the invention with a combined transportation system of the type described above, which has the characteristic features of the accompanying independent claim.

[0008] Preferred embodiments of the invention are defined by the dependent claims.

[0009] Further characteristic features and advantages of the invention will become clear from the detailed description which follows, provided purely by way of a non-limiting example, with reference to the accompanying drawings in which:

Figure 1 is a side elevation view of a first preferred embodiment of an intermodal semi-trailer of the combined transportation system according to the present invention;

Figure 2 is a side elevation view of a first assembled configuration of the intermodal semi-trailer according to Figure 1 with a first preferred embodiment of

a railway wagon of the combined transportation system according to the present invention;

Figure 3 is a side elevation view of a second assembled configuration of the intermodal semi-trailer and the railway wagon shown in Figure 2;

Figure 4 is a rear elevation view of a further preferred embodiment of an intermodal semi-trailer and a railway wagon which are assembled together and form part of the combined transportation system according to the invention;

Figure 5 is a partial side elevation view of the intermodal semi-trailer and the railway wagon according to Figure 4; and

Figure 6 is a side elevation view of a pair of railway wagons which are articulated with each other according to the combined transportation system of the present invention.

[0010] With reference in particular to Figure 1, a preferred embodiment of intermodal semi-trailers used in a system for the combined transportation of goods by rail and road according to the invention is denoted overall by 10.

[0011] The intermodal semi-trailer 10 is intended for loading, unloading and transferring goods and has a box 12 provided with a roof 14, side walls 16 and a base portion 18. The box 12 comprises a front portion 12a, able to be connected to a traction unit for road transportation (not shown) by means of coupling devices of the known type (not shown), and a rear portion 12b having an axle provided with wheels 20.

[0012] As is obvious to a person skilled in the art, in other embodiments not shown, the box 12 may have a structure of a different type, for example of the platform, double-tier, roofless or other type.

[0013] The intermodal semi-trailer 10 has a pair of receiving seats 22 which are preferably formed laterally in the base portion 18 and are intended to engage with special transfer apparatus.

[0014] Advantageously, the receiving seats 22 are formed as openings passing through the base portion 18 or are formed on both sides of the semi-trailer 10.

[0015] In the system according to the invention, the transfer apparatus consist of lift trucks (not shown) provided with forks able to engage with the receiving seats 22 so as to allow easy raising and movement of the semi-trailer 10.

[0016] With reference to Figures 2 and 3, the intermodal semi-trailer 10 is shown in a respective first and a second configuration combined with a preferred embodiment of railway wagons, denoted by 24, according to the system of the present invention.

[0017] The railway wagon 24 has a chassis which is advantageously symmetrical and comprises a first and second end bogies 28a, 28b which have, arranged between them, a middle support structure 30 able to accommodate advantageously the wheels 20 of the intermodal semi-trailer 10.

[0018] The support structure 30 of the railway wagon 24 is set lower than the first and the second end bogies 28a, 28b and is interconnected to the latter by means of a first and a second connecting portion 26a, 26b, respectively. This support structure 30 has at the top a pair of longitudinal recesses 32 (only one of which is schematically shown in broken lines) able to prevent the longitudinal and transverse movements of the intermodal semi-trailer 10, being located on opposite sides of this support structure 30 and having a width sufficient for retaining the wheels 20 inside them. Therefore, the recesses 32 define respective supporting seats for the wheels 20 of the intermodal semi-trailer 10.

[0019] As can be seen in the variation of embodiment which is shown in Figure 5 and which will be described more fully below, wedge-shaped formations 33 preferably extend inside the recesses 32 and project from the bottom of the support structure 30 of the railway wagon 24. The wedge-shaped formations 33 help define shaped compartments 35 with a substantially semi-circular shape for receiving the profile of the wheels 20 of the intermodal semi-trailer 10.

[0020] In the embodiment shown by way of example, the connecting portions 26a, 26b have a substantially gooseneck configuration.

[0021] In the first assembled configuration shown in Figure 2, the front portion 12a of the box 12 of the intermodal semi-trailer 10 is coupled with the first bogie 28a of the railway wagon 24, and in the second assembled condition shown in Figure 3, this front portion 12a is coupled with the second bogie 28b.

[0022] In short, the railway wagon 24 is designed so as to allow coupling thereof with the intermodal semi-trailer 10 arranged with the front portion 12a of the box 12 resting equally well on the bogie 28a or 28b. Said coupling operation may be performed for example by means of insertion of the mushroom-shaped part of a coupling attachment (details not shown), provided in the front portion 12a of the intermodal semi-trailer 10, inside matching seats (likewise not shown) suitably formed in the bogies 28a and 28b.

[0023] With reference to Figure 2, it can be noted how, during coupling between the intermodal semi-trailer 10 and the railway wagon 24, the second bogie 28b, which is located in an opposite position to the first bogie 28a on which the intermodal semi-trailer 10 rests, is conveniently free of loads and is able to support further an additional goods container on the portion shown in broken lines. The same comments made in respect of the first bogie 28a are applicable to Figure 3.

[0024] With reference to Figures 4 and 5, a further preferred embodiment of a combined transportation system according to the invention is shown. Details and parts which resemble or have a function similar to those illustrated in the previous figures are referred to by the same reference numbers and letters.

[0025] The intermodal semi-trailer 10 comprises in the rear portion 12b of the box 12 a pair of lugs 40 which

project underneath and which have, connected to their ends, a cross member 42 located transversely with respect to this intermodal semi-trailer 10.

[0026] As can be seen more clearly in Figure 5, the railway wagons 24 have a seat 44 with a substantially matching shape able to receive the cross member 42 by means of a form-fitting connection. This form-fitting connection may obviously be released whenever it is required to unload the intermodal semi-trailer 10 from the railway wagon 24.

[0027] Preferably, a mechanical locking device 46 including a plurality of retractable bolts 48 and advantageously of the electrically or electronically operated type is associated with the seat 44. When the mechanical locking device 46 is activated, the retractable bolts 48 are able to engage, in one of the manners known to a person skilled in the art, with mating portions (not shown) of the cross member 42. In this way, release of the form-fitting connection between the cross member 42 and the seat 44 is prevented. Activation and deactivation of the mechanical locking device 46 may be performed manually or, as will be described below, automatically or semi-automatically.

[0028] With reference to Figure 5, the railway wagon 24 advantageously comprises presence sensors 50 of the type known per se, which are designed to verify actual engagement of the cross member 42 inside the seat 44, and a central control unit 52.

[0029] The presence sensor 50 is designed to transmit to the central control unit 52 an enable signal S1 for movement of the railway wagon 24, when the presence sensors 50 detect engagement between the cross member 42 and the respective seat 44.

[0030] In variations of embodiment not shown, the central control unit 52 may in turn forward the enable signal S1 to an external communication line (not shown), for example linked to a locomotive unit of a train (not shown) which uses the combined transportation system of the present invention.

[0031] The embodiment shown in Figures 4 and 5 envisages moreover the installation of at least one detector 54 designed to detect the presence of a wheel 20 of the intermodal semi-trailer 10, when this wheel 20 is inserted in the compartments 35 of the middle support structure 30. If the detector 54 detects that the wheel 20 is seated inside the compartment 35, it transmits an enable signal S2 to the central unit 52 in order to authorize activation of the mechanical locking device 46. Obviously, a respective detector 54 may be associated with each compartment 35 so that transmission of the enable signal S2 is subject to the actual presence of all the wheels 20 inside the recesses 32.

[0032] In addition to providing the enable signal for activation of the mechanical locking device 46, the detector 54 may conveniently also have a theft-prevention function. In this case, unauthorized removal of the intermodal semi-trailer 10 from the railway wagon 24 may be immediately detected by the detector 54 which, in response to

raising of the respective wheel 20 from the compartment 35 while the mechanical locking device 46 is activated, emits, for example to the central control unit 52, an alarm signal S3, which is interpreted as a warning of an attempted theft.

[0033] The alarm signal S3 is advantageously forwarded by the central control unit 52 to the external communication line, or the detector 54 may transmit the above-mentioned alarm signal S3 directly to the external communications line.

[0034] In other embodiments not shown, the mechanical locking device 46 may instead also be associated with the cross member 42 and envisage the use of different mechanisms known to a person skilled in the art, for example hooks or the like.

[0035] Moreover, activation of the mechanical locking device 46 may be performed in a simplified manner, without using the central control unit 52, but solely by means of manual operation by an operator.

[0036] Figure 6 shows a particular possibility of assembling railway wagons of the combined transportation system according to the invention. The figure shows a first and a second railway wagon 24, 124 which are articulated with each other and each combined with a respective semi-trailer 10, 110 according to the invention. The second railway wagon 124 is similar to the type of railway wagon described above and indicated by the reference number 24. Therefore, details and parts of the second railway wagon 124 which resemble or have a function similar to those of the first railway wagon 24 are referred to using the same reference numbers and letters, but preceded by the number 1.

[0037] With reference to Figure 6, it can be noted that at one end the first and the second railway wagon 24, 124 have a single common second end bogie, denoted by the reference number 60. The chassis of the first and the second railway wagon 24, 124, in particular with the respective connecting portions 26b, 126b, are therefore coupled together by means of a central articulation (not shown) which is positioned on the common end bogie 60.

[0038] By way of conclusion, the combined transportation system according to the invention offers the advantage of being able to load/unload the intermodal semi-trailers onto/from the railway wagons equally well on either side of the abovementioned wagons and orienting the abovementioned intermodal semi-trailers in either direction.

[0039] Naturally, without altering the principle of the invention, the embodiments and the constructional details may be widely varied with respect to that which has been described and illustrated purely by way of a non-limiting example, without thereby departing from the scope of the invention, as defined in the accompanying claims.

Claims

1. System for the combined transportation of goods by road and rail, comprising:

- a plurality of intermodal semi-trailers (10) for loading, unloading and transferring goods, each comprising a front portion (12a), able to be connected to a traction unit for road transportation, and a rear portion (12b) having at least one axle provided with wheels (20);

- a plurality of railway wagons (24) each having a chassis comprising a respective first end bogie (28a) and second end bogie (28b; 60), between which a middle support structure (30) able to accommodate the wheels (20) of the intermodal semi-trailer (10) is arranged;

- transfer means for loading/unloading the intermodal semi-trailer (10) onto/from the railway wagon (24);

the system being **characterized in that:**

- the transfer means comprises a lift truck provided with forks for raising and moving the intermodal semi-trailer (10);

- each intermodal semi-trailer (10) has a plurality of receiving seats (22) which can be engaged with the forks of the lift truck; and

- each railway wagon (24) is able to be coupled with an intermodal semi-trailer (10) arranged with the front portion (12a) resting equally well on the first end bogie (28a) or on the second end bogie (28b) of the railway wagon (24).

2. System according to Claim 1, in which the receiving seats (22) are located on the two opposite sides of the intermodal semi-trailer (10).

3. System according to Claim 1 or 2, in which the receiving seats (22) are located on a base portion (18) of the intermodal semi-trailer (10).

4. System according to any one of the preceding claims, in which the middle support structure (30) of the railway wagon (24) is located in a position set lower than the end bogies (28a, 28b), is connected to the latter by means of respective connecting portions (26a, 26b) and comprises a pair of longitudinal recesses (32) which are located on opposite sides of said support structure (30) and which define support seats for the wheels (20) of the intermodal semi-trailer (10).

5. System according to Claim 4, in which said recesses (32) define shaped compartments (35) with a substantially semi-circular shape able to receive the profile of the wheels (20) of the intermodal semi-trailer (10).

6. System according to Claim 4 or 5, in which the connecting portions (26a, 26b) of the railway wagon (24) have a substantially gooseneck configuration.
7. System according to any one of the preceding claims, in which, during coupling between the intermodal semi-trailer (10) and the railway wagon (24):
 - the front portion (12a) of the intermodal semi-trailer (10) rests on the first/second end bogie (28a/28b) of the railway wagon (24); and
 - the second/first end bogie (28b/28a) is free of loads and is able to support also an additional goods container.
8. System according to any one of the preceding claims, in which said intermodal semi-trailers (10) comprise a cross member (42) projecting underneath and said railway wagons (24) have a seat (44) able to receive said cross member (42) by means of a form-fitting connection which is capable of being released.
9. System according to Claim 8, in which the cross member (42) and/or the seat (44) comprise a mechanical locking device (46) designed to prevent release of the form-fitting connection between said cross member (42) and said seat (44) when said mechanical locking device (46) is in an activated condition.
10. System according to Claim 9, in which the mechanical locking device (46) comprises at least one retractable bolt (48) associated with the seat (44) and able to engage inside corresponding portions of the cross member (42), preventing disengagement of said cross member (42) and said seat (44).
11. System according to any one of Claims 8 to 10, in which the railway wagon (24) comprises presence sensors (50) and a central control unit (52); said presence sensors (50) being designed to provide said central control unit (52) with an enable signal (S1) for movement of the railway wagon (24), when they detect engagement between said cross member (42) and the respective seat (44).
12. System according to Claim 11, in which the central control unit (52) is designed to forward the enable signal (S1) to an external communication line.
13. System according to any one of Claims 9 to 12, in which the mechanical locking device (46) is of the electrically/electronically controlled type.
14. System according to Claim 13, in which the railway wagon (24) comprises at least one detector (54) designed to:
 - detect the presence of a wheel (20) of the intermodal semi-trailer (10) in the middle support structure (30); and
 - transmit an enable signal (S2) so as to activate the mechanical locking device (46), when said wheel (20) is inserted inside said middle support structure (30).
15. System according to Claim 14, in which said detector (54) is furthermore designed to transmit an alarm signal (S3) when the locking device (46) is activated and said wheel (20) is removed from the middle support structure (30).
16. System according to Claim 15, in which the detector (54) is designed to transmit the alarm signal (S3) directly to an external communication line.
17. System according to any one of the preceding claims, in which said plurality of railway wagons comprises at least one first and second railway wagon (24, 124) coupled and articulated with each other by means of a central articulation located on a single second common end bogie (60) of said first and second railway wagon (24, 124).
18. System according to any one of the preceding claims, in which said intermodal semi-trailers (10) are able to be coupled with said railway wagons (24) by means of engagement of a coupling attachment mounted on the front portion (12a) of the box (12a) of said semi-trailer (10) inside suitable seats formed in the first and second end bogies (28a, 28b; 60) of said railway wagons (24).

FIG.1

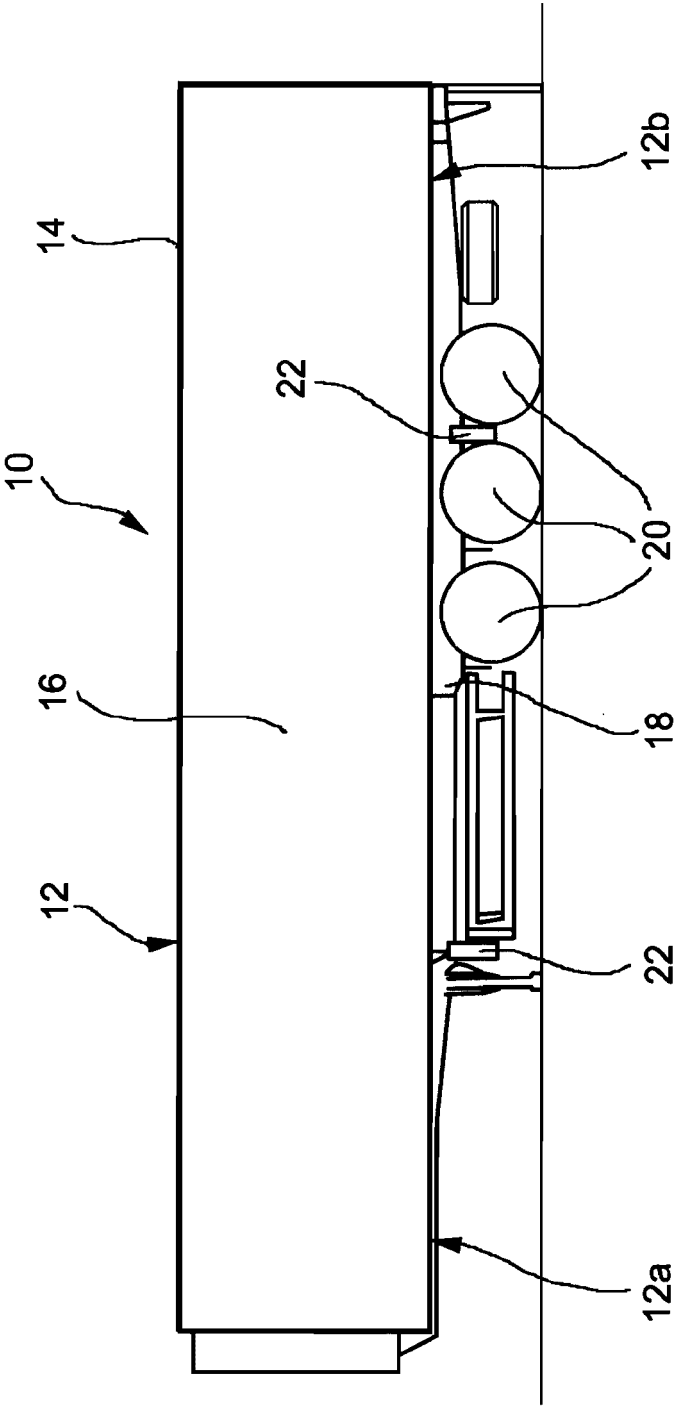


FIG. 2

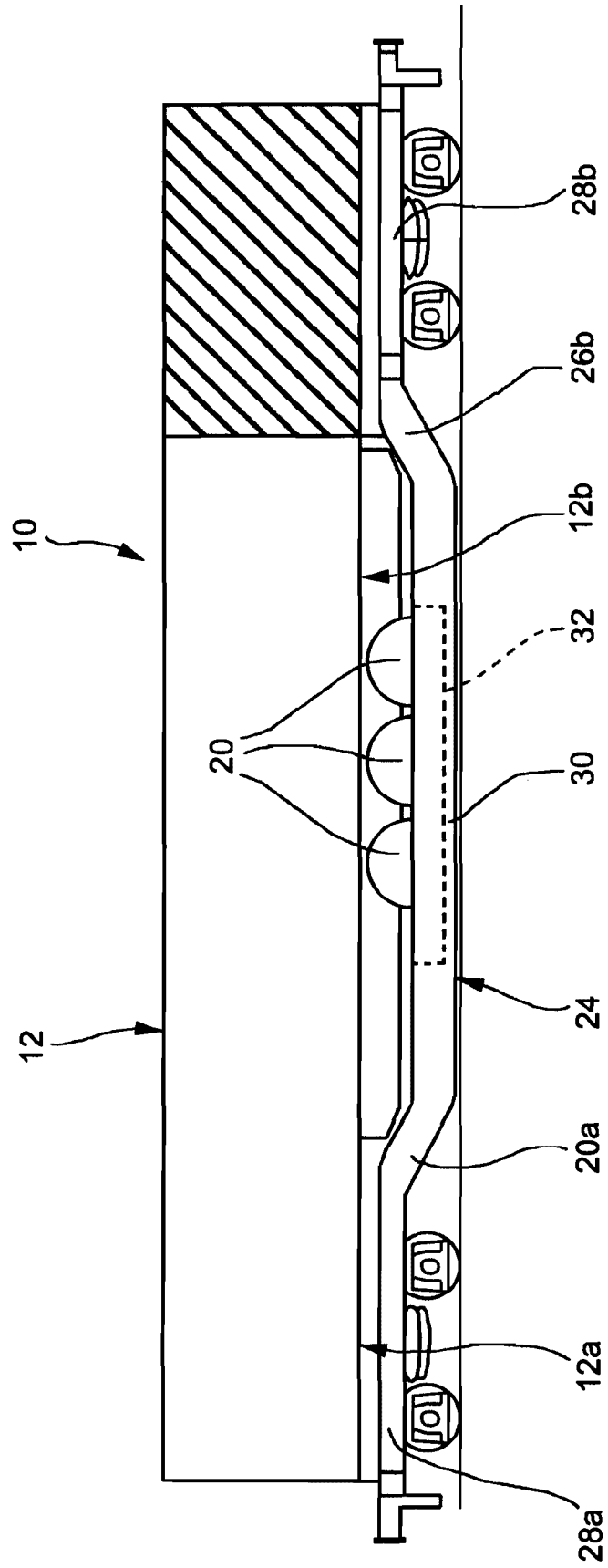


FIG.3

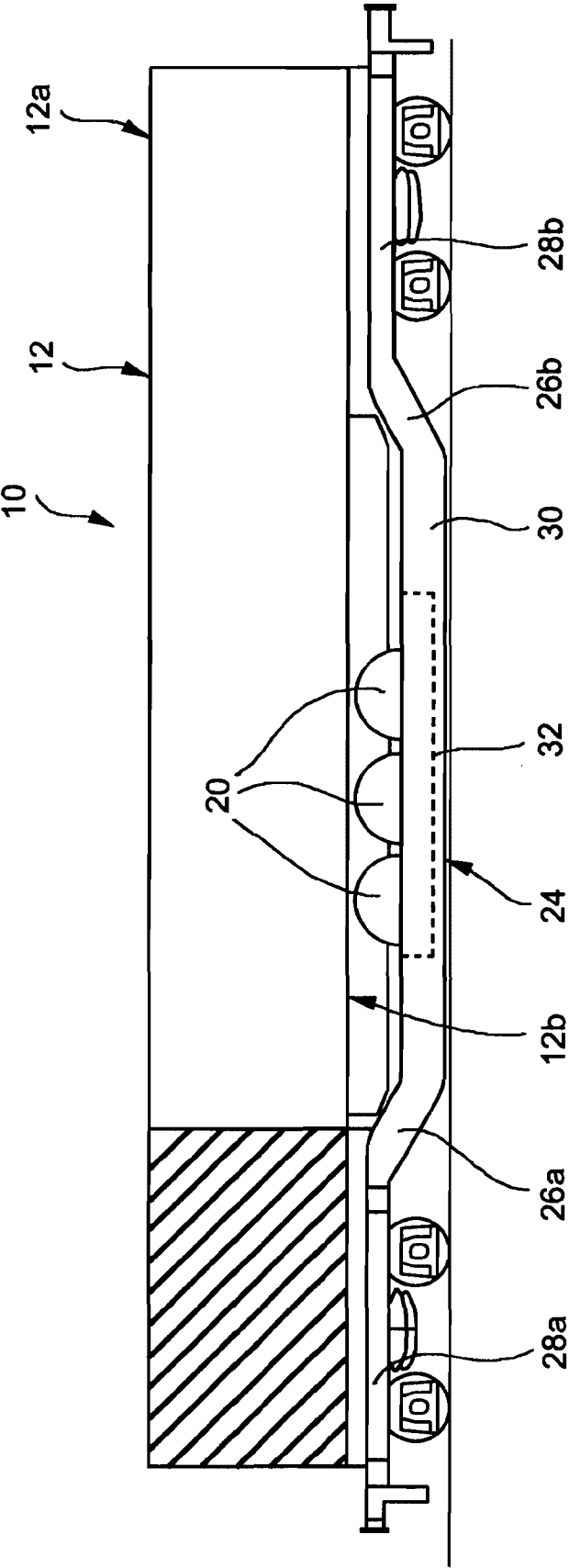


FIG.4

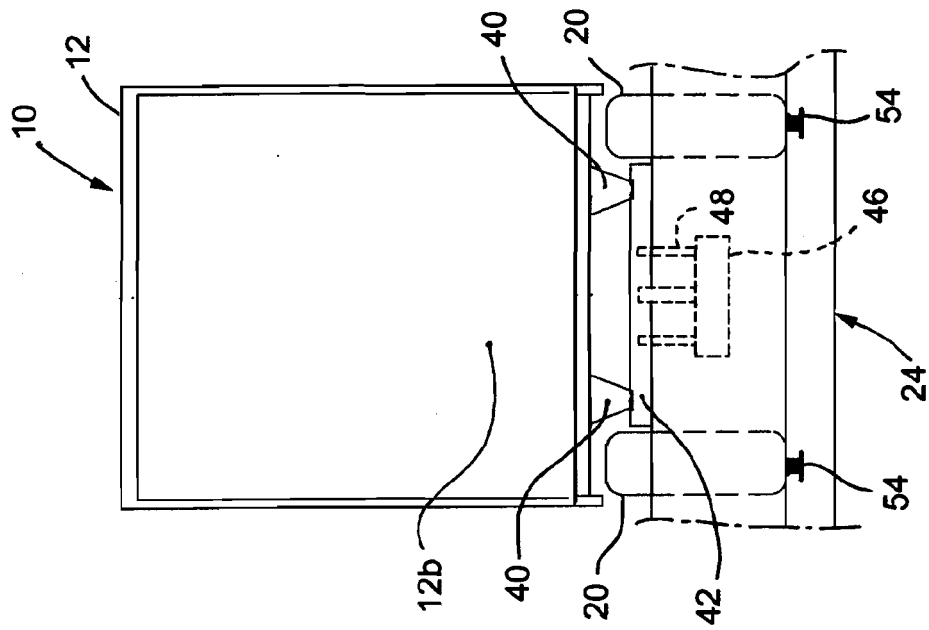


FIG.5

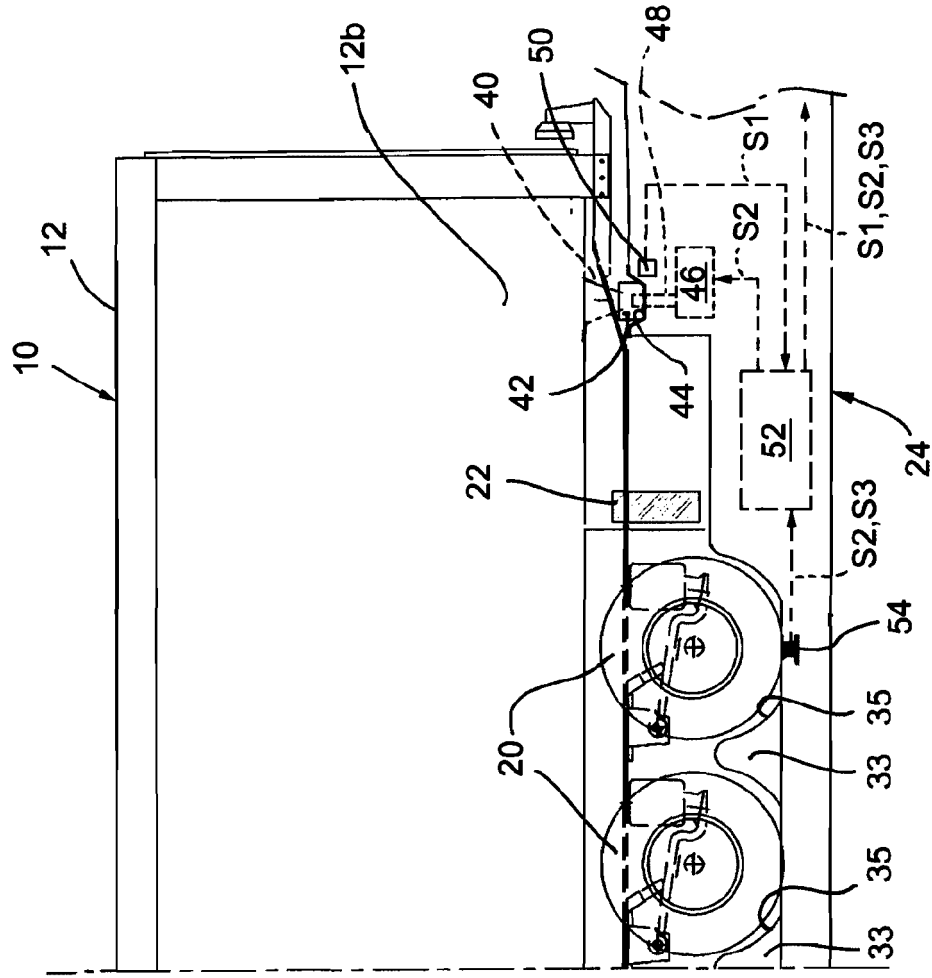
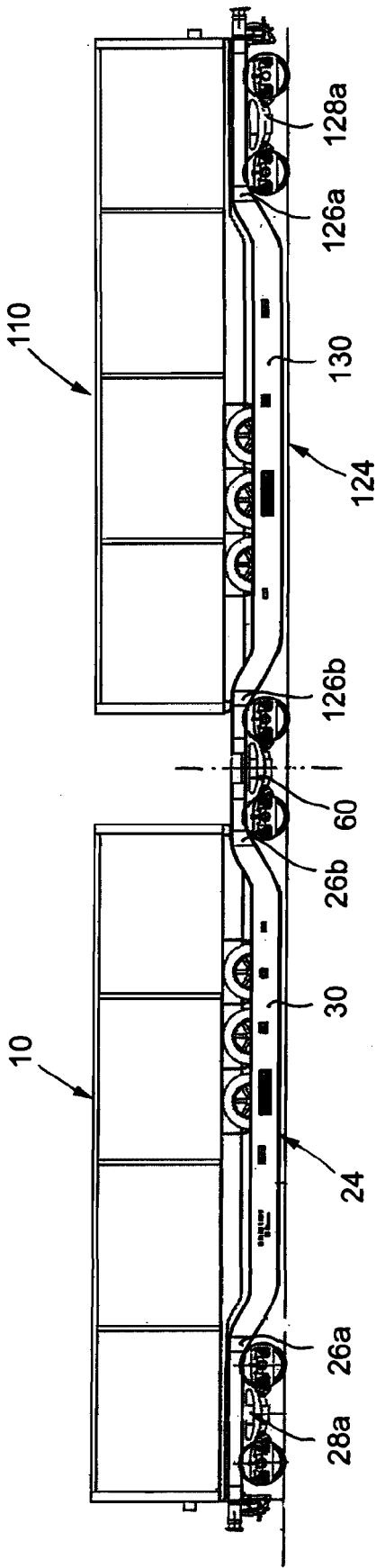


FIG.6





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 37 11 409 A1 (CATTANEO FERRIERE SA [CH]) 15 October 1987 (1987-10-15) * column 2, line 35 - column 4, line 21 * * figures 1-4 *	1-7,17, 18	INV. B61D3/18 B61D45/00
Y	-----	8-10,13	
Y	US 2 991 732 A (CONSTANTIN ALIMANESTIANO) 11 July 1961 (1961-07-11) * column 2, line 17 - column 5, line 44 * * figures 1-3 *	8-10,13	
X	----- FR 1 476 665 A (CIE IND DE MATERIEL DE TRANSP) 14 April 1967 (1967-04-14) * page 2 - page 3 * * figures 1,5 *	1-4,6,7, 17,18	
X	----- US 4 233 909 A (ADAMS MICHAEL B ET AL) 18 November 1980 (1980-11-18) * abstract; figures 1-3 *	1-4,6,7, 17,18	
A	----- DE 91 05 054 U1 (WAGGONFABRIK TALBOT, 5100 AACHEN, DE) 13 June 1991 (1991-06-13) * page 5, paragraph 2 - page 6, paragraph 1 * * figures 1-4 *	1-18	TECHNICAL FIELDS SEARCHED (IPC) B61D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 24 May 2007	Examiner Awad, Philippe
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 07 10 0986

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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24-05-2007

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
DE 3711409	A1	15-10-1987	CH 669764 A5	14-04-1989
			IT 1216924 B	14-03-1990

US 2991732	A	11-07-1961	NONE	

FR 1476665	A	14-04-1967	NONE	

US 4233909	A	18-11-1980	CA 1109335 A1	22-09-1981

DE 9105054	U1	13-06-1991	AT 114561 T	15-12-1994
			CS 9201257 A3	18-11-1992
			DK 510467 T3	08-05-1995
			EP 0510467 A1	28-10-1992
			ES 2067264 T3	16-03-1995
			FI 921709 A	26-10-1992
			HU 3711 A1	29-08-1994
			NO 921576 A	26-10-1992
			PL 294311 A1	08-02-1993
