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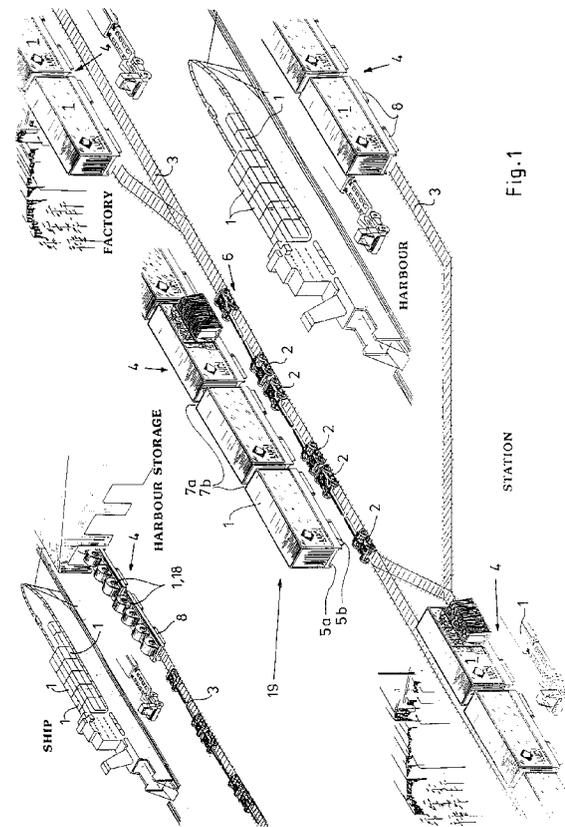
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54 A system for handling a plurality of cargo spaces.

57 A system which comprises at least cargo spaces (1; 18) and rail bogies (2) or wheel-and-axle sets, for handling a plurality of cargo spaces, which cargo spaces are at least at one stage arranged into a line (4) in alignment with a railway track (3) and are raised by the edges (5a, 5b) of the cargo spaces to a distance above the track. The wheels of the train are transferred as a line (6) of bogies (2) or wheel-and-axle sets along the track (3) to beneath the line (4) of cargo spaces (1), each bogie is positioned in the region of a cargo-space end (7a, 7b) or a cargo space (1), and the cargo spaces are lowered to bear on the bogies in order to form a train (19) ready for travel. The train is disassembled into a line of cargo spaces by removing the bogies (2) or wheel-and-axle sets along the track from beneath the cargo spaces.



The invention relates to a system which comprises at least load-bearing cargo spaces and railway bogies or wheel-and-axle sets for handling a plurality of cargo spaces, the cargo spaces being at least at one stage arranged into a line in alignment with the railway track and raised by the edges of the cargo spaces to a distance above the track. The invention relates particularly to the handling of a plurality of cargo spaces, for example, in factories, harbours, shunting yards and other storages, and to the transfer of cargo spaces from one transport mode to another, the modes of transport being marine, rail and road transport.

Systems for transporting, for example, containers both by road and by rail are known *per se*. The most typical such system is the so-called intermodal transport system, in which the cargo space is made up of a truck trailer or semi-trailer, provided with a bogie suitable for road transport. In their most conventional embodiment the wheels or wheel bogies suitable for road transport are fixedly mounted to the cargo space, as for example in publications NO-159523 and EP-264 731. For rail transport such trailers are reversed, one at a time, so that their rear ends come to bear on rail bogies, the front end is left on a support, the end of a second rail bogie is pushed under it, and the next trailer is reversed to the outer end of the same rail bogie, etc. In this arrangement the road wheels have either already been raised, or will be raised, off the rail surface for the duration of rail transport. Thus the assembling of the train takes place one wagon and one bogie at a time, as does the disassembling, but in the reverse order. In this arrangement the assembling and disassembling of a train take a considerable amount of time, and the fixed mounting of the road bogies to the cargo space keeps the price of the unit to be transported high and reduces the useful load.

A modification of this arrangement is disclosed in the publication US 4 665 834, which proposes a train construction in which the bogies are interconnected to each other in advance by push-pull bars, and the trailers with their wheels are lifted on top of the train-chassis parts thus formed and are secured to them. With respect to the useful load this system is as uneconomical as the one described above, since the wheel bogie always accompanies the cargo space. The loading of the train may be somewhat faster than in the former system, since lowering in place is obviously a simpler step than reversing one trailer at a time to the correct point but, on the other hand, a hoist is required for lifting the trailers at the site of loading and unloading.

Patent application FI-895791 describes an arrangement of a type otherwise similar to that first described, i.e. a road trailer is reversed onto a rail bogie, the next rail bogie is pushed into its place, and so forth, one trailer and one bogie at a time. The differ-

ence lies in that, after the formation of the train, the wheel bogies are removed from below the cargo space of the trailer in a direction transverse to the track. Thereby the advantage is achieved that a somewhat greater useful load on rail is obtained, but the assembling and disassembling of the train is just as slow and cumbersome as before. The individual demounting and mounting of the wheel bogies is also time-consuming. A further modification of the described arrangement is disclosed in the publication US-4 685 399, in one embodiment of which the cargo space can be left in place to bear on its frame without wheels, just like a conventional container. In other respects the handling method corresponds to the method implemented in the conventional intermodal transport system, in which a train is formed by arranging alternately and individually cargo spaces and bogies in succession. For lifting such a container to rest on rail bogies or wheel bogies, the transport apparatus must have hoists, which are not mentioned in the publication. In the main the publication describes an arrangement in which the lower side of the container has auxiliary wheels for the transfer of the containers along rails during the disassembling and assembling of the train. Overall, this proposed arrangement has the same disadvantages as were described above.

Publication DE-40 20 387 describes a line of cargo spaces which is placed in alignment with the railway track and in which the cargo spaces are raised by their edges to a distance above the track. This line of cargo spaces is formed by driving them to the site by using a tractor and by aligning them with the track. A train ready for transport is obtained from this line by driving freight wagons each made up of bogies and a flatbed without sides to beneath the line while the wagon frames are raised so that the cargo spaces are off the ground. The cargo-space supports may be fixed, or they may be telescopically retractable in order to achieve the lateral clearance required of a train. The publication relates primarily to locking bars placed on the long sides of the flatbed to secure the cargo spaces to the flatbed for the duration of railway transport. This has the drawback that both the cargo spaces and the flat-beds bear vertical loads, in which case their joint weight is large, thereby reducing the useful load. In addition, the freight wagons are completely fixed conventional units, in which case in shuttle transport the transport of empty wagons takes as much space as that of a loaded train.

The object of the present invention is thus to provide a system for handling cargo spaces so that a cargo space can be transferred rapidly and simply from any one handling step, such as marine transport, storage, rail transport and road transport, to another step. A further object of the invention is this type of system in which the useful load is maximal, in which case only the components necessary for the transport mode concerned are attached to the cargo space at any giv-

en time. Furthermore, it is an object of the invention to provide this type of system in which the utilization rate of each component is maximal, while the investment required by the system is minimal and the operating costs are low. In addition, it is an object of the invention to provide this type of system in which the transfer of the cargo spaces from one transport mode to another or from storage to transport or vice versa takes place without complicated and expensive apparatus, and possibly by using devices in the transport vehicles themselves, and that the various components do not take extra space. A further object is this type of system in which the cargo spaces are suitable for the transportation of many different goods and products and also for being handled with all commonly used transfer apparatuses such as trucks, hoists, etc.

The disadvantages described above can be eliminated and the objects defined above can be achieved with the system according to the invention, which is characterized in what is defined in the characterizing clause of claim 1.

The most important advantage of the invention is that the investment required by the system is smaller than the investment required by prior-art systems, since the most expensive components, such as rail bogies, are needed in shuttle transport in a quantity only about one-half of the number of cargo spaces, since in those situations, such as during waiting time in harbours, in storages, in shunting yards or during loading at the factory, in which it is not necessary to move the cargo space, at least over substantial distances, the cargo space has no wheels. In such situations the cargo space corresponds to a container system and can be loaded, unloaded and handled in the corresponding manner. The assembling of the cargo spaces into a train, when necessary, is rapid and simple, since the conversion is carried out at one and the same time for the entire plurality of cargo spaces, and not one by one as conventionally. Respectively, the conversion of the cargo spaces for road transport takes place in a corresponding manner rapidly and simply. Since there are in connection with the cargo space at no stage wheels or other members which are not used for the function in question, the useful load will be high. When the construction according to the invention is used, shuttle transport is also especially economical, since a train made up only of bogies or the equivalent is short owing to its contractibility.

The invention is described below in detail with reference to the accompanying drawings.

Figure 1 depicts schematically the range of uses of the system according to the invention.

Figure 2 depicts an exploded view of one embodiment of the invention.

Figure 3 depicts an exploded view of another embodiment of the invention.

Figure 4 depicts an exploded view of a third embodiment of the invention.

Figure 5 depicts the transport of rail bogies and cargo space frames according to the invention as a compact entity.

Figure 6 depicts the principle of a road bogie belonging to the system according to the invention.

In the accompanying figures, the same reference numerals have been used for the same parts. Figure 1 shows in principle the scheme of so-called shuttle transport. In it, cargo spaces 1 according to the invention have been left on support legs 8 in a factory shunting yard, a harbour shunting yard, a harbour storage, at a station, and on a ship. In these locations the cargo spaces have no wheels; they constitute independent components, such as container-type closed cargo spaces, flatbed-type cargo spaces, or cargo spaces of other types. These cargo spaces can be handled in the said areas by any known equipment, such as trucks, spider cranes, hoists, or the like. The essential idea in terms of the invention is that, at least at some stage, they are arranged into a line 4 in alignment with a railway track 3, and are in this state raised by their edges to a distance above the rails. They must thus form a cargo-space line 4 corresponding to a train, as shown in Figure 1 and in Figures 2-4. According to the invention, the wheels of the train are transferred to beneath the described line 4 of cargo spaces 1 as a line 6 made up of bogies or wheel-and-axle sets, whereby a train 19, seen in Figure 1, is formed (depicted in the figure as an exploded view). The basic principle thus is that a cargo space with support legs 8 on its edges forms in the area of a railway track 3 a tunnel parallel to it, into which the wheels of the train are pushed as a line 6 of bogies or wheel-and-axle sets along the track 3. Each wheel-and-axle set or bogie is then positioned in the region of a cargo-space end, i.e. in the region of a cargo-space end 7a, 7b, or between the ends of successive cargo spaces, or in the region of a cargo space, for example in the middle of it. The number and location of the bogies 2 or wheel-and-axle sets is, of course, largely determined by the load capacity required and on other design aspects, and it may also consist of a combination of the above-mentioned locations. Next, the cargo spaces 1 are lowered to rest on the bogies or wheel-and-axle sets to form a train 19 ready for travel. According to the invention, this train 19 ready for travel is dismantled into a line of cargo spaces through a chain of action reverse to the chain of action described above, the cargo spaces 1 being first raised off the bogies or wheel-and-axle sets, to rest on the legs 8, whereafter the bogies or wheel-and-axle sets can be removed along the track from beneath the cargo spaces. In this arrangement a cargo space 1 has wheels under it only in those situations in which it is specifically being transported, and at other times it serves as a mere storage space.

In greater detail, the raising and lowering of the cargo spaces 1 are carried out by using a mechanism in the wheels, for example in the bogie 2, the mechanism not being shown in greater detail in the figures, by which mechanism a cargo space 1, for example resting on support legs, is raised sufficiently so that its weight is no longer carried by the support legs 8, whereupon the legs can be drawn under, to the sides of, or into the cargo space, whereafter the cargo space can be lowered by using the said mechanisms to rest on locking means, not shown in the figures, in the bogies or wheel-and-axle sets. The support legs which have been drawn in no longer constitute a barrier to passage, and the locking means will prevent the cargo space from moving in the longitudinal or transverse direction during the travel of the train 19. These raising and lowering mechanisms or locking means can easily be designed so that, during the said raising or lowering, they will centre the cargo space on the bogies or wheel-and-axle sets with the required precision, if the cargo space for one reason or another is not at precisely the correct point or if the positioning of the bogies or wheel-and-axle sets was not precisely correct at the time they were pushed under. The centring can be take place, for example, by means of the mechanism disclosed in the patent DE-2207419. When bogies or wheel-and-axle sets are being removed from under the cargo spaces, the procedure is reversed, i.e. the cargo spaces are raised by using the mechanism in the wheel sets, the support legs 8 are pulled out, the cargo space is lowered by the said mechanism to rest on the support legs, and the mechanism in the wheel set is pulled in completely, whereafter the bogies 2 or wheel-and-axle sets can be pulled as a line 6 along the track 3 from beneath the line 4 made up of the cargo spaces. The said raising and lowering mechanisms and the locking means may be located in the bogies 2 themselves or in the bar structures 9 interconnecting them, which will be described later. The support legs are located preferably not only on the sides 5a and 5b of the cargo space but also at a substantial distance from each other, for example close to each end 7a and 7b of the cargo space.

It is clear that the raising of the cargo spaces off the bogies 2 and wheel-and-axle sets may also be carried out by using fixed raising and lowering means which are arranged at railway stations, harbours or factories on either side of the track 3 and keep the cargo space at the said distance above the track. These means may be, for example, hydraulic or pneumatic bars or grippers which raise the cargo spaces by their edges in order to provide moving space for the line 6 of bogies or wheel-and-axle sets. However, this limits the uses of the system according to the invention, and so cargo-space-specific support legs are presumably a more advantageous alternative. In other respects this fixed apparatus functions fully

analogously to the cargo-space support legs and hoisting mechanism described above.

Figure 2 depicts one relatively easily implemented embodiment according to the invention. Therein the bogies 2 are transferred to and from beneath the cargo spaces in a line in which always two successive bogies are interconnected by a rigid loadbearing bar structure 9, which will receive any longitudinal forces acting during the travel of the train. Here thus a pair of bogies 2 and the bar structure 9 interconnecting them always form a wagon chassis 10 having approximately the length of a cargo space, which wagon chassis is according to the invention pushed to beneath the cargo space 1 along the track 3. These wagon chassis 10 for their part are interconnected by coupling members 11 allowing resilience and changes of direction, in order to form a line of separate wagon chassis. These coupling members 11 may per se be of any known type normally used for interconnecting railway wagons. Especially in this case, wheel-and-axle sets can be used instead of bogies, or when the construction is designed for very large loads, it is possible to use only one bogie in the middle of a wagon chassis 10 and to interconnect these single-bogied wagon chassis by means of a corresponding bar structure 9 to form a line of wagon chassis. The bogie itself may, of course, include either the normal two pairs of wheels, or three pairs of wheels, or as many as four pairs of wheels, for example according to the required load capacity. On the other hand, if one bogie is used in the region of the interconnection between the cargo-space ends 7a and 7b facing each other, the rigid bar structures 9 must be interconnected in an articulated manner so that the bar structure and the cargo space 1 secured to it can turn relative to the bogie when the train is travelling on the track 3. It is clear that the bar structure 9 can be arranged to include pneumatic and/or hydraulic tubing and electric cabling for the transfer, within the train 19, of signals and energy required by shunting-yard activity and the travel of the train. In this case the cargo spaces 1 are not required to include other control elements than the support legs 8, and they need not withstand the longitudinal forces generated by the travel of the train, since the bar structure 9 will carry those forces.

Figure 3 depicts another embodiment of the invention for transferring the bogies 2 to and from beneath a line 4 of cargo spaces. In this case, two successive bogies 2 are always interconnected by a chain 12 or the like which withstands the kinetic resistances of the bogies during a push and at the same time is self-bearing. Each bogie additionally comprises a reel 13 onto which this chain can be wound and a motor which drives the said reel 13. In this case there are two bogies for each cargo space 1, and they are intended to be positioned in the region of each end 7a and 7b of the cargo space. In addition, the bo-

gies mounted under successive cargo spaces are interconnected by resilient coupling members 11 allowing changes of direction. The pushing of a line 6 of bogies to beneath a line 4 of cargo spaces is started from one end of the line of cargo spaces, and at this stage the chains 12 are on the reels 13, all of the bogies 2 being close together on the track 3. When the motors unwinding the chains are started, each unwinding chain 12 will push the second bogie coming beneath the same cargo space, and at the same time, of course, it will push all the bogies in front of it, and to a greater distance. As all the bogies unwind their chains 12 in the same manner, the result will be a spacing-out of the bogie line, the bogies moving beneath the line 4 of cargo spaces in that direction where there were initially no bogies, and ultimately the bogies will end up in the regions of the cargo spaces and will be positioned, in a manner not described here in greater detail, at the points intended for them. Thereafter the cargo spaces 1 are lowered onto the bogies 2 in the manner already described. It is clear that the removal of the bogies 2 from beneath the line of cargo spaces takes place as a chain of action reverse to that described above, i.e. the cargo spaces 1 are raised to bear on the legs 8 on their sides, the said motors are started in the reverse direction, whereupon the chains 12 are wound back onto the reels 13, as a result of which the bogies in the line will approach each other, thus ending up in a line of bogies close together at one end of the line of cargo spaces, from where the bogies are finally removed. In the case described, there needs to be in each bogie only one reel of chain, since in the region of the interconnection of the cargo spaces the adjacent bogies are interconnected with resilient coupling members 11. In the embodiment of Figure 3 there are always two chain reels 13 positioned so as to point towards each other, and the protruding ends of the chains have been interconnected, each chain reel having only half of the required maximum length of chain. In a train ready for travel the unwound chain will extend in the region of a cargo space from bogie to bogie.

In the event that only one bogie (not shown in the figures) is placed in the region of the interconnection between the ends 7a and 7b of cargo spaces and, if one chain reel per bogie is used, the reel must, of course, have the entire required length of chain. For the method described above, in which each reel has only half of the required length of chain, each bogie must have for this embodiment two chain reels, one at end of the bogie, in which case the chains can be connected end-to-end, whereby the required maximum length between the bogies is obtained.

It is clear that the chains 12 may include pneumatic and/or hydraulic tubing and electric cabling for the transfer of signals and energy in a line of bogies both during the dismantling of the bogies and during

the travel of the train. The construction of such a chain 12, which can be wound onto a reel and nevertheless withstand a considerable thrust without buckling, is not described in greater detail in the present application. In this case the cargo spaces 1 are required to withstand not only the stresses caused by their own load but also forces caused in the direction of the track 3 by the travel of the train, in order that these forces will not stress the chain and break it.

Above, in connection with Figure 3, there was a description of an active reeling mechanism and chain. Figure 4 depicts a construction of a type otherwise similar but equipped with a passive reeling mechanism and chain. Therein the operation otherwise corresponds to that described above except that a traction mechanism 16, separate from the bogies, is used, which mechanism may be a fixed winch at the end of the track 3 in the shunting yard, a shunting engine, or some other traction mechanism. As above, the pulling of the bogies is started from one end of the line 4 of cargo spaces; in the case of Figure 4 this is the end on the left-hand side. The bogies 2 are close together at the end of the line of cargo spaces, and the bogie closest to the wheelless portion of cargo spaces is connected via beneath the cargo spaces, for example by a wire rope 19, to the traction mechanism 16. When the traction mechanism is activated, the bogies 2 will move towards it while the chain 14 unwinds from the reels 15. In this arrangement it is necessary for the chain 14 to withstand only the forces generated by the pulling of the bogies, and the bogies are not required to have motors for unwinding the chain from the reels. When the bogies are pulled in the manner described above, they will space out over the entire length of the line 4 of cargo spaces, and they will be positioned, in a manner not described in this application, at the desired points of the cargo spaces. As in the previous case, also in this embodiment there are always two bogies per each cargo space, in which case the bogies coming in the regions of those ends of successive cargo spaces which face each other are interconnected with resilient coupling members 11, which allow changes of direction. In this case, if each bogie has one chain reel, the chain wound on it may be only one-half of the required length, since the chain ends facing each other can be interconnected, whereby the chain length is doubled. Alternatively, it is, of course, conceivable that there will be only one bogie in the region of the interconnection between successive cargo spaces. If these bogies each have only one chain reel, it must have the length of chain necessary for the distance between the bogies. If, on the other hand, each bogie has two chain reels, in this case each reel may have only one-half of the chain length required. In this case, also, it is possible to arrange in the chain pneumatic and/or hydraulic tubing and electric cabling for the transfer of signals and energy in the line of bogies both during

the forming of the train and during the travel of the train. Likewise, in this case the frame of the cargo space 1 must be reinforced to withstand, in addition to vertical loads, also the longitudinal forces acting during the travel of the train. Likewise, in this case the frame of the cargo space 1 must be reinforced to withstand, in addition to vertical loads, also the longitudinal forces acting during the travel of the train.

In the cases of both Figure 3 and Figure 4, the length of the unwound chain 12 and 14 corresponds to the length of the cargo space 1 so that, when one bogie is used for each end of the cargo space, the length of the chain may be somewhat shorter and, when one bogie is used for each interconnection between two successive cargo spaces, the required chain length is somewhat greater. Thus the chain 12, 14 is in its unwound state during travel and is located beneath the cargo space. If it is desired to avoid the movement, such as bending, of the chain or the like in the horizontal direction (during the travel of the train 19 at curves), the arrangement of the bogies and their reels of chain must be such that that structural part of the bogie to which the cargo space 1 is locked is functionally so connected to the chain-reeling device that they turn simultaneously. They may be constructed, for example, within the same frame, which is then swivel-mounted to the bogie frame. Thus the cargo space and the chain with its reel will remain stationary in relation to each other, and the bogie frame will move relative to them in connection with travel at curves and other changes of direction. However, this construction is not described in greater detail in this application, and it can also be solved in many other ways. The chains 12, 14 with their reeling devices 13, 15 may, of course, be articulated relative to the bogies even in some other manner which maintains them parallel to the cargo spaces 1 and immobile over the length of the interconnected chains of two successive bogies.

Regardless of whether the arrangement of the bogies or wheel-and-axle sets is in accordance with Figure 2, Figure 3, or Figure 4, one possible method for passing a line 6 of bogies to beneath a line 4 of cargo spaces is that the bogies or wheel-and-axle sets have drive motors, and by remote control of these motors the line of bogies will move automatically into place beneath the cargo spaces. Such a motor may be of relatively small power, and it is disengaged for the duration of the travel of the train. In addition, the bogies or wheel-and-axle sets may include means for connecting them in succession close together into a compact line 17, as shown in Figure 5. In this case the plurality of bogies can be transported from one place of use to another as a remarkably short train. In addition, the bogies may include fastening means or the like for supporting the bar structures 9 forming the wagon chassis or the cargo-space frames 18, and for fastening them on top of such a short bogie train 17.

Such a compact bogie train 17 is easy to transport separately or as an extension of a conventional train, without exceeding the greatest permitted train length. If the use of the cargo spaces in several countries and both on rails and on road is considered, the requirement will be a relatively narrow cargo space, or at least a relatively narrow cargo-space frame 18. Therefore, in many cases, in order to obtain the gauge matching the railway track 3, it is advantageous to form the bogies or wheel-and-axle sets by using inside-mounted bearings, thus allowing them to pass between the support legs 8 of the cargo spaces. For example, a bogie according to the patent FI-82424 can be used.

The cargo spaces 1 themselves may at their minimum be made up only of the cargo-space frame 18, which includes, depending on the wheel or bogie system, a flatbed either bearing vertical loads or also withstanding the longitudinal loads of travel on rail, and support legs. Such a basic construction for a cargo space 1 is shown in Figures 2-6. The cargo space may include, connected to such a frame 18, either detachable or fixed structures such as support bars, sides, or other structural parts for carrying cargo of the desired type. The cargo space 1 may also be made similar to a container, as depicted in Figure 1, in which case the structure may be designed for parcelled goods, bulk goods, liquids, or other goods. In addition, cargo spaces may comprise fastening means and/or gripping means by mediation of which the cargo spaces can be gripped by trucks, spider cranes, hoists, or in other ways in order to raise the cargo spaces and to transfer them into or out of ships or in storages or elsewhere.

According to the invention, at the stage when the line 6 of bogies 6 has been removed from beneath the line 4 of cargo spaces, the cargo-space line can be converted by an analogous method into separate cargo spaces suitable for road transport. For this purpose, a line of unattached wheel bogies 20 suitable for travel on road is pushed, in a manner not shown in the figures but analogous to the rail bogies 2, to beneath the line of cargo spaces, at least one wheel bogie per each cargo space 1. Each wheel bogie 20 is positioned under one end of a cargo space. If one wheel bogie is used for each cargo space, it is positioned under only one end of the cargo space, but if two wheel bogies per cargo space are used, one bogie is positioned in the region of each end 7a and 7b. In the first case, semi-trailers are formed and in the second case trailers for hauling trucks. When the bogies have been secured in place, which takes place using a centring and locking mechanism corresponding to that used for rail bogies, a hauling truck is attached to the first cargo space at one end of the line 4 of cargo spaces, which hauling truck can pull the cargo space away and move normally on road. The second hauling truck will grip the next cargo space and take it

away, the third hauling truck will grip the third one, etc. When so desired, wheel bogies can, of course, be pushed to beneath the cargo spaces one at a time, but in any case this takes place in the longitudinal direction of the cargo space, via beneath the cargo space. It is clear that a line 4 of cargo spaces can be assembled from separate cargo spaces 1 on wheel bogies 20 in an order reverse to that described above. In other words, cargo spaces 1 are reversed, one at a time, by using hauling trucks to form a line 4 of cargo spaces, and after the entire line has been formed or, alternatively, after the positioning of each separate cargo space, the wheel bogies 20 are pulled from beneath the cargo spaces in their longitudinal direction. When this line has thus been formed in the region of a railway track 3, in alignment with it, the rail bogies 2 or wheel-and-axle sets can be brought along the track 3 into the region of the cargo spaces and be secured to them in the manner described earlier in the present application.

When lines 4 are being formed in the manner described above from cargo spaces 1 which have been on wheel bogies, or when lines are being formed of cargo spaces 1 which have been elsewhere for some other reason, attention should be paid to the positioning of the cargo spaces in relation to the track and to each other. This positioning at the time of bringing cargo spaces one by one into their places in the line 4 can in the roughest manner be done by using markings on the ground in the region of the line; by means of these markings the cargo spaces can be positioned reasonably correctly. These markings thus correspond to lane markings on roads. In addition, the cargo spaces themselves or the raising and transfer devices for the cargo spaces may include positioners, such as jigs or the like, for ensuring the correct positioning of the cargo spaces for a line 4 of cargo spaces. By these auxiliary devices, sufficient precision can be achieved for positioning the cargo spaces 1 in relation to the track 3 so that the bogies or wheel-and-axle sets will be able to pass beneath the cargo spaces. The cargo spaces are then finally positioned in relation to the bogies or wheel-and-axle sets, in the manner described earlier in the present application, in connection with their being raised.

It is clear that the details of the system described above with the help of embodiment examples can also be implemented in other ways. In particular the structural details can be designed by applying a number of different solutions. The essential idea is that, in order to achieve high efficiency in the shuttle transport itself and in the loading, the structures interconnecting the bogies or wheel-and-axle sets are light in weight and enable the said compact line to be formed. Since the cargo spaces always bear all the vertical loads, these connecting structures are at maximum required to receive and carry mainly the longitudinal forces effective in the travel of the train, as described

above. If the cargo spaces are reinforced to carry even these forces, the connecting structures may be even lighter in weight, as described above. Thus the structures will have no extra, unnecessary weight or strength.

Claims

1. A system which comprises at least load-bearing cargo spaces (1) and rail bogies (2) or wheel-and-axle sets for handling a plurality of cargo spaces which, at least at one stage, are arranged into a line (4) in alignment with a railway track (3) and are raised by the edges (5a, 5b) of the cargo spaces to a distance above the track, in which case the structures containing the wheels of the train are transferred along the track (3) to beneath the line made up of cargo spaces, and the cargo spaces are placed to bear on the said structures in order to form from the line of cargo spaces a train (19) ready for travel, and that the train is disassembled into a line (4) of cargo spaces by removing the said structures from beneath the cargo spaces along the track, **characterized** in that the wheel system of the train is transferred along the track to beneath the line (4) of cargo spaces (1), and is respectively removed from beneath the line, as a line (6) made up of bogies (2) or wheel-and-axle sets, each bogie or wheel-and-axle set is always positioned in the region of a cargo-space end (7a, 7b) or the cargo space (1), and the cargo spaces are lowered to bear on the bogies or wheel-and-axle sets to form a train (19), and that the bogies or wheel-and-axle sets are interconnected by means of a bar structure (9), chain (12; 14) or the like, which primarily carries at maximum the longitudinal forces effective in the travel of the train and permits the wheel-system line (6) to be converted into a shorter, compact line (17).
2. A system according to claim 1, **characterized** in that the cargo spaces (1) have, located at both edges (5a, 5b) and extending at least close to both ends (7a, 7b) or located close to them, support legs (8) which can be drawn in, and that the lowering of the cargo spaces onto the bogies or wheel-and-axle sets is carried out by first raising the cargo space by using a mechanism in the wheel sets in order to remove the weight from the support legs; by drawing the support legs under, to the sides of, or into the cargo space; and by then lowering the cargo spaces (1) onto locking means in the bogies (2) or wheel-and-axle sets in order to form a train ready for travel.
3. A system according to claim 1, **characterized** in

- that on both sides of the track (3), at the edges (5a, 5b) of the cargo spaces (1) which are in a line (4), there are fixed raising and lowering devices which will keep the cargo space at the said distance above the track and which can be lowered in order to lower the cargo spaces onto the bogies (2) or wheel-and-axle sets which have been transferred to beneath them and aligned with them and to bear on locking means in the bogies or wheel-and-axle sets, in order to form a train ready for travel.
4. A system according to claim 2, **characterized** in that a train ready for travel is disassembled into a line (4) of cargo spaces by raising the cargo spaces by using a mechanism in the wheel sets; by bringing down the cargo-space support legs (8); by lowering the cargo spaces (1), by using the said mechanisms, to bear on the legs; and by pulling or pushing the bogies or wheel-and-axle sets as a line (6) from beneath the cargo spaces.
5. A system according to claim 3, **characterized** in that a train ready for travel is disassembled into a line (4) of cargo spaces by raising the cargo spaces (1) by using raising and lowering means on the sides of the track (3), and by pulling or pushing the bogies or wheel-and-axle sets as a line (6) from beneath the cargo spaces.
6. A system according to claim 1, **characterized** in that the bogies (2) or wheel-and-axle sets are transferred to and from beneath the line (4) of cargo spaces in the form of a line (6) in which always two successive bogies or wheel-and-axle sets are interconnected by means of a bar structure (9) receiving and carrying the longitudinal forces acting during the travel of the train, in order to form, for the cargo spaces, wagon chassis (10) of their length.
7. A system according to claim 6, **characterized** in that for each cargo space (1) there is arranged at minimum two bogies (2) or wheel-and-axle sets which are interconnected by a bar construction (9), and that these wagon chassis (10) separate per se are interconnected by coupling members (11) which allow resilience and changes of direction, in order to form a line of separate wagon chassis for a line (4) of cargo spaces.
8. A system according to claim 6, **characterized** in that for each interconnection between two successive cargo spaces (1) and for the end (4) of the line and/or for each cargo space there is arranged one bogie (2), the bogies being connected to each other by rigid bar structures (9) articulated to the bogies, in order to form a line of interconnected wagon chassis for a line of cargo spaces.
9. A system according to claim 7 or 8, **characterized** in that the bar structure includes pneumatic and/or hydraulic tubing and electric cabling for transferring signals and energy within the wagon-chassis line, and that the bar structure comprises fastening means for locking the cargo space (1) to it and thereby to the wagon chassis.
10. A system according to claim 1, **characterized** in that the bogies (2) are transferred from and to beneath the line (4) of cargo spaces as a line (6) in which always two successive bogies are interconnected by a self-bearing chain (12) or the like which overcomes the kinetic resistance of the bogies in a push, and each bogie comprises at least one motor which unwinds this chain from a reel (13); that the pushing of the bogies to beneath the cargo spaces is started from one end of the line with a line of bogies which are close together, the motors in the bogies unwind the chain (12), thereby pushing further each bogie in front of it, and thus spacing out the bogie line to the length of the entire line (4) of cargo spaces, and the bogies are positioned primarily in the regions of the cargo-space ends (7a, 7b); and that the removal of the bogies takes place in an approximately reverse chain of action.
11. A system according to claim 1, **characterized** in that the bogies (12) are transferred from and to beneath the line (4) of cargo spaces as a line (6) in which always two successive bogies are interconnected by a chain (14) or the like which withstands the kinetic resistance of the bogies in a pull, that on the track (3) or between the rails or on their extension there is a traction mechanism (16), separate from the train; that the pulling of the bogies to beneath the line of cargo spaces is started from one end of the line with a line of bogies close together, the traction means of the traction mechanism (16) being fastened to that bogie of the bogie line which faces towards the bogie-free section of the line (4) of cargo spaces, the line of bogies is pulled by the traction mechanism, whereupon, as the chain (14) unwinds from the reel (15), the line of bogies will space out over the length of the entire line of cargo spaces, and the bogies will be positioned primarily in the regions of the ends (7a, 7b) of the cargo spaces; and that the removal of the bogies takes place in an approximately reverse chain of action.
12. A system according to claim 10 or 11, **characterized** in that for the chain (12, 14) or the like there is in each bogie (2) at least one reel (13, 15) or

- the like on which the chain is wound when the bogies are close together and from which the chain can be unwound and onto which the chain can be wound according to the distance between the bogies; and that the chain includes pneumatic and/or hydraulic tubing and electric cabling for the transfer of signals and energy in the line (6) of bogies.
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13. A system according to claim 10, 11 or 12, **characterized** in that the frame of the cargo space (1) is reinforced to carry the longitudinal forces acting during the travel of the train and to bear vertical loads.
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14. A system according to claim 10 or 11, **characterized** in that for each cargo space (1) there are two bogies (2) interconnected by the said chain (12, 14) or the like, the length of the chain in the unwound state corresponding to the length of the cargo space, and the bogies (2) of this pair of bogies supporting in a train the two ends (7a, 7b) of each cargo space, and that in the region of those ends of successive cargo spaces which face each other these bogie pairs are interconnected by coupling members (11) allowing resilience and changes of direction, in order to form lines (6) of cargo-space-specific bogie pairs for a line (4) of cargo spaces.
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- nisms takes place in a situation or during a step in which the weight of the cargo space is not borne by the means holding the cargo space at a distance above the track.
18. A system according to claim 17, **characterized** in that both of the said centrings take place at the time the cargo space (1) is being lowered to bear on the locking means in the bogies or the wheel-and-axle sets, and that the locking means in the bogies or wheel-and-axle sets will prevent the movement of the cargo space in both the longitudinal direction and the transverse direction.
19. A system according to claim 1, **characterized** in that the system further comprises wheel bogies (20) separate from each other and suitable for road transport, that these wheel bogies (2) are pushed to beneath a cargo-space line from which the rail bogies or wheel-and-axle sets have been removed, one or more at a time in the longitudinal direction and at least one wheel bogie for each cargo space (1), and that each wheel bogie (20) is positioned within the region of an end (7a, 7b) of the cargo space, and that the cargo spaces are pulled away by hauling trucks, starting from the end of the line of cargo spaces, in order to disassemble a line of cargo spaces.
20. A system according to claim 19, **characterized** in that a line (4) of cargo spaces is assembled from separate cargo spaces (1) on wheel bogies (20), in a chain of action reversed in relation to the disassembling of the lines.
21. A system according to claim 1, **characterized** in that the cargo spaces (1) comprise fastening and/or gripping means by mediation of which the cargo spaces can be gripped using trucks, spider cranes, hoists, or the like, for raising and transferring the cargo spaces in order to disassemble and assemble lines (4) of cargo spaces.
22. A system according to claim 20 or 21, **characterized** in that the region of the line (4) of cargo spaces includes markings or positioning means, or the hoisting or transferring means for the cargo spaces include positioning means for ensuring the correct position of the cargo spaces (1) during the forming of a line of cargo spaces for a train ready for travel.
23. A system according to claim 1, **characterized** in that the bogies (2) or wheel-and-axle sets include a drive motor which is suitable for driving a line (6) of bogies or wheel-and-axle sets to or from beneath a line (4) of cargo spaces.

24. A system according to claim 2 or 4, **characterized** in that the mechanism, in the wheel sets, raising or lowering the cargo spaces (1) is arranged in the bogies (2) or alternatively in the bar structure (9) connecting them. 5
25. A system according to claim 1, **characterized** in that the bogies (2) or wheel-and-axle sets include means for connecting them in succession close together into a compact line (17) and means for supporting any bar structures (9) forming the wagon chassis or any cargo-space frames (18), this compact line (17) of wheel-and-axle sets or bogies being capable of being transported as such as a train along a railway (3). 10 15
26. A system according to claim 1, **characterized** in that the cargo spaces (1) include fixed or detachable means or structures for different types of cargo. 20
27. A system according to claim 1, **characterized** in that the wheel pairs of the bogies (2) or wheel-and-axle sets are equipped with inside-mounted bearings in order to allow the use of cargo spaces (1) narrow in relation to the gauge of the track (3). 25

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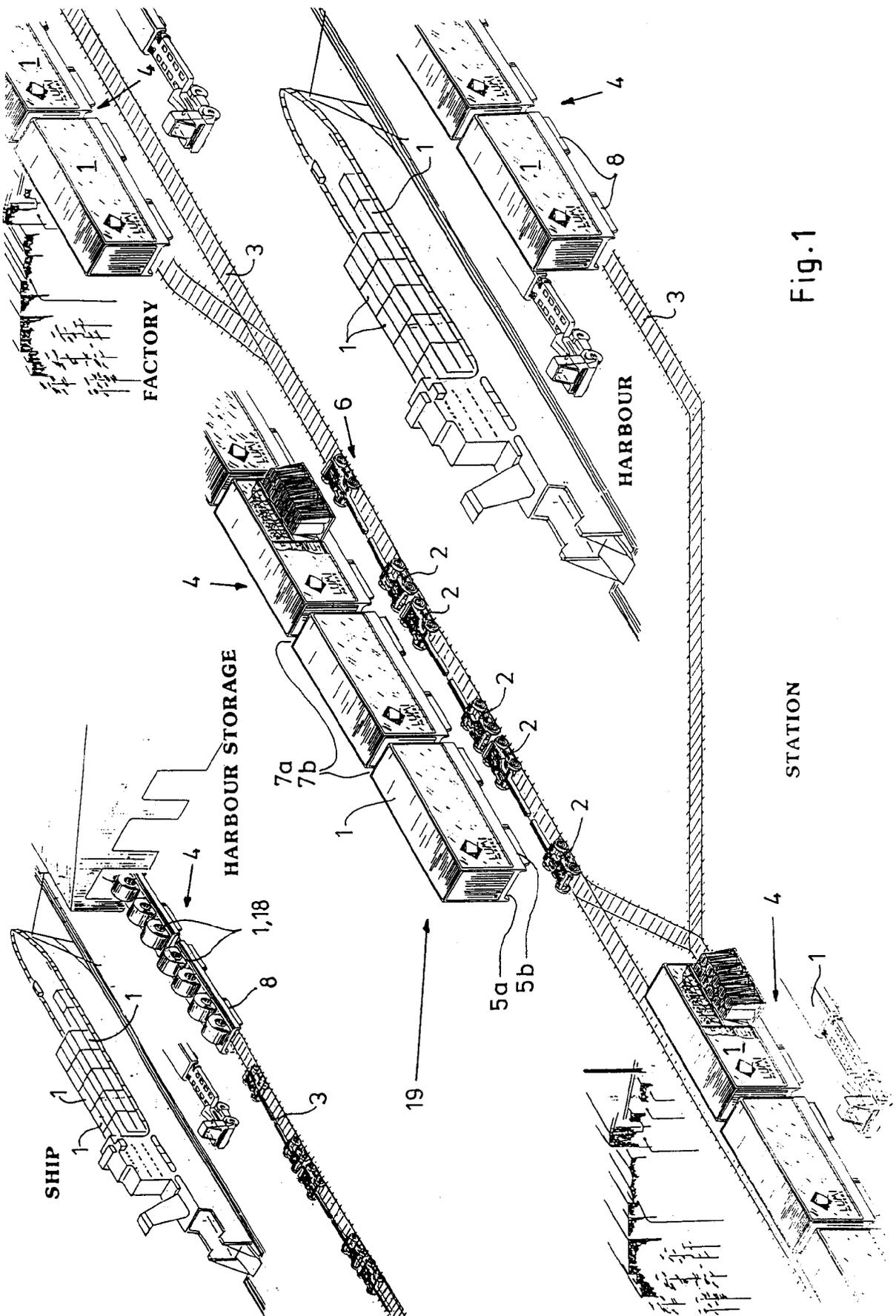


Fig. 1

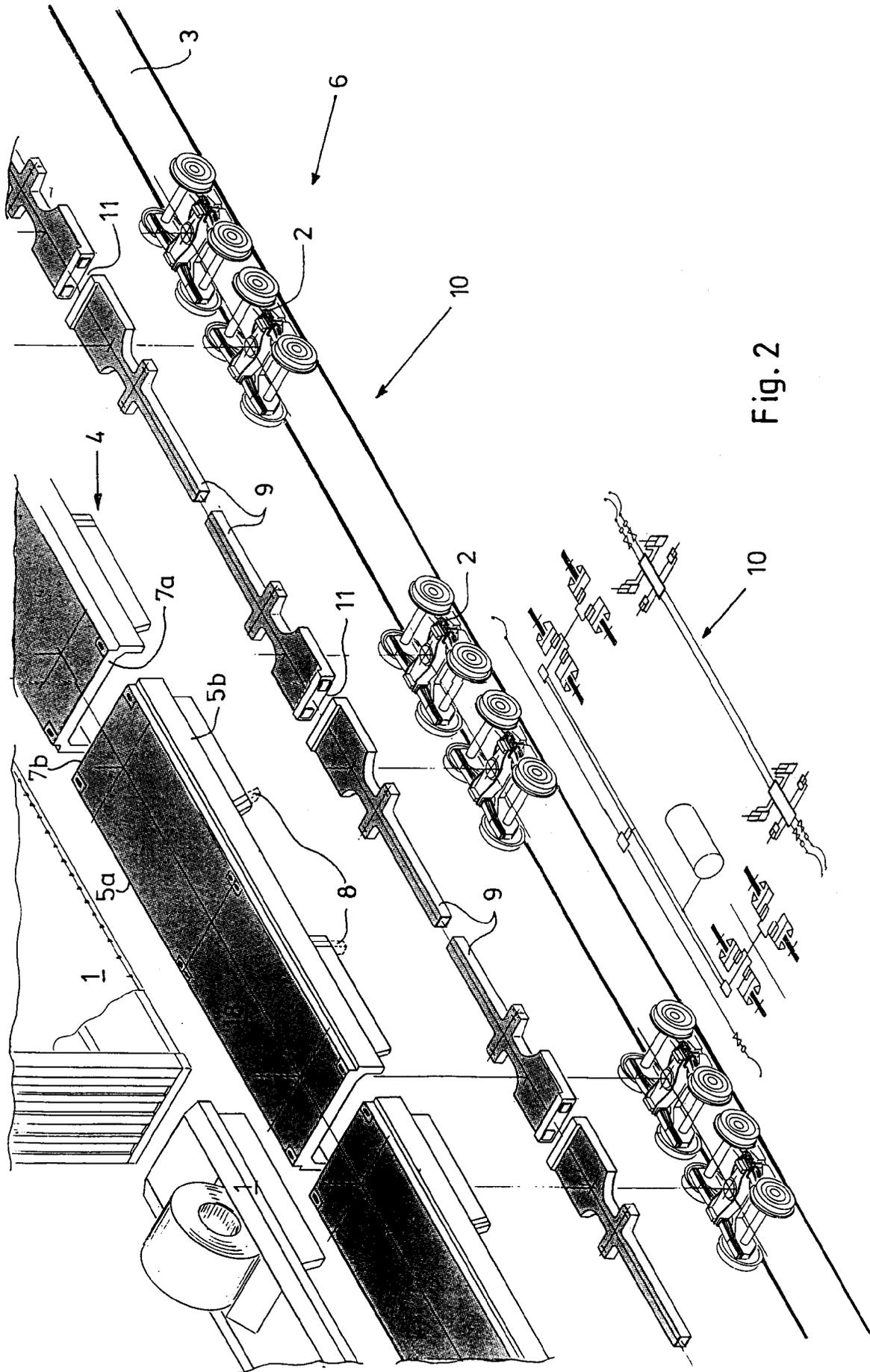


Fig. 2

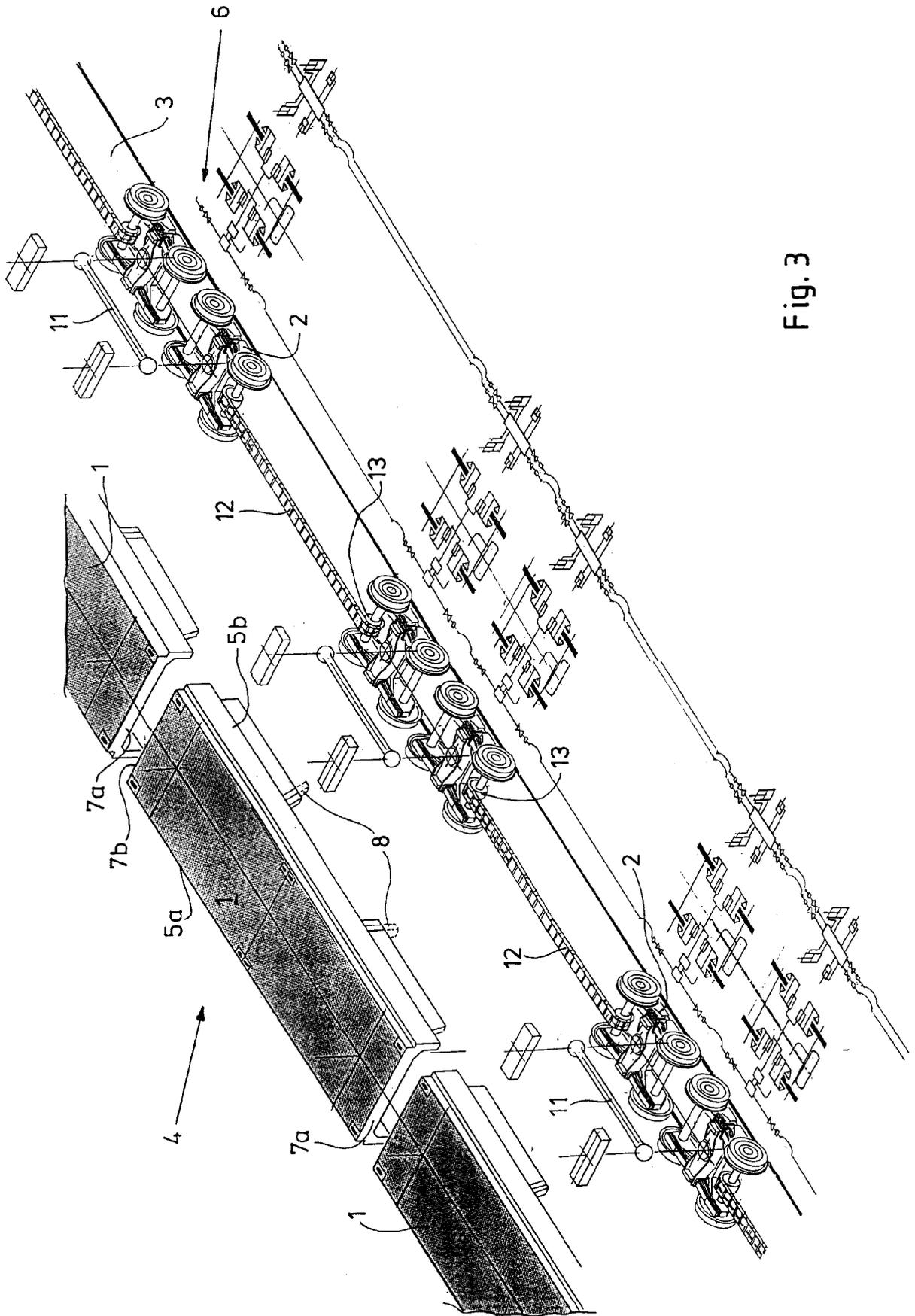


Fig. 3

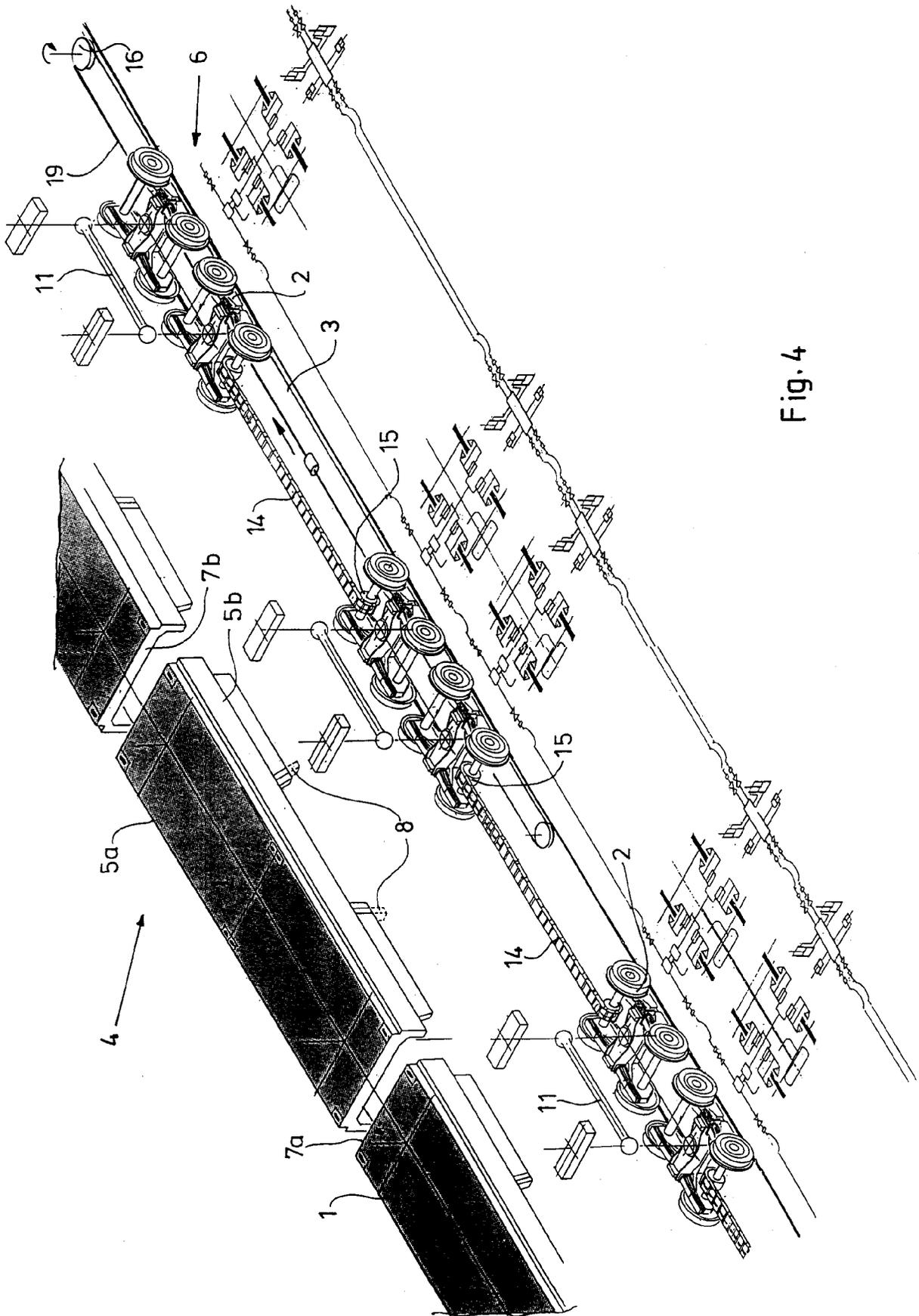


Fig. 4

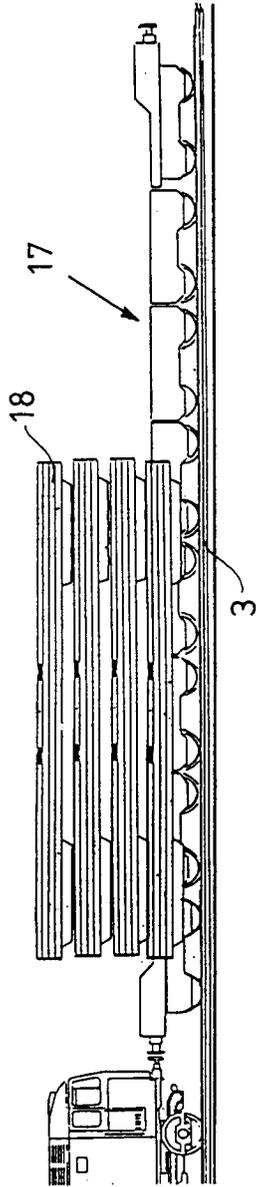


Fig. 5

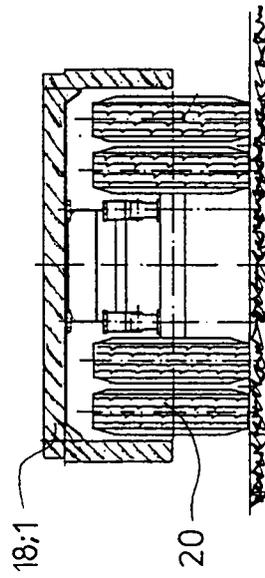


Fig. 6



European Patent
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EUROPEAN SEARCH REPORT

Application Number

EP 92 30 9451

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.5)
A	DE-A-4 020 387 (MERCEDES-BENZ AG) * column 9, line 26 - column 11, line 16; claims 1,2; figures 1-4 * * column 3, line 63 - column 4, line 18 * ---	1-4, 8, 19, 20, 24 17, 18	B61D3/20 B61B1/00 B61D3/18
A	DE-A-1 556 697 (VVB BAUMECHANISIERUNG DRESDEN) * page 4 - page 6; figure 1 * ---	1-4, 8, 17-20, 24	
A	CH-A-666 452 (GUTZWILLER & PARTNER) * the whole document * ---	1-4, 17, 18, 24	
D,A	US-A-4 665 834 (VAN IPEREN) see abstract * figures 1-3 * -----	1, 8, 9, 24	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B60F B61B B61D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 03 DECEMBER 1992	Examiner R. Becker
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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