Nov. 20, 1962 J. W. WINFREY ETAL 3,064,829

MARINE TRANSFER ASSEMBLY

Filed Dec. 10, 1959 2 Sheets-Sheet 1

Fig. 4.

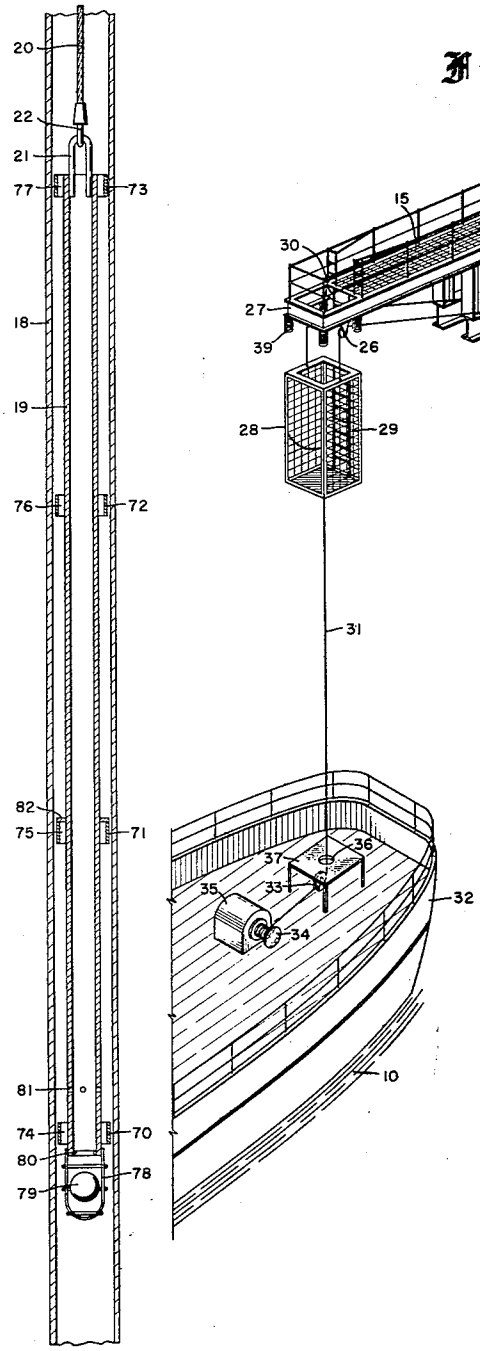


Fig. 1.

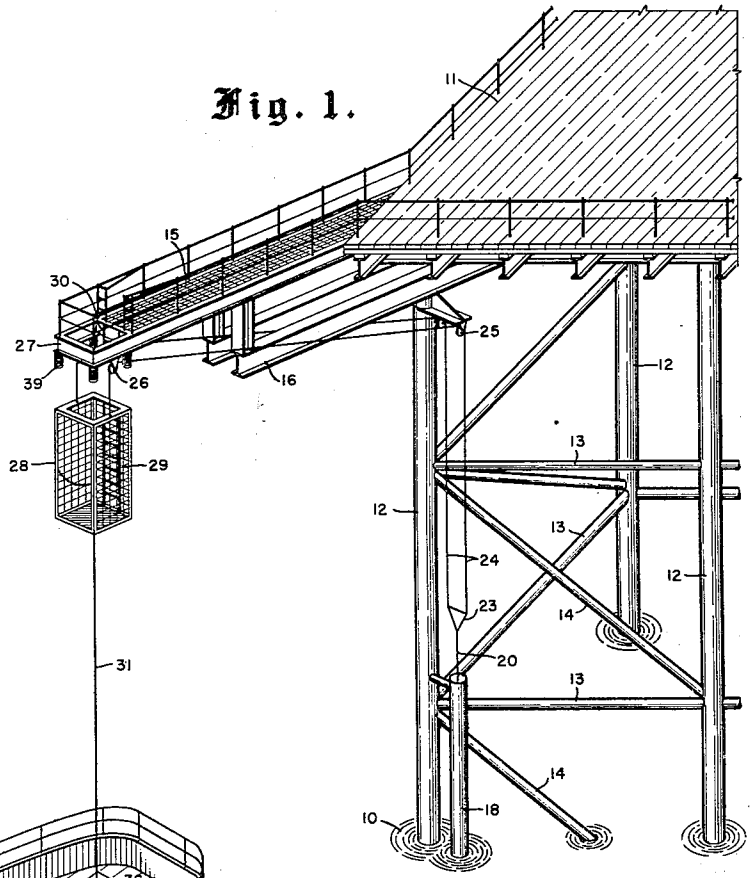
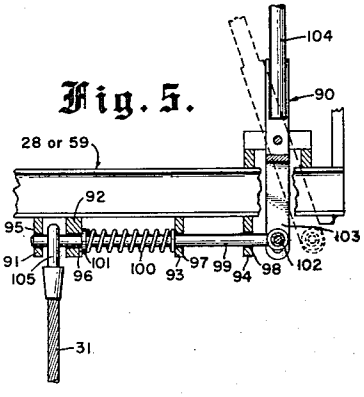


Fig. 5.



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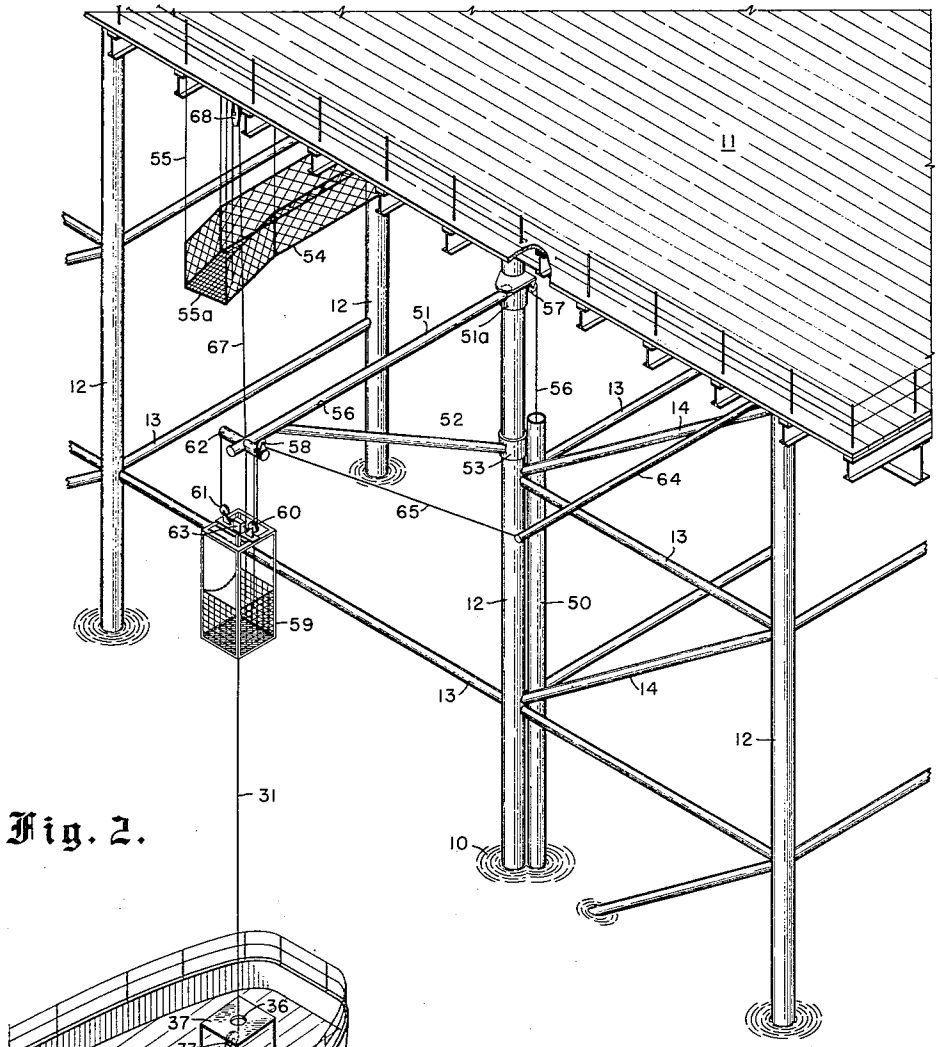
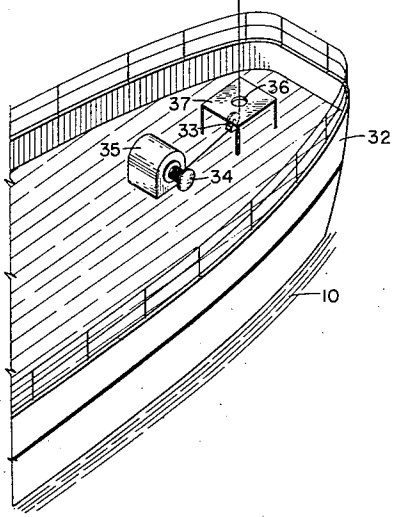


Fig. 2.



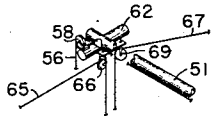


Fig. 3.

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MARINE TRANSFER ASSEMBLY

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4 Claims. (Cl. 214—14)

The present invention is directed to a marine transfer assembly. More particularly, the invention is concerned with a device for transferring personnel and material between a boat and an offshore structure or between two floating vessels. In its more specific aspects, the invention is concerned with a transfer assembly which allows personnel and material to be safely transferred between a vessel and another structure in troubled waters.

The present invention may be briefly described as a marine transfer assembly for a marine structure which comprises a ramp extending outwardly from the structure. Arranged vertically below the structure is a guide pipe adapted to contain a body of liquid such as water. Arranged within the guide pipe is a hollow elongated counterweight provided with a valve in its lower end which prevents or restricts liquid flow into the counterweight when it is moving downwardly in the guide pipe. The counterweight is suitably provided with means circumferentially spaced apart thereon for damping downward movement of the counterweight into the body of liquid. These means may suitably comprise circumferentially and vertically spaced-apart fins arranged on the exterior surface of the counterweight and which are sized and spaced to provide the desired damping effect. A carriage is provided which is connected by flexible means to the counterweight, the flexible means being arranged over spaced-apart pulleys carried by the structure. The counterweight has a weight such that the effective pull of the counterweight exerted on the carriage is greater than effective counterpull of the carriage plus any loading placed thereon such that release of the carriage from a restrained lowered position causes movement upwardly toward the ramp. While the counterweight may be greater than the weight of the carriage plus any loading thereon, the weight of the counterweight may be less than that of the carriage and its load depending on the number of purchase lines employed. The counterweight is suitably provided of a sufficient weight such that acceleration upwardly is sufficiently rapid to clear the vessel which may be pitching violently. In short, the upward acceleration of the carriage is greater than that of the vessel. The movement upwardly of the carriage, after clearing the vessel, is then damped by entrance of the counterweight into the body of liquid.

The ramp may suitably be connected to the structure for pivotal horizontal movement and the carriage is provided with a flexible means which is releasably attached to a vessel in the body of water for pulling the carriage down to the vessel. The flexible means is also releasably attached to the carriage.

While the ramp may be pivotally attached, it may also be fixedly arranged connected to the structure and the carriage may be attached to a boom extending outwardly from the structure which pivots in a horizontal plane to bring the carriage underneath or alongside the ramp. Some structures will not require a ramp.

The present invention will be further illustrated by reference to the drawing in which:

FIG. 1 is an isometric view of a preferred embodiment;

FIG. 2 is another embodiment with the ramp in a fixed position and the carriage supported on a swivel boom;

FIG. 3 is another view of the swivel boom of FIG. 2;

FIG. 4 is a sectional view of an embodiment of the guide pipe and counterweight of FIGS. 1 and 2; and

FIG. 5 is a sectional view of a quick release mechanism for disengaging the carriage from a flexible means.

Referring now to the drawing in which identical numerals will be employed to designate identical parts, the numeral 11 designates an offshore structure carried and supported by a plurality of vertically extending support members 12 which extend to the bottom of a body of water 10. It is to be understood that structure 11 may be a mobile or floating rather than a fixed structure. The support members 12 are interconnected by braces and truss work 13 and 14.

Extending outwardly from the platform 11 is a ramp 15 which is fixed by structural support means 16 to a corner of support member 12. Arranged vertically below the offshore structure 11 is a counterweight guide pipe 18 in which a counterweight 19, which will be described further hereinafter, is supported by wire line or rope 20 by means of a U-bolt 21 and eye means 22. The wire line 20 is connected by yoke 23 to parallel wire lines 24 which extend over a pair of pulleys or sheaves 25 and over a second pair of pulleys or sheaves 26 adjacent the free end 27 of the ramp 15, the wire lines 24 being attached to a carriage 28 which is suspended from the free end 27 of the ramp. The parallel lines 24 may, if desired for safety purposes, be connected directly to the counterweight 19. The carriage 28 is suitably provided with a ladder 29 which allows personnel to climb from within the carriage and, by means of the corresponding ladder 30, on to the ramp 15. Attached to the lower end of the carriage 28, by means of a quick release mechanism shown in and described more particularly with reference to FIG. 5, is a rope or line 31 which depends therefrom and which is suitably caught by personnel on a crew boat such as 32 and run over a swivel or sheave 33 and connected to a winch or hoisting means 34 operatively connected to a motor or engine 35. The rope or line 31 extends through an opening or port 36 in a landing 37 on the crew boat 32. While this landing 37, preferably fitted with shock-absorbing bumper, is shown preferably on the stern of the vessel 32, it may also be arranged on the bow thereof.

As shown in FIG. 1, it is necessary to provide shock absorbers such as 39 underneath the ramp 15 or on top of carriage 28 or both to lessen the shock of the carriage when it travels upwardly from the crew boat 32 to the ramp 15.

Referring now to FIGS. 2 and 3, an offshore structure such as 11 is suitably supported by support members 12 and by braces and support members 13 and 14 such as in FIG. 1. In FIG. 2 a counterweight guide pipe 50 is arranged adjacent and attached to one of the support members 12 and extends down into the body of water 10.

The guide pipe may be above water depending on the type of the structure employed. The guide pipe may be inside a caisson supporting a platform. Extending outwardly from the offshore structure 11 is a carriage boom 51 supported by bracing member 52 which is attached to the carriage boom 51 and to a collar 53 arranged rotatably on the support member 12.

A landing ramp 54 is carried dependingly by lines or structural members 55 from the structure 11 and extends outwardly therefrom to provide a free end 55a.

Supported by a counterweight line 56 which extends over spaced-apart pulleys 57 and 58 is a carriage 59 provided with pulleys 60 and 61 over which the line 56 extends, the carriage boom 51 being provided with a crosshead 62 on its free end in order to carry the carriage 59 in a stable, nonrotating condition. Arranged on the top of the carriage 59 and operatively connected to the line

56 is a brake 63 which may be operated by a man in the carriage 59. Connected to the lower end of the carriage 59 is a rope or line 31 which extends through a port 36 in a landing ramp 37 and over a pulley or sheave or fair lead 33 on the crew boat 32 and is connected to the winch 34 on the motor or engine 35.

Extending outwardly from the offshore structure 11 is an elongated member 64 to which is attached a line or flexible member 65, the free end of which is led over a sheave 66 (hidden by the structure in FIG. 2 but shown in FIG. 3) into carriage 59 permitting slewing carriage boom 51 from landing ramp 54 to extended postion. Another slewing line 67 is provided, one end of which is attached to ramp 54 and extends over pulley 68 on structure 11 and over pulley 69 attached to boom 51 into carriage 59. Line 67 permits slewing the carriage boom 51 from extended position to a position adjacent the landing ramp 54.

The carriage boom 51 is connected to the offshore structure 11 by pivot means 51*a* which allows the carriage boom 51 to pivot in a horizontal plane and to bring the carriage 59 adjacent the free end 55*a* of the ramp 54 so that when the carriage is in its top position, the carriage floor and ramp floor are in the same plane. The slewing arrangement is intended to position the carriage clear of the platform during ascent and descent.

Referring specifically to FIG. 4, the counterweight 19 is provided with a plurality of circumferentially spaced-apart fins 70, 71, 72, and 73, the fins 70 to 73, inclusive, being provided with ports 74, 75, 76, and 77. The lower end of the counterweight 19 is provided with a valve cage 78 in which a valve 79 is carried. The lower end of the counterweight 19 also has a valve seat 80 on which the valve 79 is designed to seat.

Immediately above the fins 70 are a plurality of ports 81 for equalizing of pressure in the counterweight 19.

The fins 70 to 73, inclusive, may be provided with removable cover plates such as 82 which are shown for illustration purposes on fins 71 only. Plates 82, when used, increase the damping effect of fins 70 to 73, inclusive.

The counterweight guide pipe 18 suitably contains a body of fluid or liquid which may be air, water, other gases, oil, or other noncompressible liquid such as mercury and the like which is used for damping downward movement of the counterweight 19. Also, it may be open to the sea by means of side ports or it may be closed to the sea.

Referring now to FIG. 5, the carriage 28 of FIG. 1 and carriage 59 of FIG. 2 is provided with a quick release mechanism generally designated by numeral 90 comprised of brackets 91, 92, 93, and 94 attached to the bottom of carriage 28. Brackets 91 to 94, inclusive, are provided with aligned openings 95, 96, 97, and 98 through which a pin 99 is inserted. A compression spring 100 is mounted between and bears with its ends against brackets 92 and 93 and against plate 101 attached to pin 99 and urges pin 99 into the position shown in the drawing. Pin 99 is connected by pivot 102 to a yoke 103 which in turn has an actuation member or handle 104 which extends into carriage 28. By depressing the handle 104, the pin 99 is moved to the right allowing the eye means 105 connected to flexible line 31 to be attached to or released from the carriage 28. Thus, if an operator in the carriage 28 wishes to be freed of line 31, he depresses the handle 104 which retracts pin 99 causing quick release of the carriage 28.

The present invention operates as follows:

In all instances in accordance with the several figures of the drawing, the effective pull of the counterweight 19 exerted on the carriage is greater than the effective counter-pull of the carriage plus a normal operating load such that the normal position for the carriage is in the up position as shown in the several figures of the drawing. Thus, the weight of the counterweight may be greater than or, as explained below, some fraction of, the weight of the

carriage plus the loading which may be placed thereon. For example, in FIG. 1 where the counterweight and carriage are connected directly by lines 24, the weight of the counterweight is greater than that of the carriage and any loading thereon. In FIG. 2 where the counterweight is connected to the carriage through a double-purchase line 56, giving the counterweight a 2 to 1 mechanical advantage, the counterweight may have a weight greater than about one-half of the total weight of the carriage and its loading. Triple, quadruple, or any greater number of purchase lines such as 56 may be employed. Where multiple or plural purchase lines are employed, it is important that the counterweight must not exceed the weight of the carriage plus any loading or the brake 63 will be ineffective in slowing and stopping the carriage since application of the brake changes a multiple purchase line in effect to a single purchase line. For slowing and stopping to be effected, the single purchase pull must be less than the weight of the carriage and load.

When the crew boat approaches, a member of the operating crew of the crew boat 32 will catch the dangling line 31 and thread it through port 36 and over the pulley 33 and attach same to the winch 34 or connect the line attached to the winch 34. By operating the motor 35, the carriage is pulled downwardly to the landing ramp 37. It is then possible for personnel to step off or on to the carriage and release of the line from the winch 34 allows the carriage to travel immediately and rapidly upward toward the offshore structure 11. In the case of FIG. 1, the shock absorber such as compression springs 39 lessens the shock on hitting the ramp whereas in FIG. 2, the man being carried upwardly operates the brake as may be desired.

The present invention is quite important and useful in that when the carriage or cage is released from the deck of the boat, the counterweight accelerates downwardly at an equal or greater rate than the boat moves upwardly until it enters the body of liquid and the liquid then decelerates the counter weight travel by the fluid damping the motion. With the counterweight producing the desired damping action, the cage is brought to rest under the ramp by the use of shock absorbers such as compression springs or brakes to absorb the small remaining impact momentum of the carriage.

An important feature of the invention is the differential damping to control deceleration. This is accomplished by providing the fins 70 to 73 with openings or ports 74 to 77 which either may all be open or part may be closed or some of the ports may be closed by plates 82. As the ball valve 79 closes buoyancy of the counterweight 19 is increased and as the fins 70 to 73 each sequentially enter the fluid or liquid in the guide pipe 18 a stepped increase in the deceleration effect is obtained, the counterweight 19 increasing progressively in buoyancy as it sinks into the water in pipe 18.

It is contemplated that deceleration may also be controlled by changing the viscosity and/or density of the liquid or fluid in guide pipe 18. For example, half or part of the fluid may be oil and the other half or part may be water, the drag force changing with viscosity and the buoyant force changing with density.

A basic criterion of the counterweight operation is that it must accelerate the loaded carriage faster than the pitching and heaving acceleration of the boat in order to prevent the boat from slamming into the bottom of the carriage. Thus, the carriage is pulled downwardly to the boat by use of the boat's winch, or capstan, and the line is connected to the boat. Since the counterweight before damping is capable of producing a carriage acceleration greater than the boat's pitching and heaving acceleration, the line between the boat and the carriage will always stay taut and any relative vertical motion between the carriage and the boat will be the amount of line taken up on the winch, or capstan. Thus the carriage may be eased down to the deck of the boat without danger of impact or slamming. Ascent of the

carriage from the boat is accomplished by easing off on the line connecting with the capstan or winch or by rapidly disengaging the carriage from the boat or line and allowing the counterweight and subsequent damping to control the carriage's upward motion.

In accordance with the present invention, the marine transfer assembly is quite safe in the upward direction should the line to the boat break or be released accidentally or on purpose. The use of two cables resists rotation and also provides a safe feature in that one cable, if broken, would not cause the carriage to fall.

Donward velocity of the counterweight causes the ball check valve to close when it enters into the liquid and blanks off the flow area through the pipe, causing greater damping of the counterweight's downward motion than open pipe because of greater drag and buoyancy. The fins provide restriction to flow of fluid in the annular space between the guide pipe and the counterweight, causing additional damping. By providing cover plates on the ports of the fins, as has been shown in FIG. 4, additional flow restriction and regulation of the amount of damping may be provided. The counterweight damping sufficiently slows down the carriage in gradual steps for stability and comfort as its approaches the ramp walkway such that the shock absorbers absorb small final impact momentum and bring the carriage to rest.

The ports 81 immediately above the fins 70 allow flow of water into the pipe to equalize the static head on the ball valve 79 and causes the nonbuoyant ball valve to drop when the counterweight is at rest. During upward travel of the counterweight, the ball valve is open, providing additional flow area for upward motion and with the valve 79 open there is less buoyancy and more effective counterweight to support the carriage.

The present invention has been successfully used in transferring personnel between a crew boat and an offshore platform.

The nature and objects of the present invention having been completely described and illustrated, what we wish to claim as new and useful and secure by Letters Patent is:

1. A device for transferring objects between an upper and a lower marine station having different relative heights above the sea, at least the lower of said stations freely floating upon the surface of the sea, which comprises a carriage, first pulley means attached to said lower station, first cable means passing over said pulley means and attached to the bottom of said carriage, cantilever support means depending from said upper station and extending laterally therefrom, second pulley means mounted on the projecting extremity of said support means, third pulley means mounted near the inward portion of said support means, second cable means attached to the upper portion of said carriage and extending over and partially around said second and said third pulley means, and counterweight means attached to and depending from said second cable means below said third pulley means, of sufficient weight to exert an effective pull greater than the combined weight of said carriage and said objects by an amount sufficient to impart an upward acceleration to said carriage at least equal to the vertical movement of said lower station which is induced by wave action, and further comprising a guide means for said counterweight vertically disposed beneath said third pulley means and extending for a distance at least equal to the length of travel of said counterweight and at least partially filled with a damping liquid, said second cable means being of such length that the counterweight is suspended above the damping liquid and enters said damping liquid only after the carriage has risen above the lower station a distance greater than the vertical movement of the station as a result of the action of the sea.

2. An apparatus in accordance with claim 1 wherein said counterweight is elongated in form, and further comprising damping vanes attached at axially-spaced points on the outer periphery of said counterweight.

3. An apparatus in accordance with claim 2 wherein said counterweight is of hollow, cylindrical form and wherein the lower portion thereof is in the form of a valve seat, and further comprising a ball valve movably supported on said counterweight below said lower portion and adapted to seal said valve seat.

4. An apparatus in accordance with claim 3 wherein said cantilever support is rotatably attached to said upper station, and further comprising a plurality of pulley means attached to the upper portion of said carriage, the second cable means passing through said pulley means and being attached to the projecting extremity of said cantilever support means, and brake means interposed between two of said plurality of pulley means for controlling the rate of ascent of said carriage.

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