March 7, 1967 M. W. GILMORE ETAL 3,307,684

ENGINE MOUNT FOR ELEVATOR CONVEYORS

Filed April 15, 1966 2 Sheets-Sheet 1

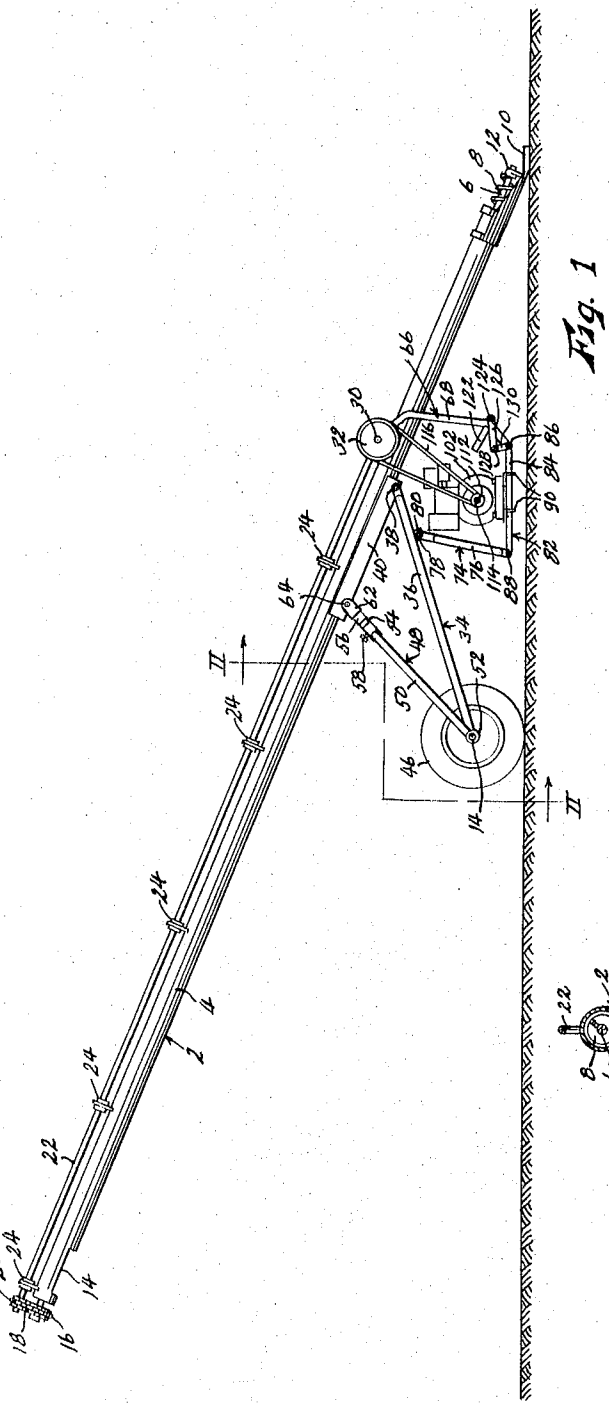

Fig. 1

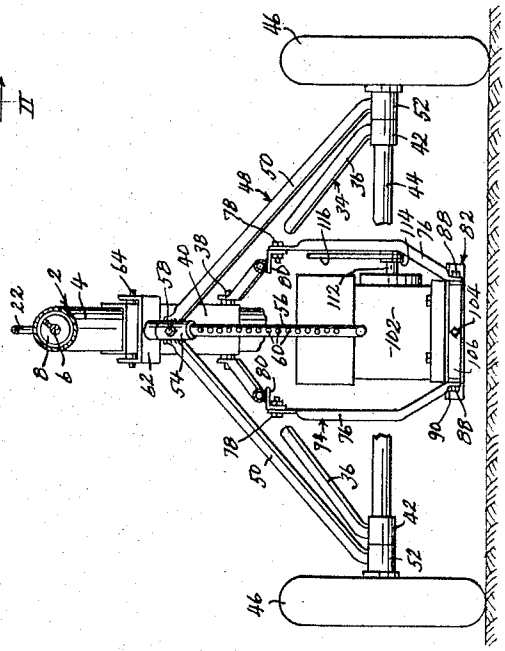

Fig. 2

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ENGINE MOUNT FOR ELEVATOR CONVEYORS

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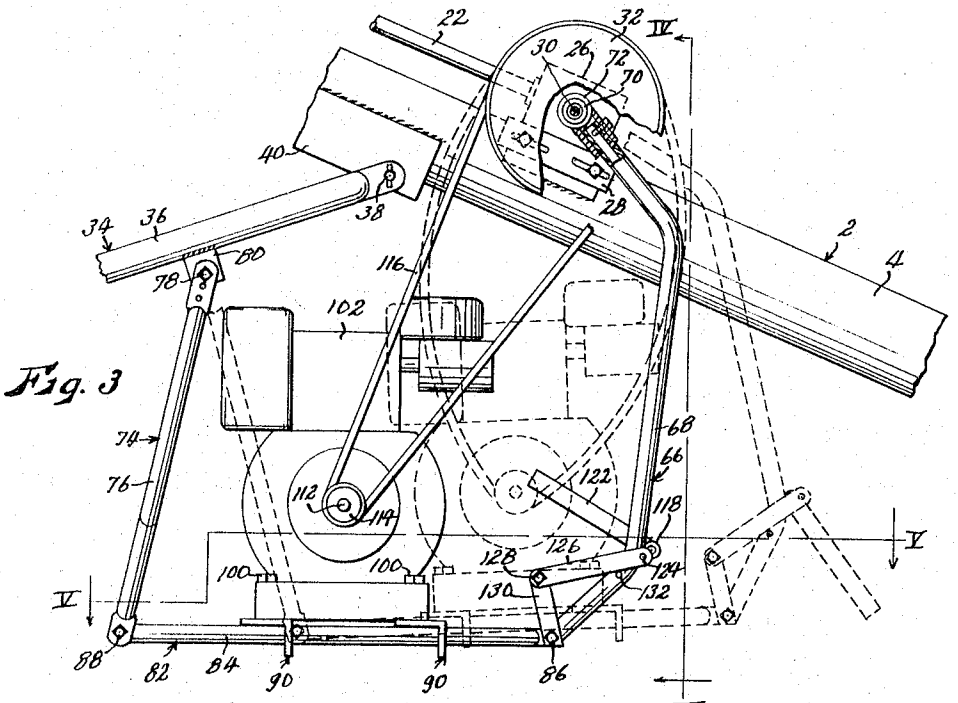

Fig. 3

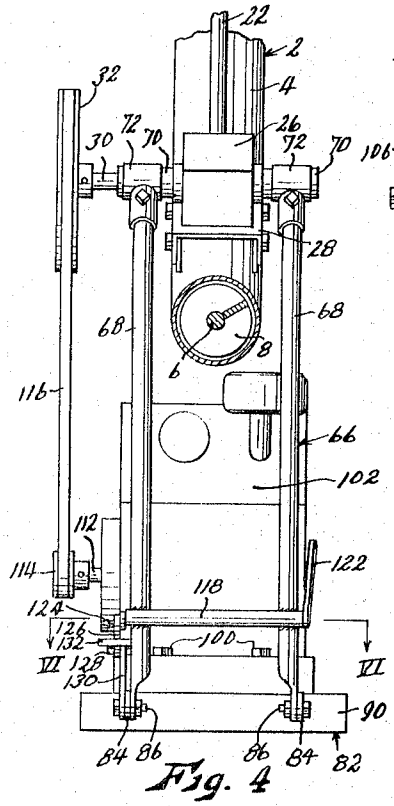

Fig. 4

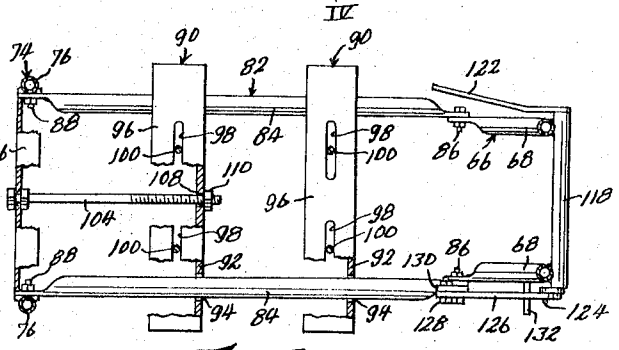

Fig. 5

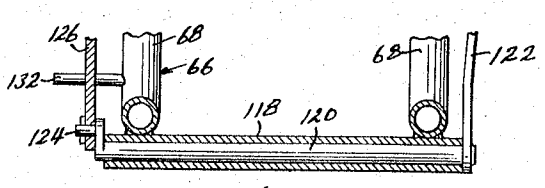

Fig. 6

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ENGINE MOUNT FOR ELEVATOR CONVEYORS

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7 Claims. (Cl. 198—233)

This invention relates to new and useful improvements in conveyor apparatus, and has particular reference to an engine or motor mount for elevator-type conveyors of the type commonly used in the agricultural field for elevating grain piled on the ground, or in some lower receptacle, to a truck bed, bin, or other higher receptacle.

In such apparatus, the power driven conveyor is elongated, often being from 25 to 60 feet long, or even longer, and is inclined so that the lower intake end thereof is supported on the ground, while the upper outlet end thereof is disposed above the receptacle into which the grain is to be deposited. The conveyor is usually supported by a ground-engaging leg pivoted thereto intermediate its ends, and being downwardly divergent from the axis of the conveyor. The angle of inclination of the conveyor, and hence the elevation of the upper end thereof above the ground, is adjusted by changing the angularity of the leg to the conveyor. The conveyor may be of any suitable type, such as a screw or auger rotatable axially in a tube, or a flighted belt conveyor.

Certain problems have arisen in connection with providing power drives for such elevators. For example, if the prime mover is a gasoline engine, said engine must be maintained substantially upright at all times in order to maintain the proper distribution and flow of the fuel and lubricating oil, while both the conveyor and the leg are variably tiltable, so that they could not serve as engine mounts. The prime mover must be declutchable from the conveyor, since it is not practical to start the prime mover when clutched to the conveyor, particularly if the conveyor is already fully loaded. The prime mover must assume the load gradually. In many cases it is desirable to be able to reverse the conveyor, as to empty grain therefrom. The engine should be rigidly supported against movement when desired, so that it will not swing or sway when started by a rope starter.

Accordingly, the principal object of the present invention is the provision of an engine mount for elevators of the character described which incorporates improvements providing all of the above discussed requisites. To this end, the present invention provides an engine mount platform suspended from the conveyor and its supporting leg by a roughly parallelogram-type linkage, whereby an engine mounted on said platform will remain substantially upright at all operative angularities between said conveyor and said leg, means operable by movement of said linkage to provide selective tightening or loosening of a drive belt from said engine to said conveyor, thereby providing a clutching and declutching operation, and manually operable means to move said linkage to either the clutching or to the declutching position, and to secure it releasably in either of said positions. The drive belt may be crossed to reverse the operation of the conveyor. Moreover, the linkage is so related to the conveyor that when the engine is clutched to the conveyor, the angularity of the leg to the conveyor may be adjusted without affecting the driving connection.

Other objects are simplicity and economy of construction, efficiency and dependability of operation, and adaptability for use with various types of elevator conveyors.

With these objects in view, as well as other objects which will appear in the course of the specification, reference will be had to the accompanying drawing, wherein:

FIG. 1 is a side elevational view of an elevator conveyor of the auger type, including an engine mount embodying the present invention,

FIG. 2 is an enlarged sectional view taken on line II–II of FIG. 1, with portions broken away,

FIG. 3 is an enlarged fragmentary view similar to FIG. 1, showing the engine mount and related portions of the elevator, said mount being shown in its clutched position in solid lines, and in its declutched position in dotted lines,

FIG. 4 is a sectional view taken on line IV–IV of FIG. 3,

FIG. 5 is a sectional view taken on line V–V of FIG. 3, with the engine omitted and with portions broken away, and

FIG. 6 is an enlarged fragmentary sectional view taken on line VI–VI of FIG. 4.

Like reference numerals apply to similar parts throughout the several views, and the numeral **2** applies generally to an elevator conveyor including an elongated straight tube **4** having an auger mounted rotatably and coaxially therein, said auger consisting of a shaft **6** with a helical flight **8** mounted thereon. In use, said conveyor is inclined, being provided at its lower end with a foot member **10** adapted to rest by gravity on the ground, and carrying a bearing **12** in which the lower end of auger shaft **6** is journalled. The auger is adapted to receive grain at its lower end, convey it upwardly through tube **4**, and to discharge it through a lateral opening **14** of said tube adjacent its upper end. At its upper end, outwardly from tube **4**, auger shaft **6** has a sprocket **16** affixed thereto, which is operably connected by sprocket chain **18** to a sprocket **20** affixed to a shaft **22** disposed above and parallel to tube **4**, being journalled in bearings **24** mounted at intervals along said tube. Shaft **22** extends to a point adjacent the lower end of the conveyor, being connected to the output of a gear box **26** mounted on tube **4**, as by bracket **28**. The input drive shaft **30** of said gear box is horizontal, extends transversely to the conveyor, and has a drive pulley **32** affixed to the extended end thereof, it being understood that rotation of said pulley will cause rotation of the auger **6–8** in tube **4**.

The invention is applicable also to other types of conveyors, such as a belt type conveyor supported at its upper and lower ends by transverse rollers rotatably supported in a frame. So far as the present invention is concerned, it is necessary only that the conveyor be operated by a horizontal drive shaft transverse to the inclination of the conveyor. However, since certain features and advantages of the invention apply particularly to auger-tube conveyors, this type has been selected for illustration.

The conveyor is supported in its inclined position by a leg **34** consisting of a pair of bars **36** pivoted at their upper ends on a pivot pin **38** carried by a bracket **40** affixed to auger tube **4** intermediate its ends, said pivot pin being horizontal and transverse to the conveyor. Said leg bars are inclined so as to be downwardly divergent from the portion of tube **4**, below pivot pin **38**, and

are transversely divergent from each other, and are each provided at their lower ends with a pivot sleeve 42 journalled on a horizontal transverse axle 44, said axle being supported by a pair of ground-engaging wheels 46 mounted at respectively opposite ends thereof.

The angularity of leg 34 relative to conveyor may be fixed, whereby the conveyor is rigidly supported by the three-point ground engagement of wheels 46 and foot 10, but rendered adjustable to permit adjustment of the inclination of the conveyor, by an adjustable strut 48. Said strut includes a pair of leg bars 50 each having at its lower end a sleeve 52 journalled on axle 44, said leg bars being upwardly convergent and affixed at their upper ends to a sleeve 54 extending radially to axle 44, a rod 56 slidable in sleeve 54 and fixable therein by a set screw 58 threaded in said sleeve and engageable selectively in any one of a series of holes 60 formed therefor in rod 56, and a yoke 62 affixed to the upper end of rod 56 and pivoted on a pivot pin 64 carried by bracket 40 of the conveyor tube, pivot pin 64 being parallel to but spaced apart from pivot pin 38 of leg 34. Power means could be provided for moving rod 56 in sleeve 54, such as a winch drum mounted on strut leg bars 50, with the cable from said drum being trained over a pulley mounted on sleeve 54 and then affixed to the lower end of rod 56, but this is not pertinent to the invention. So far as the present invention is concerned, it is necessary only that there be provided some means for adjustably changing the angle between leg 34 and the conveyor whereby to vary the inclination of the conveyor and hence the elevation of the upper end of said conveyor above the ground.

The structure thus far described is common in the art, and no claim per se is made thereto. However, for the reasons already discussed, the mounting of a prime mover such as an engine or motor on the assembly presents certain problems of maintaining the prime mover upright, and of clutching. Accordingly, the engine mount as contemplated by the present invention includes a first link 66 comprising a pair of bars 68 each pivoted at its upper end on gear box 26, and depending respectively at opposite sides of the conveyor tube. The gear box is provided with a pair of bosses 70 for this purpose as best shown in FIGS. 3 and 4, each bar 68 having at its upper end a sleeve 72 journalled on one of said bosses. Said bosses of the gear box are coaxial with the drive shaft 30 of said gear box, and are disposed intermediate the upper pivot 38 of leg 34 and the lower end of the conveyor. The engine mount also includes a second link 74 comprising a pair of bars 76 each pivoted at its upper end, as at 78, to a bracket 80 affixed to one of leg bars 36, and depending therefrom respectively at opposite sides of the conveyor tube. Pivots 78 are coaxial, and are parallel to but spaced apart from leg pivot 38.

The engine mount also includes a platform 82 comprising a pair of parallel, generally horizontal bars 84 extending between links 66 and 74 respectively at opposite sides of the conveyor, each of bars 84 being pivoted at one end, as at 86, to the lower end of one of bars 68 of link 66, and being pivoted at its opposite end, as at 88, to the lower end of one of bars 76 of link 64, pivots 86 and 88 being parallel to pivots 72 and 80. Extending transversely between bars 84 are a pair of angle-iron cross bars 90, as best shown in FIG. 5. Each of said cross bars has a depending leg 92 which is perforated at 94 to receive bars 84 slidably therein, and a horizontal leg 96 having slots 98 formed therein for receiving bolts 100 to affix the base of a prime mover such as gasoline engine 102 to said cross bars, in a generally upright position. The invention is also applicable to an electric motor as the prime mover, but since certain advantages of the invention are particularly important in connection with gasoline engines, the latter has been selected for illustration. Cross bars

90 may be moved slidably on platform bars 84, whereby to move the engine longitudinally of the platform, by means of a screw 104 extending parallel to bars 84, said screw being journalled in an angle iron cross bar 106 extending transversely between and rigidly affixed to the ends of bars 84 pivoted to link 74, extending through a hole 108 formed therefor in the vertical leg 92 of one of cross bars 90, and threaded in a nut 110 affixed to said cross bar. Engine 102 has an output power shaft 112 which extends horizontally and transversely to the conveyor and has a drive pulley 114 affixed to the extended end thereof, said pulley lying in the same vertical plane as pulley 32, and being operably connected thereto by means of a flexible drive belt 116.

It will be seen that whenever platform 82 is swung toward leg 34, which may be termed forwardly, by the swinging of links 66 and 74, as shown in solid lines in FIG. 3, engine 102 is moved farther from drive shaft 30 of gear box 26, thereby tensioning belt 116 and causing it to function as a driving connection between pulleys 32 and 114, so that the conveyor is operably driven so long as engine 102 is operating. On the other hand, when platform 82 is swung rearwardly or away from leg 34, as shown in dotted lines in FIG. 3, the engine moves closer to drive shaft 30, whereupon belt 116 becomes ineffective to drive pulley 32. Thus a clutching action is provided, the former position being the position of engagement of the clutch, and the latter position being the position of disengagement of the clutch.

The platform is moved between these engaged and disengaged positions by means including a horizontal tubular sleeve 118 extending transversely between and rigidly affixed to the bars 68 of link 66, as best shown in FIG. 6, said sleeve being positioned somewhat above the pivots 86 of said bars. A shaft 120 is journalled axially in said sleeve, and extends outwardly from the ends thereof. Affixed to one end of said shaft is a radially extending handle 122, and the opposite end of said shaft forms a crank including a crank pin 124 which is parallel to but radially offset from shaft 120. A link 126 is pivoted at one end or crank pin 124, and extends forwardly, being pivoted at its forward end, as at 128, to the upper end of an arm 130 which is rigidly fixed at its lower end to the associated platform bar 84. It will be seen that as handle 122 is moved in a counter-clockwise direction, as viewed in FIG. 3, to the position thereof shown in solid lines, crank 124 acts through link 126 and arm 130 to swing platform 82 to the solid line "clutch-engaged" position. In this position, it will be seen that crank pin 124 has moved slightly below its dead-center position with respect to link 126, and that the movement of said link is arrested by engagement thereof with a stop pin 132 affixed to the adjacent bar 68 of link 66. This locks the platform in its clutch-engaging position. When handle 122 is turned in a clockwise direction, crank 124 operates through link 126 and arm 130 to pivot platform 82 to its dotted line position, wherein the clutch is disengaged. In this position also, crank pin 124 has moved downwardly past its opposite dead-center position relative to link 126, and said link has again engaged stop pin 132 to be arrested thereby to lock the device in the clutch-disengaging position.

The operation of the engine mount described has been set forth in the course of the specification, and the advantages thereof are numerous. The links 66 and 74, and the portion of the conveyor tube 4 and conveyor leg 34 between the link pivots 78 and 72, constitute a generally parallelogram linkage supporting platform 82, such that the engine carried by the platform will remain substantially upright at all times, regardless of the relative angularity of the conveyor and its leg 34 which as described may be changed by extending or retracting strut 48. This levelling of the platform is extremely important when the prime mover is a gasoline engine as shown, since gasoline

engines generally must be positioned uprightly, or nearly so, to insure proper blow of fuel and lubricating oil. The parallelogram linkage is not entirely regular in form, and moreover link **66** and platform **82** are locked against relative pivoting at **86** during actual usage, by the action of crank **124** and link **126**. Therefore, some slight tilting of platform **82** will occur during clutching and declutching, or as the inclination of the conveyor is adjusted. However, the degree of tilting, as shown, may easily be maintained within allowable limits.

The clutching action is free, smooth and easily controlled. The engine may be started with handle **122** in the de-clutching position, and the handle then moved slowly to its clutching position, so that the engine need not be started with the full driving load, this being extremely difficult especially if the conveyor is already loaded with grain, and may assume the load gradually. In connection with the starting of the engine, the locking of platform **82** in its de-clutching position as shown in dotted lines in FIG. 3 is very important. Many such engines are started by pulling the free end of a starter rope wrapped around a rope wheel on the engine drive shaft, and this would be an extremely difficult operation if the motor platform swung freely on its pivots when in its de-clutching position. With the platform in its clutching position, belt **116** may be adjusted to the desired tension by turning screw **104**. When the platform is in its declutching position, the slack developed in belt **116** is sufficiently great that it may be detached from one of its pulleys, crossed, and reattached to the pulley. Thus the rotation of conveyor auger **6–8** may be reversed when desired. This is important when the conveyor is of the auger tube type as shown, since it permits the auger tube to be emptied of all grain by driving it from the lower end of the tube. Generally it is not possible to clean the tube completely by forward rotation of the auger, since the auger does not fit snugly in the tube, and some grain is alternately elevated upwardly and then allowed to slide downwardly past the auger flight. It is not possible to move handle **122** all the way to its locked clutching position with the belt crossed, but this is not considered objectionable since the periods of reverse operation which may be reqiured are very short, and can be provided by a continuing manual pressure on handle **122**.

Also, it will be seen that when handle **122** is moved to its locked clutching position as shown in solid lines in FIG. 3, thereby locking link **66** and platform **82** against relative pivotal movement at pivots **86**, the distance between pulleys **32** and **114** is fixed and constant, so long as link **66** is pivoted to the conveyor coaxially with drive shaft **30** thereof. For this reason, the relative pivotal movement of link **66** and platform **82** which is required to tension belt **116** will remain constant regardless of the inclination at which the conveyor has been set, so that no variation in the length of link **126**, or in the throw of crank **124**, is required. As a matter of fact, the inclination of the conveyor may be adjusted, as by extending or retracting strut **48**, while belt **116** is tensioned and functioning, and without affecting the operation of said belt. In that case, link **66** and platform **82** swing as a unit about the pivots **70**, without affecting the spacing of the drive pulleys, link **74** then pivoting to accommodate the platform movement, and to maintain said platform generally level. For these reasons it is essential that link **66** be pivoted to the conveyor coaxially of drive shaft **30** thereof, and that the adjustable connection provided by crank **124** and link **126** be interposed between link **66** and platform **82**, not between link **74** and the platform.

While a specific embodiment of the invention has been shown and described, it will be readily apparent that many minor changes of structure and operation could be made without departing from the spirit of the invention as defined by the scope of the appended claims.

What we claim as new and desire to protect by Letters Patent is:

1. In combination with an elevator conveyor comprising an elongated, inclined conveyor adapted to be supported at its lower end on the ground, a ground-engaging supporting leg pivotally connected to said conveyor intermediate the ends of the latter on a horizontal axis transverse to said conveyor and being downwardly divergent from the lower portion of said conveyor, means for adjusting the angularity of said leg relative to said conveyor whereby to adjust the inclination of said conveyor to the ground, means for driving said conveyor including a horizontal drive shaft carried by said conveyor transversely thereto, said drive shaft being disposed lower on said conveyor, longitudinally of said conveyor, than the connection of said leg to said conveyor, and a pulley mounted on said drive shaft, a driving assembly comprising:

(a) a first pair of links pivoted on said conveyor adjacent said drive shaft on an axis parallel to said drive shaft, and depending from said pivotal connection,

(b) a second pair of links pivoted at its upper end to said supporting leg in downwardly spaced relation from the pivotal connection of said leg to said conveyor, on a horizontal transverse axis,

(c) a generally horizontal platform having its opposite ends pivoted respectively to the lower ends of said first and second links, on axes parallel to the pivotal axes of said links,

(d) a prime mover mounted on said platform and including a drive shaft parallel to the drive shaft of said conveyor,

(e) a pulley mounted on said prime mover drive shaft,

(f) a flexible drive belt operably interconnecting said pulleys, and

(g) operating means for pivoting said links relative to said conveyor and supporting leg, whereby to move said platform selectively either in one direction to increase the distance between said pulleys to tension said belt, or in the opposite direction whereby to decrease the distance between said pulleys to introduce slack in said belt.

2. The combination as recited in claim **1** wherein said first pair of links is pivoted to said conveyor coaxially with the drive shaft of said conveyor.

3. The combination as recited in claim **1** wherein said operating means comprises means connecting one of said pairs of links with said platform in angular bridging relationship across the pivotal connection between said platform and one of said pairs of links, said connecting means being adjustable in length whereby to cause relative pivotal movement between said link and said platform.

4. The combination as recited in claim **1** wherein said first pair of links are pivoted to said conveyor coaxially with the drive shaft of said conveyor, and wherein said operating means comprises means connecting one of said first pair of links with said platform in angular bridging relationship across the pivotal connection between said platform and one of said first pair of links, said connecting means being adjustable selectively to either of two different lengths, whereby to secure said platform and said first link selectively in either of two relative angular relationships.

5. The combination as recited in claim **4** with the addition of means for locking said connector member at either of said two different lengths.

6. The combination as recited in claim **4** wherein said connecting means comprises:

(a) a crank,

(b) a connector link, said crank and connector link being pivoted one to said pairs of links and the other to said platform on axes parallel to but spaced apart from the pivotal connection between said pairs of links and said platform, said crank including a crank pin parallel to but radially offset from the axis of

said crank, the opposite end of said connector link being pivoted on said crank pin, and

(c) manually operable means for turning said crank.

7. The combination as recited in claim 6 wherein said crank pin has two dead-center positions wherein the axis thereof lies in the same plane as the crank axis and the axis of said connector link, and with the addition of stop means operable to limit rotation of said crank to an angular arc slightly greater than 180 degrees, both end limits of said arc being at the same side of a plane including the axes of the crank and of the pivotal connection of said link at the end of said link not pivoted to said crank pin.

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