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Description

The present invention refers to a RoRo-vessel having an upper cargo-carrying deck, and a double bottom located below the water line and adapted for carrying cargo.

The communication deck of a RoRo-vessel is usually located at the level of the water line. For the loading and unloading of cargo spaces below the water line, either internal, vertically displaceable ramps, which require much space, or complicated lifting gear are required. The loading and unloading of spaces below the communication deck has therefore taken much time, compared with corresponding cargo handling at the communication deck.

DE—A—1 756 073 shows a ship according to the first part of claim 1 having a number of superposed decks, and a single shaft, housing an elevator for communication with all decks. The intended cargo is containers mounted on trolleys or provided with wheels, so they can be moved along the decks. The single elevator will form a bottleneck with respect to the flow of cargo.

The object of the present invention is to propose a RoRo-vessel, in which a rapid and rational loading and unloading of other cargo spaces than those located upon the communication deck is possible, and which includes simple and reliable operating gear.

The invention is characterized by at least one cargo space extending from said upper deck to said double bottom, said cargo space in the longitudinal direction of the ship is provided with a series of two-storey cargo reception elevators, which are vertically displaceable by means of lifting gear, each elevator having two superposed platforms for stowing the cargo, either of which may be brought level with the communication deck.

According to an advantageous embodiment of the invention the lifting gear includes a pulling mechanism located below the upper deck, as well as means for selectively attaching the mechanism to lifting yokes associated with each elevator.

Preferably the pulling mechanism includes wire means extending longitudinally in the vessel, and at one end being connected to a tensioning device and at its opposite end being attached to a pulling device.

Advantageously the pulling wire means is provided with fixed blocks, adapted to pass through the yokes or to be locked to either of them by drivers, when the associated elevator is to be operated.

The yokes pulled by the wire means are preferably guided in a tunnel, the side walls of which are provided with fixed stops for the yokes corresponding to a lower position of the elevators, as well as movable stops corresponding to the upper position thereof.

Transverse bulkheads, extending somewhat above the water line, are advantageously provided in the cargo space, at least between some of the elevators.

In a RoRo-ship adapted for the transportation of railway cars, the upper deck is advantageously sheltered and the vessel includes at least one one-storey cargo elevator located between the communication deck and the cargo space, and attachable to a lifting gear in such a manner that it can be brought level with the lower deck or the upper cargo carrying deck, respectively.

Preferably deck panels are pivotable from vertical positions to the side of the one-storey elevator to horizontal positions for bridging a well in the communication deck adjacent to the two-storey platforms, when the one-storey elevator has been raised level with the upper cargo carrying deck.

The invention will below be described with reference to embodiments shown in the accompanying drawings, in which

Figure 1 is an elevation of a RoRo-vessel according to the invention, in which the side plating has been partly cut away,

Figure 2 is a transverse section through the vessel on a larger scale,

Figure 3 in the same scale, shows a portion of the cargo space of the vessel, as viewed from one side,

Figure 4 shows a pulling mechanism forming part of the invention, as viewed from above,

Figure 5 shows a side view of a tensioning device according to the invention, and

Figure 6 is an elevation on a larger scale of a modified embodiment of a vessel adapted for the transportation of railway cars.

The RoRo-vessel shown in Figures 1-3 is basically of conventional kind, with an aft communication ramp 10 also serving as rear closure door. The ramp is swingable in relation to a deck 11 adapted to receive wheeled cargo carriers, such as trailers or railway cars, and here referred to as the communication deck. The upper deck 12 of the vessel is adapted to receive LoLo-handled cargo containers 13 lifted by cranes 14, movable along the bulwark of the vessel.

The communication deck 11 extends longitudinally from the ramp, above the engine room 15 of the vessel to a central cargo space 16, which extends from the upper deck 12 down to the double bottom 17 of the vessel. This cargo space 16 houses a series of two-storey cargo receiving elevators 18, which are vertically displaceable, so either the upper 19, or the lower 20 platform thereof will be level with the communication deck.

The cargo receiving elevators 18 are better shown in Figures 2 and 3. Figure 2 indicates that the cargo space 16 is divided along the center line of the vessel by means of two longitudinal bulkheads 21, into a port half 16a, and a starboard half 16b. Each of these halves is provided with a series of identical cargo receiving elevators 18 and lifting means therefor. It is of course possible to design the ship with a single central cargo space only, or with more than two elevators abreast. Each platform 19, 20 in an elevator is designed to receive four ISO-containers 22 abreast, or alternatively three special containers 23 for forest products.

ducts. The headroom permits two superposed ISO-containers if they are handled by a low terminal trailer 24. Figure 3 shows one elevator lowered so it rests upon the top plate 17a of the double bottom, and a further elevator 18 raised to its upper position. Its lower platform 20 will then be level with the upper platform 19 of the first mentioned, lowered elevator. When the lower platform 20 is to be loaded, cargo carried by trailers is transferred by way of the ramp 10, the communication deck 11 and the upper platform of the first elevator. When the lower platform 20 of the forward elevator is fully loaded, the elevator is lowered to the double bottom, while simultaneously the aft elevator 18 is raised so its lower platform can be loaded. When all lower platforms are full and lowered, the upper platforms 19 as well as the communication deck 11 can be filled with trailers. When unloading the handling occurs in reverse order.

The elevators 18 are operated by means of eight lifting wires 25, operating in parallel, and attached, four to each side of the platforms in vertical beams 18a. The lifting wires are led over pulleys 26 to a yoke 27, which is displaceably guided in a tunnel 28, which extends longitudinally, centrally above each cargo space half 16a, 16b. One yoke 27 is provided for each elevator 18 and pulling wire means 29 run through each tunnel 28 from a pulling device 30 at one of its ends, through a passage in the associated yoke 27 to a tensioning device 31 at the opposite end of the pulling wires. The pulling device includes four parallel pressure fluid rams 30a. These are mounted with one end in a cross beam 32 at one end of the tunnel, while their other ends are connected to a common attachment 32 for the pulling wires 29. The fluid pressure rams 30a located in the aft part of the ship can pull the wire aftwards, against the action of the tensioning device 31, located in the forward part of the vessel. The tensioning device is shown in Figure 5 and includes a vertical tackle 34 carrying a weight 35. The weight 35 will be raised somewhat when the pulling wire means 29 is brought aftwards, and will be lowered when the fluid pressure in the rams 30 is relieved.

The yokes 27 cooperate with fixed drivers 36, which are selectively attachable to the wires 29, so either elevator 18 can be raised or lowered, while the other elevators are held stationary. The drivers may be designed in various ways, and may for instance include blocks on the wires 29, fixedly mounted at suitable positions. Normally they will pass through openings in the yokes 27, when the wires 29 are pulled, but will, in operating position, rest against an abutment at the yoke, which has been brought to blocking position. Alternatively the driver 26 can be mounted on the yoke and be designed to grip the wires 29.

The tunnel 28 is provided with stationary stops 37, which form abutments for the yokes 27 corresponding to the lower positions of the elevators 18, as well as with movable stops 38, which are operable from positions outside the tunnel 28, to

positions within the latter for locking a selected yoke 27 in the upper position of the associated elevator 18. Corresponding operable stops (not shown) are provided at the longitudinal bulkheads defining the cargo space halves 16a, 16b for locking the elevators therein in their upper positions. In this manner each elevator can be attached to the wires 29 and raised to its upper position, be locked therein, and finally released from the wires.

The vessel shown in the drawings is designed to contain sixteen elevators and can receive sixty-four trailers on the lower platforms 20, eighty trailers on the communication deck 11 and upon the upper platforms 19, as well as three hundred and thirtyeight 40' containers upon the upper deck. Other combinations of cargo units is of course possible on this particular vessel. The loading or the unloading of the vessel is expected to be arranged in less than eight hours.

Figure 6 shows a further development of the invention at a vessel adapted solely for the transportation of railway cars. In this vessel the upper cargo-carrying deck 12 is provided with a weather shelter superstructure 39. A further, one-storey elevator 40 is provided above the engine room 15, between the communication deck 11 and the cargo space 16. The two-storey elevators 18 are here operated by lifting gears which pull in the forward direction. The one-storey elevator 40 is operable by a second set of lifting gear located below the top of the superstructure 39. In its lower position its platform fits into a well in the communication deck, so it will be level therewith. In its upper position it will be level with the upper cargo-carrying deck 12.

The elevator 40 is dimensioned to handle four-axle railway cars by means of the double number of lifting wires 25, as is used with the elevators 18.

The cars are pulled from the elevator and ranged over the upper deck by suitable traction means, when the elevator 40 is raised to its upper position a number of deck panels 41 may be swung from raised positions to the side of the elevator shaft, into horizontal positions in which they bridge the well in the communication deck 11 adjacent to the two rearmost elevators 18.

In a projected vessel fitted according to Figure 6 one hundred and ninety two-axle railway cars can be carried upon the upper deck 12, the elevator 40, the upper and lower panels 19, 20 of the elevators and the swung-down deck panels.

When this ship is to be unloaded, cars are first removed from the deck panels 41 and the upper panels 19. Then the upper deck 12 is emptied by means of the vertically displaceable elevator 40, while simultaneously the two-storey elevators 18, two and two are raised to their upper positions. This procedure takes about forty minutes, whereupon cars from the lower platforms 20 can be removed from the vessel. The complete unloading can be performed in between two and three hours.

The invention is not limited to the embodiments described above, as several variations are

possible within the scope of the appended claims. Different arrangements for guiding the vertical displacement of the elevators between their two positions are possible. Transverse bulkheads extending somewhat above the water line 39 may be provided in the cargo space halves 16a, 16b, between some of the elevators 18. Hereby the safety at sea will be greatly improved, as there is small risk that the cargo space is completely filled with water as a result of a small damage below the water line. The risk is otherwise apparent, and the cause of several total losses of RoRo-vessels.

Claims

1. A RoRo-vessel having an upper cargo-carrying deck (12), a permanent communication deck (11) therebelow located above the water line (39) and a double bottom located below the waterline and adapted for carrying cargo, characterized by at least one cargo space (16) extending from said upper deck (12) to said double bottom, said cargo space (16) in the longitudinal direction of the ship being provided with a series of two-storey cargo reception elevators, vertically displaceable by means of lifting gear (25, 27, 29, 30) each elevator having two superposed platforms (19, 20) for stowing the cargo, either of which may be brought level with the communication deck (11).

2. A vessel according to claim 1, characterized in that the lifting gear includes a pulling mechanism (29, 30) located below the upper deck, as well as means for selectively attaching the mechanism to lifting yokes (27) associated with each elevator.

3. A vessel according to claim 2, characterized in that the pulling mechanism includes wire means (29) extending longitudinally in the vessel, and at one end being connected to a tensioning device (31) and at its opposite end being attached to a pulling device (30).

4. A vessel according to claim 3, characterized in that the pulling wire means (29) is provided with fixed blocks (36), adapted to pass through the yokes (27) or to be locked to either of them by drivers (36), when the associated elevator is to be operated.

5. A vessel according to either of the preceding claims, characterized in that the yokes (27) pulled by the wire means (29) are guided in a tunnel (28), the side walls of which are provided with fixed stops (37) for the yokes corresponding to a lower position of the elevators (18), as well as movable stops (38) corresponding to the upper position thereof.

6. A RoRo-vessel according to either of the preceding claims, characterized in that transverse bulkheads, extending somewhat above the water line (39) are provided in the cargo space at least between some of the elevators (18).

7. A RoRo-vessel according to either of the preceding claims in which the upper cargo-carrying deck (12) is sheltered, characterized in that at least one one-storey cargo elevator (40) is located between the communication deck (11) and the

cargo space (16), and is attachable to a lifting gear (25, 27, 29, 30) in such a manner that it can be brought level with the lower deck (11) or the upper cargo-carrying deck (12), respectively.

8. A vessel according to claim 7, characterized in that deck panels (41) are pivotable from vertical positions to the side of the one-storey elevator (40) to horizontal positions for bridging a well in the communication deck (11) adjacent to the two-storey platforms, when the one-storey elevator has been raised level with the upper cargo carrying deck.

Patentansprüche

1. Ro-Ro-Schiff mit einem oberen Fracht tragenden Deck (12), einem darunter und über der Wasserlinie (39) liegenden Dauerverbindungsdeck (11) sowie einem unter der Wasserlinie liegenden und zum Tragen von Fracht geeigneten Doppelbodens, gekennzeichnet durch zumindest einen sich vom oberen Deck (12) zum Doppelboden erstreckenden Frachtraum (16), der in Längsrichtung des Schiffes mit einer Reihe von zweigeschossigen Fracht aufnehmenden Senkrechtförderern, die mittels Hebeeinrichtungen (25, 27, 29, 30) senkrecht verschiebbar sind, wobei jeder Senkrechtförderer zwei übereinander angeordnete Plattformen (19, 20) zum Verstauen der Fracht aufweist und jeweils auf die gleiche Höhe mit dem Verbindungsdeck (11) gebracht werden kann.

2. Ro-Ro-Schiff nach Anspruch 1, dadurch gekennzeichnet, daß die Hebeeinrichtungen einen unter dem oberen Deck befindlichen Zugmechanismus (29, 30) sowie Mittel zum selektiven Befestigen des Mechanismus an den jedem Senkrechtförderer zugeordneten Hebejochen (27) aufweist.

3. Ro-Ro-Schiff nach Anspruch 2, dadurch gekennzeichnet, daß der Zugmechanismus über Drahtmittel (29) verfügt, die in Längsrichtung des Schiffes verlaufen und an einem Ende mit einer Spannvorrichtung (31) verbunden sowie mit ihrem gegenüberliegenden Ende an einer Zugvorrichtung (30) befestigt sind.

4. Ro-Ro-Schiff nach Anspruch 3, dadurch gekennzeichnet, daß die Zugdrahtmittel (29) feste Blocks (36) besitzen, die so ausgebildet sind, daß sie durch die Joche (27) hindurchlaufen oder an einen von ihnen durch Mitnehmer (36) verrastet werden, wenn der zugeordnete Senkrechtförderer betrieben werden soll.

5. Ro-Ro-Schiff nach einem der vorhergehenden Ansprüche 1 bis 4, dadurch gekennzeichnet, daß die von den Drahtmitteln (29) gezogenen Joche (27) in einem Tunnel (28) geführt werden, dessen Seitenwände mit festen Anschlägen (37) für die Joche entsprechend einer unteren sowie mit beweglichen Anschlägen (38) entsprechend einer oberen Stellung der Senkrechtförderer (18) versehen sind.

6. Ro-Ro-Schiff nach einem der vorhergehenden Ansprüche 1 bis 5, dadurch gekennzeichnet, daß sich etwa über der Wasserlinie (39) erstrek-

kende quergerichtete Schotte im Frachtraum zumindest zwischen einigen der Senkrechtförderer (18) vorgesehen sind.

7. Ro-Ro-Schiff nach einem der vorhergehenden Ansprüche 1 bis 6 mit einem geschützten oder abgedeckten oberen Fracht tragenden Deck (12), dadurch gekennzeichnet, daß zumindest ein eingeschossiger Senkrechtförderer (40) zwischen dem Verbindungsdeck (11) und dem Frachtraum (16) angeordnet ist und an Hebeeinrichtungen (25, 27, 29, 30) derart angeschlossen werden kann, daß er auf gleiche Höhe mit dem unteren bzw. oberen Deck (11, bzw. 12) bringbar ist.

8. Ro-Ro-Schiff nach Anspruch 7, dadurch gekennzeichnet, daß Deckpaneele (41) aus senkrechten Stellungen seitlich vom eingeschossigen Senkrechtförderer (40) in horizontale Stellungen zum Überbrücken eines Schachts im Verbindungsdeck (11) neben den zweigeschossigen Senkrechtförderern schwenkbar sind, wenn der eingeschossige Senkrechtförderer auf gleiche Höhe mit dem oberen Fracht tragenden Deck angehoben worden ist.

Revendications

1. Navire à transbordement roulant ou RO-RO comportant un pont supérieur de transport de cargaison (12), un pont de communication permanente (11) situé au-dessous du précédent et au-dessus de la ligne de flottaison (39) et un double fond situé au-dessous de la ligne de flottaison et prévu pour le transport de cargaison, caractérisé en ce qu'il comprend au moins un espace de cargaison (16) s'étendant dudit pont supérieur (12) audit double fond, ledit espace de cargaison (16) comportant dans la direction longitudinale du navire une série d'élévateurs de réception de cargaison à deux étages, verticalement déplaçables au moyen d'un système de levage (25, 27, 29, 30), chaque élévateur ayant deux plateformes superposées (19, 20) pour l'arrimage de la cargaison, qui peuvent chacune être amenées au niveau du pont de communication (11).

2. Navire suivant la revendication 1, caractérisé en ce que le système de levage comprend un mécanisme de traction (29, 30) situé au-dessous du pont supérieur, ainsi que des moyens pour

accoupler sélectivement le mécanisme à des attelages de levage (27) associés à chaque élévateur.

3. Navire suivant la revendication 2, caractérisé en ce que le mécanisme de traction comprend des câbles (29) s'étendant longitudinalement dans le navire, reliés à une extrémité à un dispositif de mise en tension (31) et attachés, à leur extrémité opposée, à un dispositif de traction (30).

4. Navire suivant la revendication 3, caractérisé en ce que les câbles de traction (29) comportent des blocs fixes (36) qui peuvent passer à travers les attelages (27) ou être verrouillés à l'un quelconque de ces derniers par des taquets d'entraînement (36) lorsqu'on veut actionner l'élévateur associé.

5. Navire suivant l'une quelconque des revendications précédentes, caractérisé en ce que les attelages (27) tirés par les câbles (29) sont guidés dans un tunnel (28) dont les parois latérales sont munies de butées fixes (37) pour les attelages, correspondant à une position inférieure des élévateurs (18), ainsi que de butées mobiles (38) correspondant à leur position supérieure.

6. Navire RO-RO suivant l'une quelconque des revendications précédentes, caractérisé en ce que des cloisons étanches transversales, s'étendant un peu au-dessus de la ligne de flottaison (39), sont prévues dans l'espace de cargaison, au moins entre certains des élévateurs (18).

7. Navire RO-RO suivant l'une quelconque des revendications précédentes, dans lequel le pont supérieur de transport de cargaison (12) est abrité, caractérisé en ce qu'au moins un élévateur de cargaison à un seul étage (40) est prévu entre le pont de communication (11) et l'espace de cargaison (16) et il peut être accouplé à un mécanisme de levage (25, 27, 29, 30), d'une manière telle qu'il peut être amené au niveau du pont inférieur (11) ou du pont supérieur de transport de cargaison (12), respectivement.

8. Navire suivant la revendication 7, caractérisé en ce que des panneaux de pont (41) peuvent pivoter entre des positions verticales sur le côté de l'élévateur à un étage (40) et des positions horizontales de recouvrement d'un puits formé dans le pont de communication (11) près des plateformes à deux étages lorsque l'élévateur à un étage a été élevé au niveau du pont supérieur de transport de cargaison.

FIG. 1

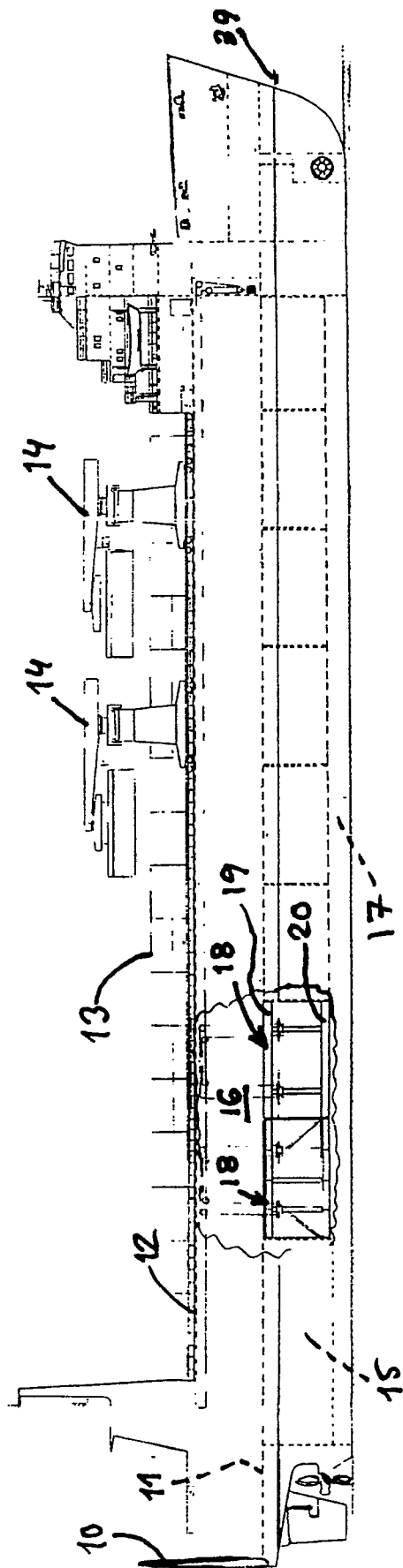


FIG. 4

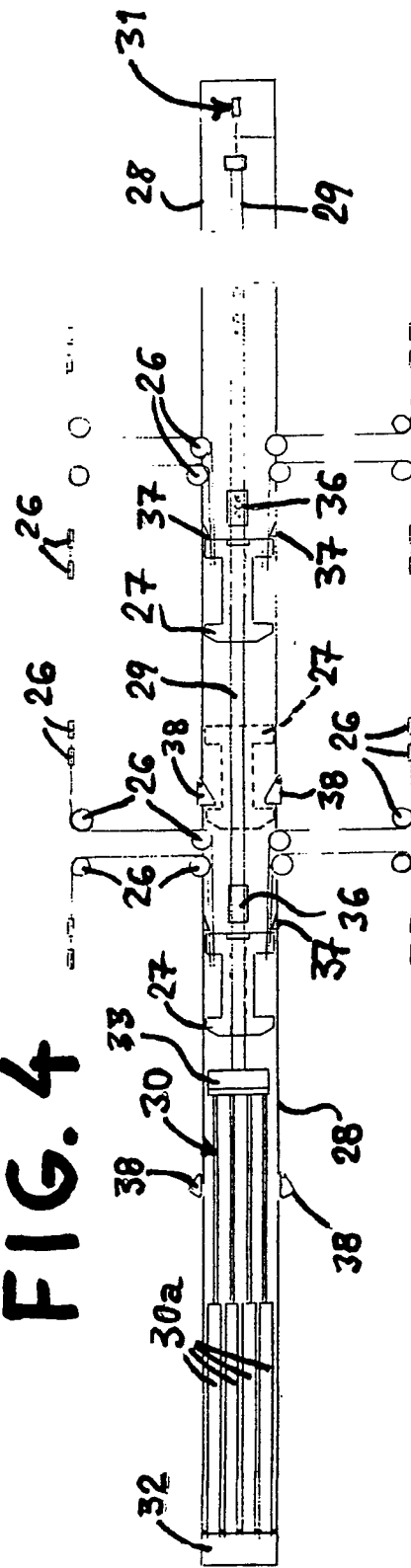
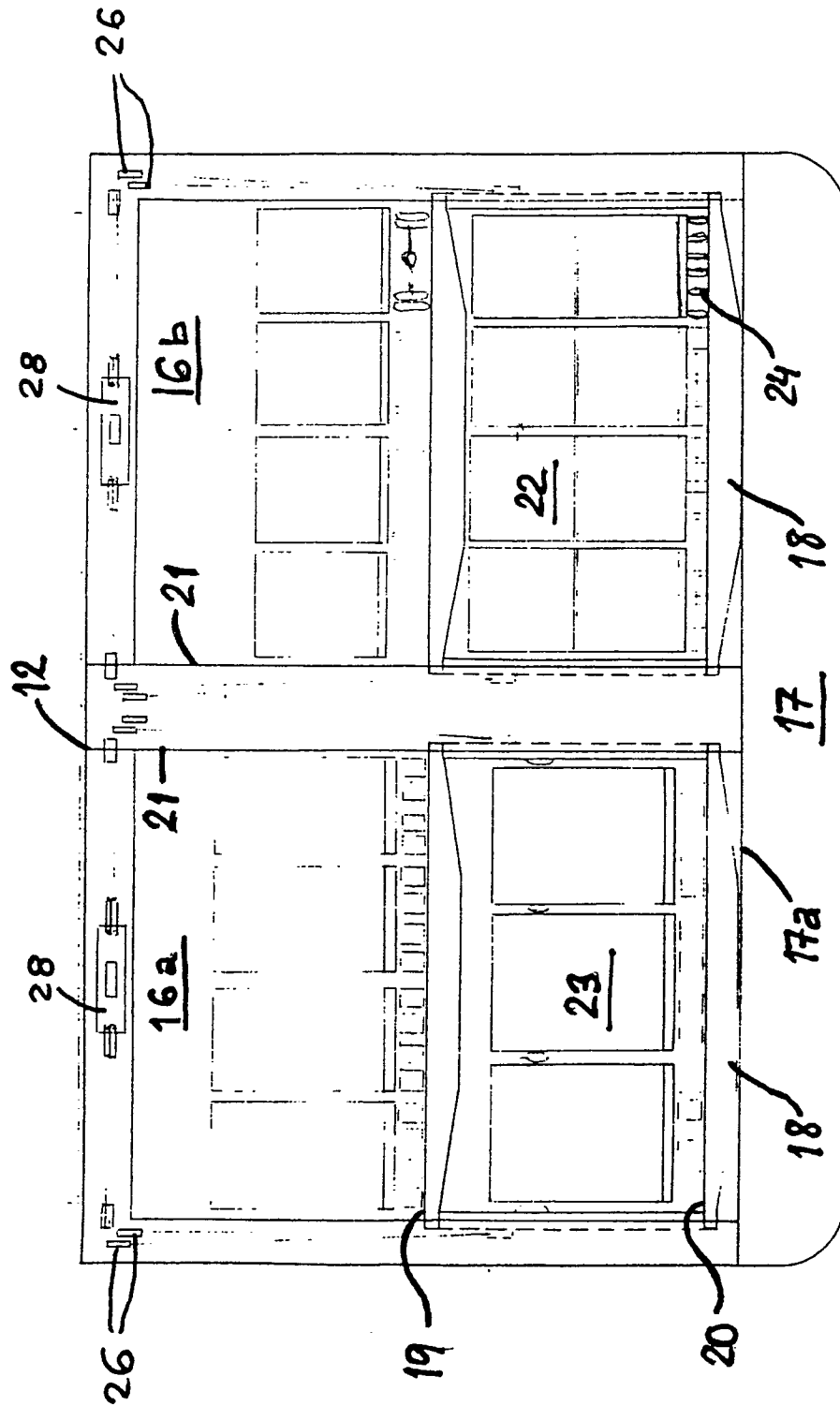


FIG. 2



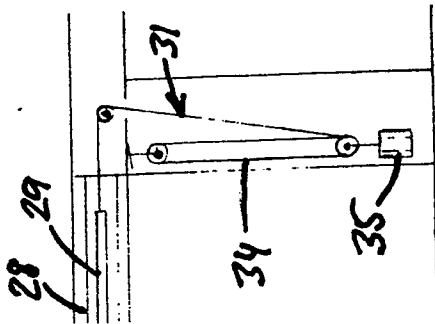
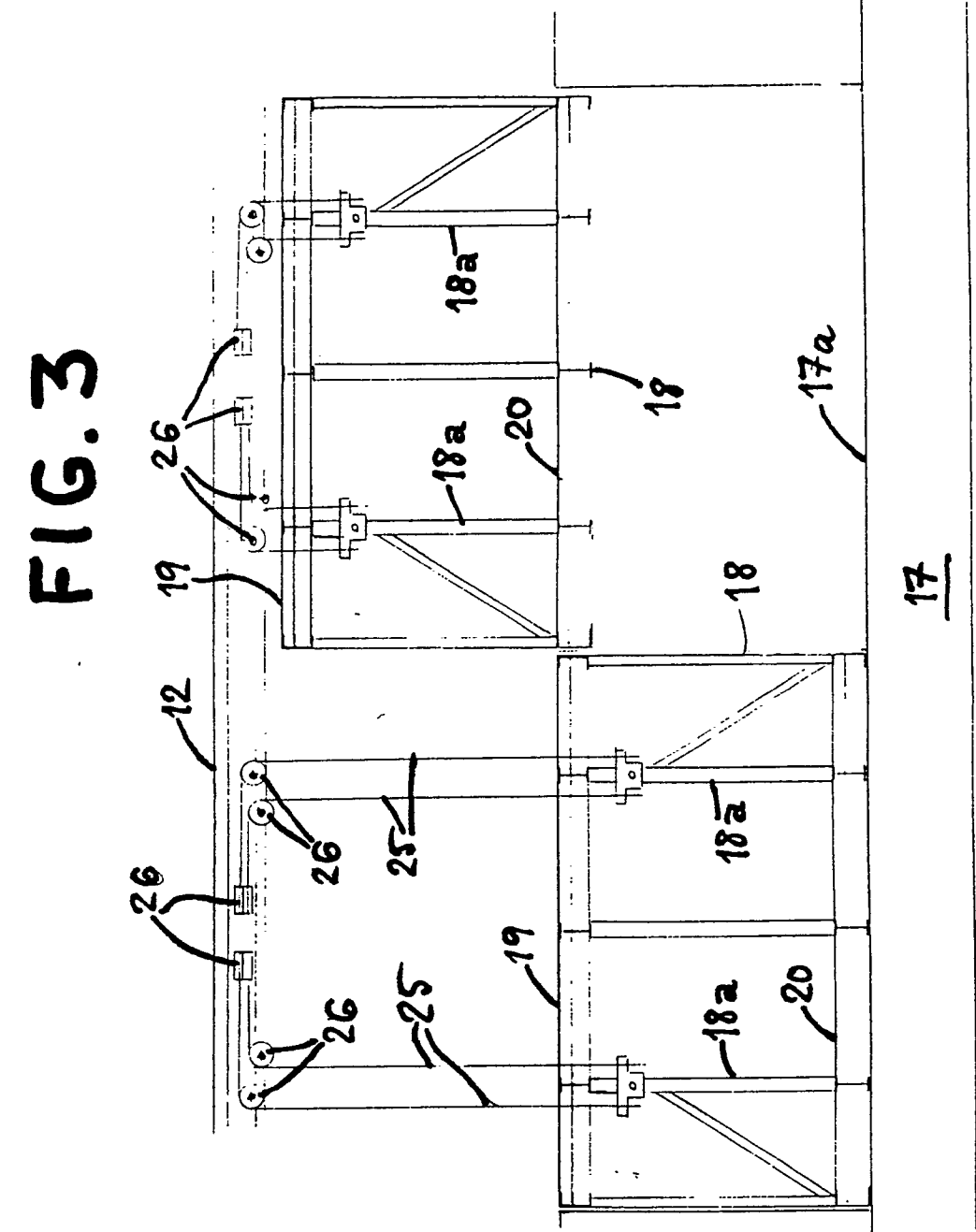


FIG. 5

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