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Allen

[11] **3,826,335**

[45] **July 30, 1974**

[54] **PERSONNEL/LOAD CARRYING SYSTEM**

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[52] **U.S. Cl.** **182/10,** 182/191

[51] **Int. Cl.** **A62b 1/06**

[58] **Field of Search** 182/10, 11, 189, 190, 191, 182/192, 193, 5

[56] **References Cited**

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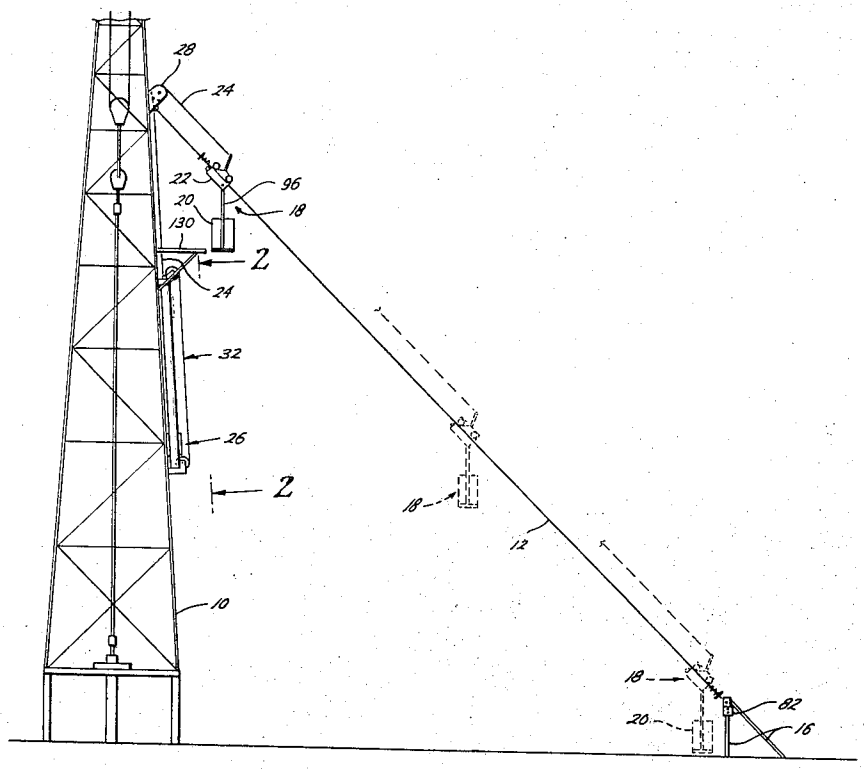
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Primary Examiner—Reinaldo P. Machado
Attorney, Agent, or Firm—Fulbright & Crooker

[57] **ABSTRACT**

An apparatus system for moving personnel and/or other loads from one elevation point to another. The apparatus system includes a carrier traversing an inclined carrying line secured between higher and lower elevation points, a movable counterweight for counterbalancing weight of the carrier, a cable interconnecting the carrier and counterweight, sheaves coacting with the cable, and fluid power means for adjusting rate and direction of movement of the carrier along the carrying line, the carrier being automatically returnable to the upper elevation point if desired. Braking means are provided to stop the carrier in an emergency situation.

20 Claims, 5 Drawing Figures



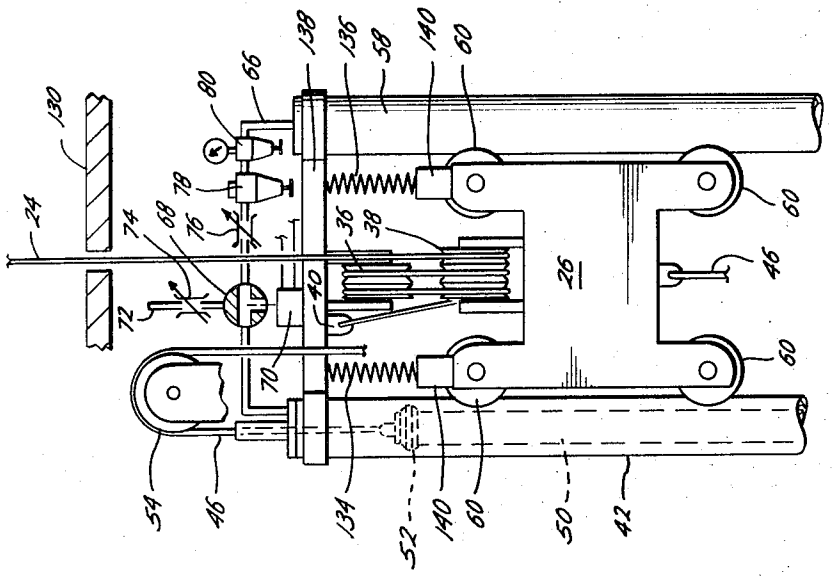

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74
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134
52
140
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50
42

Fig. 3A

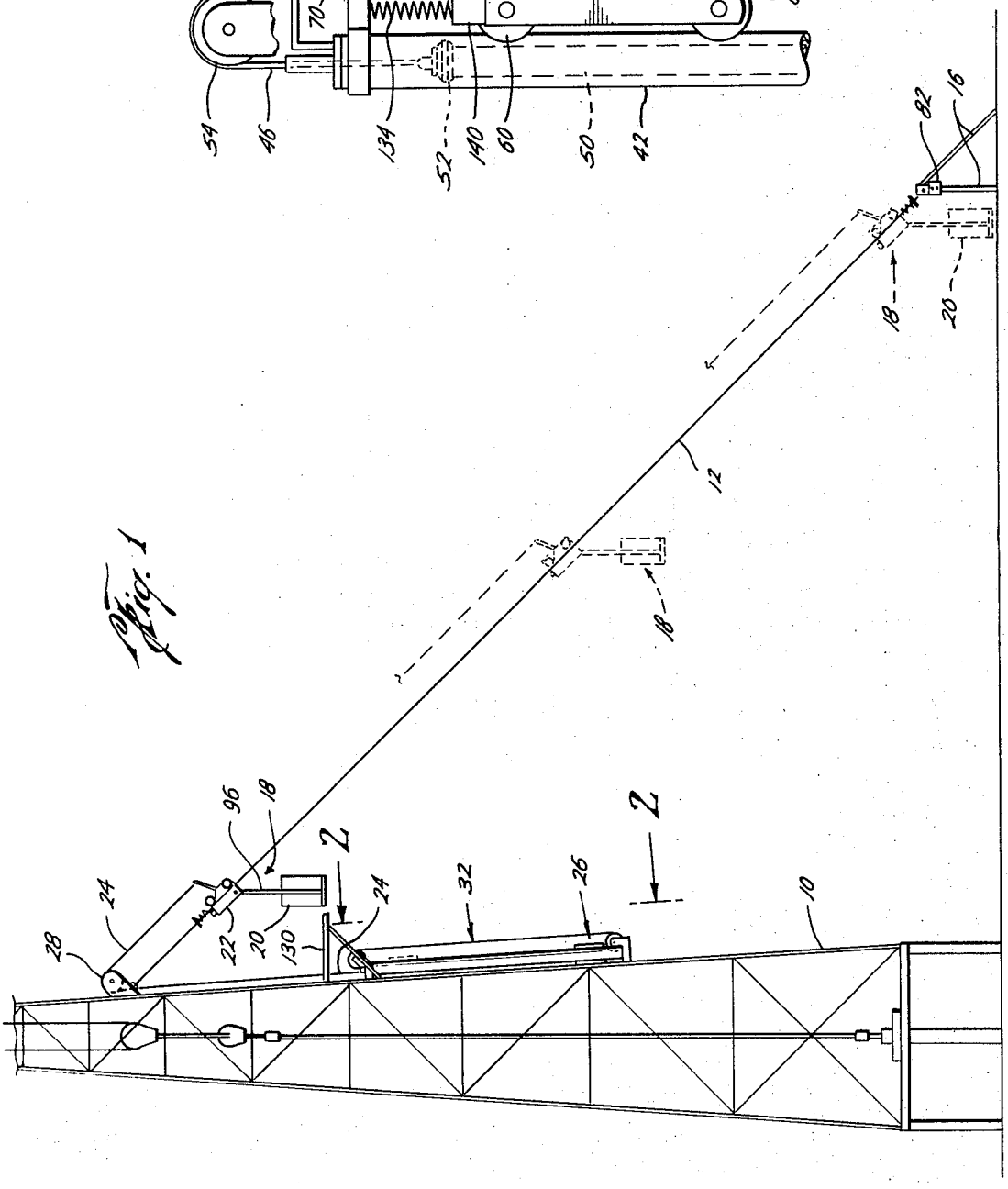
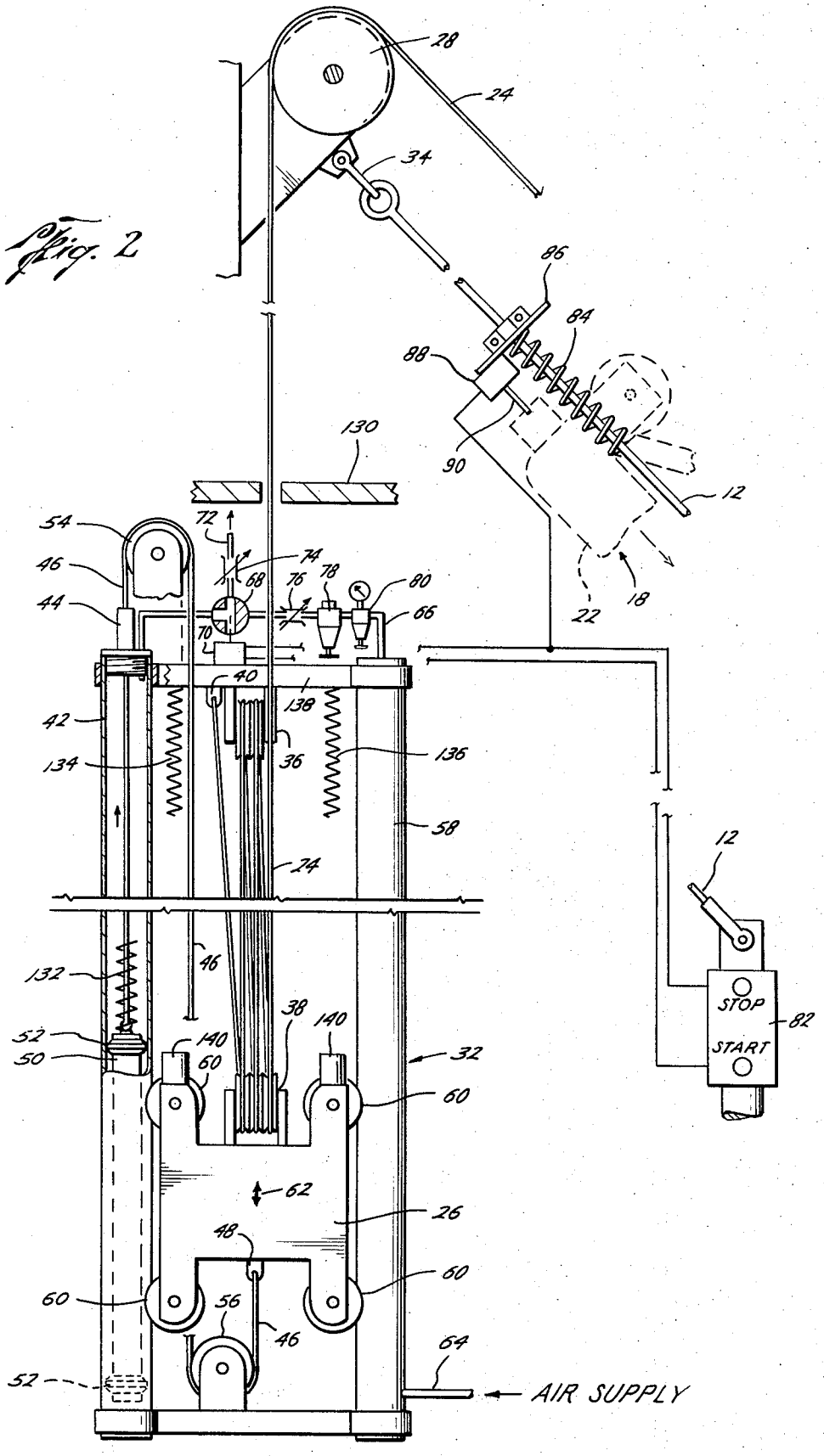

82
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12
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2
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32
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22
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Fig. 1

Fig. 2


28
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86
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130
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74
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68
76
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80
44
66
70
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138
42
36
134
136
58
74
12
STOP
START
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46
132
38
140
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140
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32
60
62
26
48
60
60
56
46
64
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AIR SUPPLY
22
18

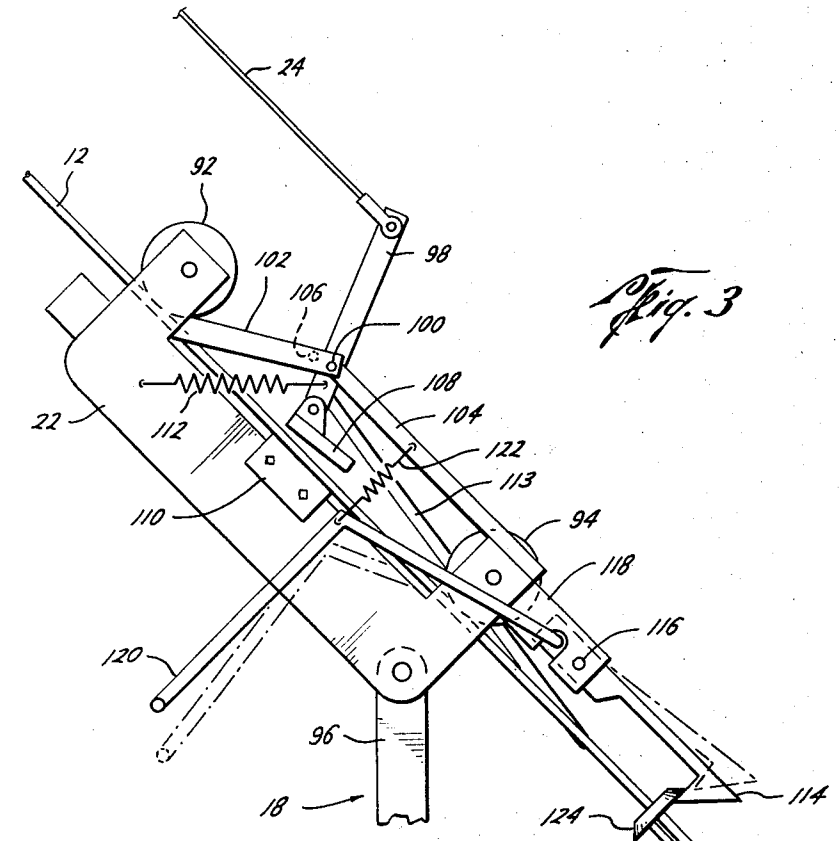

24
12
92
98
102
106
100
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104
112
22
122
113
110
94
118
116
120
96
18
114
124
12

Fig. 3

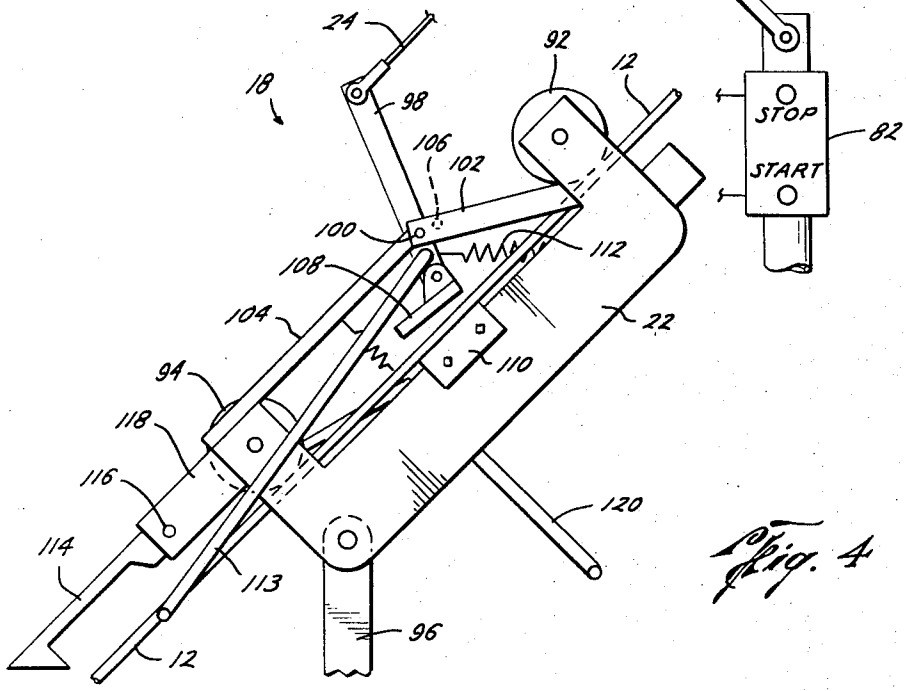

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Fig. 4

PERSONNEL/LOAD CARRYING SYSTEM

BACKGROUND OF THE INVENTION

Numerous types of construction projects as well as drilling rigs of the derrick type for drilling oil and gas wells require the transporting of personnel and other loads to and from elevated levels. Stairs, elevators and the like that are ordinarily used result in wasted time and motion. Particularly in the drilling of oil and gas wells is there danger of blowouts, explosions, fires and other perils necessitating quick evacuation from working structures. Consequently, it would be advantageous to provide a means of descent from these types of structures that is reliable, safe and fast as well as having the capability of moving loads from one elevation to another with controls stationed at either level. The present invention is directed to such means.

An example of one form of a device for carrying personnel from one level to another is illustrated in my pending United States patent application Ser. No. 239,137 filed Mar. 29, 1972 for a "Descension Device." Other forms of devices for moving personnel are illustrated in references cited in the file of such application.

Applicant presently is aware of existing patents in the field of art including U.S. Pat. Nos. 864,405 (Bowen, 1907); 1,556,555 (Brown, 1925); 1,571,096 (Rambin et al., 1926); 1,615,657 (Schwafel, 1927); 1,684,251 (Thomas, 1928); 1,888,911 (Graffenreid, 1932); 2,321,248 (Rose et al., 1943); 2,670,890 (Hodge, 1954); 2,948,348 (Bott, 1960); and the references cited therein.

SUMMARY OF THE PRESENT INVENTION

The apparatus system of the present invention generally provides means for moving personnel and/or other loads between higher and lower elevations and comprises a carrying line inclined from and anchored between the higher and lower elevation points, carrier means for traversing the carrying line to support the personnel or load being moved, movable counterweight means for counterbalancing weight of the carrier means, cable and sheave means inter-connecting and providing coaction between the carrier means and the counterweight means, and fluid power means for adjusting rate and direction of movement of the carrier means along the carrying line. Preferably, the apparatus system also includes braking means secured to the carrier means and coacting with the carrying line and the cable and sheave means such that slacking or severance of the cable and sheave means engages the braking means with the carrying line to bring the carrier means to a stationary position with respect to the carrying line. The fluid power means regulates movement of the counterweight means for purposes both of descending and ascending operation of the carrier means.

It is, therefore, an object of the present invention to provide a personnel/load moving device providing a means of quick movement of the personnel/load between higher and lower elevation points through manipulation or operation of fluid power means.

Another object of the present invention is to provide such a personnel/load moving device having automatically operable braking means to bring the carrier portion of the device to a halt upon slaking, severance or failure of the supporting cable insuring safety of the personnel or other load.

A still further object of the present invention is the provision of a descension device providing a means of quick descent from higher to lower elevation points in emergency situations, the carrier portion of the device moving personnel away from the work area rather than down alongside of the work area.

Still another object of the present invention is the provision of a personnel/load carrying system having fluid power means for adjusting rate and direction of movement of the carrier portion of the system along a carrying line, the fluid being pressurized to lift the personnel/load, the pressure of the fluid being reduced or otherwise released to lower the personnel/load.

Other and further objects, features and advantages will be apparent from the following description of preferred embodiments of the invention, given for the purpose of disclosure and taken in conjunction with the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

In the drawings forming a part of the disclosure herein, like character references designate like parts throughout the several views, wherein,

FIG. **1** is a side elevation view of the personnel/load moving apparatus system according to the present invention,

FIG. **2** is a partial elevation view, partly in cross section, taken along the line **2—2** of FIG. **1**, showing the higher elevation end of the carrying line, and showing the cable and sheave means as well as the fluid power means for adjusting rate and direction of movement of the carrier portion of the system,

FIG. **3** is a partial elevation view showing the carrier means latched by means of a retention device at the lower elevation point,

FIG. **3A** is a partial elevation view of the cable and sheave means as well as the fluid power means with a schematic of means for adjustably pressuring and directing flow of the fluid, and

FIG. **4** is a partial elevation view of the carrier with associated braking means.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Shown in FIG. **1** is a derrick **10** typical of that used in the drilling of oil and gas wells. While the apparatus system of the present invention will be described with respect to a derrick, it will be understood that the invention may be used in any application requiring movement of personnel and/or other loads to and from elevated points. The apparatus system of the present invention is particularly useful in situations wherein it is desired to move the personnel and/or other load outward, below and away from the work site so as not to be subjected to perils that might arise in the work area.

A carrying line **12** is inclined from and anchored between higher and lower elevation points. For example, the upper end of the line **12** may be anchored to the derrick **10** by suitable supports. Similarly, the lower end of the line **12** may be attached or anchored to beams **16** or other support members.

Continuing with respect to FIG. **1**, carrier means **18** are provided for traversing the carrying line **12** to support the personnel or other load being moved along the

line. The carrier means **18** generally includes a gondola **20** suspended from a frame **22**, details of the carrier means being explained with more specificity hereafter with respect to FIGS. **3** and **4**. The carrier means **18** is also illustrated in dotted outline in FIG. **1** in an intermediate position with respect to the carrying line **12** as well as at the lower elevation point or ground level.

Shown in FIG. **1** and as will be explained hereafter in more detail with respect to FIGS. **2** and **3A**, a cable **24** interconnects the carrier means **18** and the movable counterweight means **26**. The cable **24** engages sheaves **28** and **30** and engagably coacts with two opposed sets of sheaves **36** and **38** shown in FIG. **2**.

Further shown in FIG. **1** is a fluid power means **32** for adjusting rate and direction of movement of the cable **24** and in turn the carrier means **18** with respect to the carrying line **12**.

With respect now to FIG. **2**, the cable **24** engages and coacts with two opposed sets of sheaves, the number of sheaves in each set being proportional to the ratio desired of movement of the counterweight **26** relative to traverse of the carrier means **18**. As shown in FIG. **2**, one set **36** of the sheaves comprises two sheaves and the other set **38** comprises three sheaves. It will be understood and recognized by those skilled in the art, however, that the number of sheaves in each set may be varied as desired.

From the sheaves **36** and **38**, the end of the cable **24** is anchored and secured either to the counterweight **26** or to another suitable support such as a cable anchor member **40**.

The fluid power means for adjusting rate and direction of movement of the carrier means **18** along the carrying line **12** is illustrated in FIG. **2**. An enclosed tubular member **42** is provided at its upper end with a suitable stuffing box **44** for slidably and sealably receiving a cable **46** passing into the upper end of the tubular member **42**. One end of the cable **46** is secured by an anchor member **48** to the counterweight **26** and at its other end to a piston member **50** slidable within the tubular member **42**. Mounted on the piston **50** at either end are suitable seals **52** that prevent flow of fluid between the piston **50** and the inner wall of the tubular member **42**. As shown in the drawing, the cable **46** engages and is supported by an upper sheave **54** and a lower sheave **56**, both sheaves being supported on beams or other suitable framework as shown in the drawing.

A fluid reservoir **58** is mounted in spaced relation from and parallel to the tubular member **42**. The reservoir **58** is preferably an upstanding tubular member which together with the tubular member **42** provide tracks on which recessed rollers **60** may move. The rollers **60** are journalled to the counterweight **26** and form a part thereof whereby the counterweight **26** may move in a vertical plane as indicated by the arrow **62**.

The fluid reservoir **58** stores fluid for use in moving the piston **50** to operate the system of the present invention. The preferred fluid is air although hydraulic or other suitable fluids may be used. Air is supplied such as by means of a conduit **64** and is pressurized such as by means of a compressor, not shown. Of course, if hydraulic fluid is the fluid used, a pump in the line **64** may be provided for pressurization of the fluid.

A conduit or pipe **66** provides communication for the fluid with the interior of the tubular member **42** whereby pressure of the fluid may act against the upper end of the piston **50**. Provided in the air line **66** is a three-way valve **68** that preferably is actuated by a suitable solenoid **70**, one leg **72** of the three-way valve **68** venting to the atmosphere preferably through an adjustable orifice **74**. It will be appreciated, of course, that the three-way valve **68** and solenoid **70** may be integrated. While not absolutely necessary, other accessories may be provided in the line **66** such as a control valve **76**, a lubricator **78**, and a pressure regulator **80**. Thus, air may pass through the conduit **66** into the three-way valve **68** (when the valve **68** is moved counterclockwise 90° from the position shown in FIG. **2**), and thence into the tubular member **42**. Preferably, the three-way valve **68** is actuated by the solenoid **70** which in turn in manually controlled by means of a suitable switch **82** that may be mounted at the lower elevation point as shown in FIG. **1**. Thus, the fluid power means **32** may be controlled from the lower elevation point to in turn control movement of the carrier means **18**.

Continuing with respect to FIG. **2**, a suitable compression spring **84** is secured to a face plate **86** mounted at the upper end of the carrying line **12**. Mounted on the face plate **86** is a limit switch **88** having an extended actuator **90** to engage the frame **22** of the carrier means **18**. Thus, when a person is ascending on the carrier means **18** and approaches the upper end of the carrying line **12**, the frame **22** engages the compression spring **84** and upward movement of the carrier is terminated. When the person steps off of the carrier means **18**, fluid pressure within the tubular member **42** continues to act against the piston **50** which in turn urges the frame **22** of the carrier means **18** upward against the compression spring. With the load removed from the carrier means **18**, the fluid pressure is sufficient to cause the frame **22** of the carrier means **18** to further compress the spring **84** so that the frame **22** engages the actuator **90** of the limit switch **88**. Actuation of the limit switch **88** then causes the solenoid **70** to close the three-way switch **68**, i.e. move the switch **68** to position shown in FIG. **2**. The carrier means **18** will remain in position at the upper elevation point as shown in FIG. **2** provided the weight of the counterweight means **26** is substantially the same as that of the carrier means **18**.

Referring now to FIGS. **3** and **4**, the frame **22** of the carrier means **18** is provided with an upper grooved roller **92** and a lower grooved roller **94**, both rollers being journalled to the frame **22**. The rollers **92** and **94** engage over the carrying line **12** whereby the frame **22** may traverse the carrying line. The gondola **20** (as shown in FIG. **1**) is suspended from the frame **22** such as by means of a suspension arm **96** suitably secured to the frame and gondola.

Braking means are mounted on the carrier means **18**. The brake system includes a control lever **98** suitably secured to the frame **22** and the upper end of which is fastened to the cable **24**. As shown in FIGS. **3** and **4**, the control lever **98** is journalled by means of a pin **100** to structural supports **102** and **104**, the structural supports being secured to the frame member **22** such as by welding, bolting or other suitable means. Fastened to the structural supports **102** is a suitable stop member **106** which serves to limit upward movement of the control lever **98** as the control lever pivots on the pin **100**. Thus, when the pulling force is exerted on the control lever **98** by the cable **24**, the lever **98** engages the stop **106** whereby the carrier means **18** is moved upward.

Secured to the lower end of the control lever **98** is a friction plate **108** in juxtaposition to the carrying line **12.** A matching friction plate or brake table **110** is secured to the frame **22** under the carrying line **12** so that engagement of the friction plate **108** with the carrying line **12** binds the carrying line **12** between the friction plate **108** and table **110** to stop movement of the carrying means **18.** If for any reason the cable **24** slackens or severs, a spring **112** secured at one end to the frame **22** and at the other end to the lower end of the control lever **98** causes the friction plate **108** to engage with the carrying line **12.** It will be understood, of course, that the spring **112** should be of such size and modulus as to release the friction plate **108** from the carrying line **12** when the cable **24** is taut yet biases the friction plate toward the carrying line and into intimate contact therewith upon slacking or severance of the cable **24.**

As shown in FIGS. **3** and **4,** a brake lever arm **113** is provided for manual control of the braking system, if desired. One end of the brake lever arm **113** is rigidly secured to the lower end of the control lever **98.** Thus the other end of the arm **113** may be pulled manually to force the friction plate **108** into the braking position.

Continuing with respect to FIGS. **3** and **4,** a latch **114** provides means for releasably retaining the carrier means **18** as close as possible to the lower elevation point, i.e., adjacent the lower carrying line supports **16.** Otherwise, action of the springs **132, 134** and **136** might cause the carrier means **18** to lift slightly thereby causing some inconvenience in boarding the gondola **20.** The latch **14** is journalled such as by a pin **116** to an extension **118** of the carrier means frame **22.** Also forming a part of the latch is a handle **120** acting as a lever arm and integrally secured to the latch body **114** rearward of the pin **116.** As best shown in FIG. **3,** a spring **122** urges the handle **120** upward thereby urging the head of the latch **114** downward and into engagement with a catch **124** secured to the carrying line **12.** Both the latch **114** and the catch **124** have angled faces to promote sliding and snapping engagement of the latch with the catch as the carrier means **18** moves downwardly. When it is desired to begin an ascent with the carrier means **18,** the handle **120** is pulled downward thereby releasing the latch **114** from the catch **124.**

Operation of the system of apparatus according to the present invention will be explained first with respect to descent from higher to lower elevation points by means of the present invention. Thus, for example, if a person or other load is located on the platform **130** adjacent the higher elevation point of the carrying cable **12,** the person steps into the gondola **20** shown in FIG. **1.** The three-way valve **68** is manually or by remote control moved to the position shown in FIG. **2.** The adjustable orifice or valve **74** is maintained in a suitable open position to control the rate of flow therethrough. Consequently, air or fluid pressure within the tubular member **42** is released at a controlled rate and the piston **50** within the tubular member **42** may move upward. Weight of the person or other load in the carrier means **18** exerts a force on the cable **24** which in turn pulls the counterweight **26** and piston **50** upward. As will now become apparent, the adjustable orifice or valve **74** is opened only in proportion to the rate of descent desired. As the person or other load descends on the carrier means **18,** the piston **50** arises within the tubular member **42** pushing air or fluid ahead and out through the three-way valve leg **72.** The adjustable orifice or valve **74** restricts the flow of fluid as desired thereby controlling rate of descent of the carrier means **18.** As the carrier means **18** approaches the lower elevation point as shown in dotted outline in FIG. **1,** the latch **114** engages the catch **124** of the retention means as shown in FIG. **3.** Thus, after the person steps out of the gondola **20** or the load is otherwise removed from the carrier means **18,** the carrier means remains at the lower elevation point for use in an ascent.

Preferably weight of the counterweight means **26** is at least as great as weight of the carrier means **18.** Depending on the results desired, the counterweight **26** may be constructed so as to be slightly heavier than weight of the carrier means **18** so that the carrier means **18** may return automatically to the higher elevation point upon release of the latch member **114** from the catch **124.** Of course, a suitable vent preferably should be provided on the lower end of the tubular member **42** so that no back pressure is created against the piston **50** in such an operation.

Preferably provided within the tubular member **42** is a suitable compression spring **132** as shown in FIG. **2** surrounding the cable **46** to cushion and slow movement of the piston **50** as it approaches the top of the tubular member during descending operation of the carrier means **18.** Similarly, suitable compression springs **134** and **136** preferably are secured to a cross beam **138** to engage spring receptacles **140** mounted on the counterweight **26.** Thus, as shown in FIG. **3A,** the springs **134** and **136** compress upon engagement with the counterweight **26,** thereby slowing and cushioning movement of the counterweight as it approaches the uppermost position. Cushioning effect of each of these springs thereby promotes comfort and safety of the descending operation of the carrier means **18.**

With respect to operation of the system in an ascent, a person steps onto the gondola **20** (or a load is placed thereon) of the carrier means **18** as shown in FIG. **1** and the handle **120** of the retention means is actuated to release the latch **114** from the catch **124** as shown in dotted outline in FIG. **3.** Then the switch **82** is actuated to in turn actuate the solenoid **70** to move the three-way valve **68** from the position shown in FIG. **2** to the position shown in FIG. **3A.** With the three-way valve **68** in the position shown in FIG. **3A,** air or other fluid pressure within the pressurized fluid reservoir **58** is transmitted by means of the line **66** through the valve **68** and into the tubular member **42.** The pressure should be great enough to force the piston **50** downward in the tubular member **42** thereby pulling the counterweight **26** downward and in turn lifting the carrier means **18.** When the carrier means reaches the higher elevation point as shown in FIG. **1,** the person may step from the gondola **20** onto the platform **130** or the load on the gondola may be removed. Upon removal of such load or weight from the gondola **20,** continued exertion of air or fluid pressure against the piston **50** causes the carrier means **18** to move slightly higher to compress the spring **84** as shown in FIG. **2.** The frame **22** of the carrier means then contacts and actuates the limit switch **88** to in turn actuate the solenoid **70** thereby moving the three-way valve **68** to the position shown in FIG. **2.** Provided the counterweight means **26** is substantially the same weight as the carrier

means **18**, the carrier means **18** will remain at the upper elevation point even though air or fluid is vented from the tubular member **42**. Thus, the carrier means **18** remains in the upper position ready for reuse as necessary.

As an alternative to the fluid system illustrated in the drawings and described herein, a system similar to that disclosed in my pending application Ser. No. 239,127 previously identified may be used. Such other system is particular useful if hydraulic fluid is employed in view of the closed nature of the piping circuitry.

As will now be appreciated, the number of sheaves in the two sets of sheaves **36** and **38**, respectively, may be varied according to the overall size of apparatus employed, space available for travel of the counterweight means **26**, and length of traverse of the carrier means **18** along the carrying line **12**. In light of the disclosure herein, it will be well within the ability of one skilled in the art to select the desired sheave means.

Thus provided is a system of apparatus for moving personnel or other loads from one elevation to another. The system may be used not only as a means for emergency escape from an elevated point out and away from a work area, but also may be used as a means of transporting personnel and other loads under regular utility conditions. The brake system associated with the carrier means insures safety of personnel using the apparatus should the motive cable **24** malfunction in any way.

The present invention, therefore, is well adapted to carry out the objects and attain the ends and advantages mentioned as well as others inherent therein. While a presently preferred embodiment of the invention has been given for the purpose of disclosure, numerous changes in the detail of construction and the combination, shape, size and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

What is claimed is:

1. A system for moving a load between higher and lower elevations, comprising:

a. a carrying line inclined from and anchored between the higher and lower elevation points,

b. carrier means for traversing the carrying line (a) to support the load being moved,

c. movable counterweight means for counterbalancing weight of the carrier means (b),

d. cable and sheave means interconnecting and providing coaction between the carrier means (b) and the counterweight means (c), and

e. fluid power means for adjusting rate and direction of movement of the carrier means (b) along the carrying line (a) , said fluid power means including,

i. an upstanding, enclosed tubular member provided at its upper end with a stuffing box means for slidably and sealably receiving a cable passing into the upper end of said tubular member,

ii. a piston member slidable within the tubular member (e) (i),

iii. a cable interconnecting the counterweight means (c) and the piston (e) (ii),

iv. sheave means coacting with the cable (e) (iii) for guiding said cable,

v. fluid contained within the tubular member (e) (i), and

vi. means for adjustably pressuring and directing flow of the fluid (e) (v).

2. The system of claim **1** wherein the means (*e*) (vi) for adjustably pressuring and directing flow of the fluid (*e*) (v) includes, more specifically,

aa. a pressurized fluid reservoir for the fluid,

bb. a conduit providing fluid communication between the fluid reservoir (aa) and the tubular member (e) (i), and

cc. valve means in the conduit (bb) for controlling pressure and direction of flow of fluid in said conduit (bb).

3. The system of claim **1** wherein the cable and sheave means includes, more specifically,

i. a cable, one end of which engages the counterweight means (c) and the ther end of which is secured to the carrier means (b), and

ii. two opposed sets of sheaves coacting with the cable (b) (ii), the number of sheaves in each set being proportional to the ratio desired of movement of the counterweight means (c) relative to traverse of the carrier means (b).

4. The system of claim **1** including, additionally,

f. braking means mounted on the carrier means (b) coacting with the carrying line (a) and the cable and sheave means (b) such that slackening or severance of the cable and sheave means (b) causes engagement of the braking means with the carrying line (a) to bring the carrier means (b) to a stationary position with respect to the carrying line (a), said braking means including,

i. a control lever journalled to the carrier means (b) so as to pivot in the vertical plane, the control lever serving to secure the cable means of the cable and sheave means (b) to the carrier means (b) by attachment of said cable means to one end of the control lever,

ii. a friction plate secured to the other end of the control lever (f) (i) in juxtaposition to the carrying line (a), and

iii. spring means secured between the carrier means (b) and the control lever (f) (i) so as to bias the friction plate (f) (ii) toward the carrying line (a) and into intimate contact therewith upon slacking or severance of the cable means (d).

5. The system of claim **5** including, additionally, a brake lever arm, one end of which is rigidly secured to control lever (f) (i) for manual operation of the braking means (f).

6. The system of claim **2** wherein, more particularly, the valve means (e) (vi) (cc) is a three-way valve.

7. The system of claim **3** wherein in the two opposed sets of sheaves (d) (ii), one set comprises two sheaves and the other set comprises three sheaves.

8. The system of claim **2** wherein, more particularly, the pressured fluid reservoir (e) (vi) (aa) comprises an upstanding tubular member oriented parallel to the tubular member (e) (ii), and the movable counterweight means (c) comprises a weight member supported on rollers between and for movement along both said tubular members.

9. A system for moving a load between higher and lower elevations, comprising,

a. a carrying line inclined from and anchored between the higher and lower elevation point,

b. a carrier having rollers for engaging and traversing the carrying line (a) to support the load being moved,

c. movable counterweight means at least as heavy as the carrier (b) for counterbalancing weight of the carrier means (b),

d. a cable connected at one end to the carrier (b) and at the other end engaging the movable counterweight means (c),

e. two opposed sets of sheaves coacting with the cable (d), the number of sheaves in each set being proportional to the ratio desired of movement of the counterweight means (c) relative to traverse of the carrier (b), and

f. fluid power means for adjusting rate and direction of movement of the carrier (b) along the carrying line (a).

10. The system of claim **9** wherein the fluid power means (f) includes,

i. an upstanding, enclosed tubular member provided at its upper end with a stuffing box means for slidably and sealably receiving a cable passing into the upper end of said tubular member,

ii. a piston member slidable within the tubular member (f) (i),

iii. a cable interconnecting the counterweight means (c) and the piston member (f) (ii),

iv. sheave means coacting with the cable (f) (iii) for guiding said cable,

v. fluid contained within the tubular member (f) (i), and

vi. means for adjustably presuring and directing flow of the fluid (f) (v).

11. The system of claim **10** wherein the means (f) (vi) for adjustably pressuring and directing flow of the fluid (f) (v) includes, more specifically,

aa. a pressured fluid reservoir for the fluid,

bb. a conduit providing fluid communication between the fluid reservoir (aa) and the tubular member (f) (i), and

cc. valve means in the conduit (bb) for controlling pressure and direction of flow in said conduit (bb).

12. The system of claim **9** including, additionally,

g. braking means mounted on the carrier (b) and coacting with the carrying line (a) and the cable (d) such that slacking or severance of the cable (d) causes engagement of the braking means with the carrying line (a) to bring the carrier (b) to a stationary position with respect to the carrying line (a).

13. The system of claim **12** wherein, more particularly, the braking means (g) includes,

i. a control lever mounted on the carrier (b) so as to pivot in the vertical plane, the control lever serving to secure the cable (d) to the carrier (b) by attachment of said cable to one end of the control lever,

ii. a friction plate secured to the other end of the control lever (g) (i) in juxtaposition to the carrying line (a), and

iii. spring means secured between the carrier (b) and the control lever (g) (i) so as to bias the friction plate (g) (ii) toward the carrying line (a) and into intimate contact therewith upon slacking or severance of the cable (d).

14. The system of claim **13** including, additionally, a brake lever arm, one end of which is rigidly secured to the control lever (g) (i) for manual operation of the braking means (g).

15. The system of claim **9** including, additionally, means for releasably retaining the carrier (b) at the lower elevation point.

16. The system of claim **10** wherein, more particularly, the valve means (f) (vi) (cc) is a three-way valve.

17. The system of claim **9** wherein in the two opposed sets of sheaves (e), one set comprises two sheaves and the other comprises three sheaves.

18. The system of claim **11** wherein, more particularly, the pressured fluid reservoir (f) (vi) (aa) comprises an upstanding tubular member oriented parallel to the tubular member (e) (ii), and the movable counterweight means (c) comprises a weight member supported on rollers between and for movement along both said tubular members.

19. A system for moving a load between higher and lower elevations, comprising,

a. a carrying line inclined from and anchored between the higher and lower elevation points,

b. a carrier having rollers for engaging and traversing the carrying line (a) to support the load being moved,

c. movable counterweight means at least as heavy as the carrier (b) for counterbalancing weight of the carrier means (b),

d. a cable connected at one end to the carrier (b), the other end engaging the movable counterweight means (c),

e. two opposed sets of sheaves coacting with the cable (d), the number of sheaves in each set being proportional to the ratio desired of movement of the counterweight means (c) relative to traverse of the carrier (b),

f. fluid power means for adjusting rate and direction of movement of the carrier (b) along the carrying line (a), said fluid power means more particularly including,

i. an upstanding enclosed tubular member provided at its upper end with a stuffing box means for slidably and sealably receiving a cable passing into the upper end of said tubular member,

ii a piston member slidable within the tubular member (i),

iii. a cable interconnecting the counterweight means (c) and the piston (ii),

iv. sheave means coacting with the cable (iii) for guiding said cable,

v. fluid contained within the tubular member (i), and

vi. means for adjustably pressuring the fluid (v) including, more specifically,

aa. a pressured fluid reservoir,

bb. a conduit providing fluid communication between the fluid reservoir (aa) and the tubular member (i), and

cc. valve means in the conduit (bb) for controlling pressure and direction of flow of fluid in said conduit (bb), and

g. braking means mounted on the carrier (b) and coacting with the carrying line (a) and the cable (d) such that slacking or severance of the cable (d) causes the braking means to engage with the carry-

ing line (a) to bring the carrier (b) to a stationary position with respect to the carrying line (a).

20. The system of claim **19,** wherein, more particularly, the braking means (g) includes,

i. a control lever mounted on the carrier (b) so as to pivot in the vertical plane, the control lever serving to secure the cable (d) to the carrier (b) by attachment of said cable to one end of the control lever,

ii. a friction plate secured to the other end of the control lever (i) in juxtaposition to the carrying line (a), and

iii. spring means secured between the carrier (b) and the control lever (i) so as to bias the friction plate (ii) toward the carrying line (a) and into intimate contact therewith upon slacking or severance of the cable (b).

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