(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 538 143 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
16.04.2025 Bulletin 2025/16

(21) Application number: **23210922.3**

(22) Date of filing: **20.11.2023**

(51) International Patent Classification (IPC):
B61D 3/18 *(2006.01)* ***B61D 3/20*** *(2006.01)*
B61D 45/00 *(2006.01)* ***B61D 47/00*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B61D 3/184; B61D 3/20; B61D 45/004; B61D 47/005

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(30) Priority: **20.11.2022 PL 44288522**

(71) Applicants:
- **Wagony Swidnica sp. z o.o.**
  58-100 Swidnica (PL)
- **ASTRA Rail Project s.r.o.**
  058 01 Poprad (SK)

(72) Inventors:
- **Kopani ák, ubomír**
  Mlynica (SK)
- **Vlaha, Peter**
  Poprad (SK)
- **Studzi ski, Dionizy**
  widnica (PL)

(74) Representative: **Bartula-Toch, Marta**
Kancelaria Prawno-Patentowa Patent
Krzeslawicka 3A
31-416 Kraków (PL)

(54) POCKET WAGON

(57) The pocket wagon is provided with at least one blade (1), and the dorsal beam (3) of the blade (1) and the crossbeams (4) of the blade (1) support the floor (22) of the basket (20) in such a way that the outermost running belts (22') of the basket (20) are located between the blades (2) and the dorsal beam (3), and the dorsal beam (3) on at least one side of the spurs (1) passes through a torsion beam 8, which is connected to the spurs (2) to form a saddle (9) at the connection point for the pivot support bracket (33) of the fifth wheel trailer (32) into a coupling beam 7 connected to the spurs by a headstock (12). In the pocket (6) of the wagon is placed a basket (20). In the upper portions of the side walls of the basket (20) there are an even number of longitudinal open cut-outs (24), whereby in the portions of the upper walls of the basket (20) between two adjacent cut-outs (24) there are pivotally bearing longitudinal handle arms (25), having a length corresponding to the length of the cut-outs (24), the free ends of which are provided with catches for locking the handle arms (25) in locks (30) located on opposite sides of the two adjacent cut-outs (24).

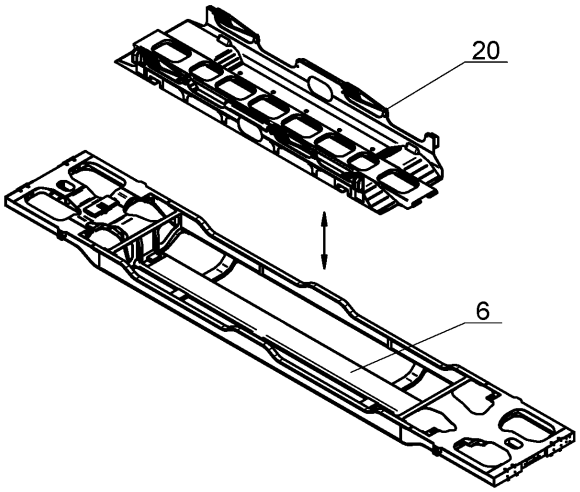


Fig. 2

EP 4 538 143 A1

Description

[0001] The object of the invention is a pocket wagon for transporting road trailers and containers.

[0002] The essence of combined transport is the use of more than one form of transport to get a load from its origin to its destination. This is most often done by carrying the initial and final cargo unit by road and using rail or shipping for the middle leg.

[0003] Combined road-rail transport uses tractor units with semi-trailers, which are then transported using specially adapted pocket wagons. In their basic version, pocket wagons have a loading platform supported on bogies. The lowered floor of the platform creates a pocket-like loading space in the axis of the bogies, in which the semi-trailers are placed using the cranes and other infrastructure located at the transhipment terminal. The main disadvantage of this solution is that the semi-trailer needs to be adapted for crane handling, in particular by reinforcing the semi-trailer frame particularly at the grab contact points. This involves a significant increase in production costs, so that the vast majority of trailers in use are not suitable for this form of transport. In addition, it complicates the issue of logistics, as it has to be taken into account at the very beginning of planning whether a trailer is to be used for combined transport.

[0004] The second type of pocket wagons are wagons in which the pocket is rotated around the shaft. In this position, a trailer or semi-trailer can be slid directly onto the pocket. The disadvantage of this solution is the complexity of the wagon and the operating system, requiring skilled personnel and a lot of time.

[0005] In order to solve the above problem and enable the use of any semi-trailers in combined transport, the pocket wagons are equipped with removable baskets in which the semi-trailers are placed and which can be removed and placed in the pockets by means of cranes or overhead cranes.

[0006] From the description of the invention EP3268257B1, an example of the design of a load-bearing device - a basket - used for transporting semi-trailers on pocket wagons is known.

[0007] From the description of EP1712444, a pocket wagon is known, consisting of a wagon spur, supported by support areas on bogies and connected to each other by two longitudinal beams, and a transport basket. The basket constitutes the floor of the pocket wagon and is positioned in the frame of the spur by suspending its structure on the longitudinal beams by means of tabs in the walls of the basket.

[0008] A wagon for combined rail-rail transport is known from the description of the invention EP1292477B1. The wagon consists of two end platforms seated on rail bogies, connected to each other by a single longitudinal connecting element in the form of a beam. The connecting element serves in this configuration to stabilise the structure during loading and unloading. The load-bearing capacity of the wagon is provided by a basket structure superimposed on the platforms. The basket consists of the floor together with the elevated side edges and has the possibility to pivot about an end or central pivot centre.

[0009] Polish patent application P. 294311 discloses a wagon for transporting semi-trailers of road vehicles. The wagon is equipped with at least one pocket receiving the wheels of the semi-trailer and at least one support bracket adjustable in the longitudinal direction of the wagon, receiving the main kingpin of the semi-trailer. The wagon is adapted for the transport of oversized semi-trailers as well as containers and swap tanks.

[0010] From patent document PL201606, a pocket wagon spur is known, consisting of spurs connected by crossbeams, containing an upper and lower chord, connected by a vertical semicolon. In the middle section between the torsion beams, the uprights are connected to the sheet metal of the pocket floor. The bottom chords of the crosspieces from the torsion beams run diagonally downwards towards the pocket floor, to which they are connected in such a way that, along the length of the floor, the horizontal part of the floor plate passes into the bottom chords of the crosspieces, while its side parts are the semicolons of the crosspieces.

[0011] From patent document PL235404, there is known a two-unit pocket wagon comprising two load-bearing frames supported on two-axle bogies fitted with typical train-crash devices and fifth wheels for attaching semi-trailers, with the load-bearing frame in each member supported in the front section by a sprung castor above which is a fifth wheel.

[0012] From patent document PL173864, there is known a railway basket wagon for transporting semi-trailers with a basket located in the lower part of the wagon between two side walls, which are equipped with support elements for seating it on the longitudinal side beams of the wagon and with lifting eyes for lifting the basket. Restraining and positioning elements are placed on the support members of the basket with a projecting rear edge and/or on the longitudinal side beams of the wagon. Between the longitudinal side beams, at least one side of the basket is fitted with a transverse buffer beam.

[0013] The pocket wagon consists of at least one ostoy with two ostoy of irregular height, running in the middle at equal distances from the ostoy a dorsal beam connected to the ostoy by at least two crossbeams and a running gear in which is detachably placed a basket for a semi-trailer with a total width corresponding to the distance between the ostoy, the side walls and a tripartite floor composed of three strips parallel to each other. **The essence of the** solution according to the invention consists in the following:

- the dorsal beam and the crossbeams of each stub support the basket floor in such a way that the outermost running straps of the basket floor are between the stubs and the dorsal beam, and the dorsal

beam on at least one side of the stub passes through a torsion beam which is connected to the stubs, forming with it, at the point of connection, a saddle for the support bracket of the stub of the semi-trailer, into a coupling beam connected to the stubs by a headstock,

- the wagon pocket in the longitudinal axis is delimited by crossbeams connecting the dorsal beam to the stays, with two vertical guides attached to the crossbeams to facilitate the insertion of the basket into the pocket of the stays and to stabilise the loaded basket along the wagon axis,
- a basket the two outer running boards of which are of a width less than the distance between the rack and the dorsal beam of the rollstock, the intermediate upward flange between the two being of a width greater than the width of the dorsal beam of the rollstock and less than the distance between the wheels of the semi-trailer and the road tractor, and provided at both ends with semicircular slides co-operating with guides to facilitate insertion of the basket into the rollstock pocket and to stabilise the basket along the axle of the wagon, and in the upper parts of the side walls of the basket there are an even number of longitudinal open cut-outs, the parts of the upper walls of the basket between two adjacent cut-outs bearing pivoting longitudinal arms of handles, the length of which corresponds to the length of the cut-outs, the free ends of which are provided with catches for locking the handles into the locks located on opposite sides of the two adjacent cut-outs.

[0014] Advantageously, the crossbars have ends that curve upwards in two steps. Advantageously, the wagon with a single stand has a symmetrical design with respect to the transverse axis and is equipped with a running gear with an equal number of axles or bogies in the outermost parts of the wagon and collision devices on both faces.

[0015] Advantageously, the two-bay wagon has two spurs and is equipped with a six-axle running gear, each spur having one bogie on the side of the headstock with buffer device and one common bogie for the two spurs at the other end.

[0016] Advantageously, the top edge of the crossbars bounding the wagon pocket is flush with the top edges of the uprights.

[0017] Advantageously, the spur of a two-unit wagon is equipped at one end with connecting hardware to connect to the other spur and support it on a common bogie.

[0018] In an advantageous design, at the upper edges of the torsion beam wall on the side of the transverse beam delimiting the wagon pocket, there are line-bearing container pins, locked in the operating position by a bolt in a hole made in the torsion beam flange and having on their upper surface pins on which containers are seated by means of holes made in the lower corners. In an advantageous design, at the upper edges of the crossbar delimiting the wagon pocket on the side of the centre of the spur there are linear-bearing container supports, locked in the working position by a pin in a hole made in the shelf of the crossbar delimiting the wagon pocket and having on the upper surface pins on which containers are seated by holes made in the lower corners.

[0019] Advantageously, the central strip of the basket floor has axially aligned holes along its entire length.

[0020] Advantageously, at both ends of the running lanes, there are elevated two-way equal inrunners, the top of which is flush with the surface of the central lane and the distance between the inner equal inrunners is greater than the distance between the outermost wheels of the semi-trailer, while underneath the equal inrunners, mounting tunnels are made in the floor of the basket, corresponding to the width of the cross-members of the spurs. Advantageously, there are stabilising brackets at the ends of the side walls of the basket.

[0021] Advantageously, in the lower parts of the side wall of the basket, there are evenly spaced vertical reinforcements in series located at the level of the attachment points of the handle arms.

[0022] In the favourable design, the side walls of the basket have, in the sections between the two central cut-outs, longitudinal reinforcements.

[0023] The main advantage of the solution according to the invention is the versatility of the wagon. The wagon can be used to transport both road trailers and containers. Importantly, the semi-trailers themselves do not need to be adapted to lift a grab. The semi-trailer can be placed in a basket mounted on the spur by means of a crane or overhead crane, but can also be rolled into a basket set on the ground and then transferred in that basket to the spur. The wagon is designed to carry semi-trailers of different lengths, and the adjustable basket handles enable semi-trailers with different centres of gravity to be carried safely.

[0024] The solution according to the invention is illustrated by the manufacturing examples shown in the figure, where Fig. 1 depicts an articulated wagon blade, Fig. 2 - a wagon blade with one blade with a basket , Fig. 3 - front part of the blade, Fig. 4 - rear part of the articulated wagon blade, Fig. 5 - wagon basket, Fig. 6 - container supports, Fig. 7 - articulated wagon with loaded road semi-trailers, Fig. 8 - road semi-trailer, Fig. 9 - articulated wagon with loaded container.

[0025] The wagon according to the invention consists of one or two inseparably connected spurs 1. Each spur 1 has spurs 2 of irregular height, running at equal distances t from the spurs 1 a dorsal beam 3 connected to the spurs 2 by two crossbeams 4, with ends curved two degrees upwards. The wagon with one stand 1 is of symmetrical construction with respect to the transverse axis and is equipped with a running gear 5 with an equal number of axles or bogies in the outermost parts of the wagon and collision devices 13 on both headboards 12. A two-body wagon with two blades 1 is equipped with a running gear 5 with three bogies, in which case each blade 1 has one bogie at the end of the headstock 12 with a buffer device

13 and at the other end one common bogie for the two blades 1. In a two-body wagon, each blade 1 is equipped at one end with a connecting fitting 16, to be connected to the other blade 1 and supported on a common bogie.

[0026] The dorsal beam 3 on at least one side of the spur 1 passes through a locking step 6 into a torsion beam 8, which is connected to the spurs 2, forming a saddle 9 at the connection point for the supporting bracket 15 of the kingpin 33 of the semitrailer 32 a coupling beam 7 connected to the spurs by a face 12.

[0027] The wagon pocket 6 in the longitudinal axis of the wagon is bounded by crossbars 11 connecting the dorsal beam 3 to the spurs 2, two vertical guides 10 each being attached to the crossbars 11 to facilitate the insertion of the basket 20 into the pocket 6 of the spurs 1 and to stabilise the loaded basket 20 along the wagon axis.

[0028] On the inner sides of the stays 2 in the pocket area 6 of the stays 1, two vertical side guides 18 each are attached to facilitate the insertion of the basket 20 into the pockets of the stays 1 and to stabilise the basket 20 across the wagon.

[0029] In a two-berth wagon, the refuge 1 at the end opposite the headstock 12 with buffer devices 13 is equipped with connecting hardware 16 to connect to the other refuge 1 and support it on a common bogie.

[0030] The stays 2 are also equipped on both sides with hooks 14 attached to their outer walls for shunting the wagons, located at the height of the torsion beam 8.

[0031] At the lateral edges of the wall of the torsion beam 8 on the side of the cross-member 11 and, in double-beam wagons 1, at the upper edges of the cross-member 11 delimiting the pocket 6 of the wagon on the side of the centre of the cross-member 1, there are bearing-mounted container supports 17, locked in the working position by pins 18 inserted in holes made in the shelf of the torsion beam and the shelf of the cross-member delimiting the pocket 6 of the wagon, having on their upper surface pins 19 on which containers 34 are seated by means of holes made in the lower corners.

[0032] A detachable basket 20 for the semi-trailer is seated on each of the spurs, the width of which corresponds to the distance d between the spurs 2 of the spur 1. The basket 20 has side walls 21 and a tripartite floor 22 consisting of three parallel strips, the outer running strips 22' and an elevated central strip 22' in which there are through-holes arranged in series along the axis. The dorsal beam 3 and the cross members 4 of the spurs 1 support the floor 22 of the basket 10 in such a way that the running belts 22' are located between the spurs 2 and the dorsal beam 3. The central chord 22' has a width greater than the width s of the dorsal beam 3 of the uprights 1 and less than the distance v between the wheels of the semi-trailer 32 and the truck tractor is provided at both ends with semicircular slides 23 to facilitate the insertion of the basket 20 into the pockets 6 of the uprights 1 and to stabilise it in the guides 10 of the uprights 1.

[0033] In the upper portions of the side walls of the basket 20 there are four longitudinal open cut-outs 24 and in the portions of the upper portions of the walls of the basket 20 between two adjacent cut-outs 24 there are pivotally bearing longitudinal handle arms 25, the length of which corresponds to the length of the cut-outs 24. The free ends of the handle arms 25 are provided with catches for locking the handle arms 25 into locks 30 located on opposite sides of the two adjacent cut-outs 24.

[0034] Depending on the centre of gravity of the semi-trailer 32, the handle arm 25 translates by closing one or the other of the adjacent cut-outs 24 locking into the corresponding lock 30.

[0035] At both ends of the outermost driving lanes 22' are upwardly elevated bidirectional equal 26 overruns, the top of which is flush with the surface of the central lane 22'. The distance between the inner equal 26 is greater than the distance between the outermost wheels of the semi-trailer 32. Underneath the overrun ditches 26, mounting tunnels 27 are made in the floor of the basket 20, corresponding to the width of the crossbars 4 of the spur 1, which, when the basket 20 is placed on the spur 1, cover the crossbars 4 from above.

[0036] The basket 20 is provided with side wall reinforcements 21, that is, longitudinal reinforcements 21 in the upper part of the wall 21' in the sections between the two central cut-outs 24 and vertical reinforcements 21 in the lower part of the wall 21' spaced evenly in series and located at the height of the attachment points of the handle arms 25.

[0037] The loading of the semi-trailer 32 may be carried out by means of a crane or overhead crane, which carries it and lowers it into the basket 20 positioned on the spur 1. Alternatively, the crane may lift the basket 20 from the spur 1 and place it on the ground. The semi-trailer 32 is then rolled by the semi-trailer tractor to the basket 20, whereupon the position of the handle arms is adjusted to the centre of gravity of the semi-trailer 32. The basket 20 is then lifted by the crane or crane gripper hooked to the opposite handle arms 25 and transferred to the spur 1, where the basket 20 is stabilised in the pocket of the spur 1 by the semi-circular slides 23 in the guides 10 and the position stabilisers 28.

[0038] In the case of a wagon with two spurs 1, semi-trailers 32 are placed in baskets 20 located in both spurs 1 in such a way that they face in opposite directions.

[0039] When it is necessary to load containers onto a wagon, the container supports 17 are repositioned by dropping them on the surface of the torsion beam 8 or on the upper surfaces of the cross member 11 and by pressing the pins 18 into the holes on the surface of the torsion beam 8 or cross member 11, and then the container, raised by means of a crane or overhead crane, is placed with the holes in the bottom on the container pins 19.

List of designations

[0040]

A. Ostoja

1 - refuge
2 - oystercatchers
3 - dorsal beam
4 - crossbar
5 - running gear
6 - wagon pocket
7 - coupling beam
8 - torsion bar
9 - saddle
10 - guides
11 - crossbar
12 - headboard
13 - impact device
14 - hook
15 - support bracket for the pivot of the semi-trailer
16 - connecting fittings
17 - container support
18 - container support pins 17
19 - container support pins 17
t - distance of the spur 2 from the dorsal beam 3
s - width of dorsal beam
d - distance between ostracodes 2

B. Bin

20 - basket
21 - basket side walls
22 - floor
22' - running lanes
22" - middle belt
23 - semicircular slide
24 - notch
25 - handle arm
26 - overrun level
27 - assembly tunnel
28 - position stabilisers
29 - vertical reinforcement
30 - castle
31 - longitudinal reinforcements
32 - semi-trailer
33 - trailer pivot
34 - container
v - distance between wheels of semi-trailer 32

Claims

1. A pocket wagon, comprising at least one ostoy (1) with two ostoids (2) of irregular height, running centrally at equal distances t from the ostoids a dorsal beam (3) connected to the ostoids (2) by at least two crossbeams (4) and a running gear (5), in which a basket (20) for a semi-trailer (32) with a total width corresponding to the distance d between the uprights (2) of the uprights (1), the side walls (21) and the tripartite floor (22) consisting of three parallel strips (22', 22") is detachably placed, **characterised in that:**

- The dorsal beam (3) and the crossbeams (4) of each spur (1) support the floor (22) of the basket (20) in such a way that the outermost running belts (22') are located between the spurs (2) and the dorsal beam (3), and the dorsal beam (3) on at least one side of the spur (1) passes through a torsion beam 8, which is connected to the spurs (2), forming a saddle (9) for the pivot support bracket (33) of the fifth wheel trailer (32) at the connection point, into a coupling beam 7 connected to the spurs by a headstock (12),
- The pocket (6) of the wagon in the longitudinal axis of the wagon is bounded by crossbars (11) connecting the dorsal beam (3) to the uprights (2), where two vertical guides (10) are each attached to the crossbars (11) to facilitate the insertion of the basket (20) into the pocket (6) of the uprights and to stabilise the loaded basket (20) along the longitudinal axis of the wagon,
- a basket (20), the two outermost chords (22') of which have a width less than the distance t between the ostomy (2) and the dorsal beam (3) of the ostomy (1), and the upwardly elevated central chord (22") between them has a width greater than the width s of the dorsal beam (3) of the props (1) and less than the distance v between the wheels of the semi-trailer (32) and the tractor unit is provided at both ends with semicircular slides (23) to facilitate the insertion of the basket (20) into the pocket (6) of the props (1) and to stabilise it in the guides (10) of the props (1), and in the upper portions of the side walls of the basket (20) there are an even number of longitudinal open cut-outs (24), wherein in the portions of the upper walls of the basket (20) between two adjacent cut-outs (24) there are pivotally bearing longitudinal handle arms (25), having a length corresponding to the length of the cut-outs (24), the free ends of which are provided with catches for locking the handle arms (25) in locks (30) located on opposite sides of the two adjacent cut-outs (24).

2. The wagon according to claim. 1, **characterised in that** the crossbars (3) have ends bent upwards in two steps.

3. wagon according to claim. 1, **characterised by** the fact that the wagon with a single stand (1) has a symmetrical structure with respect to the transverse axis and is equipped with a running gear (5) with an equal number of axles or bogies in the outermost parts of the wagon and collision devices (13) on both front ends (12).

4. Wagon according to claim. 1, **characterised by** the fact that the wagon with two spurs (1) is equipped with a running gear (5) with three bogies, each spur (1) having at the front end (12) with a buffer device (13) a running gear (5) with one bogie, and at the other end one common bogie for the two spurs (1).

5. Wagon according to claim. 1, **characterised by** the fact that the upper edge of the crossbar (11) is flush with the upper edges of the uprights (2).

6. Wagon according to claim. 1, **characterised by** the fact that a three-carriage bogie (1) with a running gear (5) is at one end provided with a connecting fitting (16) for connection to a second bogie (1) and support on a common bogie.

7. Wagon according to claim. 1, **characterised by** the fact that at the lateral edges of the torsion beam wall (8) on the side of the crossbar (11) there are line-bearing container supports (17), locked in the working position by pins (18) in holes made in the shelf of the crossbar (11) delimiting the pocket (6) of the wagon and having on the upper surface pins (19) on which containers (34) are seated with holes in the lower corners.

8. wagon according to claim 1, **characterised in that** there are line-bearing container supports (17) at the upper edges of the crossbar (11) from the centre of the spur (1), which are locked in the operating position by bolts (17). 1, **characterised by** the fact that at the upper edges of the crossbar (11) on the side of the centre of the spur (1) there are line-bearing container supports (17), locked in the working position by pins (18) in holes made in the shelf of the crossbar (11) bounding the pocket (6) of the wagon and having on the upper surface pins (19) on which they are seated by holes made in the lower corners of the container (34).

9. Wagon according to claim. 1, **characterised in that** the central flange (22") of the floor (22) of the basket (20) has axially aligned holes along its entire length.

10. wagon according to claim 1, **characterised in that** at both ends of the outermost running lanes (22') there are elevated two-way equally (26) overrun lanes, the top of which is flush with the surface of the centre. 1, **characterised by** the fact that at both ends of the outermost running lanes (22') there are elevated two-way inrun equals (26), the top of which is flush with the surface of the central lane (22'), and the distance between the inner equals (26) is greater than the distance between the outermost wheels of the semi-trailer (32), while under the inrun equals (26) in the floor of the hopper there are mounting tunnels (27) corresponding to the width of the cross-members (4) of the spurs (1).

11. wagon according to claim. 1, **characterised in that** there are position stabilisers (28) at the ends of the side walls (21) of the basket (20).

12. wagon according to res. 1, **characterised by** the fact that in the lower parts of the side wall (21) of the basket (20) there are evenly distributed vertical reinforcements (29) in series, situated at the height of the attachment points of the handle arms (25).

13. Wagon according to claim. 1, **characterised in that** the side walls (21) of the basket (20) have longitudinal reinforcements (31) on the sections between the two central cut-outs (24).

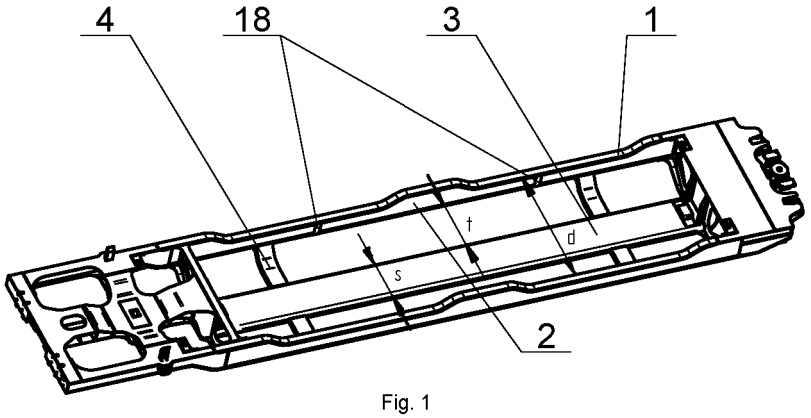


Fig. 1

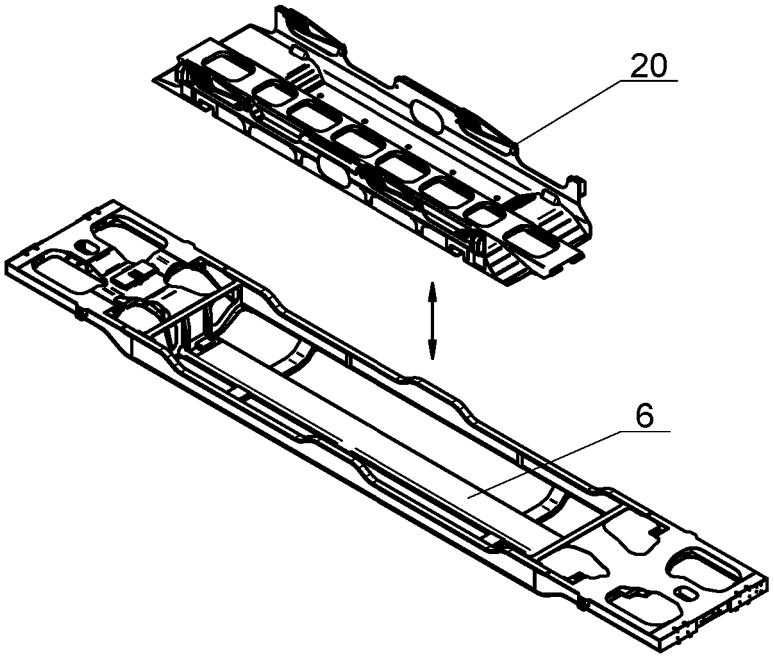
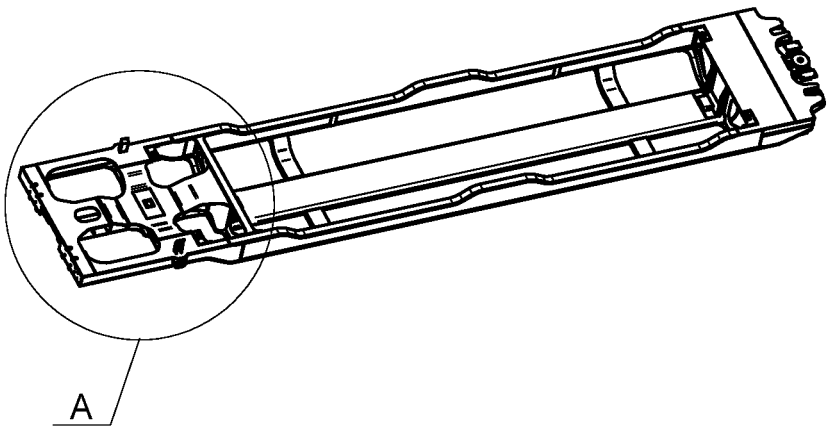


Fig. 2



A

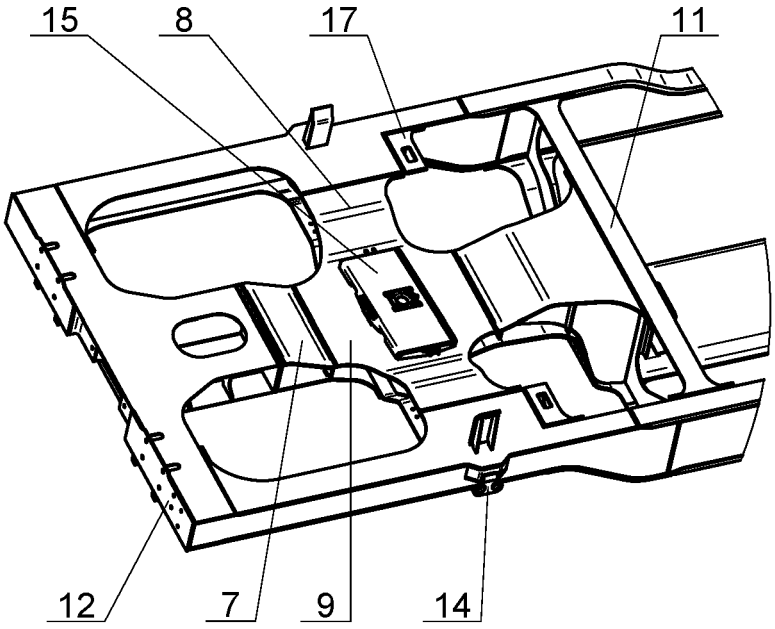
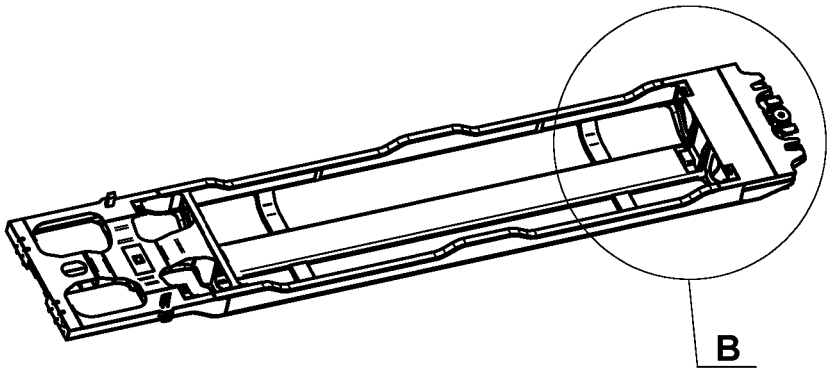


Fig. 3



B

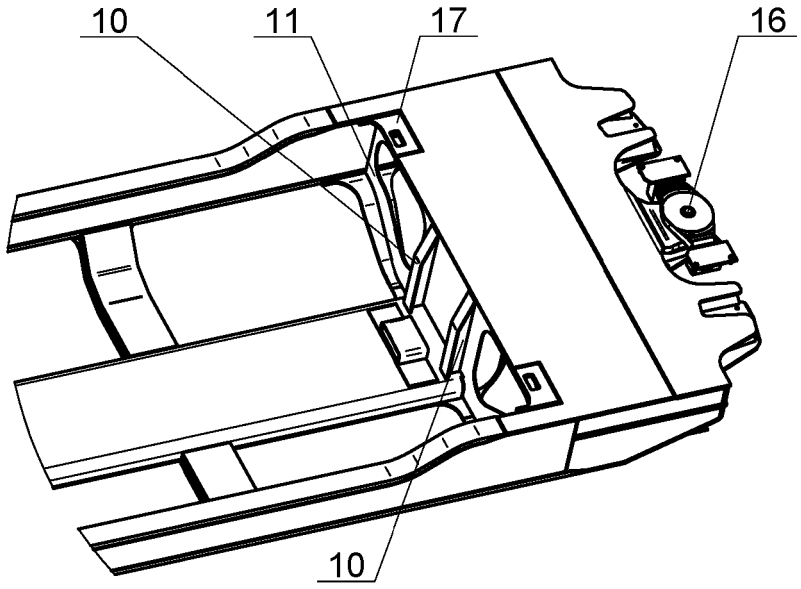


Fig. 4

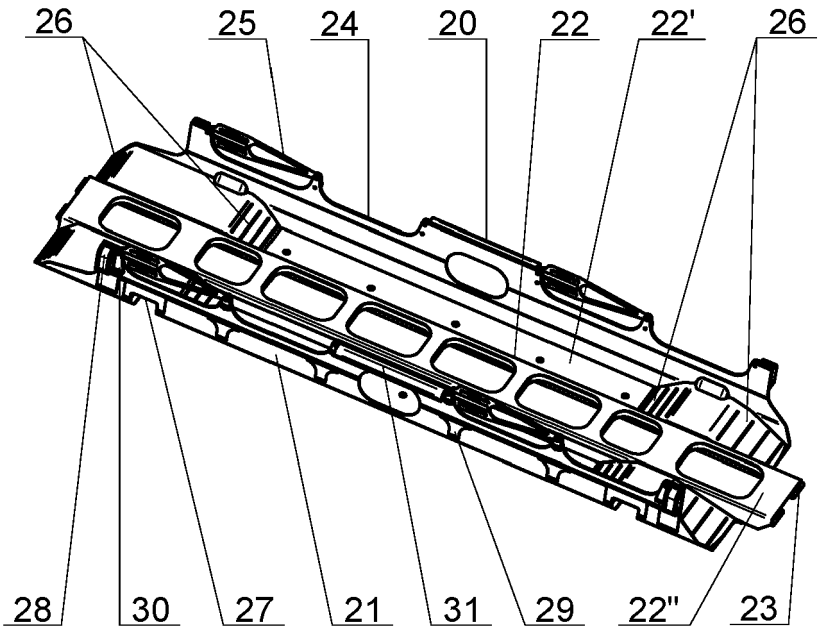


Fig. 5

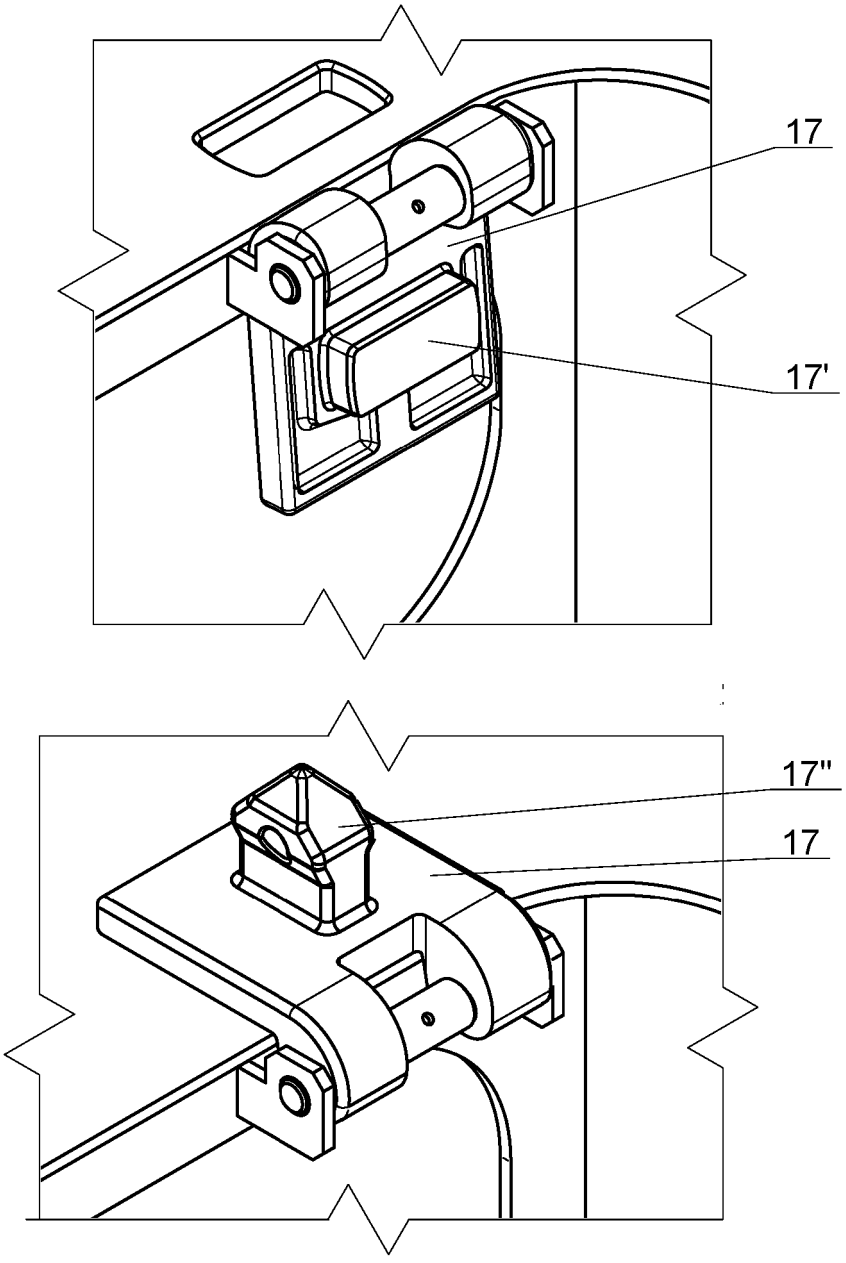


Fig. 6

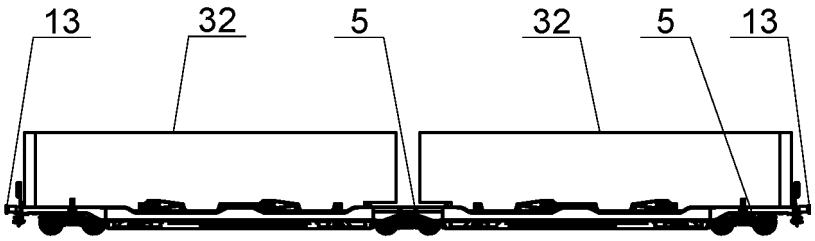


Fig. 7

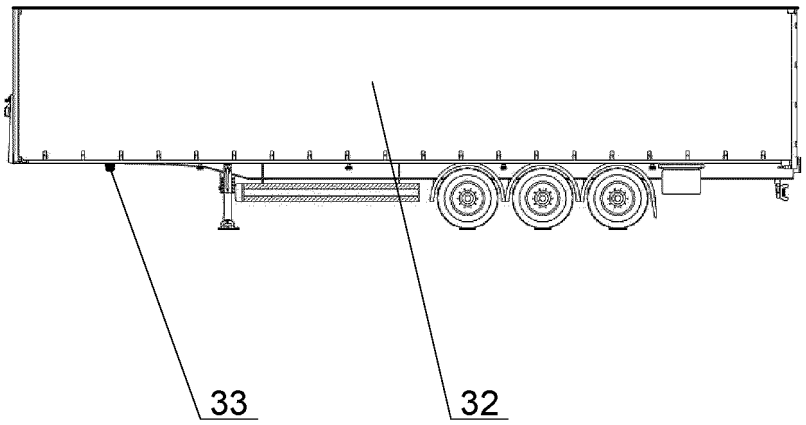


Fig. 8

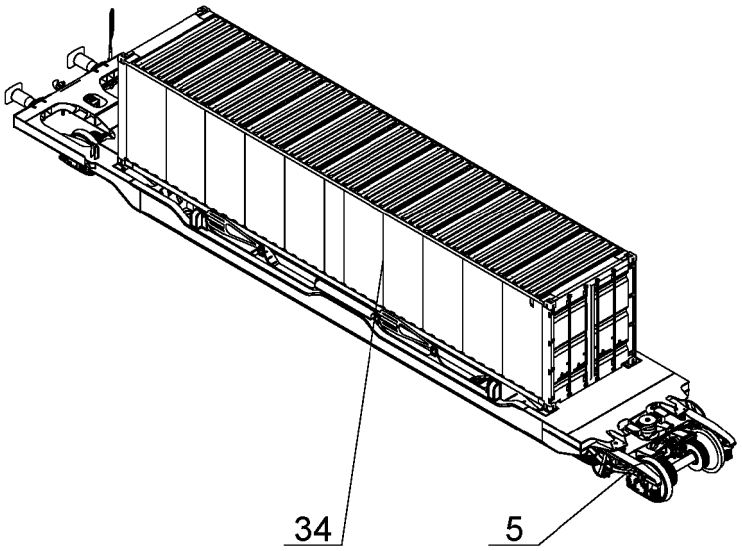


Fig. 9

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 23 21 0922

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 3 699 057 A1 (KAESSBOHRER TRANSP TECHNIK GMBH [AT]; BLUM FRANZ [AT]) 26 August 2020 (2020-08-26) * the whole document * -----	1-13	INV. B61D3/18 B61D3/20 B61D45/00 B61D47/00

TECHNICAL FIELDS SEARCHED (IPC)

B61D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	11 February 2025	Crama, Yves

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

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 23 21 0922

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

11-02-2025

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 3699057 A1	26-08-2020	NONE	

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 3268257 B1 **[0006]**
- EP 1712444 A **[0007]**
- EP 1292477 B1 **[0008]**
- PL 294311 **[0009]**
- PL 201606 **[0010]**
- PL 235404 **[0011]**
- PL 173864 **[0012]**