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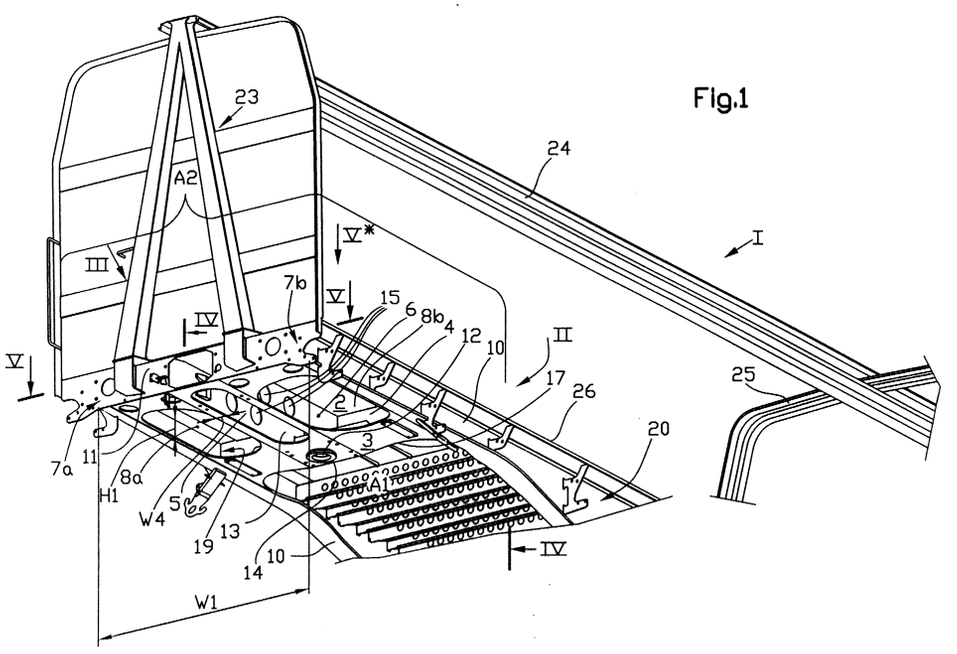
(54) Underframe end of a railway freight car comprising a bogie centre coupling element

(57) The invention relates to an end for a railway wagon frame (1) propped on a bogie centre. The wagon frame comprises longitudinal side beams (10) and end structures (23), as well as a top beam (24). The frame end is provided with a coupling element (12) for a bogie centre and at least a substantially continuous bottom panel (2) for constituting a section of a load-bearing floor (26) in a cargo space. The frame end further comprises a backing plate (3), disposed at a vertical distance (H1) below the bottom panel, and a lateral crosswise web plate (4) which is attached both to the bottom panel and to the backing plate. From an end plate (11) of the frame to an area (A1) of the bogie centre coupling element extend two lengthwise web plates (5 and 6) which are attached both to the bottom panel and to the backing plate. This results in bracing joists, in which the bottom panel and the backing plate function as flanges and the web plates as webs.

Fig.1



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Description

[0001] The invention relates to an end for a railway wagon frame propped on a bogie centre, said frame comprising two longitudinal side beams for the wagon and an end plate connecting the same, as well as end structures and a top beam connecting the top portions thereof, said end of the frame comprising a coupling element for the bogie centre, at least a substantially continuous bottom panel constituting a part of a load-bearing floor in a cargo space, as well as bracing joists between said coupling element and the bottom panel.

[0002] Traditionally it is desirable that the end of a railway wagon frame, which is propped upon the bogie centre of a wheel bogie, be made as rigid as possible. Therefore, the end structure of railway wagons over the length of a bogie typically consists at least of a single crosswise box beam or possibly a plurality of crosswise box beams and, in addition, often also of longitudinal box beams, said box beams being usually provided with quite heavy-duty material thicknesses, as well. One such box beam structure for the end of a freight wagon is disclosed in patent application FI-964371. However, a rigid railway wagon end representative of this type of structure is awkward to manufacture and becomes relatively expensive, particularly with regard to freight wagons which should be economically attractive, as well.

[0003] Hence, it is an object of the invention to provide the frame of such a railway freight wagon, which comprises not only load-bearing structures present in the floor area but also a top beam connecting the ends of the frame, with an end capable of having a bogie centre coupled therewith, said end of the frame being structurally simple and manufacturable at reasonable costs, yet having a strength and rigidity sufficient for its intended application. A second object of the invention is an end of the above type for a railway wagon frame, which would have as few spots as possible likely to accumulate water, snow and ice, as well as other corrosion-activating dirt. A third object of the invention is an end of the above type for a railway wagon frame, which would have a sufficiently low height for providing the freight wagon, if necessary, with at least a substantially flat floor capable of receiving conventional, platform-carried cargo.

[0004] The above problems can be resolved and the above-defined objects can be accomplished by means of a cover structure of the invention, which is characterized by what is defined in the characterizing clause of claim 1.

[0005] It has now been surprisingly discovered that especially in railway wagons in which the wagon section, extending between the bogies and receiving freight units and establishing together with a top beam lengthwise of the wagon a load-bearing section, has been designed to be slightly elastic, a traditional rigid-construction end for the frame leads easily to frame damages in the freight wagon. Therefore, in discordance with the prior art, it has been found advantageous to design the end of a freight wagon frame slightly elastic. Indeed, the most essential virtue of the invention is a minor and specifically distributed elasticity for the end of a freight wagon frame, whereby the entire freight wagon is able to achieve an excellent strength and durability. The inventive frame end constitutes, along with the rest of the undercarriage, the gables and the top beam of a wagon, such an integrated entity that no adverse discontinuities develop either at the end of the frame or between the end and the rest of the frame. Another benefit of the invention is that the frame end is convenient and reliable to manufacture and has an excellent corrosion resistance.

[0006] The invention will now be described in detail with reference made to the accompanying drawings.

[0007] Fig. 1 shows generally an end of the invention for a railway wagon frame and its connection with the rest of the undercarriage, end structures and top beam, as well as the floor of a freight wagon, generally from below, i.e. upwards from railway tracks, and in an axonometric view from a direction I in figs. 2 and 3.

[0008] Fig. 2 shows the end of fig. 1 for a railway wagon frame in a plan view, i.e. from the opposite side relative to fig. 1, with a bottom panel constituting the floor of a loading space removed, without longitudinal side beams of a wagon, and in an axonometric view from a direction II in figs. 1 and 3.

[0009] Fig. 3 shows the end of fig. 1 for a railway wagon frame in a plan view, i.e. from the opposite side relative to fig. 1 and in the opposite direction relative to fig. 2, with a bottom panel constituting the floor of a loading space removed, without longitudinal side beams of a wagon, and in an axonometric view from a direction III in figs. 1 and 2.

[0010] Fig. 4 shows an end of the invention for a railway wagon frame in a lengthwise elevation, without longitudinal side beams of a wagon, along a plane IV-IV in figs. land 4-5.

[0011] Fig. 5 shows in its top portion an end of the invention for a railway wagon frame in a horizontal section, without longitudinal side beams of a wagon, in a plan view along a plane V-V in figs. 1, 4 and 5, and in its bottom portion, in a plan view from a direction V^* in figs. 1, 4 and 5.

[0012] Fig. 6 shows an end of the invention for a railway wagon frame in a crosswise elevation, without longitudinal side beams of a wagon, along a plane VI-VI-VI-VI in fig. 5.

[0013] Fig. 1 visualizes an end for a railway freight wagon frame 1, propped on a bogie centre and then extending as the rest of a railway wagon undercarriage 20 to the other respective end of the wagon frame 1. In this context, the ends of a wagon or its frame refer to those two length sections of a wagon structure which extend from the end point constituted by wagon buffers and per se known interlinking elements, not shown in the present figures, over the extent of wagon wheel bogies,

not shown in the figures. More specifically, the end of the frame 1 refers to permanent components of a wagon structure, not to more or less readily removable optional accessories or the like, such as, for example, a wagon cover, just mentioned buffers or bogies. The undercarriage of a railway freight wagon generally comprises two longitudinal side beams 10 covering the entire length of a wagon, which can be of any appropriate type, and end plates 11 or the like connecting the ends or end faces of these side beams. In this case, the load-bearing freight wagon frame 1 also includes wagon end structures 23, which may comprise beams or profiles, or some sort of box structure, rigidly secured to the frame end at appropriate parts and spots and extending upwards at least to the proximity of a wagon top level. Further included in the wagon frame is a top beam 24 parallel to the wagon length, extending between the top portions of the end structures 23 and being rigidly secured to these end structures. If desirable, but not necessarily, the frame 1 may also include a central arch 25. The end structures 23 and the top beam 24 of a wagon may differ in design from what has been described above and depicted in fig. 1, but the discussed components are in some form or another included in a railway freight wagon subject to the invention. In addition, at least a conventional flat-bed freight wagon is provided with floor structures in connection with the undercarriage, one of the sections thereof extending into the area of a wagon end as defined above. In this case, the freight wagon end is provided with at least a substantially solid and continuous bottom panel 2 for constituting at least a part of the cargo space floor - the floor extends from the end of a wagon to the middle sections of a wagon as an identical or non-identical structure - but, as the invention is not particularly concerned with a floor, it shall not be further explained in this specification. Furthermore, the wagon frame end is provided with a coupling element 12 for a bogie centre, upon which the bogie centre of a wheel bogie, not shown in the figures, is propped and by way of which the weight of goods carried in the cargo space or on the floor of a freight wagon and other forces resulting from cargo and running of the train transfer between the bogie and the rest of a freight wagon. Additionally, in some cases, there are bracing joists set between said bogie centre coupling element and the bottom panel.

[0014] According to the invention, a frame end A2 as described above comprises in combination structural elements at least as follows. First of all, the frame end includes a backing plate 3, which is located at a vertical distance H1 below a bottom panel 2, i.e. from the floor-surface forming bottom panel towards railway tracks, not shown in the figures. This backing plate 3 is partly or to some extent parallel to the bottom panel 2 and includes the coupling element 12 for a bogie centre on its side facing away from the bottom panel. According to the invention, this backing plate further includes within an area A1 of the bogie centre coupling element 12 at least one crosswise web plate 4 transverse to the wagon, which is attached both to the bottom panel 2 and the backing plate 3, at the face-to-face internal surfaces thereof, as well as at least two lengthwise web plates 5 and 6, extending from the end plate 11 of a wagon frame at least into the area A1 of the bogie centre coupling element 12 and both also attached both to the bottom panel 2 and the backing plate 3, at the face-to-face internal surfaces thereof. In such an assembly, said web plates constitute sort of bracing joists for wagon ends A2, wherein the bottom panel 2 and the backing plate 3 function as flanges common to the "beams" and the web plates 4, 5, 6 serve as genuine webs.

[0015] According to the invention, the end A2 of a wagon frame preferably comprises no more than one such crosswise web plate 4 which extends from a first side 7a of the wagon to a second side 7b thereof and which crosswise web plate 4 is secured 19 by its ends to the side beams 10 of the frame. Preferably, the crosswise web plate 4 extends across the area A1 defined by the bogie centre coupling element 12, as visualized by the figure. Furthermore, the end of a wagon frame preferably comprises no more than two such above-mentioned lengthwise web plates 5, 6 which extend into the area A1 of the bogie centre coupling element 12 or alongside the area A1, and continue further therefrom, i.e. past said area, as extensions 5' and 6' having a lower height H2 or a declining height. These extensions 5' and 6' are only in contact with the bottom panel 2, since the lower height H2 thereof is not sufficient to fill the distance H1 between the backing plate and the bottom panel. However, these extensions 5' and 6' to the lengthwise web plates are believed to effectively prevent the development of a discontinuity between the frame end A2 and the rest of the wagon frame 20, whereby the structural rigidity of a wagon as a whole remains roughly the same or changes gradually and smoothly.

[0016] At least within the area A2 defined by a space between the longitudinal side beams 10 of a freight wagon and by a total length L1 of the extensions thereof, the bottom panel 2 does not essentially have holes in it. This is quite obvious even for the reason that the bottom panel generally, although not necessarily, constitutes one of the sections for a freight wagon floor or floor surface. This does not account for small holes or an insignificant number of holes. In contrast with the bottom panel, the backing plate 3 has a sizable opening 13 within a section defined between the lengthwise web plates 5 and 6 attached thereto, and a sizable opening 8a and 8b, respectively, within each of the sections defined between the lengthwise web plates 5 and 6 attached thereto and the side beams 10 of a wagon. On the other hand, the backing plate 3 extends from the wagon end plate 11 past the discussed area A1 of the bogie centre coupling element 12 to a certain extent, this edge 17 of the backing plate lateral to the wagon being located at a lateral distance L4 from the crosswise web plate. These sizable openings 13; 8a, 8b of the backing plate have such a

size that the lengthwise web plates 5, 6 and the crosswise web plate 4 will be provided thereby with bottom flanges of an appropriate width W4 and L5 and, in addition, the end plate 11 with a bottom flange 18 of a somewhat greater width L6 and with engagement flanges 21 against the face-to-face internal surfaces of the side beams 10. Said end plate 11 is secured both to the side beams 10 and to the lengthwise web plates 5 and 6, and the crosswise web plate 4 is secured to the lengthwise web plates 5, 6 at intersections thereof. Thus, the frame end structure will be provided with an appropriate rigidity and a sufficient strength and the frame end can be linked to the rest of the undercarriage of a wagon as desired.

[0017] Moreover, the end of a wagon frame is provided on either side of the above-discussed crosswise web plate 4 with bracing strips 9a and 9b, which are spaced by a distance L3 from the crosswise web plates. These bracing strips 9a, 9b have a height H3 which is substantially less than the height H1 of the crosswise web plate and, thus, such strips are only attached to the backing plate 3 along its surface facing the bottom panel, i.e. along the top surface as the freight wagon is in its operative position. The bracing strips have a length W3, which is substantially less than the distance W1 between the side beams and, thus, such strips do not extend all the way to the longitudinal side beams 10. The crosswise web plate 4 extends preferably essentially across the bogie centre coupling element 12 by way of its mid-point or at least by way of the area A1 defined by the bogie centre coupling element. The lengthwise web plates 5, 6 extend tangentially alongside the vicinities of an edge 14 or alongside the edges 14 of the bogie centre coupling element 12, said assembly being effective in terms of taking up a moment coincidental with the bogie centre and its coupling element and active in a plane longitudinal to the wagon. The above-discussed bracing strips 9a, 9b extend at a distance W2 from the edge 14 of the bogie centre coupling element, said distance being less than a diameter D of the bogie centre coupling element, i.e. the bracing strips 9a, 9b are no more than a distance 1,5xD away from a median 22 of the bogie centre coupling element.

[0018] The crosswise web plate 4 and the lengthwise web plates 5 and 6 are attached to the bottom panel 2 and the backing plate 3, as well as to the side beams 10 or the end plate 11, respectively, by means of welds or rivets. The bracing strips 9a, 9b are fastened to the backing plate 3 also with welds or rivets. The bogie centre coupling element 12 is mounted by some appropriate means on the backing plate 3 for receiving a bogie centre, not shown in the figures.

[0019] The lengthwise web plates 5, 6 include typically one or more holes 15 along or near the median of a web plate height H1, and the crosswise web plate 4 likewise includes typically one or more holes 16 along or near a web plate height H1, as visualized particularly in figs. 2 and 3. It is reminded that the distance H1 between the bottom panel 2 and the backing plate 3 is a dimension equal to the height H1 of the web plates 4, 5, 6, since, after all, the web plates are in contact with the bottom panel and the backing plate. This does not deny the web plate height H1 a possibility of declining for example in the direction of the wagon width W1, for example when proceeding in lateral directions from the bogie centre, whereby, instead of being a level - which it would be if the height H1 were equal everywhere - the backing plate 2 will be convex in a downward direction as the freight wagon is in its normal running position. This design impedes e.g. the accumulation of water on top of the described components.

[0020] The inventive elastic end A2 for the frame 1 is capable of eliminating local stresses between the same and the remaining section of a freight wagon floor 26 as this frame end and the remaining floor section function, as far as stresses and distortions are concerned, as a flexible structure having its homogeneity improved over the prior known solutions, and some of the stresses are transmitted by way of the end structures 23 to the top beam 24, the latter in turn functioning as a structure taking up compression stresses.

Claims

1. An end of a railway wagon frame (1) propped on a bogie centre, said frame comprising two longitudinal side beams (10) for the wagon and an end plate (11) connecting the same, as well as end structures (23) and a top beam (24) connecting the top portions thereof, said end of the frame comprising a coupling element (12) for the bogie centre, at least a substantially continuous bottom panel (2) constituting a part of a load-bearing floor (26) in a cargo space, as well as bracing joists between said coupling element and the bottom panel, **characterized** in that the frame end further comprises:

   - a backing plate (3), at least partially parallel to the bottom panel (2) and including the bogie centre coupling element and disposed at a vertical distance (H1) below the bottom panel;
   - at least one crosswise web plate (4), lateral to the wagon and located within the area of the bogie centre coupling element (12) and connected with both the bottom panel and the backing plate; and
   - at least two lengthwise web plates (5 and 6), extending from the end plate (11) of a wagon frame into an area (A1) of the bogie centre coupling element (12) and connected with both the bottom panel and the backing plate; whereby

   said web plates constitute bracing joists, in which the bottom panel (2) and the backing plate (3) function as flanges and the web plates (4; 5, 6) as webs.

2. A wagon frame end as set forth in claim 1, **characterized** in that it comprises no more than one such crosswise web plate (4) which extends from one side (7a) of the wagon to a second side (7b) thereof; and that the crosswise web plate (4) extends by way of the area (A1) defined by the bogie centre coupling element.

3. A wagon frame end as set forth in claim 1, **characterized** in that it comprises no more than two such above-mentioned lengthwise web plates (5, 6) which continue past the bogie centre coupling element (12) as extensions (5', 6') having a lower height (H2) and being attached to the bottom panel (2).

4. A wagon frame end as set forth in claim 1 or 3, **characterized** in that the bottom panel (2), at least within an area (A2) defined by a distance between the longitudinal side beams (10) of a freight wagon and by a combined length (L1) of the lengthwise web plates and the extensions thereof, has substantially no holes therein; that the backing plate (3) includes an opening (13) within an area between the lengthwise web plates (5 and 6) attached thereto, an opening (8a, 8b) within each of the areas between the lengthwise web plates (5 and 6) attached thereto and the side beams (10) of a wagon; and that the backing plate (3) extends from the wagon end plate (11) at least past said area (A1) of the bogie centre coupling element.

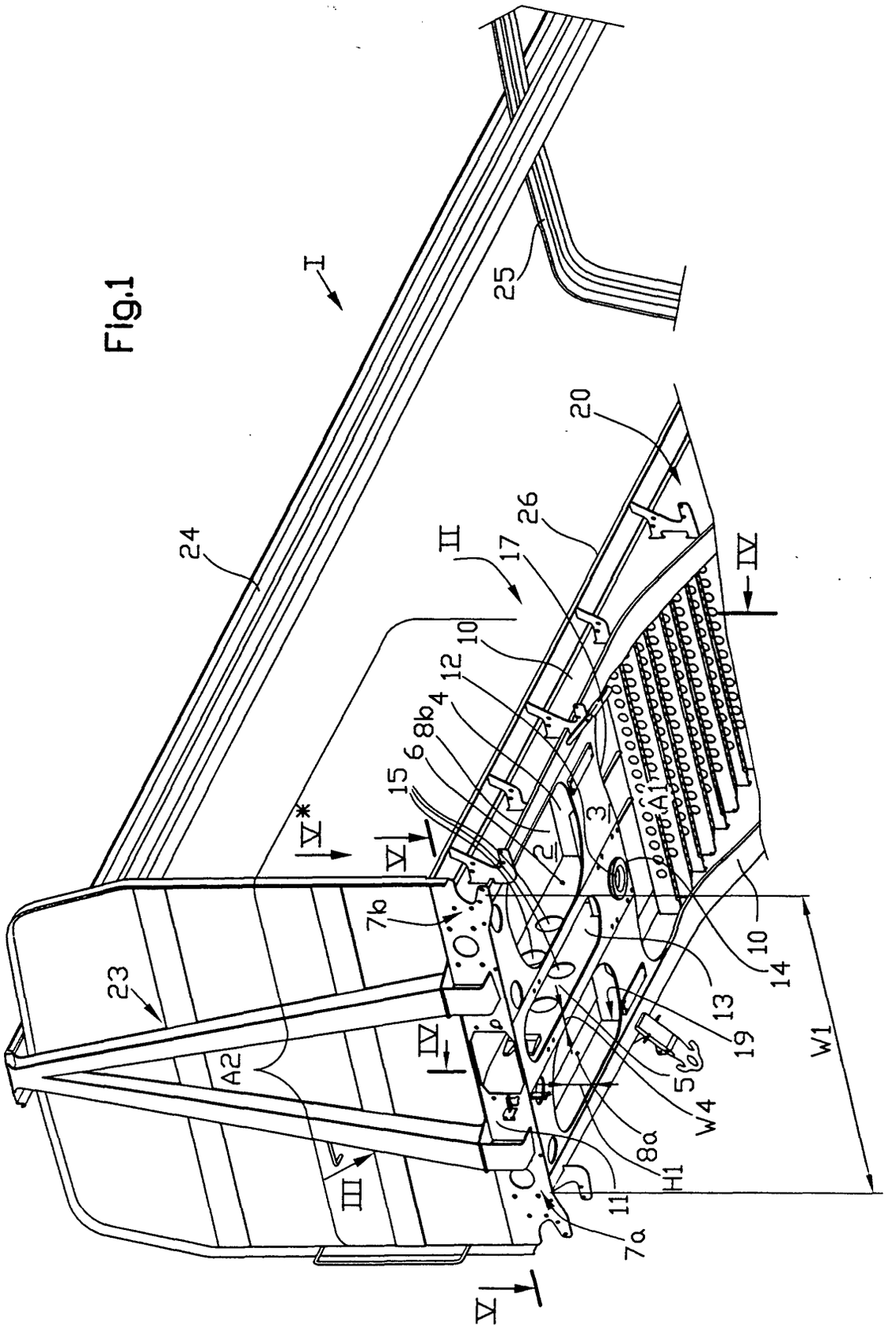
5. A wagon frame end as set forth in claim 1 or 2 or 3, **characterized** in that the crosswise web plate (4) is secured to the side beams (10) of the frame; that said end plate (11) is secured both to the side beams (10) and the longitudinal web plates (5 and 6); and that the crosswise web plate (4) is secured to the lengthwise web plates (5,6).

6. A wagon frame end as set forth in claim 1 or 2 or 3, **characterized** in that it further comprises bracing strips (9a, 9b) on both sides of the crosswise web plate (4) and at a distance (L3) from the crosswise web plate; that these bracing strips (9a, 9b) are secured to the backing plate (3) at its surface facing the bottom panel; and that said bracing strips have a length (W3) which is substantially less than a distance (W1) between the side beams and a height (H3) which is substantially less than a height (H1) of the crosswise web plate.

7. A wagon frame end as set forth in any of the preceding claims, **characterized** in that the crosswise web plate (4) extends essentially by way of the midpoint of the bogie centre coupling element (12) and the lengthwise web plates (5, 6) extend tangentially alongside an edge (14) region of the bogie centre coupling element (12); and that the bracing strips (9a, 9b) extend at a distance (W2) from the edge (14) of the bogie centre coupling element, said distance being less than a diameter (D) of the bogie centre coupling element.

8. A wagon frame end as set forth in any of the preceding claims, **characterized** in that the crosswise web plate (4) and the lengthwise web plates (5 and 6) are attached to the bottom panel (2) and the backing plate (3), as well as to the side beams (10) or the end plate (11), respectively, by means of welds or rivets and said bracing strips (9a, 9b) are attached to the backing plate (3) by means of welds or rivets; and that the bogie centre coupling element (12) is mounted on the backing plate (3) for receiving a bogie centre.

Fig.1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26
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V*
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23
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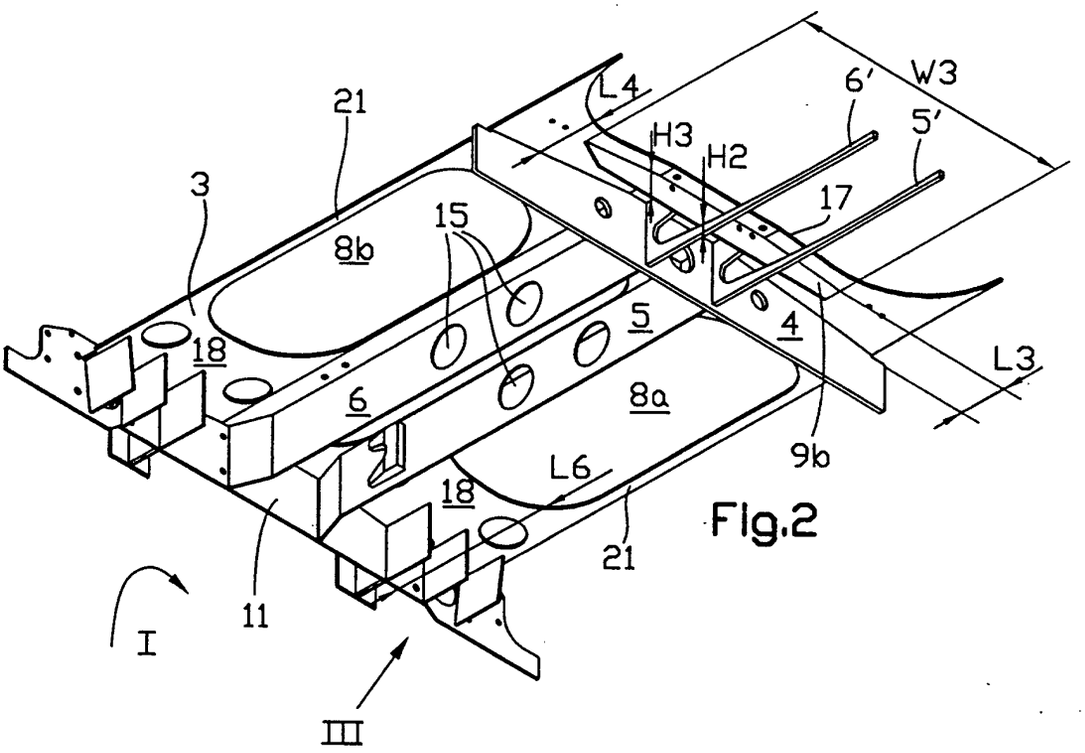
14
13
19
W1
IV
A2
5
W4
8a
H1
III
11
7a
V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H2
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L6
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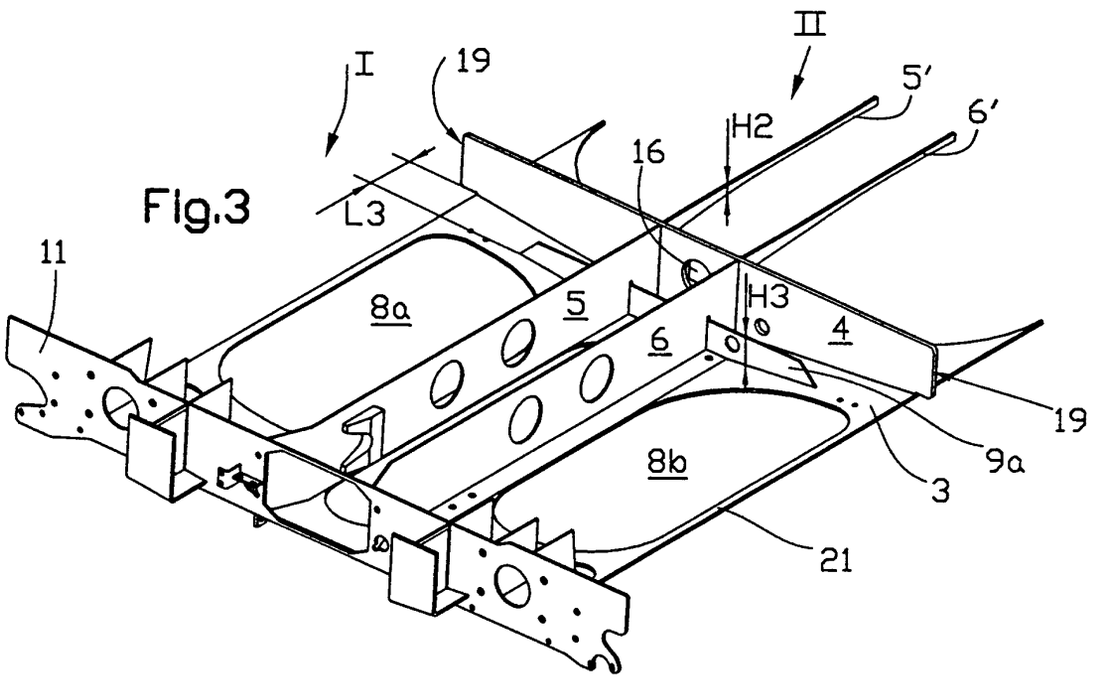
11
I
III

Fig.2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H3
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9a
8b
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21

Fig.3

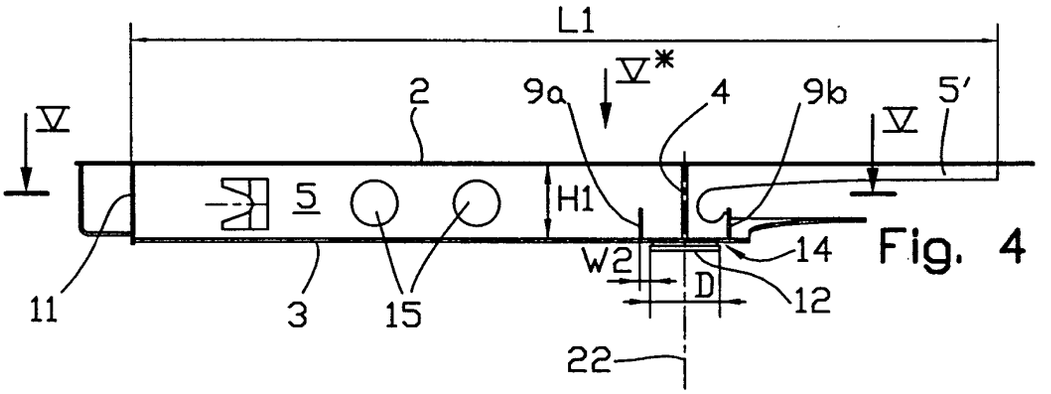

Fig. 4

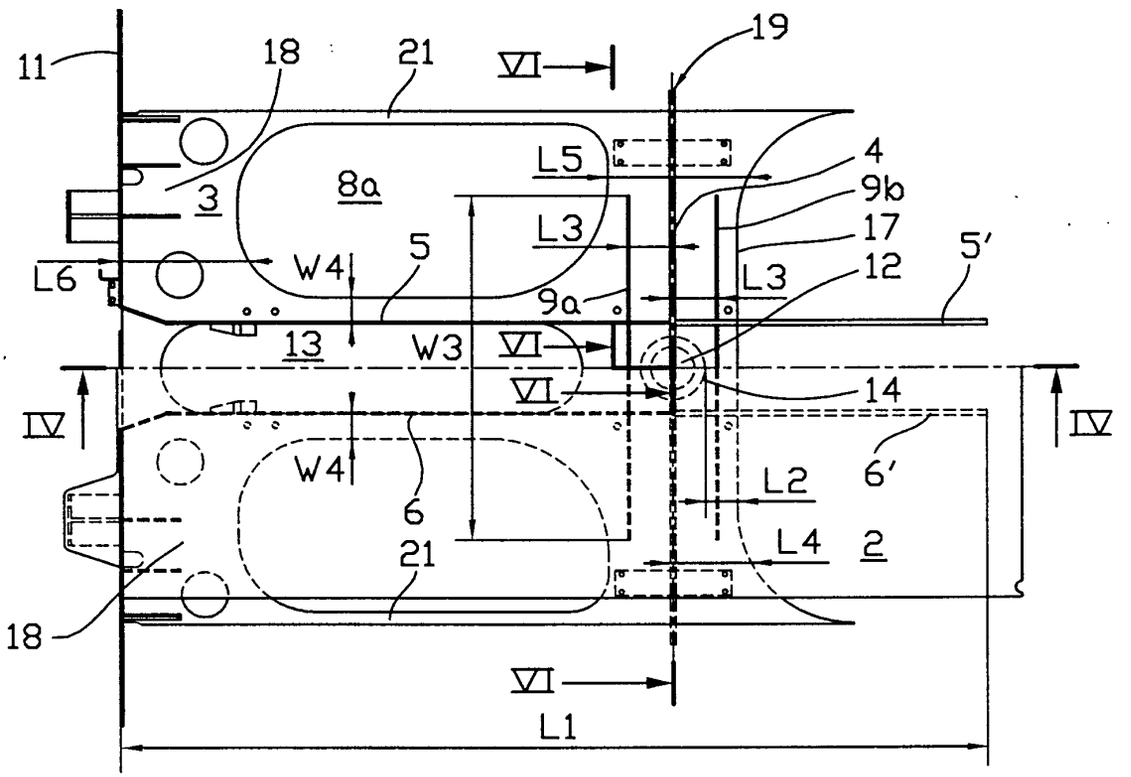

Fig. 5

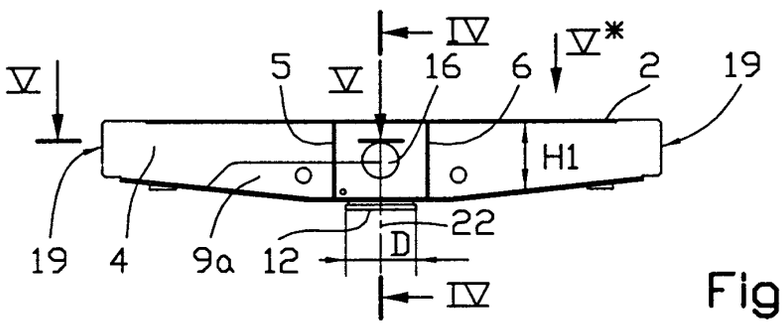

Fig. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 01 66 0022

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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A	EP 0 329 551 A (ARBEL FAUVET RAIL SA) 23 August 1989 (1989-08-23) * figures 2,3 *	1	
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TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B61F
B61D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	11 June 2001	Ferranti, M

CATEGORY OF CITED DOCUMENTS

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11-06-2001

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