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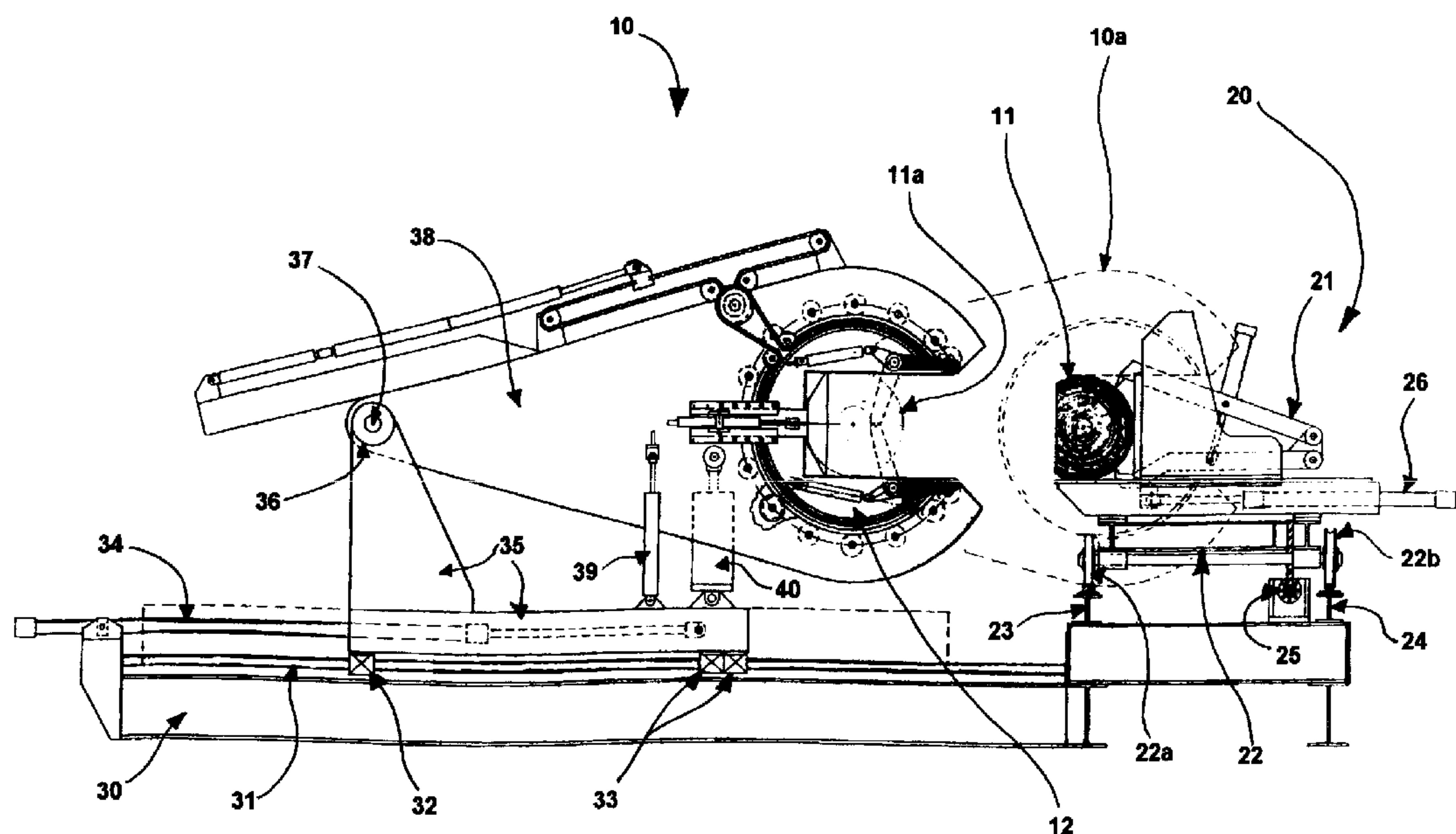
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(54) **SYSTEME AUTOMATISE PERMETTANT DE TOURNER ET DE  
PRE-POSITIONNER LES GRUMES AVEC PRECISION**

(54) **AUTOMATED PRECISION LOG PRE-POSITIONING AND LOG  
TURNING SYSTEM**



(57) An automated log pre-positioning and turning system including a log manipulating mechanism with a C-shaped positioning unit for capturing, rotating, skewing, or otherwise moving logs. The system may be used to entirely replace antiquated sawmill systems or may be used in part to replace antiquated turning elements with the inventive log manipulating mechanism and its C-shaped positioning unit. The log manipulating mechanism is designed to operate in cooperation with computerized scanning equipment without requiring excessive modifications to do so. With relatively few mechanical parts, the log manipulating mechanism includes both rotational and skewing capabilities to position a log quickly and automatically with both precision and finesse. This provides new and useful pre-positioning, turning, and skewing features that increases sawmill productivity, while effectively decreasing log waste.

**ABSTRACT**

An automated log pre-positioning and turning system including a log manipulating mechanism with a C-shaped positioning unit for capturing, rotating, skewing, or otherwise moving logs. The system may be used to entirely replace antiquated sawmill systems or may be used in part to replace antiquated turning elements with the inventive log manipulating mechanism and its C-shaped positioning unit. The log manipulating mechanism is designed to operate in cooperation with computerized scanning equipment without requiring excessive modifications to do so. With relatively few mechanical parts, the log manipulating mechanism includes both rotational and skewing capabilities to position a log quickly and automatically with both precision and finesse. This provides new and useful pre-positioning, turning, and skewing features that increases sawmill productivity, while effectively decreasing log waste.

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# AUTOMATED PRECISION LOG PRE-POSITIONING AND LOG TURNING SYSTEM

## BACKGROUND OF THE INVENTION

### 5 Field of Invention

The present invention relates generally to the field of sawmill equipment. More particularly, the present invention relates to a device for providing fast and precise log positioning in a sawmill setting. More particular yet, the present invention involves an improved log turner for automated precise turning and  
10 positioning of raw logs before and during sawing.

### Description of Prior-art

While the general lumber industry involves many problems associated with obtaining an increased yield of lumber from raw logs of lesser and lesser quality,  
15 the more specific problem of obtaining the highest yield of logs from raw lumber during the sawing process will be discussed herein. In the sawmill industry, it is becoming more common to automate the processing of raw logs into end products as automation offers significant advantages in terms of processing speed, reliability, and cost. It should be noted that this discussion is limited to the  
20 specific field of sawmill processes for the sole purpose of illustrative clarity and is not meant to limit the intended scope of the invention.

In handling raw logs during any sawmill operation, the logs are generally carried on conveyor belts between processing equipment that performs specific tasks on the logs. For example, in the processing of logs into sawed lumber,  
25 there are a number of steps involved. First, a group of raw logs are processed by equipment that separates the group into individual logs. Each individual log is then processed by de-barking equipment. The logs are then fed on a conveyor past scanning equipment that analyses the cross-sectional area of each log and determines the orientation of the log for maximum recovery or conversion into  
30 saleable product. An example of such scanning equipment can be found in **U.S.**

**Patent No. 4,139,035** issued to **Bystedt et al.** where a log is positioned via scanners to determine a preferred saw line. In prior-art devices such as **Bystedt et al.**, the log is then passed by orienting equipment that rotates the log to the desired orientation and onto the sawing equipment that cuts the log into raw  
5 lumber. An additional step may also involve cutting the logs into set lengths at some stage in the process. An important part of this automatic processing of logs as outlined above is the orientation of the log to ensure maximum recovery.

Conventional equipment known as "flying vertical rolls" have also been developed to adjust the orientation of logs in response to control signals  
10 generated by computer scanning equipment. The scanning equipment determines the angle to which a log should be rotated and the "flying vertical rolls" carry out the rotation of the log about its longitudinal axis. Conventional equipment comprises one or more pairs of spaced, upstanding spike rolls positioned on either side of a conveyor belt that define a passage through which  
15 a log to be rotated passes. The spike rolls are cylindrical members with radially extending spikes to grip and engage the log. The upstanding spike rolls are driven to rotate about their vertical axis thereby causing a log in the passage between the rolls to be advanced forward. The term "flying" in the name of the equipment refers to the fact that the log moves continuously through the passage  
20 even as it is being oriented. The spike rolls are also adapted for movement along the vertical axis about which they rotate. Moving a spike roll on one side of a log along the vertical axis while maintaining the position of the spike roll on the other side of the log causes the log to rotate to a new angle.

In addition to the "flying vertical roll" equipment, there more commonly  
25 exists the "Hill-type" turner equipment. Based upon technologies perfected during the last century by the William E. Hill Manufacturing Company of Kalamazoo, Michigan, Hill-type turners have endured for more than 100 years as the predominant sawmill device for turning raw logs. Hill-type turners are devices that include a vertical bar having pivoting teeth. The bar travels tangentially  
30 upward against the face of a log allowing the protruding teeth to engage the log

and force it to rotate. The bar also rocks back and forth towards and away from the log face to allow for irregularities in the log surface.

While earlier versions of the Hill-type turner were actuated via steam pistons, contemporary versions utilize current hydraulics to actuate the vertical bar. However, operation of such Hill-type turners has remained virtually unchanged such that manual control by a sawmill operator is required. Such manual control occurs via a control handle that is rocked left/right for corresponding up/down movement of the vertical bar. The control handle is rocked forward and back for related back and forth movement of the vertical bar towards and away from the log face. Such manual control is an acquired skill that is highly subject to the vagaries of human error. Indeed, many months of costly training is involved for a sawmill operator to even become productive in using a Hill-type turner and mastery of such manual control is rare.

Various known devices exist that operate fundamentally the same as the Hill-type turner. That is to say, such known devices exist for orienting logs that effect log rotation by tangentially applying forces to the log surface. For example, **U.S. Patent No. 3,269,432** issued to **Mellott et al.** discloses a vertically oriented chain for rotating a log against a fixed abutment. Even more recently, **U.S. Patent No. 4,102,229** issued to **Pryor et al.** discloses a log turner having a rectangular hollow bar that includes pivotable teeth. The bar is manipulated for tangential movement astride a log so as to allow the teeth to pivot when contacting the log. Vertical movement of the bar then transfers rotational motion to the log via the teeth in order to effect a log turn.

Such prior-art devices, while relatively simply constructed and maintained, limit the efficiency of a log cutting operation because each exhibits cumbersome movement of the log. Further, time-consuming steps are needed to prevent axial rotation of the log while the log is being engaged and rotated to the desired orientation by the log turner. Accordingly, an otherwise continuous line of production is interrupted. Moreover, once the given prior-art device turns the log, the log is unclamped and able to roll back to an undesirable orientation while it is progressing to a subsequent processing station.

Although, the "flying vertical roll" and "Hill-type turner" equipment do perform log rotation, these types of prior-art turners suffer from the significant drawbacks that accurate angular rotation of a log is difficult to achieve. Further, lengthwise skewing of the log is not practical using the prior-art devices. The calculations needed for such vertical movement of one or more spike rolls or toothed bars to rotate a log through a selected angle is quite complex. Because a log is essentially a tapered cylinder, rotating the log axis through a given angle by a tangential vertical movement at the perimeter of the log will depend on the circumference of the log at the point of engagement of the spike rolls. Therefore, it is necessary to take many variables into account.

Such variables include, among others, the feed speed of the log through the equipment, the time of engagement with the spike/teeth, and the overall surface irregularities of each log. These variables are needed to be able to calculate the circumference of the portion of the log that is engaged by the spike/teeth when the log is to be rotated. Further, raw logs tend to have a curvature or "sweep" that must be taken into account when determining the vertical movement of the spike/teeth. It is readily apparent that the accuracy of operation of the prior-art devices is greatly diminished by the asymmetrical nature of raw logs having knots or other defects. Such asymmetrical defects in the log will result in slippage of the spike/teeth along the log. In sum, it is extremely difficult to achieve optimum angular positioning of a raw log using such "flying vertical roll" and "Hill-type turner" equipment.

Indeed, none of the prior-art references discussed above adequately provide for the finesse necessary to quickly and accurately position raw logs to enable the best cuts of lumber from any given log. Contemporary improvements in these prior-art devices have been limited to cumbersome designs that combine useful log-scanning technologies with sorely antiquated log-turning technologies. The prior-art devices do not provide any features that would quickly and accurately allow total scanning of each log so as to pre-position the log. Further, the prior-art devices do not provide any features that would quickly and

accurately provide re-positioning of the log between cuts. Such ineffective log positioning using the prior-art devices not only results in slower production of lumber, but also results in undesirable waste of raw lumber due to inaccurate positioning and cutting even in the presence of current scanning technologies.

5           Accordingly, it is desirable to provide for a new and improved, effective positioning device for such purposes as, but not limited to, log pre-positioning and turning during sawmill processing. What is needed is such a positioning device that substantially automates sawmill operation during all stages – i.e., scanning, pre-positioning, cutting, and turning stages. What is also needed is  
10 such a positioning device that increases production of lumber with a related reduction in waste. What is further needed is such a positioning device that can be used either to replace antiquated systems entirely or enhance the efficiency of a contemporary scanning system using antiquated turning elements. Still, what is  
15 needed is such a positioning device that is able to operate in cooperation with computerized scanning equipment and does not require excessive modifications to do so. Still further, what is needed is such a positioning device that includes both rotational and skewing capabilities, all while requiring relatively few mechanical parts. Yet still further, what is needed is such a positioning device  
20 which overcomes at least some of the disadvantages of the prior-art while providing new and useful pre-positioning, turning, and skewing features.

### **SUMMARY OF THE INVENTION**

It is an objective of the present invention to provide a new and improved, effective automated log pre-positioning and turning system that provides  
25 precision pre-positioning of raw logs and highly accurate turning of such logs along with skewing movement during sawmill processing. It is another objective of the present invention to provide such an automated log pre-positioning and turning system that utilizes computerized automation of sawmill operation during all stages including scanning, pre-positioning, cutting, and turning (with skewing)  
30 without human intervention. Thus, the present invention substantially eliminates human error and related waste of mill time and log resources. Another objective

of the present invention is to provide such an automated log pre-positioning and turning system that entirely replaces antiquated systems or may be used in-part to replace antiquated turning elements so as to increase the efficiency of a contemporary scanning system still using such antiquated turning elements. Still  
5 another objective of the present invention is to provide an automated log pre-positioning and turning system that delivers increased finesse in manipulation of raw logs while not interfering or jeopardizing other sawmill processes. Yet still another objective of the present invention to provide an automated log pre-positioning and turning system that operates in cooperation with computerized  
10 scanning equipment without requiring excessive modifications to do so. Such an automated log pre-positioning and turning system includes both rotational and skewing capabilities, yet requires few mechanical parts.

The present invention is directed to an automated log pre-positioning and turning system that includes a hydraulically actuated log manipulating mechanism  
15 with an integrated C-shaped element (hereinafter "positioning unit") useful for, but not limited to, sawmill purposes such as capturing, positioning, skewing, rotating, and transporting logs. In addition to the hydraulically actuated log manipulating mechanism with its positioning unit, the overall inventive system includes a stop and loader section, a conveyor section, a scanning section, a carriage section,  
20 and a sawing section. The stop and loader section provides a means for loading raw logs from a log deck one at a time into a pre-positioning area. Within the pre-positioning area, the conveyor section provides a means for conveying a log through a trough into a roller area. In the roller area, turning wheels rotate the log at least one complete rotation so that the scanning section can electronically  
25 scan the log. This electronic scanning functions to capture the log's dimensional information, calculate the optimal cutting solution for the given log, and output operational commands to the log manipulating mechanism, the carriage section, and the sawing section.

Moreover, after the log passes through the scanning area, the log  
30 manipulating mechanism is utilized to capture the log within the positioning unit. In response to computer-generated operational commands derived from the

scanning process, the log manipulating mechanism moves to secure the log within its positioning unit and rotate and skew the log to the log's predetermined best opening face (BOF). The BOF represents the initial lengthwise cut to the log that will optimize the quality and quantity of the resulting lumber. Once rotated and skewed to the BOF, the log is deposited onto the carriage section by the log manipulating mechanism. The carriage section includes multiple headblocks that hold the log onto a movable carriage. Each headblock moves in response to the given shape of the log. That is to say, the headblocks are actuated (e.g., hydraulically, electromechanically, ..etc.) in response to computer commands derived from the scanning process such that the multiple headblocks together conform to the given log shape. While the headblocks might be aligned identically for a very straight log, they may each be positioned drastically differently for a particularly crooked or knotty log.

The headblocks in the carriage section will maintain the log on the movable carriage. The movable carriage is movable in two directions and allows for multiple passes through the sawing section. The first direction moves the BOF (and subsequent cuts) past a bandsaw, or similar sawing device, in a back and forth motion along the length of the log. While the sawmill described herein is a carriage-type sawmill, it should be noted that any type of sawmill will benefit from the features of the present invention. A single pass results in a single cut of lumber from the log. After each pass, the movable carriage incrementally moves the open face of the log towards the bandsaw. This results in varying lumber thickness according to the given increment of movement. This is continued until the pre-determined point for log turning is reached. That pre-determined point having been calculated during the scanning process.

At that pre-determined point where all cuts on the first face (BOF and the successive cuts) have been made, the log manipulating mechanism will again capture the log and rotate the log by either a quarter turn (90°) or a half turn (180°). According, to the commands derived from the scanning process, additional skewing may or may not be necessary. Though it should be noted that it is possible to skew the log at any time while the log manipulating mechanism

holds it. This becomes a critically useful feature when a raw log having a significant sweep is encountered. After such rotation (with or without skewing) to the second face to be cut, the log manipulating mechanism will re-deposit the log into the carriage section. Again, the headblocks will adjust to the changing shape of the cut log so as to secure the log for several passes into the sawing section. This cutting, re-positioning, cutting process is repeated until all possible cuts have been made and all lumber acquired from the given log. At such point, a new log enters the system and is milled accordingly.

An important aspect of the present invention is that the next log to be milled may be deposited into the conveyor section and scanned while the last cutting passes are being made to the previous log. In this way, the log manipulating mechanism can deposit the next log onto the carriage section upon completion of the final cut of the previous log. This allows the immediate commencement of the cutting of the next log. This elimination of any required log adjustments on the movable carriage prior to cutting virtually keeps a log constantly in the sawing section. This represents a substantial benefit over prior-art positioning systems and turning devices.

Overall, it should be understood that elements such as conveyors, rollers, carriages, bandsaws, electronic scanning equipment, computer controllers, hydraulic cylinders, electrical solenoids, wiring harnesses and electrical connection devices, and various related and similar devices may be used within the present invention. However, the specificity of such related and similar devices is a secondary consideration as compared to the primary features embodied in the present invention. That is to say, the log manipulating mechanism and its incorporation into and inter-relation to the inventive system as a whole is considered to embody that which is considered the invention. Further, it should be readily apparent that many different combinations of such related and similar devices may be utilized within the inventive system in cooperation with the log manipulating mechanism without straying from the intended scope of the present invention.

The invention will be described for the purposes of illustration only in connection with certain embodiments; however, it is to be understood that other objects and advantages of the present invention will be made apparent by the following description of the drawings according to the present invention. While a preferred embodiment is disclosed, this is not intended to be limiting. Rather, the general principles set forth herein are considered to be merely illustrative of the scope of the present invention and it is to be further understood that numerous changes may be made without straying from the scope of the present invention.

### BRIEF DESCRIPTION OF THE DRAWINGS

**FIGURE 1** is a side view of the log manipulating mechanism and its C-shaped positioning unit according to the preferred embodiment of the present invention shown in operation with a carriage section and partially cut log.

**FIGURE 2** is a top view of the inventive system showing multiple logs entering the system and one log within the positioning unit of the log manipulating mechanism that is shown in **FIGURE 1**.

**FIGURE 3** is a side view of the log manipulating mechanism taken alone according to the preferred embodiment.

### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is directed to a computerized log positioning system useful in a sawmill setting. The inventive system includes a novel log manipulating mechanism having a positioning unit. The log manipulating mechanism is preferably used in combination with an overall sawmill system that includes a stop and loader section, a conveyor section, a scanning section, a carriage section, and a sawing section. Although a carriage-type sawmill is preferred, the present invention can be adapted for use within any type of sawmill. Further, each section is fully computer controlled in a manner consistent with current technologies an interconnected through standard connecting devices

– e.g., electrical wiring and cabling, hydraulic hosing and tubing, ...etc.). More specifically, a system operator can oversee and override operation of the inventive system, but normal operation including log loading, scanning, positioning, and cutting are accomplished in response to computer generated commands. While a preferred configuration of the overall system will be shown in the drawings, this should be considered as a general preference for descriptive purposes. Accordingly, for illustrative clarity, the present invention will be described hereinbelow in specific detail only with respect to the novel log manipulating mechanism. All other system components being generally discussed only insofar as necessary to enable the utility of the log manipulating mechanism to one of ordinary skill in the sawmill art.

Referring now to **FIGURE 1**, there is shown a side view of the log manipulating mechanism **10** in accordance with the preferred embodiment of the present invention. The log manipulating mechanism **10** includes a positioning unit **12**. The positioning unit **12** is preferably C-shaped and dimensioned so as to substantially surround logs sized for lumber uses (e.g., three foot diameter logs). The positioning unit **12** is rotatably situated within the end of the log manipulating mechanism **10**. A log **11** is shown having its BOF already cut. The log **11** is shown secured within a headblock **20**. The headblock **20** includes a dogging mechanism **21** that clamps the log **11** down atop a movable carriage **22**. The movable carriage **22** is able to move via wheels **22a** and **22b** along rails **23** and **24**, respectively, in a direction parallel to the length of log **11**. Movement along the rails **23**, **24** is actuated by way of hydraulics via a carriage traverse cylinder **25**. Additionally, the movable carriage **22** is able to move in a direction perpendicular to the length of log **11** via a headblock cylinder **26**. This dual movement of the movable carriage **22** will become more apparent with reference to **FIGURE 2** below.

With continued reference to **FIGURE 1**, the log manipulating mechanism is seen to include a baseframe **30** that includes rails **31** (one hidden). Mounted to the baseframe **30** is a support **35**. The support **35** is attached to the rails **31** via

bearing mounts **32** and **33**. A baseframe cylinder **34** is provided and attached between the baseframe **30** and support **35**. The baseframe cylinder **34** is a hydraulic cylinder which, when activated, causes the support **35** to ride along the rails **31**. Such movement by the log manipulating mechanism **10** is shown by dotted element **10a** where it can be seen how the log manipulating mechanism **10** is able to fit beside the headblock **20** and movable carriage **22**. This reveals how the positioning unit **12** is able to deposit the log **11** into the position as shown from the position shown by dotted lines **11a**. Specific structure on the log manipulating mechanism **10** related to log positioning will be discussed later with respect to **FIGURE 3**.

With final reference to **FIGURE 1**, the support **35** of the log manipulating mechanism **10** includes a pivot mount **36**. The main body **38** of the log manipulating mechanism **10** has a pivot **37** that connects to the pivot mount **36**. As steel or some relatedly durable alloy is preferably used to fabricate the log manipulating mechanism, it becomes apparent that the forces acting upon the pivot **37** within the pivot mount **36** are great. In order to facilitate raising and lowering the positioning unit **12** (and any given accompanying log held therein), the heavy steel main body **38** is held against pivoting movement via a lifting cylinder **40**. The lifting cylinder **40** is mounted between the support **35** and the main body **38**. Since most weight of the log manipulating mechanism **10** is therefore taken up by the pivot mount **36** and the lifting cylinder **40**, arcuate movement about the pivot **37** only requires the use of a fine positioning cylinder **39**. Similar to the lifting cylinder **40**, the fine positioning cylinder **39** is mounted between to support **35** and the main body **38**. However, the fine positioning cylinder **39** is designed to react faster than the lifting cylinder **40** to effect small vertical adjustments of the main body **38** and thus adjustments of the grasped log (see **11a**).

**FIGURE 2** is a top view of an automated precision log pre-positioning and log turning system **100** according to the preferred embodiment of the present invention. The system **100** shows the log manipulating mechanism **10** as seen in

**FIGURE 1** along with multiple headblocks **20**, a log deck **50**, a stop and load section **51**, a conveyor section **52**, a scanning section **53**, a carriage section **54**, a sawing section **55**, and a control cab **56**. It is preferred that the system **100** include at least the above-mentioned general elements **10**, **20**, and **50-56**.  
5 However, it should be understood that the specific type of headblocks **20**, log deck **50**, stop and load section **51**, conveyor section **52**, scanning section **53**, carriage section **54**, a sawing section **55**, and control cab **56** may be altered without straying from the intended scope of the inventive system. Accordingly, the following discussion of operation of the system **100** will be discussed in  
10 general terms with respect to elements **20** and **50-56** as such elements are sufficiently known in the sawmill art.

In operation, multiple logs **50a-50d** are ushered along the log deck **50** (in the direction shown by directional arrows) towards the stop and load section **51**. The stop and load section **51** stops the rolling logs **50a-50d** and loads each log  
15 one at a time onto the conveyor section **52**. The conveyor section **52** operates in a manner similar to any conventional conveyor belt in order to move a log **50e** into position within the scanning section **53**. The scanning section includes a means for rolling the log **50e** through at least one complete turn (360°). Preferably, a pair of rollers **53a** and **53b** are provided as such a means though  
20 any suitable roller trough may be used. Within the scanning section **53**, there is included an electronic scanner (not shown) that will scan the entire log during the complete turn by rollers **53a** and **53b**. This provides a digital map of the given log **53e**. The digital map is then utilized within a computerized controller **56a** to find the best cutting solution for the log including the BOF with which to begin  
25 cutting.

Using the best cutting solution, the controller **56a** outputs commands to all actuators located throughout the system **100** to automatically: 1) position each log to its BOF upon the carriage section **54** via the log manipulating mechanism **10**; 2) adjust each headblock **20** to accept the given uniquely-shaped log and  
30 secure it to the movable carriage **22**; 3) pass the log face through the sawing

section **55** and incrementally move the movable carriage **22** towards the cutting element during each pass; 4) re-position the log upon the carriage section **54** by a quarter turn ( $90^\circ$ ) or a half turn ( $180^\circ$ ) via the log manipulating mechanism **10**; and 5) repeat steps 3 and 4 until the log is completely sawn according to its best cutting solution. In order to further enhance continuous operation, the next log **50a** will be scanned and pre-positioned within the log manipulating mechanism **10** during the last passes of the previous log **50e** through the sawing section **55**. It should be noted that all related wiring needed to allow the controller **56a** to control the various actuators of the system **100** is of the type readily known in the computer controller art and has been omitted for the sake of clarity.

While general components may be used within the system **100** for elements **20** and **50-56** within the functional constraints delineated above, the components of the log manipulating mechanism **10**, and more particularly the positioning unit **12**, will be discussed in specific detail with respect to **FIGURE 3**.

**FIGURE 3** is a side view of the log manipulating mechanism **10** according to the preferred embodiment of the present invention. The log manipulating mechanism **10** includes the positioning unit **12** that is rotatable within the main body **38** of the log manipulating mechanism **10**. Such rotation is accomplished via two drive chains **63** and **64** that are coupled together via a change-up gear **69**. The drive chain **63** is looped around a series of pulleys **70-73**. The pulleys are mounted to the main body **38** of the log manipulating mechanism **10**. Specifically, pulleys **70** and **71** are mounted via pulley supports **70a** and **71a**, respectively. Winding around pulleys **78** and **79** and along the outer circumference of the positioning unit **12**, the drive chain **64** is affixed to the end tips of the C-shaped positioning unit **12**. The ends of the other drive chain **63** are affixed to a link **75** that is, in turn, attached to a rod end **74** of a series of cylinders **60**, **61**, and **62**. Cylinder **62** being secured to a cylinder mount **77** that is affixed to a cylinder support **76**. The cylinder support **76** is affixed to the main body **38** of the log manipulating mechanism **10**.

Upon actuation of any one of cylinders **60**, **61**, and **62**, the rod end **74** will be linearly actuated and thereby move the drive chain **63**. The drive chain **63** will then rotate the change-up gear **69**, which then rotates the drive chain **64** and thus rotates the positioning unit **12**. More specifically, actuation (i.e., expansion) of cylinder **60** will create a clockwise quarter turn ( $90^\circ$ ) of the positioning unit **12**. Actuation (i.e., expansion) of both cylinders **60** and **61** will together will create a clockwise half turn ( $180^\circ$ ) of the positioning unit **12**. Actuation (i.e., retraction) of only cylinder **62** will create a counter-clockwise quarter turn ( $-90^\circ$ ) of the positioning unit **12**. Smooth rotational movement of the positioning unit **12** is assured via rollers **68** that are mounted on the main body **38** of the log manipulating mechanism **10** and peripherally spaced around the positioning unit **12**. Such rotational movement provides rotation of any log placed within the positioning unit **12**. Retention of such a log is accomplished via clamps **66a** and **67a** that are actuated, respectively, via clamp cylinders **66** and **67**. Such actuation of clamp cylinders **66** and **67** functions to retract clamps **66a** and **67a** as can be seen via the dotted lines of retracted clamps **66a'** and **67a'**.

While rotational movement of any clamped-in log is apparent by the discussion above, the skewing movement is best described with reference to both **FIGURES 2** and **3**. In **FIGURE 2**, skewing cylinders **65** and **65'** are shown. Each skewing cylinder **65** and **65'** operates independent of one another. In **FIGURE 3**, it is seen that each skewing cylinder (only **65** is visible) operates a skewing plate **65a**. By activating either skewing cylinder **65** or **65'**, the related skewing plate will push the log in a manner so as to skew the log. This skewing movement combined with the vertical movement of the fine positioning cylinder **39** and the rotational movement derived from one or more of cylinders **60**, **61**, and **62** creates a multitude of positional movements. Further, each of the skewing cylinders **65**, **65'**, the fine positioning cylinder **39**, and the cylinders **60**, **61**, and **62** for rotational movement are operated automatically via the controller **56a** in response to the pre-determined commands created during scanning. This results in a fast and accurate positioning of a log during sawmill operations.

It should be understood that the preferred embodiment mentioned here is merely illustrative of the present invention. Numerous variations in design and use of the present invention may be contemplated in view of the following claims without straying from the intended scope and field of the invention herein  
5 disclosed.

## I Claim:

1. An automated log pre-positioning and turning system for use within a sawmill, said system comprising:
- 5 a log deck for providing entry of logs into said system;  
a stop and load section for limiting said entry of logs into said system to a single one of said logs;  
a conveyor section for receiving said single one of said logs,  
a scanning section for electronically recording a best cutting solution of  
10 said single one of said logs;  
a log manipulating mechanism for positioning said single one of said logs according to said best cutting solution;  
a carriage section for receiving said single one of said logs from said log manipulating mechanism;  
15 a sawing section for cutting said single one of said logs; and  
a computer controller for automatically operating said stop and load section, said conveyor section, said scanning section, said log manipulating mechanism, said carriage section, and said sawing section.
- 20 2. The system as claimed in **Claim 1**, wherein said log manipulating mechanism, said carriage section, and said sawing section automatically function in response to output commands of said computer controller, said output commands being derived from said best cutting solution.
- 25 3. The system as claimed in **Claim 2**, wherein said log manipulating mechanism and said carriage section include a plurality of actuators, each said actuator operating in response to said output commands of said computer controller.
- 30 4. The system as claimed in **Claim 3**, wherein said plurality of actuators are hydraulic pistons.

5. The system as claimed in **Claim 4**, wherein said log manipulating mechanism includes a C-shaped positioning unit for holding said single one of said logs securely therein.

5 6. The system as claimed in **Claim 5**, wherein said log manipulating mechanism includes a lifting actuator for vertical movement of said positioning unit, a series of linear actuators for rotational movement of said positioning unit, and at least two side-mounted actuators, said at least two side-mounted actuators designed for skewing movement of said single one of said logs located securely  
10 within said positioning unit.

7. The system as claimed in **Claim 6**, wherein said positioning unit includes two clamps that are able to be actuated so as to retain said single one of said logs securely therein.

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8. A log manipulating mechanism for use within an automated log pre-positioning and turning system having a log deck, a stop and load section, a conveyor section, a scanning section, a carriage section, a sawing section, and a computer controller for automatically operating said stop and load section, said  
20 conveyor section, said scanning section, said log manipulating mechanism, said carriage section, and said sawing section, said log manipulating mechanism comprising:

25 a plurality of actuators, each said actuator automatically operating in response to output commands of a computer controller, said output commands being derived from a scanning section that electronically records a best cutting solution of a log being milled wherein said log manipulating mechanism by way of said plurality of actuators is able to rotate said log, raise said log, lower said log, and longitudinally skew said log.

30 9. The log manipulating mechanism as claimed in **Claim 8**, wherein said plurality of actuators are hydraulic pistons.

**10.** The log manipulating mechanism as claimed in **Claim 9**, wherein said log manipulating mechanism includes a C-shaped positioning unit for holding said log securely therein.

5 **11.** The log manipulating mechanism as claimed in **Claim 10**, wherein said plurality of actuators includes a lifting actuator for vertical movement of said positioning unit, a series of linear actuators for rotational movement of said positioning unit, and at least two side-mounted actuators, said at least two side-mounted actuators designed for skewing movement of said log located securely  
10 within said positioning unit.

**12.** The log manipulating mechanism as claimed in **Claim 11**, wherein said positioning unit includes two clamps, each said clamps including a clamp actuator such that upon activation of said clamp actuator said log is unable to be removed  
15 from said positioning unit.

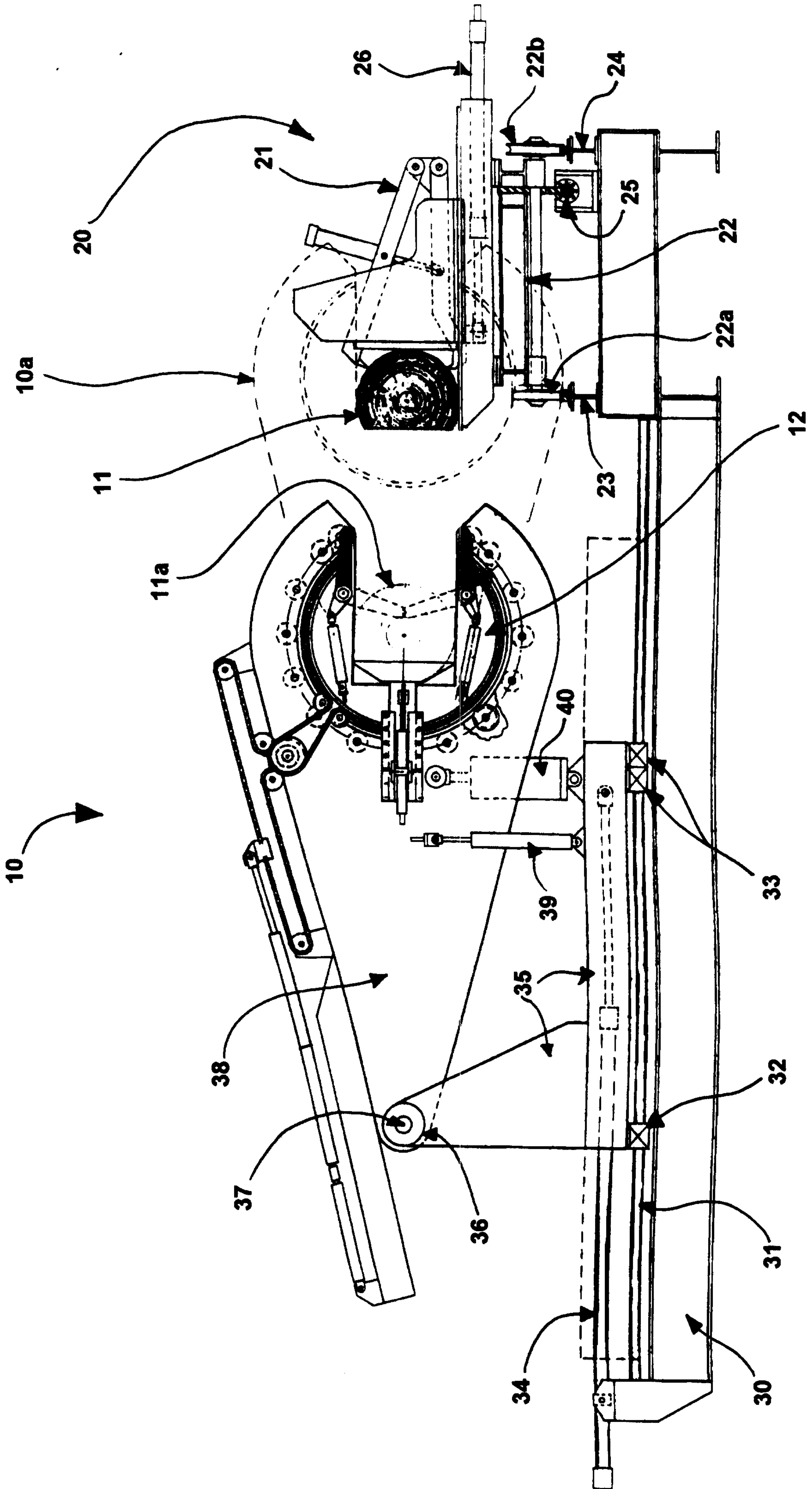


FIGURE 1



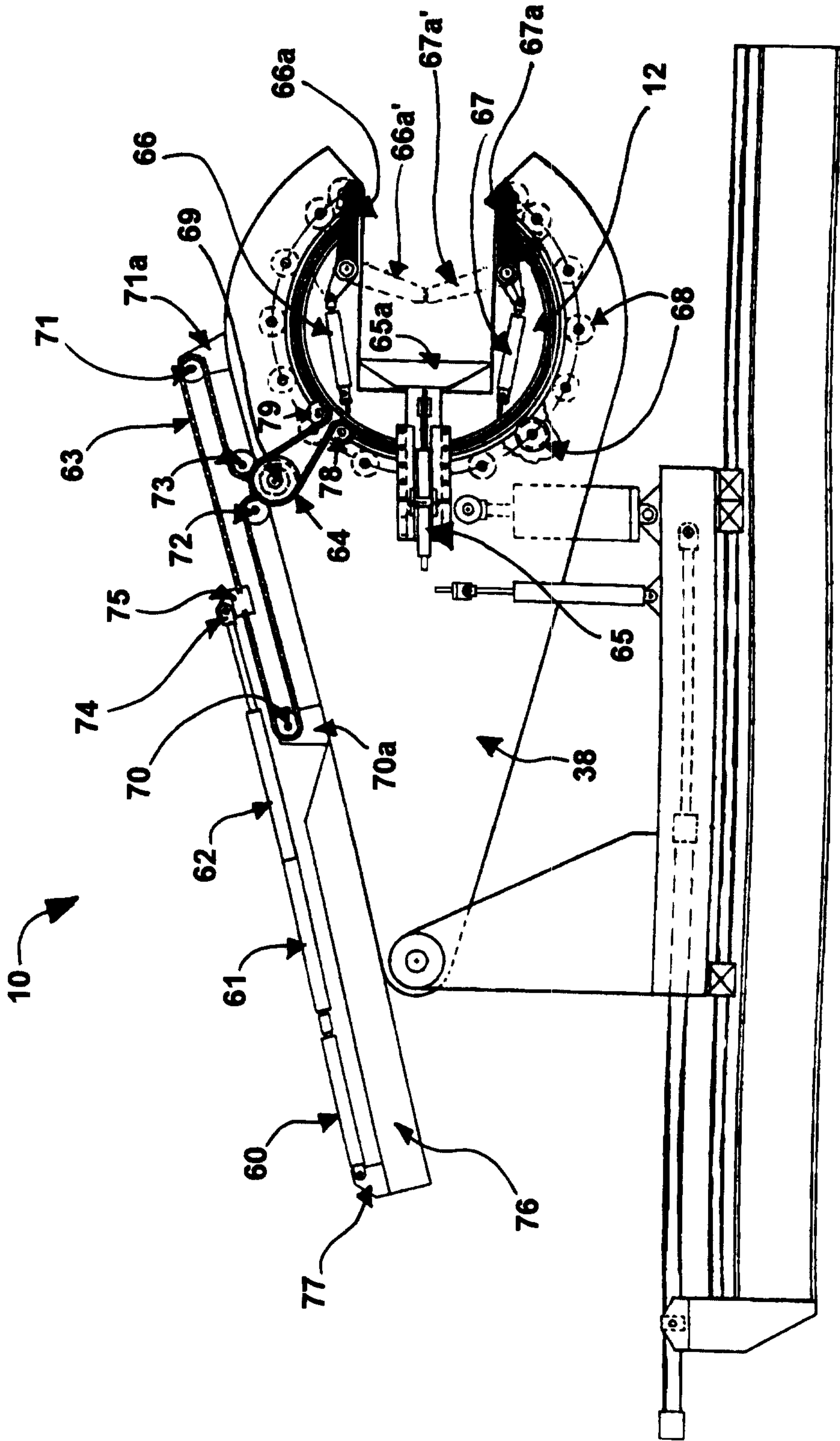


FIGURE 3

