

EUROPEAN PATENT APPLICATION

Application number: 86850003.4

Int. Cl.⁴: **B 63 B 25/22**

Date of filing: 13.01.86

Priority: 14.01.85 SE 8500152

Applicant: **Rederi AB Ragne, Gustav Adolfs torg 14, S-111 52 Stockholm (SE)**

Date of publication of application: 30.07.86
Bulletin 86/31

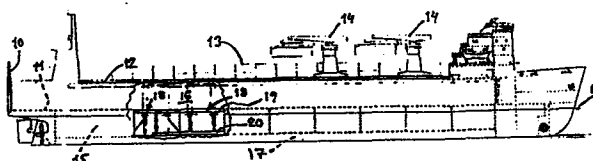
Inventor: **Strömbeck, Per, Lundvägen 13, S-437 00 Lindome (SE)**

Designated Contracting States: **BE DE FR GB IT**

Representative: **MacFie, W.R. et al, Backers Patentbyrå AB Drottninggatan 15, S-41114 Göteborg (SE)**

A ro-ro vessel.

A RoRo-vessel having an upper cargo-carrying deck (12) and a permanent communication deck (11) therebelow, as well as at least one centrally located cargo space (16). This extends from the upper deck to below the water line. This cargo space houses two series of two-storey cargo reception elevators (18), which are vertically displaceable by means of lifting gear in such a manner that either the upper (19), or the lower (20) platform thereof will be level with the lower communication deck (11).



A RORO VESSEL

The present invention refers to a RoRo-vessel having an upper cargo-carrying deck and a permanent communication deck therebelow as well as at least one central cargo space extending from the upper deck to below the water line.

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.

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 in that the cargo space is provided with a series of two-storey cargo reception elevators, which are vertically displaceable by means of lifting gear in such a manner that the upper or the lower platform will be 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.

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. 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 sace 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 releived.

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 sixtyfour 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) and a permanent communication deck (11) therebelow as well as at least one central cargo space (16) extending from the upper deck (12) to below the water line (38), c h a r a c t e r i z e d in that the cargo space (16) is provided with a series of two-storey cargo reception elevators, which are vertically displaceable by means of lifting gear (25, 27, 29, 30) in such a manner that the upper (19) or the lower (20) platform will be level with the communication deck (11).

2. A vessel according to claim 1, c h a r a c t e r - i z e d 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, c h a r a c t e r - i z e d 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, c h a r a c t e r - i z e d 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, c h a r a c t e r i z e d 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 in which the upper cargo-carrying deck (12) is sheltered, c h a r a c t e r i z e d 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.

7. A vessel according to claim 6, c h a r a c t e r - i z e d 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.

FIG. 1

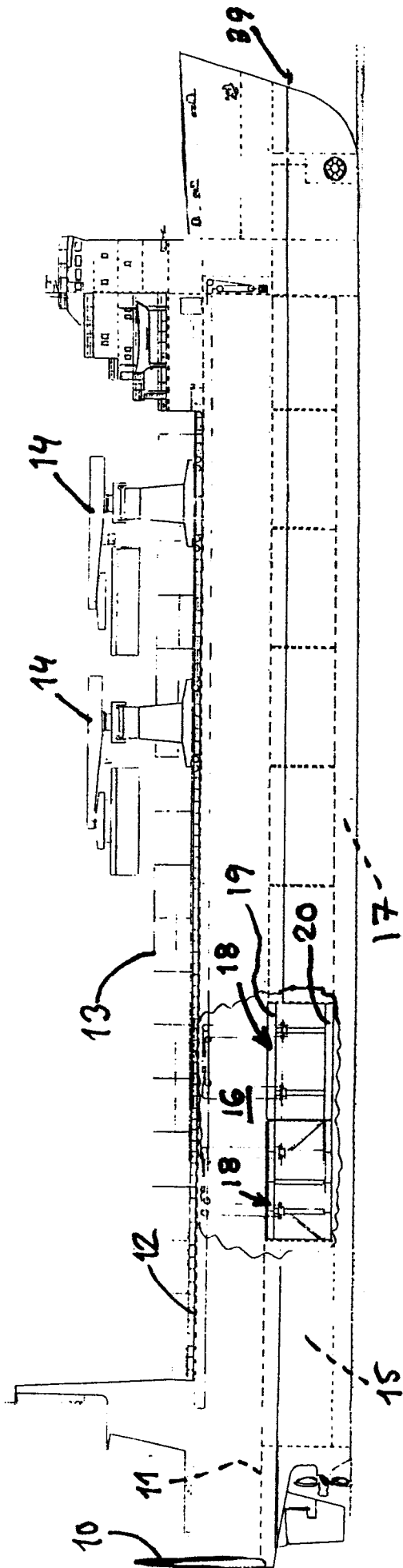
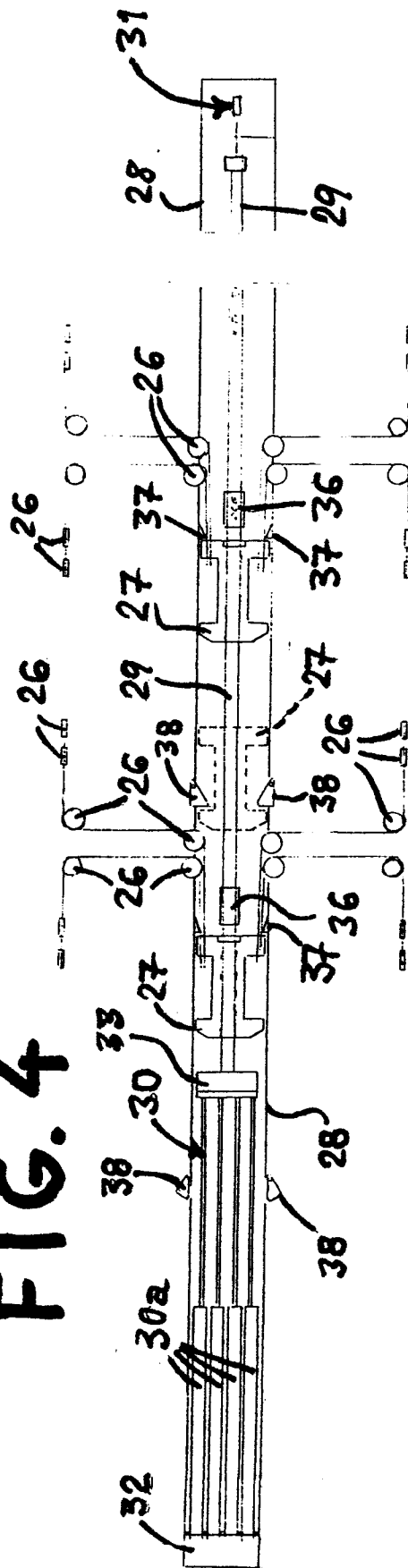


FIG. 4

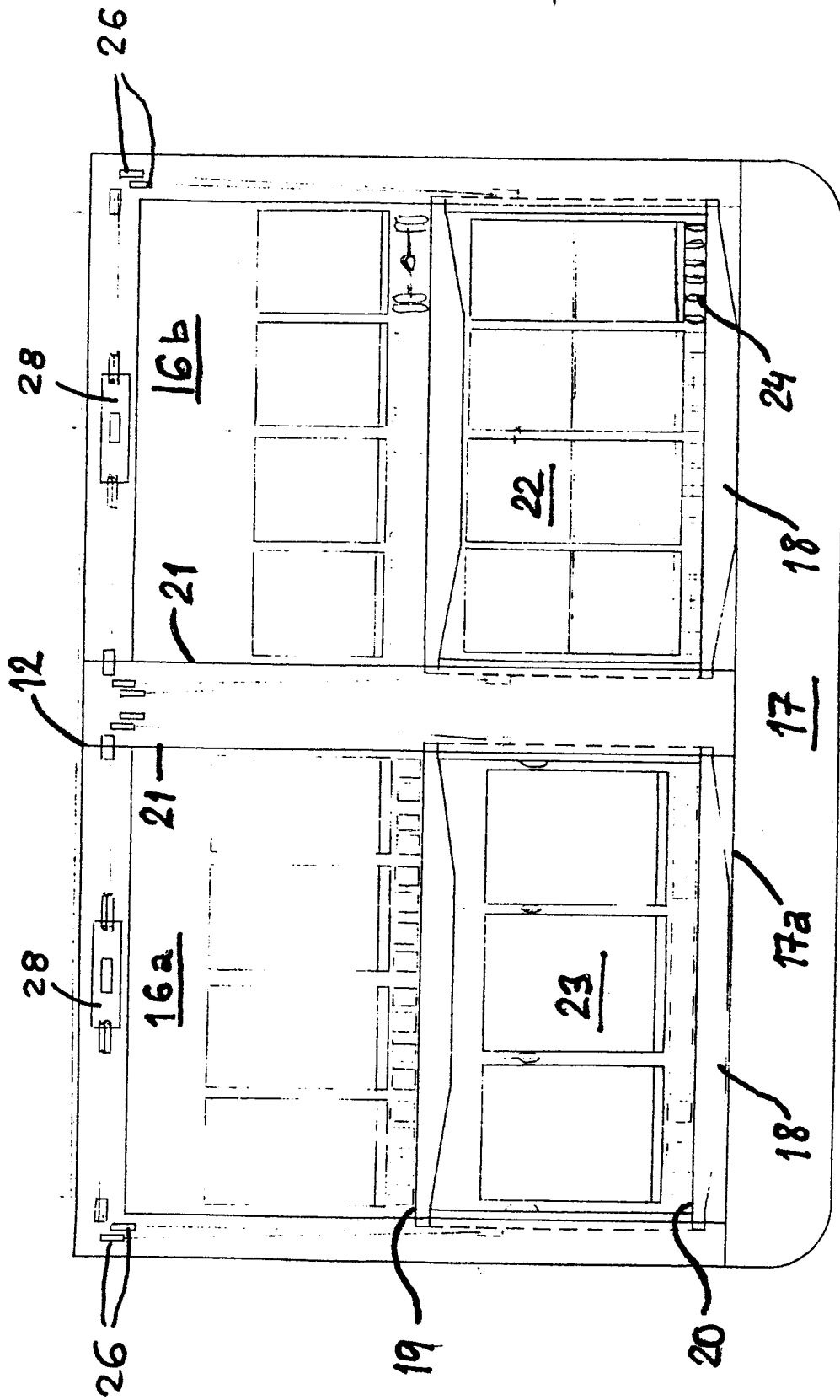


1/4

0189384

2/4

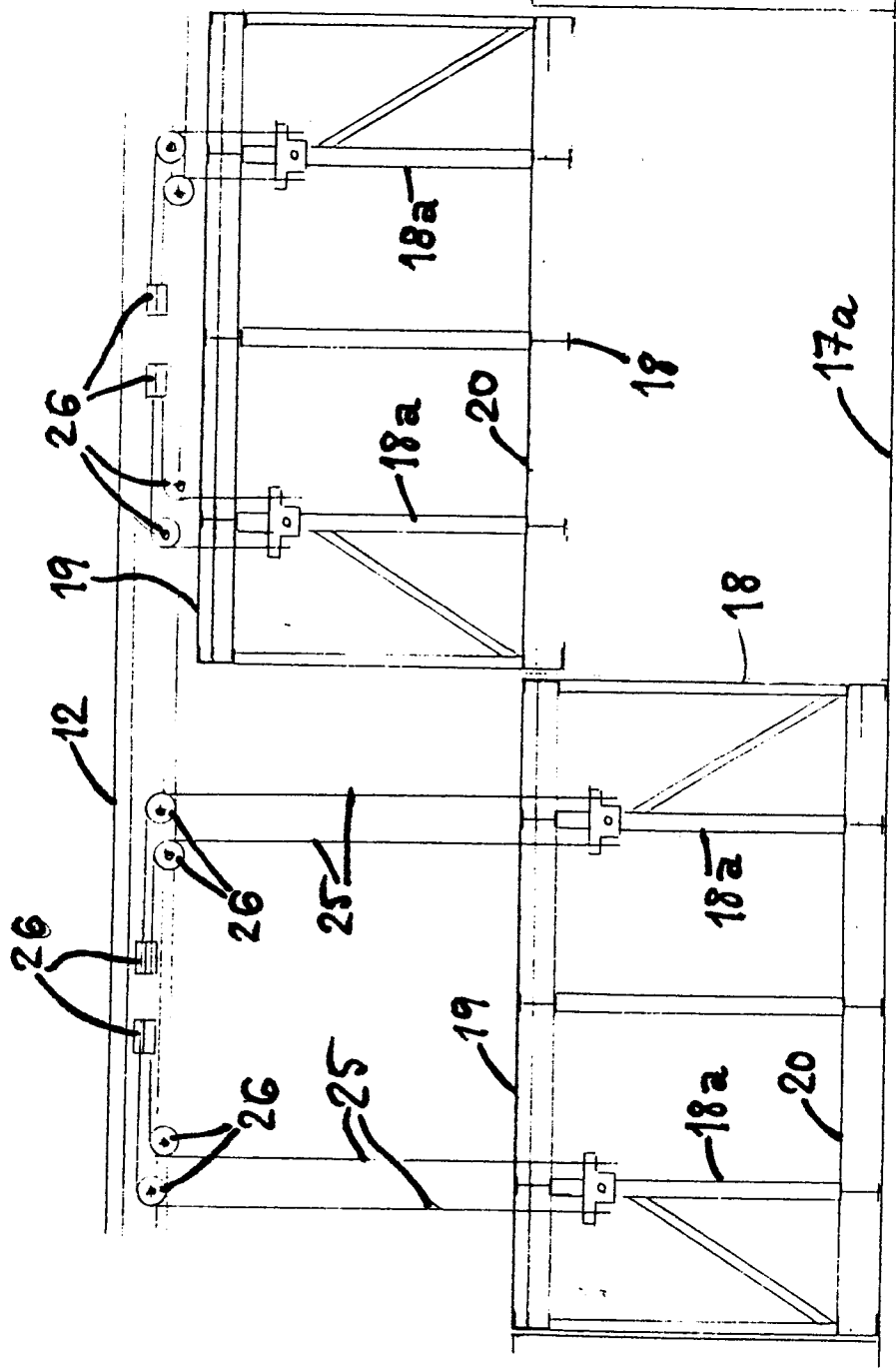
FIG. 2



3/4

0189384

FIG. 3



17

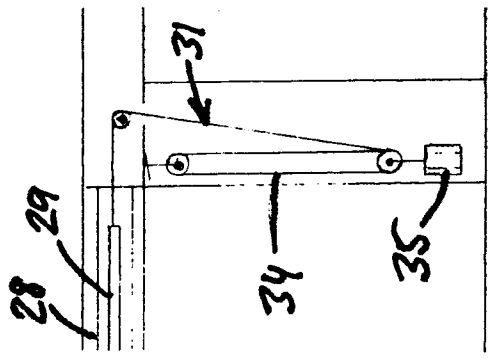


FIG. 5

