United States Patent

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[54] **PORTABLE CONVEYOR**
16 Claims, 10 Drawing Figs.

[52] **U.S. Cl.** **198/120.5**
[51] **Int. Cl.** **B65g 21/02**
[50] **Field of Search** 198/120.5, 121, 122, 99, 233

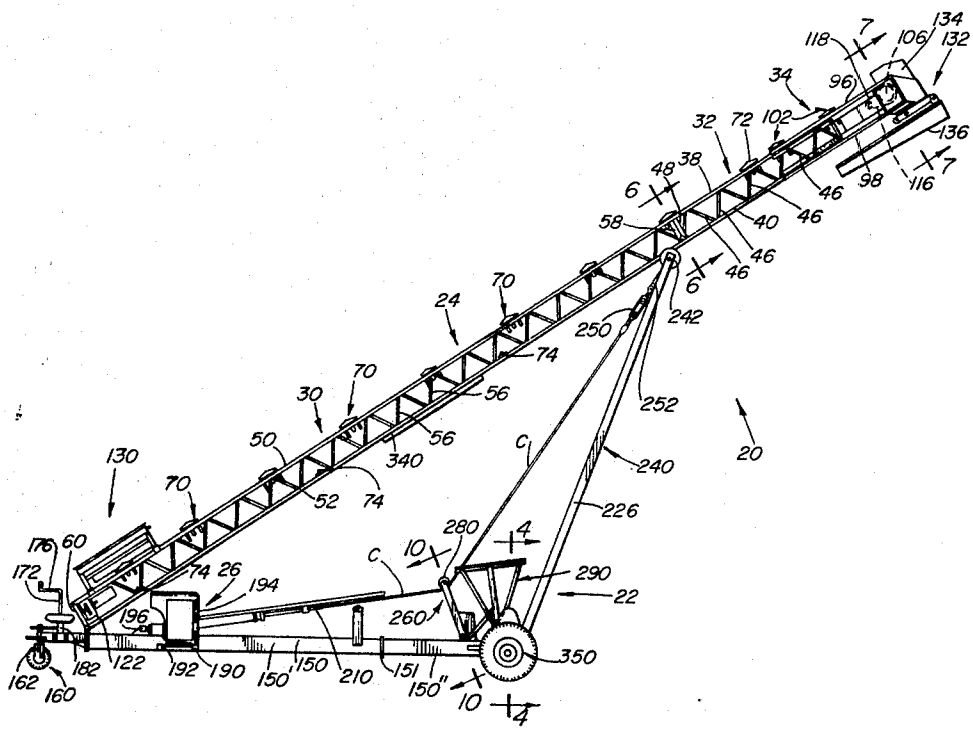
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ABSTRACT: In an improved conveyor of the type including an elongated conveyor-carrying boom pivotally mounted at one end to a wheeled supporting frame, with the other end of the boom being supported by an arm pivotally mounted adjacent the other end of the frame, with a sheave-carrying arm pivotally mounted adjacent the said other end of the support frame, and with a cable passing over the sheave and connected at one end to the support arm and at its other end to an hydraulic cylinder, the sheave arm and support arm are positioned such that the ratio of the reaction force acting on the support arm to the moment arm lying between the support arm pivot point and the point the cable passes over the sheave remains substantially equal for any given position of the conveyor boom. Such a conveyor additionally preferably includes means for adjusting the length of the aforesaid moment arm such that the same structural elements may be employed for booms of varying length.



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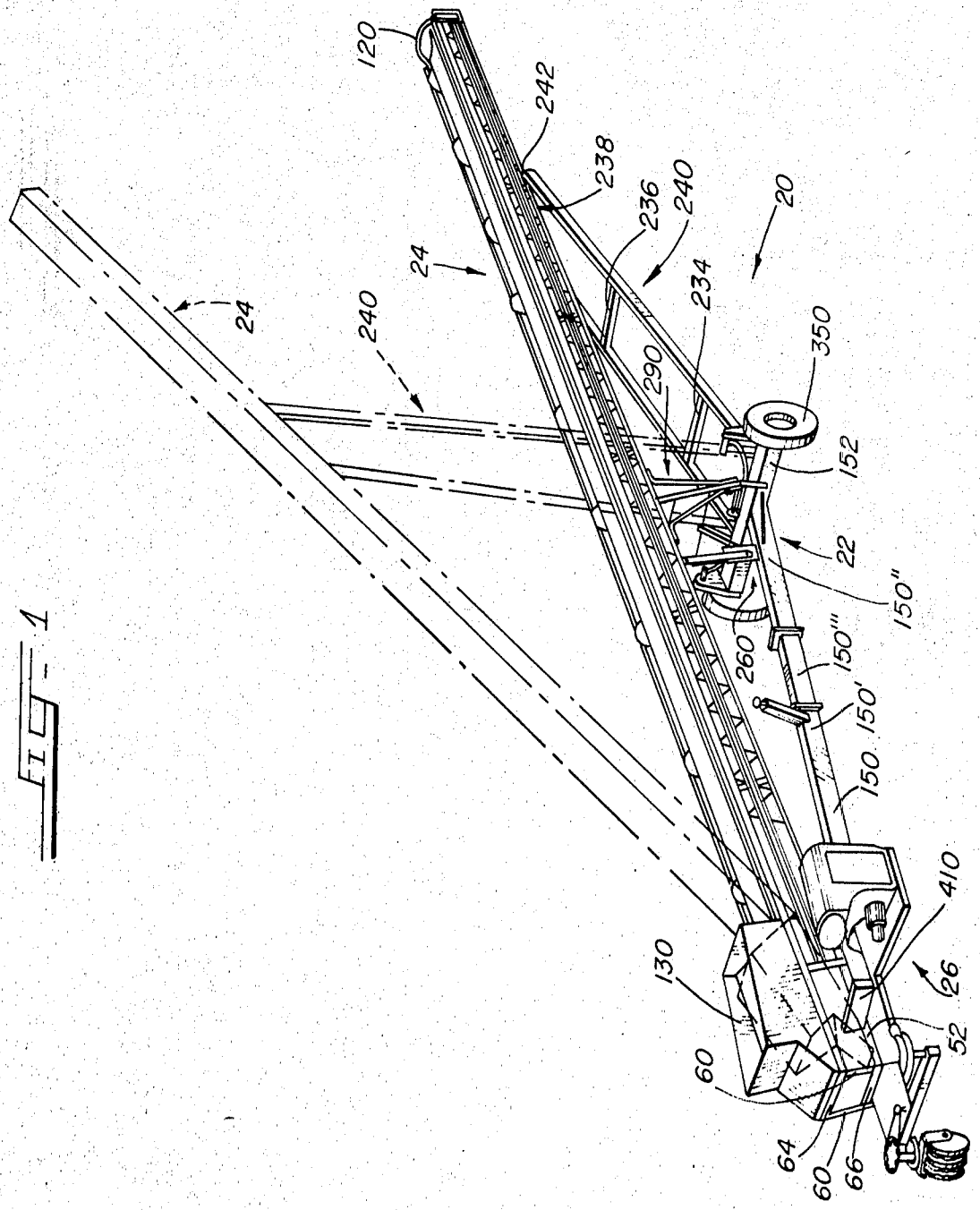


FIG. 1

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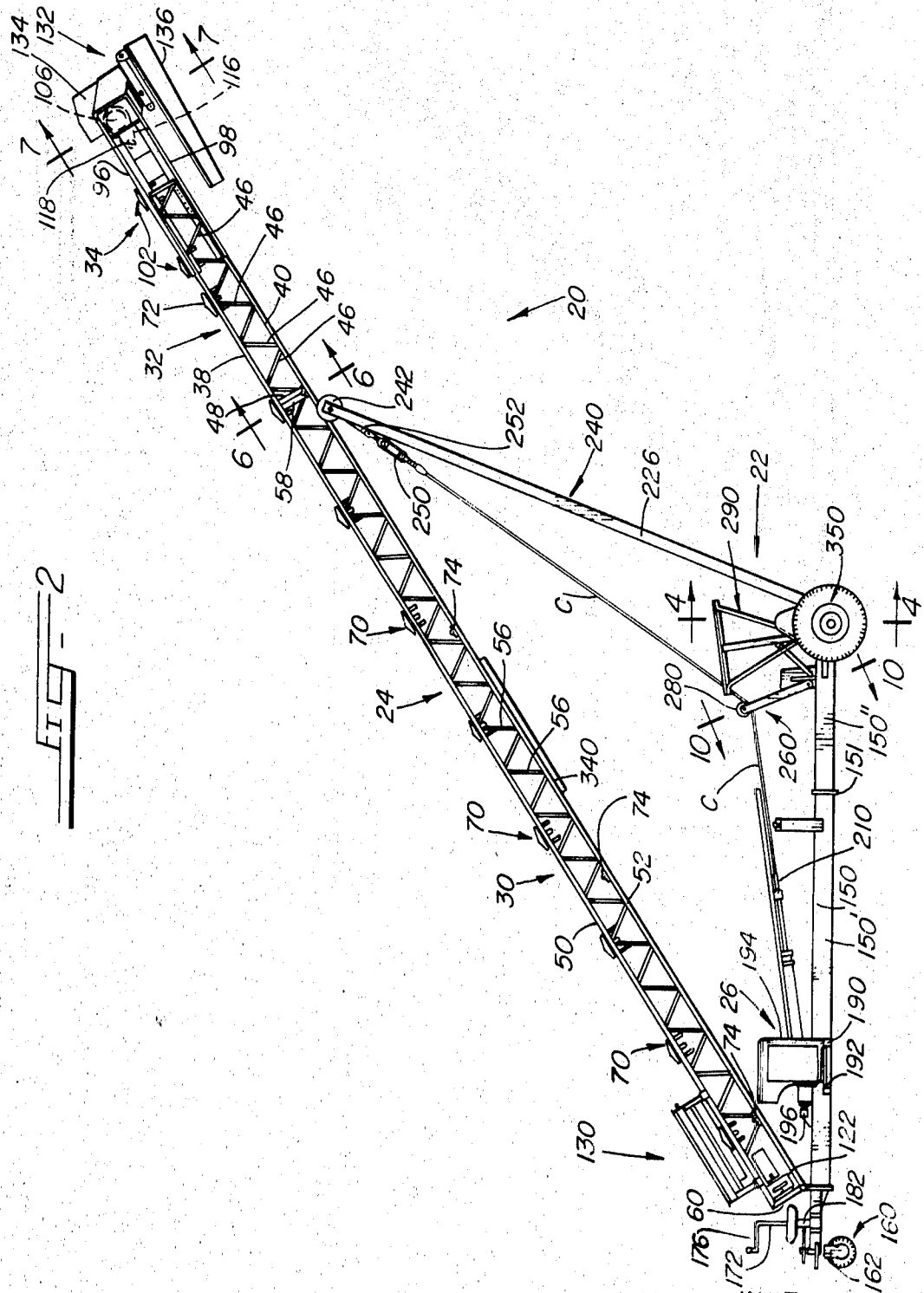


FIG-2

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FIG. 3

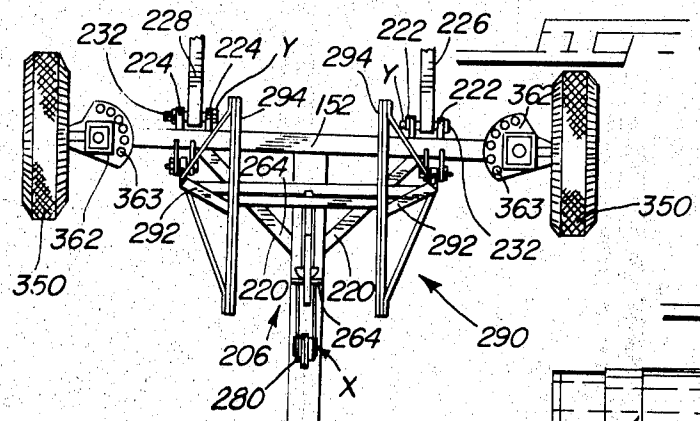
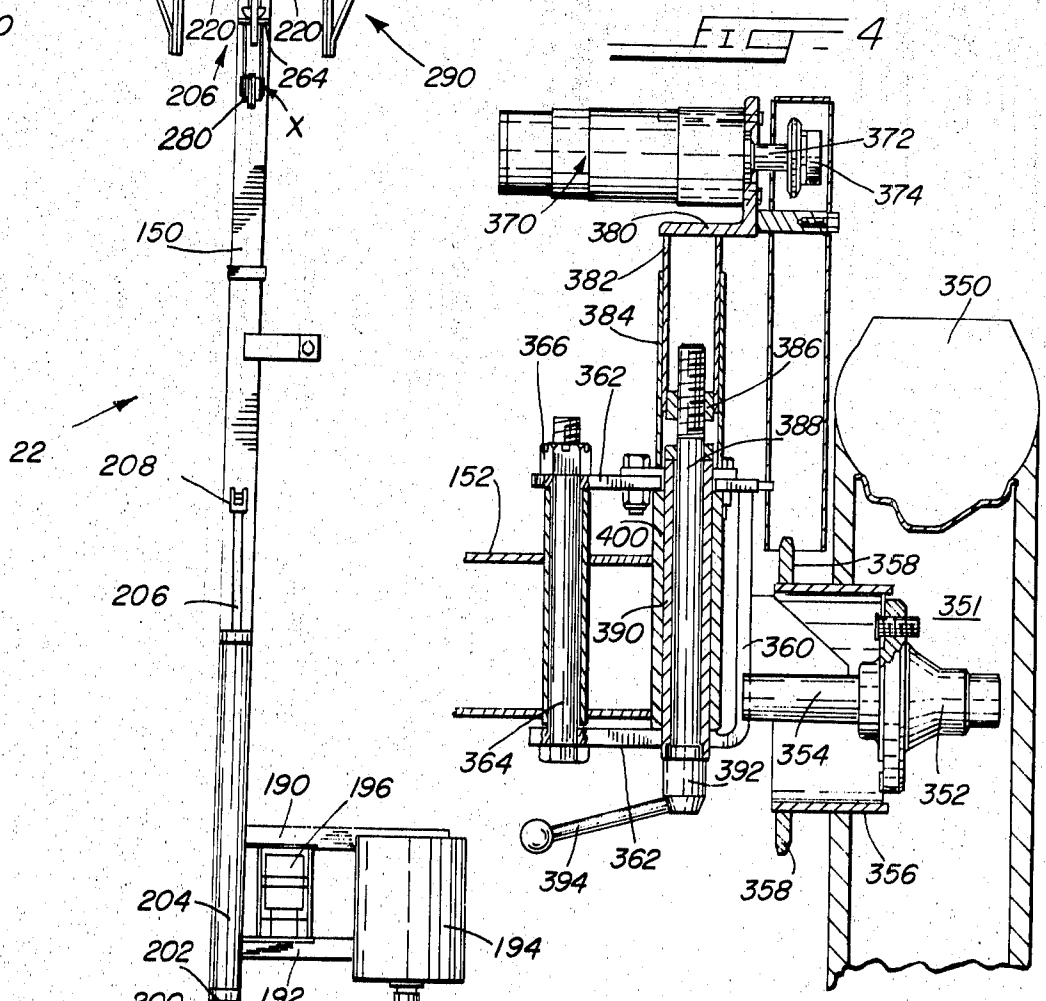


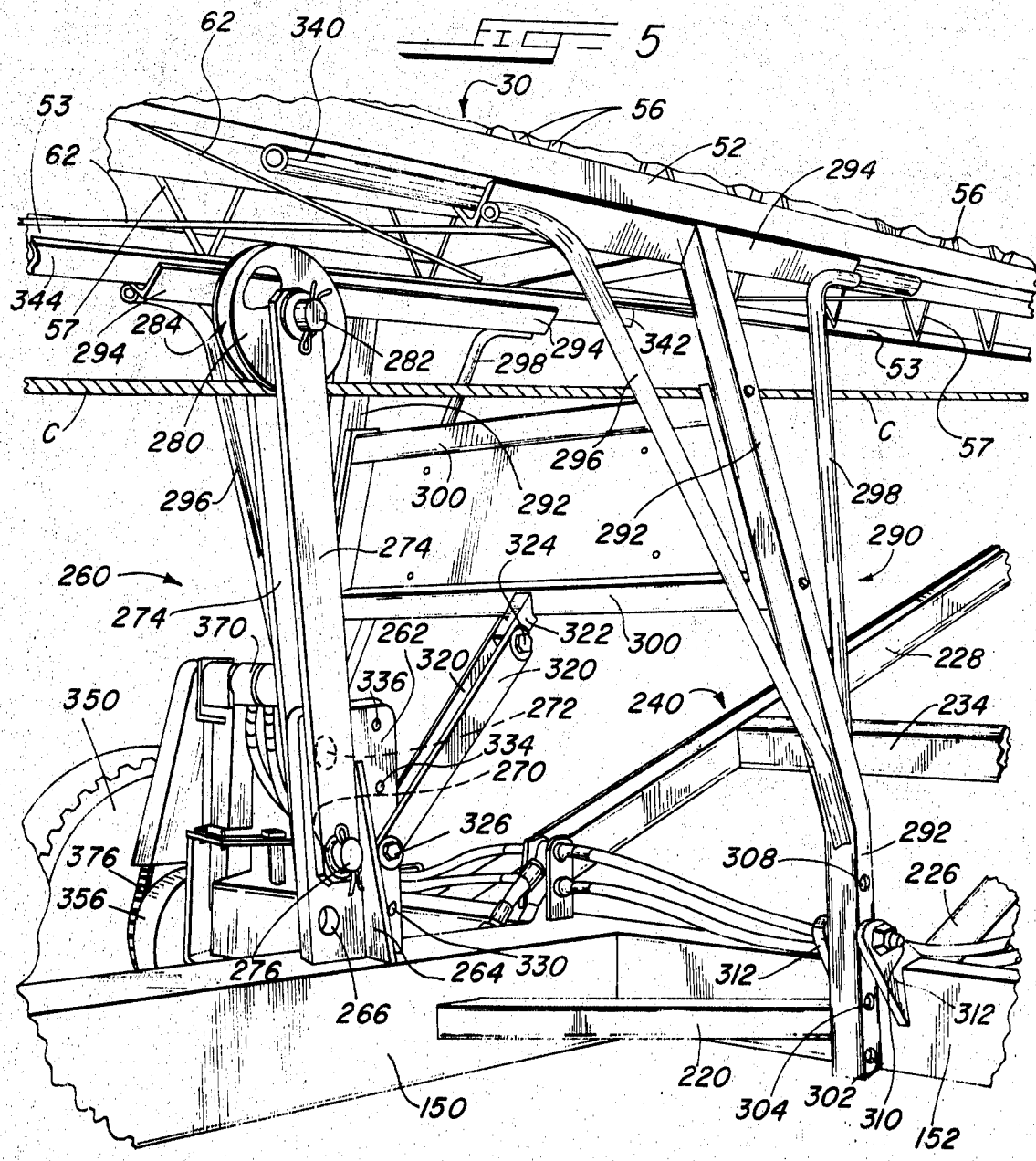
FIG. 4



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FIG. 5



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FIG. 6

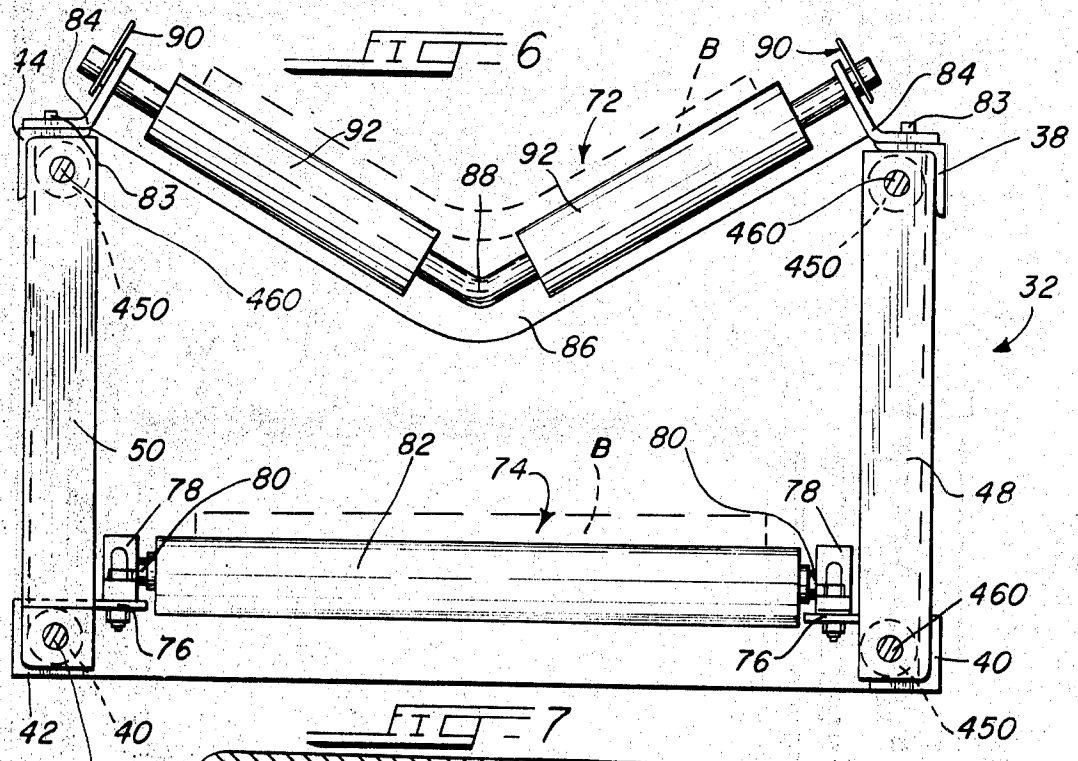
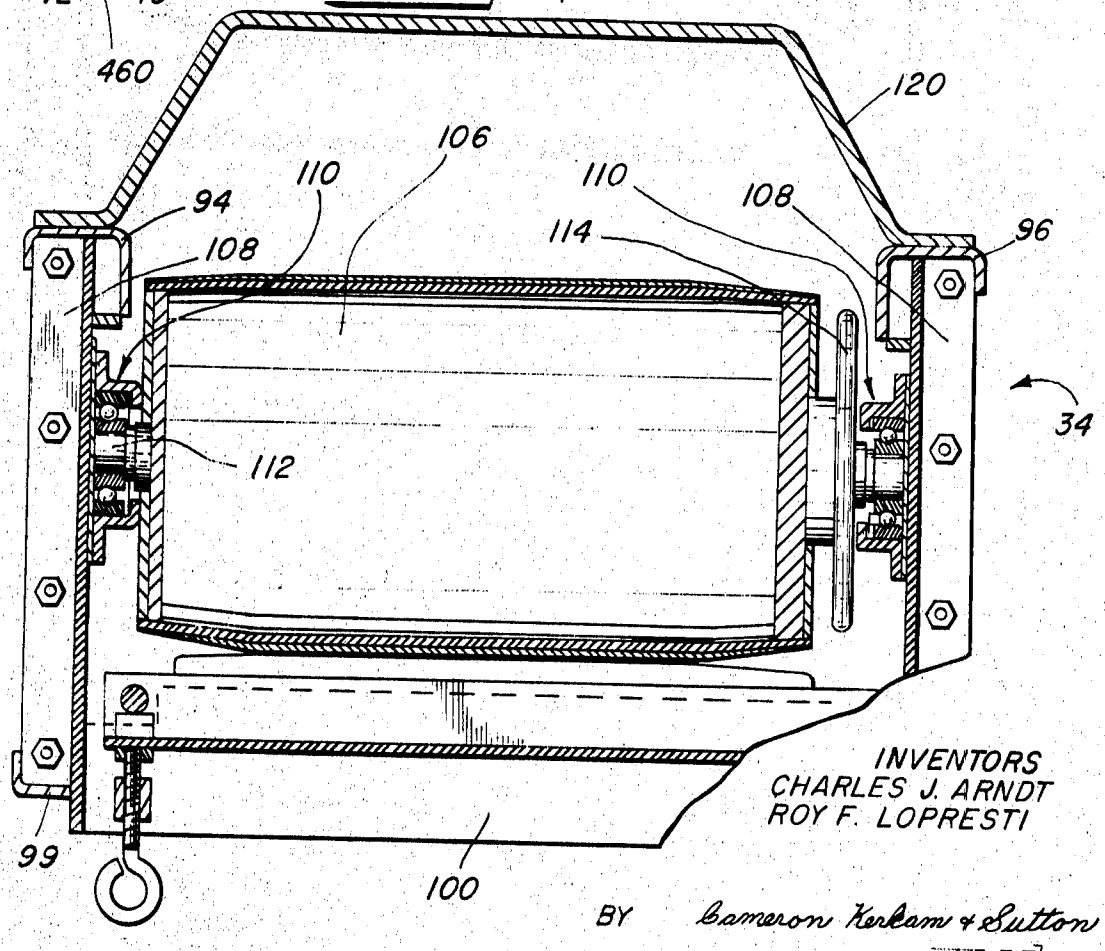


FIG. 7



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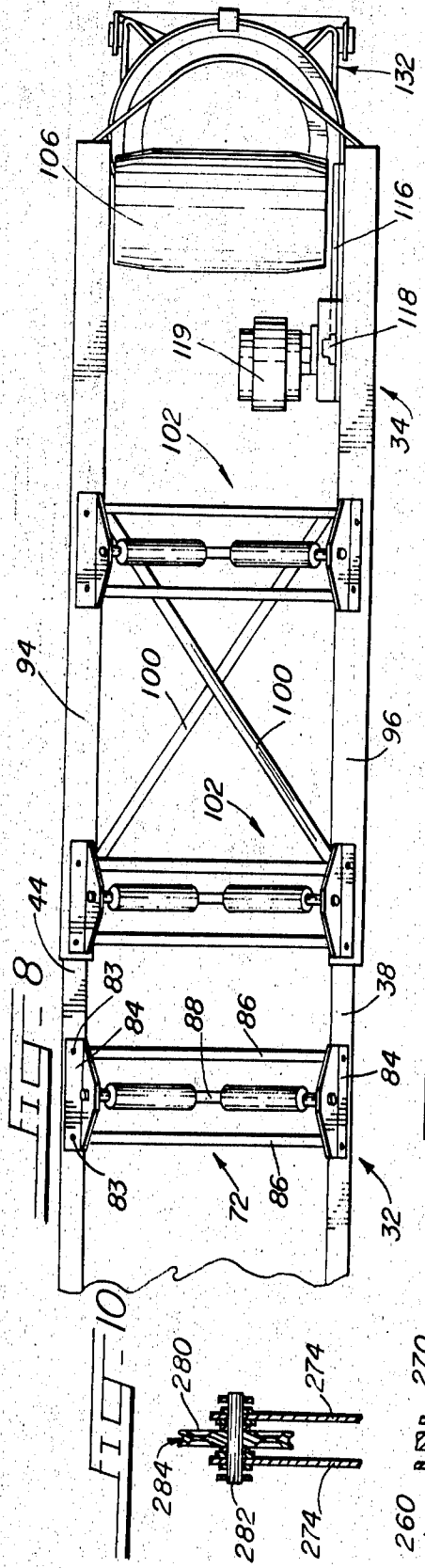


FIG - 8

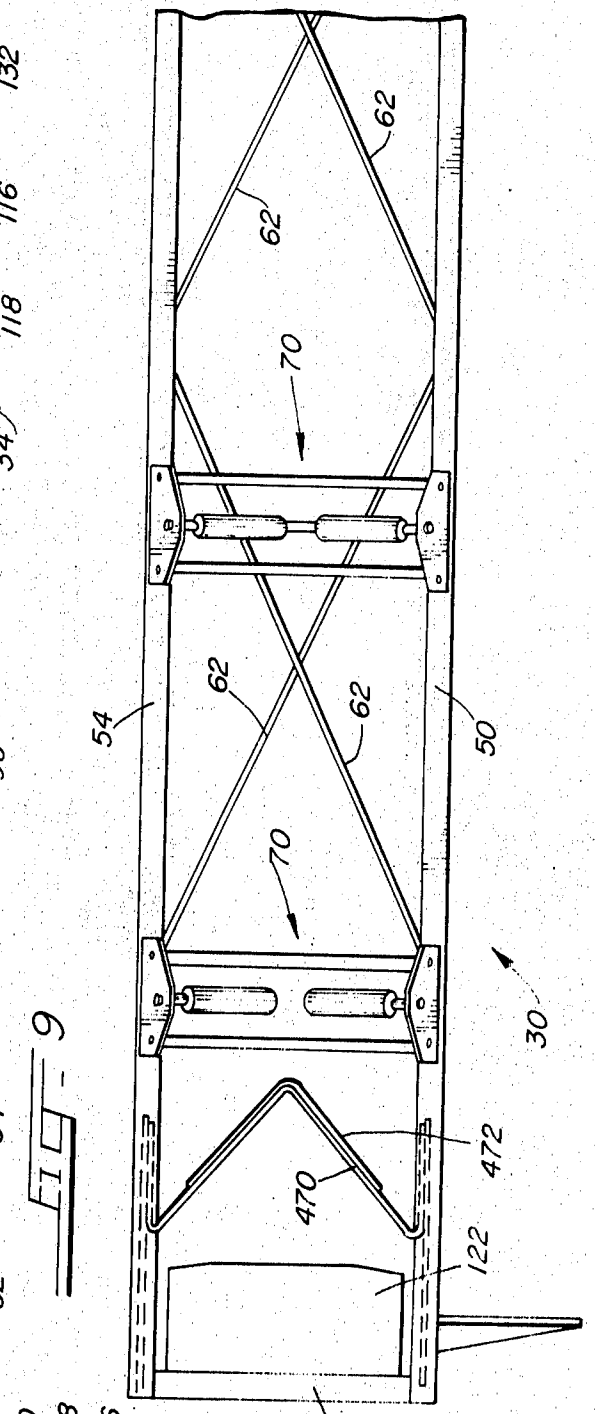


FIG - 9

FIG - 10

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PORTABLE CONVEYOR

BACKGROUND OF THE INVENTION

1. Field of The Invention

The present invention relates to conveyors and more particularly to a power-driven elevator-type conveyor especially designed for use with concrete mix or the like.

2. Description of the Prior Art

While portable boom-type conveyors of the elevator type, in which a conveyor supporting boom is pivoted at one end of a portable frame with the other end of the boom being supported by a pivotal support arm, have long been known in the art, problems have been encountered with reference to the particular manner in which the position of the support arm (and hence of the conveyor-supporting boom) is adjusted or maintained in static equilibrium. In particular, problems have been encountered where the position of the support arm is maintained by a cable passing over a sheave arrangement to a cable drive arrangement. Because of the geometry of the prior art systems, as the conveyor was elevated hydraulic pressure increased, thereby increasing the tension in the cable. Likewise, the prior structures have not been usable with conveyor-supporting booms of varying length. It has been necessary to provide completely different support frame structures for booms of different lengths.

A further difficulty encountered with prior art devices is that the preferred endless conveyor belts have not been usable because of the configuration booms involved. With such prior structures, it has been necessary to use a spliced conveyor belt which is much less desirable.

Furthermore, such devices have been unsatisfactory in the manner in which the conveyor boom is supported in a lowered, rest position in that the exact centering of the conveyor on a supporting cradle structure has been achieved only with careful manual manipulation. Yet a further difficulty has been the manner in which the wheels on the supporting structure have been driven.

SUMMARY OF THE INVENTION

The foregoing and other difficulties encountered with prior power-driven elevator-type conveyors have been overcome in accordance with the conveyor supporting apparatus of the present invention, which comprises: a support frame; a conveyor support boom pivotally mounted on the support frame adjacent one end thereof, the other end of the boom being free; a support arm pivotally mounted at one of its ends adjacent the other end of the support frame; antifriction means provided at the other end of the support arm, with the antifriction means adapted to support the free end of the conveyor support boom; a sheave arm pivotally mounted at one of its ends adjacent the other end of the support frame; A sheave pivotally mounted at the other end of the sheave arm; cable means fixed at one end to the support arm, with the cable being passed over the sheave; the other end of the cable means being secured to means for tensioning and adjusting the length of the cable means; the sheave arm and support arm being located such that the ratio of the reaction force acting on the antifriction means to the moment arm between the point at which the cable passes over the sheave and the pivot point of the support arm is substantially equal for any given position of the conveyor support boom.

In addition, the device preferably includes auxiliary mounting means for the sheave arm such that by merely varying its mounting point, the aforesaid equilibrium conditions can be maintained for conveyor support booms of varying length. In addition, means are preferably provided for supporting the conveyor boom in its lowered or rest position, including automatic centering means for locating the boom in its rest position.

As a result, a primary object of the present invention is to provide a portable elevator conveyor of the character described in which stresses within the system are equalized irrespective of the exact position of the conveyor boom.

A related object is to provide a conveyor support structure of the character described which is fully portable and which is fully power operated.

Yet another object is to provide a structure of the character described in which an endless conveyor belt may be quickly and conveniently and removably positioned in operative relation.

A further object is to provide a structure of the character described using interchangeable parts and the same basic supporting structure for conveyor booms of varying length.

A still further object is to provide a device of the character described in which improved means are provided for tensioning the conveyor belt supported by the boom.

DETAILED DESCRIPTION OF THE DRAWINGS

The foregoing and other objects, advantages, and features of the present invention will hereinafter appear, and, for purposes of illustration will but not of limitation, exemplary embodiments of the present invention are shown in the accompanying drawings, in which:

FIG. 1 is a perspective view of the device produced in accordance with the present invention;

FIG. 2 is a side elevational view thereof;

FIG. 3 is a plan view of the support frame portion thereof;

FIG. 4 is a fragmentary view, partially in section, taken substantially along line 4–4 in FIG. 2;

FIG. 5 is an elongated fragmentary perspective view of the forward end of the support frame structure;

FIG. 6 is a sectional view taken substantially along line–6 in FIG. 2;

FIG. 7 is a sectional view taken substantially along line 7–7 in FIG. 2;

FIG. 8 is a top plan view of the head section of the conveyor;

FIG. 9 is a top plan view of the tail section of the conveyor with the feeding hopper removed; and

FIG. 10 is a sectional view taken substantially along line 10–10 in FIG. 2.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 and 2 show a portable elevator-type conveyor 20 comprising a support frame assembly 22, a boom sa assembly 24, and a power assembly 26. As will hereinafter be described in detail, boom assembly 24 is pivotable between a lowered or rest position shown in full lines in FIG. 1 and a raised position shown in broken lines in FIG. 1.

As best shown in FIGS. 2 and 6—9, boom assembly 24 comprises a main section 30, an extension section 32 (see FIG. 2), and an adjustable tail section 34 mounted on extension section 32 in a manner and for a purpose to be described in detail hereinafter. Main section 30 and extension section 32 are of the same general configuration and structure and differ only in size and position. Sections 30, 32 are bolted together in a manner that will hereinafter be described in detail.

As best shown in FIG. 6, conveyor extension section 32 comprises four longitudinally spaced angles 38, 40, 42, 44 arranged in a generally rectangular cross-sectional form (see FIG. 6). REspective pairs of angles 38, 40 and 42, 44 are fixed in position by a plurality of diagonally positioned spacer bars 46 (see FIG. 2), the ends of which are welded to the respective angle pairs. In additional vertical spacer angle 48, 50 (see FIG. 6) is welded in place at one end of section 32 and a similar angle (not shown) is welded in position at the other end thereof.

Main boom section 30 is of the same basic overall construction with longitudinal angles 50, 52 forming one side of the boom and longitudinal angles 53, 54 forming the other side of the conveyor section. A plurality of bars 56 are welded in position between angles 50, 52 and a plurality of similar bars 57 (see FIG. 5) are welded between angles 53, 54 in order to stabilize them in position. A pair of vertically disposed end angles 58, 60 (see FIG. 2) further serve to stabilize relative positions of the respective pairs of side angles.

As best shown in FIG. 9 the respective sides of boom secton 30 are stabilized in position by a plurality of bars 62, the ends of which are welded to the opposite lower angles of section 30. Similar crossbars (not shown) are provided between the bottom angles 40, 42 of section 32. In addition, generally horizontal angles are welded between the respective longitudinal side angles in order to further stabilize the positions of the longitudinal angles forming the general configuration of the respective boom sections. Thus, a cross angle 64 is provided between angles 50, 54 of boom section 30 and a similar cross angle 66 (see FIG. 1) is provided between angles 52 and 53.

As a result, the boom sections of the device of the present invention are strongly and stably formed by the four longitudinal angles maintained in position by welded crossbars and angles.

In order that a problem experienced with portable prior art conveyors at the point of interconnection of adjacent boom sections may be avoided, as best shown in FIG. 6, a bushing 450 is welded in position behind the face of vertical angles (e.g., angles 48, 50) provided at abutting ends of the adjacent boom sections, and bolts 460 are passed through respective pairs of bushing located behind such adjacent spaces in order to solidly bolt the adjacent boom sections together.

In order to support a movable conveyor belt on the boom assembly 24, a plurality of upper idler roller assemblies 70 are provided between angles 50, 54 of section 30 and an additional upper idler assembly 72 (see FIG. 8 is provided between upper angles 38, 44 of section 32. Similarly, a plurality of lower idler roller assemblies 74 are provided between lower angles 52, 53 of section 30 and lower idler roller assembly may also be provided for section 32 if desired.

As best shown in FIG. 6, the lower idler roller assembly 74 comprises a pair of opposed brackets 76 projecting inwardly from angles 40,4 40, 42, respectively. A pair of upstanding ears 78 are bolted to brackets 76, and ears 78 contain pockets in which the ends of a shaft 80, on which is rotatably carried a lower idler roller 82, are rotatably received. The other lower idler roller assemblies 74 are of similar configuration.

Each of the upper idler roller assemblies 70, 72 (which are best shown in FIGS. 6, 8, and 10) are removable for a purpose that will best hereinafter appear. As best shown in FIGS. 6 and 8, assembly 72 comprises a pair of opposed angle brackets 84, each of which is secured respectively to one of the longitudinal angles 38, 44 as by the use of a plurality of bolts 83. A pair of V-shaped bars 86 are welded between angle brackets 84 (see especially FIG. 8) and bars 86 serve to further strengthen extension section 32. An additional V-shaped bar 88 passes through a pair of openings in angle brackets 86, with the end being secured in position by retaining pins 90 (see FIG. 6). A pair of upper idler rollers 92 are disposed on the opposed legs of V-shaped shaft 88. Because the ends of V-shaped rod or shaft 88 pass through openings in angle brackets 84, the rollers 92 may be removed and/or changed without removing brackets 84 from the positions in which they are bolted. The upper idler roller assemblies 70 which are removably positioned on main boom section 30 are identical to upper idler section 72.

As previously described, a tail section 34 is provided at the end of boom extension section 32. As shown in FIG. 8, section 34 comprises a pair of upper longitudinal angles 94, 96 and a similar pair of lower longitudinal angles 98, 99 (see FIGS. 2 and 7). the bottom longitudinal angles are braced in position by welded crossbars 100 (see FIG. 7), and upper longitudinal angles 94, 96 are retained in their desired configuration by a pair of upper idler roller assemblies 102, each of which corresponds in structure and in function to the previously described upper idler roller assembly 72. Provision is made for slidable movement of section 34 with respect to section 32, by means of the telescoping interrelation between the longitudinal angles of the section 32 and the longitudinal angles of section 34, for a purpose that will hereinafter appear.

A drive roller 106 is journaled for rotation at the forwardmost end of section 34 (see FIGS. 7 and 8, especially). A pair of vertical channels 108 are fixed in position between the respective pairs of upper and lower longitudinal channels (e.g., channels 94, 99 shown in FIG. 7), and a pair of bearing assemblies 110 are mounted on angles 108. A shaft 112, on which drive roller 106 is mounted, is journaled for rotation in the two bearing assemblies 110. In addition, a drive sprocket 114 is mounted adjacent one end of roller 106 and a drive chain 116 shown in broken lines in FIG. 2 passes over sprocket 114 and a sprocket 118 of an hydraulic drive motor 119 (see FIG. 7). Suitable hydraulic connections are provided between hydraulic motor 119 and power assembly 26, which includes selective controls for effecting the driving of drive roller 106 via motor 119, chain 116, and sprockets 114, 118. A stabilizing hoop 120 is welded in position between longitudinal angles 94, 96 in order to further stabilize the end of the tail section 34.

As best shown in FIG. 2, at the lower end of main section 30, a large end idler roller 122 is journaled for rotation, the mounting of idler roller 122 being similar to the mounting of previously described drive roller 106 except that a power drive connection is not provided.

A conveyor belt B is passed over the rollers 106, 122 disposed at opposite ends of the boom assembly 24, and the upper train of the belt B (shown in broken lines in FIG. 6) passes over the top of the idler rollers 92 provided in the various series of upper idler roller assemblies 70, 72 and 102. The lower train of belt B passes over the upper surfaces of the rollers 82 provided in the lower idler roller assemblies 74 provided along the bottom of boom assembly 74.

In order to properly adjust the tension of the conveyor belt B between the drive roller 106 and the opposite end idler roller 122, the exact position of extension tail section 98 with respect to extension section 32 may be adjusted by telescoping the section 34 in the previously described manner and then locking the respective overlapping longitudinal angles in the desired position, in accordance with the belt-tensioning system described and claimed in J.F. Oury, U.S. Pat. No. 3,203,538.

A hopper 130 is mounted over the lower end of the boom 24 at the lower end of main section 32 in order to provide a means of funneling concrete mix or the like onto the belt B, and a discharge chute assembly 132 is preferably provided at the discharge end of section 34. Briefly, chute assembly 132 comprises a hood section 134 fixed to hoop 120 and a pivotal underlying chute 136 into which the hood 134 directs concrete mix. As noted, chute 136 is pivotable in order to move it from a withdrawn transport position (as shown in FIG. 2) to any desired pouring configuration, as will be obvious to those skilled in the art.

A belt scraper holder 470 (see FIG. 9) is mounted at the receiving end of boom section 30, and a scraper blade 472 is fixed to support frame 470 so as to contact the underside of belt B as it passes over idler roller 122 at the receiving end of boom section 30, thereby to clean the surface of belt B prior to its passing under the hopper 130 directing fresh concrete mix or the like onto the moving surface of belt B.

As previously noted, the actual length of boom assembly 24 may be varied by incorporating additional extension sections (similar to section 32 shown the drawings). An especially suitable arrangement for the device of the character described embodies a basic main boom section 30 32 feet long with extension sections 32 in additional 8 foot increments up to a total of 32 additional feet, thereby providing a boom assembly 24 of up to 64 feet in length.

As best shown in FIG. 3, support assembly 22 comprises a generally T-shaped frame formed by a main longitudinal member 150 (shown in cross section in FIG. 10) and a transverse member 152 fixed thereto at its forward end. A pivot bar 154 is fixed to longitudinal member 150 at one end, and a pair of pivot pins 156 project outwardly from the end of member 154 and are adapted to pass through suitable openings in the opposed lower longitudinal channels 52, 53 of main boom section 30 in order to provide for the pivotal mounting of boom assembly 24 with reference to support assembly 22.

A rear wheel **160** is suitably journaled in a wheel mounting yoke **162** (see FIG. 2), which is in turn mounted on a shaft **164** (see FIG. 3) which passes rotatably through the rearward end of member **150**. A sprocket **166** is mounted on the upper end of shaft **164**. A chain **168** passes about sprocket **166** (see FIG. 3) and about a smaller sprocket **170** provided on a shaft **172** (see FIG. 2) journaled for rotation in a sidewardly projecting beam **174** (see FIG. 3) which is welded to longitudinal member **160**. A crank arm **176** (see FIGS. 2 and 3) permits a shaft **172** to be rotated via sprockets **164**, **170** and chain **168**, and thus yoke **162** and the wheel **160** may be rotated about a vertical axis thereby serving to steer the conveyor **20** when it is moved. A seat **180** mounted on a seat support **182** is provided on sidewardly projecting beam **174** in order to provide a convenient location for an operator to sit.

A pair of sidewardly projecting beams **190**, **192** (see FIG. 3) provide a base for a suitable engine or motor **194** which in turn provides a source of energy for the conveyor **20** and the operation of the hydraulic power source **196** which provides the motive force for the operation of the conveyor belt B and the other power features embodied in the conveyor **20**.

An upstanding ear **200** is welded in position on the top edge of longitudinal member **150**, and ear **200** has an opening therein. A pair of complementary ears **202** are provided on the end of an hydraulic cylinder **204**, and a pivot pin (not shown) passes through ears **200**, **202** in order to provide a pivotal mounting for hydraulic cylinder **204** for a purpose that will hereinafter appear. Cylinder **204** is provided with an actuating arm **206** which extends from the forward end thereof, and, in response to operation, may be extended or withdrawn under hydraulic pressure. Arm **206** terminates in a yoke **208** adapted to receive pivotally a cable mounting bracket **210** fixed in position at the end of a cable C provided for a purpose that will hereinafter appear.

As best shown in FIG. 3, a pair of diagonal angle braces **220** are welded between longitudinal member **150** and transverse member **152** in order to lend stability to the forward end of the support frame assembly **22**. A pair of forwardly projecting ears **222** are provided at one side on member **152** and a similar pair of forwardly projecting ears **224** are provided at a similar location at the opposite side of member **152**. A pair of upwardly projecting support arms **226**, **228** are pivotally mounted between the respective ear pairs **222**, **224** by means of pivot pins **230**, **232** (see FIG. 3). Support arms **226**, **228** are fixed together by three crossbars **234**, **236**, **238** (see FIGS. 1 and 5) such that arms **226**, **228** pivotally move with reference to the member **152** as a single unit which will be referred to hereinafter as the arm assembly **240**.

A roller **242** (see FIGS. 1 and 2) is journaled for rotation between the ends of arms **226**, **228**, and the ends of roller **242** preferably comprise upstanding flanges whereby the center portion of roller **242** provides an antifriction support surface on which boom assembly **24** may be supported as shown in FIGS. 1 and 2. Because roller **242** functions as an antifriction support, as the support arm assembly **240** is pivoted the angle of elevation of boom assembly **24** varies, with the respective extreme positions of support arm assembly **240** and boom assembly **24** being shown in full and broken lines in FIG. 1.

The forward (see of cable C is fixed to a turnbuckle **250** (see FIG. 2) which is in turn pivotally attached to the upper end of support arm assembly **240** by a pivotal link **252**. As a result, when hydraulic cylinder **204** is properly actuated and the actuating arm **206** thereof is hydraulically moved, cable C is either advanced toward the right (whereby under the influence of gravity support arm assembly **240** may pivot downwardly) or toward the left. Support arm assembly **204** is pulled upwardly so as to move boom assembly **204** toward its broken line raised position (shown in FIG. 1).

A sheave assembly **260** is provided in order to guide the cable C intermediate its linking with the arm **206** and the support arm assembly **240**. As best shown in FIGS. **5** and **10**, the sheave assembly **260** comprises an upwardly projecting plate **262** which is welded to member **150** and which is provided with a pair of reinforcing angles **264** (see FIGS. **3** and **5**). Four openings **266**, **268**, **270**, **272** are provided in one side of plate **262**, the precise location of which holes is determined in a manner that will hereinafter be described in detail. A pair of sheave arms **274** are pivotally mounted about a pivot shaft **276** which passes through one of the openings **266**, **268**, **270**, **272**. The particular opening through which bottom portion of sheave arms **274** are pivotally mounted will be determined in the manner hereinafter described in detail. A sheave **280** is pivotally mounted between the upper ends of arms **274**, with shaft **282** passing through openings in the end of each arm **274** and with sheave **280** pivoting thereabout. A groove **284** is provided in the periphery of sheave **280** and provides a channel through which cable C passes. Because sheave arms **274** are free to pivot about shaft **276**, sheave arms **274** and sheave **280** will thus be free to assume the natural position to which it is urged by the cable C depending upon the precise angle at which support arm assembly **240** is disposed. Normally, sheave arms **274** will substantially bisect the angle formed by cable C.

A cradle assembly **290** (see FIGS. **2**, **3**, and **5**) is provided in order to provide a framework for boom assembly **24** upon which to rest in its lowered or rest position as shown in FIG. **1**. Cradle assembly **290** comprises a pair of side legs **292** formed of metal bar or tubular material which project upwardly and then angle inwardly as best shown in FIG. **5**. At the upper end of each side leg **292** is provided V-shapd angle **294** disposed in a longitudinal direction as shown in FIG. **5**. A pair of tubular braces **296**, **298** link the respective ends of V-angles **294** and side legs **292** in order to stabilize each side of the cradle assembly **290**. In addition, a pair of crossbars **300** serve to solidly stabilize the respective sides of the assembly **290**. A series of openings **302**, **304**, **306**, **308** are provided in the lower end of each side leg **292** (opening **306** is not per se shown in the drawings because a pivot bolt **310** which passes through a pair of ears **312** and through opening **306** serves to provide a pivot point about which the cradle assembly **290** may pivot). A similar pivotal mounting arrangement is provided for the opposite leg **292**.

In order to brace cradle assembly **290** in a given angular position, a pair of braces **320** are pivotally attached to a lug **322** on cross brace **300** by means of a pivot rod **324**, the other ends of braces **320** pivotally mounted on plate **262** by means of a pin **326** which passes through one of a series of openings **330**, **332**, **334**, **336** (opening **332** being obscured in the drawing). When it is desired to use boom assemblies **24** of greater length or when it is desired that the rest position (as shown in FIG. **1**) of boom assembly **24** be higher or lower, the pivotal mounting of legs **292** through one of the series of four holes therein may be varied and likewise the lower mounting point of braces **320** may be varied in its similar select series of four holes provided in plate **262** may likewise be varied.

In **5**), and with the present invention, an especially desirable feature of cradle assembly **290** is the provision of the V-shaped supporting angles **294** (best shown in FIG. **5**). A longitudinally positioned anchoring member **340** (which preferably takes the form of a metal tube) welded beneath the lower longitudinal angle **52** of boom section **30** (see FIGS. **2** and **5**), and a similar tube **344** is provided beneath longitudinal angle **53**. As best shown in FIG. **5**, members **340**, **344** are respectively carried in V-shaped angles **294** when the boom assembly **24** is disposed in its rest position. However, in order that precise centering of the boom assembly **24** on the cradle assembly **290** need not be accomplished in lowering the boom assembly **24** to its rest position, the provision of the outwardly projecting sides of V-shaped angles **294** cooperate with the tubular cross section of members **340**, **344** to provide for an automatic centering as the boom assembly **24** is lowered. Thus, precise centering need not be accomplished, with the angularly disposed sides of angles **294** accomplishing this purpose automatically.

As shown in FIGS. **1**—**5**, a pair of wheels **350** are provided at the respective ends of transverse member **152**. The detailed

construction and manner in which wheels **350** are driven and mounted on transverse member **152** are best shown in FIGS **4** and **5** Each tire **350** is mounted on a wheel **351**, which in turn is mounted on a hub **352** Hub **352** is mounted on an axle **354**, on which is provided a drum **356** having a plurality of sprocket teeth **358** disposed thereon Hub **352** is adapted to rotate with respect to axle **354**, with hub **352** being fixed to drum **356** so as to rotate therewith Axle **354** is welded to a U-shaped bracket **360** having projecting side legs **362**, and bracket **360** is bolted to transverse member **152** by a bolt **364** and nut **366** which pass through legs **362** of U-shaped bracket **360** and through transverse member **152**. As best shown in FIG. **3**, legs **362** of bracket **360** comprise a plurality of radially positioned openings (e.g., openings **363**), and bolt **364** may be removably passed through different pairs of openings **363** in order that wheels **350** may be disposed at any desired angle.

Wheel **350** is driven by an hydraulic motor **370** which drives a shaft **372** on which is mounted for rotation therewith a sprocket **374**. A chain **376** passes about sprocket **374** and sprocket teeth **358**.

Hydraulic motor **370** is mounted on an angle bracket **380** and bracket **380** is in turn mounted on a tube **382** which is slidably fitted within a sleeve **384** for vertical movement. A bushing **386** is welded in the lower end of tube **382**, and an adjustment bolt **388** is threaded in bushing **386** for a purpose that will hereinafter appear. Bolt **388** is journaled for rotation in a sleeve **390**, and a ratchet connection **392** and a ratchet handle **394** are provided at the lower end of bolt **388** in order to rotate the same. By rotating bolt **388** bushing **386** and hence tube **382** may be adjusted vertically so as to adjust the vertical position of hydraulic motor **370**. As a result, the tension on drive chain **376** may be precisely adjusted merely by operating ratchet handle **394** in order to quickly and conveniently provide the desired degree of chain tension. Sleeve **390** is likewise bolted in position within a sleeve **400** welded to the end of transverse member **152**. An identical hydraulic drive system and chain adjustment arrangement is provided for the other of the wheels **350**.

Suitable hydraulic hose connections for pressurized hydraulic fluid are provided between the power assembly **26** and hydraulic motors **370**, hydraulic motor **119**, and hydraulic cylinder **204**. A control panel **410** (see FIG. **1**) may be provided in order to give the operator convenient control of all of the power options provided on the device.

In order that appropriate support is given to the elongated boom assemblies (i.e., a boom assembly to which additional extension sections, such as section **32**, have been added), additional insert sections in the longitudinal member **150** may desirably be provided. The minimum length is shown in FIG. **2** in which member **150** comprises a main section **150'** and an extension section **150''** bolted together at a joint **151**. FIG. **1** shows a conveyor in which an additional extension section **150'''** has been interposed between sections **150'** and **150''**. In general, where an extension section (such as section **32**) is added to boom assembly **24**, it is unnecessary to add any extension sections to member **150**. However, for each successive extension section added to the boom assembly **24**, an additional extension section (such as extension **150'''**) should be interposed as a part of member **150**.

In operation, once the appropriate configurations of the boom assemblies **24** and the member **150** have been satisfactorily chosen and the correct mounting positions for the cradle mounting assembly **290** and the sheave assembly **260** have been ascertained, in accordance with the hereinafter to be described principles of operation, an operator sitting in the seat **180** can by manipulating appropriate hydraulic controls on the control panel **410** cause the boom assembly **24** to move either upwardly or downwardly between its extreme positions (as shown in FIG. **1**) and likewise by operating hydraulic motors **370** may cause the portable conveyor to advance either forwardly or rearwardly, with steering being accomplished by manipulating handle **176**, all as previously described in detail.

Because of the geometric relationship between the support arm assembly **240** and the sheave assembly **260**, stresses throughout the portable conveyor and particularly throughout cable C are maintained substantially uniform. More particularly, the geometry of the arrangement is such that the ratio of the reaction force acting on antifriction roller **242** to the moment arm between the point at which cable C passes over sheave **280** and the pivot point for support arm assembly **240** (i.e., the perpendicular distance between the point denoted by the lead arrow from reference character X and a line passing through the pivot points identified by the reference character y as shown in FIG. **3**) is maintained substantially equal for differing angular positions of boom assembly **24**. Thus for all positions of boom assembly **24**, the apparatus satisfies the expression

$$\frac{F}{M}=K$$

where F is the reaction force acting on roller **242**; where M is the perpendicular distance between a line passing through points Y and a parallel line passing through point X; and where K is substantially constant.

In other words, as boom assembly **24** changes its position and the reaction force on roller **242** changes, the pivot of sheave arms **274** about pivot point **276** results in a change in the aforesaid moment arm such that the substantially constant ratio is maintained. Because of the differences in the reaction forces acting on the antifriction roller means **242** with boom assemblies **24** of differing lengths, the moment arm distance must likewise be changed, and this is achieved by positioning pivot point **276** through a different one of the openings **266**, **268**, **270**, **272** in order to vary the desired moment arm distance and so that the equilibrium expression may be obtained for various angular positions of boom assembly **24**. Also, the length of member **150** is appropriately adjusted. In this manner, stresses within cable C are equalized and the likelihood of operational failures due to unbalanced stresses within the cable C are absolutely minimized.

We claim:

1. Supporting apparatus for a conveyor for concrete mix and the like comprising:

a support frame;

a conveyor support boom pivotally mounted on the support frame adjacent one end thereof, the other end of the boom being free;

a support arm pivotally mounted at one end adjacent the other end of the support frame, the other end of the support arm being adapted to support the free end of the conveyor support boom;

a sheave arm pivotally mounted o at one end about a pivot point adjacent the other end of the support frame;

a sheave pivotally mounted at the other end of the sheave arm; and

cable means fixed at one end to the support arm and at the other end to means for moving the cable means, with the cable means being passed over the sheave;

the sheave arm and support arm being relatively positioned such that the ratio of the reaction force acting on the support arm to the moment arm lying between the point at which the cable passes over the sheave and the pivot point of the support arm is substantially equal for any given pivotal position of the conveyor support boom.

2. Supporting apparatus, as claimed in claim **1**, wherein the conveyor support boom comprises a main section and a tail section, with the sections being telescopically mounted end-to-end whereby to adjust the tension of a conveyor belt carried by said boom.

3. Supporting apparatus, as claimed in claim **2**, wherein the length of the conveyor support boom is increased by the provision of at least one extension section interposed between the main section and the tail section.

4. Supporting apparatus, as claimed in claim **3**, wherein the length of the support frame is increased by the provision of a

support frame extension member for each boom extension section in excess of one.

5. Supporting apparatus, as claimed in claim 4, wherein the position of the pivot point for the sheave arm is adjustable in order to lengthen the said moment arm whereby, for a conveyor support boom of a given length, the ratio of the said reaction force to the said moment arm remains substantially equal for any given pivotal position of the conveyor support boom.

6. Supporting apparatus, as claimed in claim 1, and further comprising antifriction means provided at the other end of the support arm on which the conveyor support boom rests.

7. Supporting apparatus, as claimed in claim 1, wherein the support frame comprises:

a plurality of rotatably mounted wheels, with at least one of the wheels being driven by a chain driven by an hydraulic motor; and

an adjustable telescopic mounting for the hydraulic motor for adjusting the tension of the chain drive by varying the relative position between the hydraulic motor and the wheel.

8. Supporting apparatus, as claimed in claim 1, and further comprising cradle means pivotally mounted on the support frame adjacent the said other end thereof and adapted to provide a support for the conveyor support boom when the conveyor support boom is disposed in a lowered, rest position, the said cradle means including at least one longitudinally disposed V-shaped angle generally positioned beneath the conveyor support boom, with at least one generally cylindrical member being mounted beneath the conveyor support boom and generally in longitudinal alignment with a corresponding V-shaped angle, whereby when the conveyor support boom is pivoted downwardly toward its rest position, each cylindrical member cooperates with the corresponding V-shaped angle to self-center the conveyor support boom on the cradle means.

9. Supporting apparatus, as claimed in claim 8, wherein the cradle means comprises a pair of V-shaped angles.

10. Supporting apparatus, as claimed in claim 8, wherein the pivotal mounting for the cradle means is adjustable whereby the cradle means may be disposed in different positions for conveyor support booms of different lengths.

11. Supporting apparatus, as claimed in claim 1, wherein the conveyor support boom comprises:

a power-driven drive roller disposed at one end of the conveyor support boom;

a main idler roller disposed at the other end of the conveyor support boom;

a plurality of upper V-shaped idler roller assemblies removably mounted on the conveyor support boom;

a plurality of lower idler roller assemblies mounted on the conveyor support boom; and

an endless conveyor belt disposed about the main idler roller and the drive roller;

with the upper train of the belt being supported by the V-shaped idler roller assemblies, and the lower train thereof being supported by the lower idler roller assemblies.

12. In a supporting apparatus for a conveyor comprising a support frame; a conveyor support boom pivotally mounted adjacent one end of the support frame, with the other end of the boom being free; a support arm pivotally mounted adjacent the other end of the support frame; a sheave arm pivotally mounted at one end about a pivot point adjacent the other end of the support frame; a sheave pivotally mounted on the other end of the sheave arm; and a cable fixed at one end to the support arm and at the other end to means for moving the cable, with the cable being passed over the sheave, the improvement comprising the pivot point for the support arm being positioned relative to the pivot point for the sheave arm such that the ratio of the reaction force acting on the support arm to the moment arm lying between the point at which the cable passes over the sheave and the pivot point of the support arm is substantially equal for any given potential position of the conveyor support boom.

13. The improvement, as claimed in claim 12, wherein the conveyor support boom comprises a main section and a tail section, with the sections being telescopically mounted end-to-end whereby to adjust the tension of a conveyor belt carried a by said boom.

14. The improvement, claimed in claim 13, wherein the length of the conveyor support boom is increased by the provision of at least one extension section interposed between the main section and the tail section.

15. An improvement, as claimed in claim 14, wherein the length of the support frame is increased by the provision of a support frame extension member for each boom extension section in excess of one.

16. An improvement, as claimed in claim 15, wherein the position of the pivot point for the sheave arm is adjustable in order to lengthen the said moment arm whereby, for a conveyor support boom of a given length, the ratio of the said reaction force to the said moment arm remains substantially equal for any given pivotal position of the conveyor support boom.