United States Patent [19]

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[11] **3,712,241**

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[54] ENDLESS TOWING CONVEYOR

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Nov. 20, 1970 Germany.....P 20 57 082.5

[52] **U.S. Cl.**.....**104/172.5,** 104/103
[51] **Int. Cl.**.....**B65g 17/42**
[58] **Field of Search**.....104/172 B, 172 C, 172 S, 96, 104/103

[56] **References Cited**

UNITED STATES PATENTS

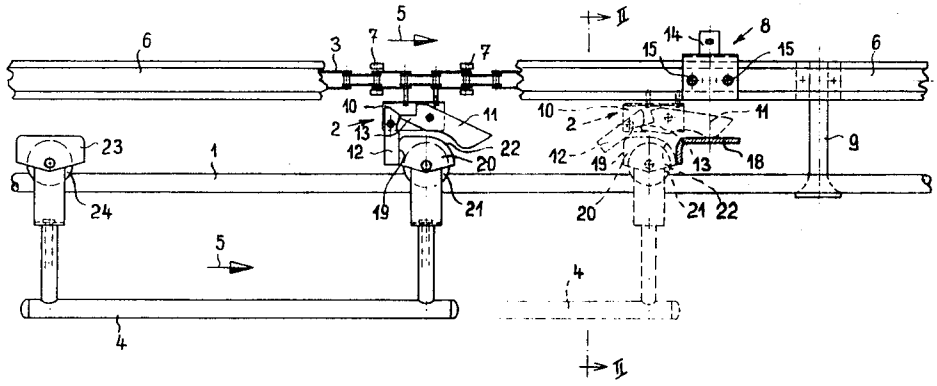
3,091,191	5/1963	Fur	104/172 S
3,024,740	3/1962	Peras	104/172 C
3,039,403	6/1962	McDonough	104/172 S
3,541,967	11/1970	Birkhead	104/172 S

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Assistant Examiner—Robert Saifer
Attorney—Robert H. Jacob

[57] **ABSTRACT**

Endless towing conveyor having a suspension track disposed below the towing chain for running carts rolling thereon, where the movable part of a coupling device is disposed between a towing chain and running carts exclusively on the drivers or dogs of the towing chain and cooperate with a curved member on the running carts which is rounded forwardly in the direction of advancement and equipped with a vertical abutment surface in the back.

11 Claims, 11 Drawing Figures



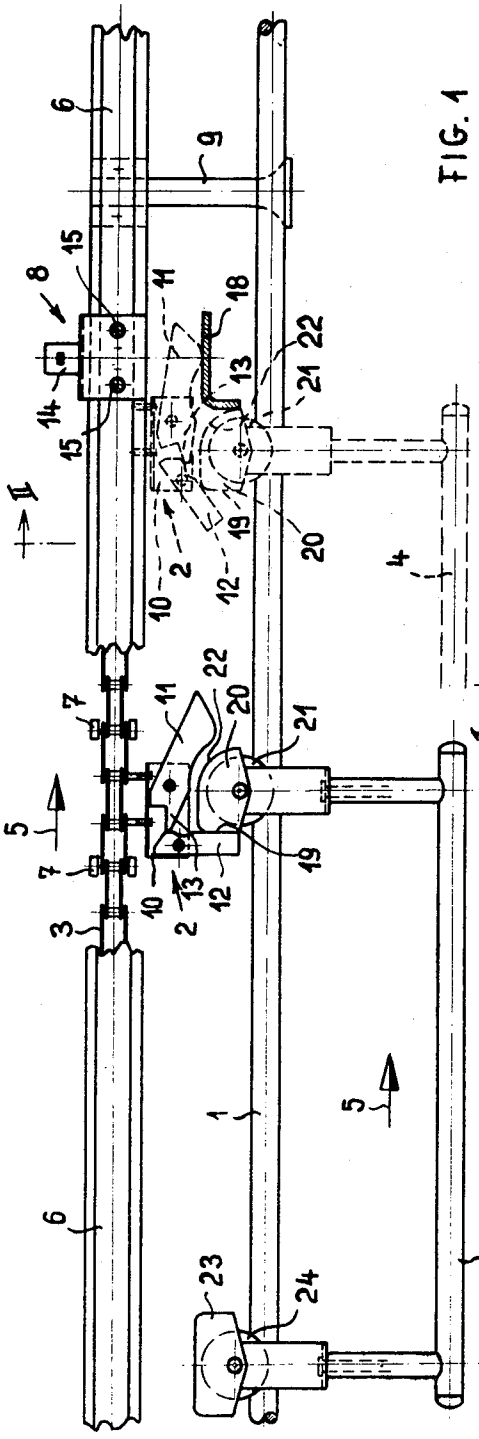


FIG. 1

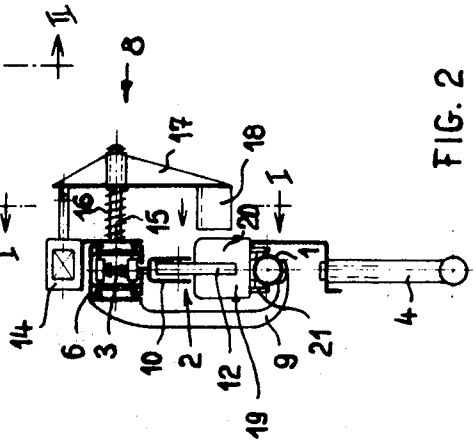


FIG. 2

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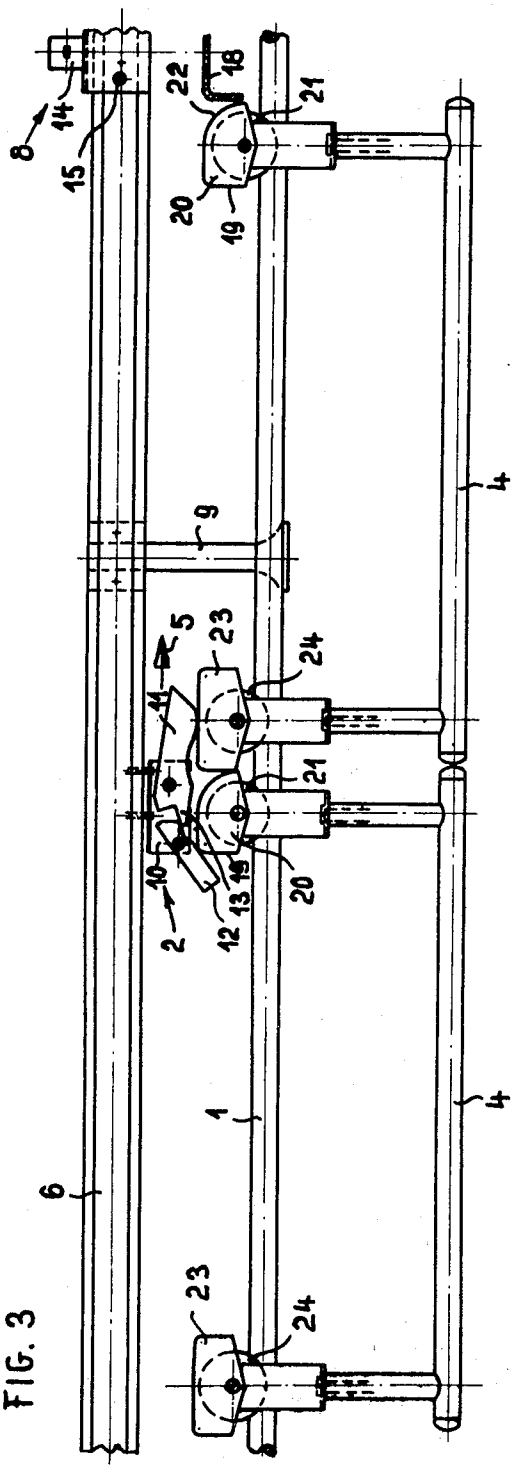


FIG. 3

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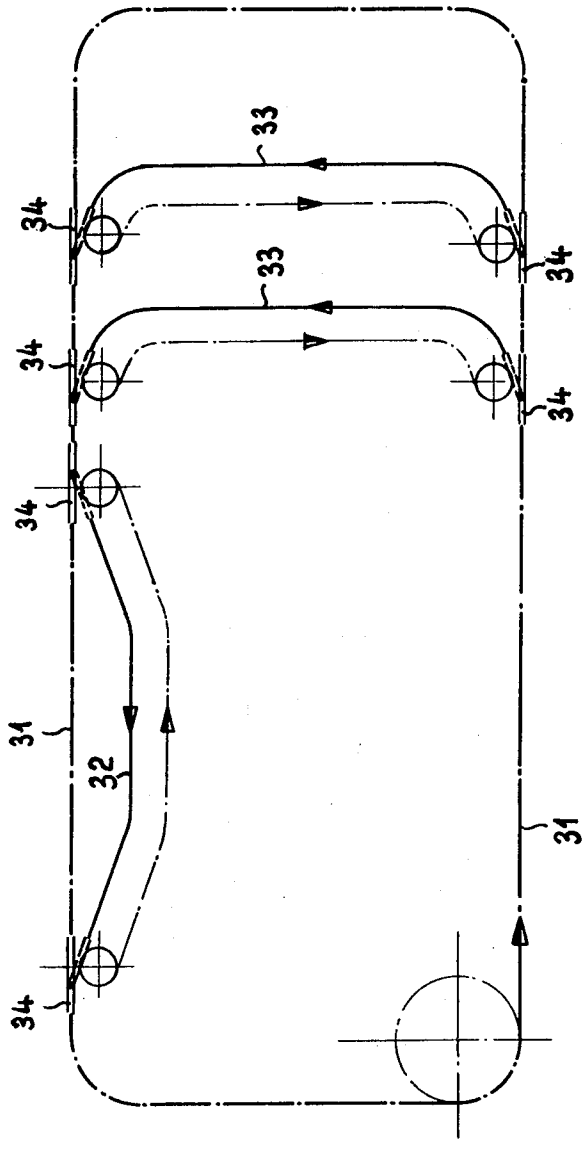


FIG. 4

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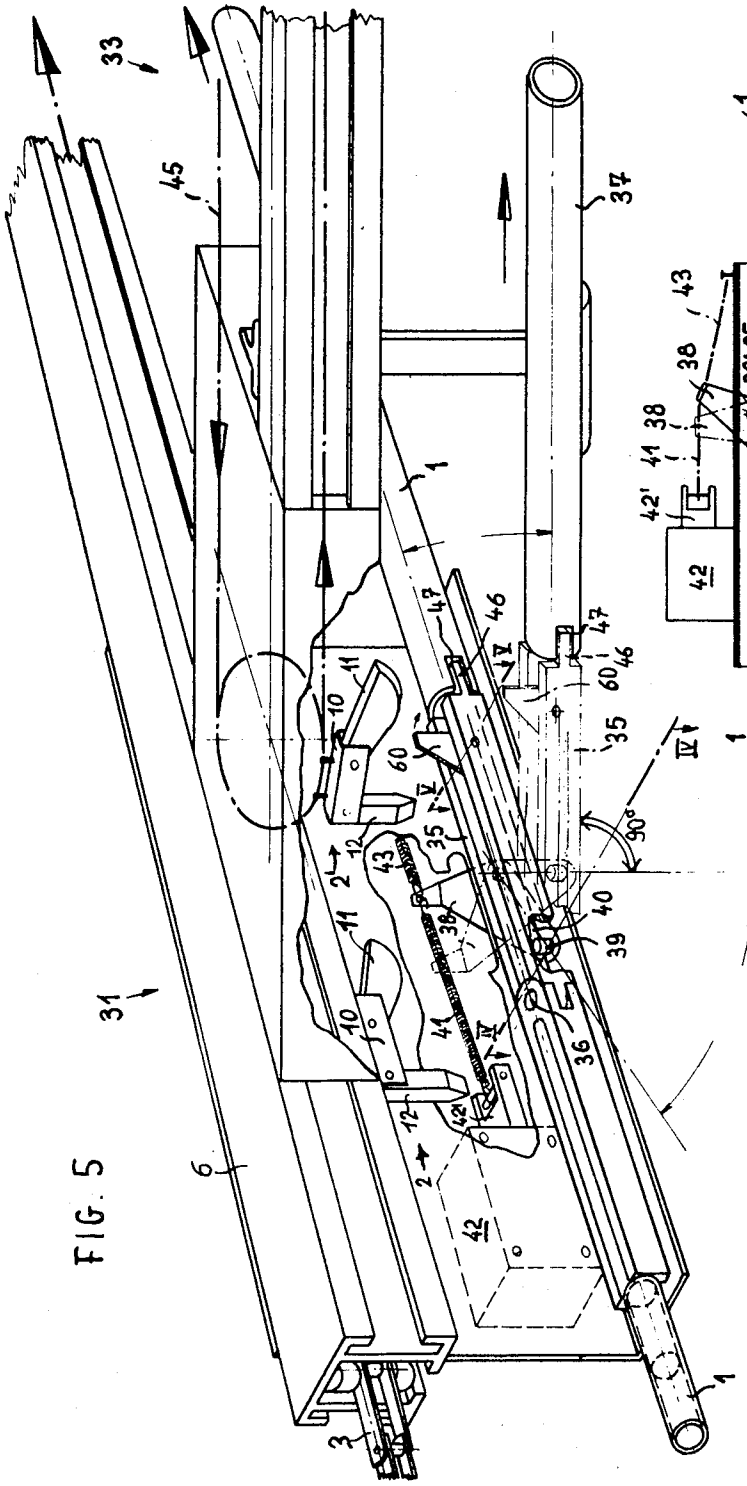


FIG. 5

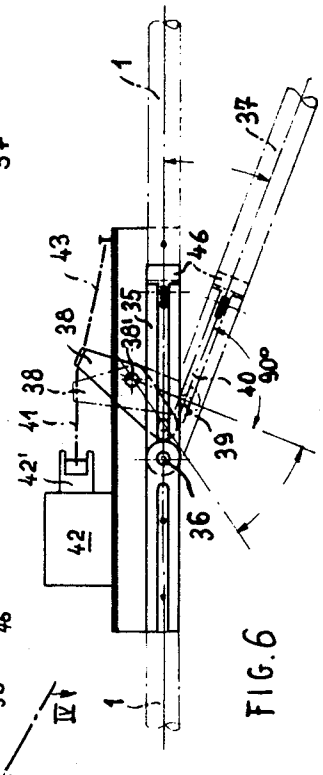


FIG. 6

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FIG. 7

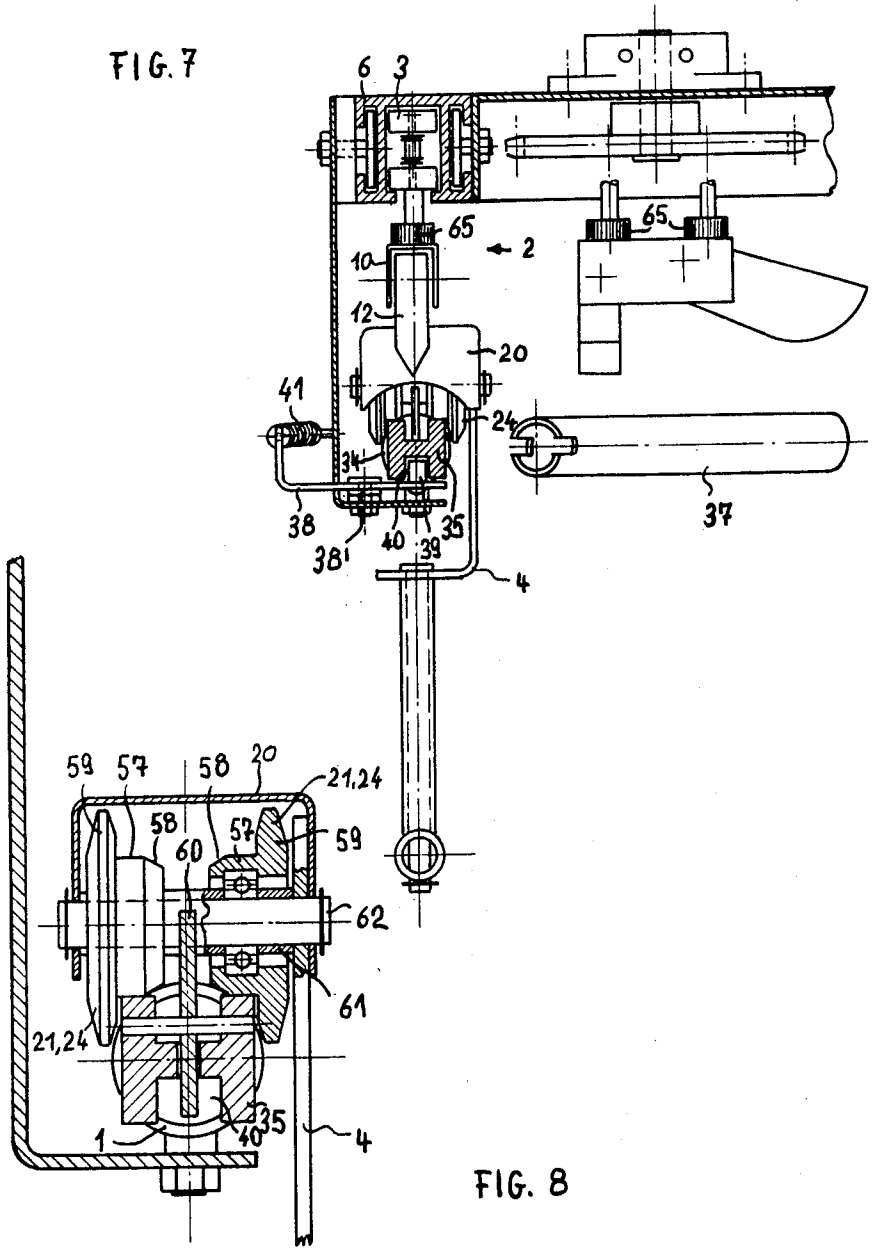

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FIG. 8

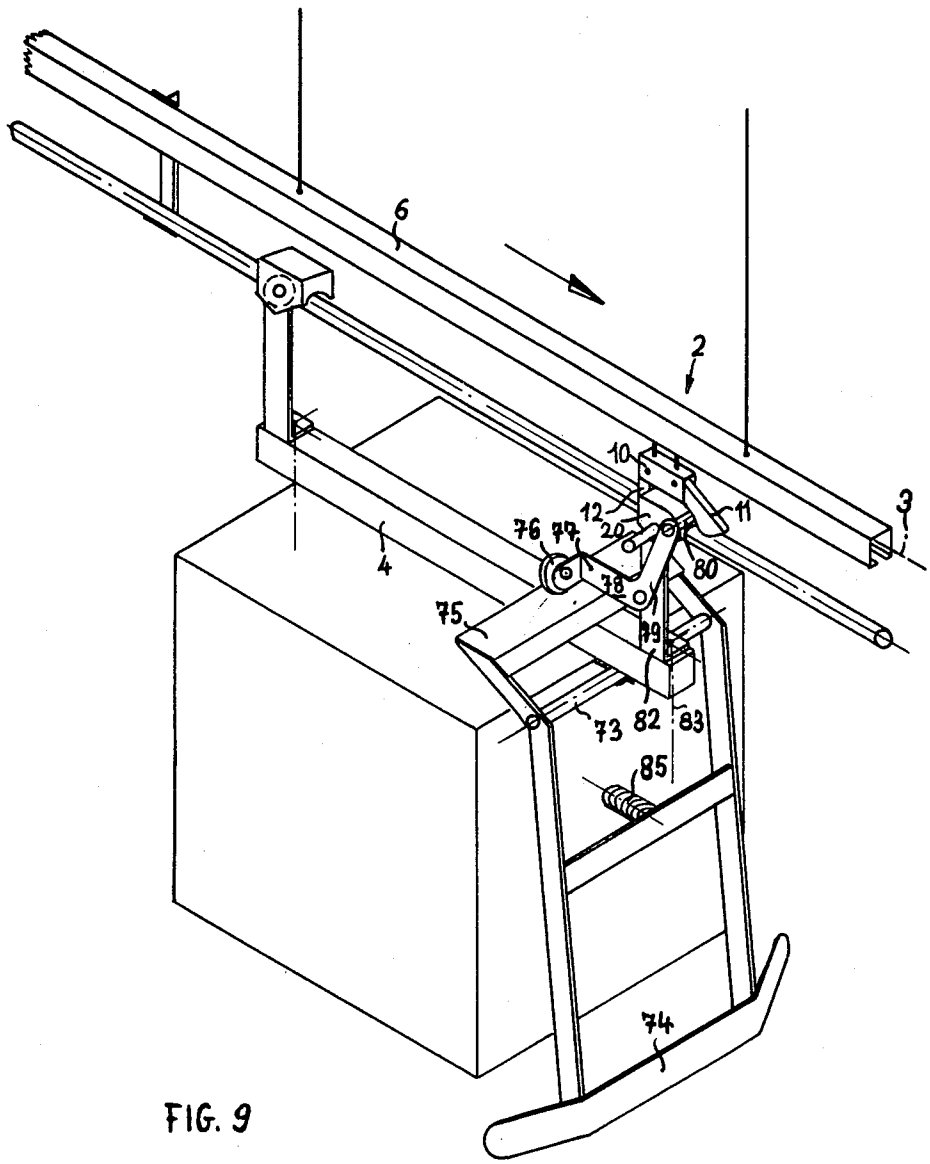


FIG. 9

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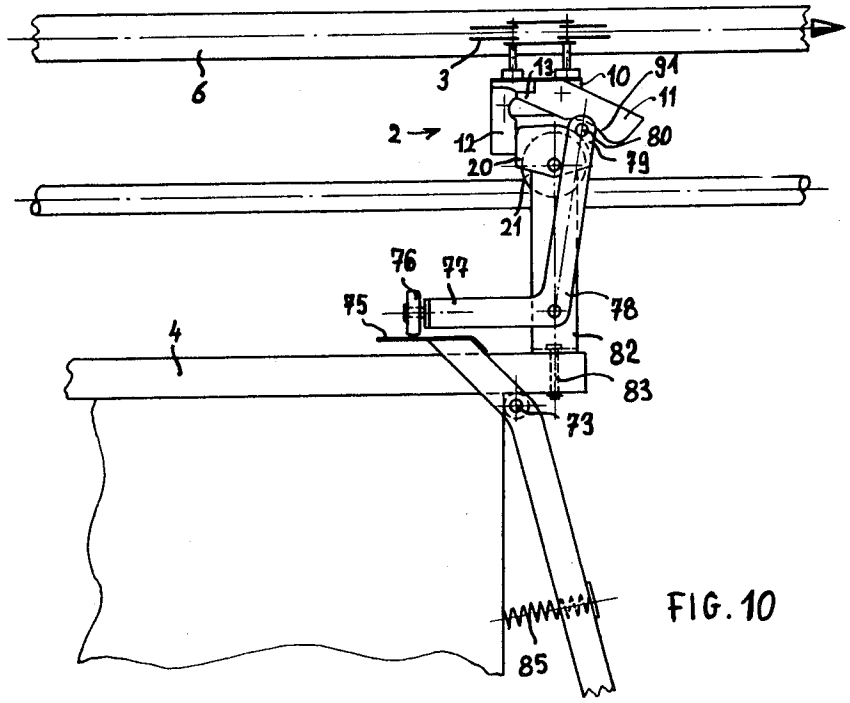


FIG. 10

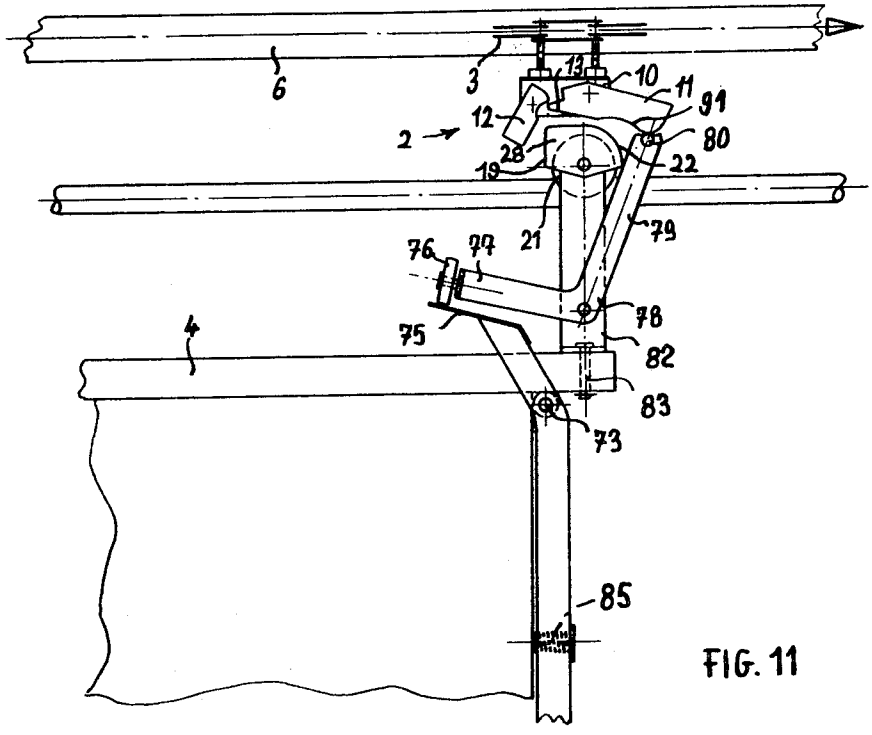


FIG. 11

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ENDLESS TOWING CONVEYOR

BACKGROUND OF THE INVENTION

The invention relates to an endless conveyor system of the towing type. More particularly the invention is concerned with an endless towing conveyor having a suspension track disposed below the towing chain for running carts rolling thereon. These endless towing conveyors constitute a combination of known endless conveyors with a towing chain guided in a suitable guide section and hand suspension tracks, also known per se, where the possibilities of coupling and uncoupling an operative connection between the towing chain and the individual running carts moving on the suspension track rails of the hand suspension tracks are of decisive significance.

In known conveyor installations the running carts are always moved along by drivers or dogs which are secured to the towing chain with space therebetween. This towing chain runs continuously. The running carts moved by the drivers must, however, stand still at stopping stations to be installed at any desired location, and it must be possible for them to be stacked there one behind the other. The stopping stations as a rule have an entering and a release cam or curve for the coupling device and can be moved, for example, by means of an electromagnet into and out of the traveling track for the running carts.

Essentially the problem in accordance with the invention is based on the fact that the coupling device between the towing chain and the running carts is so constructed that first, no movable parts are required on the running cart. The running carts are to be deployable in numerous ways, and their construction must not be too expensive. For example, if they are deployed upon manual suspension rails without an endless conveyor, coupling devices or parts thereof are not necessary on the running carts. There is also little fundamental requirement to provide the possibility of stacking the running carts behind one another. Finally, such installations as a rule have more running carts in operation than the towing chain has drivers.

SUMMARY OF THE INVENTION

The problem in accordance with the invention is solved by means of an endless towing conveyor having a coupling device that is constructed in such a manner that its movable parts are exclusively disposed at the drivers of the towing chain, which cooperate with a curved member on the running carts, which is rounded at the forward end in the direction of travel and has a vertical abutment surface in the back.

Advantageously the caps covering the running rollers of the running carts serve the purpose of such curved members.

Preferably the coupling device secured to the drivers of the towing chain is defined by a housing in which a latching lever and a claw are pivotally supported for movement about coordinated horizontal axes in a manner that a lug on the latching lever in its lowered position stops the claw in its vertical position, and in its raised position for pivoting upwardly releases it in the direction opposite the direction of travel, while furthermore the forward roller cap of the running carts is rounded or curved in the direction of advancement and is provided in the back with a vertical abutment surface while in the rearward roller cap the front curving is omitted.

It has furthermore been found that the possibilities of deployment of such an endless towing conveyor can be essentially extended if besides a closed conveyor circuit side branches and connecting branches or channels are provided, which may generally be referred to as transfer conveyors.

For building such an installation it is necessary, however, for channeling the running carts rolling upon the suspension track in and out of the main circuit to provide switches between this circuit and the transfer conveyors, furthermore means for controlling these switches, and to make provisions that the running carts rolling on the suspension tracks of the main circuit can travel also on the transfer conveyors at as little technical expenditure as possible.

For this purpose the invention provides that in the main circuit and in the transfer circuit there are basically equal elements such as equal towing chains, equal drivers and equal chain guiding rails as well as suspension tracks for the running carts. This constitutes an essential simplification of the art because the different means mentioned are the same in all areas of the entire installation.

Furthermore also the switch must, of course, be as simple and as reliable to operate as possible, while it requires at least one adaptation of the running rollers of the running carts so that they can travel on the suspension tracks as well as also along curved areas or sections.

The switch comprises essentially a switch tongue which is pivotally movable by means of a lever which is journalled at a pivot point along the switch tongue and is at one end under the control of a setting or displacing force, and at the other end of which a pin is provided which slides in a groove of the switch tongue, while furthermore the switch tongue is of rectangular design and provided with a flat nose at its free end which swings into corresponding slots of the suspension tracks coordinated with the switch.

For the power effect upon the lever that rocks the switch tongue an electromagnet may preferably be provided, while between the magnet plunger and the lever end a spring is provided as an elastic element. At this end of the lever that is associated with this spring a further spring is provided as return pull spring.

Preferably the lever that actuates the tongue of the switch is disposed at an angle of 90° relative to the tongue when it is turned out, so that it is stopped in the turned out position. Any lateral forces applied by the running carts against the turned out switch tongue are thus intercepted at the pivot point and are not transferred onto the magnet.

The running rollers of the running carts have a cross section that has an axis parallel running roller area for rolling upon the switch tongue that has the rectangular shape and continuing inwardly a skewed or oblique area rolling upon the tubes of the suspension tracks that have circular cross section.

Advantageously a recoil latch is provided in the tongue of the switch that prevents the back rolling of the running carts, which could be possible when the suspension track is not satisfactorily aligned or the material being carried that is suspended on the running

carts pendulates in a manner that an impulse is imparted to the running cart to run backward.

The recoil latch is formed in a simple manner as a latch that is pivotally movable about a horizontal axis acting automatically due to the counter weight of its lower region.

At the drivers of the conveyor chain an elastic intermediate region may be provided which is defined by a rubber element. By means of this it is possible if unfavorable moments should develop that the catcher or drive can escape laterally. These rubber elements furthermore serve as a safeguard against shearing.

Finally, it must be considered that in endless towing conveyors of this type having a suspension track disposed below the towing chain there always exists the danger that persons and objects move into the path of travel of the running carts, and thus these persons or objects or the material conveyed by the running carts can be hurt or damaged. At least the orderly course of the conveyor which usually is automatically guided can be disturbed.

Thus the problem must be solved, to provide an arrangement that effects the uncoupling between the driver on the towing chain and the curved member on the running cart when the latter or the material carried thereby encounters an obstacle.

In accordance with the invention an uncoupling device is provided for this purpose, which essentially comprises a downwardly extending hoop or the like that is pivotally movable about a horizontal axis on the running cart and has at its upper end an actuating surface that cooperates with a roller that is mounted at the end associated with the actuating surface of an angular lever that is likewise pivotable about a horizontal axis, and which has in the area of its other end that extends essentially upwardly at the level between the latching lever of the driver of the towing chain and the forward rounded portion of the curved element on the running cart a pin that is rockable between the latching lever and the curved member, while a recoil spring for supporting the uncoupling device is arranged in any desired location of its non-operative position.

If the switching hoop encounters an obstacle, it is moved against the force of the recoil spring. The actuating surface that is in contact with the hoop is raised as well as the lower arm of the angular lever. The arm of the angular lever that extends substantially vertically rocks into an oblique position. The actuating bolt at its free end raises the latching lever of the coupling device so that the driving finger is freed. The driving finger thus slides over the curved member on the running cart. The effective connection between the latter and the towing chain is released. The cart stands still.

Further features of the invention will become apparent from the following description with reference to the embodiment schematically illustrated in the drawings, in which:

FIG. 1 illustrates in a side view a coupling device with different positions of a running cart;

FIG. 2 is a cross section taken along line II—II in FIG. 1;

FIG. 3 is a further side view of a stopped running cart with a further cart run against it;

FIG. 4 is a schematic illustration of a possible construction of an endless towing conveyor arrangement having a branch track and two connecting tracks;

FIG. 5 is a perspective illustration of an area of the endless towing conveyor with a switch;

FIG. 6 is a horizontal section through the switch area;

FIG. 7 is a section along the lines IV—IV of FIG. 5;

FIG. 8 is a section taken in the direction of the arrows V—V in FIG. 5;

FIG. 9 is a schematic perspective illustration of the uncoupling device in accordance with the invention;

FIG. 10 is a schematic side view of the device in inoperative position, and

FIG. 11 is the same side view with the device in operative position.

DESCRIPTION OF THE INVENTION

Upon the suspension track rails **1**, drivers **2** on the towing chain **3** move the running carts **4** in the direction of the arrow **5**. The chain runs continuously in a guiding section or profile **6**, where it is guided by means of rollers **7**. The carts **4**, however, are to be stopped by stopping devices **8** disposed at any desired location in the installation whereby also stowing of several carts, one behind the other, is to be made possible.

The suspension track rails may be secured, for example, by means of connecting bridges **9** on the guide section **6** of the endless conveyor.

The drivers **2** of the towing chain **3** are provided with a housing **10** between the lateral side walls of which a latching lever **11** and a driving finger **12** are mounted for pivotal movement about horizontal axes. The latching lever **11** is provided with a nose **13** which in lower position of latching lever **11** stops the driving finger **12** in a downwardly directed position and frees the driving finger **12** as the latching lever **11** rocks upwardly so that it can swing upwardly in opposite direction of the advancing movement.

The stopping device **8** comprises essentially an electromagnet **14** or another suitable control means which can move a curved stopping member **18** into the advancing track of the running carts **4** and out of the same against the resetting force of a spring **16** by way of a connecting member **17** disposed upon a rod **15**.

If the curved member **18** is in operative position, then it raises the latching lever **11** of the driver **2**, whose nose **13** frees the driver **12**, which up to then was stopped in its vertically downwardly extending position and thus engaged a rearward vertical abutment surface **19** of a cap **20** of the front running roller **21** of the running cart **4**. Thus the running cart **4** remains standing held by the curved member **18**. The driver **2** may slide over the cap **20** and the curved member **18**.

The cap **20** of the forward running roller **21** of the running cart **4** is rounded in front at top **22** in the direction of travel, so that the latching lever **11** upon sliding over the cap can swing downwardly and thus stop the catching finger **12** in its vertical position.

The cap **23** of the rearward wheel **24** of the running carts **4**, however, is not rounded in front so that the latching lever **11** of the driver **2** can slide over it in the same manner as it slides over the curved member **18** of the stopping device **8** and thus does not stop the top catching finger **12** which in its turn slides over this cap.

If a running cart **4** is held by the curved member **18** of the stopping device **8**, the release mechanism of the driver **2** that brings along the next running cart **4** acts in

the same manner with the forward cap of this running cart and the rearward cap of the preceding running cart as with the forward cap **20** thereof and the curved member **18**, i.e., the latch lever **11** is swung upwardly and remains upward so long, that it cannot stop the driving finger **12**. The second running cart is likewise released by the catcher **2** of the towing chain **3** as the first running cart at the stopping device **8**. This applies to all subsequently arriving running carts so that they can be stowed behind one another in any desired number.

An endless towing conveyor installation is schematically illustrated in FIG. **4** where the main stretch is indicated by dot and dash lines **31**. By way of example, a side track **32** and two connecting tracks **33** are indicated, which may be identified quite generally as transfer conveyors. The endless conveyor installation is equipped with target and/or program controls and thus makes possible completely automatic performance. The connection between the main track and the side tracks or connecting tracks is completed by means of switches **34**. In order to have the entire installation as simple as possible, especially the side and connecting tracks and the associated switches, equivalent elements, i.e., equivalent conveyor chains, drivers, chain guiding machines, running tracks for the main track and for the transfer conveyors are provided.

Furthermore, in order to permit the equipment of all parts of the installation with equal elements, the switches between the main track and the transfer tracks of the installation require special design. For this purpose it is proposed to provide in the running track **1** of the suspension rails of the main conveyor a switch tongue **35** which is pivotable about a vertical stud **36** in the direction of a running track **37** of a connecting rail or a transfer conveyor. To actuate the switch tongue **35** a lever **38** is provided, which is pivotable about vertical stud **38'** radially of the switch tongue **35** and which engages with its end coordinated to the switch tongue **35** by means of pin **39** a groove **40** that extends along the switch tongue. The other end of the lever **38** is connected with a plunger **42'** of an electromagnet **42** by way of an elastic element in the form of a helical tension spring **41**. Besides that a return or pullback spring **43** is provided at the said end of the lever **38** which at its other end is secured at any desired location of the structure.

By means of lever **38** the switch tongue **35** can be actuated with little expenditure of energy, which makes possible the use of actuating elements, for example alternating current thrust magnets, at reasonable cost.

Furthermore, the arrangement of lever **38** and switch tongue **35** is such that with the switch tongue **35** displaced, i.e., in the direction of the running rail **37**, the lever **38** and the switch tongue **35** include an angle of 90°. Thus, the switch tongue **35** is arrested in its displaced position. If lateral forces arise as the switch tongue is travelled on by a cart **4**, then they are intercepted at the pivot point **38'** of the lever **38** and are not transferred to the magnet **42**. In order to set back the switch tongue **35**, the small force of the return spring **43** will be sufficient due to the disposition of lever **38**.

If a cart **4** is switched off by way of the switch tongue **35**, then it leaves the effective range of the driver **2** of the main conveyor chain **3** and arrives in the effective range of an entirely equally constructed driver **2'** of a towing conveyor chain **45** of the transfer conveyor which is merely indicated by dots and dashes in FIG. **5**.

The design of the switch tongue **35** is of rectangular cross section, primarily for manufacturing reasons. By means of a rectangular section the running rollers **24** can be shifted better than with a tube of circular cross section. The running rail proper may be in the form of a tube having circular cross section, or also of rectangular cross section.

At the free end of the switch tongue **35** a flat nose **46** is provided which engages in the end positions of the switch tongue corresponding slotted recesses **47** of the running rails **1** or **37**. Thus, the switch tongue **35** engages or rests at both ends and can absorb correspondingly great forces in vertical direction, i.e., it can be of lighter construction, for example of plastic. Due to the light construction of the switch tongue the operating forces can in turn be reduced.

The running rollers **21**, **24** of the running carts **4** can be adapted in a simple manner to the changing sections or profiles. This is effected in that the double running rollers are equipped at their inner sides with running surfaces **57** for travelling on rectangular sections and with running surfaces **58** which merge with these running surfaces for travelling on sections having circular cross section. Besides, they are provided with flanges **59** for lateral guidance.

In order to avoid that the carts **4** roll back in the area of the switches a recoil latch in the form of a catch **60** is provided in the switch tongue **35**. Running back in this manner could occur when the running rails of the suspension track are not properly horizontal or if the material that is moved is suspended on the cart **4**. The cart has imparted to it a return impulse caused by pendulating. Furthermore, the cart **4** must wait after release out of the effective range of the driver **2** until it is taken over by the driver **2'** of the transfer conveyor **32** or **33**. Here again the cart could prematurely leave the effective range of the driver **2'** by rolling back, if the recoil latch were not provided. With automatic operation it is necessary, however, that the cart is taken over by the next driver of the transfer conveyor.

The catch **60** is in the form of a simple catch acting below its pivot by its own counterweight. It can, for example, be actuated by the spacing sleeve **61** on the running roller shaft **62** of the carts as illustrated in the drawing.

Between the drivers **2** or **2'** and the towing chains **3** or **45** rubber elements **65** may be provided, so that the drivers **2**, **2'** can evade laterally, for example, when straightforward running carts unfavorably encounter drivers **2'**.

Otherwise, wedging of the running carts could occur. Besides, these rubber elements **65** act as a safeguard against shearing if, for example, a cart should be blocked by external conditions.

Finally, a switching hoop or shackle **74** that pivots about a horizontal axis **73** may be provided on the cart **4** which is under the resetting force of spring **85**. At the upper end of the switch hoop **74** an obliquely extending member presenting an actuated surface **75** is provided which cooperates with a roller **76**. This roller **76** is provided at the lower lever arm **77** of a pivotable angular lever **78** that extends substantially horizontally. The

second arm **79** of the angular lever **78** which extends substantially vertically upwardly carries an actuating bolt **80** or a suitably formed sheet metal part which in the position of rest engages the curved portion **22** of the running roller cap **20**.

The latch lever **11** is arched at **91** to correspond to this rounded shape so that the bolt **80** here is located between the curved portion **22** and this curvature **91**.

In response to the smallest pressure against the switch hoop **74**, the magnitude of which is determined by the form of the spring **85**, the actuating surface **75** raises the roller **76** and thus the lever arm 77. The lever arm **79** and the actuating bolt **80** are tilted forwardly. The bolt **80** raises the latch lever **11** whose nose **13** frees the catch finger **12** which slides over the cap **20**. The cart stops immediately.

The angle lever **78** is pivotally secured at the roller block **82** for the running wheel **21** associated with the cap **20**. In order that this roller block **82** can pivot about the vertical axis **83** when travelling along curves, the roller **76** already mentioned is provided on the lever arm 77. As the roller block **82** is rocked, it follows a circular path on the actuating surface **75** without being raised.

Having now described the invention, the protection to be covered by Letters Patent is set forth in the appended claims.

I claim:

1. Endless towing conveyor comprising a towing chain, a suspension track disposed below said chain, carts having driven means movable on said track, driving means comprising each as movable members a driving finger and a latching lever on said towing chain disposed between said towing chain and one of said carts, said driven means having a curved portion at the forward end in the direction of travel for cooperation with said driving means and having a portion presenting a vertical abutment surface at the rearward end, and a stopping member below said chain in the path of movement of said driven means.

2. Endless towing conveyor in accordance with claim **1**, where each said cart has a front and a rear running roller, and a cap covering each said roller, and said cap on said front running roller defining said curved portion.

3. Endless towing conveyor in accordance with claim **2**, where said driving means include a housing that is open at the bottom in which one said driving finger and one said latching lever are journalled for pivotal movement about horizontal axes, said latching lever having a nose retaining said driving finger in lowered vertical position and freeing said driving finger in raised position for pivotal upward movement in the direction opposite to the direction of travel, and said cap on said rearward running roller being devoid of a curved member.

4. Endless towing conveyor in accordance with claim **3**, comprising a main conveyor channel and transfer conveyor branches and switches between said main conveyor channel and said transfer conveyor branches said channel and said branches being provided with elements of equal form of construction such as equal towing chains, equal coupling devices and equal suspension tracks for carts.

5. Endless towing conveyor in accordance with claim **4**, where said switches between the main conveyor channel and transfer conveyors comprise essentially a switch tongue and an actuating lever for moving said switch tongue, a vertical stud supporting said lever biased at one end and having a pin at the other end, said switch tongue being rectangularly shaped and having a slot receiving said pin for sliding movement.

6. Endless towing conveyor in accordance with claim **5**, comprising a flat nose at the free end of said switch tongue and slotted recesses in the ends of said suspension rail, slidingly receiving said flat nose.

7. Endless towing conveyor in accordance with claim **6**, including an electromagnet having a plunger in engagement with said actuating lever for moving said switch tongue, a biasing spring connected to one end of said actuating lever and a recoil spring connected to said end associated with said biasing spring.

8. Endless towing conveyor in accordance with claim **7**, where said switch tongue and said actuating lever include an angle of 90° between them when said switch tongue is inoperative.

9. Endless towing conveyor in accordance with claim **8**, where said carts are provided with rollers having a cross-section with an area parallel to the axis for rolling on the rectangular shaped switch tongue and an inwardly connecting area for rolling on rails of circular cross-section.

10. Endless towing conveyor in accordance with claim **9**, comprising a catch in said switch tongue defining a recoil latch automatically actuated by the counterweight in its lower area.

11. Endless towing conveyor in accordance with claim **10**, comprising elastic intermediate areas defined by rubber elements provided intermediate the towing chain and said driving means.

* * * * *