

[54] **SUBFLOOR TOWLINE CONVEYOR SYSTEM**

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[51] Int. Cl. **B65g 17/42**

[58] Field of Search. **104/170, 172 BT, 178**

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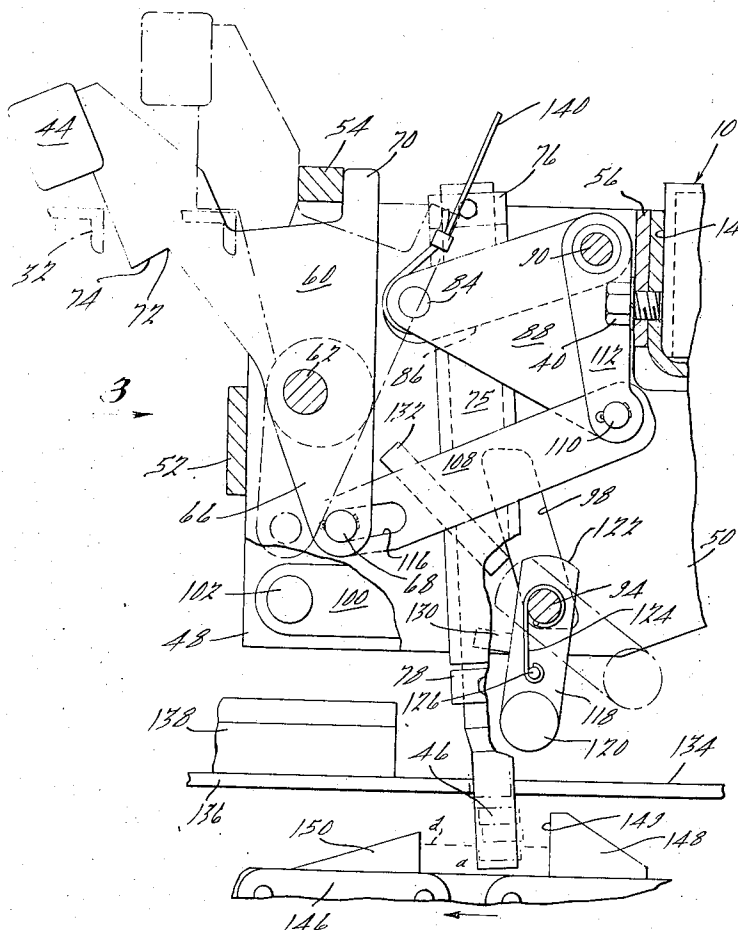
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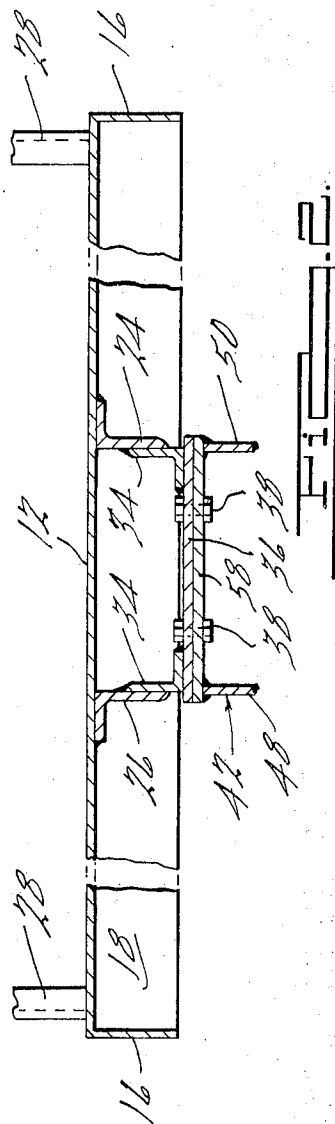
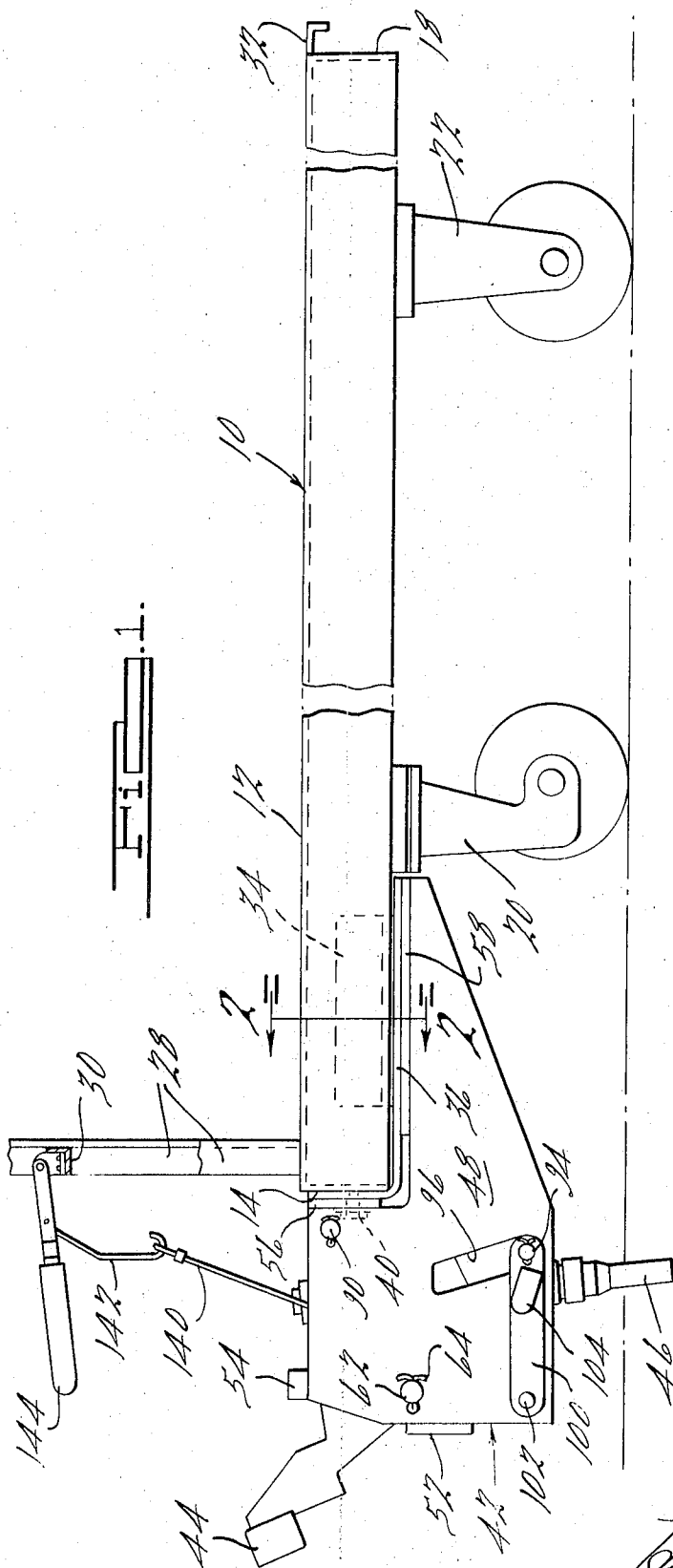
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[57] **ABSTRACT**

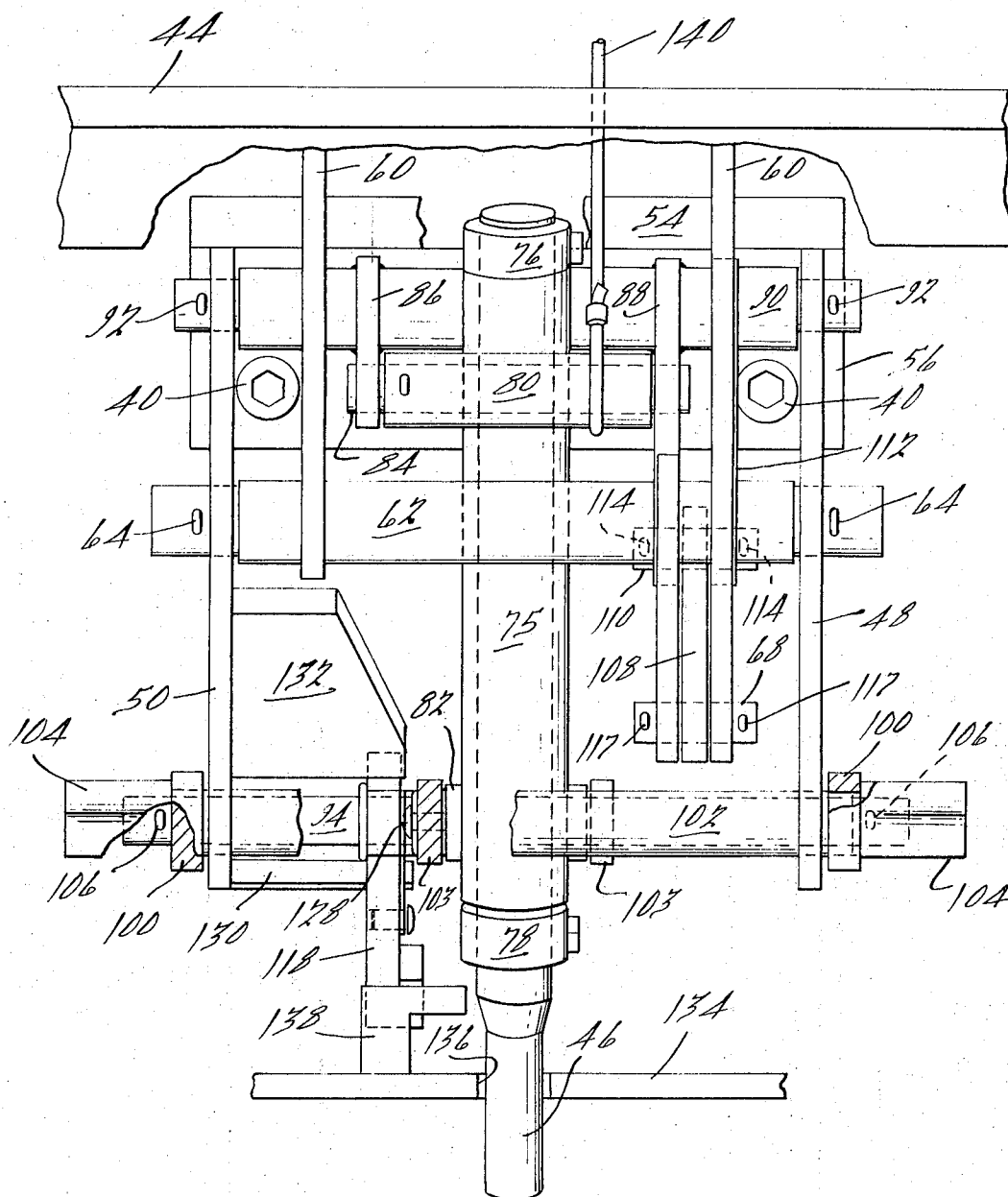
Disclosed is a subfloor towline conveyor system including a tow cart therefor having an improved tow pin actuating, controlling and locking mechanism. The mechanism includes a linkage system for controlling the movement of the tow pin to obtain power assisted engagement and disengagement with the towline conveyor, as well as improved means for positively locking the tow pin in a driven position and for manually locking the tow pin out of an operative position. There is also disclosed improved accumulating bumper means providing automatic accumulation of a plurality of such tow carts and also serving as a personnel safety bumper.

34 Claims, 5 Drawing Figures





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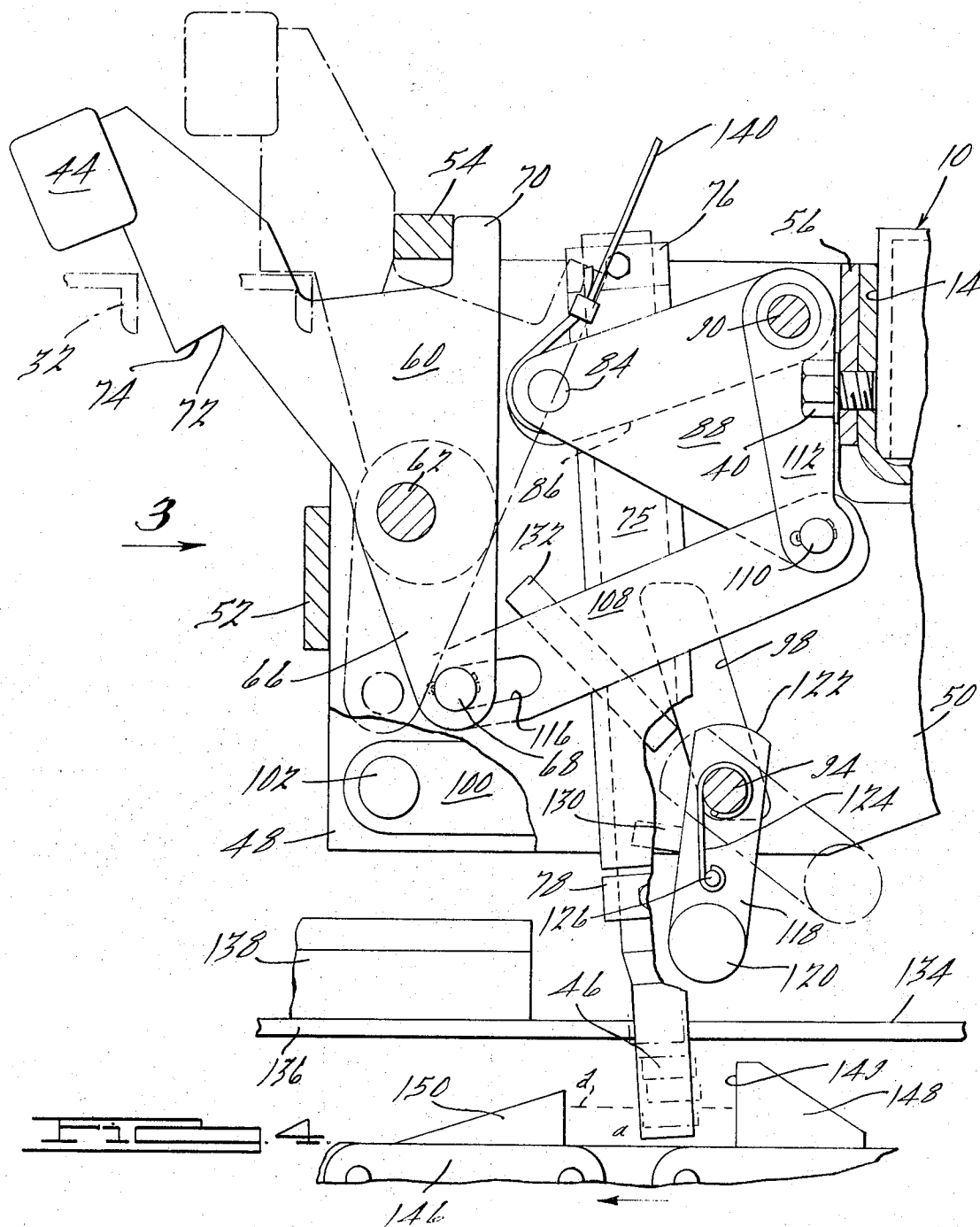
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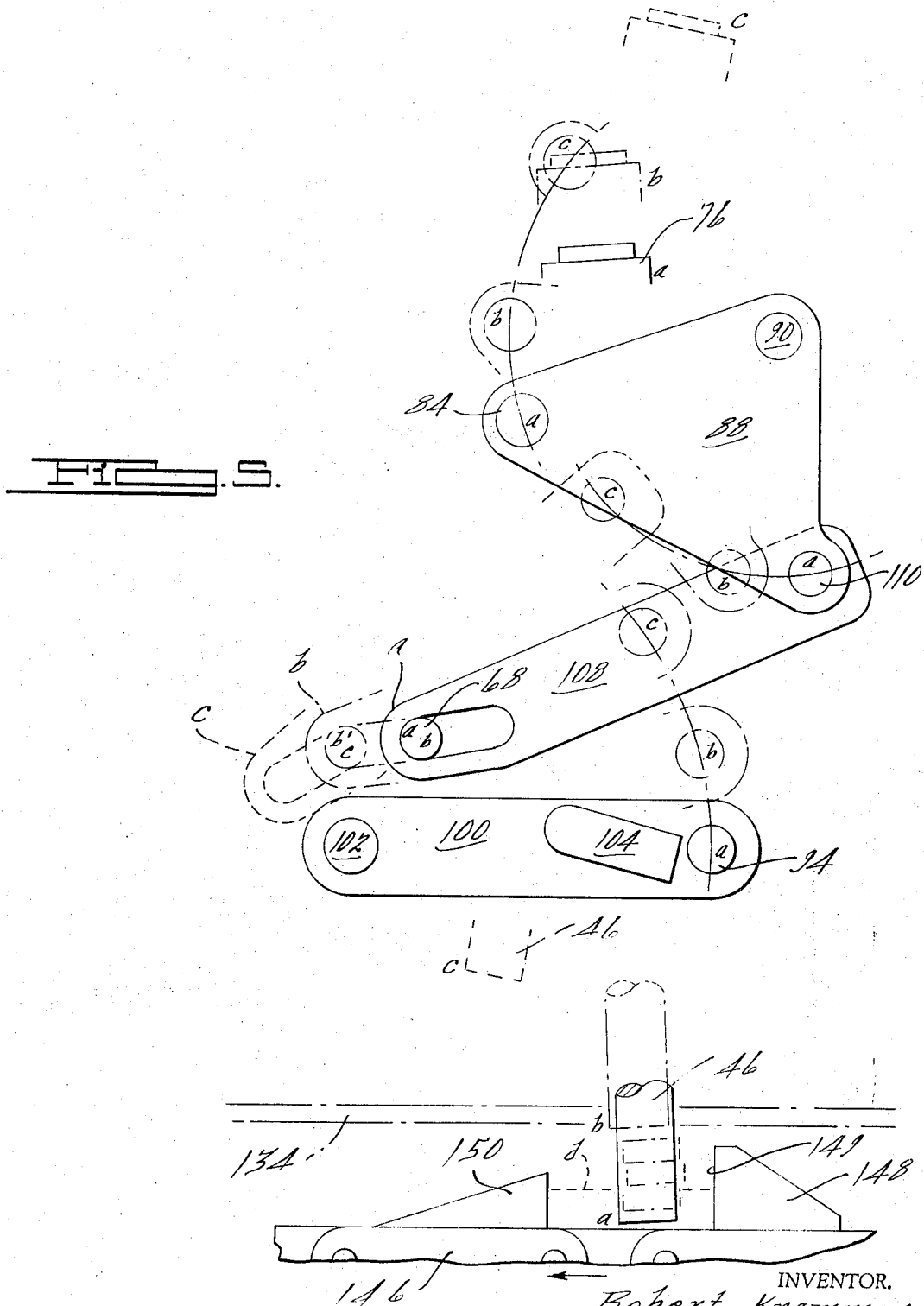


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SUBFLOOR TOWLINE CONVEYOR SYSTEM

BACKGROUND AND SUMMARY OF THE INVENTION

The present invention relates generally to subfloor towline conveyor systems and particularly to a tow cart incorporating improved tow pin actuating, controlling and locking means.

Subfloor towline conveyor systems generally comprise an endless powered conveyor disposed in a channel beneath the floor and exposed by a slot in the floor in alignment therewith. Material is conveyed by a plurality of wheeled tow carts which roll on the floor and are provided with a tow pin which in one position extends into the slot for engagement with a driving dog on the conveyor chain to drive the cart, the tow pin being elevatable out of the slot so that the cart may be wheeled across the floor independently of the conveyor. The tow cart mechanism for controlling the movement and positioning of the tow pin may be simply manually actuable or it may also include means permitting automatic accumulation of one or more tow carts at a given position along the conveyor. The latter type mechanisms generally include bumper means on the tow cart adapted to raise the tow pin out of driving engagement with the driving dog when the tow cart encounters an obstacle along the path of the conveyor, such as fixed stop member or the rear end of another tow cart. During such accumulation the tow pin is not raised all the way out of the slot in the floor but only out of driving engagement with the conveyor chain, whereby further movement transversely to the conveyor is restrained. The tow pin mechanism may also include means permitting switching of the tow pin from one conveyor chain to another conveyor chain, as well as means for positively holding the tow pin in its driving position along those portions of the conveyor where it would be undesirable or dangerous for accidental disengagement to occur. Because of the relatively abusive treatment which such tow carts receive in actual practice and the relatively coarse tolerances to which they are built, numerous problems are not uncommon, such as bending of the tow pin, the failure of tow pins to disengage or engage due to excessive friction, the failure of positive locks to operate reliably, the bending of the tow pin so that it will not rotate freely as a result of which wear will be concentrated at one point, and like difficulties.

It is therefore an important object of the present invention to provide an improved subfloor towline conveyor and tow cart which avoid the aforesaid difficulties encountered with known mechanisms.

Another object of the present invention resides in the provision of a tow pin mechanism providing an improved path of movement of the tow pin whereby frictional forces encountered during switching, disengagement and engagement are minimized and wherein conveyor driving forces are utilized to facilitate engagement and disengagement with the drive chain.

A further object of the present invention resides in the provision of a tow pin mechanism which is reliable in operation, relatively simple to manufacture, and easily assembled to a conventional tow cart.

Another object of the present invention concerns the provision of a tow pin mechanism having an improved accumulating bumper mechanism operable at excep-

tionally low impact forces, thus further constituting a safety feature in that conveyor driving power will be disengaged from the tow cart should the latter run into any obstacle or person. A related object concerns the provision of such a mechanism which will permit disengagement of the tow pin from the floor slot by means without actuating the safety bumper, whereby quicker action of the tow pin may be achieved with less wear on the entire mechanism, and which will permit substantially full operation of the tow pin mechanism with the entire accumulating bumper assembly removed.

A further object of the present invention concerns the provision of a tow pin mechanism which utilizes a relatively short, lightweight tow pin, thereby reducing the likelihood of bending and the weight of the entire movable structure, as well as one in which the tow pin is free to rotate so as to uniformly distribute any wear thereon.

Yet another object of the present invention resides in the provision of a tow pin mechanism and subfloor towline conveyor having means for positively locking the tow pin in driving engagement with the conveyor in such a way as not to be adversely affected by normally encountered elevations and depressions in the floor, minor dimensional variations, and the like.

Another object resides in the provision of a tow pin mechanism which in operation is substantially free of sliding friction, utilizing primarily rotational elements, whereby overall operational friction is reduced.

These and other objects, features and advantages of the present invention will become apparent from the subsequent description and the appended claims, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a subfloor towline conveyor tow cart embodying the principles of the present invention;

FIG. 2 is a partial transverse sectional view taken along line 2-2 in FIG. 1;

FIG. 3 is a partial front elevational view of the tow pin mechanism of the present invention partially broken away and partially in section;

FIG. 4 is a partial side elevational view of the tow pin mechanism of the present invention partially broken away and partially in section; and

FIG. 5 is a diagrammatic view illustrating the respective positions of the various major parts of the mechanism of the present invention under different conditions.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to FIG. 1, the tow cart of the present invention generally comprises tow cart body 10 having a load carrying surface 12, a front wall 14, side walls 16, a rear wall 18, front caster assemblies 20 and rear wheel assemblies 22, all of conventional construction. The tow cart may be provided with a pair of longitudinally extending reinforcing elements 24 and 26, and at its forward end is provided with an upstanding frame structure 28 including a horizontally disposed frame member 30. Extending transversely across the rearward end of the tow cart is an actuating element 32 having a generally horizontal upper surface and being of the general configuration shown.

Rigidly secured to the front lower corner of the tow cart by means of a pair of angle brackets 34 secured to reinforcing elements 24 and 26, is an L-shaped mounting bracket 36 which is rigidly affixed to the bottom surfaces of brackets 34. Bracket 36 has mounted thereto, such as by means of a plurality of convention threaded fasteners 38 and 40, a tow pin mechanism indicated generally at 42, comprising an accumulating bumper 44 and a generally vertically movable tow pin 46. As best illustrated in FIGS. 1, 3 and 4, the tow pin mechanism is housed within a structure comprising a pair of generally vertically extending side plates 48 and 50 joined across the front by a structural element 52 and across the top by structural elements 54, 56 and 58. This housing structure may be fabricated by welding.

Bumper 44 is supported by means of a pair of brackets 60 affixed at their upper ends to bumper 44 and mounted for pivotal movement upon a shaft 62 extending through plates 48 and 50 and being pivotally supported thereby. For ease of assembly shaft 62 may consist of a sleeve disposed between plates 48 and 50 and a pin extending through the plates and sleeve and retained in position by means of suitable cotter pins 64. The lower end of the right hand bracket 60, as seen in FIG. 3, is provided with an extension 66 having a transverse opening therethrough in which is rotatably disposed a pin 68. The upper end of each bracket 60 is provided with a projection 70 adapted to abut structural element 54 upon forward movement of bumper 44 to limit the extent of such movement. The normal at rest position of the bumper assembly is illustrated in solid lines in FIG. 4 in which projection 70 is held against element 54 under the influence of gravity. As can be best seen in FIG. 4, the bumper assembly is so positioned that upon impact with the actuating element 32 of the immediately preceding tow cart on the conveyor, brackets 60 will be caused to rotate in a clockwise direction to the position shown in phantom lines. Each of the brackets 60 is provided on its forward edge with an angular recess 72 having a generally flat upper surface 74 which is generally horizontal when the bumper assembly is rotated to its clockwise position (shown in phantom). In this latter position surface 74 will rest upon the generally horizontal upper surface of element 32 so that minor relative movement of the two adjacent tow carts will not cause brackets 60 to move from this position.

Tow pin 46 is supported for free rotation within a sleeve 75 disposed in a generally vertical attitude between plates 48 and 50. Tow pin 46 is provided with upper and lower collars 76 and 78, respectively, which serve to hold it against axial movement within sleeve 75 without restricting its freedom to rotate. Permanently affixed to the front edge of sleeve 75 adjacent the upper end thereof is a transverse sleeve 80, and rigidly affixed to the rearward edge of sleeve 75 adjacent the bottom thereof is a transverse sleeve 82. The upper end of the tow pin assembly is supported by means of a shaft 84 passing through sleeve 80 and pivotally supported at one end by a simple link 86 and pivotally supported at the opposite end by a triangularly shaped link 88. Links 86 and 88 are in turn rigidly affixed to a shaft 90 the opposite ends of which pass through and are pivotally supported by plates 48 and 50. To facilitate assembly, shaft 90 may consist of a sleeve disposed between plates 48 and 50 with a pin extending through

the plates and sleeve and retained in place by conventional cotter pins 92, as best seen in FIG. 3.

The lower end of the tow pin assembly is supported by means of a shaft 94 extending through sleeve 82 and passing through inclined slots 96 and 98 in plates 48 and 50, respectively. The outer ends of shaft 94 are pivotally secured to the ends of a pair of generally horizontal levers 100 disposed outside plates 48 and 50, the opposite ends of levers 100 being rigidly secured to a shaft 102 passing through and pivotally supported by plates 48 and 50. For rigidity an additional pair of levers 103 may be rigidly secured to shaft 102 for pivotally supporting by shaft 94 at their free ends, as best seen in FIG. 3. The bottoms of slots 96 and 98 limit the downward movement of the tow pin. The shaft 94 may be retained in position by a pair of cotter pins 106. Levers 100 are each provided on their outer faces with outwardly projecting inclined lugs 104 each having a generally rounded forward surface. In these zones of the conveyor where it is desired to raise the tow pin, a suitable ramp (not shown) may be provided along the conveyor adapted to engage one or both of lugs 104 to cam the tow pin to the desired elevation where it will be maintained by the ramp, in accordance with conventional practices.

As can thus be visualized, the tow pin assembly constitutes a part of a three linkage system, the links between shafts 90 and 84 constituting the upper link, the tow pin assembly constituting the intermediate link, and the levers between shafts 94 and 102 the lower link. Shafts 90 and 102 constitute the fixed pivot points for the linkage system with respect to the tow cart. In the exemplary embodiment shown, the upper link inclines forwardly and downwardly in the driven position and is somewhat shorter than the lower link, which extends generally horizontally in the same position. The intermediate link is almost vertical in the same position and is somewhat longer than the lower link. The exact dimensions may of course be varied in any given application in accordance with the teachings hereof.

The bumper assembly is connected to the tow pin linkage system by means of an intermediate link 108 the rearward end of which is pivotally connected to a pin 110 which is pivotally supported at one end by triangular link 88 and at its opposite end by a link 112 the upper end of which is rigidly affixed to shaft 90. Pin 110 may be retained in place by a pair of cotter pins 114. The forward end of link 108 is provided with a slot 116 through which extends pin 68 connected to extension 66 of the right hand bracket 60. Pin 68 may be retained in position by cotter pins 117. As can be visualized in FIG. 4, engagement of bumper 44 with an immediately preceding tow cart will cause bracket 60 to rotate in a clockwise direction, which in turn will cause pin 68 to move to the left pulling lever 108 with it. This will cause links 112 and 88, and shaft 90, to rotate in the clockwise direction to raise the tow pin assembly. When the bumper moves back to its normal at rest position the tow pin assembly will drop under the influence of gravity to its original position shown, assuming such movement is not otherwise restricted. As will become apparent, the tow pin assembly may be raised in a number of additional ways, in which event the provision of slot 116 prevents movement of link 108 from actuating the bumper assembly. This reduces the movable mass in the system when the tow pin is raised and lowered by means other than the bumper, and shortens

response time because there is less mass to accelerate. It also serves to reduce wear.

Means are also provided for positively locking the tow pin in its lowermost driven position shown in those zones of the conveyor in which is essential that disengagement with the conveyor be prevented, i.e., on inclines or declines, in ovens, at work stations, etc. As best seen in FIGS. 3 and 4 there is provided a swinging dog 118 pivotally supported on shaft 94 and provided at its lower end with a rounded portion 120 and provided at its upper end with an arcuate surface 122. Dog 118 is spring biased in a clockwise direction as seen in FIG. 4 by means of a spring 124 wrapped around shaft 94 and having one end affixed to dog 118, as at 126, and the other end affixed to adjacent lever 103, as at 128. Clockwise rotation of dog 118 is limited to the position shown in solid lines in FIG. 4 by means of a stop element 130 affixed to plate 50. Also affixed to plate 50 is a stop element 132 which is positioned to lie in the upward path of arcuate surface 122 when dog 118 is rotated slightly from its normal at rest position shown in solid lines in FIG. 4. As can be seen, when dog 118 is in its normal position shaft 94 is free to move up and down with the tow pin assembly, but when dog 118 is rotated a relatively small amount in the counterclockwise direction, arcuate surface 122 will move into an interference relationship with respect to stop 132, thereby preventing further upward movement of shaft 94 and hence the tow pin assembly, regardless of whether the conveyor chain is pulling the tow pin or retarding its movement.

As illustrated in the drawings the floor plate covering the channel in which the subfloor tow line conveyor operates is designated 134 and has a slot 136 therein through which tow pin 46 normally projects. In those zones of the conveyor where it is desired to maintain tow pin 46 in its lower most driven position shown there is provided on plate 134 in such zone a longitudinal cam element 138. As best seen in FIG. 3, cam element 138 is in vertical alignment with rounded end portion 120 of dog 118 so that when the tow cart reaches such zone engagement of dog 118 with cam element 138 will cause the former to rotate in the counterclockwise direction as shown in FIG. 4 to the position shown in phantom lines, in which position the interfering alignment of surface 122 and stop 132 will positively prevent further upward movement of tow pin 46. As can be visualized in FIG. 4, there is substantial range of rotation of dog 118 over which positive locking may be accomplished. As a consequence, it has been found that the positive locking feature of this invention is not adversely affected by the normally encountered undulations in the floor or even slightly damaged portions of the cam element.

In order to provide means for manually raising the tow pin completely out of the tow line slot 136 so that the tow cart can be moved freely as a simple hand cart, there is fastened about sleeve 80 a cable 140 the upper end of which is affixed to the hook 142 of a conventional toggle pull clamp 144 rigidly affixed to frame member 30. Thus, with reference to FIG. 1, when it is desired to raise and lock out the tow pin the operator merely grasps the handle of toggle clamp 144 and pulls it upward (clockwise) until it is over center, at which point the entire tow pin mechanism will be elevated to raise the tow pin out of slot 136 will be maintained so elevated.

The mode of operation of the tow pin mechanism is best shown in FIG. 5, in which there is illustrated a conventional powered subfloor tow line conveyor chain 146 having a driving dog 148 including a driving surface 149, and a hold back dog 150 spaced forwardly thereof. A plurality of pairs of such dogs are generally provided, at spaced intervals. The respective basic elements of the mechanism are shown in solid lines in the driven position; i.e., the position in which tow pin 46 is, or is about to be, engaged by a driving dog 148 to move the tow pin and tow cart along slot 134. The respective locations of the various parts of the mechanism in this position are indicated at *a*. The tow pin normally falls to this position under the influence of gravity. If it should drop to this position ahead of a hold back dog 150, when the latter reaches the tow pin it will cam it up over the top whereupon it will drop back to the driven position shown. The tow pin may be positively locked in this position in any given zone by providing a cam element 138 along slot 136 in that zone.

When it is desired to accumulate tow carts or otherwise render them nondriven, while maintaining the tow pins in slot 136 to keep the tow carts in position, the tow pins are raised to an accumulating position. The locations of the parts in this position are indicated at *b* in the case where the tow pin is raised by a ramp acting on one or both lugs 104. In the event the tow pin is raised to the accumulating position by virtue of bumper 44 having encountered an obstacle, the only difference in the location of the parts is that pin 68 will have been moved by bracket 60 to the position indicated at *b'*. The locations of the various parts when the tow pin is locked out by actuation of toggle clamp 144 are indicated at *c*. In this position of the tow pin the tow cart may be rolled anywhere as a simple hand cart, independently of slot 136. In this latter position the bumper assembly is also pivoted towards the cart to render it shorter and more compact.

One of the important features of the present invention resides in the path of movement of the free end of the tow pin as it moves from its driven position to its accumulating position, as determined by the aforescribed linkage system. As best seen in FIG. 5 this path is generally arcuate (open in the forward direction) with the apogee disposed at an intermediate level between the levels of the top and bottom of driving surface 149 of driving dog 148. This intermediate level is indicated generally at *d*. This arrangement results in the utilization of driving forces to actuate the tow pin, thereby reducing the external force necessary to raise the tow pin and minimizing the need for heavy components simply to maintain the tow pin in the driven position by sheer weight. This is accomplished by utilizing the force components exerted on the tow pin linkage system by driving dog 148. As can be visualized in FIG. 5, when the free end of the tow pin is disposed below intermediate level *d* driving forces tend to urge the tow pin downwardly toward its lowermost driven position. The tow pin is thus self-locking in the driven position. On the other hand, when the free end of the tow pin is disposed above intermediate level *d*, driving forces tend to urge the tow pin upwardly out of its driven position to its accumulating position. Thus, the primary external force required to raise the tow pin is only that which is required to move the free end of the tow pin to just above intermediate level *d*, after which driving forces assist. This powered release feature is significant be-

cause of the extreme amount of friction often existing between the tow pin and the driving dog under heavy loads. The tow pin is preferably inclined slightly in side elevation with respect to vertical, in the order of 3°, with the lower end trailing the upper end, so that when the tow pin is deflected under heavy driving loads its lower end will not point forwardly and thus tend to be cammed upwardly by the driving dog.

In situations in which the tow cart and pin tend to accelerate ahead of the driving dog, such as on declines, disengagement is prevented by engagement of the tow pin with hold back dog 150.

During normal conveying operations the tow pin is down and positive lock is not engaged, whereby the tow pin is free to ride up a conventional switching ramp at any time and be transferred to another subfloor chain, in the usual manner. The tendency for the tow pin to jam against the far side of the slot of the conveyor transferred to is substantially reduced because of the arcuate path of up and down movement of the tow pin; specifically, the tow pin initially moves back towards the tow cart and away from the far side of the slot as it drops into engagement with the driving dog. Furthermore, because the entire tow pin assembly swings upwardly and downwardly the tow pin need not be as long as conventional tow pins which must slide (not swing) for their full stroke. The shorter length not only reduces weight, wear, cost and acceleration time, but also the tendency to bend and lock-up under heavy driving loads. The use of a lightweight tow pin and the linkage system makes bumper 44 a true personnel safety bumper, in addition to an accumulating bumper, because of the relatively low forces needed to actuate it, i.e., the force necessary to actuate it and disengage the tow pin is less than that which would normally injure a person hit by a driven tow cart. The use of rolling rather than sliding friction also contributes to the operation of this feature. On the other hand, the mechanism is such that the tow cart may still be used with the entire bumper assembly removed, if desired.

Thus, there is disclosed in the above description and in the drawings an embodiment of the invention which fully and effectively accomplishes the objects thereof. However, it will be apparent that other variations in the details of construction may be indulged in without departing from the sphere of the invention herein described, or the scope of the appended claims.

What is claimed is:

1. A tow cart for a tow line conveyor including a forward moving powered conveyor chain or the like having a plurality of driving elements thereon, said tow cart comprising: a load carrying body; a tow pin having a free end, said tow pin being movable between a first driven position in which said free end thereof is positioned to be drivingly engaged by a driving element on the conveyor chain, and a second nondriven position in which said free end just clears the driving element; and mounting means for attaching said tow pin to said body for movement between said first and second positions, said mounting means including pivotal linkage means operable to cause driving forces on said tow pin to exert a downward moment on said linkage means to thereby bias said tow pin toward the conveyor chain when said tow pin is disposed in said first position, and operable to cause driving forces on said tow pin to exert an upward moment on said linkage means to thereby bias said tow pin away from the conveyor chain

when said tow pin is disposed in a position intermediate said first and second positions.

2. A tow cart as claimed in claim 1, wherein the path of movement of said free end between said first and second positions lies substantially in a single plane.

3. A tow cart as claimed in claim 2, wherein said plane is generally vertical.

4. A tow cart as claimed in claim 1, wherein the path of movement of said free end is generally arcuate.

5. A tow cart as claimed in claim 4, wherein said path lies generally in a vertical plane.

6. A tow cart as claimed in claim 5, wherein the longitudinal apogee of said arcuate path is disposed at a level between said first and second positions of said free end.

7. A tow cart as claimed in claim 6, wherein said axis is disposed closely adjacent to and slightly above the level of said first position of said free end.

8. A tow cart as claimed in claim 1, wherein the axis of said tow pin lies generally in a longitudinal plane including the path of movement of said drive element, said free end being disposed rearwardly with respect to the opposite end of said tow pin in said first position.

9. A tow cart as claimed in claim 8, wherein said longitudinal plane extends generally vertically.

10. A tow cart as claimed in claim 1, further comprising bumper means on said tow cart responsive to engagement with an obstacle to cause said tow pin to move from said first position to said second position.

11. A tow cart as claimed in claim 10, wherein said mounting means permits movement of said tow pin from said first position to said second position without actuating said bumper means.

12. A tow cart as claimed in claim 1, further comprising locking means responsive to cams located in the path of movement of said tow cart to positively lock said tow pin in said first position.

13. A tow cart as claimed in claim 1, wherein said mounting means includes first link means pivotally connected adjacent one end to said body, second link means pivotally connected adjacent one end to the other end of said first link means, and third link means pivotally connected adjacent one end to said body and adjacent the other end to the other end of said second link means, said pivotal connections to said body being spaced from one another in a direction parallel to the direction of movement of the conveyor chain, said tow pin being supported by said second link means.

14. A tow cart as claimed in claim 1, wherein the movement of said tow pin with respect to said tow cart is solely pivotal.

15. A tow cart as claimed in claim 1, wherein said mounting means includes sleeve means rotatably supporting said tow pin, and means preventing axial movement between said tow pin and said sleeve means.

16. A tow cart as claimed in claim 1, further comprising stop means affixed to said tow cart, and positive locking means pivotally connected to said tow cart and depending therefrom adjacent the conveyor chain, said locking means being movable between a locking position in which it engages said stop means to prevent upward movement of said tow pin and a nonlocking position in which it clears said stop means upon upward movement of said tow pin.

17. A tow cart as claimed in claim 1, further comprising a hold back dog on said conveyor chain spaced forwardly from each of said driving elements, each of said

hold back dogs including a tow pin engaging surface facing said corresponding driving dog.

18. A tow cart as claimed in claim 17, wherein said tow pin engaging surface is disposed at a level which will engage said tow pin in said intermediate position.

19. A tow cart as claimed in claim 1, wherein upward movement of said tow pin is not restricted in said first position thereof.

20. A tow cart for a towline conveyor including a forward moving powered conveyor chain or the like having a plurality of driving elements thereon said tow cart comprising: a load carrying body; a tow pin having a free end, said tow pin being movable between a first driven position in which said free end thereof is positioned to be drivingly engaged by a driving element on the conveyor chain, and a second nondriven position in which said free end just clears the driving element; and mounting means for attaching said tow pin to said body for movement between said first and second positions, said mounting means including first link means pivotally connected adjacent one end to said body, second link means pivotally connected adjacent one end to the other end of said first link means, and third link means pivotally connected adjacent one end to said body and adjacent the other end to the other end of said second link means, said pivotal connections to said body being spaced from one another in a direction parallel to the direction of movement of the conveyor chain, said tow pin being supported by said second link means.

21. A tow cart as claimed in claim 20, wherein said pivotal connections to said body are disposed on opposite sides of said second link means in a direction parallel to the movement of the conveyor chain.

22. A tow cart as claimed in claim 20, wherein said first link means is disposed above said third link means.

23. A tow cart as claimed in claim 20, wherein said pivotal connection between said body and said first link means is disposed rearwardly of said second link means, and wherein said pivotal connection between said third link means and said body is disposed forwardly of said second link means.

24. A tow cart as claimed in claim 20, wherein said first link is shorter in length than said second link means.

25. A tow cart as claimed in claim 20, wherein said first means is shorter in length than said third link means.

26. A tow cart as claimed in claim 20, wherein said third link means is shorter in length than said second link means.

27. A tow cart as claimed in claim 20, wherein said first link means is shorter in length than said third link means and said third link means is shorter in length than said second link means.

28. A tow cart as claimed in claim 20, wherein said second link means lies in a vertical plane including the conveyor chain and slightly inclined with respect to the vertical in said plane when said tow pin is in said first position, with the lower end thereof disposed rearwardly of the upper end thereof, said first link means extending generally forwardly and downwardly and

said third link means extending generally horizontally when said tow pin is in said first position.

29. A tow cart for a tow line conveyor including a forward moving powered conveyor chain or the like having a plurality of driving elements thereon, said tow cart comprising: a load carrying body; a tow pin having a free end, said tow pin being movable between a first driven position in which said free end thereof is positioned to be drivingly engaged by a driving element on the conveyor chain, and a second nondriven position in which said free end just clears the driving element; and mounting means for attaching said tow pin to said body for movement between said first and second positions, said mounting means including pivotal linkage means so constructed as to cause driving forces of the conveyor chain on said tow pin to exert a downward moment of said linkage means to thereby bias said tow pin toward the conveyor chain when said tow pin is disposed in said first position.

30. A tow cart as claimed in claim 27, further comprising means preventing said bumper means from permitting said tow pin to move away from said second position when the obstacle engaged moves slightly away from the tow cart.

31. A tow cart as claimed in claim 10, further comprising cam means on said tow cart for moving said tow pin from said first position to said second position in response to engagement with a ramp disposed adjacent the conveyor chain.

32. A tow cart as claimed in claim 31, wherein movement of said tow pin by said cam means does not cause actuation of said bumper means.

33. A tow car as claimed in claim 29, wherein said mounting means further provides a substantially rigid connection between said tow pin and said tow cart in the direction of movement thereof.

34. A tow cart for a tow line conveyor including a forward moving powered conveyor chain or the like having a plurality of driving elements thereon, said tow cart comprising: a load carrying body; a tow pin having a free end, said tow pin being movable between a first driven position in which said free end thereof is positioned to be drivingly engaged by a driving element on the conveyor chain, and a second nondriven position in which said free end clears the driving element; mounting means for attaching said tow pin to said body for movement between said first and second positions, said mounting means including sleeve means rotatably supporting said tow pin, first link means pivotally connected adjacent one end to said body, second link means pivotally connected adjacent one end to the other end of said first link means, and third link means pivotally connected adjacent one end of said body and adjacent the other end to the other end of said second link means, said pivotal connections to said body being spaced from one another in a direction parallel to the direction of movement of the conveyor chain, said sleeve means being part of said second link means; and means preventing axial movement in both directions between said tow pin and said sleeve means.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,789,767 Dated February 5, 1974

Inventor(x) Robert Krammer

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

Column 1, line 11, after "conveyor" insert -- chain --.
Column 1, line 29, after "as" insert -- a --.
Column 2, line 6, after "by" insert -- other --.
Column 4, line 19, "these" should be -- those --.
Column 5, line 5, after "which" insert -- it --.
Column 8, line 58, "chart" should be -- cart --.
Column 9, line 43, after "link" (first occurrence) insert -- means --.
Column 9, line 46, after "first" insert -- link --.

Signed and sealed this 9th day of July 1974.

(SEAL)
Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents