



Europäisches Patentamt
 European Patent Office
 Office européen des brevets



(11) **EP 1 262 388 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
04.12.2002 Bulletin 2002/49

(51) Int Cl.7: **B61D 19/00**, B61D 3/18,
 B61D 17/06

(21) Application number: **02396069.3**

(22) Date of filing: **15.05.2002**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
 MC NL PT SE TR**
 Designated Extension States:
AL LT LV MK RO SI

(72) Inventors:
 • **Heilimo, Veijo**
01480 Vantaa (FI)
 • **Iitti, Raimo**
00970 Helsinki (FI)

(30) Priority: **30.05.2001 FI 20011130**

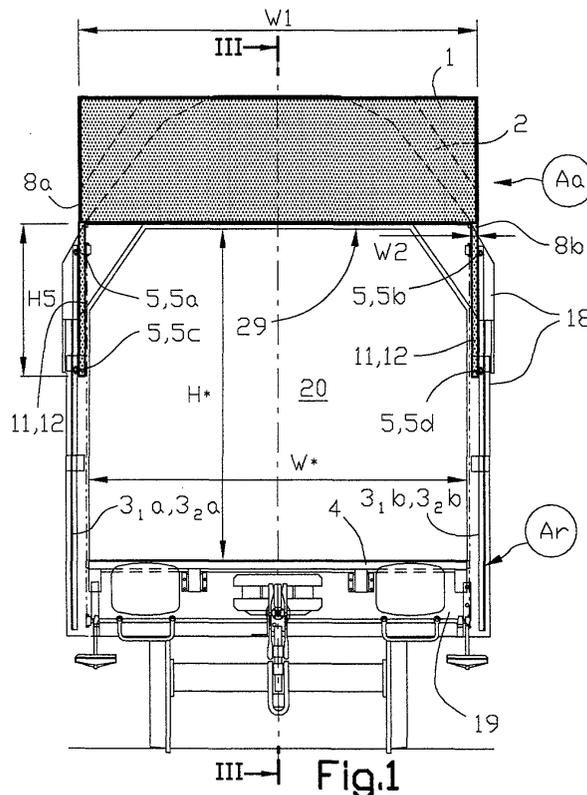
(74) Representative: **Laako, Tero Jussi**
Berggren Oy Ab
P.O. Box 16
00101 Helsinki (FI)

(71) Applicant: **Mock Doors Oy**
00731 Helsinki (FI)

(54) **End door in railway transport wagons**

(57) A door assembly in a railway transport wagon, comprising a chassis (19) and a cover (18). The said door assembly forms the end doors of the railway wagon and comprises vertical, parallel door leaves (1, 2), which have vertical dimensions smaller than the height (H^*) of the door opening (20). On the opposite vertical edges

(8a, 8b) of each door leaf, there are guide rollers (5), which are not dependent on the other door leaves, and which bear on the linear guide rails $3_1a, 3_1b; 3_2a, 3_2b$ located on the sides of the door opening, for guiding the door leaves past each other, maintaining their vertical position, between a closed position (Ko) and an open position (Ao) above the door opening.



EP 1 262 388 A1

Description

[0001] The invention relates to a door assembly in a railway transport wagon, comprising a chassis and a cover with a door opening having a height, the door assembly comprising at least door leaves, which have vertical dimensions smaller than said height of the door opening, and which can be moved by means of guide rollers along guide means located on the sides of the door opening and being at least partially vertical, between a closed position and an open position above the door opening.

[0002] In railway transport wagons, which are loaded in the longitudinal direction of the wagon, manually operated door assemblies have been used so far. Such railway wagons, which are loaded and unloaded in the longitudinal direction of the wagon, are car transporters, for example, to which cars are driven in the longitudinal direction of the wagon to sequentially connected wagons through the driving bridges that cross the gaps between the wagons. Depending on the structure of the covering, other kinds of loading can also be placed in these railway wagons, either by using forklift trucks or the like, in the longitudinal direction of the wagons or from the top or the side. Publication DE-43 17 013, for example, describes such a railway transport wagon, mentioning the end doors of the railway wagon, which turn to the side. These end doors consist of two two-piece doors, wherein the parts of the doors as well as the doors are hinged to turn around vertical lines. Such a door arrangement is difficult to power and becomes relatively expensive. Publication EP-0 454 261 describes a mechanized lamellar overhead door, which is assembled from several door leaves, which are hinged together, and the door of which is intended for use in track vehicles, where strong suction or compression can be exerted on the doors, unlike on doors in stationary buildings. The hinge lines between the door leaves are horizontal and guide rollers are arranged next to the hinge lines on both sides of the door, moving from the area of the vertical guide bars next to the door opening along an arc to the area of the horizontal guide bars above the door opening and the loading space and back, correspondingly. Thus, the door is turned between a closed vertical position and an open horizontal position and, therefore, the door leaves are allowed to turn because of the pivoting between them. Such a door assembly as such may be useful in railway wagons, but the construction is complex and thus expensive. Furthermore, the door of the described type requires a suitable space above the door opening and the loading space under the wagon cover, limiting the useful height of the loading space.

[0003] The object of the invention is to provide an end door assembly, which is mechanized, i.e., provided with drive motors, for railway transport wagons, such as car transporters, the end doors of which can be opened quickly and, possibly, simultaneously in several wag-

ons, whereby it is possible to quickly unload and load several sequential wagons in the longitudinal direction. A second object of the invention is such a door assembly, the space required by the opening and closing of which is small enough for it to be used in wagons that are sequentially connected together, in the narrow gap between them. A third object of the invention is such a mechanized door assembly, which is sufficiently solid to withstand blow-like variations in the air pressure during the travel of the railway wagon, and sufficiently tight as not to convey the blow-like variations in the air pressure mentioned above inside the wagon, at least not to a disturbing extent. A fourth object of the invention is such a mechanized door assembly, the mechanisms and the parts of which that close the opening do not decrease the inner space of the wagon. Furthermore, the door assembly should be reliable and its manufacturing costs moderate.

[0004] The problems described above can be eliminated and the objects defined above implemented by the door assembly according to the invention, which is characterized in that defined in the characterizing part of Claim 1.

[0005] First, an advantage of the invention is that the parts of the door in their open position neither protrude over the extreme edges of the sidewalls or the roof of the wagon nor outside the buffers. The operation mechanism of the doors can fairly freely be placed in the respective space available. On the whole, the space taken by the door assembly and its actuators according to the invention is very small. Another advantage of the invention is the high door opening, which makes it possible to drive high vehicles from one wagon to another. Furthermore, the door assembly can easily be rendered solid and sufficiently tight.

[0006] In the following, the invention is described in detail with reference to the appended drawings.

[0007] Fig. 1 shows the end of a railway transport wagon, wherein the end door according to the invention is in its open position, viewed from the outside from the direction I of Fig. 3.

[0008] Fig. 2 shows the same end of the railway transport wagon, wherein the end door according to the invention is in its closed position, viewed from the outside from the direction II of Fig. 4.

[0009] Fig. 3 shows the same end of the railway transport wagon, wherein the end door according to the invention is in its open position, as a longitudinal section along the plane III-III of Fig. 1.

[0010] Fig. 4 shows the same end of the railway transport wagon, wherein the end door according to the invention is in its closed position, as a longitudinal section along the plane IV-IV of Fig. 2.

[0011] Fig. 5 shows the same end of the railway transport wagon, wherein the end door according to the invention is in its closed position, as a horizontal section along the plane V-V of Figs. 2 and 4.

[0012] Fig. 6 shows the first embodiment of the guide

rollers and the guide rails of the door leaves of the end door according to the invention, in the same view as in Fig. 5, at section VI, only on a larger scale.

[0013] Fig. 7 shows the second embodiment of the guide rollers and the guide rails of the door leaves of the end door according to the invention, in the same view as in Fig. 6.

[0014] Fig. 8A shows the sealing between the upper edge of the inner door leaf of the end door according to the invention in its closed position and the lower edge of the end wall of the wagon, in the same view as in Fig. 4, section VIIIA, only on a larger scale.

[0015] Fig. 8B shows the sealing between the lower edge of the inner door leaf of the end door according to the invention in its closed position and the upper edge of the outer door leaf, in the same view as in Fig. 4, section VIIIB, and on the same scale as in Fig. 8A.

[0016] Fig. 8C shows the sealing between the lower edge of the outer door leaf of the end door according to the invention in its closed position and the outer edge of the driving ramp lifted up into its vertical position, in the same view as in Fig. 4, section VIIC, and on the same scale as in Figs. 8A and 8B.

[0017] The railway transport wagon, which can be used for transporting single consignments or cars, comprises, first, a chassis 19 and, second, a cover 18, which in turn can be a solid cover or a transfer cover or a transfer wall. The chassis 19, of course, comprises base structures, which carry most of the forces exerted on the chassis and, in this case, at least side columns at the ends of the wagon, to which columns the guide rails 3_{1a}, 3_{1b}; 3_{2a}, 3_{2b} of the wagon's end door are rigidly attached, and end wall sections 9 at the upper parts of the ends. These side columns and their guide rails, the base structures, and the end wall sections define a door opening 20 having a height H* at the ends of the railway wagon, the width W* of which opening corresponds to or is near the distance between the opposite sides of the cover 18, the sides essentially being in the longitudinal direction L of the wagon. Such a railway transport wagon can be loaded and unloaded in the longitudinal direction L of the wagon, for example, by driving the cars or the like to be transported over the driving bridges that constitute an extension to the floor, which belongs to the base structures, on the lower edge of the door opening 20 and on top of the buffers, through the door opening, and further along the floor of the wagon.

[0018] The door assembly according to the invention for the door, which is located at the end of the wagon, comprises door leaves 1, 2, which have vertical dimensions substantially smaller than the height H* of the door opening. There are preferably two door leaves, i.e. an outer door leaf 2 and an inner door leaf 1. In principle, there could be several door leaves, but this would increase the total thickness of the door assembly in the longitudinal direction of the wagon, which is harmful, not giving any advantages. According to the invention, the door assembly also comprises a driving ramp 4, which

in its vertical closing position Kr forms the end doors of the railway wagon together with the door leaves in their closed position Ko. Thus, each end door typically comprises three parts that close the door opening 20; in other words, door leaves 1, 2, and the driving ramp 4. The door opening is closed, when the door leaves are in their closed position Ko, i.e. low down, and the driving ramp in its closing position Kr, i.e., high up and, correspondingly, the door opening is open, when the door leaves are in their open position Ka, i.e., high up, and the driving ramp in its driving position Kr, i.e., low down. In the door assembly, the outer door leaf 2 in its closed position Ko is lower than the inner door leaf 1 in its closed position Ko, as can be seen in Figs. 1 and 3. In their open position Ka, the door leaves 1, 2 are mainly side by side in the horizontal direction, as viewed in the longitudinal direction L of the wagon and, regarding the door parts 10, above the door opening 20, as can be seen in Figs. 2 and 4. In the open position Ao of the door leaves, their extension bars 11, 12 are on both sides on the edges of the door opening. The end doors that open/close in the vertical direction, i.e., the door leaves above the driving ramp, and the driving ramp can be opened and closed, when the railway wagons are connected together sequentially or when the railway wagons are detached from one another. The inner door leaf 1, which in the closed position Ko of the door leaves is higher than the outer door leaf 2, can be tapered at its upper part by means of bevels 27, for example, whereby the shape of the range of travel is taken into consideration.

[0019] Furthermore, the door leaves 1, 2 are vertical and parallel and spaced apart by a second distance G2, which is perpendicular to the door leaves, the distance as such being as small as possible. The sole purpose of the second distance G2 is to enable the movement of the door leaves with respect to each other in the direction of their planes into the open position Ao, wherein the door leaves 1, 2 are thus side by side, and into the closed position Ko, wherein the door leaves are in a vertically sequential relationship and interleaved by the extent of a second sealing dimension T2. Correspondingly, the inner door leaf 1 is at the distance of a first distance G1 from the end wall section 9, the distance as such being as small as possible. The sole purpose of the first distance G1 is to enable the movement of the door leaf with respect to the end wall section in the direction of their planes and into the open position Ao, wherein the inner door leaf 1 and the end wall section 9 are parallel as viewed in the longitudinal direction L of the wagon, and into the closed position Ko, wherein the inner door leaf and the fixed end wall section are vertically one after the other and interleaved to the extent of the first sealing dimension T1. The heights H1 and H2 of the vertical door leaves 1, 2 and the length H4 of the driving ramp 4, when all added together, exceed the height H* of the door opening to the extent of the sealing dimensions T1, T2, T3, which are dealt with in detail hereinafter, i.e., $H1+H2+H4 = H^*+T1+T2+T3$.

[0020] The door leaves also comprise extension bars 11, 12, which point downwards on the vertical edges 8a, 8b thereof, for guiding the door leaves and making it possible to lift them sufficiently high up. The extension bars 11 and 12 are rigidly attached to the rest of the door leaf, i.e., to its door part 10, and their length H5 is at least as great as the height H1, H2 of the door leaves. The length H5 of the extension bars of the outer door leaf 2 can be as great as the distance from the outer edge 24 of the driving ramp 4 in its closing position Kr to the range of travel below the base structures of the wagon chassis 19, at the maximum, although in practice, this length H5 can mostly be as great or slightly shorter than the distance M from the outer edge 24 of the driving ramp 4 in the closing position Kr to the lower surface of the base structures of the wagon chassis 19. Typically, the thickness of the extension bars 11, 12 is the same as the thickness S1, S2 of the door leaf 1, 2, and the width W2 in the transverse direction of the wagon as small as possible; however, the extension bars should bear the forces exerted on them with sufficiently small deformation only. Typically, the width W2 of the extension bars is within two times - a half of the thickness S1, S2 of the door leaves. Thus, the door leaves 1, 2 are a combination of the plate-like door parts 10, which have the heights H1 and H2, correspondingly, and preferably widths W1 of equal sizes, and the extension bars 11, 12 that extend downwards from these door parts; i.e., to a certain extent, the door leaves resemble the letter U turned upside down, with the portion that connects its legs and corresponds to the door part mentioned above being essentially widened. It should be noted that the heights H1, H2 and the upper edges 21a, 22a and the lower edges 21b, 22b of the door leaves refer to the heights, the upper edges and the lower edges of the door parts 10, and that the door parts 10 in particular are the parts of the door leaves that close the door opening 20.

[0021] Provided on the opposite vertical edges 8a, 8b of each door leaf, there are guide rollers, which are not dependent on the other door leaves, and which are marked with a general reference number 5 and, when needed, with reference numbers 5a-5d, which specify the places of the guide rollers. For these guide rollers, there are vertical guide means comprising linear guide rails 3_{1a}, 3_{1b}; 3_{2a}, 3_{2b} on the sides of the door opening, the guide rollers 5 bearing on the guide rails, for directing the door leaves 1, 2 past each other, maintaining their upright positions. The upper guide rollers 5a, 5b of the guide rollers are located in the area of the upper ends 6a of the extension bars 11, 12 of the door leaves, i.e., near the lower edges 21b, 22b of the actual door leaves. Typically, each door leaf 1, 2 has four guide rollers 5a-5d, but there are no obstacles for placing even more guide rollers in the door leaf. The rotation axis lines 15a of the guide rollers 5 can be perpendicular to the door leaves, as shown in Fig. 7. However, it is more preferable to arrange the rotation axis lines 15b of the guide

rollers parallel with the door leaves, as shown in Fig. 6. The lower guide rollers 5c, 5d are located at the lower ends 6b of the extension bars. The guide rollers are on the length of these extension bars 11 and 12, making it possible to locate the door parts 10 of the door leaves above the door opening without having to lift the guide rails 3_{1a}, 3_{1b}; 3_{2a}, 3_{2b} outside or above the cover 18; instead, the outer surface of the cover determines the range of travel of the wagon for this part. Accordingly, the guide rails can extend from the level of the outer surface of the closed cover 18 to the range of travel below the base structures of the wagon chassis 19 or, typically, to the lower surfaces of the base structures of the wagon chassis 19, and the length of the guide rails is H6. In principle, shorter guide rails can be used, but it is of no use. In the open position Ao of the door leaves, the upper guide rollers 5a, 5b have transferred upwards Du with them so that they bear on the upper ends of the guide rails and the lower guide rollers bear on the guide rails lower down. In the closed position Ko of the door leaves, the lower guide rollers 5c, 5d of the outer door leaf 2 have moved downwards Da with them so that they bear on the lower ends of the guide rails and the other guide rollers are located within the length H6 of the guide rails. Within these limits, the distances between the upper and the lower guide rollers can be maximized. In the case of Fig. 6, door edge seals 28a take care of that the guide rollers 5 travel being pressed against the guide rails 3_{1a}, 3_{1b}; 3_{2a}, 3_{2b}; in other words, the leg of the guide rail presses between the guide rollers and the door edge seal, whereby the door leaves are not allowed to move during the opening or closing of the door, to a disturbing extent, in the direction of their thickness S1, S2. In the case of Fig. 7, the guide rollers 5 have concave rolling surfaces, which move along the edge of the guide rail, preventing the movement of the door leaves in the direction of their thickness S1, S2.

[0022] The driving ramp 4 that belongs to the door assembly according to the invention is pivoted on the wagon chassis 19 to be turned around a horizontal pivot line 14. By means of swinging motions, the driving ramp 4 can thus be lowered into a drive-over position Ar and lifted up into a vertical closing position Kr that corresponds to the closed position Ko of the door leaves, the driving ramp closing the lower part of the door opening 20. The outer edge 24 of the driving ramp 4 in its closing position Kr is at least partly aligned with the outer door leaf 2, as shown in Fig. 8C. In that case, it is preferable to have a projection 26, such as a leg of a profile, provided on the lower edge 22b of the outer door leaf, against which the outer edge of the driving ramp - through the lower seal described hereinafter - and the upper surface 25a of the driving ramp in particular turn into the essentially vertical closing position Kr after the door leaves have first been lowered into their closed position Ko. It is also possible to arrange the order of operation of the driving ramp and the door leaves in some other way, whereby the driving ramp 4 is first turned into

its vertical closing position Kr so that its outer edge is located towards the inner parts 30 of the wagon from the level of the outer door leaf, after which, when lowering the outer door leaves into the closed position Ko, the lower edge 22g of the outer door leaf presses against the outer edge of the driving ramp and against the lower surface 25b of the driving ramp in particular. For example, in Fig. 8C, the outer edge 24 of the driving ramp would be somewhat to the left and the lower edge of the door leaf would be so much lower that it would extend to the portion of the lower surface 25b of the driving ramp which is shown in the figure. When the driving ramp has been lowered to its approximately horizontal drive-over position Ar, it extends all the way to the driving ramp of the adjacent wagon or to the edge of the loading platform of the railway station, and possibly bears on them and/or the buffers of the wagon, whereby a car, a forklift truck or the like can be driven along the driving ramp into the railway transport wagon and out of there. In its closing position Kr, the driving ramp 4 is again mainly vertical.

[0023] The operation mechanism 16, 7 of the door assembly comprises vertically moving means 7, such as chains 31 that travel through chain wheels 32, or screw rods or the like, and a horizontal projection 17, such as a piece of plate rigidly attached to the chain 31, a piece of plate that is attached to a nut part on the screw rod, or the like, which is connected to the moving means 7, in this case, the chain 31 and which extends along the measure of the thickness S1 and S2 of the door leaves and below the door parts 10 of the door leaves. The moving means 7 are located on the sides of the door opening 20 adjacent to the extension bars 11, 12 and the guide rails 3_{1a}, 3_{1b}; 3_{2a}, 3_{2b}. The operation mechanism preferably further comprises electrically driven and controlled or, alternatively, hydraulically or pneumatically driven and controlled source of power 16, which is coupled to the moving means 7. The coupling comprises a gear, which is connected to the chain wheels by a rod. The sources of power and the said coupling can be of any new or known type; therefore, they are not described in detail. When the projection 17 under the effect of the source of power moves upwards Du with the chain, it reaches the lower edge 21b, 22b of the respective door leaf 1, 2; in other words, first, the lower edge 22b of the outer door leaf 2 then the lower edge 21b of the inner door leaf 1, and lifts the door leaves upwards to their open position Ao. The action is reversed with the projection moving downwards Da, whereby the projection 17 lowers the door leaves; in other words, first, the inner door leaf 1, supporting it at its lower edge 21b, and then the outer door leaf 2, supporting it at its lower edge 22b, to its closed position Ko. It is also possible to arrange the moving means in contact with the outer door leaf 2 only, whereby the stop at its lower edge, extending to the thickness of the inner door leaf 1, upon reaching the lower edge of the inner door leaf, also lifts the latter upwards into the open position

and lowers it in a reversed manner. The driving ramp 4 can be turned up to the closing position and lowered to the drive-over position either by using the same source of power 16 than the door leaves or some other suitable source of power. In this way, the door leaves 1, 2 and the driving ramp 4 are moved between the open position/drive-over position Ao&Ar and the closed position/closing position Ko&Kr. The operation mechanism is controlled by means of on/off switches and the operation mechanism receives the position data of the door leaves either from limit switches or a revolution counter integrated with the motor.

[0024] The mutual sealing of the door leaves, the sealing between the door leaves and the wagon chassis, the sealing between the door leaves and the driving ramp, and the sealing between the driving ramp and the wagon chassis are implemented by a centre seal 23, an upper seal 13, and door edge seals 28a, a lower seal 35, and ramp edge seals 28b. For this purpose, first, the first part 13a of the upper seal 13 extending from the upper edge 21a of the inner door leaf 1 to the end wall section is attached to the upper edge, and the second part 13b of the upper seal extending to the door leaf is attached to the lower edge 29 of the end wall section 9 of the cover. Furthermore, the first part 23a of the centre seal 23 extending to the outer door leaf 2 is attached to the lower edge 21b of inner door leaf 1, and the second part 23b of the centre seal extending to the door leaf is attached to the upper edge 22a of the outer door leaf. In this way, the upper seal 13 and the centre seal 23 both comprise two parts 13a, 23a and 13b, 23b, which allow the movement of the door leaves with respect to each other and the movement of the inner door leaf with respect to the end wall section. These parts 13a, 23a; 13b, 23b of the upper and the centre seals at least substantially comprise horizontal, ribbon-like pieces, which are of a flexible and elastic material, as shown in Figs. 8A and 8B. The lower edge 22b of the outer door leaf 2 is provided with the lower seal 35, on which the upper surface 25a of the driving ramp is sealed, as shown in Fig. 8C and described above, or which is sealed on the lower surface 25b of the driving ramp in the way mentioned previously. In the preferred embodiment shown by the figures, this lower seal is a hollow seal of elastic material, which is attached to the projection 26 of the lower edge 22b of the door part 10 of the door leaf, and which yields elastically under the effect of the compression of the upper surface 25a of the driving ramp, which at least on this spot is smooth and near the outer edge 24. Between the end wall section and the inner door leaf, there is interleaving that extends to the extent of the sealing dimension T1; between the inner door leaf and the outer door leaf, there is interleaving that extends to the extent of the second sealing dimension T2; and between the outer door leaf and the driving ramp, there is interleaving that extends to the extent of the third sealing dimension T3, enabling the use of the effective seals described above. On both vertical edges 8a, 8b of both

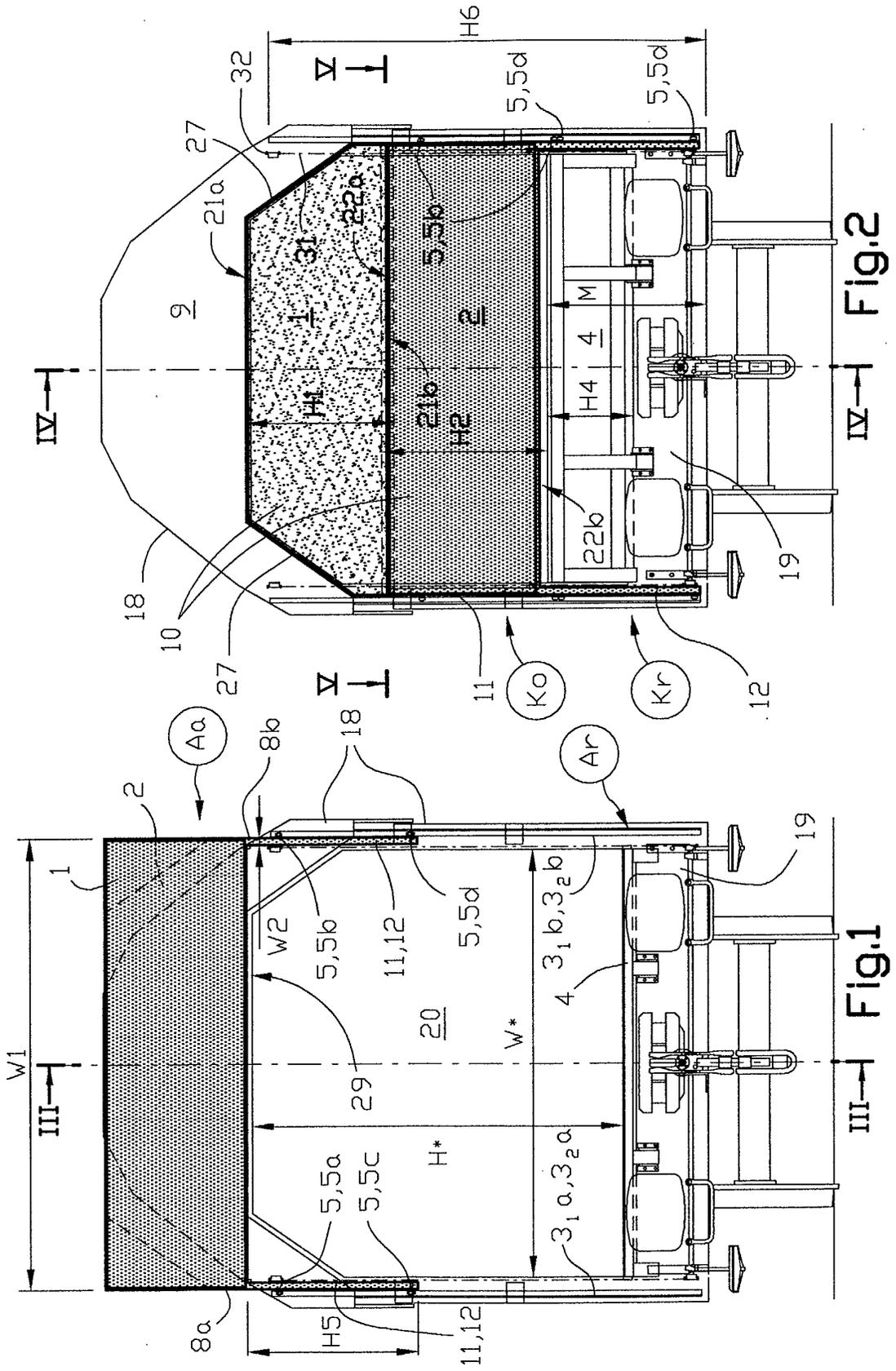
door leaves, there are door edge seals 28a, which extend at least to the height H1, H2 of the door leaves, i. e., at least to the height of the door parts 10, and which are pressed against the guide rails 3_{1a}, 3_{1b}; 3_{2a}, 3_{2b}. As the door edge seals 28a are parallel with the direction of movement Du, Da of the door leaves, they slide without effort along the guide rails, when the door leaves are lifted and lowered. The lower seal 35 on the lower edge of the outer door leaf preferably extends from above from the corner between the door part 10 and the extension bars 12, and in the form of ramp edge seals 28b downwards along these extension bars 12 of the second door leaf. The upper surface 25a of the driving ramp 4, which at least on this spot is smooth and near the side edges of the driving ramp, which are transverse to its outer edge 24, presses the ramp edge seals 28b, which are of the hollow seal type, forming an effective sealing also on these spots.

Claims

1. A door assembly in a railway transport wagon, comprising a chassis (19) and a cover (18) with a door opening (20) having a height (H*), the door assembly comprising at least door leaves (1, 2), which have vertical dimensions smaller than said height of the door opening, and which can be moved by means of guide rollers (5) along guide means located on the sides of the door opening and being at least partially vertical, between a closed position (Ko) and an open position (Ao) above the door opening, **characterized in that** the said door assembly forms the end doors of the railway wagon, which doors are adapted to be opened and closed while the railway wagons are connected to each other sequentially or are apart from each other; and that in the door assembly:
 - the door leaves (1, 2) are vertical and parallel and spaced apart from each other by a second distance (G2), which is perpendicular to the door leaves;
 - guide rollers (5), which are independent of the other door leaves, are provided on the opposite vertical edges (8a, 8b) of each door leaf; and that
 - the guide means are linear guide rails (3_{1a}, 3_{1b}; 3_{2a}, 3_{2b}) for guiding the door leaves past each other, maintaining their vertical position.
2. A door assembly according to Claim 1, **characterized in that** it further comprising a driving ramp (4), which can be lowered around a horizontal pivot line (14) into a drive-over position (Ar) and lifted into a vertical closing position (Kr), which corresponds to the closed position (Ko) of the door leaves and in which the driving ramp closes the lower part of the door opening (20).
3. A door assembly according to Claim 2, **characterized in that** it comprising two door leaves (1, 2) having heights (H1, H2), which when added up with a length (H4) of the driving ramp (4), exceeds the height (H*) of the door opening to the extent of sealing dimensions (T1, T2, T3).
4. A door assembly according to Claim 1, **characterized in that** the guide rollers (5) have rotation axis lines (15a), which are perpendicular to the door leaves, or alternatively parallel with the door leaves; and that each door leaf (1, 2) is provided with four guide rollers (5a-5d).
5. A door assembly according to Claim 4, **characterized in that** the door leaves further comprise downward-pointing extension bars (11, 12) on the vertical edges (8a, 8b) thereof; and that two of said guide rollers (5a, 5b) are located in the area of the upper ends (6a) of said extension bars, and two of said guide rollers (5c, 5d) are located on the lower ends (6b) of said extension bars.
6. A door assembly according to Claim 1, **characterized in that** an operation mechanism (16, 7) comprises a horizontal projection (17), which is connected to vertically moving means (7), and which extends along *thickness (S1 and S2) of the door leaves, whereby said projection, when moving upwards (Du) and reaching a lower edge (21b, 22b) of the respective door leaf (1, 2), lifts the door leaf upwards along with it into their open position (Ao) and, in reverse, when moving downwards (Da), lowers the door leaves into their closed position (Ko).
7. A door assembly according to Claim 1 or 2 or 6, **characterized in that** the outer one of said door leaves (2) in its closed position (Ko) is lower than the inner one of said door leaves (1) in its closed position (Ko); and that the door leaves in their open positions are substantially side by side as viewed in the horizontal direction.
8. A door assembly according to Claim 7, **characterized in that** a first part (13a) of an upper seal (13) extending to an end wall section (9) of the cover is attached on an upper edge (21a) of the inner door leaf (1), and a second part (13b) of the upper seal extending to the door leaf is attached on a lower edge (29) of the end wall section.
9. A door assembly according to Claim 7 or 8, **characterized in that** a first part (23a) of a centre seal (23) extending to the outer door leaf (2) is attached on a lower edge (21b) of the inner door leaf (1), and a second part (23b) of the centre seal extending to

the door leaf is attached on an upper edge (22a) of the outer door leaf.

10. A door assembly according to Claim 2, 8 or 9, **characterized in that** an outer edge (24) of the driving ramp (4) in its closing position (Kr) is either partly aligned with the outer door leaf (2) or from there towards inner parts (30) of the wagon. 5
11. A door assembly according to Claim 10, **characterized in that** a lower edge (22b) of the outer door leaf (2) is provided with a lower seal (35), on which an upper surface (25a) of the driving ramp is sealing; and that the extension bars (12) of the outer door leaf are provided with ramp edge seals (28b), which extend downwards from above, and on which the upper surface (25a) of the driving ramp is sealing. 10
15
12. A door assembly according to any of the preceding Claims, **characterized in that** both vertical edges (8a, 8b) of each door leaf are provided with door edge seals (28a), which extend at least to the height (H1, H2) of the door leaves. 20
25
13. A door assembly according to Claim 6, **characterized in that** said operation mechanism comprises an electrically driven and controlled power source (16) for moving the door leaves (1, 2) and the driving ramp (4), on the one hand, between an open position resp. a drive-over position (Ao & Ar) and, on the other hand, a closed position resp. a closing position (Ko & Kr). 30
35
40
45
50
55



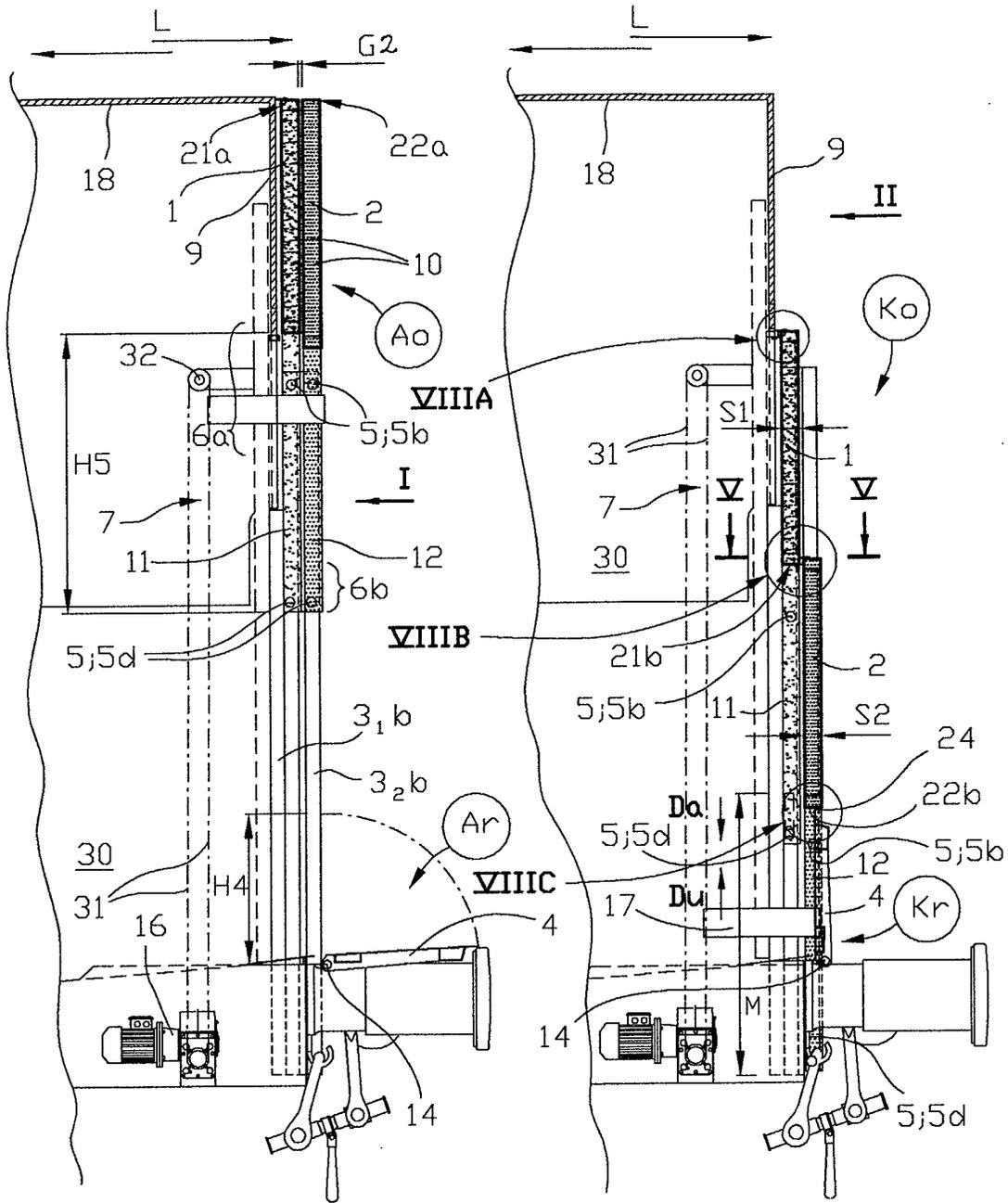
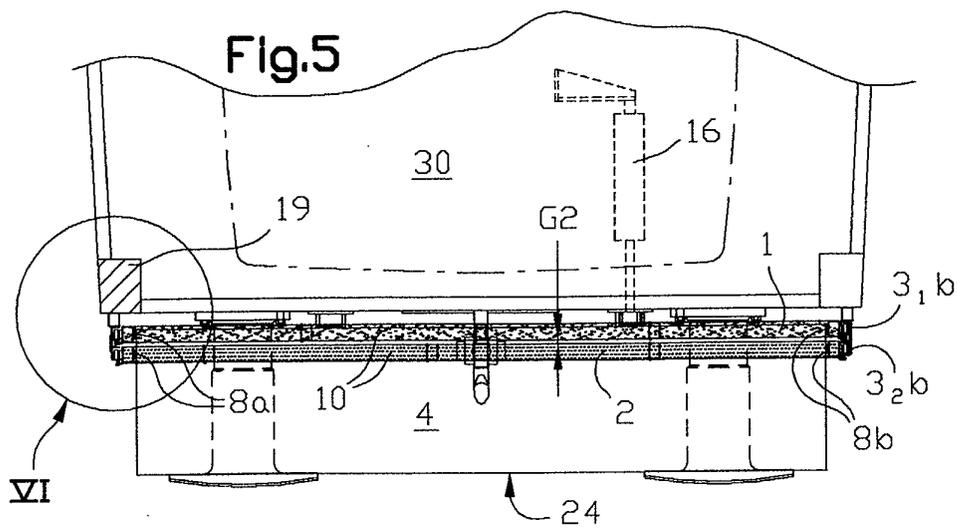
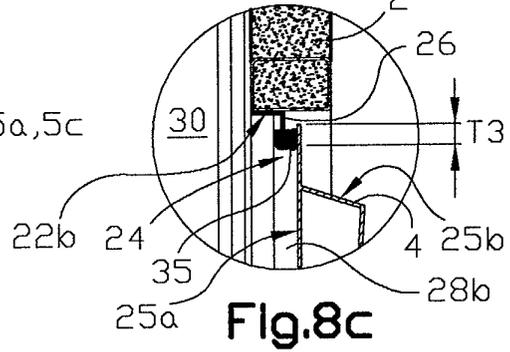
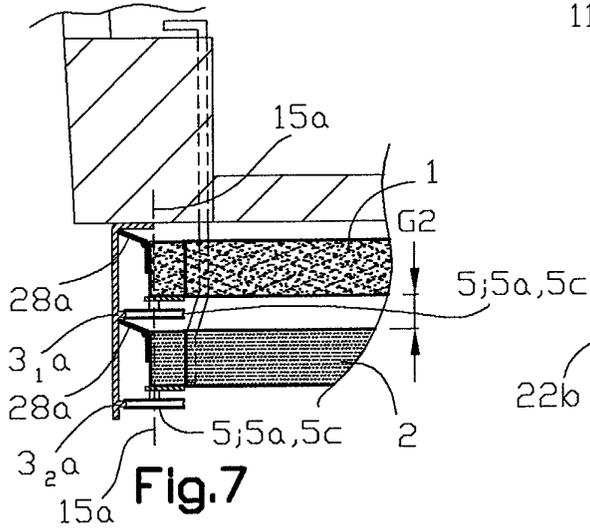
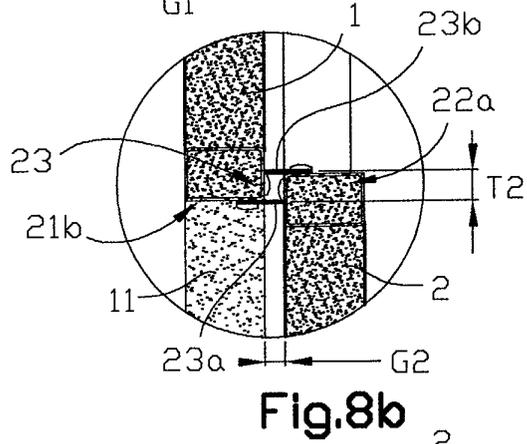
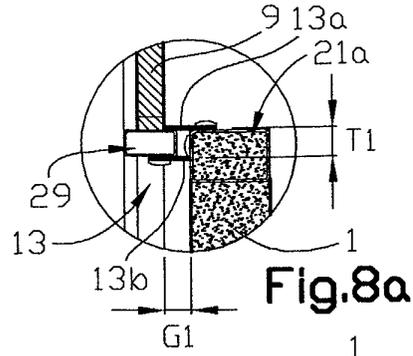
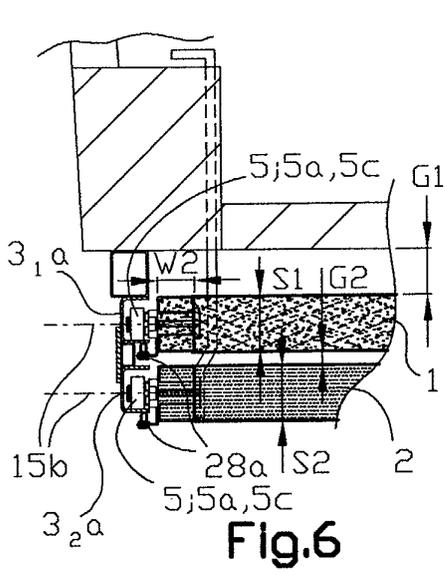


Fig.3

Fig.4





European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 39 6069

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)
X	US 3 977 123 A (CLAY JR ROY T ET AL) 31 August 1976 (1976-08-31) * column 3, line 28 - column 6, line 53; figures 1-5 *	1	B61D19/00 B61D3/18 B61D17/06
A	-----	3-6	
A	US 3 687 186 A (PATON HAMILTON NEIL KING) 29 August 1972 (1972-08-29) * column 2, line 30 - column 5, line 3; figures 1-7,11 *	1-4,7-9, 11-13	
A	-----		
A	US 3 191 547 A (ADLER FRANKLIN P) 29 June 1965 (1965-06-29) * column 2, line 52 - column 7, line 13; figures 1-20 *	1-4,8,9, 11,12	
A	-----		
A	US 3 516 366 A (BRADFORD DUDLEY M ET AL) 23 June 1970 (1970-06-23) * column 2, line 26 - column 3, line 2; figures 1-3 *	1,2	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B61D B60J E05D E05F
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	4 September 2002	Chlosta, P	
CATEGORY OF CITED DOCUMENTS		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	
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			

EPO FORM 1503 03/82 (P04001)

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

EP 02 39 6069

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.

04-09-2002

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 3977123	A	31-08-1976	NONE	
US 3687186	A	29-08-1972	CA 930614 A1	24-07-1973
			CA 957903 A2	19-11-1974
			DE 2007268 A1	12-11-1970
			FR 2046256 A5	05-03-1971
			GB 1296516 A	15-11-1972
			JP 49034922 B	18-09-1974
			SU 566515 A3	25-07-1977
			US 3792667 A	19-02-1974
US 3191547	A	29-06-1965	NONE	
US 3516366	A	23-06-1970	NONE	

EPO FORM P0459

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