United States Patent

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[54] **ELEVATOR**
4 Claims, 9 Drawing Figs.

[52] **U.S. Cl.** **187/12,**
182/103, 187/2, 187/94, 187/95
[51] **Int. Cl.** **B66b 9/06**
[50] **Field of Search** 187/2, 6,
10—14, 94, 95; 182/2, 103, 148

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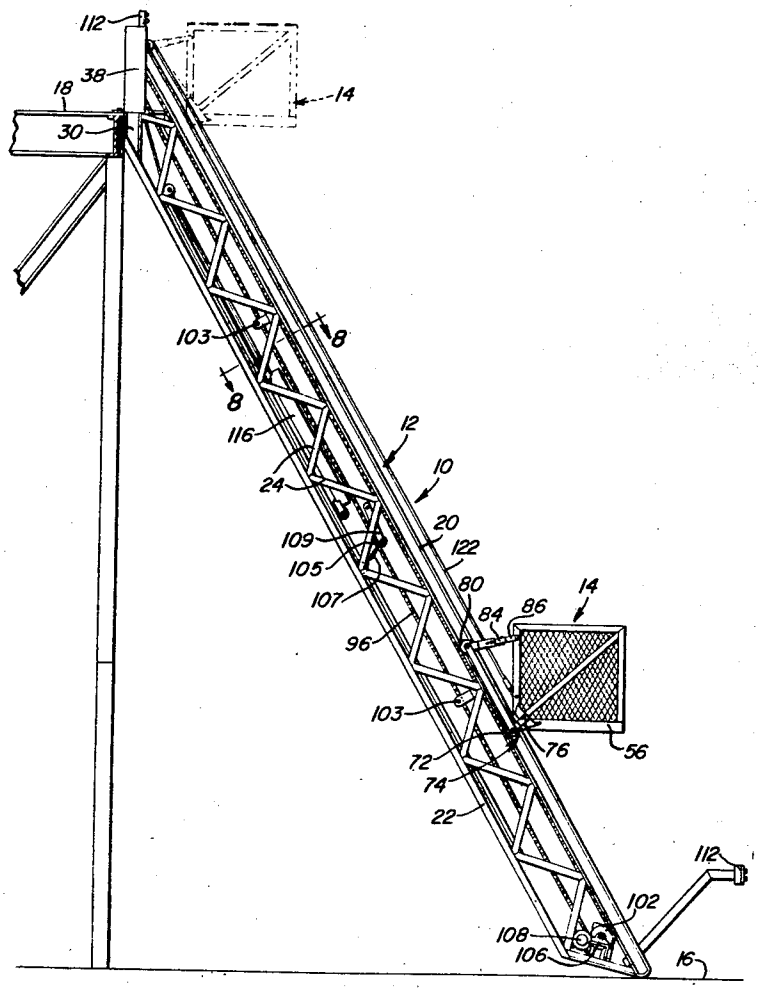
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ABSTRACT: A construction elevator including an elongated structural framework incorporating a pair of laterally spaced tracks upon which a material and personnel carriage operates. The framework is adjustable so as to extend between the ground and a construction platform located at varying heights above the ground through a variation in the angle of the framework. The carrier is angularly adjustable on the framework so as to assume a horizontal positioning thereof regardless of variations in the angle of inclination of the framework. A counterweight unit is engaged with the carrier and mounted within the framework for track-guided movement therealong in a direction opposed from the direction of movement of the carrier so as to act as a counterbalance therefor. The carrier and framework are so orientated as to allow free access to and egress from the carrier at both ground level and at the construction platform.



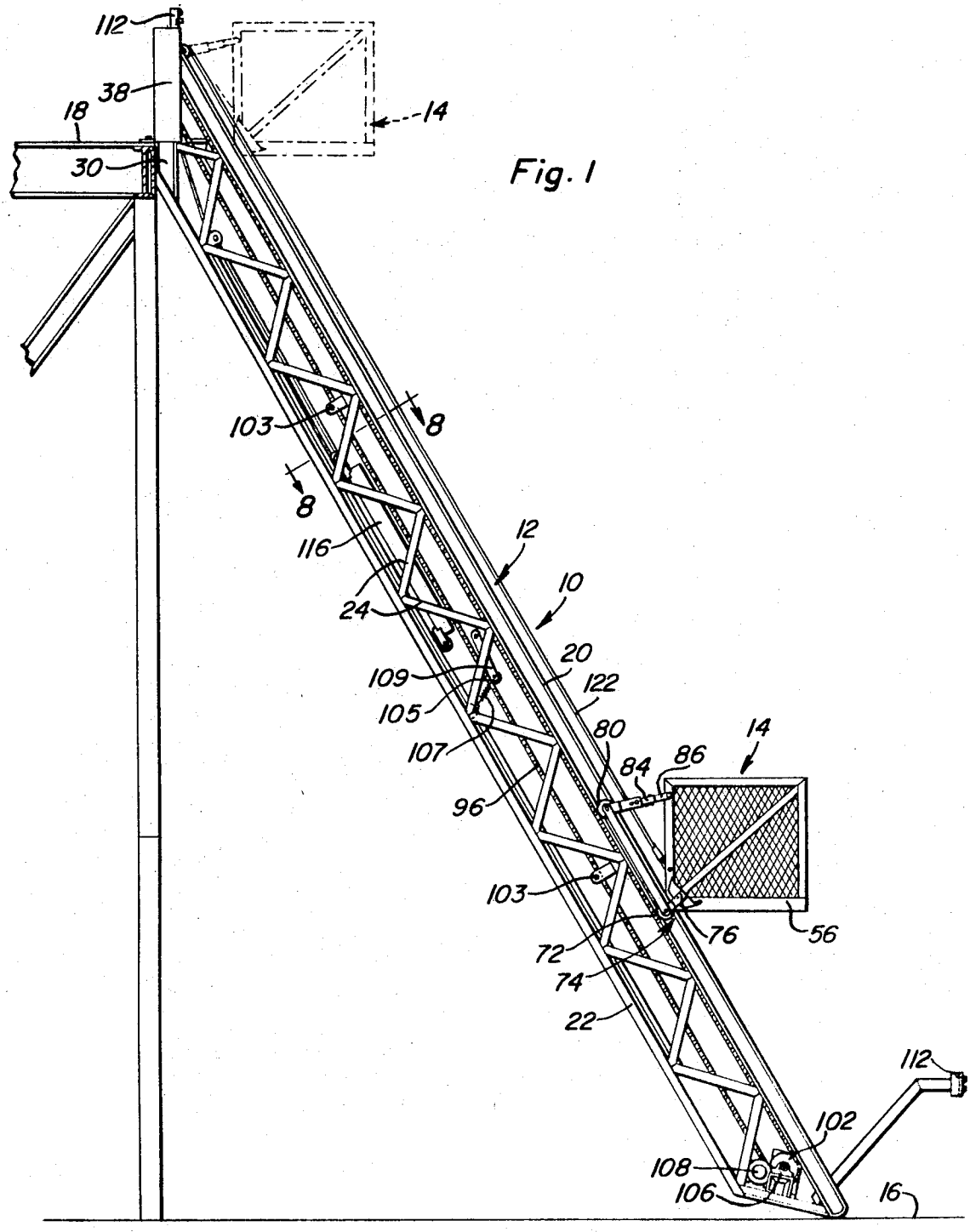
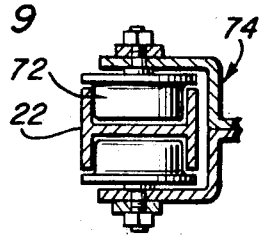


Fig. 1

Fig. 9



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Fig. 2

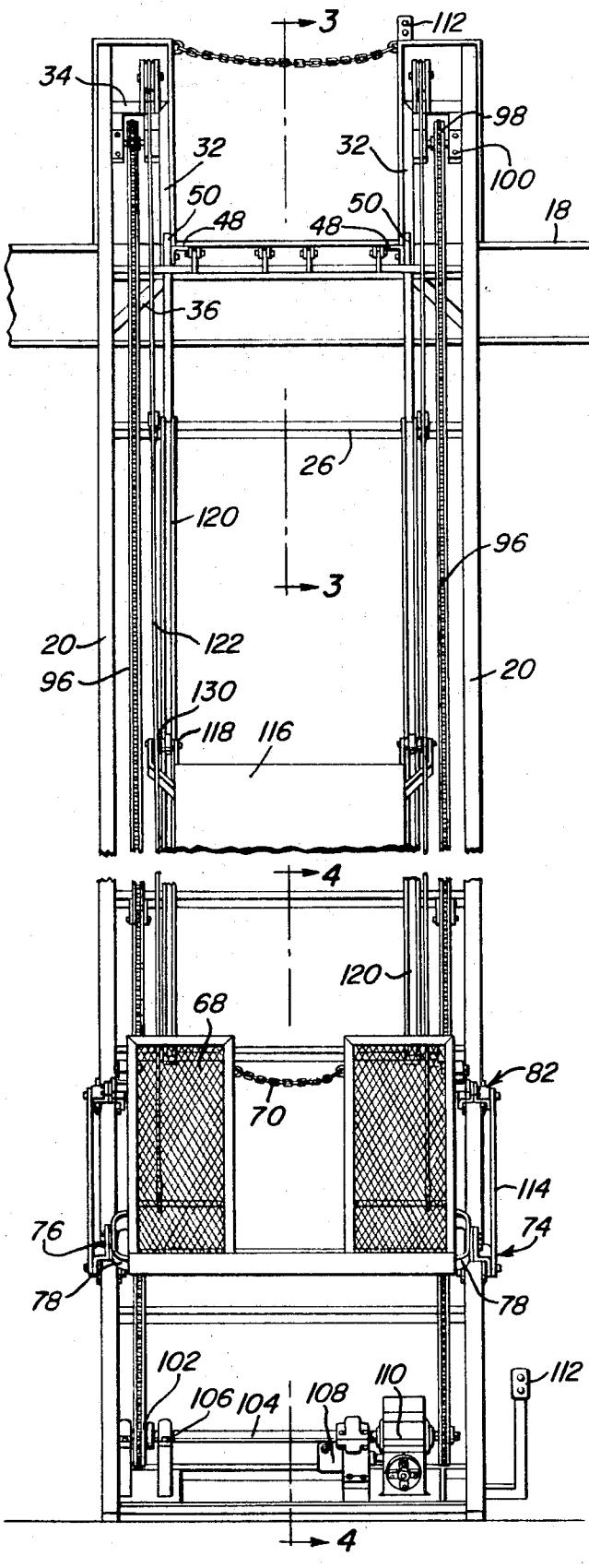
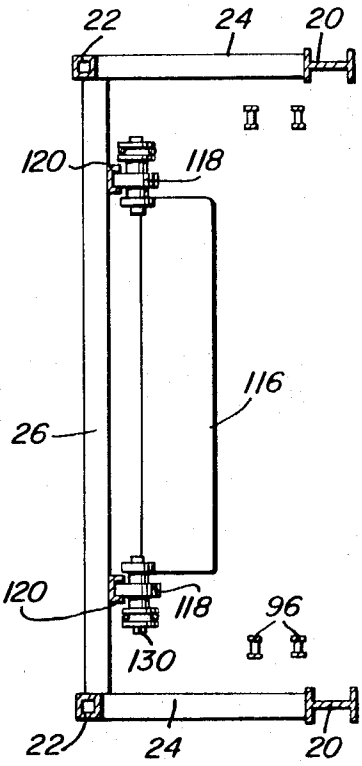


Fig. 8



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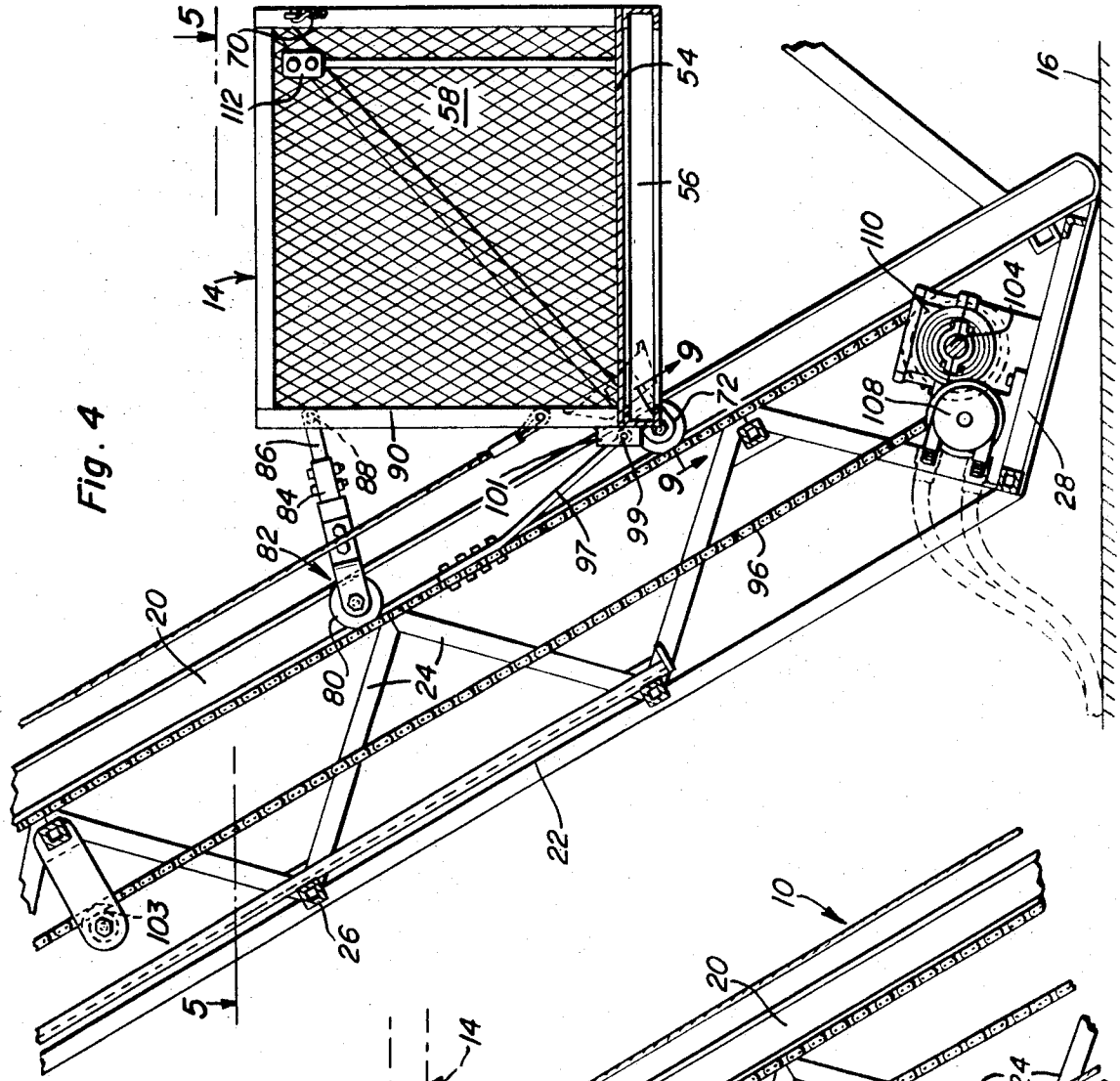


Fig. 4

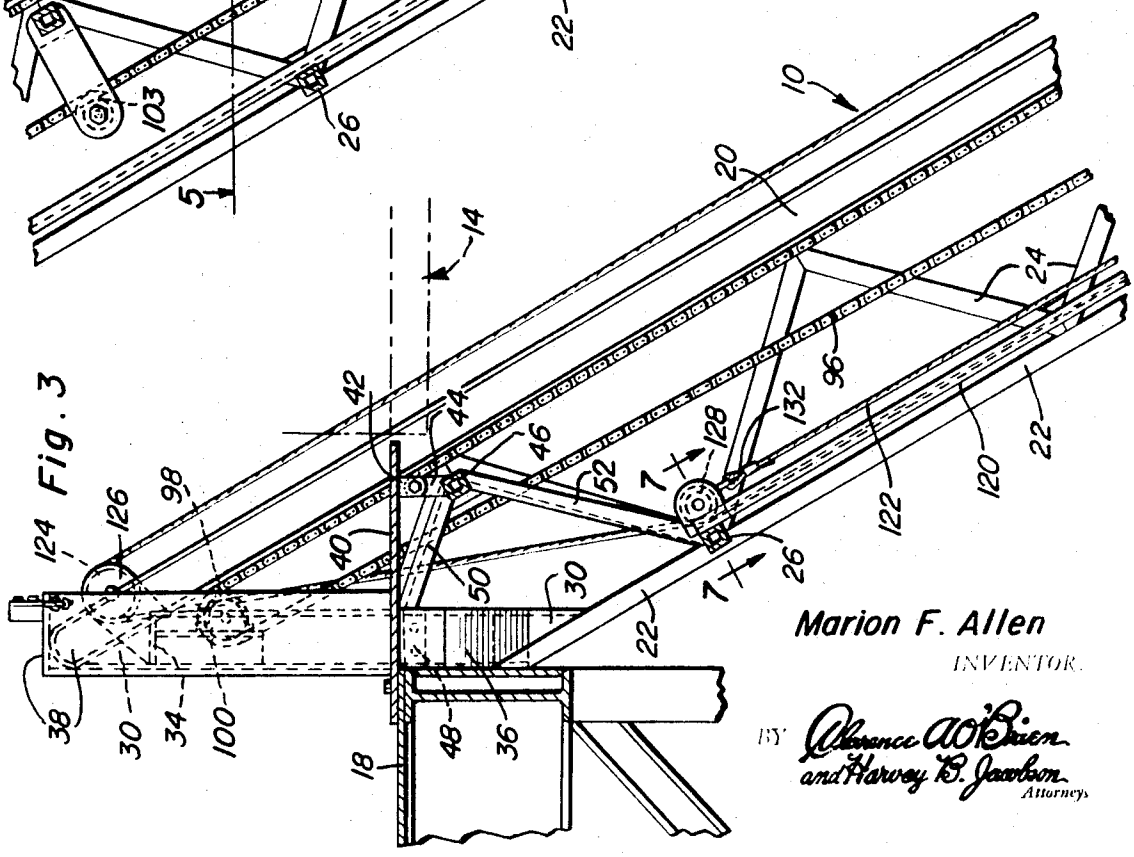


Fig. 3

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Fig. 5

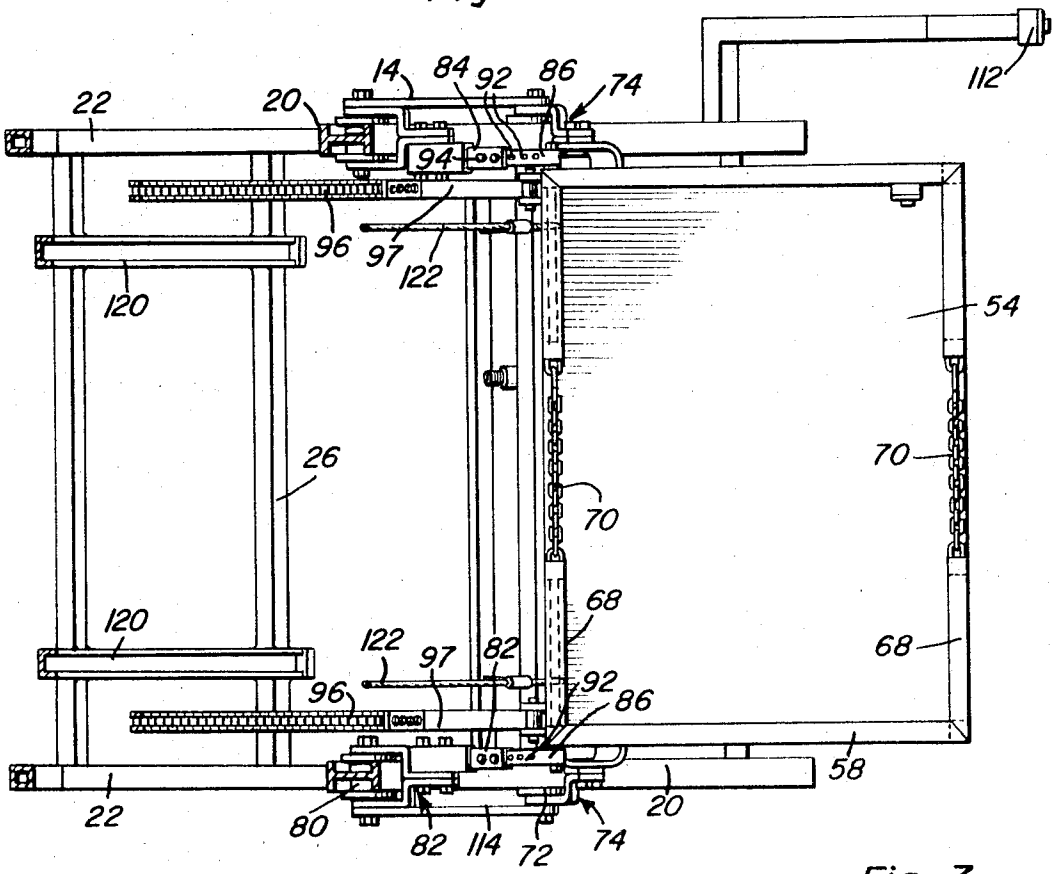


Fig. 6

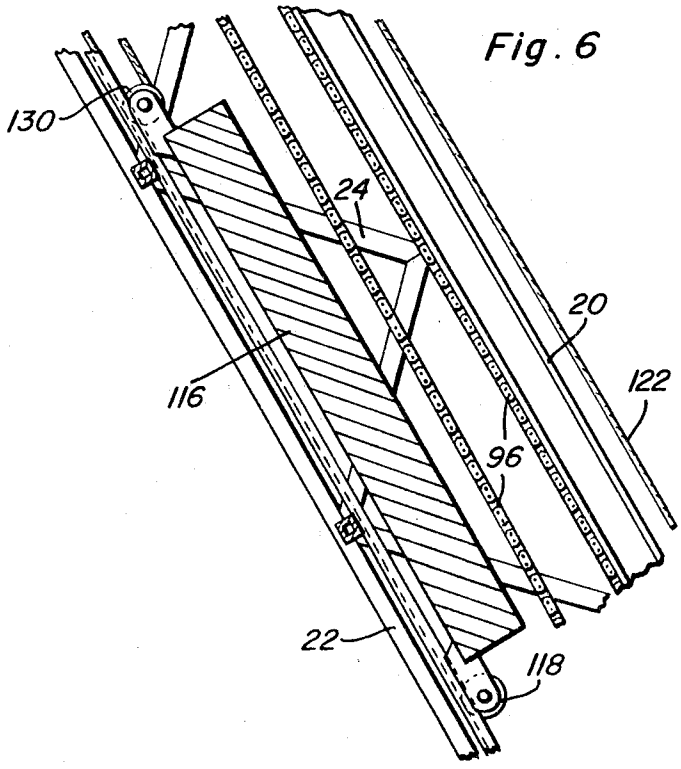
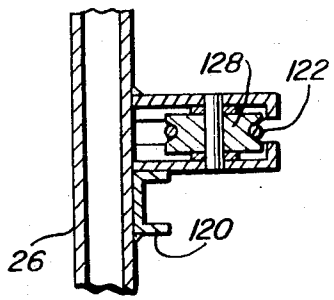


Fig. 7



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ELEVATOR

The instant invention is generally concerned with power elevators, and is more particularly directed to a construction elevator for transporting both material and personnel between the ground and an elevated construction platform of any type, including elevated drilling rig platforms, floors of buildings under construction, and the like.

While elevators for use at construction sites are known, such units are frequently awkward to position and adjust to varying heights. In addition, movement to and from the associated carrier or carriage is, in many instances, difficult due to interference from various of the operating components by which the vertical travel of the carrier is effected. Accordingly, it is a primary object of the instant invention to provide an elevator wherein free passage to and from the carrier is possible both at ground level and at the construction platform.

In providing for the desired free passage to and from the carrier, the instant invention contemplates the orientation of the support and operating components below and to the sides of the carrier, the carrier traveling thereover by means of wheels engaged within elongated laterally spaced tracks which constitute portions of the supporting framework.

Other significant objects of the instant invention reside in the provision of a construction elevator which is angularly adjustable, provide for a positioning of the carrier floor level with the elevated construction platform, incorporates a counterbalancing system for the carrier, and engages the ground in outwardly spaced relation to the construction whereby movement of the carrier between ground level and the desired height is effected without passing close to any structural or construction framework.

Basically, the advantages of the instant invention are derived from the provision of an elevator including a material and personnel carrier mounted on and traveling along a pair of elongated subjacent tracks which constitute portions of a subjacent inclined framework orientated to provide a clear exposure of the carrier for simplified passage thereinto and therefrom. The carrier is moved along the tracks by means of power-driven endless chains engaged thereto, the weight of the carrier being counterbalanced by an appropriate track-guided counterweight. Both the supporting framework and the carrier are angularly adjustable so as to accommodate construction platform of varying heights while retaining a substantial horizontal orientation of the carrier itself.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIG. 1 is a side elevational view of the elevator of the instant invention in an installed position;

FIG. 2 is an enlarged partial front elevational view of the elevator;

FIG. 3 is an enlarged cross-sectional view taken substantially on a plane passing along line 3–3 in FIG. 2;

FIG. 4 is an enlarged partial cross-sectional view taken substantially on a plane passing along line 4–4 in FIG. 2;

FIG. 5 is a cross-sectional view taken substantially on a plane passing along line 5–5 in FIG. 4;

FIG. 6 is a partial longitudinal cross-sectional view taken through the supporting framework and illustrating the track mounted counterweight;

FIG. 7 is an enlarged cross-sectional detail taken substantially on a plane passing along line 7–7 in FIG. 3;

FIG. 8 is a cross-sectional view taken substantially on a plane passing along line 8–8 in FIG. 1; and

FIG. 9 is a cross-sectional detail taken substantially on a plane passing along line 9–9 in FIG. 4.

Referring now more specifically to the drawings, reference numeral **10** is used to generally designate the elevator comprising the instant invention. This elevator comprises basically a supporting framework **12** and a personnel and construction material carrier **14** travelable thereon, normally between ground level **16** and an elevated construction platform or deck **18**.

The framework **12** includes a pair of elongated laterally spaced track-defining I-beams **20** defining in effect the top chord of a pair of laterally spaced truss units which additionally include an approximately full length tubular bottom beam **22** and appropriate tubular diagonal bracing **24** extending between the track beam **20** and lower beam **22** of each truss unit. The bottom beams **22**, and hence the opposed truss units, are interconnected by transversely extending tubular braces or beams **26** at spaced points along the length thereof.

With reference to FIG. **4** in particular, a braced powerplant mounting base **28** rigidly affixed, as by welding or the like, to the lower ends of the track beams **20** and projects rearwardly therefrom at approximately a 45° angle thereto, the rear end of the base **28** being engaged with and supported by the adjacent foreshortened ends of the lower beams **22**. Thus, at the lowest normal range of adjustment of the elevator, such being at an angle of 45 to the ground, the base **28** will sit flat on the ground **16**, providing a stable support therefor. As will be readily appreciated, appropriate ground anchors or blocking means can be utilized, such being readily releasable so as to retain the portable nature of the elevator.

Attention is now specifically directed to FIGS. **1**, **2** and **3** for the framework construction at the upper end of the elevator **10**. A vertical column **30** is welded to and depends at a 30° angle from the upper end of each of the track beams **20**, the lower end of each of the columns **30** in turn being rigidly affixed, as by welding, to the slightly foreshortened end of the corresponding lower beam **22**. The 30° orientation of the columns **30** relative to the upper track beam **20** is deemed significant in that upon an inclination of the elevator **10** at a 60° angle to the ground **16**, such constituting the preferable maximum of the elevator **10**, the columns **30** will be orientated at 90° to the horizontal and abuttable in face-to-face contact with the vertical edge of a construction platform **18** whereby the maximum force transferring bearing area is effected. A second column **32** parallels each of the columns **30** and is located in inwardly spaced relation thereto, the column **32** being preferably a channel member. Each column **32** is rigidly engaged with the laterally spaced corresponding column **30** by means of a transverse beam section **34** extending between the upper end of the beam **32** and the beam **30** at a point slightly below the extreme upper end of the track beam **20**, and by a diagonal brace **36** extending between the lower end of the column **32** and the lower end of the corresponding column **30**, the lower end of the column **32** being positioned above the lower end of the column **30**. Appropriate cover plates **38** enclose a pair of columns **32** and **34** across the top thereof, along the opposed sides thereof, and across the back thereof, leaving the forwardly directed or track side thereof open for the reception of the various operating components as shall be described subsequently. An adjustable floor plate **40** is provide between the opposed inner columns **32**. This plate **40** includes a series of depending ears **42** thereon, adjacent one end thereof received between the tracks **20**, these ears in turn being pivotally pinned to a series of upwardly projecting ears **44** rigid with a transverse bar **46** located below the tracks **20**. The plate **40** is adapted to project horizontally between and beyond the inner columns **32** into overlying relation to the construction platform **18** to which it will be releasably bolted so as to provide in effect a direct walkway between the carrier **14** and the platform **18**. A pair of inwardly directed angle supports **48** are provided on the inner columns **32** in underlying relation to the opposed edges of the floor plate or walkway **40**, these angle supports **48** being so orientated as to support the horizontally positioned plate **40** when the elevator **10** is inclined at its maximum angle, approximately 60°. At any

lesser angular orientation of the elevator **10**, the walkway **40** will still of course be firmly supported between the transverse bar **46** and platform **18**. By the same token, the angle supports **48** can be adjustably mounted, for example through the provision of a series of mounting holes, for adjustment so as to effect a supporting engagement with the walkway plate **40** regardless of the angle of the elevator **10**. The bar **46** is stabilized by means of a first pair of diagonal braces **50** extending between the columns **32** and the bar **46**, and a second pair of diagonal braces **52** extending between the bar **46** and the next lower transverse brace **26**.

Referring now specifically to the personnel and material carriage or carrier **14**, such includes a platform or deck **54** supported on a rectangular channel iron framework **56**. Opposed screenlike safety sidewalls **58** are affixed to the opposite side Edges of the platform **54**, rising to a height of approximately 4 feet so as to provide a proper retaining barrier. In addition, partial front and rear walls **60** project perpendicularly inward from the opposed edges of the sidewalls **58** along the front and rear edges of the platform **54**, the partial walls **60** along both the front edge and the rear edge of the platform **54** terminating in spaced relation to each other so as to provide for clear access to and from the carrier **14**, these access openings being selectively closed by a releasable chain guard **70**.

The actual means by which the carriage **14** is mounted on the opposed parallel tracks **20** includes a first set of two pairs of wheels **72** affixed to the lower rear corners of the carrier **14** and angled rearwardly and downwardly therefrom for tracking engagement within the tracks **20**. With particular reference to FIG. **9**, in conjunction with FIGS. **3** and **4**, the two wheels **72** of each pair of wheels are mounted on a yoke **74** and are inwardly directed relative to each other so as to rollingly engage within the opposed channels defined by the corresponding I-beam track **20**. The yoke **74** extends from the wheels and has the opposite end portion **76** thereof bolted to an outwardly bowed mounting plate **78** rigidly affixed diagonally across the lower rear corner of the carrier **14** whereby a lateral positioning of the yoke-mounted wheels, relative to the carrier **14**, is effected, resulting in a positive clearance between the carrier **14** and the adjacent wheel-receiving track **20**.

A similar pair of yoke-mounted wheels **80** are mounted in each track **20** above the first pair of wheels **72**, the yoke **82** of each of these second pair of wheels **80** being rigidly affixed to a first rod section **84** which telescopically receives a second rod section **86** adjustable relative thereto. The second rod section **86** is pivotally engaged at the forward or free end thereof, generally indicated by reference numeral **88**, to the rear edge of the adjacent sidewall **58** toward the upper end thereof, and more particularly to a rigid vertical postlike member **90** to which the screenlike material of the sidewall **58** is secured. Referring to FIG. **5**, in conjunction with FIG. **4**, the inner adjustable member **86** includes a series of adjusting holes **92** therein which are selectively alignable with a pair of similar holes in the outer member **84** for the reception of a pair of locking bolts **94** therethrough whereby **84** and **86** can be effected, this in turn resulting in the pivoting of the carrier **14** in a vertical plane and a variation in the angle thereof. In this manner, the carrier **14** can be maintained in a horizontal orientation regardless of the particular angle of the framework **12** of the elevator **10**, of course within suitable limits, normally between 45° and 60° as previously indicated. As will be readily appreciated, the upper wheel units and the associated adjustment arms are located at the lateral extremes of the carrier **14** and in no way interfere with free passage into and out of the carrier.

The movement of the carrier **14**, both up and down, along the tracks **20** is effected by means of a pair of endless drive chains **96**, each located inward of and slightly below one of the track beams **20**. The upper end of each of the drive chains **96** is is engaged about a sprocket **98** mounted on an appropriate shaft rotatably support between pillow block bearings **100** affixed between the corresponding pair of columns **32** and **30** immediately below the transverse column brace **34**, such being a sufficient height above the walkway plate **40** whereby a movement of the carrier **14** so as to align the platform **54** with the walkway **40** is possible. The lower ends of the two drive chains **96** are in turn engaged about appropriate sprockets **102** mounted on a common or synchronized shaft **104**, also appropriately supported within pillow block bearing units **106**, the actual power being transmitted from any appropriate power unit **108**, such for example a hydraulic, gasoline or electric motor, to the shaft or shafts **104** through an appropriate gearbox **110**. The control of the power unit will preferably be effected from three points through suitable control boxes **112**, one being at the base of the elevator **10**, the second being at the upper end of the elevator **10**, and the third being on the carrier itself. As will be readily appreciated, appropriate safety brake means are to be associated with both the power unit and the carrier itself. Incidently, with regard to the operation of the carrier **14**, attention is directed to the fact that the aligned pairs of wheels **72** and **80** are maintained in the proper spaced relation to each other by means of rigid spreaders or spreader bars **114** engaged therebetween, noting FIG. **5** in particular, in a manner whereby the angular orientation of the carrier **14** is adjustable while providing for a fixed distance between the aligned pairs of rollers.

The actual engagement of the carrier **14** with the drive chains **96**, and more particularly the upper runs of the drive chains **96**, is effected by the means of a pair of attaching links **97**. Each link **97** has one end thereof bolted or otherwise affixed to one of the chains **96** is spaced relation above the lower rear roller supported edge of the carrier **14**, and the other end thereof pivotally engaged with the corresponding rear edge corner of the carrier **14** by means of a pin **99** received through the end of the link **97** and mounted on the carrier **14** through a pair of rearwardly projecting mounting ears **101**. Thus, the pull on the carrier **14** is effected substantially directly at the lower tracking rollers **72**, the upper tracking rollers **80** acting so as to retain the desired orientation of the carrier **14** during the travel thereof.

With reference to FIG. **1**, a pair of bracket mounted guide sprockets **103** are rigidly mounted on the framework and orientated so as to engage beneath the lower run of each of the chains **96** at spaced points therealong. In addition, a spring-loaded idler sprocket **105** is associated with the lower run of each of the drive chains **96** between the guide sprockets **103**, this idler sprocket **105** being biased downwardly by an appropriate biasing spring **107** engaged between the idler sprocket pivot arm **109** and a portion on the lower face of the framework **12**, for example one of the cross braces **26**. Thus, it will be appreciated that each of the drive chains is both properly guided and tensioned.

The elevator of the instant invention also includes an enlarged slab or block counterweight **116** track mounted for guided rolling movement along the lower portion of the framework **12** beneath the traveling carrier **14**. The counterweight **116** is of a relatively low height so as to move freely below the traveling carrier **14** in spaced relation thereto, the counterweight including bracket mounted wheels **118** located at the four corners thereof and traveling within a pair of upwardly opening channel tracks **120**. The tracks **120** are laterally spaced from each other and affixed directly to the cross beams or braces **26**, the tracks extending along substantially the full length of the framework **12**. The engagement of the carrier **14** with counterweight **116** is effected through a pair of elongated flexible cables **122**. Each of the cables **122** is engaged with a rigid component of one of the rear wall portions **68** in slightly spaced relation above the carrier platform **54** in laterally spaced relation to the passage therethrough so as to not interfere with movement through the rear wall opening. Each cable **122** extends upwardly in parallel overlying relation to the framework **12** about a pulley **124** mounted by appropriate bracket means **126** on the upper corresponding crossbeam **34** slightly inward of and adjacent the drive chain sprocket **98**. The cable then extends downwardly and for-

wardly about a second pulley **128** bracket mounted on one of the uppermost crossbeams or braces **26**, the cable **122** then continuing downward into encircling engagement with the corresponding rear corner of the counterweight **116**. The cable then reverses its direction and extends up the framework **12**, terminating at the end **132** thereof tied to a fixed point on the framework adjacent the intermediate pulley **128**. Thus, it will be appreciated that the counterweight **116** acts so as to counterbalance the weight of the carrier **14**. Incidently, it will of course be appreciated that the upper limit of travel of the counterweight **116** is substantially below the walkway plate **40** so as to maintain the area between the upper ends of the tracks **20** clear and free of any encumbrances to the free passage to and from the carrier.

From the foregoing, it will be appreciated that a highly unique elevator, particularly adapted for use as a construction elevator, has been defined. The framework of the elevator is to be adjustable between approximately a 45° angle and a 60° angle, depending upon the height of the construction platform, with the carrier of the elevator being likewise adjustable so as to maintain a horizontal orientation along the path of travel, the uppermost limit of which positions the floor of the carrier at a common level with the construction platform in view of the unique orientation between the drive chains and the carrier itself. This relationship includes a specific engagement of the drive chains with the lower rear edge portion of the carrier **14** and a mounting of the upper end portions of the chains for travel to an elevated position relative to the walkway plate **40**, the tracks **20** themselves also continuing upwardly beyond the walkway plate **40** for the accommodation of the upper pairs of carrier rollers **80** as the carrier moves to the level of the walkway **40** and platform **18**. Further, the carrier and the supporting framework, including the carrier tracks, are so constructed as to provide for free passage to and from the carrier at both ground level and at the elevated construction platform.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

What I claim as new is as follows:

1. An elevator comprising an elongated framework said framework including a pair of laterally spaced generally parallel elongated units, each unit having an upper elongated track-defining beam, a lower beam paralleling said upper beam in spaced relation therebelow, and brace means interconnecting said upper and lower beams, transverse brace means extending between and interconnecting said lower beams in spaced relation below said upper beams, a carrier mounted on the track-defining upper beams for travel therealong, drive means mounted between said units and in engagement with said carrier for moving said carrier along said track beams, said carrier including a generally horizontal base, upstanding generally encircling walls on said base, and means for angularly adjusting the orientation of the carrier relative to the framework so as to maintain a generally horizontal orientation of the carrier base throughout a range of angular adjustment of the elongate framework, said carrier base including a rear edge portion immediately adjacent the track beams, said base projecting horizontally forward from the rear edge portion, and wheel means on said rear edge portion rollingly engageable with said track beams, said carrier being generally cantilevered forward from said track beams, upper wheel means engaged with said track beams above said first wheel means and longitudinally spaced therealong, and arm means engaged with and between said upper wheel means and the rear portion of the carrier in spaced relation above the base, said arm means including telescopically adjustable sections which, through an adjustment thereof, can rotatably position the upper position of the carrier about the track mounted lower wheel means, thereby defining the means for angularly adjusting the orientation of the carrier relative to the framework, terminal column means affixed to the upper ends of said track beams and depending therefrom into engagement with the upper ends of said lower beams so as to define a structure-abutting surface, and base-forming means rigid with the lower end of said track beams and projecting rearwardly therefrom into attached engagement with the lower ends of said lower beams so as to define a ground-engaging base, said drive means comprising a pair of endless drive chains, one located laterally inward and below each of said track beams between said track beams and said lower beams, power means mounted on said base-forming means, drive sprockets on said power means receiving said drive chains thereover for a synchronized driving thereof, and upper sprockets mounted on said column means immediately below the point of engagement of the track beams thereof, said drive chains generally paralleling said track beams, and a platelike walkway pivotally mounted to said framework generally between said track beams, said walkway projecting laterally through said column means whereby movement from the track beams through the framework thereover can be effected.

2. The elevator of claim **1** wherein said column means engage and depend from the upper ends of said track beams at approximately a 30° angle thereto, said base forming means projecting rearwardly from engagement with the other end of said track means at approximately a 45° angle thereto.

3. The elevator of claim **2** including a counterweight mounted on said framework for movement therealong, and flexible cable means engaged between said counterweight and said carrier for counterbalancing the weight of the carrier during the movement thereof.

4. The elevator of claim **3** including elongated track means mounted in said framework vertically between said upper and lower beams and laterally between said framework units, said track means extending longitudinally along said framework, said counterweight including means thereon engaged within said track means for guided movement of the counterweight therealong.