Sept. 25, 1962 D. M. SCHWARTZ ET AL 3,055,489

TAKE-UP MECHANISM

Filed Jan. 15, 1959 6 Sheets-Sheet 1

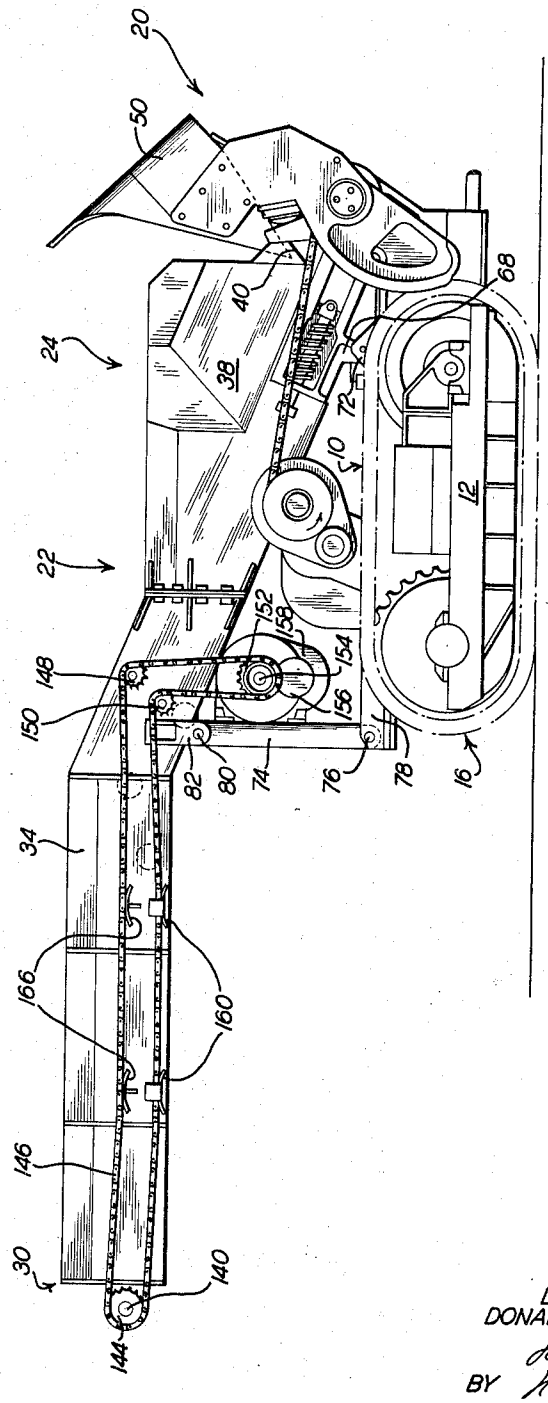


FIG. 1.

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6 Sheets-Sheet 2

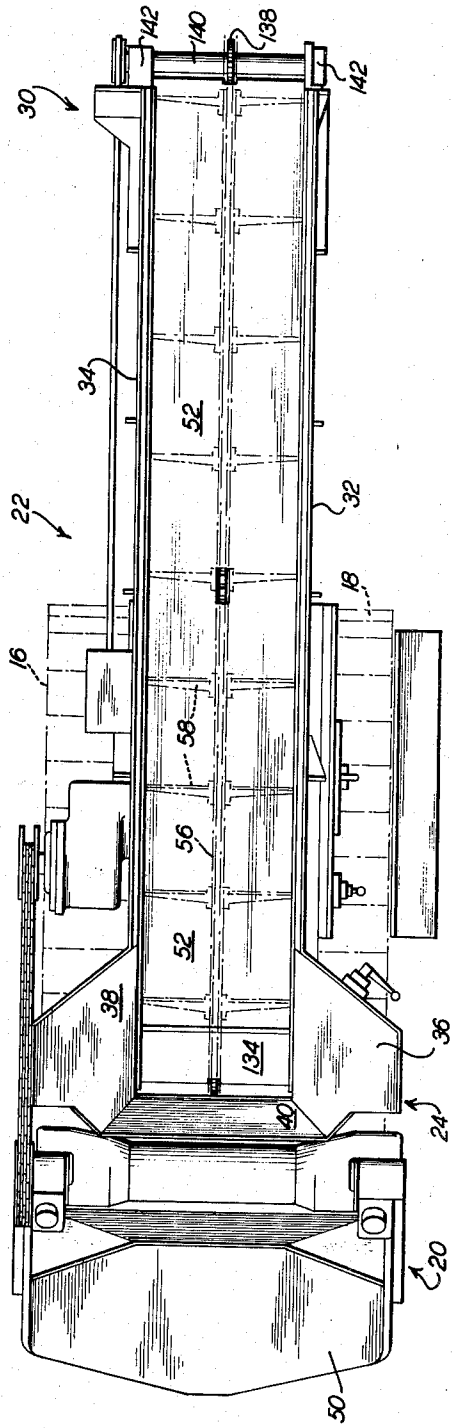


Fig. 2

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6 Sheets-Sheet 3

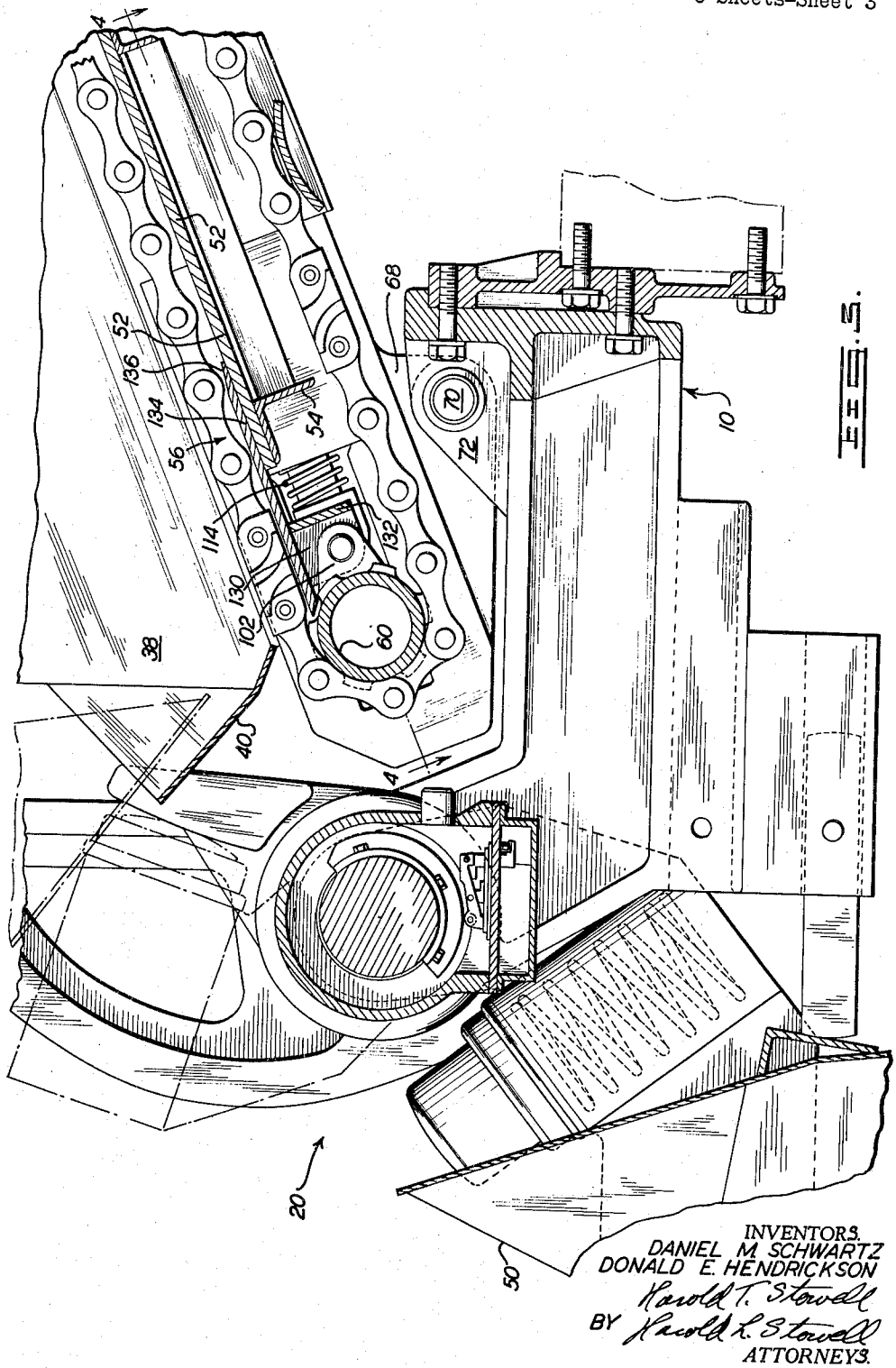


FIG. 5.

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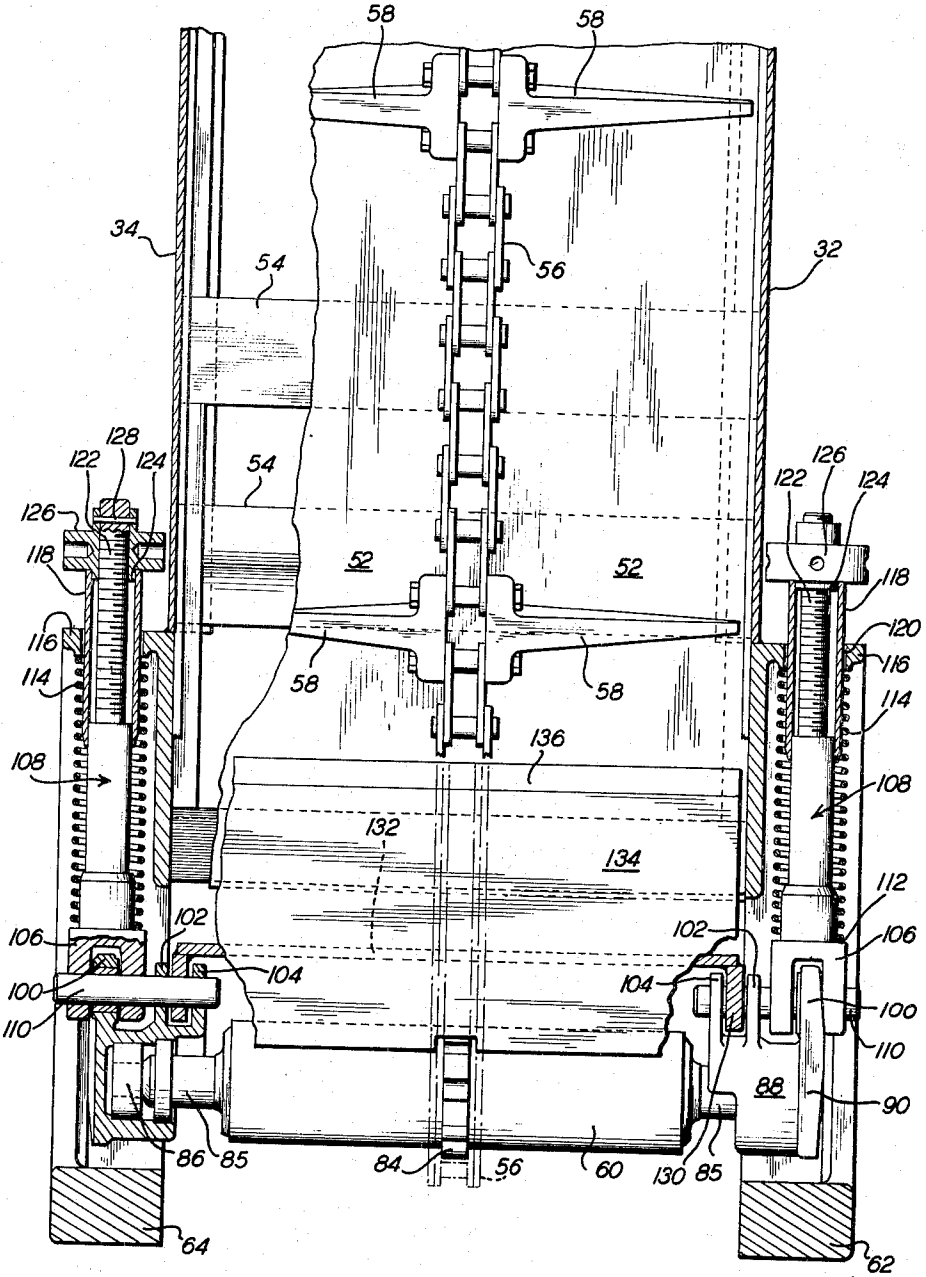


FIG. 4.

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TAKE-UP MECHANISM

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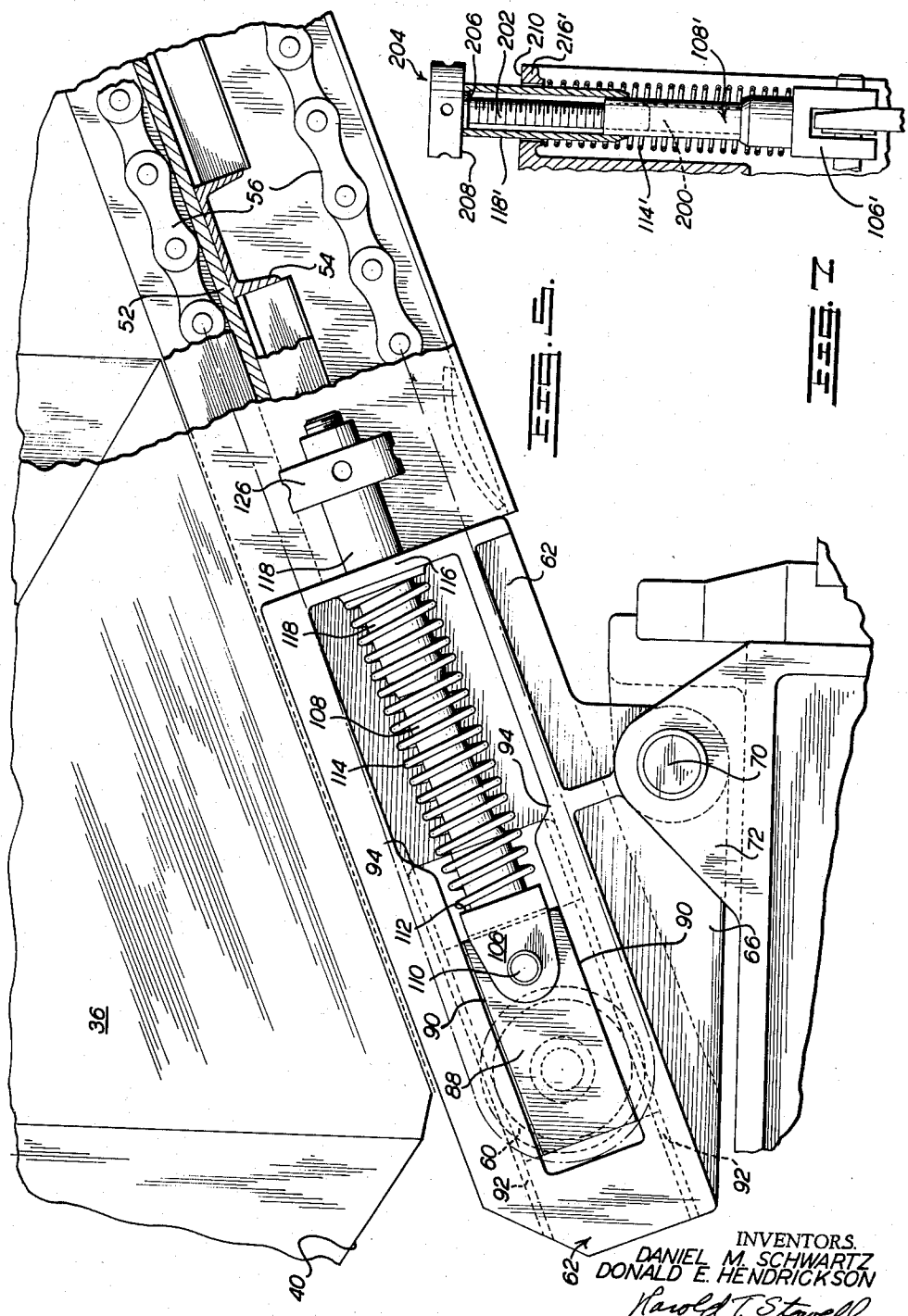


FIG. 5.

FIG. 4.

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TAKE-UP MECHANISM

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6 Sheets-Sheet 6

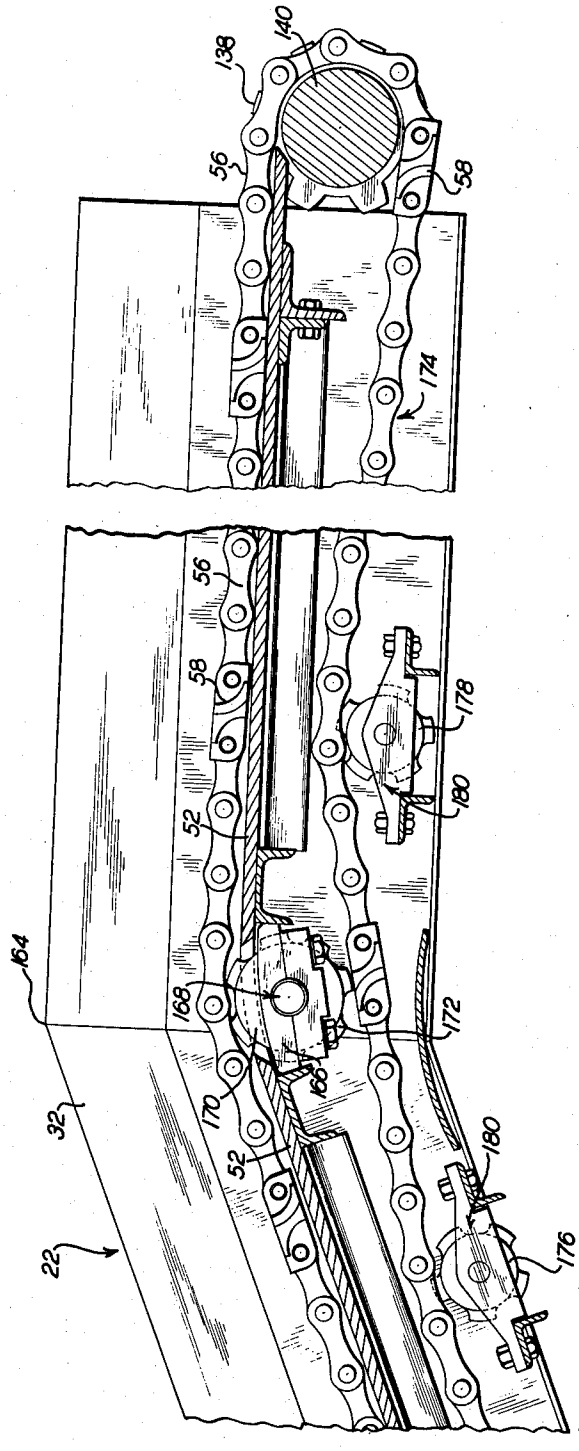


Fig. 6

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3,055,489

TAKE-UP MECHANISM

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Filed Jan. 15, 1959, Ser. No. 786,971
9 Claims. (Cl. 198—208)

This invention relates to new and improved take-up mechanism and, in particular, to resilient take-up mechanism for conveyors, traveling webs and belts, and the like.

It is a particular object of the present invention to provide improved resilient take-up mechanism including adjusting means for moving the take-up rod against resilient urging of resilient means for assembling and disassembling the mechanism.

A further object is to provide such a device wherein the adjusting means includes cooperating threadedly engaged elements which only takes the force of the resilient means during assembly and disassembly.

A further object is to provide such a device that is reliable in use, sturdy in construction, and relatively inexpensive to manufacture.

The invention will be described with reference to the incorporation of the novel resilient take-up mechanism in an endless belt conveyor and in conjunction with a novel sliding pan arrangement for the coveyor and movable with the resilient take-up mechanism.

The invention generally comprises a resilient take-up mechanism including a frame having an opening therein, a take-up member guided for axial movement through said frame opening, resilient means normally urging the take-up member in one direction axially of the frame opening, means for longitudinally adjusting the take-up member against the resilient urging of the resilient means including a threaded portion on the take-up member and a mating threaded member, the threaded member being adjustable into abutting engagement with the frame to longitudinally move the take-up member in the other direction axially of the frame opening against the resilient urging of the resilient means.

The invention will be more particularly described in reference to the accompanying illustrative embodiments thereof, wherein:

FIG. 1 is an elevational view of a pivoted bucket material handling machine including a conveyor incorporating the features of the invention;

FIG. 2 is a top plan view of the machine shown in FIG. 1;

FIG. 3 is an enlarged fragmentary sectional view of the front end portion of the structures shown in FIGS. 1 and 2;

FIG. 4 is a section on line 4—4 of FIG. 3;

FIG. 5 is an enlarged fragmentary detailed view of the tensioning mechanism shown in FIG. 4;

FIG. 6 is an enlarged fragmentary view in partial section of the rearward portion of the conveyor; and

FIG. 7 is a fragmentary view in partial section of a modified form of take-up member.

Referring to the illustrative embodiments of the invention, there is shown a material handling and excavating apparatus as disclosed in United States patent application Serial No. 739,751, filed June 4, 1958, of which this is a continuation-in-part.

The machine generally comprises a main frame **10** mounted on paired laterally extending crawler frames **12** carrying self-laying endless traction chains **16** and **18**.

The vehicle carries at its forward end a material handling structure **20** of the type adapted to load or gather

material at a low forward position and to discharge the material at an elevated position into a material conveying apparatus generally designated **22** adapted to receive material from the material handling device at its forward end **24** and to convey the material upwardly and rearwardly to a discharge end **30** positioned rearwardly of the rear end of the main frame of the vehicle.

The conveyor **22** includes spaced side walls **32** and **34**, the forward ends of which flare outwardly to provide a material receiving bin having side walls **36** and **38** and a front end wall **40**. The side walls **36** and **38** and the front end wall **40** are shaped to provide a substantially enclosed receiver for the bucket **50** when the bucket is in the discharge postion as shown in FIG. 1.

Between the side walls **36** and **38** is a bed plate **52** suitably supported on transverse structural members **54**. The bed **52** receives, on the upper surface thereof, an endless conveyor chain **56** provided with laterally extending chain flights **58** which gather the material discharged into the hopper and conveys the material upwardly and rearwardly to the discharge end **30**. The return flight of the endless conveyor chain **56** is below the deck plate **52** as shown, for example, in FIGS. 3, 5 and 6 of the drawings.

Positioned at the forward end **24** of the conveyor is an idler shaft **60** which is reciprocally mounted in front conveyor support members or frames generally designated **62** and **64**. Each of the side plates of support members **62** and **64** of the conveyor is provided with a wing portion **66** and **68**, respectively. These wing portions are bored and connected by pins **70** to the bosses **72** of the main frame **10**. The rearward portion **30** of the conveyor **22** is secured to the rearward deck portion of the main frame **10** of the vehicle by vertically extending structural members **74**. The lower ends of the members **74** are pin connected as at **76** to the rear end **78** of the main frame **10** of the vehicle while the upper ends are pin connected as at **80** to a bracket **82** secured to each side **32** and **34** of the conveyor.

By pin connecting the conveyor **22** at its rearward end to the main frame of the vehicle through the vertically extending structural members **74** and at its forward end through the winged frames **62** and **64** to the main frame **10** stresses and strains placed upon the vehicle when operating on unlevel ground and the like are kept to a minimum as relative movement is permitted at the points of the plural pin connections.

The front idler shaft **60** has a centrally positioned sprocket **84** formed thereon to provide a guide for directing the passage of the flexible conveyor chain **56** about the forward end of the conveyor structure and to insure rotation of idler shaft **60** with movement of conveyor chain **56**. The extended ends **85** of the idler shaft **60** are rotatably mounted in bearings **86** maintained in bearing blocks **88** provided with quadrangular faces **90** which are slidably received in an elongated trackway **92** formed in each of the front mounting members or frame portions **62** and **64** for the conveyor. The trackways **92** formed in each of the support members **62** and **64** are enlarged as at **94** at their rearward ends whereby the bearing blocks **88** may be inserted in or removed from their respective trackways as to be more fully described hereinafter.

As more clearly shown in FIG. 4, the rearwardly extending portions of each of the bearing retaining blocks **88** is provided with plural bosses designated **100**, **102** and **104**. Bosses **100** are received in the bifurcated ends **106** of take-up members **108** which control the longitudinal receiprocating movement of the bearing blocks **88**. The bifurcated ends **106** are bored and connected by pins **110** to bearing block bosses **100**. The bifurcated

end **106** of each take-up member or shaft **108** is also provided with a lower seat **112** for spring **114** while the other end of each spring abuts the end **116** of its respective conveyor support frame.

Each of the ends **116** of the frames **62** and **64** is bored to receive a sleeve **118** freely therethrough, with clearance **120** between the outer surface of the sleeve **118** and the inner surfaces of the openings through the rearward portions **116** of the frames.

The sleeves **118** protect the threaded portion **122** of each of the take-up members **108** during reciprocation of the take-up members in the bores in the end plates **116** of the frames **62** and **64**. The rearwardmost end of each of the sleeves **118** engages a boss **124** at the inner end of each of the capstan nuts **126** which capstan nuts are threadedly mounted on the extended ends of the threaded portions **122** of each of the take-up members **108**. The sleeves **118** may be press-fitted to the bosses **124** or welded thereto to insure that the sleeves remain in their protective location relative to the threaded portions **122** of the take-up members.

Each of the capstan nuts **126** may be provided with a pin **128** whereby the nuts may be pin-connected to the extended end of its take-up member **108** in a normal operating position. While in the form of the invention illustrated in the drawings, the resilient means or spring **114** is of the compression type, it will be apparent that extension spring or other types of resilient means acting between the frames **62** and **64** and respective take-up members **108** could be employed for urging the bearing blocks **88** in a direction remote from the ends **116** of the frames to place tension on the endless conveyor chain **56** or other member passing about the roller **60**.

In operation of the idler shaft tensioning structure, with the mechanism positioned as shown, the springs **114** maintain a predetermined forward pressure on their respective bearing retaining blocks **88** urging the roller **60** forward against the endless conveyor chain **56** while permitting the chain to resiliently give in the event rocks and other foreign material lodge between the chain links which would normally interfere with the passage of the chain about the idler and drive shafts, thus relieving the conveyor chain of unnecessary strains. The tensioning mechanism also provides the means whereby the conveyor chain may be manually placed in a slack condition for easy removal, replacement and repair. To remove the tension on the chain, pins **128**, where they are employed, are removed and each of the capstan nuts **126** is screwed toward the bifurcated ends of the guide rods. When the capstan nuts **126** are screwed downwardly until their inner faces are in engagement with the outer surfaces of frame members **116** of their respective support members, further rotation of the capstans compress the springs **114** and slide the bearing blocks **88** toward the rearward ends of their tracks **92** formed in respective conveyor support frames **62** and **64**.

If it is necessary to remove or replace the take-up springs **114**, if they have been broken or damaged, this may be readily accomplished without dismantling the whole conveyor.

To remove the spring take-up assembly, nut **126** is turned to compress the spring **114** until the resilient force of the spring is restrained and transferred from a direct force on the pin **110** to restraint against the frame. The pin **110** can then be removed freely. After the pin is removed the nut **126** is turned further to move the bifurcated end **106** to the rear until it is clear of boss **100**. The whole assembly may then be cocked to the outside in clearance **120** provided in the opening in end frame **116**. Nut **126** is then turned in the opposite direction and removed from the take-up member **108**, allowing complete disassembly.

To install a new spring the procedure is reversed by tightening nut **126** and compressing the spring **114**, at the same time advancing end **106** to the rear until it can be inserted over the boss **100**. Turning capstan nut **126** in the opposite direction will allow the spring to expand and the bifurcated end **106** to advance over boss **100** until the pin **110** can be replaced.

As hereinbefore described, each of the bearing blocks **88** also includes bosses **102** and **104**. These bosses are bored to receive the pins **110** which couple the bifurcated ends **106** of the guide rods **108** to the bosses **100**. Between each of the pair of bosses **102** and **104**, and maintained therein by pins **110**, are plates **130** which are interconnected by a depending rib **132** secured such as by welding to the under surface of a plate **134** corresponding to a front extension of the bed **52** of the conveyor. The most rearward edge of the bed extension **134**, designated **136**, is tapered to provide a narrow edge for sliding contact with the bed **52**. It will also be noted from FIGS. 3 and 4 that the bed extension **134** overlaps the forward edge of the main bed **52** to insure that as the bearing blocks **88** carrying the idler shaft **60** are caused to reciprocate, by foreign material which may engage the links in the conveyor chain **56** no open space is formed in the conveyor deck.

The conveyor chain **56** is driven from the discharge end **30** of the conveyor by sprocket **138** secured to live shaft **140** rotatably mounted in bearing blocks **142** secured to each side wall of the conveyor. The shaft **140** has also secured thereto a sprocket **144** about which a drive chain **146** is trained. The drive chain **146** extends about a pair of idler sprockets **148** and **150** and then about a driven sprocket **152** keyed to the output shaft **154** of a reduction gear unit **156** driven by a motor **158** supported between the vertical support members **74** at the rearward end of the conveyor.

As more clearly shown in FIG. 1, the lower flight of the drive chain **146** passes over chain guides **160** while the upper flight of the drive chain **146** is provided with guide elements **162**.

In order to reduce the headroom requirements of the material handling machine, in the illustrative embodiment of the present invention, the rearward portion of the conveyor **22** is disposed in a plane generally parallel with the bed of the main frame **10** of the vehicle. Referring particularly to FIG. 6 of the drawings, at the line of juncture **164** between the generally horizontal portion and the inclined portion of the conveyor, the bed **52** of the conveyor **22** is apertured and an idler sprocket generally designated **166** is rotatably mounted in suitable bearings **168** with a segment of the barrel portion **170** of the idler sprocket **166** projecting through the aperture to engage the conveyor chain **56**. The toothed portion **172** of the sprocket **166** provides lateral stability to the conveyor chain and the location of the idler sprocket **166** supports the upper conveyor flight of the conveyor chain to minimize wear on the conveyor pan **52** in the area of the conveyor bend from the inclined portion to the generally horizontal portion.

The lower flight **174** of the conveyor chain **56** is also supported in the area of the juncture between the inclined and the horizontal portions of the conveyor structure. The lower flight **174** is supported by a pair of idler sprockets **176** and **178**. Each of these idler sprockets rotate with motion of conveyor chain **56** and each is suitably supported in bearings carried by brackets generally designated **180** which brackets are secured to the conveyor structure. As more clearly shown in FIG. 6 of the drawings, the lower idler sprocket **176** and the upper idler sprocket **178** for the lower chain flight **174** are positioned generally forwardly and rearwardly of the upper chain flight support and idler sprocket **166**, whereby the lower flight **174** of the conveyor chain is elevated and the weight of the lower flight of the conveyor chain is effectively carried minimizing unnecessary loading and wear of the conveyor chain during its return flight.

From the foregoing description, it will be seen that the conveyor fully accomplishes the aims and objects herein-

before set forth. It will also be apparent that other advantages are inherent in the improved conveyor structure. For example, with the conveyor chain **56** driven by the rear sprocket **140** the tension side of the chain is upper material conveying flight thereof, whereby the tension required for proper operation of the structure is reduced and in addition the conveyor chain **56** is to a large measure prevented from bunching up as it drags material being conveyed across the pan **52** to the discharge end **30** of the conveyor bed.

Having described our invention, it will be seen that a novel resilient take-up mechanism is provided for belts, chains and the like and an improved conveyor flight including a sliding pan extension movable with the extension and retraction of a conveyor chain or web passing about the take-up mechanism. It will be apparent that various modifications may be made in the form of construction shown in the drawings without departing from the invention as defined in the appended claims. For example, the nut **126** for the take-up member **108** could comprise an externally threaded bolt as illustrated in FIG. 7. Referring to FIG. 7, the take-up member **108'** is bored and internally threaded as shown at **200**. The internal threads of the take-up member **108'** mate with the external threads **202** of a capstan bolt **204** which bolt is provided with a boss **206** to which the sleeve **118'** is secured.

In operation of this form of the invention, the mating threads on the capstan bolt and the take-up member **108'** do not take any of the force of spring **114'**. However, when it is desired to assemble or disassemble the unit bolt **204** is screwed inwardly of the take-up member **108'** until the face **208** of the bolt head comes into contact with surface **210** of the frame portion **116'**. Further inward movement of the bolt **204** compresses spring **114'** as the lower end **106'** of the take-up member **108'** is moved toward the frame portion **216'** as described with reference to the form of the invention shown in FIGS. 1–6.

We claim:

1. A resilient take-up device comprising a frame having an opening therein, a bearing member slidably mounted in said frame, a take-up member guided for axial movement through said frame opening and connected to said bearing member for reciprocation therewith, resilient means normally urging said take-up member in one direction axially of said frame opening, means for longitudinally adjusting said take-up member against the resilient urging of said resilient means including a threaded portion on said take-up member and a mating threaded member, said threaded member being adjustable into abutting engagement with said frame to longitudinally move said take-up member in the other direction axially of said frame opening against the resilient urging of said resilient means when said threaded member is screwed toward said resilient means from a position of abutting engagement with said frame.

2. The invention defined in claim 1 wherein said resilient means comprises a compression spring.

3. The invention defined in claim 1 wherein said mating threaded member comprises a nut.

4. The invention defined in claim 1 wherein said mating threaded member comprises a bolt.

5. A resilient take-up device comprising a frame having an opening therein, a bearing member slidably mounted in said frame, a take-up member guided for axial movement through said frame opening and pivotally connected to said bearing member for reciprocation therewith, resilient means acting between said frame and said take-up member and normally urging said take-up member in one direction axially of said frame opening, means for longitudinally adjusting said take-up member against the resilient urging of said resilient means including a threaded portion on said take-up member and a mating threaded member normally maintained out of engagement with said frame, said threaded member being adjustable into abutting engagement with said frame to longitudinally move said take-up member in the other direction axially of said frame opening against the resilient urging of said resilient means when said threaded member is screwed toward said resilient means from a position of abutting engagement with said frame.

6. A resilient take-up device comprising a frame having an opening therein, a bearing member slidably mounted in said frame, a take-up member guided for axial movement through said frame opening and pivotally connected to said bearing member for reciprocation therewith, resilient means acting between one face of said frame and the take-up member normally urging said take-up member in one direction axially of said frame opening, means for longitudinally adjusting said take-up member against the resilient urging of said resilient means including a threaded portion on said take-up member and a mating threaded member on said take-up member and positioned adjacent the other face of said frame, said threaded member being adjustable along said take-up member into abutting engagement with the said other face of said frame to longitudinally move said take-up member in the other direction axially of said opening against the resilient urging of said resilient means.

7. In an endless conveyor comprising a material receiving end and a material discharge end, an endless conveyor means extending between said receiving and discharge ends, drive means for said endless conveyor chain connected to one of said ends, an idler shaft at the other end about which said endless conveyor means pass, and means for urging said idler shaft away from said drive end comprising a pair of side frames for said conveyor, means slidably mounting the ends of the idler shaft in the respective side frames, each of said side frames having an opening therein, a take-up member guided for axial movement through the opening in each of the side frames and having connection to its respective mounting means for the idler shaft ends, resilient means acting between one face of said frame and the take-up member and normally urging said take-up member in one direction axially of said frame opening, means for longitudinally adjusting said take-up member against the resilient urging of said resilient means including a threaded portion on said take-up member and a mating threaded member on said take-up member and position adjacent the other face of said frame, said threaded member being adjustable into abutting engagement with the said other face of its respective frame to longitudinally move said take-up members toward the drive end of the conveyor axially of each of said frame openings against the resilient urging of said resilient means.

8. In an endless conveyor comprising a material receiving end and a material discharge end, an endless conveyor means extending between said receiving and discharge ends, drive means for said endless conveyor chain connected to one of said ends, an idler shaft at the other end about which said endless conveyor means pass, and means for urging said idler shaft away from said drive end comprising spaced bearing blocks for the ends of said conveyor shaft, said bearing blocks mounted for reciprocating motion in guideways, rear stop members for said guideways having openings therethrough, a take-up member guided for axial movement through the openings in each of the stop members and having connection to its respective mounting means for the idler shaft ends, resilient means normally urging each of said take-up members in one direction axially of said stop member openings, means for longitudinally adjusting each of said take-up members against the resilient urging of said resilient means including a threaded portion on each of said take-up members and a mating threaded member therefor, said threaded member being adjustable into abutting engagement with its respective stop member to longitudinally move the take-up members in the other

direction axially of said stop member openings against the resilient urging of said resilient means when said threaded member is screwed toward said resilient means from a position of abutting engagement with said frame.

9. The invention defined in claim 8 including a conveyor pan extension adjacent the idler shaft and means connecting said conveyor pan extension to said bearing blocks whereby said pan extension reciprocates with said conveyor shaft.

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