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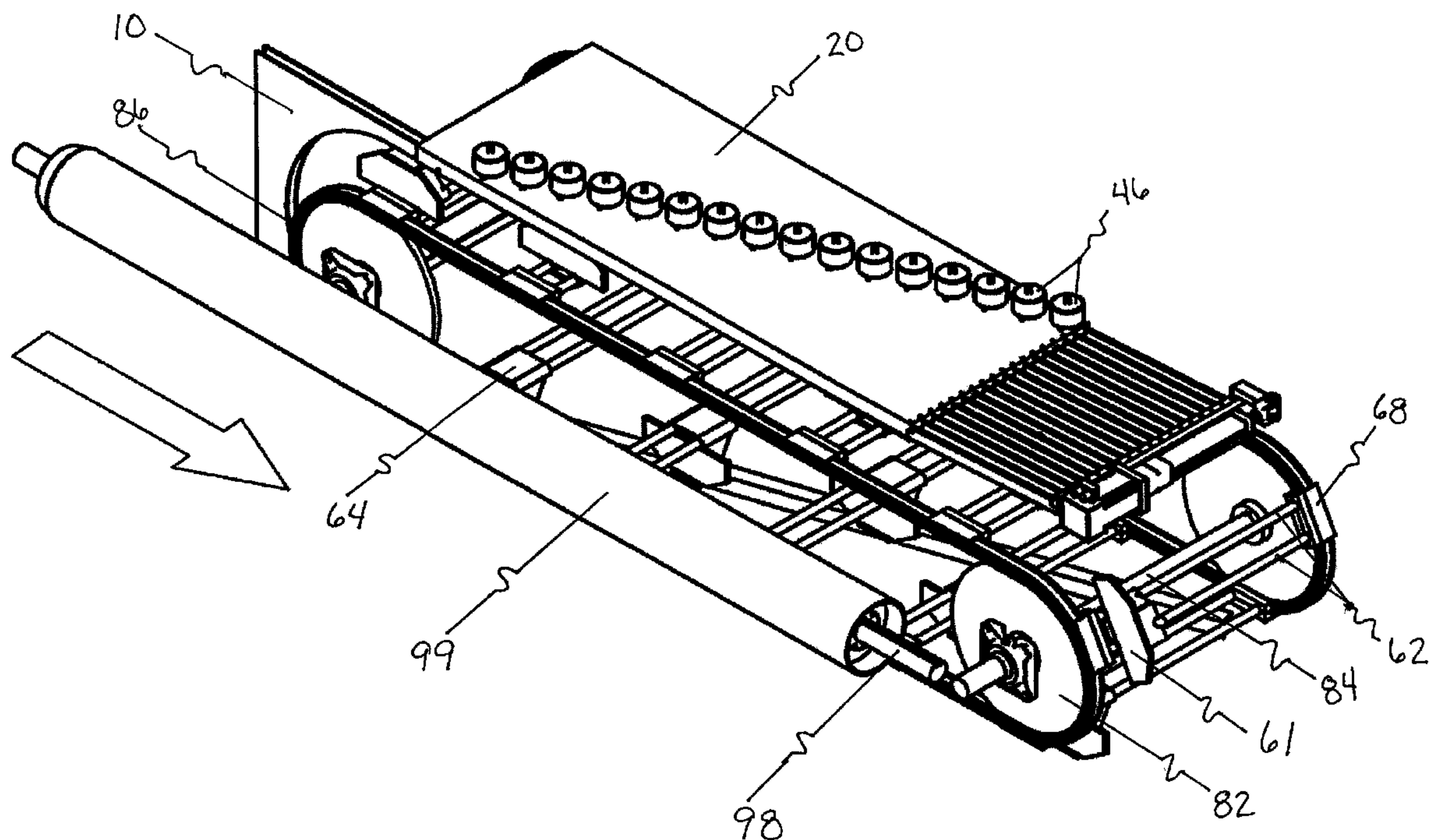
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(57) Abrégé/Abstract:

Embodiments provide systems, methods and apparatuses for positioning boards and other wood pieces in preparation for sawing/trimming. In embodiments, board stops are slideably mounted to board stop guides on a continuous track loop that conveys the board stops in a direction of flow. A cam follower on a board stop is engaged by a lateral positioning guide and diverted to one of a plurality of longitudinal positioning guides that are selectively shiftable or rotatable to provide highly controllable lateral positioning of the board stops. This allows the board stops to be finely positioned without the use of braking devices or other added sources of mass, friction or vibration.



Abstract of the Disclosure

[0056] Embodiments provide systems, methods and apparatuses for positioning boards and other wood pieces in preparation for sawing/trimming. In embodiments, board stops are slideably mounted to board stop guides on a continuous track loop that conveys the board stops in a direction of flow. A cam follower on a board stop is engaged by a lateral positioning guide and diverted to one of a plurality of longitudinal positioning guides that are selectively shiftable or rotatable to provide highly controllable lateral positioning of the board stops. This allows the board stops to be finely positioned without the use of braking devices or other added sources of mass, friction or vibration.

ROTARY POSITIONING FENCE

Technical Field

[0001] Embodiments herein relate to the field of sawmill machinery, and, more specifically, to systems, methods and apparatuses for positioning lumber for presentation to a sawing station.

Background

[0002] Sawmills and lumber mills typically route lumber through a series of cutting and finishing stations. After exiting one station, the lumber must be positioned for presentation to the next station. This positioning may take place during transportation of the lumber from one station to the next. In certain stations, boards are trimmed at one or both ends. Current systems often position boards lengthwise along a conveyor with evenly spaced lugs used to separate and convey the boards towards the trimming station.

[0003] Conventional positioning systems often use conveyor chains to carry boards positioned lengthwise across the width of the conveyor, while simultaneously using pipe rolls or similar mechanisms to urge the boards transverse to the direction of flow towards a fence that results in a workpiece position where the defect line matches a downstream saw position. Other workpiece positioning systems do not use the transverse rolls, but rely instead on a positioning bumper to push wood into position (see for example US 591130).

[0004] In moving paddle fence systems, boards are pushed against positioning bumpers or “paddles” connected to chains that are configured in a continuous moving loop. The paddles move in the direction of material flow, parallel with the board

conveyor chains and at the same velocity. The rotating chain and paddle concept allows more time for each board to reach its final destination than a traditional trailing fence design.

[0005] Speed and accuracy are critical in positioning lumber for presentation to sawing stations – inaccurate positioning leads to waste, while slower speeds limit output. However, in the current positioning systems, increasing the processing speed tends to cause a reduction in accuracy. Similarly, as the current systems are adapted to increase accuracy, speed is diminished. As planer optimization becomes more widely accepted, the need for positioning accuracy has increased. But lumber system speeds have increased to such an extent that the traditional trailing fences are not as effective as they once were, often resulting in the positioning systems causing a bottle neck in the processing system.

[0006] Existing paddle fence systems use mechanisms such as paddle brakes, air actuators, and/or hydraulic positioners to position paddles. These mechanisms increase the accuracy of positioning. However, they also increase the complexity of the systems, add mass to the paddles, induce vibration and increase friction. Therefore, existing systems are limited in their range of possible operation speeds relative to lug spacing and physical size. To match the wider lug spacing configuration frequently used in sawmill board transfers while also matching the board transfer speeds, the currently available paddle fence systems must be physically extended to compensate for the vibration and other problems created by the positioning mechanisms.

Brief Description of the Drawings

[0007] Embodiments will be readily understood by the following detailed description in conjunction with the accompanying drawings. Embodiments are

illustrated by way of example and not by way of limitation in the figures of the accompanying drawings.

[0008] Figure 1 illustrates an isometric view of a moving fence apparatus in accordance with various embodiments;

[0009] Figure 2 illustrates a perspective view of a moving fence apparatus in accordance with various embodiments;

[0010] Figures 3a -3e illustrate plan views of moving fence apparatuses in accordance with various embodiments;

[0011] Figures 4a – 4b illustrate side elevational views of moving fence apparatuses in accordance with various embodiments;

[0012] Figures 5a – 5b illustrate bottom views of moving fence apparatuses in accordance with various embodiments;

[0013] Figures 6a – 6b illustrate rear elevational views of moving fence apparatuses in accordance with various embodiments; and

[0014] Figures 7a – 7b illustrate an exploded view of components of a moving fence apparatus in accordance with various embodiments.

Detailed Description of Disclosed Embodiments

[0015] In the following detailed description, reference is made to the accompanying drawings which form a part hereof, and in which are shown by way of illustration embodiments that may be practiced. It is to be understood that other embodiments may be utilized and structural or logical changes may be made without departing from the scope. Therefore, the following detailed description is not to be

taken in a limiting sense, and the scope of embodiments is defined by the appended claims and their equivalents.

[0016] Various operations may be described as multiple discrete operations in turn, in a manner that may be helpful in understanding embodiments; however, the order of description should not be construed to imply that these operations are order dependent.

[0017] The description may use perspective-based descriptions such as up/down, back/front, and top/bottom. Such descriptions are merely used to facilitate the discussion and are not intended to restrict the application of disclosed embodiments.

[0018] The terms “coupled” and “connected,” along with their derivatives, may be used. It should be understood that these terms are not intended as synonyms for each other. Rather, in particular embodiments, “connected” may be used to indicate that two or more elements are in direct physical or electrical contact with each other. “Coupled” may mean that two or more elements are in direct physical or electrical contact. However, “coupled” may also mean that two or more elements are not in direct contact with each other, but yet still cooperate or interact with each other.

[0019] For the purposes of the description, a phrase in the form “A/B” or in the form “A and/or B” means (A), (B), or (A and B). For the purposes of the description, a phrase in the form “at least one of A, B, and C” means (A), (B), (C), (A and B), (A and C), (B and C), or (A, B and C). For the purposes of the description, a phrase in the form “(A)B” means (B) or (AB) that is, A is an optional element.

[0020] The description may use the terms “embodiment” or “embodiments,” which may each refer to one or more of the same or different embodiments.

Furthermore, the terms “comprising,” “including,” “having,” and the like, as used with respect to embodiments, are synonymous.

[0021] The terms “lumber” and “boards” are used interchangeably herein to mean work pieces laterally positioned on a transport/conveyor such that their lengths are perpendicular to the direction of flow (i.e. extending across the width of the conveyor rather than along the length of the conveyor).

[0022] The terms “board stop” and “paddle” are used interchangeably and are herein defined as a moving fence component configured to be conveyed synchronously with lumber in the direction of lumber flow for lateral positioning of boards (i.e. positioning along an axis perpendicular to direction of lumber flow).

[0023] The term “cam follower” is herein defined as any component configured to be translocated within a positioning guide. Cam followers in accordance with various embodiments may include a pin, a ball bearing, or other components and may be cylindrical, round, or of any other shape, solid/hollow, and/or made of any suitable material (e.g. a metal, polymer, or any resilient material known in the art). Cam followers may be constructed as a single part/unit, or they may be constructed from/include two, three, four or more parts.

[0024] The term “continuous track loop” is herein defined to include, but is not limited to, one, two, three or more continuous belts, chains, or other moving elements rotatable around rotating elements such as sprockets, gears, wheels, rollers, etc. In some embodiments, a continuous track loop includes a pair of chains/chain loops mounted on rollers/sprockets/wheels and driven simultaneously. In other embodiments, belts or other similar components alone or in combination may be included. A

continuous track loop may be configured to convey one or more components, including board stops and board stop guides, and may be adjustable to convey the components at a rate matching that of lumber flow.

[0025] The term “actuator” is herein defined as a device for converting a signal/energy into motion/force, and is intended to include any such device powered for example, electrically, pneumatically, and/or hydraulically, in any combination. In embodiments, an actuator may be used to produce rotary or linear motion to position a guide selector, board, longitudinal/adjustable guide, or other component.

[0026] Embodiments may include applications in which a board is moved toward and/or held against a paddle or board stop. Other embodiments may include applications in which a board is pushed laterally by a paddle or board stop. Embodiments may include one or more rolls, skatewheels and/or other similar mechanisms known in the art for pushing a board laterally toward a paddle or board stop.

[0027] Embodiments herein provide a moving fence for positioning of workpieces prior to presentation to a processing station, such as an end saw station. In various embodiments, boards conveyed along a conveyor in a direction of flow may be axially/laterally positioned on the conveyor by a moving fence apparatus positioned and with paddle stops moving generally parallel to the board conveyor. Embodiments of a moving fence may convey paddles/board stops synchronously with lumber and may be adjustable to accommodate a range of lug spacing and/or lumber spacing configurations.

[0028] In addition, embodiments may provide components of a moving fence (such as a board stop guide or positioning guide) that is configured to be integrated with a pull back style moving fence (with or without a roller) and/or a push style moving fence. Positioning may include pulling/pushing the boards against the paddles or pushing/pulling paddles against the boards. Some embodiments may include one or more rollers positioned in parallel with the direction of board flow, and such rollers may push/pull boards to paddles. Similarly, devices other than rollers may be utilized to move the boards towards the paddles. In other embodiments, paddles/board stops may position boards by pushing the boards, rather than by stopping the boards as they are pushed toward the paddles/board stops.

[0029] Embodiments further provide a board positioning system configured for improved accuracy and speed, using a series of positioning guides to position boards. The use of such positioning guides reduces/eliminates the need for mechanisms such as brakes, air actuators, and hydraulic positioners to position the board stops, thereby avoiding the increase in board stop mass, friction, resistance and vibration that are induced by those mechanisms. As exemplified by the embodiments described, positioning guides may allow for a potentially unlimited range of lug spacing options and may consequently enable operation of such board positioning systems on shorter conveyances, which may be fitted to existing processing operations. For example, common transfers may be used for both positioner and trimmer, avoiding inaccuracies and other issues created through hand-offs between transfers. Thus, embodiments of a moveable fence as described herein may be integrated by sawmill operations to directly feed downstream processes and/or transfer equipment already in place downstream.

[0030] In various embodiments, methods, apparatuses, and systems for positioning workpieces are provided. In exemplary embodiments, a computing device may be endowed with one or more components of the disclosed apparatuses and/or systems and may be employed to perform one or more methods as disclosed herein. In embodiments, a computing device may be coupled to an actuator, a track loop, and/or other components. In some embodiments, a computing device may control positioning of a component, actuate an actuator to position a component, start/stop operation of the track loop, etc.

[0031] **Figures 1 and 2** show exemplary moving fence apparatuses in accordance with various embodiments. **Figure 1** illustrates an isometric view of a moving fence apparatus in accordance with embodiments. As illustrated, a roll **99** may be rotatable around a roll shaft **98** in a direction generally perpendicular to the flow of boards (arrow shows direction of flow), which is operable to move a board toward a paddle and/or to retain a board against a paddle.

Figure 2 shows a perspective view of a moving fence apparatus in accordance with various embodiments.

[0032] As illustrated, an embodiment of a moving fence apparatus may include a continuous track loop comprising two chains **86** mounted in parallel on rotatable members **82**. Rotatable members **82** may be rotatable around shafts **84**. Board stop guides **62** may be coupled to chains **86** by guide fasteners **68**. A board stop **61** may be coupled to a board stop guide **62** by a slide mount **64**. Board stop **61** may also include cam follower **66** coupled thereto that is adapted to engage one or more positioning

guides and help facilitate desired lateral movement of the board stop **61** (see **Figures 4a and 4b**).

[0033] In various embodiments, a lead in support structure **10** may include an initial positioning guide **25** (see **Figures 5a, 5b**) that is generally disposed parallel to the direction of flow and is adapted to initially control positioning of the board stops **61** prior to moving into a desired position to engage an end of a workpiece. In some embodiments vertical support member **10** lacks an initial positioning guide.

[0034] A horizontal or laterally displaced structure **20** may disposed relative to the chains **86** (e.g. above or below), and adapted to help move board stops **61** about board stop guides **62**. A lateral positioning guide **26** (see **Figures 3a – 3e, 5a, 5b, 7a, and 7b**) may be angularly disposed about the lateral structure **20** relative to the direction of flow, and be adapted to cause lateral movement of the board stops transverse to the direction of flow. A plurality of fixed longitudinal guides **30** placed at intervals along lateral positioning guide **26** and which are generally parallel to the direction of flow.

[0035] In various embodiments, a plurality of adjustable guides **50** may be movably coupled to longitudinal guides **30**, such that a continuous channel may be defined from the lateral positioning guide **26** through the distal end of an adjustable guide **50**. In various embodiments, adjustable guide **50** may be pivotably coupled at their distal ends to one or more shifting members **54**.

[0036] In embodiments, the guides **25, 26, 30** and/or **50** may be sized to accommodate a cam follower **66** that may be coupled to a board stop **61** (see e.g. **Figures 5a, 5b**). One or more guide selectors **46** may be disposed along the horizontal positioning guide and adapted to direct the cam follower to transition from the

lateral positioning guide to a selected one of the longitudinal guides **30** and/or adjustable guides **50**. A reset guide **70** may be disposed on a return side of the continuous track loop and configured to cause the board stops **61** to move laterally along the board stop guides **62** to a desired position, such as a home position. The home position may be the same position as the position established in the initial positioning guide **25**.

[0037] In the operation of the illustrated embodiment, board stop guides are translocated along the length of the continuous track loop at the same rate as (and in parallel with) board conveyance along the board conveyor. Board stops **61** are slideably mounted on board stop guides **62** such that they are moveable along a plane perpendicular to the length of the continuous track loop. As board stop guides **62** are conveyed along the top and around the end to the underside of the apparatus, the reset guide **70** angles toward the vertical support **10**, pushing/sliding the board stops **61** along the board stop guides **62** toward a board stop starting position, e.g. a home position.

[0038] As the board stop guides **62** are conveyed upward from the underside of the continuous track loop to the upper side of the continuous track loop, cam followers **66** engage transition from engagement of the initial positioning guide **25** to the lateral positioning guide **26** (see **Figures 3a – 3e**, top view, and **Figures 5a, 5b**, view from below). With the lateral positioning guide **26** extending at an oblique angle within the horizontal plane, the translocation of a cam follower **66** along the lateral positioning guide **26** repositions board stop **61** along board stop guide **62**, moving board stop **61** away from the starting position in a lateral direction (i.e. across the width of the continuous track loop).

[0039] A guide selector **42** positioned near a longitudinal guide **30** (see **Figures 5a, 5b, and 7a, 7b**) is controlled by a guide selector actuator **46**. In a first position (**Figures 6a, 6b**) guide selector **42** prevents entry of cam follower **66** into fixed longitudinal guide **30** as the cam follower **66** is translocated along lateral positioning guide **26**. In a second position, the guide selector **42** moves to block further translocation of cam follower **66** along the lateral positioning guide **26**, thereby diverting the cam follower **66** into the longitudinal guide **30**. The diversion of the cam follower **66** to the selected longitudinal guide **30** may cause the corresponding board stop **61** to generally stop translocation along board stop guide **62**. At this stage, board stop **61** has been roughly positioned and continues to be moved in a direction parallel to the direction continuous track loop.

[0040] In various embodiments, each longitudinal guide **30** may be pivotably coupled to an adjustable guide **50**. In the illustrated embodiments, each adjustable guide **50** is pivotably coupled at its distal end, by a hinge pivot **56**, to a shifting member **54**, which may shift laterally to move the distal ends of the adjustable guides **50**, thereby altering the angle of adjustable guides **50**, allowing for fine positioning of board stops **61**. One or more actuators **97** may be coupled to the shifting member **54** to urge such lateral movement (i.e. perpendicularly to the direction of track loop operation). In various embodiments, the longitudinal guides **50** can be adjusted by rotationally positioning the lateral structure **20** to achieve the fine positioning.

[0041] In the embodiment illustrated, as cam follower **66** exits the distal end of adjustable guides **50**, cam follower **66** and board stop **61** continue to move along the continuous track loop toward the underside or return side of the device, whereat cam

followers **66** engage reset guide **70** to reset the position of board stop **61** on board stop guide **62** to the starting position. The translocation of board stops **61** on board stop guides **62** along the continuous track loop is synchronized with the translocation of boards/lugs along a board conveyor, such that board stops **61** are brought into contact with board ends. Thus, board stops **61** may be used to adjust the lateral position of the boards as they approach a sawing/trimming station or other processing station, first by gross position adjustment (longitudinal guides) and then by fine position adjustment (adjustable guide). The use of such guides allows for positioning without the use of brakes, air actuators/hydraulic devices and other mechanisms as part of the rotating elements, which increase mass, induce vibration and limit speed.

[0042] **Figures 3a – 3e** show plan views of embodiments of a moving fence apparatus. As shown in **Figure 3a**, each longitudinal guide **30** is associated with a guide selector **42** and actuator **46**. Guide selector actuators **46** may be, for example, solenoids controlled by a computing environment (e.g. a processor, a scanner, etc.) to select the optimal fixed longitudinal guide to which each cam follower **66** should be diverted. Additionally, shifting member **54** and/or one or more actuators coupled to shifting member **54** may be controlled by the same computing environment or by a different computing environment to more finely adjust the position of board stops **61** as described above.

[0043] In **Figure 3a**, a first cam follower **90** is shown in/near the initial positioning guide **25** prior to repositioning of the board stop, with the board stop in the starting position. A second cam follower **91** has been diverted from the lateral positioning guide into a longitudinal guide and the coupled board stop has been correspondingly laterally

repositioned along its board stop guide. A third cam follower **92** has been diverted into another longitudinal guide at a greater distance from the starting position, the coupled board stop having been correspondingly repositioned further along the board stop guide.

[0044] **Figures 3b, 3c and 3d** show embodiments which include one or more rolls **99** for moving boards laterally toward board stops. These embodiments are configured for pull applications, in which a board is driven against a board stop by the one or more rolls.

[0045] **Figure 3e** shows an embodiment in which a board stop pushes a board laterally into a new position, with the vertical arrow showing the direction of the push. In this embodiment, the board stops are reversed in direction on their slide rails, allowing boards to be pushed to their final positions. One or more rolls and/or skate wheels may be used to ensure that the board remains against the paddle at the final position.

[0046] In various embodiments, the angle of the lateral positioning guide may be adjustable in order to increase or decrease the rate of lateral movement of the board stops about the board stop guides. In the illustrated embodiment, the angle of the lateral positioning guide with respect to the direction of continuous track loop operation is approximately 20°. However, the angle of the lateral positioning guide in various embodiments may be any angle within the range of 10°-80°. In some embodiments, the angle of the lateral positioning guide may be adjusted manually, while in other embodiments, the angle of the lateral positioning guide may be adjusted by an actuator. In an embodiment, some or all of the guides may be channels formed by removal of material from a solid structure, while in other embodiments some or all of the positioning

guides are formed by placing elements (e.g. rails, etc.) at the desired intervals along a surface of the lateral structure.

[0047] Board stop guides **62** are shown in the figures as paired cylindrical elements, but the configuration of board stop guides **62** may vary widely among embodiments and may include one, two, three, four or more channels, tracks, solid members, cylindrical/edged/grooved elements, etc. Similarly, board stops **61** are shown in the figures as being slideably mounted to board stop guides **62** with a slide mount **64**. However, guide mounts may vary widely among embodiments to include various elements (e.g. bearing based arrangements, or other slide mechanisms generally known in the art). A guide mount may be absent in some embodiments (e.g. board stops **61** may be slideably mounted directly to board stop guides **62** without additional components).

[0048] **Figures 4a and 4b** illustrate side elevational views of a moving fence apparatus in accordance with various embodiments. In the embodiment shown in **Figure 4a**, the apparatus may be configured such that board stops **61** are conveyed along a horizontal plane below the level of the guide selector actuators and guides. This configuration may help prevent dust and debris from boards from falling into the components, such as the guide selector actuators and guides, and interfering with proper operation. However, in other embodiments, lateral structure **20** may be oriented with guide selectors and and/or guides disposed below the level of the board stops and/or the board stop guides. In various embodiments, the system may be configured to position the board stop along the desired longitudinal guide, and then have a transverse roll, skate wheel, or other urging device push the board against the board

stop (“pull” embodiments). In other embodiments, the system may be configured such that the boards may be positioned by the board stops pushing them laterally (“push” embodiments).

[0049] **Figure 4b** shows an embodiment that additionally includes a roll **99** rotatable around a roll shaft **98**. The illustrated embodiment also includes an actuator **97** for lateral positioning of the shifting member/adjustable guides, which provides fine positioning of board stops **61**.

[0050] **Figures 5a and 5b** illustrate sectional views of a moving fence apparatus in accordance with various embodiments. The view illustrated in **Figure 4a** is a sectional view from below the section marked in **Figure 3a**, showing the underside of the lateral structure **20** from the vantage of a horizontal plane between the lateral structure **20** and the chains **86**. Likewise, Figure 4b is a sectional view from below the section marked in Figure 4b. Guide selector stops **49** are shown in proximity to guide selectors **42** (see also **Figures 7a and 7b**). Guide selector actuator **46** may be coupled to guide selector **42** by a guide selector pivot **44**, and is rotatable in opposite directions about guide selector pivot **44**, such that guide selector actuator **46** can move the corresponding guide selector **42**. When a guide selector **42** is positioned to block lateral positioning guide **26** and to divert a cam follower into the corresponding longitudinal guide, the guide selector **42** may be prevented from over-rotating (unblocking the lateral positioning guide) by a guide selector stop **49**, which stops the guide selector **42** in a position for diverting the cam follower into the longitudinal guide. **Figure 5b** also shows an embodiment that includes an actuator **97** coupled to shifting member **54** and operable to shift the adjustable guides **50**. In this illustration, the adjustable guides **50**

have been slightly shifted for fine adjustment of board stop position, as described above.

[0051] In various embodiments, e.g. those with solenoid actuators, selection of a longitudinal guide for diversion of a cam follower may be accomplished by sending a signal from a computing environment to the actuator corresponding to the selected longitudinal guide. Some or all of the guide selectors may be positioned to block a longitudinal guide at rest and to block the lateral positioning guide upon activation of the actuator, while in other embodiments, some or all of the guide selectors may be positioned to block the lateral positioning guide unless/until the corresponding actuator is activated.

[0052] While the illustrated embodiments include both longitudinal guides and adjustable guides, in various embodiments, longitudinal guides may be themselves adjustable. In such embodiments, the longitudinal guides become adjustable guides that are pivotally coupled to a longitudinal positioning guide at intervals along the lateral positioning guide. In some embodiments, series of adjustable guides may be pivotally coupled consecutively, end-to-end, and each series of adjustable guide may be pivotally coupled to a lateral positioning guide. In an embodiment of this type, each adjustable guide section may be limited to a maximum/minimum range within which the guides may be adjusted, providing for varying degrees of adjustment along the length of the lateral structure **20**. Additionally, embodiments comprising adjustable guides without longitudinal guides may include any/all of the means of guide selection described above.

[0053] **Figures 6a and 6b** illustrate rear elevational views of a moving fence apparatus in accordance with various embodiments. Figure 6a illustrates a rear elevational view of a moving fence apparatus that may be adapted for push and/or pull applications. **Figure 6b** illustrates an embodiment that includes a roll **99** rotatable around a roll shaft **98**, and an actuator **97**. In this figure, a board is shown being pushed against a board stop **61** by the roll **99**. As shown in the figures, each board stop **61** may be separately positioned across the width of the continuous track loop. While the illustrated embodiments use the continuous track loop configuration shown, continuous track loop mechanisms are well known in the art. Embodiments vary as to the continuous track loop mechanism employed, including any/all such mechanisms known in the art. For example, a continuous track loop may be powered or non-powered, may be a roller/belt/chain conveyor, and may include a chain drive for power transmission. In some embodiments, a continuous track loop may be powered by another conveyor and/or the drive used to power another conveyor. The embodiments described herein are exemplary and are not intended to be limiting as to the continuous track loop mechanisms or other mechanisms known in the art and included within the various embodiments.

[0054] **Figures 7a and 7b** illustrate magnified views of components of a moving fence apparatus in accordance with various embodiments. Guide selector **42** is shown coupled to a guide selector pivot **44** generally at or near the interface of lateral positioning guide **26** and a longitudinal guide **30**. Guide selector pivot **44** is coupled to guide selector actuator **46**, which may be coupled to the lateral structure **20**. In **Figure 7a**, a guide selector **42** is shown blocking longitudinal guide **30**. In **Figure 7b**, a guide

selector **42** has been pivoted into position to divert the cam follower **66** from the positioning guide **26** into longitudinal guide **30**.

[0055] Although certain embodiments have been illustrated and described herein, it will be appreciated by those of ordinary skill in the art that a wide variety of alternate and/or equivalent embodiments or implementations calculated to achieve the same purposes may be substituted for the embodiments shown and described without departing from the scope. Those with skill in the art will readily appreciate that embodiments may be implemented in a very wide variety of ways. This application is intended to cover any adaptations or variations of the embodiments discussed herein. Therefore, it is manifestly intended that embodiments be limited only by the claims and the equivalents thereof.

Claims

1. A rotating fence for locating boards, comprising:
 - a length of continuous track loop operable in a first direction of flow along its length and configured to convey one or more board stop guides in said first direction;
 - a lateral structure generally disposed in a plane generally parallel to the first direction of flow, and including:
 - a lateral positioning guide extending across at least a portion of the lateral structure at an angle oblique to the first direction of flow,
 - a plurality of longitudinal guides extending from the lateral positioning guide generally in the direction of flow, the longitudinal guides being spaced at intervals along at least a portion of the length of the lateral positioning guide, and
 - a guide selector positioned at one or more of said intervals, the guide selector movable from a first position wherein the longitudinal guide at said interval is blocked to a second position wherein the lateral positioning guide is blocked;
 - a board stop assembly comprising a board stop and a cam follower, the cam follower being configured to selectively engage the lateral positioning guide and said longitudinal guides; and
 - a plurality of adjustable guides, each adjustable guide pivotally coupled at a first end to a longitudinal guide and pivotably coupled at a second end to a shifting member.
2. The rotating fence of claim 1, further comprising an actuator configured to translocate said second end for adjusting said adjustable guides.
3. The rotating fence of claim 1, further comprising an actuator coupled to said guide selector to move the guide selector.
4. The rotating fence of claim 3, wherein said actuator is a solenoid.

5. The rotating fence of claim 1, wherein the lateral positioning guide is disposed at an angle of between 10 and 80 degrees relative to the first direction of flow.
6. The rotating fence of claim 1, wherein said lateral positioning guide is positioned generally above said board stop.
7. The rotating fence of claim 1, wherein said lateral positioning guide is positioned below said board stop.
8. The rotating fence of claim 1, further comprising a return guide positioned on the return side of the continuous track loop and configured to engage the cam followers to cause the board stops to return to a desired starting position.
9. The rotating fence of claim 1 further comprising a computing device coupled to the adjustable guides, wherein the computing device is configured for coordinating the positions of the adjustable guides, the position of the guide selector, and the velocity of said flow to coordinate said positioning the board.
10. A rotating fence for locating boards, comprising:
 - a length of continuous track loop operable in a first direction of flow along its length and configured to convey one or more board stop guides in said first direction;
 - a lateral structure generally disposed in a plane generally parallel to the first direction of flow, and including:
 - a lateral positioning guide extending across at least a portion of the lateral structure at an angle oblique to the first direction of flow,
 - a plurality of longitudinal guides extending from the lateral positioning guide generally in the direction of flow, the longitudinal guides being spaced at intervals along at least a portion of the length of the lateral positioning guide, and
 - a guide selector positioned at one or more of said intervals, the guide selector movable from a first position wherein the longitudinal guide at said

interval is blocked to a second position wherein the lateral positioning guide is blocked; and

a board stop assembly comprising a board stop and a cam follower, the cam follower being configured to selectively engage the lateral positioning guide and said longitudinal guides, wherein the longitudinal guides are adjustable about a longitudinal guide first end.

11. The rotating fence of claim 10, further comprising an actuator configured to adjust said longitudinal guides about the longitudinal guide first end.

12. The rotating fence of claim 10, further comprising an actuator coupled to said guide selector to move the guide selector.

13. The rotating fence of claim 12, wherein said actuator is a solenoid.

14. The rotating fence of claim 10, wherein the lateral positioning guide is disposed at an angle of between 10 and 80 degrees relative to the first direction of flow.

15. The rotating fence of claim 10, wherein said lateral positioning guide is positioned generally above said board stop.

16. The rotating fence of claim 10, wherein said lateral positioning guide is positioned below said board stop.

17. The rotating fence of claim 10, further comprising a return guide positioned on the return side of the continuous track loop and configured to engage the cam followers to cause the board stops to return to a desired starting position.

18. The rotating fence of claim 10 further comprising a computing device coupled to the longitudinal guides, wherein the computing device is configured for coordinating

the positions of the longitudinal guides, the position of the guide selector, and the velocity of said flow to coordinate said positioning the board.

19. The rotating fence of claim 10, the lateral structure being rotationally positionable to adjust said longitudinal guides about the longitudinal guide first end.

20. A board positioning apparatus comprising:

- a continuous track loop operable in a first direction of flow;

- a board stop guide mounted to the continuous track loop;

- a board stop assembly movably coupled with the board stop guide;

- a first guide oriented transverse to the first direction, the first guide configured to engage the board stop assembly and guide the board stop assembly along the board stop guide from an initial position to a selected one of a plurality of first positions, wherein the first positions are spaced apart at predetermined intervals along the board stop guide; and

- a plurality of second guides configured to engage the board stop assembly and guide the board stop assembly from the selected first position to a selected one of a plurality of second positions, wherein the selected second position is located between adjacent ones of the first positions, and the second guides are pivotable or rotatable to adjust an angle of the second guides relative to the first direction of flow.

21. The apparatus of claim 20, further comprising means for returning the board stop assembly from the selected second position to the initial position.

22. The apparatus of claim 20, further including means for diverting the board stop assembly from the first guide to a selected one of the second guides.

23. The apparatus of claim 20, wherein the second guides are fixedly coupled with the first guide, and the first guide and the plurality of second guides are collectively pivotable to adjust an angle of the second guides relative to the first direction of flow.

24. The apparatus of claim 20, further including a shifting member, the second guides having first ends pivotably coupled with the first guide and opposite second ends pivotably coupled with the shifting member, wherein the second guides are configured to engage said portion of the board stop assembly and the shifting member is selectively movable to adjust an angle of the second guides relative to the first direction of flow.

25. The apparatus of claim 20, further including a shifting member and a plurality of fixed guides, the fixed guides extending between the first guide and the second guides and configured to engage said portion of the board stop assembly, the second guides having first ends pivotably coupled to corresponding ones of the fixed guides and second ends pivotably coupled with the shifting member.

26. A positioning assembly for use with a rotary fence, wherein the rotary fence includes a continuous track loop operable in a first direction of flow, a board stop guide mounted to the continuous track loop, and a board stop assembly movably coupled with the board stop guide, the positioning assembly comprising:

- one or more fixed guides disposed in a plane substantially parallel to the board stop guide;

- a plurality of adjustable guides having first ends and opposite second ends, the first ends pivotably coupled to the one or more fixed guides; and

- a shifting member coupled to the adjustable guides, wherein the one or more fixed guides and the adjustable guides are configured to slideably engage a portion of the board stop assembly, and wherein the shifting member is laterally movable in a second direction transverse to the first direction to thereby adjust an angle of the adjustable guides relative to the one or more fixed guides.

27. The positioning assembly of claim 26, wherein the shifting member is pivotably coupled to the second ends of the adjustable guides.

28. The positioning assembly of claim 26, further including an actuator coupled to the shifting member, wherein the actuator is operable to selectively move the shifting member in the second direction.

29. The positioning assembly of claim 26, wherein the one or more fixed guides includes a first guide oriented transverse to the first direction of flow, and the first ends of the adjustable guides are pivotably coupled to the first guide at intervals along the first guide.

30. The positioning assembly of claim 26, wherein the one or more fixed guides includes a first guide oriented transverse to the first direction of flow and a plurality of second guides extending from the first guide at intervals along the first guide, the second guides are oriented substantially parallel to the first direction of flow, and the first ends of the adjustable guides are pivotably coupled to corresponding ones of the second guides.

31. A method for positioning boards on a conveyor, the method comprising:
providing a rotary fence proximal to the conveyor, wherein the rotary fence includes a continuous track loop rotatable in a first direction of flow, a board stop guide mounted to the continuous track loop, a board stop assembly slideably coupled with the board stop guide, a first positioning guide oriented transverse to the first direction of flow, a plurality of second positioning guides coupled with the first positioning guide at intervals along the first positioning guide, and guide selectors positioned proximal to said intervals, wherein the first and second positioning guides are configured to slideably engage a portion of the board stop assembly;
rotating the continuous track loop to bring said portion of the board stop assembly into sliding engagement with the first positioning guide;
operating one or more of the guide selectors to divert said portion of the board stop assembly from the first positioning guide to a selected one of the second positioning guides to thereby position the board stop assembly at a corresponding first

position along the board stop guide, wherein the corresponding first position is one of a plurality of first positions spaced apart along the board stop guide; and

pivoting the plurality of second positioning guides relative to the continuous track loop to thereby position the board stop assembly at a corresponding second position along the board stop guide, wherein the corresponding second position is located between adjacent ones of said first positions.

32. The method of claim 31, wherein the second positioning guides are arranged on a generally horizontal structure, and pivoting the plurality of second positioning guides includes pivoting the generally horizontal structure.

33. The method of claim 31, wherein the second positioning guides have corresponding first ends pivotably coupled with the first positioning guide and opposite second ends, and pivoting the plurality of second positioning guides includes moving the second positioning guides relative to the first positioning guide.

34. The method of claim 33, wherein the rotary fence further includes shifting means coupled with the second positioning guides, and pivoting the plurality of second positioning guides includes operating the shifting means to move the second ends of the second positioning guides in a second direction transverse to the first direction of flow.

35. The method of claim 34, wherein the shifting means includes an elongate shifting member pivotably coupled with the second ends of the second positioning guides and an actuator coupled with the shifting member, the actuator selectively actuable to move the elongate shifting member laterally in the second direction.

36. The method of claim 31, further including providing a computing system operatively coupled with the rotary fence, the computing system configured to operate the guide selectors, the second positioning guides, or the guide selectors and the

second positioning guides to thereby position the board stop assembly at said corresponding second position along the board stop guide.

37. A workpiece positioning system for use in a wood processing line, wherein the wood processing line includes a conveyor configured to convey a workpiece along a path of flow, the system comprising:

a continuous track loop disposed proximal to the conveyor and operable in a first direction generally parallel to the path of flow;

a board stop guide mounted to the continuous track loop;

a board stop assembly slideably coupled with the board stop guide, the board stop assembly including a board stop and an engaging member;

a first positioning guide oriented transverse to the first direction;

a plurality of second positioning guides coupled with the first positioning guide at intervals along the first positioning guide, wherein the first and second positioning guides are configured to slideably engage the engaging member of the board stop assembly;

guide selectors positioned proximal to said intervals, the guide selectors selectively operable to divert the engaging member from the first positioning guide to a selected one of the second positioning guides; and

pivot means coupled with the plurality of second positioning guides, the pivot means operable to pivot the second positioning guides relative to the conveyor.

38. The system of claim 37, wherein one or more of the first and second positioning guides are arranged on a generally horizontal structure, and the generally horizontal structure is rotatable.

39. The system of claim 37, wherein the second positioning guides have first ends and opposite second ends, the first ends are pivotably coupled with the first positioning guide, and the second ends are movable in a second direction transverse to the first direction.

40. The system of claim 39, wherein the pivot means includes a shifting member coupled with the second positioning guides and an actuator coupled with the shifting member, the actuator configured to move the shifting member in the second direction.

41. The system of claim 40, wherein the shifting member is pivotably coupled with the second ends of the second positioning guides.

42. The system of claim 37, further including a plurality of longitudinal positioning guides extending from the first positioning guide to corresponding ones of the second positioning guides, wherein the longitudinal positioning guides are fixedly coupled with the first positioning guide and pivotably coupled with the second positioning guides.

43. A positioning apparatus for use with a rotary fence, wherein the rotary fence includes a board stop coupled with a continuous track loop, the continuous track loop is operable in a first direction of flow and the board stop is movable relative to the continuous track loop in a second direction that is transverse to the first direction of flow, the positioning apparatus comprising:

a positioning guide with guide surfaces configured to engage the board stop, the guide surfaces including a lateral guide surface oriented transverse to the first direction and a plurality of longitudinal guide surfaces arranged at intervals along the lateral guide surface, the longitudinal guide surfaces defining a corresponding plurality of first lateral positions, wherein the positioning guide is operable to divert the board stop from the lateral guide surface to a selected one of the longitudinal guide surfaces to position the board stop at a corresponding one of the first lateral positions; and

a shifting member coupled with a downstream end of the positioning guide, the shifting member configured to laterally displace a downstream end of the longitudinal guide surfaces to move the board stop to a second lateral position between adjacent ones of said first lateral positions.

44. The positioning assembly of claim 43, further including an actuator coupled to the shifting member, wherein the actuator is selectively operable to laterally displace the shifting member.

45. The positioning apparatus of claim 43, wherein the positioning guide comprises a lateral structure disposed in a plane generally parallel to the first direction of flow and coupled with the lateral and longitudinal guide surfaces, and the lateral structure is rotationally positionable to laterally displace the downstream end of the longitudinal guide surfaces to move the board stop to the second lateral position.

46. The positioning apparatus of claim 43, wherein the lateral guide surface is defined by a lateral guide and the longitudinal guide surfaces are defined by longitudinal guides having first ends and opposite second ends, the first ends coupled with the lateral guide and the second ends coupled with the shifting member.

47. The positioning apparatus of claim 46, wherein the first ends of the longitudinal guides are pivotably coupled with the lateral guide and the second ends of the longitudinal guides are pivotably coupled to the shifting member.

48. The positioning apparatus of claim 47, wherein the longitudinal guides have one or more pivot joints between the first and second ends, the first ends of the longitudinal guides are fixedly coupled with the lateral guide, and the second ends of the longitudinal guides are pivotably coupled to the shifting member.

49. The positioning apparatus of claim 43, the positioning guide further including a guide selector positioned at one or more of said intervals, the guide selector being movable from a first position wherein the longitudinal guide surface at said interval is blocked to a second position wherein the lateral guide surface is blocked.

50. A method of positioning a board stop of a rotary fence at a desired lateral position, wherein the rotary fence includes a continuous track loop operable in a first

direction of flow and the board stop is movable relative to the continuous track loop in a second direction that is transverse to the direction of flow, the method comprising:

providing a guide apparatus with a lateral guide and a plurality of longitudinal guides arranged at intervals along the lateral guide, the lateral guide and the longitudinal guides configured to slideably engage the board stop from an upstream end of the lateral guide to a downstream end of the longitudinal guides, wherein the intervals define corresponding first lateral positions;

diverting the board stop from the lateral guide to a selected one of the longitudinal guides to position the board stop at the corresponding one of said first lateral positions; and

laterally displacing a downstream end of the longitudinal guides to position the downstream end of the selected one of the longitudinal guides at the desired lateral position, wherein the desired lateral position is a second lateral position between adjacent ones of said first lateral positions.

51. The method of claim 50, wherein the guide apparatus includes guide selectors positioned at the intervals and individually operable to block the lateral guide downstream of the corresponding longitudinal guides, and wherein diverting the board stop from the lateral guide to the selected one of the longitudinal guides includes actuating the corresponding one of the guide selectors to block the lateral guide downstream of the selected one of the longitudinal guides.

52. The method of claim 50, wherein the guide apparatus includes guide selectors positioned at the intervals and individually actuatable to unblock the longitudinal guide, and wherein diverting the board stop from the lateral guide to the selected one of the longitudinal guides includes actuating the corresponding one of the guide selectors to unblock the selected one of the longitudinal guides.

53. The method of claim 50, wherein a downstream end of the guide apparatus is coupled with a shifting member, and laterally displacing the downstream end of the

longitudinal guides includes displacing the shifting member substantially in the second direction.

54. The method of claim 53, wherein the guide apparatus further includes a lateral structure coupled with the lateral guide and the longitudinal guides, and laterally displacing the downstream end of the longitudinal guides includes rotationally positioning the lateral structure.

55. The method of claim 50, wherein the longitudinal guides have upstream ends pivotably coupled with the lateral guide and downstream ends pivotably coupled with a shifting member, and laterally displacing a downstream end of the longitudinal guides includes displacing the shifting member substantially in the second direction.

56. A system for positioning a board on a conveyor, the system comprising:
 a continuous track loop operable in a first direction of flow;
 a board stop guide mounted to the continuous track loop;
 a board stop slideably mounted to the board stop guide and movable along the board stop guide in a second direction generally perpendicular to the first direction;
 a positioning guide disposed in a plane generally parallel to the first direction and having a first engaging surface and a plurality of second engaging surfaces configured to slideably engage the board stop, the first engaging surface extending transverse to the first direction and the second engaging surfaces extending generally in the first direction; and
 a shift member coupled with the positioning guide, the shift member actuable to laterally reposition a downstream end of the second engaging surfaces,
 wherein the positioning guide is configured to guide the board stop to a selected one of a plurality of first lateral positions relative to the continuous track loop, and
 wherein the shift member is operable to move the board stop from the selected one of the plurality of first lateral positions to a desired lateral position relative to the conveyor.

57. The system of claim 56, further including a return guide coupled with the continuous track loop, the return guide configured to reset the board stop from the desired lateral position to an initial lateral position for engagement with the first engaging surface.

58. The system of claim 56, wherein the positioning guide is pivotable, and the shift member is configured to laterally reposition the downstream end of the positioning guide by rotating the positioning guide.

59. The system of claim 56, further including a first actuator coupled with the shift member, the first actuator configured to displace the shift member substantially in the second direction.

60. The system of claim 59, further including a computing device operatively coupled with the first actuator, the computing device configured to control the first actuator to move the board stop from the selected one of the plurality of first lateral positions to the desired lateral position.

61. The system of claim 60, further including one or more second actuators operatively coupled with the positioning guide, the one or more second actuators operable to halt translocation of the board stop along the board stop guide at the selected one of the plurality of first lateral positions.

62. The system of claim 61, wherein the computing device is operatively coupled with the one or more second actuators and further configured to control the one or more second actuators to move the board stop to the selected one of the plurality of first lateral positions.

63. The system of claim 61, wherein the computing device is operatively coupled with the continuous track loop and further configured to coordinate operations of the

continuous track loop, the first actuator, and the one or more second actuators to move the board stop to the desired lateral position.

64. The system of claim 63, wherein the computing device includes a scanner.

65. A method of modifying a rotary positioning fence for positioning boards on a conveyor, wherein the rotary positioning fence has a continuous track loop operable in a direction of flow and a board stop coupled with the continuous track loop, and the board stop is movable relative to the continuous track loop in a second direction of flow that is transverse to, and substantially co-planar with, the first direction, the method comprising:

- providing a positioning guide in a plane generally parallel to the first and second direction, wherein the positioning guide has a first engaging surface oriented transverse to the first direction and a plurality of second engaging surfaces oriented generally parallel to the first direction, the first and second engaging surfaces configured to slideably engage the board stop assembly; and

- coupling a shift member with the positioning guide, the shift member configured to laterally displace a downstream end of the second engaging surfaces substantially within said plane,

- wherein the positioning guide is operable to guide the board stop to a selected one of a plurality of first lateral positions relative to the continuous track loop, and

- wherein the shift member is operable to move the board stop from the selected one of the plurality of first lateral positions to a desired lateral position relative to the conveyor.

66. The method of claim 65, wherein the positioning guide is pivotable, and the shift member is configured to laterally displace the downstream end of the positioning guide by rotationally positioning the positioning guide.

67. The method of claim 66, further comprising operatively coupling a computing device with the shift member, wherein the computing device is configured to control the shift member to move the board stop to the desired lateral position.

68. The method of claim 65, wherein the downstream end of the positioning guide includes a plurality of second guides pivotably coupled with the first guide at fixed intervals along the first guide and configured to slideably engage the board stop, the plurality of first lateral positions defined by the plurality of second guides, and wherein coupling the shift member with the positioning guide includes pivotably coupling the shift member with downstream ends of the second guides.

69. The method of claim 65, further comprising coupling a first actuator with the shift member, the first actuator configured to displace the shift member substantially in the second direction.

70. The method of claim 69, further including operatively coupling one or more second actuators with the positioning guide, the one or more second actuators operable to substantially halt lateral translocation of the board stop relative to the continuous track loop at the selected one of the plurality of first lateral positions.

71. The method of claim 70, further including operatively coupling the computing device with the one or more second actuators, the computing device configured to control the one or more second actuators to position the board stop guide at the selected one of the plurality of first lateral positions.

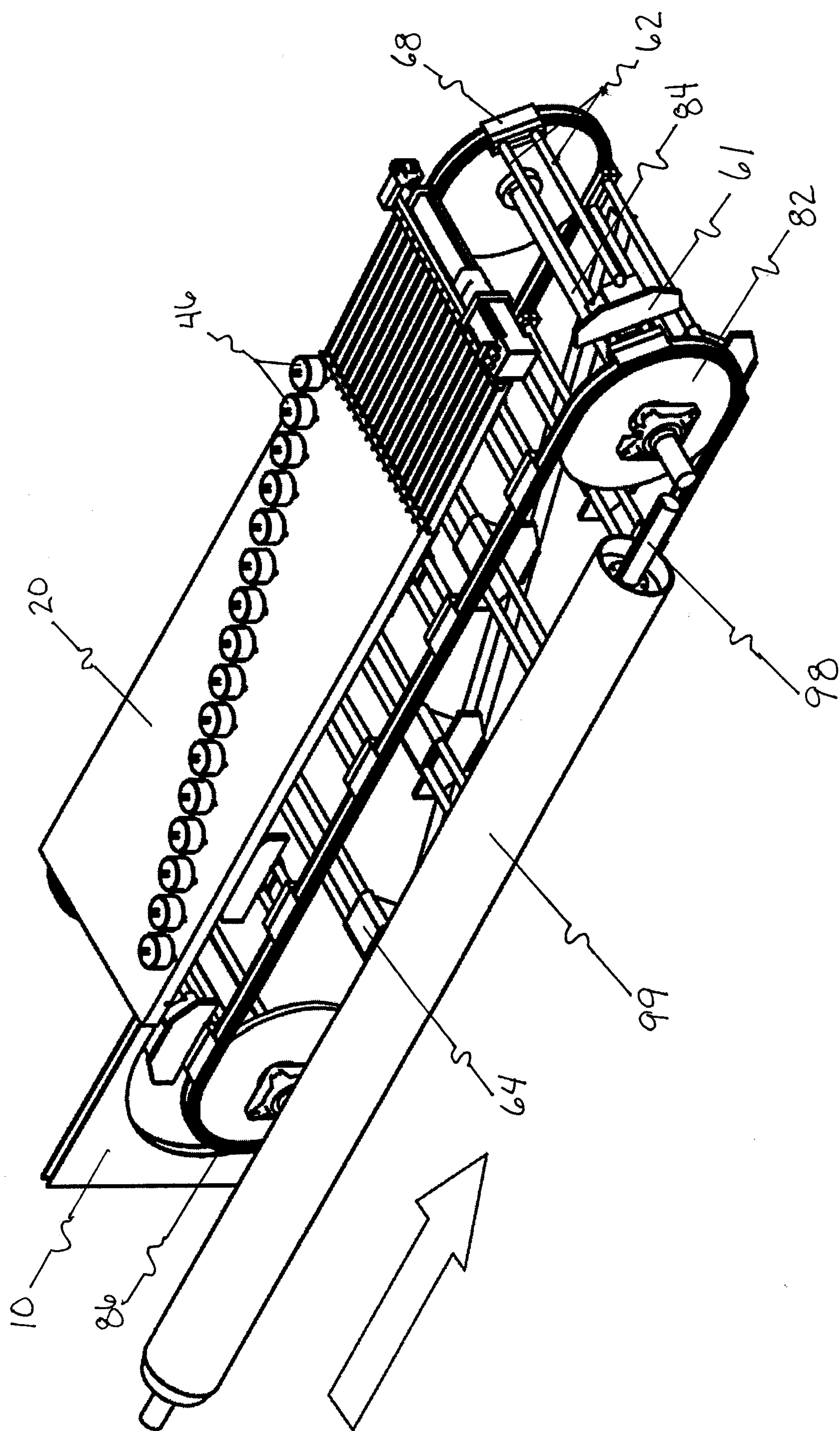


Figure 1

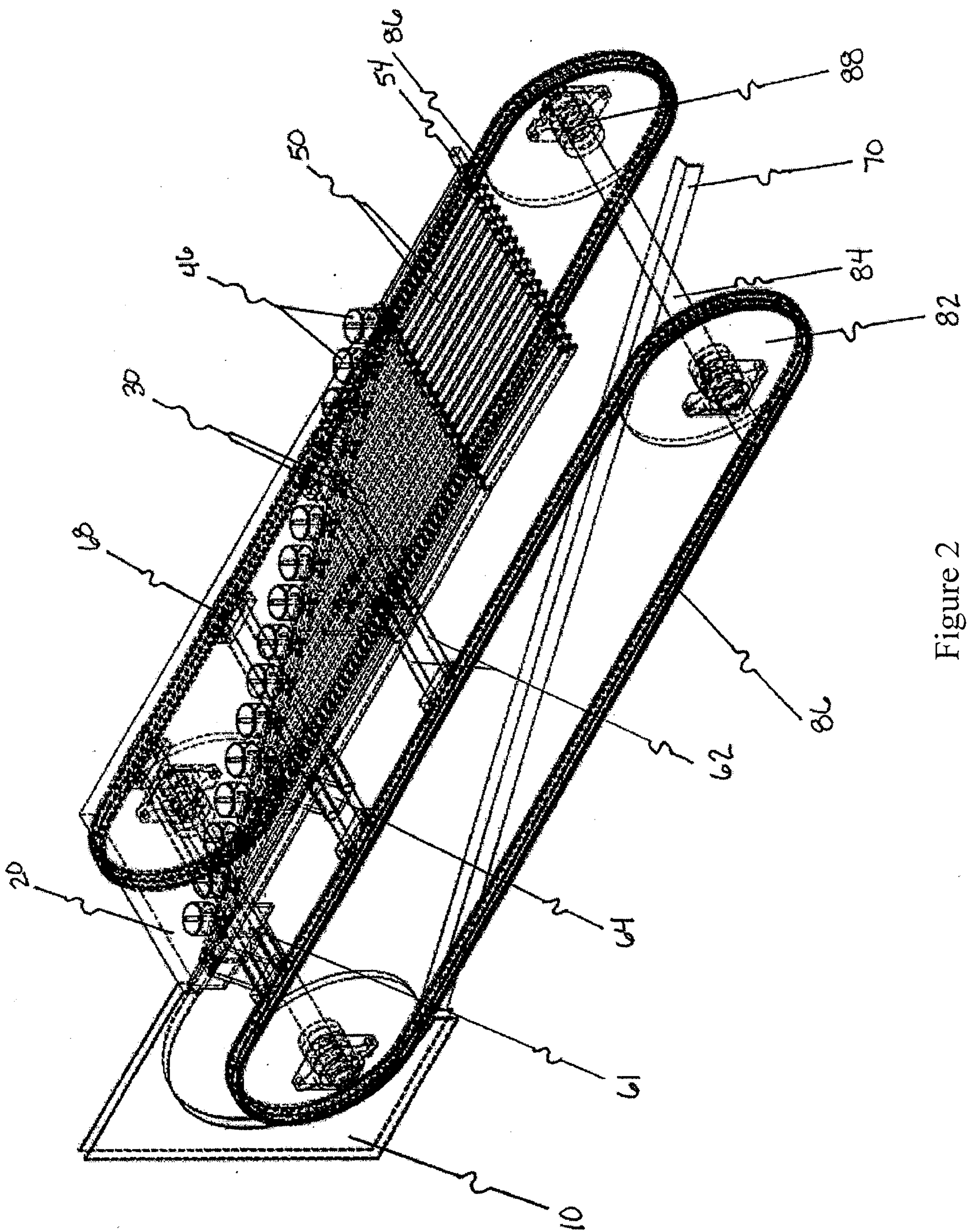


Figure 2

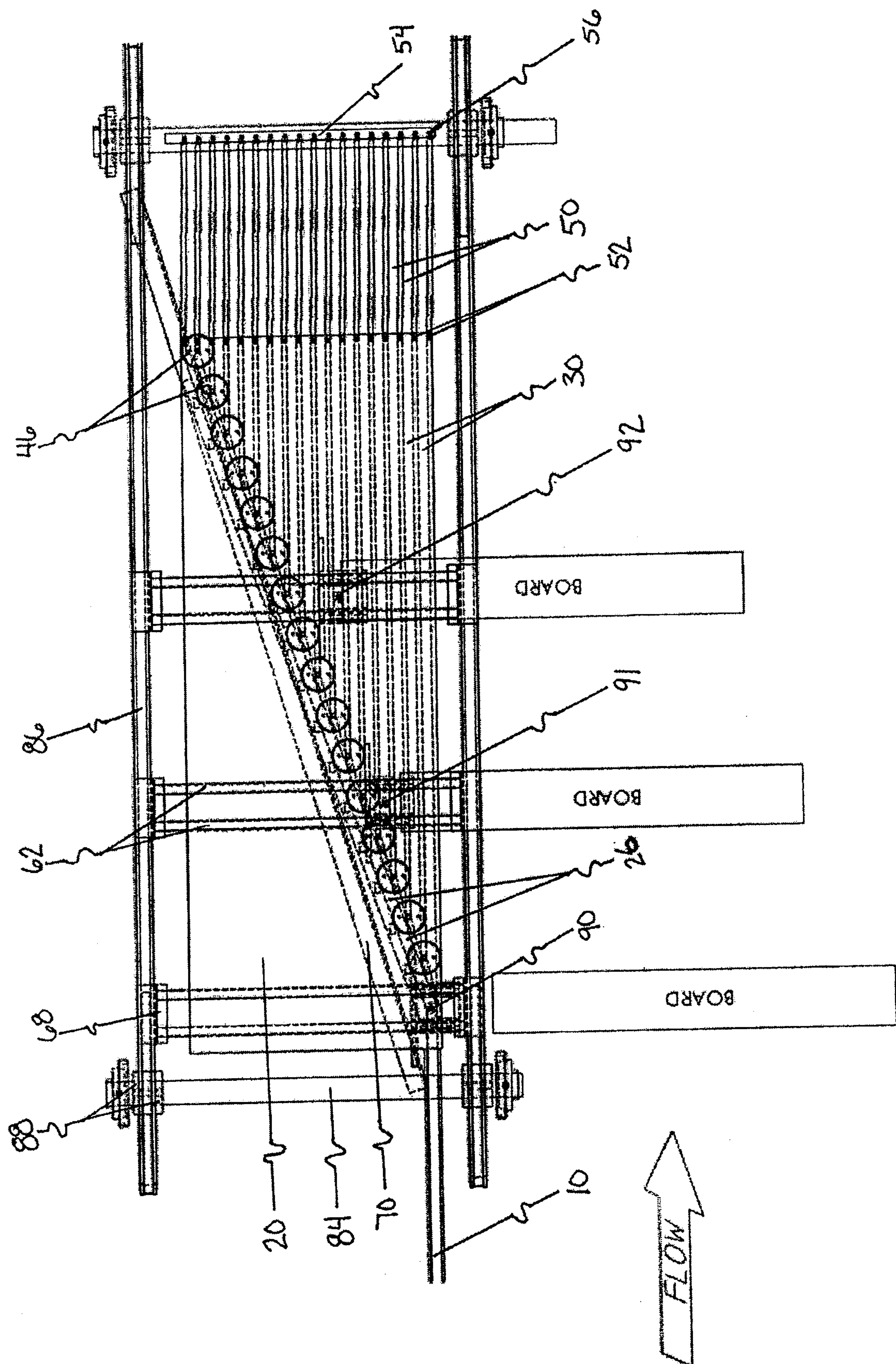


Figure 3a

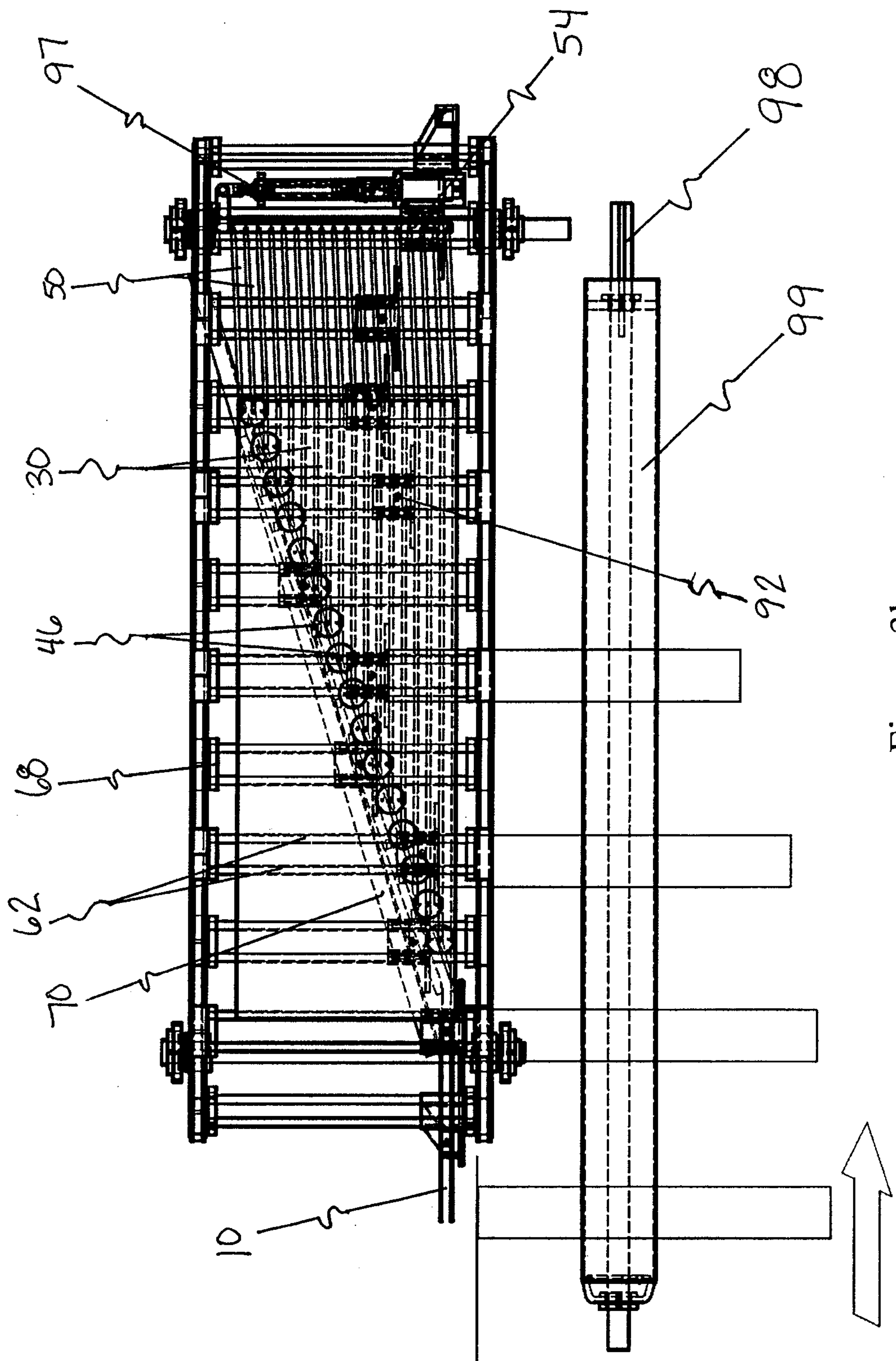


Figure 3b

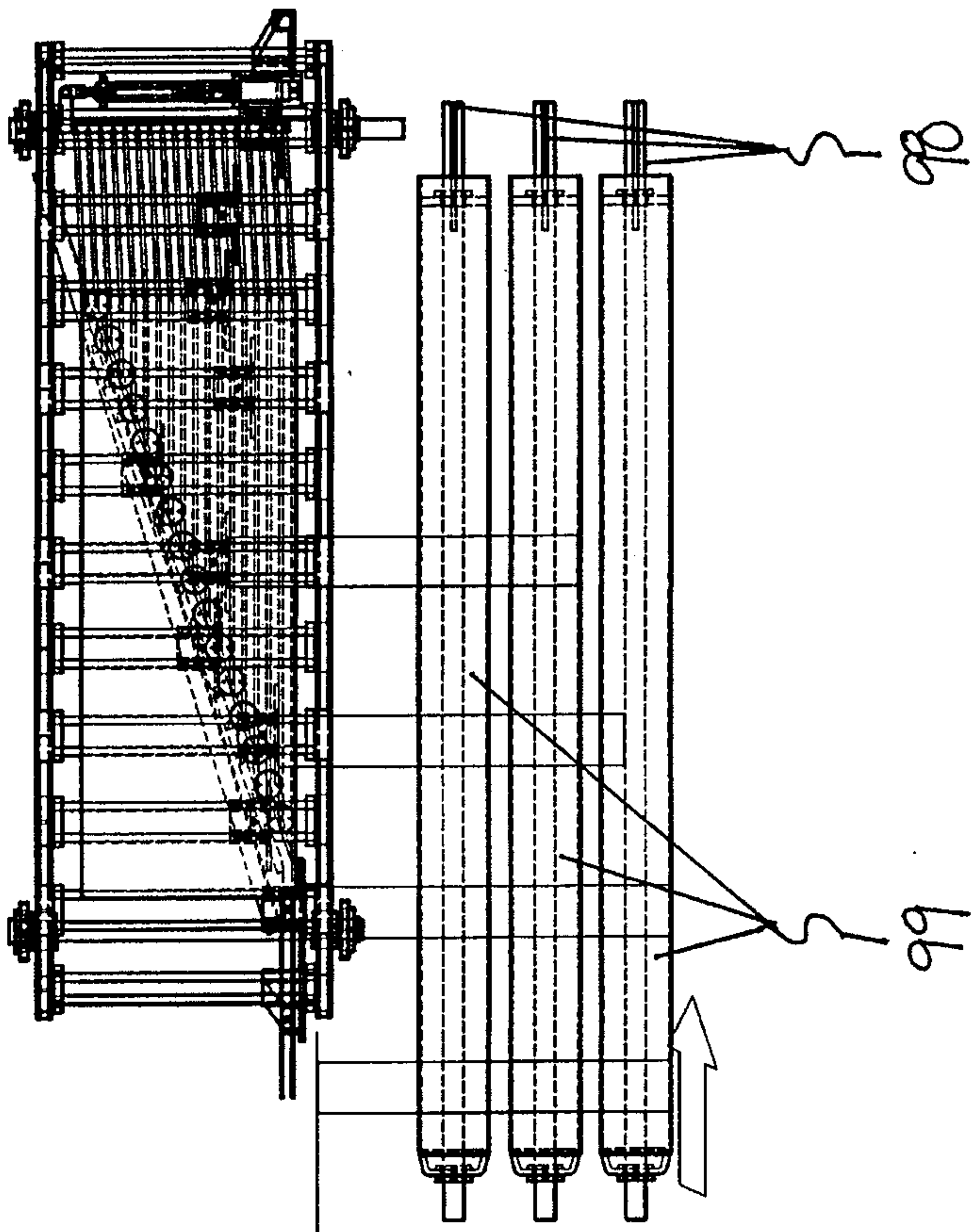


Figure 3d

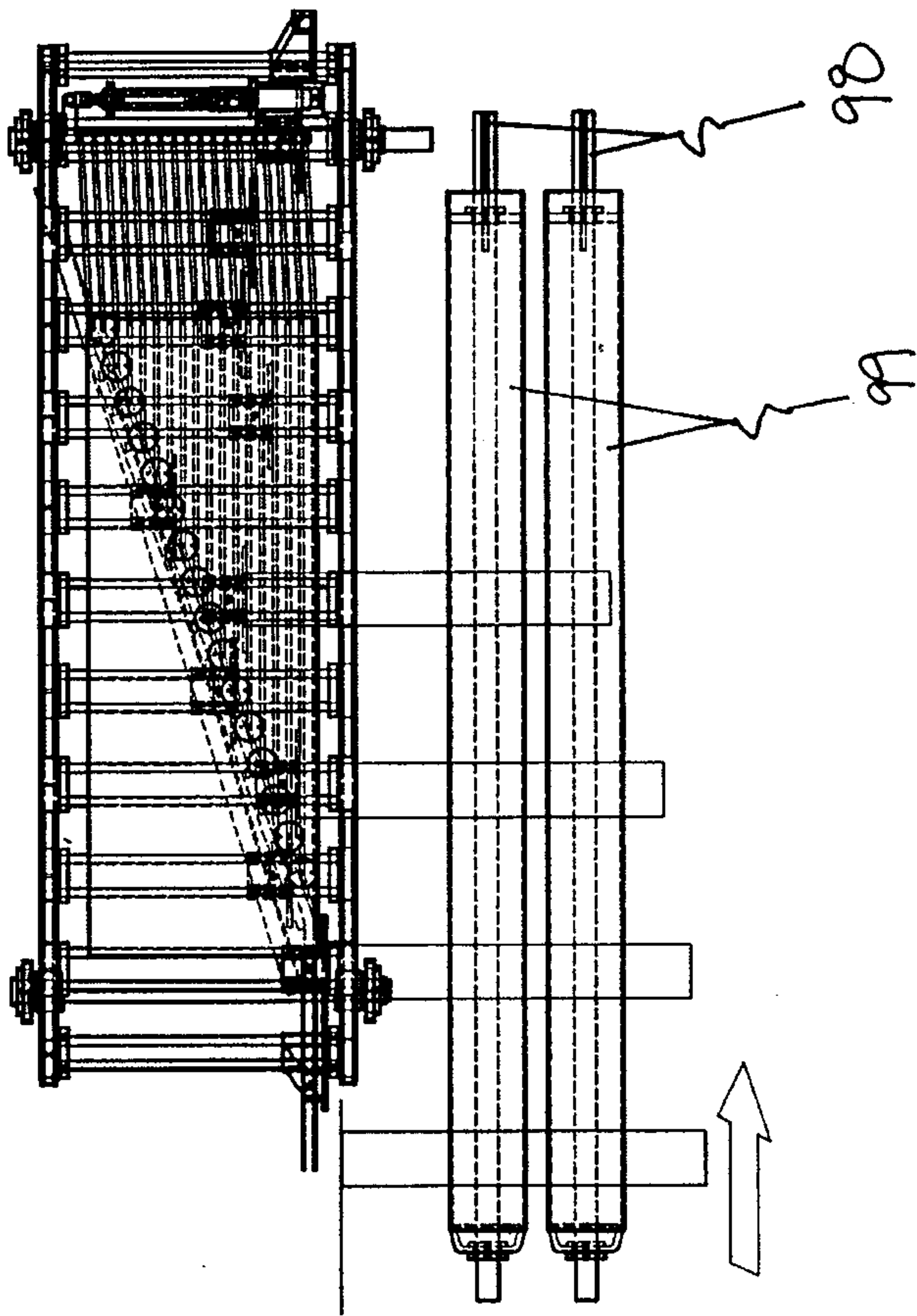


Figure 3c

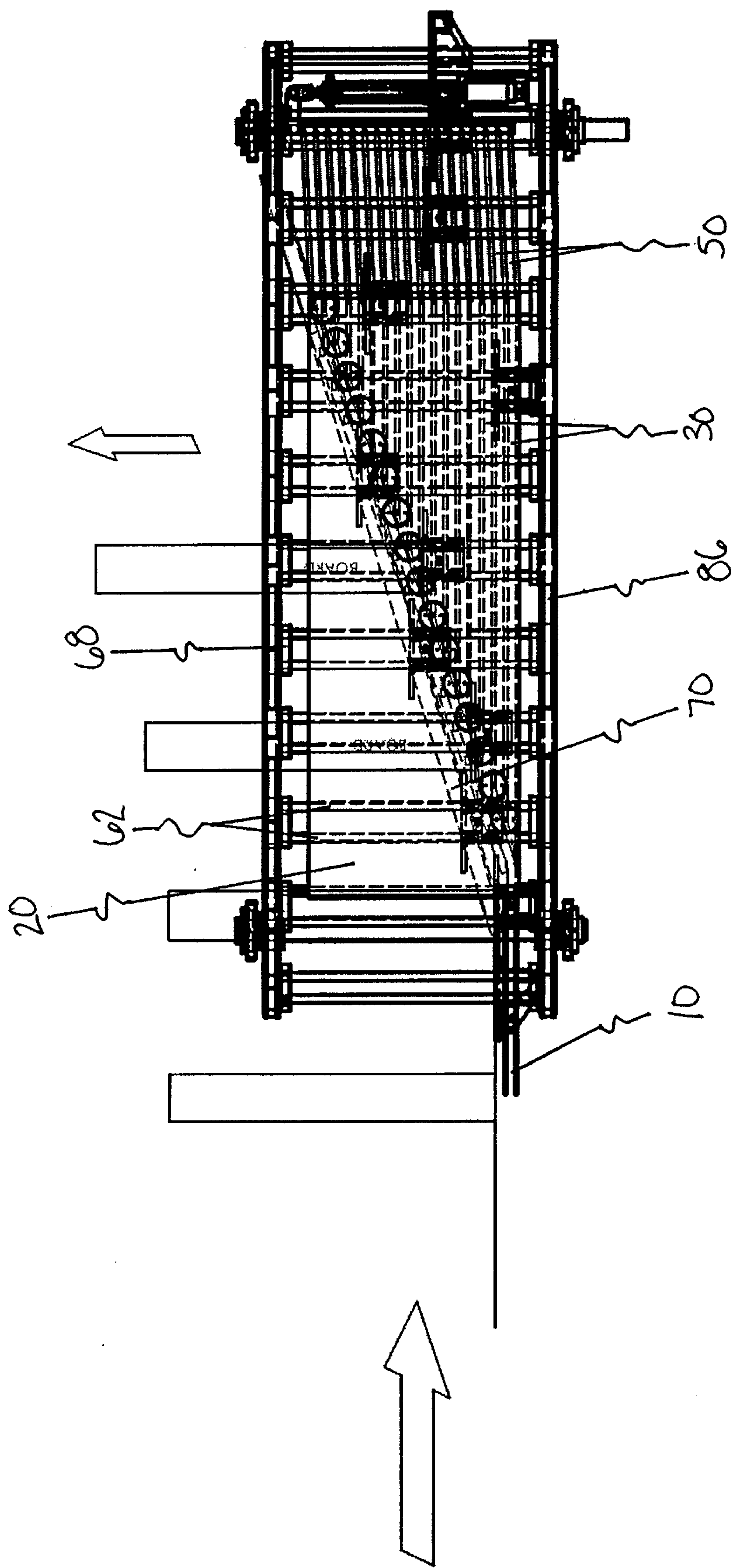


Figure 3e

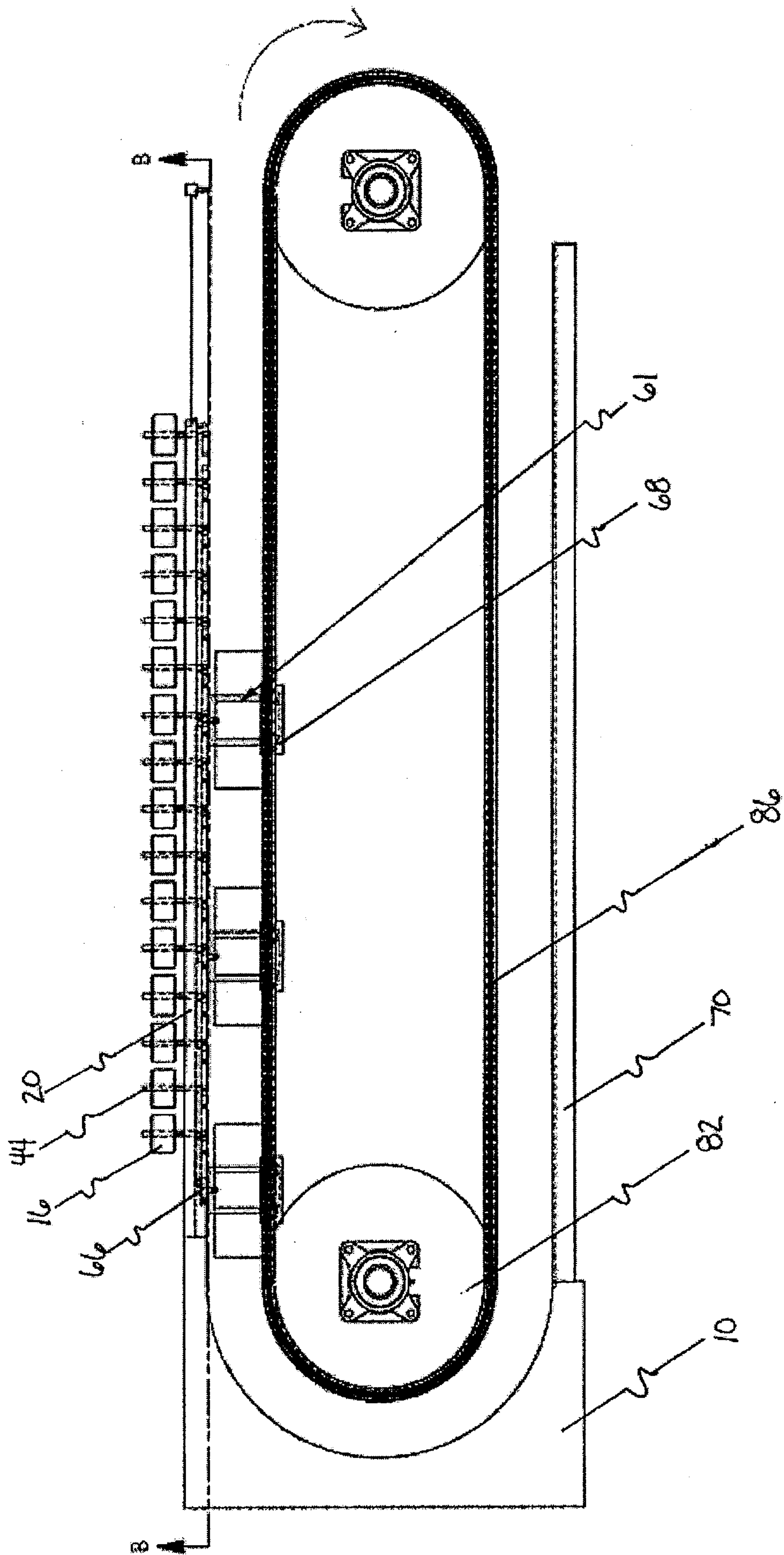


Figure 4a

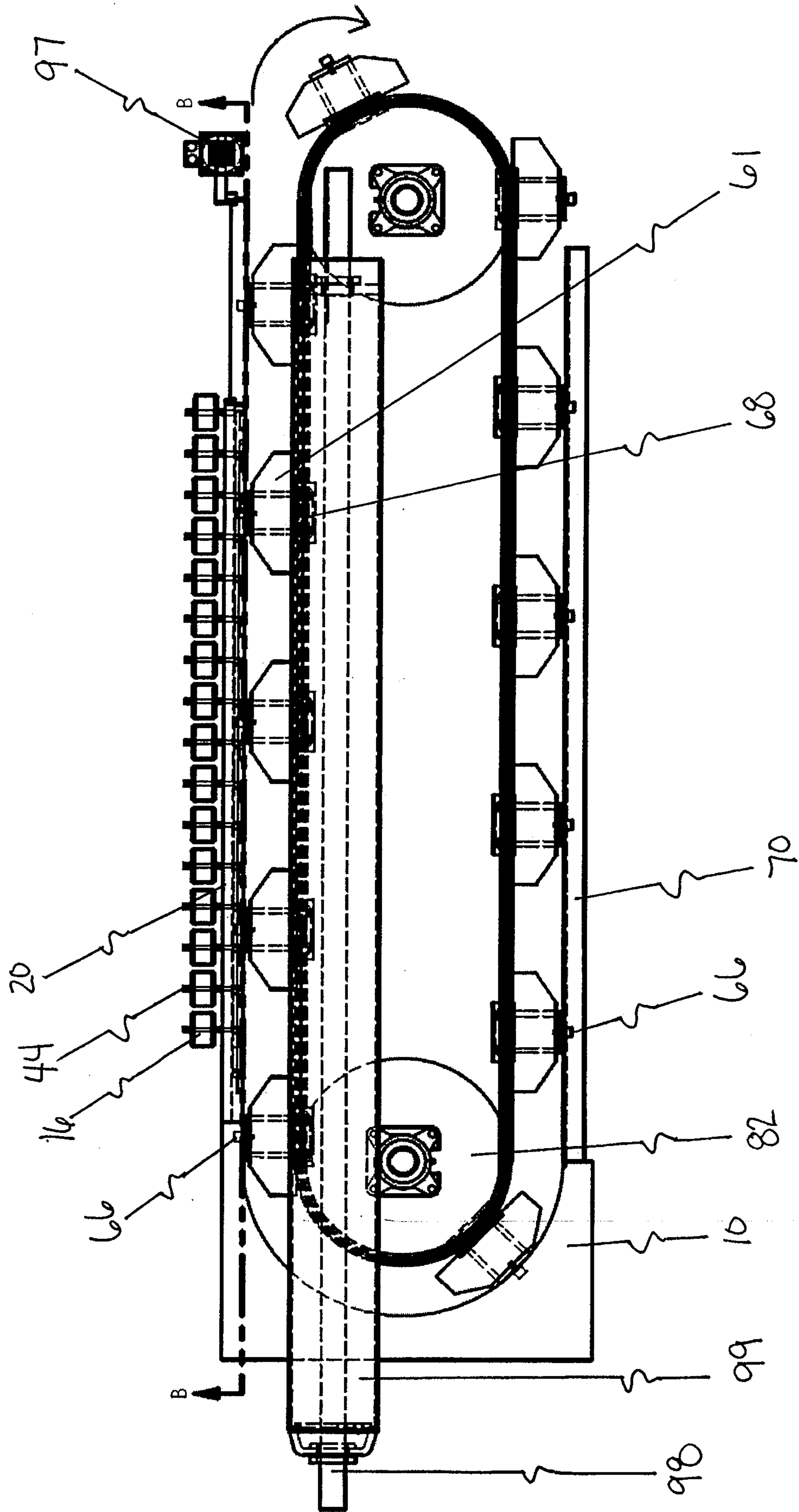


Figure 4b

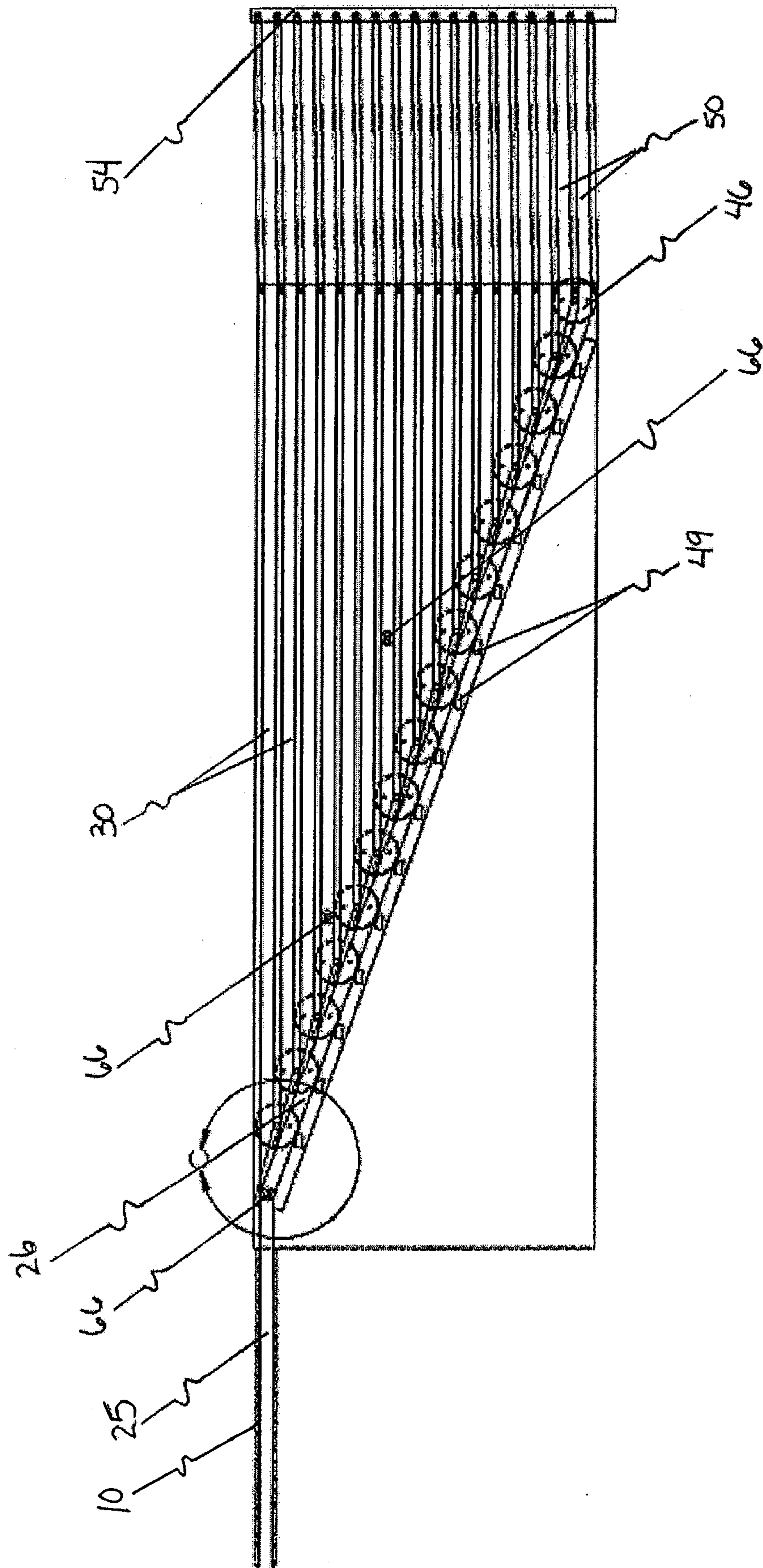


Figure 5a

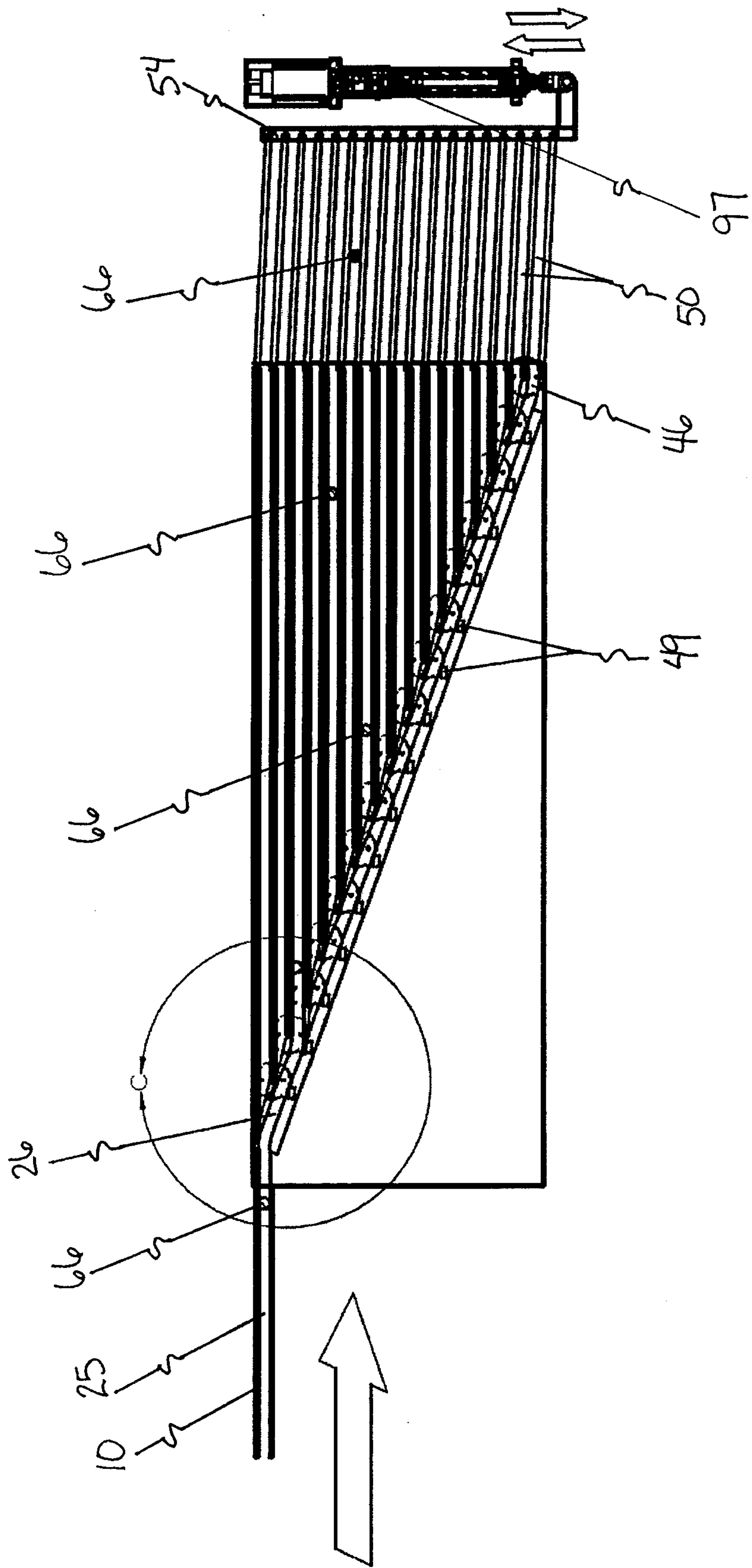


Figure 5b

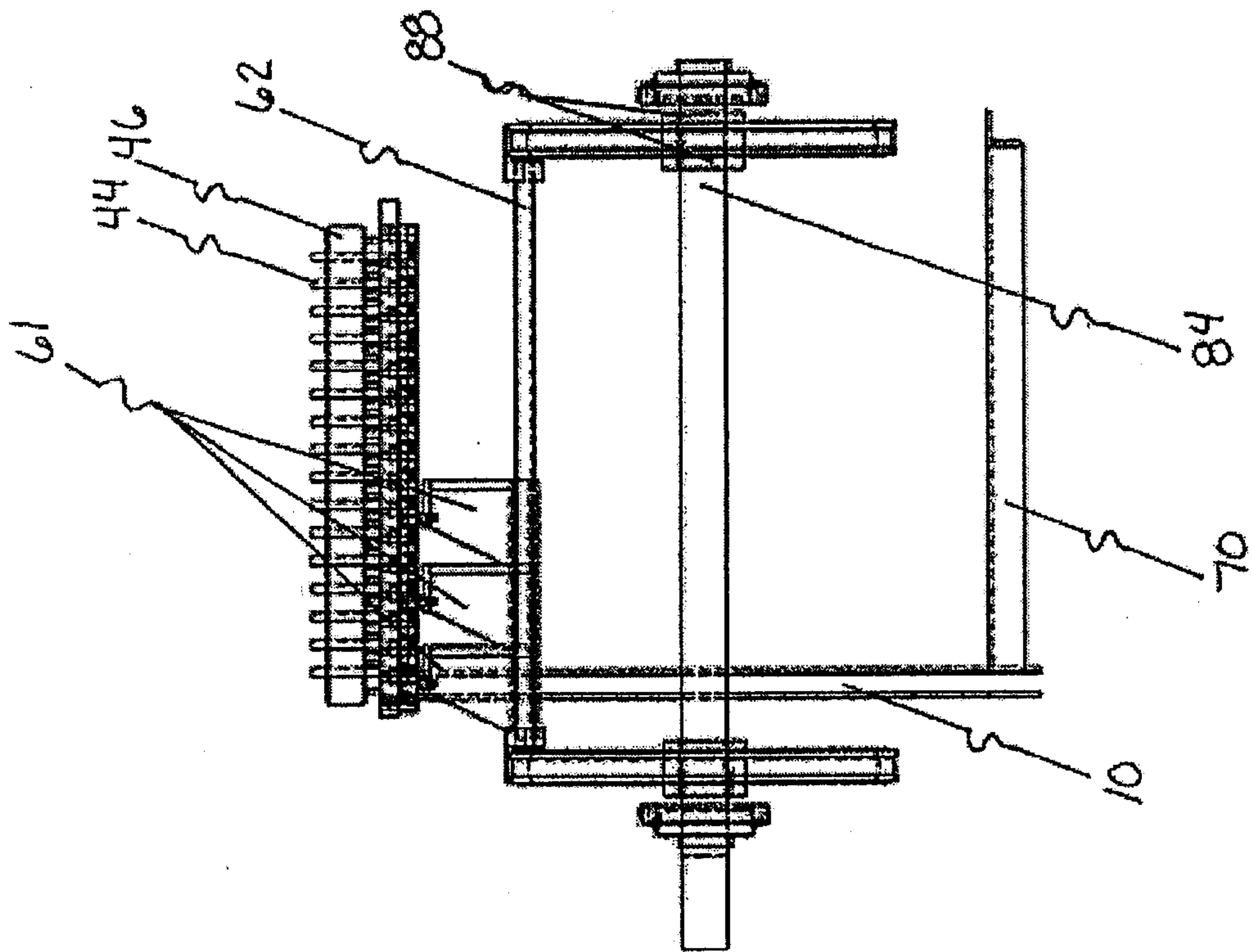


Figure 6a

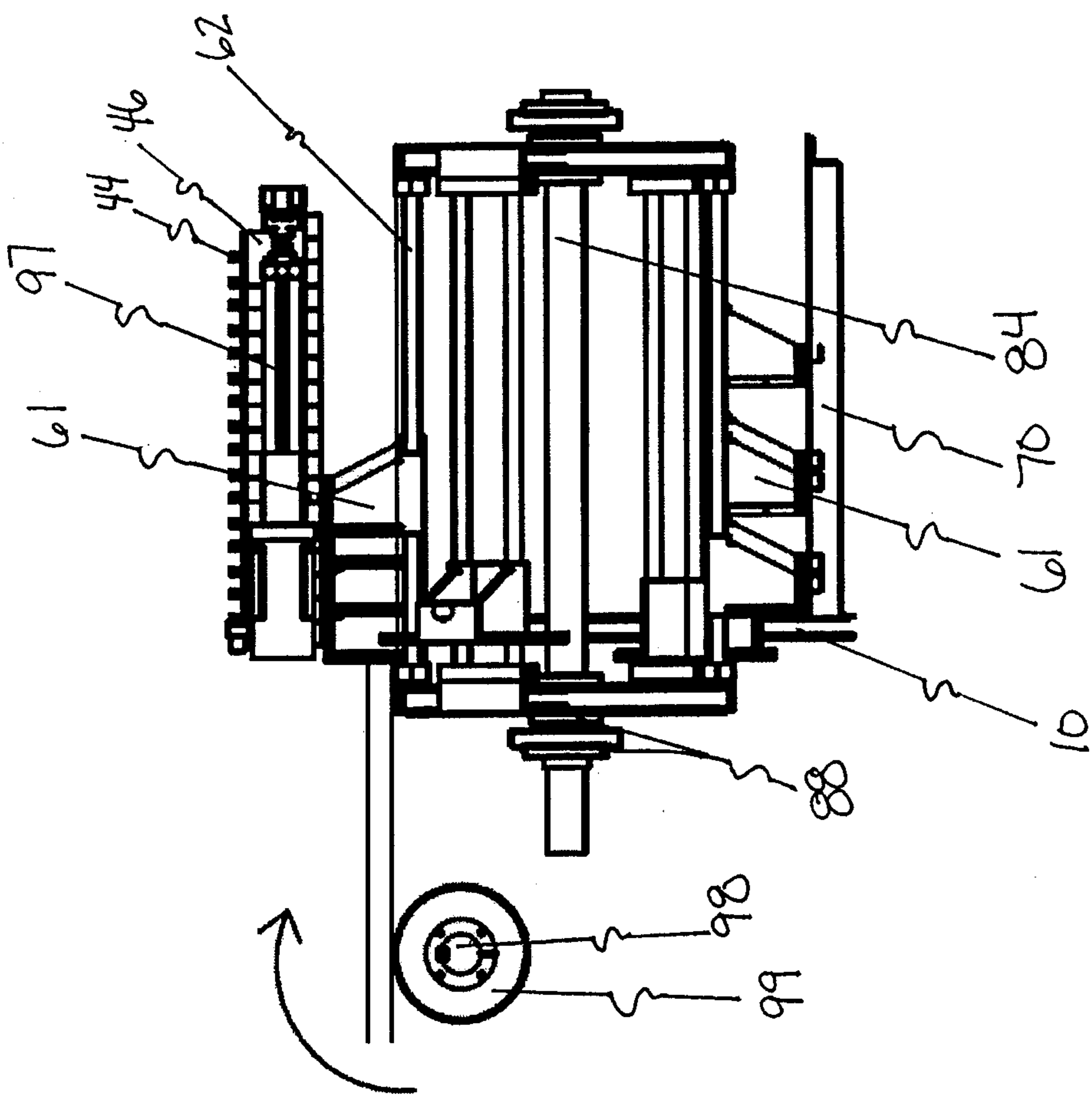


Figure 6b

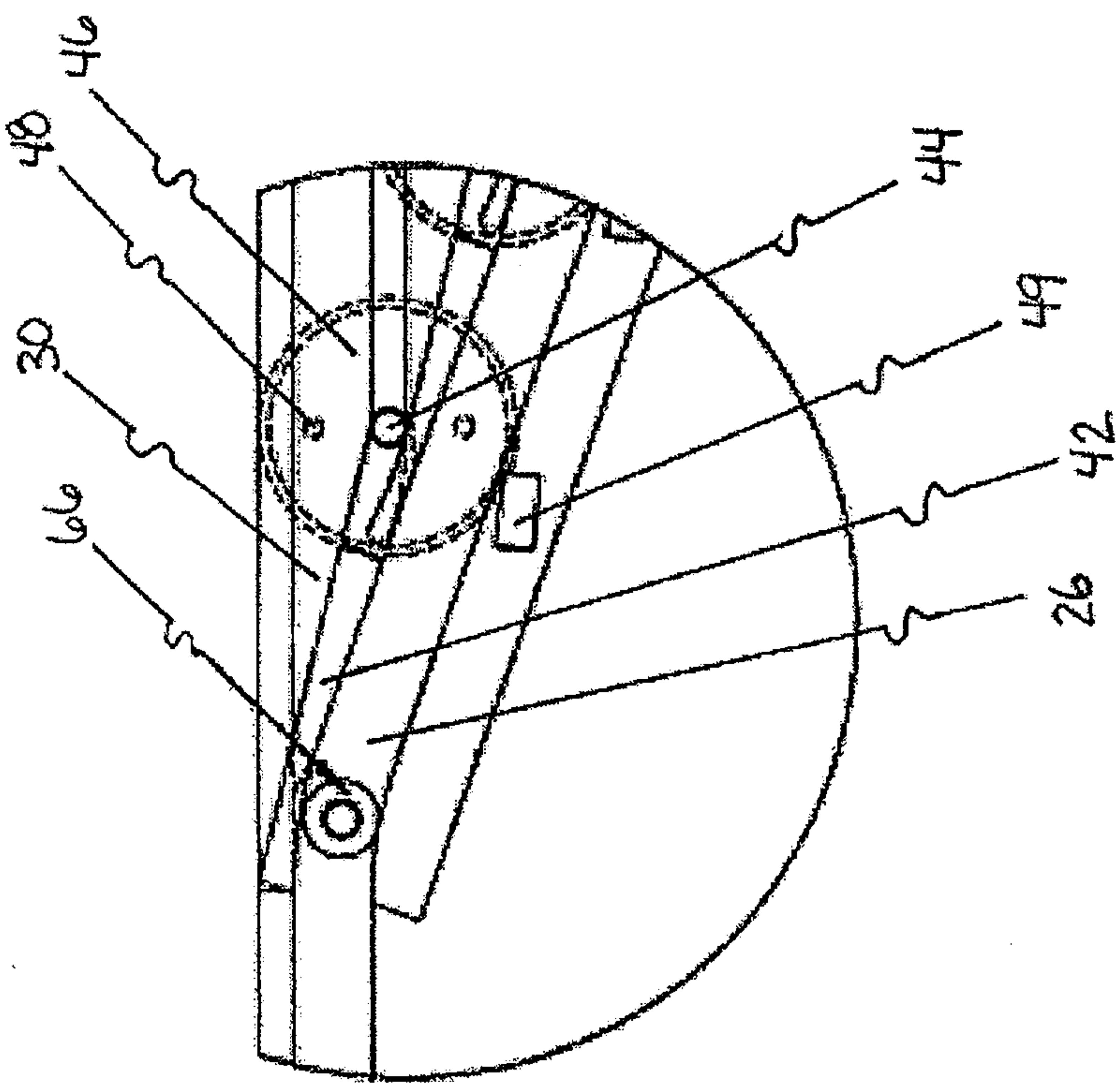


Figure 7a

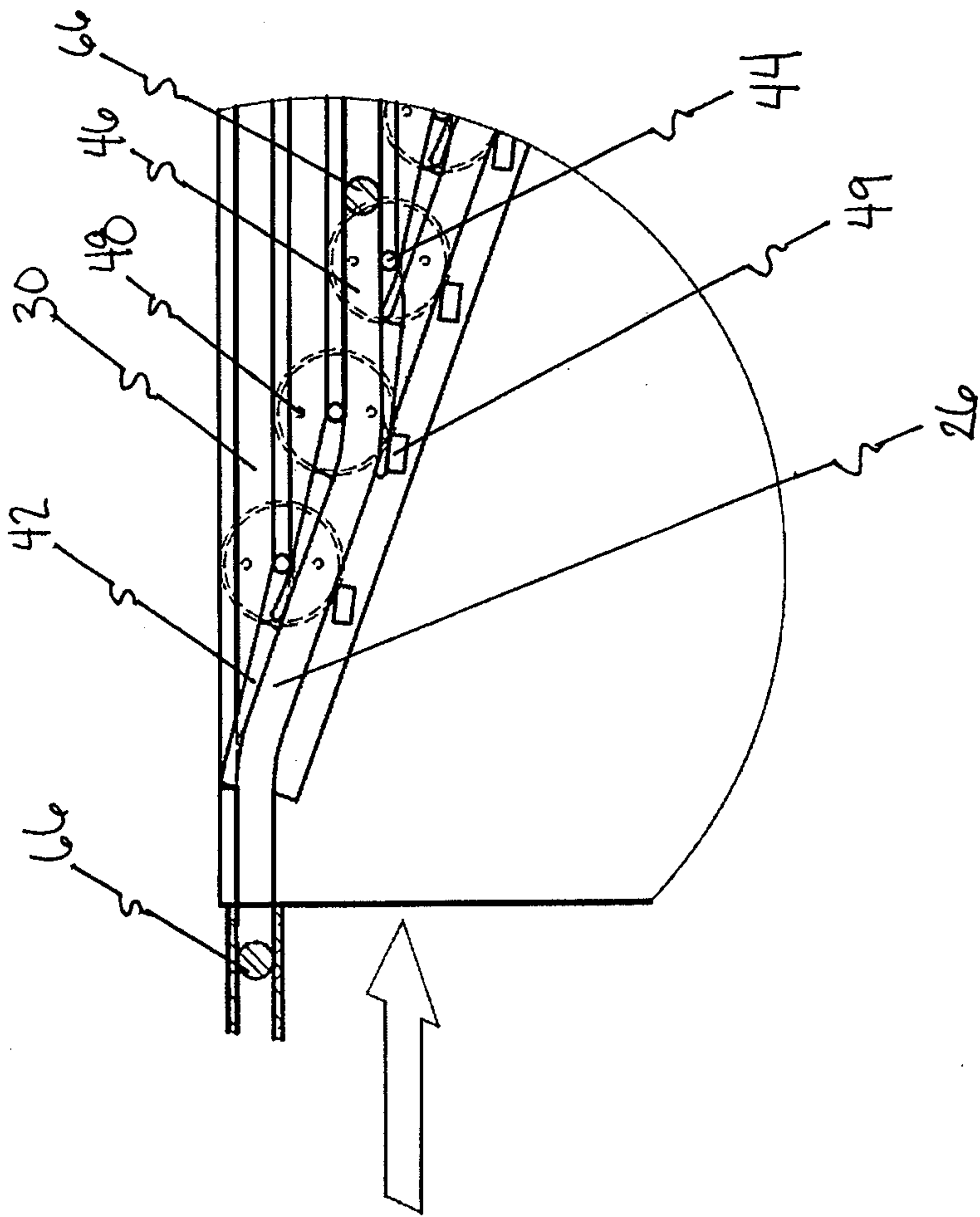


Figure 7b

