United States Patent

[11] 3,533,357

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[45] Patented **Oct. 13, 1970**
Continuation-in-part of application Ser. No. 733,899, June 3, 1968, now abandoned.

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[54] **APPARATUS FOR ASCENDING AN INCLINED GUY OR THE LIKE**
3 Claims, 9 Drawing Figs.

[52] **U.S. Cl.** **104/113,** 104/112, 105/153
[51] **Int. Cl.** **B61b 7/06,** B61b 3/02
[50] **Field of Search** 104/89, 112, 113, 114, 115, 116, 117, 118; 105/30, 153; 188/185, 77

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Assistant Examiner—Robert Saifer
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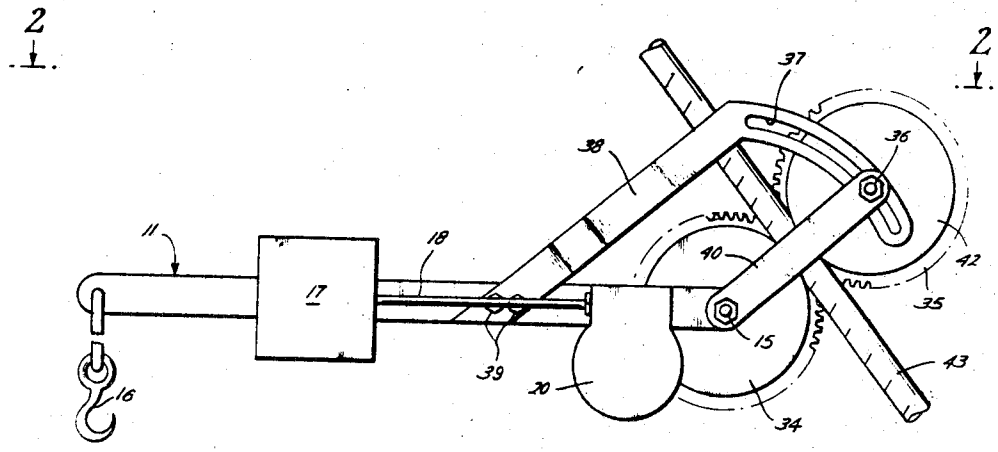
ABSTRACT: The invention is for an apparatus for ascending and descending an inclined guy or the like. It includes a frame, with drive means connected to the frame for drivingly engaging the guy. It also includes power means operably connected to the drive means for operating the drive means, whereby the frame is caused to advance upwardly along the guy.



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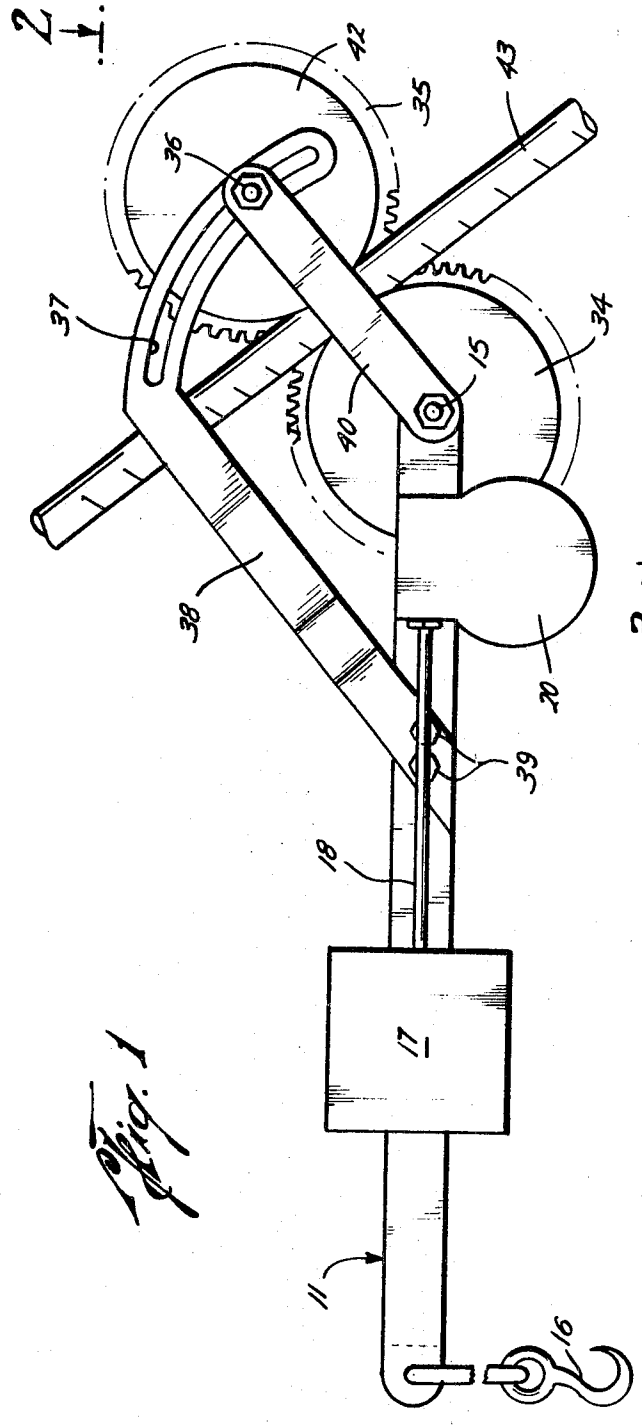

Fig. 1

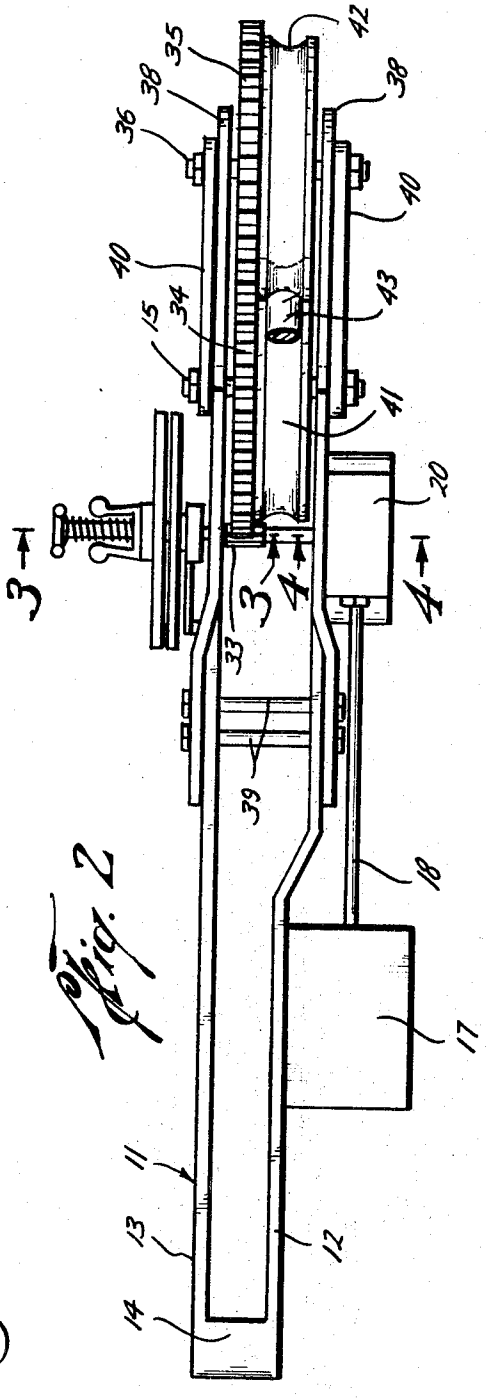

Fig. 2

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Fig. 3

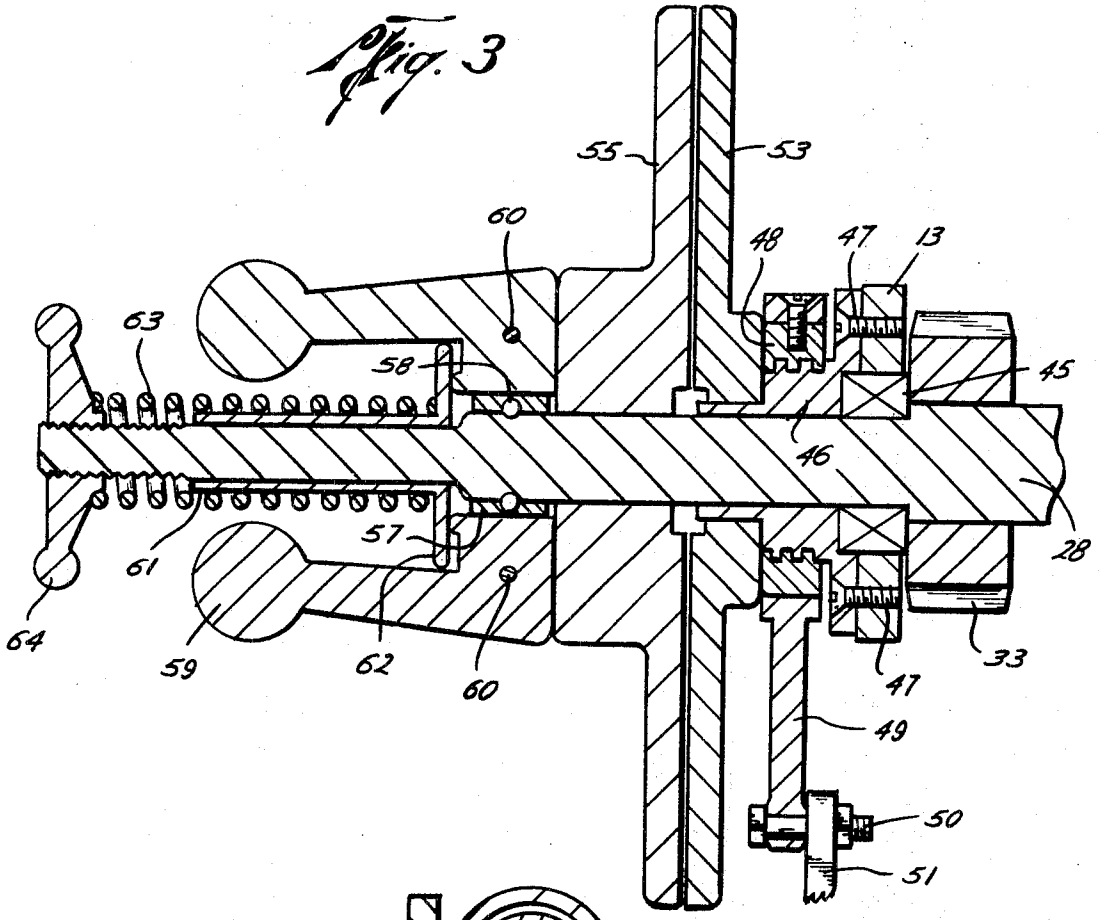
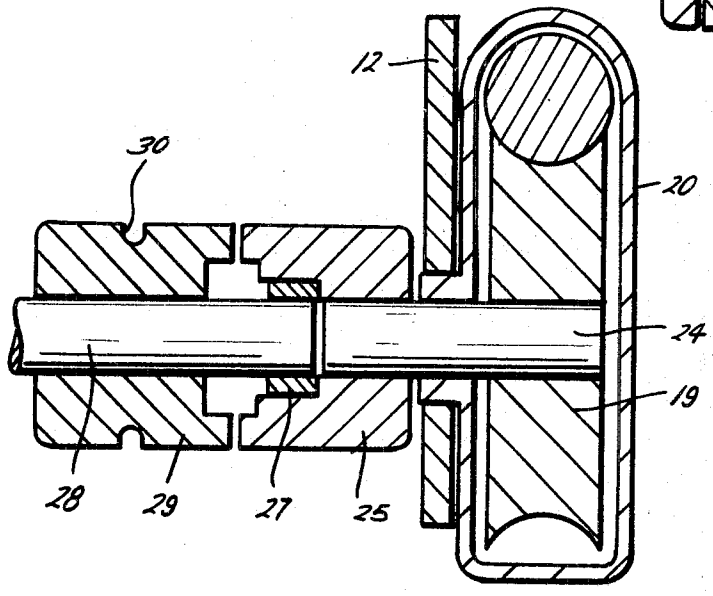


Fig. 4



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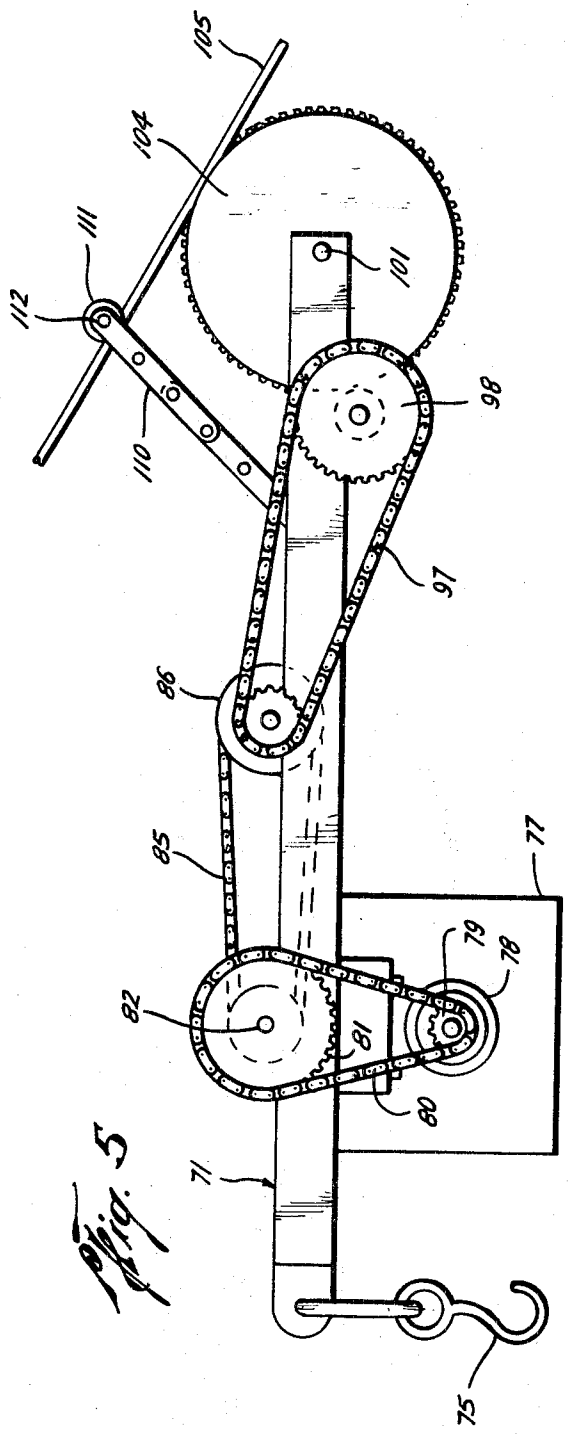

Fig. 5

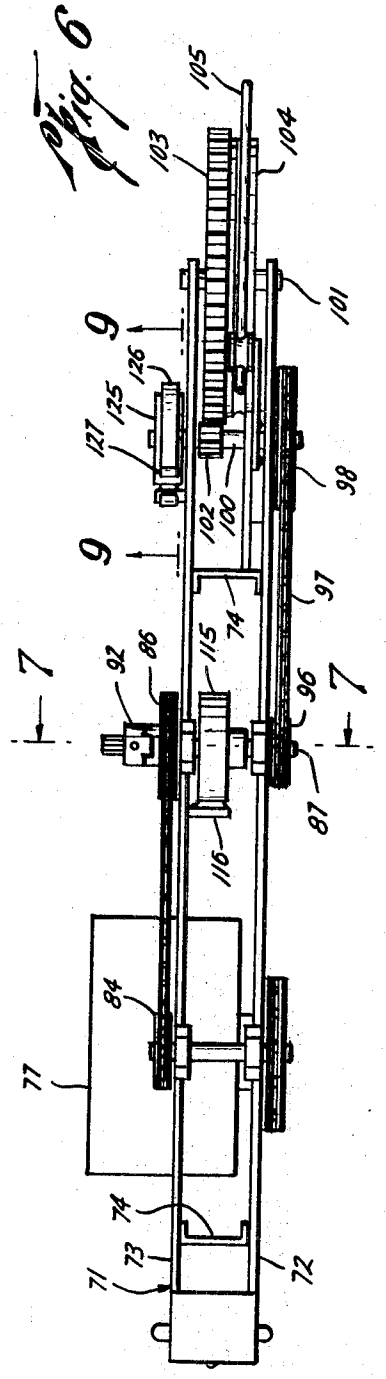

Fig. 6

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Fig. 7

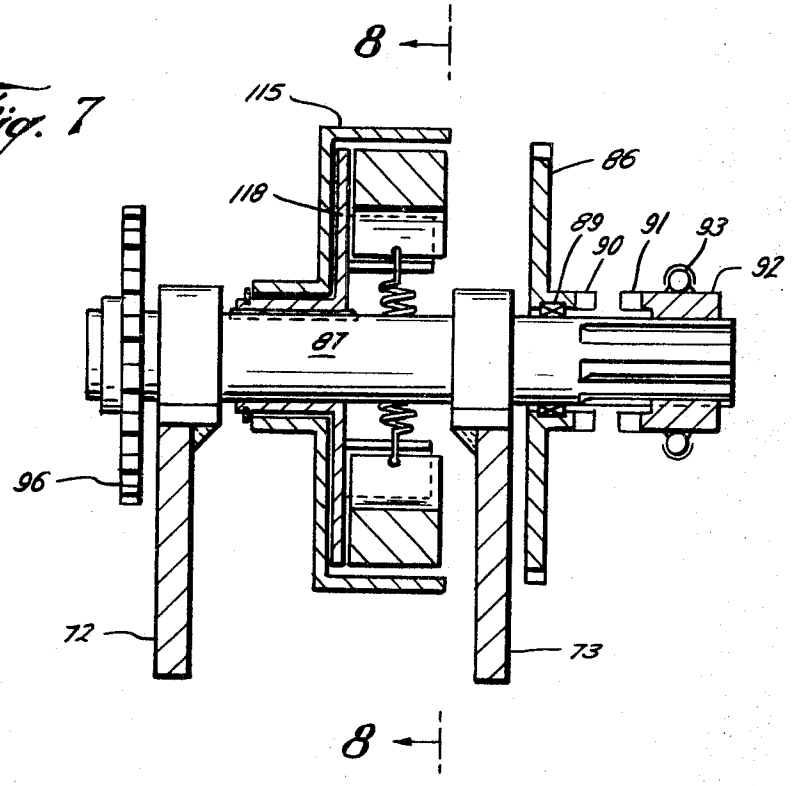


Fig. 8

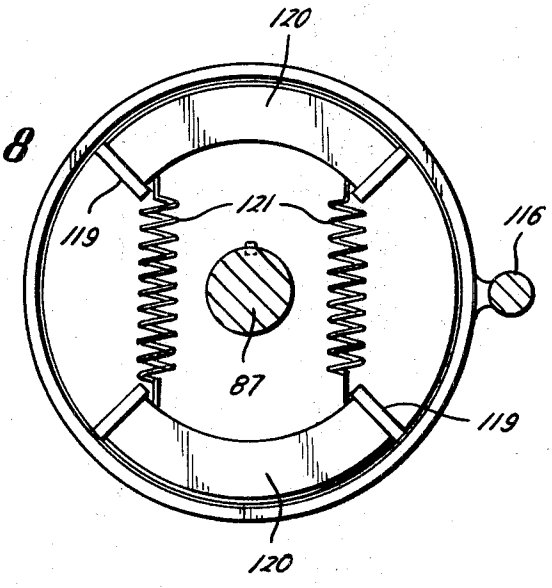
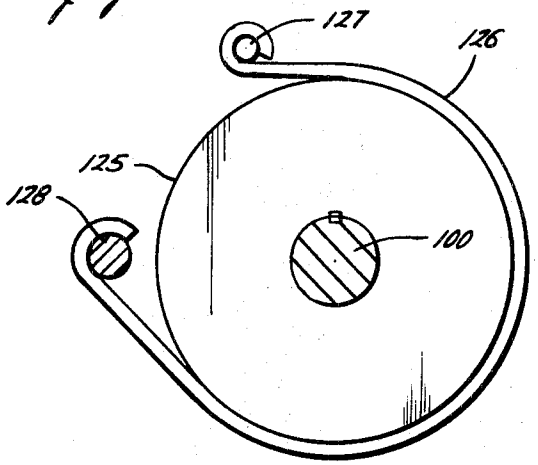


Fig. 9



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APPARATUS FOR ASCENDING AN INCLINED GUY OR THE LIKE

CROSS-REFERENCE TO RELATED APPLICATIONS

This is a continuation-in-part of U.S. Pat. application Ser. No. 733,899 filed June 3, 1968, now abandoned and entitled Apparatus for Ascending an Inclined Guy or the Like, by the same applicant.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an apparatus for ascending and descending an inclined guy or the like. More particularly this invention relates to an apparatus for conveying men and materials up and down a guy, such as guy wires on radio and television transmitting towers.

2. Description of the Prior Art

Heretofore there has been a need for an apparatus which could ascend or descend rather steeply inclined guy lines or guy wires for the purpose of conveying men and materials therealong. While there have been numerous prior art examples of apparatuses for conveying along horizontal wires, there has heretofore been no apparatus provided which could climb or descend along an inclined guy, such as a guy wire or guy line, whereby men and materials may be transported to the top or an upward portion of a tower or the like.

SUMMARY OF THE INVENTION

It is therefore an object of this invention to provide an improved apparatus for accomplishing the aforesaid purposes.

Briefly stated, the apparatus of this invention includes a frame, and drive means connected to the frame for drivingly engaging the guy. It also includes power means operably connected to the drive means for operating the drive means whereby the frame is caused to advance upwardly along the guy.

In certain embodiments of the invention, brake means are also included, which are connected to the drive means for controlling the rate of descent down the guy means. The apparatus may also include clutch means arranged for engaging and disengaging the power means with the drive means. In certain embodiments the drive means may include at least one annular member arranged to frictionally engage the guy. Preferably the power means includes a motor connected to the carriage and power transmitting means connected between the motor and the annular member whereby operation of the motor causes the annular member to rotate and advance along the guy.

In certain embodiments, the brake means may include two spaced-apart brake discs, one of which is operably connected to the frame and held against rotation and the other of which is operably connected to the drive means for rotation during movement of the frame along the guy. In this instance, means are also provided for frictionally engaging the brake discs to effect braking of the movement of said frame along the guy.

In certain other embodiments, the brake means may include a drum which is arranged to rotate as an incident of movement of the frame along the guy and brake band connected to the frame which is a manually operable by the operator to engage the band with the drum to effect braking. Certain embodiments of the invention may also include centrifugally operated brake means which operate automatically for controlling the rate of descent of the carriage.

Brief Description of the Drawings

The invention may be further understood by reference to the drawings wherein like numerals refer to like parts and in which:

FIG. 1 is a generally side elevation view of one embodiment of the invention.

FIG. 2 is a top plan view of the apparatus shown in FIG. 1.

FIG. 3 is an enlarged central sectional view taken generally along line 3–3 of FIG. 2.

FIG. 4 is also an enlarged central sectional view taken along line 4–4 of FIG. 2.

FIG. 5 is a general side elevation view of the alternate embodiment of the invention.

FIG. 6 is a top plan view of the apparatus shown in FIG. 5.

FIG. 7 is a cross-sectional view generally taken along line 7–7 of FIG. 6 and showing the arrangement of the centrifugal brake and clutch means.

FIG. 8 is an end view of the centrifugal brake taken generally along line 8–8 of FIG. 7.

FIG. 9 is a sectional view generally taken along line 9–9 of FIG. 6 showing portions of the manually operated brake.

Description of the Preferred Embodiments

Referring now to the drawings and FIGS. 1–4 in particular, the apparatus includes a frame generally designated by the numeral 11. Frame 11 is comprised of front member 12 and rear member 13 rigidly secured together at the left end as shown in FIG. 2 by connector 14 and by axle bolt 15 passing transversely through the opposite ends thereof. Frame 11 may have connected thereto attachment means, such as hook 16, for attaching a load, such as a bucket for supporting material or a seat for supporting a man.

The apparatus is provided with power means in the form of a small two-cycle gasoline engine 17 which is provided with a centrifugally operated clutch (not shown) which engages at approximately 1,800 r.p.m. During engagement of the clutch, engine 17 rotates drive shaft 18, the opposite end of which is provided with threads arranged to engage worm gear 19 mounted in worm gear housing 20.

Worm gear 19 is mounted for rotation on worm gear shaft 24 as best seen in FIG. 4. Shaft 24 passes through frame member 12 a short distance and has rigidly mounted thereon, as by keying or the like, positive clutch 25 having a counter bore in which is received pilot bearing 27 and brake shaft 28 on which is mounted positive clutch 29. Clutch 29 is keyed to shaft 28 for axial sliding movement therewith. Upon being moved axially to the right as shown in FIG. 4, clutch 29 engages clutch 25, and on movement to the left, clutch 29 disengages clutch 25. Such axial movement is affected by a yoke (not shown) which is arranged for mounting an annular recess 30 in conventional manner, which yoke can be operated by a hand lever or the like (not shown).

As best shown in FIGS. 2 and 3, brake shaft 28 has rigidly mounted thereon for rotation therewith pinion gear 33 which is in mesh with spur gear 34 which, in turn, is in mesh with spur gear 35. Gear 34 is mounted for rotation on axle bolt 15, previously described, and spur gear 35 is mounted on axle bolt 36. It will be observed that axle bolt 36 passes transversely through a pair of arcuate shaped slots 37 provided in the base end of inverted L-shaped and spaced apart frame brackets 38 connected to frame members 12 and 13 by a pair of bolts 39. It will also be noted that axle bolt 15 has mounted thereon a pair of straps or frame arms 40 which are arranged for rotation thereon and which have the opposite ends thereof connected by axle bolt 36. It will be observed that, by varying the angle of arms 40 with respect to frame members 12 and 13, the apparatus can be adapted to ascend guys or different inclinations and still maintain frame 11 in a horizontal attitude.

Spur gears 34 and 35 have mounted thereon and rigidly attached thereto for rotation therewith annular members in the form of identical rollers 41 and 42 respectively, each having grooved surfaces thereabout for frictionally engaging guy line 43, as shown in the drawings.

The apparatus also includes brake means which will now be described in detail. Brake shaft 28, previously described and as shown in FIGS. 2 and 3 in particular, has a bearing 45 mounted thereabout which is held in frame member 13, as best seen in FIG. 3. Brake shaft 28 also has mounted thereabout an annular brake hub 46 which is connected to frame member 13 by screws 47, as shown. Hub 46 has a brake adjustment ring 48 mounted thereabout by course meshing threads, as shown, which in turn is connected to a brake lever

49, which is connected by connector 50 to a conventional brake rod 51 which can be operated by the operator. By rotation of brake lever 49, ring 48 is caused to move axially with respect to hub 46, the purpose of which will be explained hereinafter.

Hub 46 also has mounted thereabout inner brake disc 53 which is splined thereon, but arranged for axial movement therewith. Hence, brake disc 53 is free to move axially as brake lever 49 is operated. It is also to be understood that hub 46 is free of brake shaft 28 and serves as a retainer for bearing 45.

Brake shaft 28 also has mounted thereon outer brake disc 55 which is splined thereon and arranged for axial movement therewith. Disc 55 is of the similar dimensions to disc 53 with the two discs being arranged to frictionally engage upon relative axial pressure forcing the two together, and thereby effecting braking action of shaft 28. The left side of disc 55, as viewed in FIG. 3, has abutting thereagainst a governor comprising a governor bracket 57 which is held by pins 58 rigidly to brake shaft 28. Governor bracket 57 supports a pair of governor arms 59 which are pivotally mounted thereon by pivot pins 60, as shown. During rotation of brake shaft 28, arms 59 are urged outwardly by centrifugal force. Arms 59 are retained in the retracted position by sleeve 61 mounted about shaft 28, which is provided with an annular flange 62 which abuts against governor arms 59, as shown. Sleeve 61 is urged into engagement with governor arms 59 by coil spring 63 which is held on shaft 28 by wing nut 64, threadably mounted on the end of shaft 28. Hence, the tension on spring 63 can be varied by tightening wing nut 64. By tightening nut 64, spring 63 is compressed, thereby increasing the force of the sleeve 61 acting against governor arms 59. When centrifugal force applied to the governor arm 59 during rotation of shaft 28 exceeds the pressure applied by coil spring 63, then arms 59 pivot outwardly and force outer brake disc 55 axially into engagement with inner brake disc 53, to thereby effect braking of brakeshaft 28.

In operation, the apparatus is mounted on guy line 43 as shown. When it is desired to cause the apparatus to ascend the guy line, the operator causes the engine 17 to operate at a speed in excess of 1,800 r.p.m. to thereby engage the centrifugally operated clutch. Engine 17 then imparts rotation to drive shaft 18, which turns worm gear 19 and worm gear shaft 24 and positive clutch 25.

When the operator then desires to ascend, he engages positive clutch 29, thereby causing brake shaft 28 to rotate and, hence, pinion gear 33 and spur gears 34 and 35 which, in turn, cause rollers 41 and 42 to ascend along guy line 43.

During the ascent, the movement of frame 11 can be stopped at any time by reducing engine speed enough to disengage the aforementioned centrifugally operated clutch. Due to the high ratio of the worm gear 19 and drive shaft 18, frame 11 will not move until the engine speed is again increased or positive clutch 29 is disengaged. Hence, paints, tools or other materials can be sent up the wire by attaching them to the frame 11 and increasing the engine speed enough to engage the centrifugally operated clutch of the engine and thereafter engaging positive clutch 29.

When it is desired to cause the frame to decline, the operation is such that it can be returned to the ground at a controlled rate of speed by disengaging positive clutch 29. The rate of descent is controlled by the governor arrangement, including governor arms 59 applying pressure to brake disc 55 when the rate of descent exceeds a predetermined rate of travel, as determined by the amount of pressure applied by coil spring 63.

The descending rate of speed is controlled automatically by the aforesaid centrifugally operated brake which is assembled at the outer end of brake shaft 28 as described. Thus, there are two means by which the downward descent of frame 11 can be controlled. One is the use of brake rod 51 to rotate brake lever 49. The other is the engagement of positive clutch 29 such that the high gear ratio of worm gear 19 acts as a braking force. By having two means of braking descent, in addition to the centrifugally operated brake arrangement, the apparatus is very safe.

Referring now to FIGS. 5–8, an alternate embodiment of the invention will be described in detail. This embodiment includes a frame generally designated by the numeral 71 having a front member 72 and a back member 73 with spacer bars 74 therebetween. The left end of the frame may have attached thereto support means in the form of a hook 75 which is similar to hook 16 of the previous embodiment for supporting men and materials on the apparatus.

Frame 71 supports engine housing 77 in which is mounted engine 78 which may be a two-cycle gasoline engine for example, which is arranged to drive pinion gear 79.

Gear 79 has mounted thereon drive chain 80 which passes over and is arranged to rotate sprocket 81 which is mounted on shaft 82 appropriately journaled in and supported by frame 71.

Shaft 82 has mounted on the other end thereof a smaller sprocket 84 for rotation therewith and which has passing thereover another drive chain 85 which passes over a larger sprocket 86 spaced longitudinally therefrom. Sprocket 86 is mounted for rotation, as by bearing 89, on shaft 87 which is appropriately journaled in and supported for rotation by frame 71, as shown. Sprocket 86 is provided with laterally extending lugs 90 which are arranged to engage mating lugs 91 of axially slidable clutch member 92 mounted for axial movement on and rotation with shaft 87 as shown in FIG. 7. Axial movement of clutch member 92 is effected by a yoke 93 connected to a conventional clutch lever (not shown). Hence, the rotational force of sprocket 86 is imparted to shaft 87 when lugs 90 and 91 are engaged.

The opposite end of shaft 87 has keyed thereto a smaller sprocket 96 which is arranged to drive chain 97 which passes over larger sprocket 98 which is keyed to shaft 100, which is appropriately journaled in and connected to frame 71.

Shaft 100 has fixedly mounted thereon pinion gear 102 which is arranged to mesh with and drive large spur gear 103 to which is secured for rotation therewith a large roller wheel 104 which is arranged for frictionally engaging guy 105, as shown. Spur gear 103 is mounted for rotation on axle 101 journaled for rotation in the end of frame 71.

Frame 71 also has attached therewith an adjustable strap 110 the upper end of which supports roller 111 on axle 112. Strap 110 has appropriate means for adjusting the length thereof. By varying the length of strap 110, the apparatus can be adjusted to accommodate guys having different angular inclinations.

This embodiment is provided with separate brake means, one of which is centrifugally operated and the other of which is manually operated. Referring now to FIGS. 6, 7 and 9, the centrifugally operated brake will first be described. A generally concave shaped brake drum 115 is mounted about shaft 87 and secured to frame 71 by anchor pin 116 whereby drum 115 is prevented from rotation. Drum 115 has mounted thereinside a brake disc 118 which is keyed for rotation with shaft 87. As shown in FIG. 8, disc 118 has four axially extending and circumferentially equally spaced apart lugs or shoe stops 119, two of which support a brake shoe 120 and the other two of which support another brake shoe 120. Shoes 120 are urged against stops 119 by a pair of coil springs 121, as shown. Springs 121 bias shoes 120 away from engagement with drum 115 until a centrifugal force caused by rotation of shaft 87 forces shoes 120 radially outwardly into frictional engagement with brake drum 115, thereby limiting the speed of rotation of shaft 87. The braking force at this point controls the descending speed of the apparatus. The arrangement is such that the rotation of shaft 87 during ascent is not sufficient to engage shoes 120 with drum 115. Therefore, the descending speed is slightly greater than the ascending speed.

Referring now to FIGS. 6 and 9, the manually operated brake will be explained. Brake drum 125 is keyed to shaft 100 for rotation therewith. Drum 125 has loosely mounted

thereabout a brake band **126**, one end of which is connected to anchor pin **127** which is fixedly connected to frame **71**. The other end of band **126** is connected to pin **128** which is connected to a conventional brake lever (not shown). Hence, upon actuation of the brake lever (not shown) pin **128** is caused to move to the left as shown in FIG. **9**, thereby causing brake band **126** to frictionally engage brake drum **125** and thereby effect braking of the apparatus. By this arrangement and by operation of the manual brake and the centrifugal brake, the operator still has control of the descent of the apparatus if the chain drive should fail.

The operation of this embodiment is similar to the previous embodiment. The apparatus is first mounted on guy line **105** in the position shown in FIG. **5**. Strap **110** is adjusted such that frame **71** is held in generally horizontal relationship, with roller wheel **104** drivingly engaging the underside of guy line **105** and roller **111** engaging the upper side thereof. Engine **78** is then started and operated at a speed sufficient to engage a conventional centrifugal clutch (not shown) at which point gear **79** imparts rotational force which is transmitted through the power chain, discussed above, whereby wheel **104** imparts a driving force against guy **105** to advance the apparatus upwardly therealong, with clutch member **92** engaged, as discussed above.

When the apparatus is removed to the desired position on guy line **105**, then clutch member **92** is disengaged by the operator and brake band **126** is engaged with brake drum **125**.

During descent, clutch member **92** is disengaged and the downward rate of travel is controlled by the centrifugal brake discussed above, which may be described as being of the standard gocart centrifugal type. As the apparatus moves down guy **105**, shaft **87** is caused to rotate thereby by actuating the centrifugal brake. If for any reason the centrifugal brake should fail, the operator still has the use of the manual brake, including brake band **126** and brake drum **125** discussed above.

It will thus be observed that the art has been provided with a very simple apparatus for ascending guys and the like and yet, one which provides numerous safety features. It is adaptable for climbing guys at different angles of inclination and can be readily mounted and demounted from such a guy.

Further modifications may be made in the invention as particularly described without departing from the scope thereof. Accordingly, the foregoing description is to be construed as illustrative only.

I claim:

1. An apparatus for ascending an inclined guy line or the like, the combination comprising:

a generally horizontally extending frame;

drive means connected to said frame for drivingly engaging said guy line, said drive means including a first rotary member frictionally engaging the underside of said guy line and a second rotary member frictionally engaging the upperside of said guy line, with said rotary members being connected near one end of said frame; and

means for supporting a load on said frame at a point generally horizontally spaced apart from said rotary members, whereby said load biases both of said rotary members into greater frictional engagement with said guy line.

2. the invention as claimed in claim **1** wherein: said power means is connected to rotate said first annular member.

3. The invention as claimed in claim **2** including: means for varying the position of said second annular member relative to said frame to thereby adjust the apparatus to accommodate guy lines of different angles of inclination.