United States Patent [19]

Brandt

[11] **3,863,774**

[45] **Feb. 4, 1975**

[54] **SKYLINE CARRIAGE**

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[73] Assignee: **Weyerhaeuser Company,** Tacoma, Wash.

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[52] **U.S. Cl.** **212/94,** 212/122

[51] **Int. Cl.** **B66c 21/00**

[58] **Field of Search** 212/94, 96, 97, 99, 122

[56] **References Cited**

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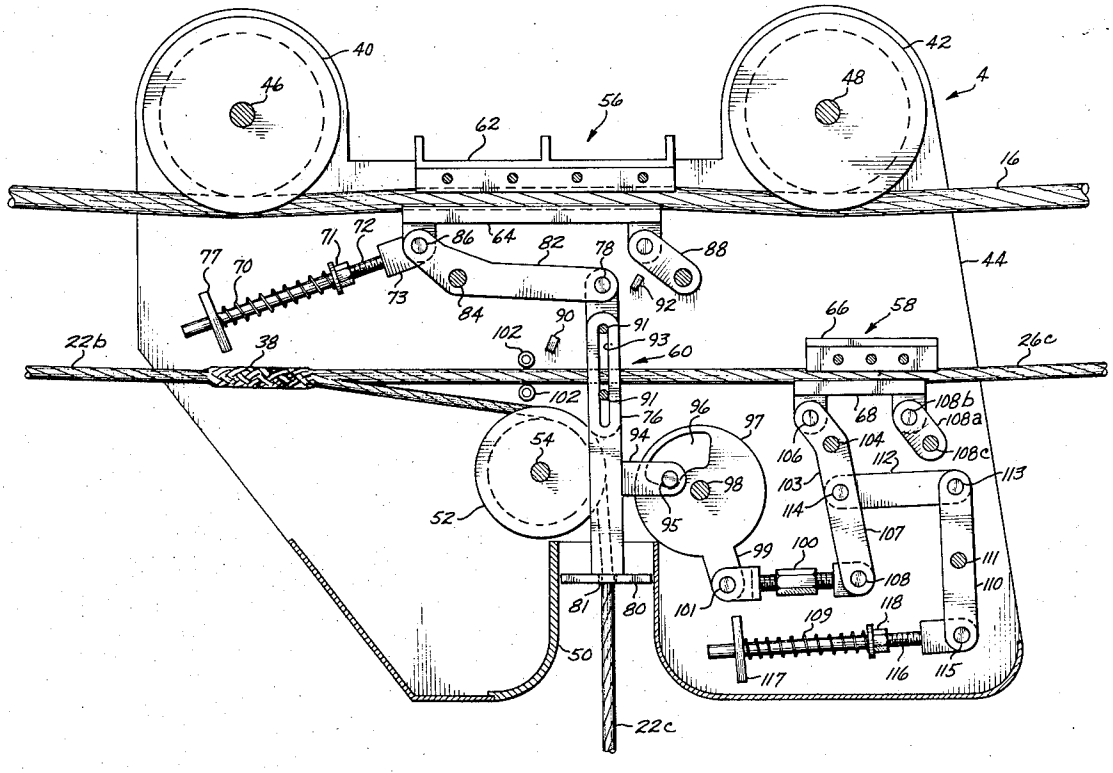
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Primary Examiner—Robert J. Spar
Assistant Examiner—R. B. Johnson

[57] **ABSTRACT**

A pair of opposed sheaves are mounted towards the top of the skyline carriage, such that the carriage can move along a suspended skyline cable. Extending through the carriage beneath the pair of sheaves is a haul-back cable, one end of which runs to a yarding drum while the other end is connected to the mainline cable. The mainline cable runs from the mainline yarding drum through the carriage and over a sheave within the carriage that allows the bottom portion of the mainline to extend downwardly toward the ground. A clamping system within the carriage and actuated through tension control on the cables acts to clamp and release the skyline cable and the haul-back cable, depending on the mode of operation desired.

3 Claims, 3 Drawing Figures



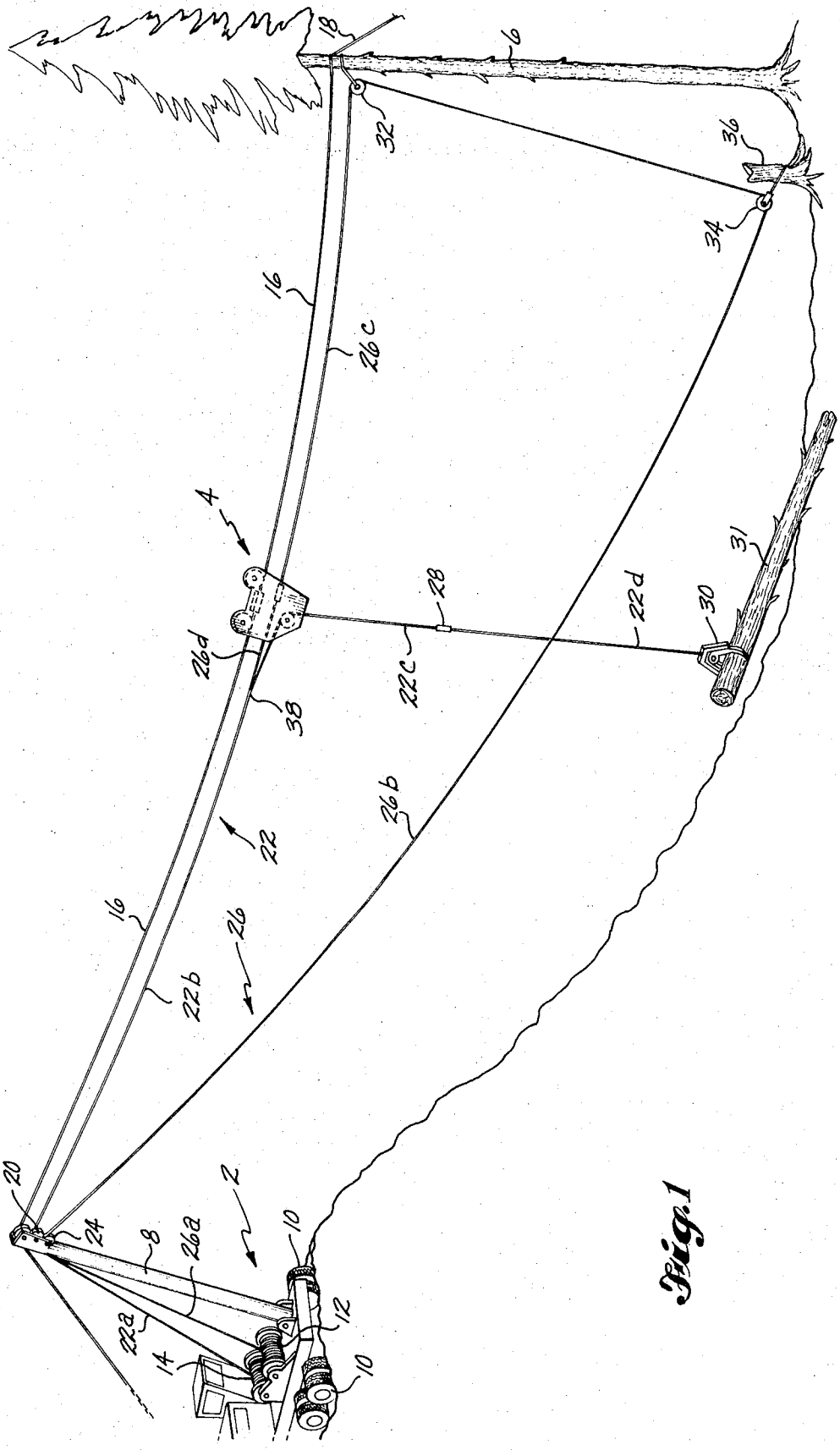

18
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34
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26c
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31
28
22d
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26d
38
22c
26b
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16
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22b
20
2
24
8
26a
10
12
22a
14
10

Fig. 1

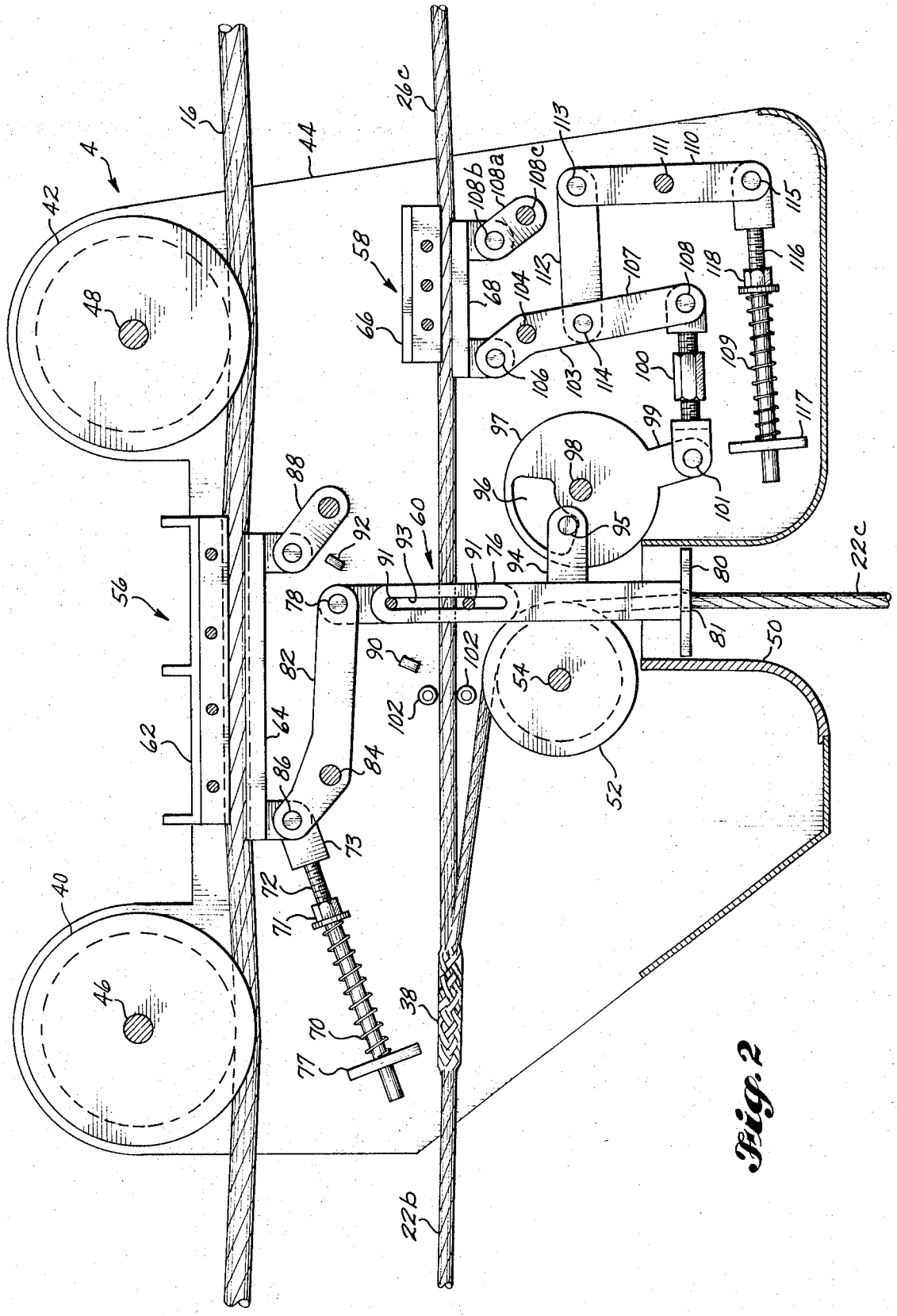

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16
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26c
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108b
108a
108c
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109
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76
94
22c
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81
50
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102
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86
84
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73
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77
38
22b

Fig. 2

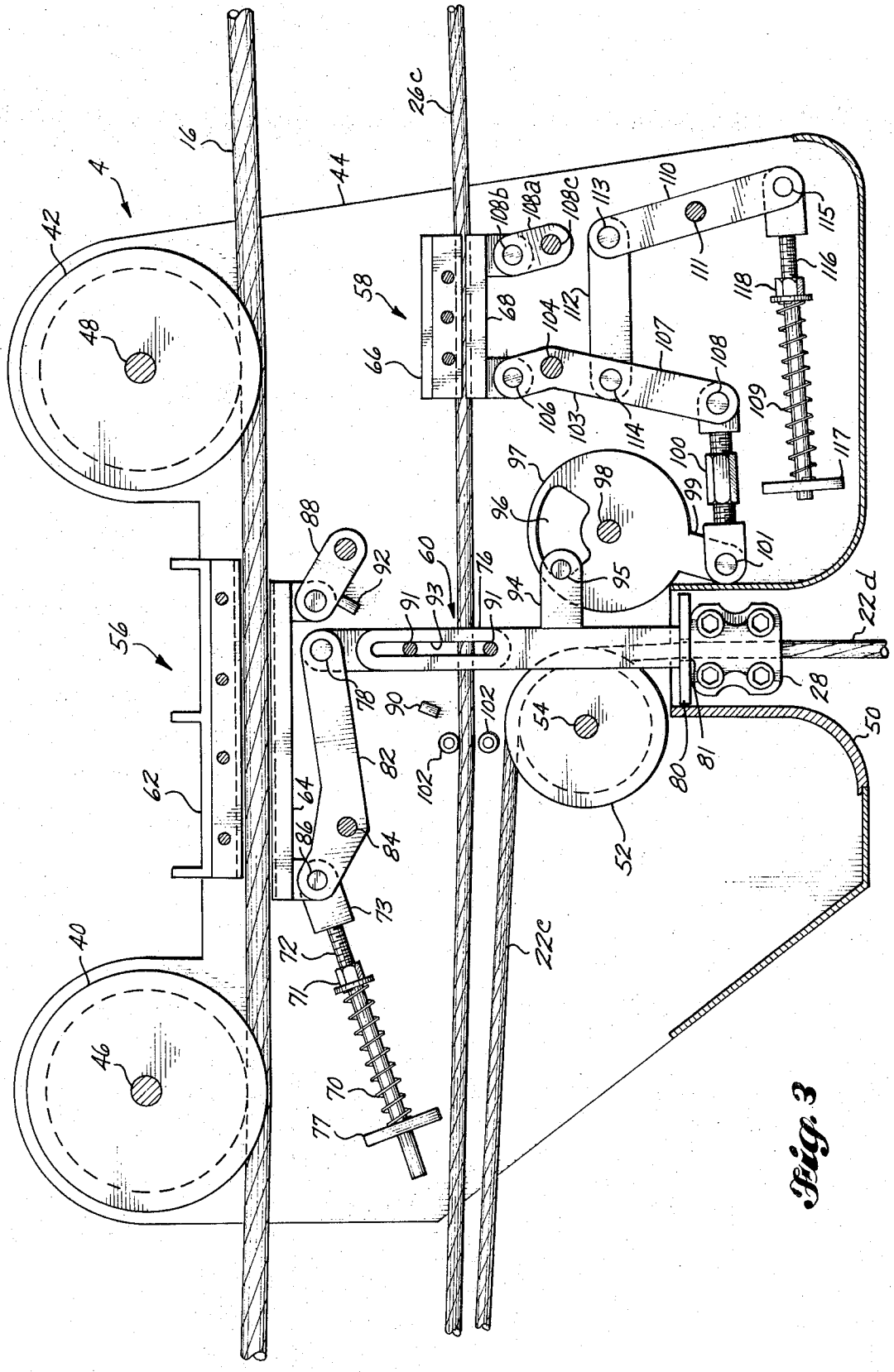

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93
94
22d
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102
54
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81
52
73
72
71
22c
40
46
70
77

Fig. 3

SKYLINE CARRIAGE

BACKGROUND OF THE INVENTION

This invention relates generally to skyline carriages and more particularly to a skyline carriage that is useful for logging operations where safety, simplicity, and efficiency is desired.

There are many known skyline carriages and skyline logging systems that carry out the function of moving a turn of logs from one point to another. The systems are similar and generally have a skyline carriage that traverses the logging area on a skyline cable by proper actuation of a haul-back cable that essentially controls the position of the carriage on the skyline cable. The mainline cable extends downwardly through the carriage and has a grapple device on the end so as to grasp the logs. Some examples of known skyline carriages and skyline logging systems may be seen by referring to the following issued U.S. Pat. Nos.: McIntyre et al. – Re. 27,621, Lysons et al. – 3,718,262, Rennie et al. – 3,712,478, Larsen – 3,011,653, Naud – 2,685,373, Whitlock – 1,725,325, Fayette – 1,543,373, Ball – 1,164,628, O'Dell – 428,349 and Day – 419,004. While the skyline carriages and logging systems disclosed in the above cited prior art patents offer various apparatus and methods for moving logs or the like from one point to another, none is particularly adapted to smaller loads and with the improved safety features as in the skyline carriage of the present invention. Another advantage with the skyline carriage of the present invention is that it is less costly to manufacture and operate, compared to most of those of the prior art.

Among the advantages of the present invention are that the skyline carriage depends from a fixed skyline cable as opposed to a running skyline cable. A positive clamping arrangement is provided internal to the carriage and acts to positively clamp the carriage to the skyline at the point where logs are to be picked up and conversely the carriage is positively clamped to the haul-back cable when the carriage is either returned to the landing or returned to the point of log collection.

From the foregoing, one object of the present invention is to provide a skyline carriage tht is simple in design yet efficient in operation. Another object of the invention is to provide a skyline carriage for use in logging operations that has improved safety features over prior art carriages. Yet another object is to provide a skyline carriage that is lightweight and inexpensive to fabricate. These and other objects of the invention will become apparent upon reading the following specification in conjunction with the attached drawing.

SUMMARY OF THE INVENTION

Briefly stated, this invention is practiced in one form by suspending a skyline carriage from a fixed skyline cable and also having the haul-back cable and mainline cable operatively extending through the carriage. The haul-back cable is spliced or otherwise connected to a point on the mainline cable at a position on the yarder side of the carriage. A pair of locking mechanisms act through a suitable linkage arrangement to clamp and unclamp respectively the carriage from the skyline cable and the haul-back cable. The mainline cable extends downwardly through the carriage over a sheave and has a grapple or other means connected to its lower end for grasping the logs.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a graphic depiction of the skyline carriage of the present invention within its operating environment.

FIG. **2** is a section view taken through the skyline carriage showing the internal mechanism within the carriage in a position where it is locked on the skyline cable.

FIG. **3** is a view similar to FIG. **2**, only showing the internal locking mechanism in a position where the carriage is locked to the haul-back cable.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to FIG. **1**, a typical skyline logging system is depicted and includes a yarder generally indicated at **2**, a skyline carriage indicated generally at **4**, and a spar pole generally indicated at **6**. Of course, as will be recognized by those skilled in the art, since the logging system is of the overhead type, the spar pole **6** and the yarder mast **8** will generally be well above the ground level, since the grappling of logs normally takes place at ground level as is depicted in FIG. **1**.

The yarder **2** disclosed in FIG. **1** is of the type mounted on wheels **10** and therefore is adapted to move from place to place, depending on the area to be logged. Also included at the front of yarder **2** is the haul-back yarding drum **12** and the mainline yarding drum **14**. Both drums **12, 14** are powered and are adapted to rotate independently of each other. Extending between the top of the yarder mast **8** and a high position on spar pole **6** is the skyline cable **16**. Cable **16** is fixed relative to mast **8** and spar pole **6** and can be fixed to the spar pole **6** through any suitable attaching means, such as through a clamping loop arrangement. At the yarder mast **8** the skyline cable **16** can extend rearwardly of the yarder **2** and be affixed at a ground point so as to give additional support to yarder **2** and skyline cable **16**. Similarly, one or more cables **18** can be extended downwardly to ground from the spar pole **6** in order to give additional support to the overall skyline logging system.

Also at the top of yarder mast **8** are a pair of independently rotatable pulleys, the top one of which is indicated at **20** supports the mainline cable **22**, while the bottom pulley indicated at **24** supports the haul-back cable indicated at **26**. The mainline and haul-back cables **22, 26** are comprised of different functionally and operationally related portions which will now be described in order to have a full understanding of the present invention. One portion of mainline cable **22** is that extending from the mainline yarding drum **14** to the top pulley **20** and is indicated as section **22*a***. The portion of the mainline cable extending from pulley **20** to the skyline carriage **4** is indicated as section **22*b*** and the portion of mainline **22** extending downwardly from skyline carriage **4** is indicated as section **22*c***. Section **22*c*** extends downwardly from carriage **4** to a mainline clamp **28** which is fixed to the mainline cable. The final section **22*d*** of mainline cable **22** is that extending from the mainline clamp **28** to the grapple attachment **30** which is fixed to the free end of mainline cable **22**. The grapple attachment **30** may be of any suitable variety operable for the intended function of grasping an object such as log **31**.

Similar to mainline cable **22**, the haul-back cable **26** has a plurality of relatd sections. The section extending from the haul-back yarding drum **12** to the bottom pulley **24** on the mast **8** is indicated as section **26***a*. The portion of the haul-back cable extending between the bottom pulley **24** outwardly to a position in close proximity to the spar pole **6** is indicated as section **26***b*. At this position, the haul-back cable **26** reverses itself and extends back toward the skyline carriage **4**, such portion of which is indicated as section **26***c*. In the embodiment as depicted in FIG. **1**, the reversal arrangement for the haul-back cable **26** is comprised of a pair of vertically spaced pulleys **32** and **34**. Pulley **34** is shown mounted on a stump **36** which is, of course, fixed to the ground. The top pulley **32** is fixed at a position on the spar pole **6** which is in close proximity to the position where the skyline cable **16** is attached thereto. The final portion of haul-back cable **26** is that indicated as section **26**d and is that section which extends through the carriage **4** and outwardly a distance toward the yarder **2** to a position where it is fixably connected at connection point **38** to the mainline cable **22.**

SKYLINE CARRIAGE STRUCTURE

Turning now more specifically to the structure of the skyline carriage, reference will be made to FIGS. **2** and **3**. Looking first at FIG. **2**, the structure depicted would be for a condition as that depicted in FIG. **1** where the grapple attachment **30** and mainline cable section **22***d* is below the carriage **4.** In this mode of operation the skyline carriage **4** will be fixed to the skyline cable **16** while the haul-back and mainline cables **22, 26** will be free to move through the carriage **4.**

The basic structure for skyline carriage **4** is similar to those known to the art in that a pair of spaced sheaves or grooved wheels **40, 42** are positioned within the carriage **4** and towards the top thereof so as to run on skyline cable **16.** Each of the sheaves **40, 42** are rotatable about respective axles **46, 48.** The carriage body **44** then depends downwardly from the pair of sheaves **40, 42** and generally below the skyline cable **16.** Positioned at the bottom the carriage body **44** is a cylindrically shaped channel **50** through which the mainline cable **22** passes after it changes from the horizontal plane to a vertical plane by passing over a rotatable mainline sheave or grooved pulley **52** which rotates on an axle **54.** As previously mentioned, the connection point **38** where the end of haul-back cable **26** at its section **26***d*is fixed to the mainline cable **22,** at an axial position which is generally, during operation, on the yarder side of the mainline sheave **52.** It should be noted that since the two cables are connected at point **38,** the haul-back cable section **26**d and mainline cable section **22***b* will generally be along the same axis prior to the mainline cable passing over the sheave **52** and then becoming section **22***c*.

In order to carry out the intended function of the skyline yarding system, two cooperating locking mechanisms are provided internal to the carriage body **44,** one being the skyline clamping mechanism generally indicated at **56** and the other being the haul-back clamping mechanism generally indicated at **58.** A cooperating linkage mechanism generally indicated at **60** operates to control each of the clamps depending on the tensioning of the mainline cable and the haul-back cable as set by the operator within yarder **2.** During operation, one of the respective clamping mechanisms will be locked while the other will be unlocked, allowing the carriage to either be fixed or movable on the skyline cable **16.**

There are several skyline clamping mechanisms that are known in the art, one in particular being that disclosed in the Whitlock U.S. Pat. No. 1,725,325. The skyline clamping mechanism **56** of the present invention is comprised of a flat stationary shoe member **62** and a vertically movable clamping plate **64.** When the clamping plate **64** is in its uppermost position, it clamps and holds the carriage **4** from moving on the skyline cable. Positioned on the spar pole side of the carriage body **44** and in line with the haul-back cable **26** is haul-back clamping mechanism **58** which similarly is comprised of a flat stationary shoe member **66** and a vertically movable clamping plate **68.** A similar kind of locking action occurs at the haul-back clamping mechanism **58** as does at the skyline clamping mechanism **56.** In the clamping mechanism **56** a suitably sized skyline clamping spring **70** is provided to force the clamping plate **64** upwardly to its clamping plate **64** upwardly to its clamping or locked relationship against the skyline cable **16.** The spring **70** exerts its biasing force against a spring tensioning nut **71** which is threadably mounted on a skyline clamp drive rod **72.** Drive rod **72** is attached at one end to the clamping plate **64** through the pinned connection **73** while at the other end it is slidably mounted in skyline spring stop **77** which in turn is fixed to the carriage body **44** through any suitable means such as welding. The haul-back and skyline clamping mechanisms **56, 58** are operatively connected to a linkage mechanism **60.** Describing the linkage mechanism **60** first and then the clamping mechanisms **56, 58** it is seen that mechanism **60** is comprised of a generally vertically extending linking shaft **76.** At the upper end of linking shaft **76** is a pivotal connection point **78** and at the bottom end of linking shaft **76** is a flat plate member **80,** which is adapted to be slidably mounted within the cylindrical channel **50.** A suitable aperture **81** is provided in the plate member **80** such that the mainline cable **22** is freely movable through the carriage body **44.** At pivotal connection **78** a lever arm extends outwardly from linking shaft **76** and upwardly toward the clamping plate **64** and is indicated at **82.** Lever arm **82** is in turn pivotal about a fixed point **84** approximately midway between its respective ends. At the other end of lever arm **82** is a pivotal connection **86** which connects to the clamping plate **64** at the same point as does the pinned connection **73** of drive rod **72.** A stabilizing linking arm **88** can be appropriately positioned at the other end of the clamping plate **64** in order to stabilize the vertical movement of the plate **64.** A stop **90** is positioned below and toward one end of the lever arm **82** and acts to halt the downward movement of the linking shaft **76.** Similarly, another stop **92** is appropriately positioned so as to halt the movement of linking arm **88** when it moves vertically downward. A pair of vertically spaced stabilizing pins **91** act to constrain the movement of shaft **76** by way of the vertical slide way **93** within shaft **76.**

Turning now to a description of the haul-back clamping mechanism **58,** it is apparent from the figures that it is controlled through movement of the linking shaft **76.** Fixed to shaft **76** toward the bottom thereof is an outwardly extending arm **94** which in turn has a pin **95** extending transverse to it at its outer end. The pin is adapted to fit within an aperture **96** that is formed in

a rotatable member 97. The aperture 96 is positioned toward the top of member 97 and has a plurality of surfaces that allow the pin 95 to slide thereabout upon movement of shaft 76. Since member 97 is rotatable about a fixed point indicated at 98, it will be appreciated that when the linking shaft 76 moves a sufficient distance up or down, the pin 95 will hit its corresponding stop point within aperture 96 and thereby cause member 97 to rotate about point 98.

Fixed to the bottom of member 97 and extending downwardly therefrom is a dog member 99 that has a turnbuckle 100 attached to its outer end through a pinned connection 101. Of course, it will be appreciated that when member 97 is caused to rotate, it in turn will cause dog 99 to move the turnbuckle 100 either to the left or right transversely to shaft 76.

The motion of the turnbuckle 100 is transformed into a vertical movement of the clamping plate 68 through a pivotal linkage arm 103. Linkage arm 103 is pivotal about fixed point 104 with an upper portion 105 extending upwardly toward plate 68 and attached thereto at a pinned connection point 106. The lower portion 107 of arm 103 extends downwardly from pivot point 104 to the end of turnbuckle 100 where it is attached thereto through the pinned connection 108. It is seen in FIGS. 2 and 3 that the two portions of linkage arm 103 are both at a slight angle from the vertical direction. By constructing the haul-back clamping mechanism 58 in such a manner it will be recognized that upward movement of shaft 76 will act to move clamping plate 68 upward against haul-back cable 26 thereby locking the carriage 44 to cable 26. Providing a stabilizing and equalizing function to allow clamping plate 68 to move up and down uniformly is a pivoting arm 108a attached at one end through pinned connection 108*b* to one end of plate 68 and at the other end to a fixed pinned connection 108*c*.

Providing additional biasing means for haul-back clamping mechanism 58 when in the locked position is the haul-back biasing spring 109. Spring 109 acts to exert additional side force against the lower portion 107 of arm 103 which in turn acts to exert the upward force against the clamping plate 68. A linking arrangement acts to transfer the spring force to the arm 103 and is comprised of an arm 110 pivotal about fixed point 111 to which is connected at its upper end the biasing arm 112 through a pinned connection 113. Biasing arm 112 is then attached at its other end through pinned connection 114 to the arm 103. At the other end of arm 110 is a pinned connection 115 which connects the haul-back biasing drive rod 116 to arm 110 for transmittal of the spring force to arm 103. Spring 109 extends between a lower stop 117 and a spring tensioning nut 118 in a manner similar to that of spring 70. In order for the spring 109 to carry out its intended function its strength will be less than that of spring 70.

A pair of vertically spaced guiding pins 102 can be provided in order to positively constrain the vertical movement of haul-back cable portion 26*d* within the carriage body 44. The guiding pins 102 also provide a positive constraint to prevent the connection 38 between the haul-back cable and mainline cable from passing beyond the mainline sheave 52.

OPERATION OF THE INVENTION

Starting with a normal sequence of operations, it will be assumed that the skyline carriage 4 is at a position adjacent the yarder mast 8 and that the grapple attachment 30 is empty. The operator within yarder 2 makes the decision to run the carriage 4 out along the skyline cable 16 to the point of logging. His first activity is to wind the mainline yarding drum 14 in so as to cause the mainline clamp 28 to abut the flat plate member 80. The operator continues to apply tension on the mainline cable and this in turn will cause the linking shaft 76 to move vertically upward, thereby unlocking the skyline clamping mechanism 56. At the same time, the arm 103 will be caused to rotate about pivot point 104 thereby forcing the clamping plate 68 against the haul-back cable 26 and locking the haul-back clamping mechanism 58. Of course, it will be appreciated that while the operator is winding in the mainline cable 22, he is at the same time reeling out the haul-back yarding drum 12.

At this point the skyline carriage 4 is free to move along the skyline cable 16. Sufficient tension is maintained on mainline cable 22 while at the same time the haul-back yarding drum 12 is caused to pull the carriage 4 along the skyline cable 16. When the carriage 4 is in the proper position over the logging area, the tension on the mainline cable 22 is relaxed and mainline cable 22 is allowed to pass through the carriage 4 over the sheave 52 at which point an operator at ground level will secure the grapple attachment 30 and fix it to the logs to be moved. Once the tension is released on mainline cable 22, the mainline clamp 28 will begin to move downwardly and in response to this movement, the linking shaft 76 will also start to move vertically downward due to the force exerted by the skyline clamping spring 70. Upon the downward movement of the linking shaft 76, the clamping plate 64 will move upwardly and against the skyline cable 16. At this point, the skyline clamping mechanism 56 is locked and since the arm 103 has pivoted about point 104 causing the clamping plate 68 to move downwardly, the haul-back clamping mechanism 58 will be unlocked. Since the haul-back clamping mechanism 58 is now in the unlocked position as the mainline cable 22 is allowed to move downwardly to ground level, the haul-back cable can be reeled in to pick up the slack on yarding drum 12. This sequence of operations allows the grapple attachment 30 to grasp its load while the skyline carriage 4 is securely locked to the skyline cable 16 overhead. Since the haul-back cable 26 is being reeled in while mainline cable is being reeled out, the jointly operating cables are kept in proper tension.

The operator now is ready to bring the logs into the yarder 2. At this point, the mainline yarding drum 14 will begin to apply tension and reel in the mainline cable 22. The haul-back yarding drum 12 is reversed. As section 22*d* of the mainline cable is moved vertically upward, the mainline clamp 28 will ultimately reach the downwardly extended plate member 80 and since the operator continues to apply tension through the mainline yarding drum 14, the clamp 28 will cause the linking shaft 76 to move upward, thereby releasing the skyline clamping mechanism 56 and locking the haul-back clamping mechanism 58. With the load and skyline carriage in this position, the operator then continues to reel in the mainline cable 22 while reeling out haul-back cable 26. This function is, of course, possible since the haul-back cable is connected to the mainline cable at connection point 38 on the yarder side of the carriage 4. After the skyline carriage 4 traverses the

proper distance on skyline cable **16** and the load is at the proper position, the mainline yarding drum **14** will begin to reel out mainline cable **22,** releasing the haul-back clamping mechanism **58** and locking the skyline clamping mechanism **56.** When a suitable amount of mainline cable has been allowed to move downwardly through the skyline carriage **4,** a ground operator will release the grapple attachment **30** from the load and the sequence of operations will be repeated.

While a detailed example of the principal embodiment has been described, it is understood that many changes and modifications may be made in the above described skyline carriage and logging system without departing from the spirit of the invention. All such modifications are intended to be included within the scope of the appended claims.

What is claimed is:

1. A skyline carriage of the type with first and second sides and a bottom adapted to traverse a skyline cable and having mainline and haulback cables in operative communication therewith together with means to independently actuate said mainline and haulback cables with the improvement comprising:

means within the carriage to direct the mainline cale from its entry point at the first side of said carriage to the bottom thereof such that a portion of said mainline cable extends downwardly from the bottom of said carriage,

means to direct the haulback cable from its entry point at the second side of said carriage toward said first side,

means to join the end of said haulback cable to said mainline cable at a position which is above said mainline cable directing means and generally in the same plane therewith, and

a locking mechanism for sequentially locking and unlocking said carriage to said skyline cable and to said haul-back cable comprising:

means to sense a vertical position of the downwardly extending portion of said mainline cable,

first means responsive to said sensing means to lock the carriage to the hualback cable and to substantially simultaneously unlock the carriage from said skyline cable when the downwardly extending portion of the mainline cable is substantially in its uppermost position, and

second means responsive to said sensing means to lock the carriage to the skyline cable and to substantially simultaneously unlock the carriage from said haulback cable when the downwardly extending portion of the mainline cable is in a lower vertical position with respect to its uppermost position.

2. The skyline carriage as in claim **1** in which the sensing means is comprised of a clamp fixed to said mainline cable at a position at the beginning of said downwardly extending portion and a vertically moveable plate member positioned at the bottom of said carriage.

3. The skyline carriage as in claim **2** in which said first and second means is comprised of haulback and skyline clamping mechanisms in operative communication with each other through a linkage mechanism which are adapted to open and close respectively depending on the position of said clamp.

* * * * *

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(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,863,774 Dated February 4, 1975

Inventor(s) DENNIS L. BRANDT

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In column 1, line 44, "tht" should read --that--;

in column 3, line 2 "relatd" should read --related--;

in column 4, line 21, delete second "plate 64 upwardly";

in column 4, line 22, delete "to its clamping";

in column 6, line 16, between "haulback" and "yarding" insert --cable 26 on haul-back--;

in column 8, line 9, "hualback" should read --haulback--; and

in column 7, line 24, "cale" should read --cable--.

Signed and sealed this 29th day of April 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
and Trademarks