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(54) **Straddle carrier**

(57) The invention concerns a straddle carrier, which comprises a portal body (11), to which belong essentially vertical supporting pillars (13a, 13b), and an upper body (15) connecting them at the top and to which are mounted the necessary hoisting devices for hoisting and supporting containers (1, 2). On each side of the straddle carrier (10) at the lower end of the supporting pillars (13a, 13b) there are wheels (12) carrying the portal body (11), and in between both front and rear supporting pillars (13a, 13b) the straddle carrier's (10) transverse hoisting beams (20) are arranged for movement in the vertical direction

as well as the necessary means for gripping containers (1, 2). The means for gripping containers (1, 2) comprise two container spreaders (16a, 16b), which are suspended from the hoisting beams (20) and are arranged in parallel in relation to the straddle carrier's (10) driving direction. The hoisting devices for hoisting and supporting containers (1, 2) comprise one common hoisting mechanism (18), which is connected through hoisting ropes (28a, 28b) or other such hoisting means to the hoisting beams (20) for handling parallel containers (1, 2) at the same time.

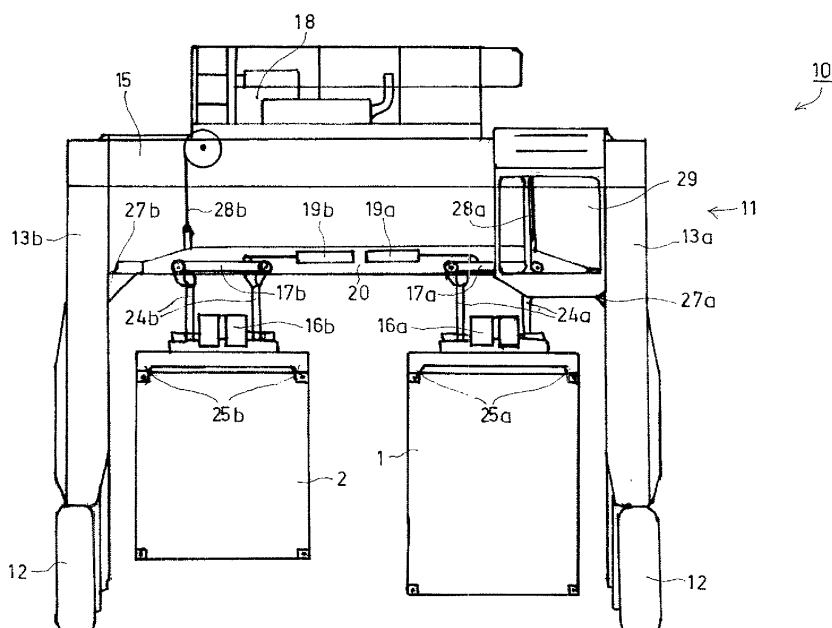


FIG. 2

Description

[0001] The invention is related to the handling of containers in ports and terminals, especially with the aid of a so-called straddle carrier system. In greater detail, the invention concerns a straddle carrier, to which belong a portal body comprising essentially vertical supporting pillars and an upper body connecting them at the top and resting on which are mounted necessary hoisting devices for hoisting and supporting containers, and on each side of the straddle carrier at the bottom end of the supporting pillars there are wheels carrying the portal body, whereby in between both the front and the rear supporting pillars there are arranged the straddle carrier's transverse hoisting beams movable in the vertical direction as well as the necessary means for gripping the containers.

[0002] The invention thus is to do with the moving and transporting of freight with the aid of containers. The freight goods are transported conveniently in containers from the dispatcher/manufacturer of the goods directly to the buyer/recipient without any special intermediate stages. When transportation distances are long, the critical points of the transportation are located at those points where the manner of transporting the containers changes, such as in ports, where great quantities of containers are to be unloaded, placed in intermediate storage and reloaded for another mode of transportation. In ports the aim is to achieve as short loading/unloading times as possible, because it is expensive to have ships stay at the quayside and it will be even more expensive if the loading/unloading is delayed for some reason, thus causing the ship to be late in her scheduled line service. If a ship has to catch up for lost time on her line of service, she will have to use a higher and more uneconomical travelling speed, whereby her fuel consumption and costs will be higher than calculated. Thus, loading and unloading the ship must take place as quickly as possible and without any additional delays and disturbances.

[0003] For loading and unloading ships in ports they use a port crane, which lifts the containers either directly from trailers pulled by a vehicle or from under the crane, where they have been brought, for example, by a straddle carrier or by a transporting carrier, and it moves the containers into a ship or the other way round, that is, it moves the containers from the ship on to trailers or to a place under the crane for removal by a straddle carrier or by a transporting carrier. In the straddle carrier system, the straddle carrier or transporting carrier thus usually transports containers between the port crane and a storage area. Container cranes for their part are devices of a big size, and due to their big size it is a difficult and slow process to move them during these work rotations. When containers are moved directly on to a trailer or from a trailer, the port crane can handle only one container at a time. When using a straddle carrier system such solutions have already been developed, where the port crane is able to handle or hoist two containers at a time, so that the containers are located in parallel while being hoisted.

When a ship is unloaded, the port crane leaves the containers side by side under the crane waiting for transportation. Correspondingly, when loading, the containers must be left precisely in parallel under the crane, so that the port crane can pick them both up in one go. Until now it has not been possible with straddle carriers or, correspondingly, with transporting carriers to handle two parallel containers at the same time, for which reason it has not been possible to benefit fully from the port crane's possibility to handle two containers.

[0004] The straddle carrier should have a structure that is as favourable as possible for the development in the other environment and in equipment relating to the environment. In order to achieve this objective as well as other objectives emerging from the description of the invention, the invention is mainly **characterized in that** the means for gripping the containers comprise two container spreaders, which are suspended from hoisting beams and are arranged in parallel in relation to the straddle carrier's driving direction, and that the hoisting devices for hoisting and supporting the containers comprise one common hoisting mechanism, which is connected through hoisting ropes or other such hoisting means to the hoisting beams for handling parallel containers at the same time.

[0005] Side transfer carriages, from which the container spreaders are suspended in a manner allowing their height difference, are mounted for the container spreaders to the hoisting beams of the straddle carrier for movement along the hoisting beams. The side transfer carriages are equipped with actuators, which are used for separately transferring the side transfer carriages and the container spreaders suspended from these in order to separate the containers from each other and, correspondingly, to move them closer towards each other.

[0006] The hoisting beams are suitably supported in the horizontal plane direction on the straddle carrier's supporting pillars for movement in the vertical direction. The hoisting beams are preferably supported at both their ends on the straddle carrier's supporting pillars through slide shoe structures allowing the movement in the vertical direction.

[0007] The points where the hoisting ropes are attached to the hoisting beams are preferably arranged in the area of the hoisting beams' ends in order to allow handling of one container at a time.

[0008] The straddle carrier may be a piling straddle carrier or a low transporting carrier equipped with longitudinally controlled container spreaders for handling containers of different measurements. The straddle carrier's container spreaders may be twin-spreaders, whereby it is possible for the straddle carrier to handle four containers at the same time.

[0009] The invention provides significant advantages in comparison with the state of the art. Prominent among these advantages is, for example, the considerably better efficiency, because in the straddle carrier system according to the invention it is possible to transport and corre-

spondingly to pile on the storage area two containers in parallel at the same time. The achieved savings especially in energy and operator costs are significant. At the same time the storage density increases, because no driving lane need now be left for the straddle carrier's wheels in between every container row, but instead in between every second container row. Other advantages and characteristic features of the invention will emerge hereinafter from the following detailed description of the invention.

[0010] In the following, the invention will be described by way of example by referring to the figures in the appended drawing.

[0011] Figure 1 is an overall view from one side of the straddle carrier according to the invention.

[0012] Figure 2 is a corresponding view from the front of the straddle carrier shown in Figure 1.

[0013] In the figures of the drawing, the general reference number 10 indicates the straddle carrier. The straddle carrier 10 comprises a portal body 11, to which belong essentially vertical supporting pillars 13a, 13b, 14a, 14b and an upper body 15 connecting them at the top. On each side of straddle carrier 10 at the lower end of supporting pillars 13a, 13b, 14a, 14b there are wheels 12 supporting the portal body 11. The operator's cabin of straddle carrier 10 is indicated by reference number 29 in the figures. As illustrated in the figures of the drawing, especially in Figure 2, the basic features of straddle carrier 10 are preserved in the straddle carrier structure according to the invention, but the portal body 11 of the straddle carrier 10 according to the invention is made essentially wider than in state-of-the-art solutions in such a way that in between the body's supporting pillars 13a, 13b, 14a, 14b it has been possible to fit in two parallel container spreaders 16, 16a, 16b, whereby it is possible with the straddle carrier 10 to handle parallel containers at the same time. The figures of the drawing show a low so-called transporting carrier, but it is quite obvious that a similar structure can also be applied to high piling carriers.

[0014] To the upper body 15 of the straddle carrier's 10 portal body 11 a hoisting mechanism 18 is mounted, which is shown entirely schematically and which is connected, for example, by ropes 28a, 28b to transverse hoisting beams 20, which are located in between the front and correspondingly rear supporting pillars 13a, 13b, 14a, 14b and from which the container spreaders 16, 16a, 16b are suspended. Figure 2 shows only the foremost hoisting beam 20 located in between the foremost supporting pillars 13a, 13b, but it is obvious that a similar hoisting beam 20 is also mounted in between the rear-most supporting pillars. In the solution according to the invention, two container spreaders 16a, 16b are mounted to rest on the hoisting beams 20 in parallel in relation to the straddle carrier's 10 driving direction, and these container spreaders are thus moved in the height direction (hoisted and lowered) with the aid of a common hoisting mechanism 18.

[0015] The hoisting beams 20 thus extend in the straddle carrier's 10 transverse direction, and in order to support them horizontally there are slide shoe structures 27a, 27b or corresponding guides arranged in between the hoisting beams 20 and the supporting pillars 13a, 13b, 14a, 14b, whereby the hoisting beams 20 get their required guidance from said supporting pillars 13a, 13b, 14a, 14b. Slide shoe structures 27a, 27b or other such structures are used in connection with both the front 13a, 13b and the rear 14b supporting pillars. It can also be advantageous to use the slide shoe structures 27a only on one side of the straddle carrier 10, while on the other side the support of the hoisting beams 20 on the supporting pillars 13b, 14b may be more free in the side direction. Especially when lifting heavy loads any bending of the structures will not hereby cause any jamming between the hoisting beams 20 and the supporting pillars 13a, 13b, 14a, 14b. Each hoisting beam 20 is connected by hoisting ropes 28a, 28b to a hoisting mechanism 18 resting on the upper body 15 and with the aid of which the hoisting movement is implemented. It is advantageous to arrange the points of attachment of the hoisting ropes 28a, 28b to the hoisting beams 20 close to the ends of the hoisting beams 20, whereby it is possible for the straddle carrier 10 to handle only one container at a time. The hoisting mechanism is not described in greater detail in this context and it may be, for example, of a structure and operation as those described in the applicant's earlier FI Patent 107142.

[0016] Side transfer carriages 17a, 17b are mounted for parallel container spreaders 16a, 16b on the transverse hoisting beams 20, so that there are two of them both in the front and in the rear hoisting beam 20. The side transfer carriages 17a, 17b are mounted to rest on the hoisting beams 20 so that they can be moved in the straddle carrier's 10 transverse direction. The side transfer carriages 17a, 17b are equipped with actuators, for example, with the hydraulic cylinders 19a, 19b shown in Figure 2 or with corresponding equipment. Actuators of other types may also be used, and an electric drive (for example, a combination of an electric motor and a chain transmission) can be mentioned as a possible solution. The container spreaders 16a, 16b are suspended from the side transfer carriages 17a, 17b with the aid of suitable suspending means 24a, 24b, for example, with the aid of chains and suitable guides or other such in such a way that the container spreaders 16a, 16b can move in the vertical direction in relation to each other. Hereby, when parallel containers 1, 2 are handled, they need not be of the same height, as the figures in the drawing show clearly. If adjacent containers 1, 2 are of different height as shown in the figures (for example, 8' and 9½'), then when picking up containers the container spreader 16a will first hit the higher container 1, whereby it must be possible to lower the container spreader 16b even further in order to grip the lower container 2. The suspension means 24a, 24b allow this until a determined limit.

[0017] Thus, the side transfer carriages 17a, 17b can

be moved in the transverse direction along the hoisting beams 20 with the aid of their actuators 19a, 19b. With the aid of said side transfer carriages 17a, 17b it is possible to separate adjacent containers 1, 2 from each other when required.

[0018] In the figures of the drawing, reference marks 25, 26, 25a, 25b indicate the container spreaders' 16, 16a, 16b hoisting shanks, with which the containers 1, 2 are gripped at the upper corners of the containers. The container spreaders 16, 16a, 16b themselves are longitudinally controlled in such a way that they can be used for handling at least the 20' - 45' containers in use today. Containers located in parallel need not even be of equal length, but the straddle carrier 10 can be used for parallel handling of even 20' and 45' containers at the same time. Although it is not shown in the figures, as container spreaders 16, 16a, 16b it is also possible to use so-called twin-spreaders, which are equipped with middle shanks in addition to the hoisting shanks located at the ends. With one such twin-spreader it is possible at the same time to lift and move two 20' containers located one behind the other, whereby the straddle carrier 10 according to the invention when equipped with such container spreaders is able to handle four 20' containers in one go.

[0019] In the foregoing, the invention was described by way of example with reference to the figures in the appended drawing. However, the invention is not limited to concern only the examples shown in the figures, but different embodiments of the invention may vary within the scope of the inventive idea defined in the appended claims.

Claims

1. Straddle carrier, which comprises a portal body (11), to which belong essentially vertical supporting pillars (13a, 13b, 14a, 14b), and an upper body (15) connecting them at the top and to which are mounted necessary hoisting devices for hoisting and supporting containers (1, 2), and on each side of the straddle carrier (10) at the lower end of the supporting pillars (13a, 13b, 14a, 14b) there are wheels (12) supporting the portal body (11), whereby in between both the front and the rear supporting pillars (13a, 13b, 14a, 14b) there are arranged the straddle carrier's (10) transverse hoisting beams (20) movable in the vertical direction as well as the necessary means for gripping the containers (1, 2), **characterized in that** the means for gripping the containers (1, 2) comprise two container spreaders (16a, 16b), which are suspended from the hoisting beams (20) and are arranged in parallel in relation to the straddle carrier's (10) driving direction, and that the hoisting devices for hoisting and supporting containers (1, 2) comprise one common hoisting mechanism (18), which is connected through hoisting ropes (28a, 28b) or other such hoisting means to the hoisting beams (20)

in order to handle parallel containers (1, 2) at the same time.

2. Straddle carrier according to claim 1, **characterized in that** side transfer carriages (17a, 17b) for the container spreaders (16a, 16b) are mounted on the hoisting beams (20) for movement along the hoisting beams (20), from which carriages the container spreaders (16a, 16b) are suspended in a manner allowing their height difference.
3. Straddle carrier according to claim 2, **characterized in that** the side transfer carriages (17a, 17b) are equipped with actuators (19a, 19b), by which the side transfer carriages (17a, 17b) and the container spreaders (16a, 16b) suspended from them can be moved separately in order to separate the containers (1, 2) from each other and, correspondingly, to move them closer towards each other.
4. Straddle carrier according to some preceding claim, **characterized in that** the hoisting beams (20) are supported in the horizontal plane direction on the straddle carrier's (10) supporting pillars (13a, 13b, 14a, 14b) for moving in the vertical direction..
5. Straddle carrier according to claim 4, **characterized in that** the hoisting beams (20) are supported at both their ends on the straddle carrier's (10) supporting pillars (13a, 13b, 14a, 14b) through slide shoe structures (27a, 27b) allowing movement in the vertical direction.
6. Straddle carrier according to some preceding claim, **characterized in that** the points of attachment of the hoisting ropes (28a, 28b) to the hoisting beams (20) are arranged in the area of the hoisting beams' (20) ends in order to allow handling of one container at a time.
7. Straddle carrier according to some preceding claim, **characterized in that** the straddle carrier (10) is a transporting carrier, which is equipped with longitudinally controlled container spreaders (16a, 16b) for transportation of containers of different sizes.
8. Straddle carrier according to claim 1 - 6, **characterized in that** the straddle carrier (10) is a piling straddle carrier, which is equipped with longitudinally controlled container spreaders (16a, 16b) for handling containers of different measurements.
9. Straddle carrier according to some preceding claim, **characterized in that** the container spreaders of the straddle carrier (10) are twin-spreaders (16a, 16b), whereby it is possible with the straddle carrier to handle four containers at the same time.

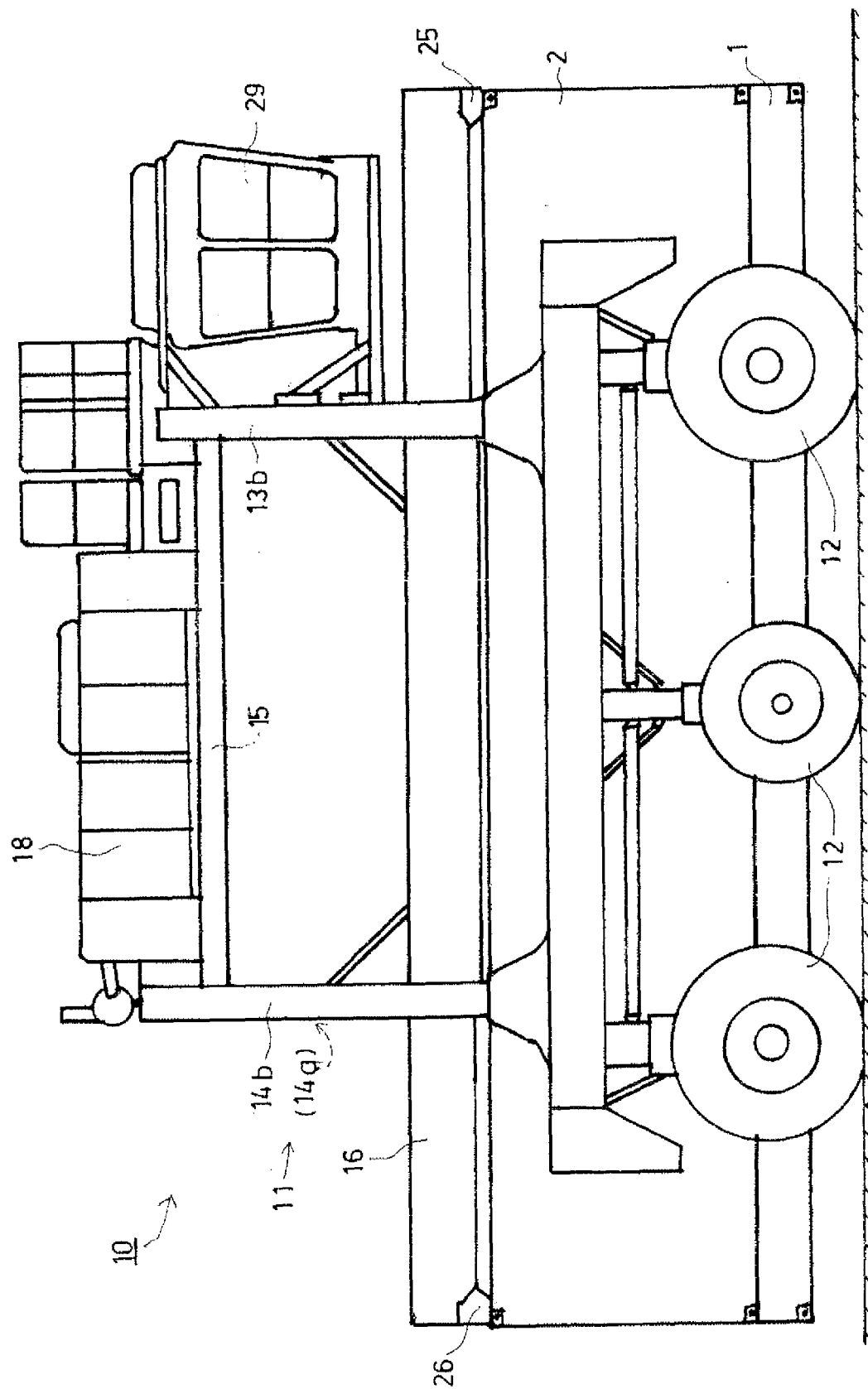


FIG. 1

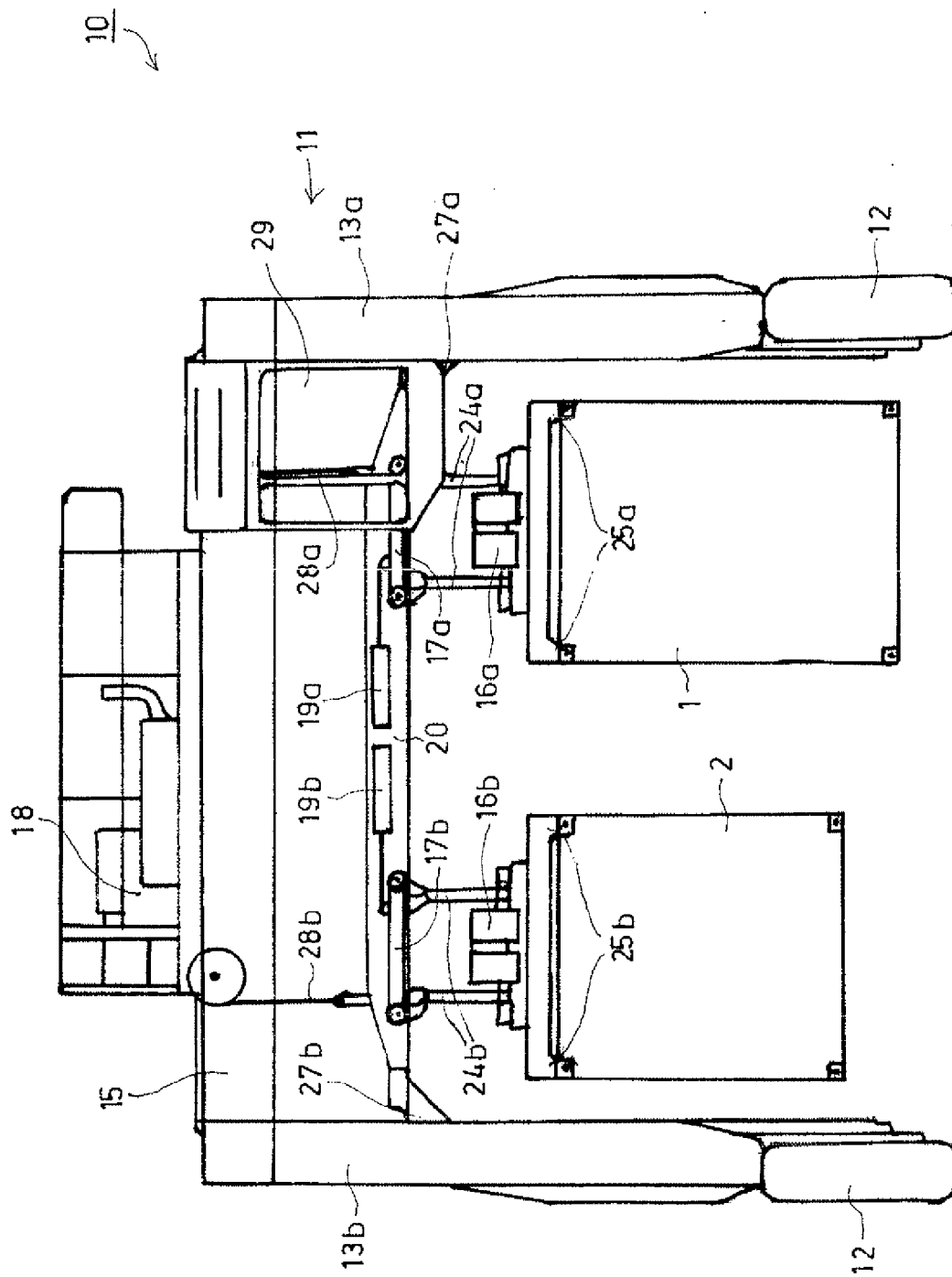


FIG. 2



EUROPEAN SEARCH REPORT

Application Number
EP 09 16 1064

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			B66C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 26 August 2009	Examiner Serôdio, Renato
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

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

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