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An agency of Industry Canada

CA 2531763 A1 2006/06/30

(21) 2 531 763

(12) DEMANDE DE BREVET CANADIEN
CANADIAN PATENT APPLICATION

(13) A1

(22) Date de dépôt/Filing Date: 2005/12/30

(41) Mise à la disp. pub./Open to Public Insp.: 2006/06/30

(30) Priorité/Priority: 2004/12/30 (US60/640,364)

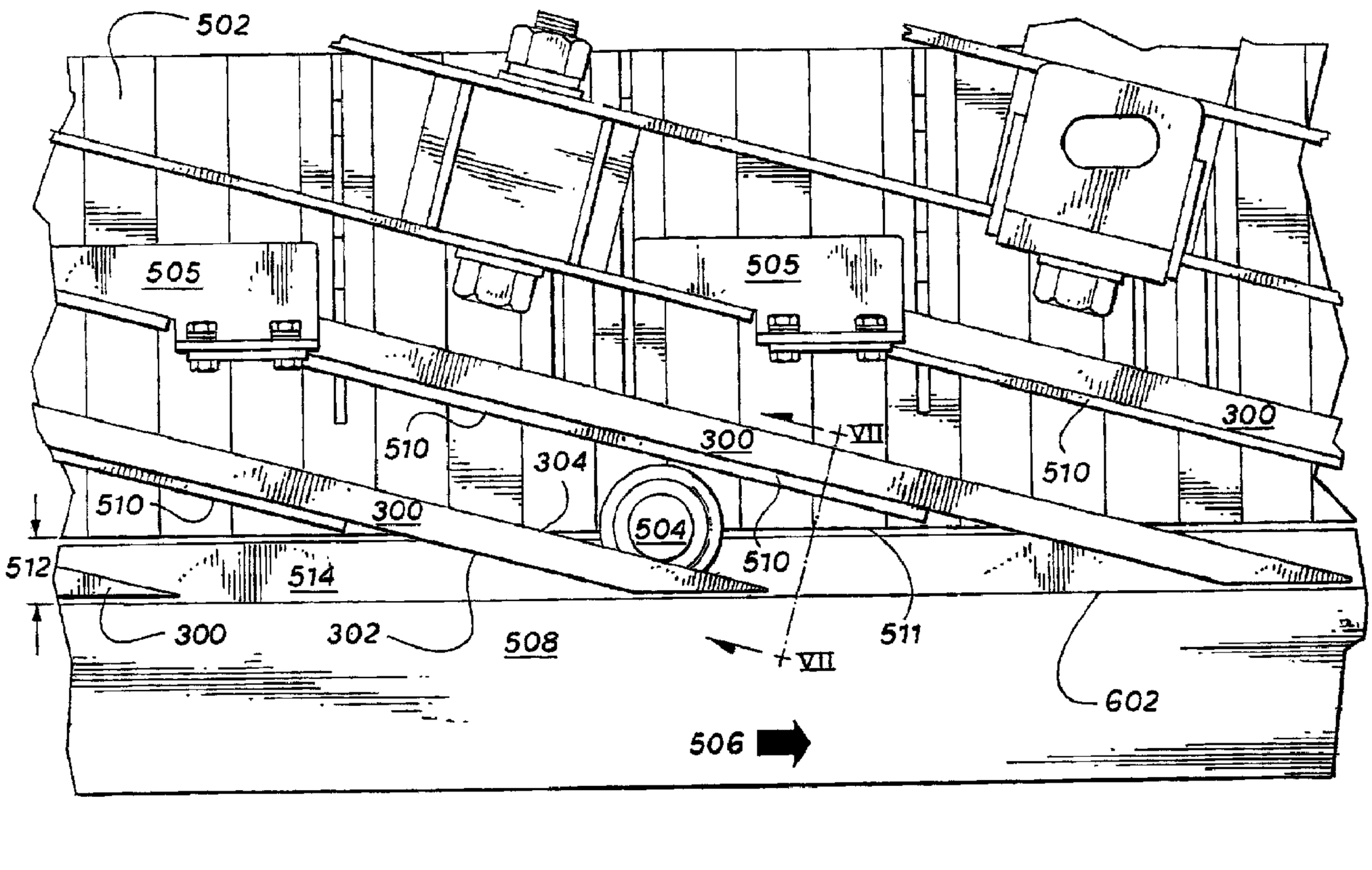
(51) Cl.Int./Int.Cl. *B65B 35/56* (2006.01), *B65B 21/04* (2006.01), *B65B 43/42* (2006.01)

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(54) Titre : GUIDE DE CONTENANTS POUR MACHINE A EMBALLER
(54) Title: CONTAINER GUIDE FOR PACKAGING MACHINE



(57) Abrégé/Abstract:
A container guide for preventing bottles or other containers from overturning as the bottles are loaded into cartons includes guide bars mounted above a container conveyor and in parallel alignment with lane dividers for directing bottles from the container conveyor and into the cartons, which are conveyed on a carton conveyor. The guide bars support the upper portions of the bottles as the bottles cross a potentially uneven transition region extending between the two conveyors and beyond the extent of the lane dividers. Each guide bar has a guiding edge for supporting the upper portion of the bottles, which may be tapered or shouldered thereby requiring the guiding edge to be offset somewhat from the lane dividers. Each guide bar also has an outfeed end that is relatively thinner than its infeed end to facilitate the outfeed end clearing the upper edges of the end flaps of the cartons.

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ABSTRACT

A container guide for preventing bottles or other containers from overturning as the bottles are loaded into cartons includes guide bars mounted above a container conveyor and in parallel alignment with lane dividers for directing bottles from the container conveyor and into the cartons, which are conveyed on a carton conveyor. The guide bars support the upper portions of the bottles as the bottles cross a potentially uneven transition region extending between the two conveyors and beyond the extent of the lane dividers. Each guide bar has a guiding edge for supporting the upper portion of the bottles, which may be tapered or shouldered thereby requiring the guiding edge to be offset somewhat from the lane dividers. Each guide bar also has an outfeed end that is relatively thinner than its infeed end to facilitate the outfeed end clearing the upper edges of the end flaps of the cartons.

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NONPROVISIONAL PATENT APPLICATION

CONTAINER GUIDE FOR PACKAGING MACHINE

RELATED APPLICATION

[0001] This application claims the benefit of the filing of Provisional Patent Application Serial No. 60/640,364, entitled "Container Guide for Packaging Machine" and filed on December 30, 2004, the entirety of which is hereby incorporated by reference.

TECHNICAL FIELD

[0002] This invention relates generally to machines for loading containers into cartons or other packages, and more particularly, to a container guide that prevents containers from overturning during the carton loading process.

BACKGROUND OF THE INVENTION

[0003] Automatic packaging machines are commonly configured to rapidly load one or more lanes of cylindrical containers such as bottles, into cartons to facilitate distribution and ultimate use of the product within the containers. For example, certain packaging machines convey bottles from a product conveyor into multiple lanes where the bottles are grouped according to the package configuration, and then the bottles are pushed off of the product conveyor and into one or both ends of sleeve-type paperboard cartons. Such automatic packaging machines operate at high speeds to maximize the efficiency of the packaging operation. Furthermore, the bottles must be pushed into the carton with sufficient force to overcome the friction caused by the top and base of each bottle contacting the respective upper and lower inner surfaces of the carton, as only very small gaps therebetween can be tolerated to yield a snug package.

[0004] Unfortunately, propelling bottles forward at high speeds into a relatively snug carton yields an unacceptably high probability that bottles will frequently overturn. This is particularly the case when the bottles are inherently relatively unstable. For example,

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Polyethylene Terephthalate (PET) bottles that commonly have petaloid bases, or bottles having a relatively high ratio of height to diameter, are inherently relatively unstable. Such tip-overs are costly in time and resources. The entire machine may have to be shut down to clear overturned bottles, packages may be improperly loaded or damaged, and bottles may rupture and spill their contents. Ruptured bottles often contain sugary beverages that are difficult to clean from the packaging machine components and surroundings.

[0005] Bottles frequently overturn at the critical transition region between the ends of angled lane dividers that guide the bottles along a product conveyor and the opening of a carton on a carton conveyor. Each bottle is conveyed in the general direction of travel of the product conveyor until the bottle reaches the angled lane dividers. The lane dividers are typically angled with respect to the path of the continuously moving product conveyor to direct the bottles toward an over an edge of the product conveyor. The bottles move from the outfeed end of a lane, over a transition region, and into a carton, the transition region being the area between the end of an adjacent lane and an open end of a carton. The carton typically moves on a carton conveyor at a comparable pace as the product conveyor. As grouper lugs on the product conveyor push each group of bottles forward, the angled lane dividers support and redirect the bottles off of the product conveyor and into the carton. In the transition region, each bottle travels beyond the extent of one or both of the adjacent lane dividers, which cannot extend across the transition region without interfering with the passage of the minor flaps of the cartons on the carton conveyor. As it crosses the transition region, each bottle is propelled by the force of other bottles, but is no longer guided on both sides by adjacent lane dividers. During this interval, maneuvering small gaps and differences in elevation between any of the conveyors, the carton surface, or the transition region can cause a bottle (such as the first bottle in the first row that is loaded into each carton) to overturn.

[0006] Previous attempts at addressing the problem of overturning bottles require tight tolerances or frequent adjustment and maintenance, as the attempts have focused on minimizing gaps and minimizing variations in elevation between the various conveyors, carton surfaces, and the transition region, or on stabilizing mechanisms such as brushes that apply pressure to top flaps or walls of the carton. These solutions, although time consuming and resource intensive, fail to eliminate the problem of bottles overturning.

[0007] Thus, there is a need for a solution that reduces the incidence of containers overturning in high-speed packaging machines.

SUMMARY OF THE INVENTION

[0008] The various embodiments of the present invention overcome the shortcomings of the prior art by providing a packaging machine that implements systems and methods for guiding a container or other article so as to prevent the container from overturning as the container is conveyed from a product conveyor and loaded into a carton or other package. The embodiments described illustrate the various features of an exemplary container guidance system that can be implemented in a packaging machine for loading containers into cartons or similar packages.

[0009] When erected, the exemplary carton comprises a top wall, a pair of opposed side walls connected to opposing side edges of the top wall, at least one end wall interconnecting the side walls, and a bottom wall interconnecting respective lower edges of the side walls and the end walls. During the container loading process, the carton may be partially erected such that at least one end of the carton is open.

[0010] Generally, a packaging machine equipped with the container guidance system of the present invention includes one or more substantially rigid guide bars that are each mounted above a lane. The lane redirects products driven by a product transport chain or similar product conveyor. In the exemplary embodiments, at least a portion of the product conveyor is in parallel alignment with a carton conveyor, and both are simultaneously driven through a carton loading station at substantially similar or complementary speeds. Each guide bar angles toward the carton conveyor, extends beyond the end of at least one of the angled lane dividers that define the respective lane, and extends at least partially across a transition region between the lane and the open end of a carton on the carton conveyor. The transition region can be small or relatively expansive, depending primarily clearance required to prevent the lane dividers from striking the flaps of the cartons on the carton conveyor. In general, the transition region can be defined as the region in which an article leaving the product conveyor loses the support of one or both lane dividers that define the lane along which the article travels. The transition region may include, but is not limited to, a stationary component

of the packaging machine that separates the product and carton conveyors, or may include a gap between the two conveyors.

[0011] According to an aspect of the invention, each guide bar can be mounted to a component of the packaging machine, such as a lane divider or an overhead boom structure, which may facilitate height adjustment to accommodate bottles of different heights. Each guide bar is substantially parallel to the angle of the lane dividers, and is offset somewhat such that at least one side of the guide bar is not in vertical alignment with any surface of any lane divider. Preferably, the guide bar is also adjustably mounted to facilitate adjustment of the offset distance to accommodate bottles having various diameters or widths. The infeed end can extend as far upstream, with respect to the flow of bottles, as necessary to provide convenient mounting to a fixed component. It is advantageous for at least a portion of the proximal edge of the infeed end of the container guide to be angled, tapered, and/or rounded to avoid obstructing incoming bottles.

[0012] According to another aspect of the invention, each guide bar is machined or otherwise shaped such that at least a portion of an edge of the guide bar provides a support surface that aligns closely with, and preferably matingly engages a surface of the upper portion of the bottle, such as the outer surface of a bottle cap. This portion of the guide bar is herein after referred to as the guiding edge. The guiding edge is parallel to the direction of travel of the bottle, and is preferably vertically positioned no higher than an upper edge of the carton. The guiding edge provides support to the upper portion of the bottle until the bottle has almost completely crossed over the transition region and entered the carton, thereby countering the tendency of the bottle to overturn as it crosses the transition region.

[0013] According to another aspect of the invention, a distal edge of the outfeed end of the guide bar is positioned so as to vertically align with the top of the open end of each carton as the carton travels through the loading station, and can be angled to be parallel to the flow of the carton conveyor.

[0014] According to another aspect of the invention, the guide bar also includes a leading edge opposite the guiding edge. The shape and configuration of the leading edge enables the guide to avoid interfering with the passage of the minor side flaps of the carton as the carton travels through the loading station. In certain embodiments, at least a portion of a leading edge of the guide bar is tapered proximal to the outfeed end

of the guide bar, and relative to the guiding edge. In certain other embodiments, the guide bar is a thin (for example, about ¼ inch) polygonal, cylindrical, or tubular rod fashioned from material with sufficient strength to provide enough support to guide bottles into the carton. Examples of suitable materials for guide bars include stainless steel and other ferrous or non-ferrous alloys, or any other material having yield strength sufficient to resist deformation.

[0015] Yet another aspect of the invention provides means for each guide bar to dynamically adjust for guiding and supporting containers or other articles having varying heights, widths, and shapes. Examples of means for dynamically adjusting include spring-loaded or slotted mounting brackets that allow fluctuations in the elevation and angular orientation of the guide bar with respect to a horizontal plane defined by the container conveyor.

[0016] According to another aspect of the invention, the guide bars may be detachable, adjustable, or interchangeable to be compatible with various container and package types and configurations.

[0017] The foregoing has broadly outlined some of the aspects and features of the present invention, which should be construed to be merely illustrative of various potential applications of the invention. Other beneficial results can be obtained by applying the disclosed information in a different manner or by modifying the disclosed embodiments. Accordingly, other aspects and a more comprehensive understanding of the invention may be obtained by referring to the detailed description of the exemplary embodiments taken in conjunction with the accompanying drawings, in addition to the scope of the invention defined by the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] FIG. 1 is a plan view of the exemplary embodiment of a blank for forming a carton of the present invention.

[0019] FIG. 2 is a perspective view of the carton formed from the blank of FIG. 1.

[0020] FIG. 3 is a plan view of an exemplary guide bar according to certain of the various embodiments of the container guide invention.

[0021] FIG. 4 is a side elevation view of the guide bar of FIG. 3.

[0022] FIG. 4b is a end elevation view of the guide bar of FIG. 3

[0023] FIG. 5 is a simplified plan view showing certain components of an exemplary carton loading station, including an exemplary embodiment of a guide bar.

[0024] FIG. 6 is a perspective view of the carton loading station of FIG. 5.

[0025] FIG. 7 shows the carton loading station of FIGs. 5 and 6, as viewed from the perspective of the outfeed end of the exemplary guide bar.

[0026] FIG. 8 is a side elevation of a carton passing through a carton loading station.

[0027] FIG. 9 is a side elevation of an alternative guide bar according to certain embodiments of the invention.

[0028] FIG. 10 is a side elevation of another alternative guide bar according to certain embodiments of the invention.

[0029] FIG. 11 is a side elevation of yet another alternative guide bar according to certain embodiments of the invention.

[0030] FIG. 12 is a side elevation of yet another alternative guide bar according to certain embodiments of the invention.

DETAILED DESCRIPTION

[0031] As required, detailed embodiments of the present invention are disclosed herein. It will be understood that the disclosed embodiments are merely examples to illustrate aspects of the invention that may be embodied in various and alternative forms. The figures are not necessarily to scale, and some features may be exaggerated or minimized to show details of particular components. In other instances, well-known materials or methods have not been described in detail to avoid obscuring the present invention. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but as a basis for the claims and for teaching one skilled in the art to variously employ the present invention.

[0032] Referring now to the drawings in which like numerals indicate like elements throughout the several views, the drawings illustrate certain of the various aspects of exemplary embodiments of a container guide according to the teachings of the present

invention. In the embodiments described herein, the term "container" refers to any cylindrical article or receptacle having a circular, elliptical, or polygonal base with or without a tapered or relatively narrower upper portion, where the container is solid or encloses a liquid, semi-liquid, gaseous, or solid substance, such as a consumable product. The term "package" refers, for the non-limiting purpose of illustrating the various features of the invention, to a carton for enclosing, carrying, and dispensing articles such as beverage bottles. However, it is contemplated that any suitable package could be loaded via the systems and methods of the various embodiments of the invention.

[0033] The features and aspects of the systems and methods of the invention are described with reference to a carton **200** formed from a foldable sheet material such as paperboard, corrugated board, plastic, laminates, any combination thereof, or the like. To encourage an understanding of the various aspects of the invention, the construction of an exemplary carton will now be described in some detail. The foldable sheet material is typically provided as a unitary blank **100**, the inside surface of which is shown in **FIG. 1**. The blank **100** includes a first side panel **102** hingedly connected along longitudinal fold line **105** to a top panel **104**, which is hingedly connected along fold line **106** to a second side panel **108**, which is hingedly connected along fold line **110** to a bottom panel **112**, which is hingedly connected along fold line **114** to an edge flap **116**. Each of the panels is hingedly connected, respectively, to minor end flaps **118a**, **120a**, **136a** or end wall panels **122a**, **124a** defined in part by transverse fold lines **126a**, **128a**, **130a**, **132a**, **138a** disposed along one edge of the blank **100**. At the opposite edge of the blank **100**, the panels may also include hinged connections to similar minor end flaps **118b**, **120b**, **136b** or end wall panels **122b**, **124b** defined in part by transverse fold lines **126b**, **128b**, **130b**, **132b**, **138b**. More specifically, top panel **104** is hingedly connected to end wall panels **122a**, **122b** along respective fold lines **128a**, **128b**. Second side panel **108** is hingedly connected to end flaps **120a**, **120b** along respective fold lines **130a**, **130b**. Bottom panel **112** is hingedly connected to end wall panels **124a**, **124b** along respective fold lines **132a**, **132b**. First side panel **102** is hingedly connected to end flaps **118a**, **118b** along respective fold lines **126a**, **126b**. In certain embodiments, edge flap **116** is hingedly connected to end flaps **136a**, **136b** along respective fold lines **138a**, **138b**.

[0034] To erect the carton **200** shown in FIG. 2, the first side panel **102** is glued or is otherwise secured to the edge flap **116** to form the first side wall **202** of carton **200**, which is at this point open-ended and tubular. End flaps **136a**, **136b** are secured to respective end flaps **118a**, **118b** to form composite end flaps **118a/136a** and **118b/136b**. The top panel **104** becomes the top wall **204** of the erected carton **200**. Similarly, the second side panel **108** becomes the second side wall **208**, and the bottom panel **112** forms the bottom wall **212** of the erected carton **200**. In this collapsed state, the open-ended carton can be fed into the packaging machine, where the carton **200** is partially erected and placed on a carton conveyor, which is described in greater detail below. After the articles are grouped and loaded through either or both of the open ends of the carton **200**, the end flaps **118a/136a**, **120a** and end wall panels **122a**, **124a** are folded and secured together to form an end closure structure **210** while the end flaps **118b/136b**, **120b** and end wall panels **122b**, **124b** are folded and secured together to form the other end closure structure **214**.

[0035] **FIG. 3** shows a plan view of the exemplary guide bar **300** according to certain embodiments of the invention. Generally described, the guide bar **300** is substantially longer than it is wide, and thus, has two relatively long side edges **302**, **304** and two relatively shorter end edges **306**, **308**. End edge **308** is angled so as to be parallel with the direction of flow (the machine flow **506**) of a container conveyor **502** (best shown in **FIGs. 5** and **6**). End edge **306** at infeed end **310** of the guide bar **300** includes a lead-in angle and/or a radius, which is useful to avoid interfering with the flow of containers **504**.

[0036] With regard to **FIGs. 3** and **4**, side edge **302** is hereinafter referred to the leading edge of the guide bar **300** and side edge **304** is hereinafter referred to as the guiding edge of the guide bar **300**. Portions of respective leading and guiding edges **302** and **304**, near the outfeed end **312** of the guide bar **300**, are tapered. Stated differently, the surface height **A** of at least a portion of edges **302, 304** are tapered or otherwise gradually diminished near the end edge **308** so that the surface height **A** at the end edge **308** is substantially less than the surface height **B** of most of each of the edges **302, 304**, as can also be seen in FIG. 4b. This arrangement provides the guide bar **300** with a chamfered, or beveled, surface **402** that extends from an angled edge **314** on a lower surface **322** toward an upper surface **320**, and toward the angled end edge **308**. In alternative embodiments, the surface height **B** of the guiding edge **304** may remain constant along the length of the guide bar **300** on condition that it is sufficient to provide

a support surface for supporting an upper portion **700** of a container **504** (as best shown in FIG. 7) as the container **504** crosses a transition region **512**, as discussed in further detail below. As also will be discussed in more detail below, the tapering of the leading edge **302** and of the guiding edge **304**, to at least partially define the beveled surface **402**, is advantageous to ensure that the guide bar **300** clears the uppermost edges of end flaps **118a/136a**, **120a** as the open-ended cartons **200** move through the loading station.

[0037] Referring to FIGs. 3 and 4, infeed end **310** of guide bar **300** includes means for facilitating attachment of guide bar **300** to a stationary component of the packaging machine, such as drilled holes **318** for receiving connecting means such as bolts, pins, or screws, and the like (not shown). As shown, each of upper and lower surfaces **320** and **322** of guide bar **300** is flat and smooth, and the upper surface **320** is greater in length than the lower surface **322**. However, in alternative embodiments, each of the upper surface **320** and the lower surface **322** may taper or curve, and they each may have the same length.

[0038] A container conveyor **502** transports at least one container **504**, in a direction of machine flow **506**, along a container path and through a loading station. A portion of the loading station is represented by FIGs. 5, 6, 7 and 8. The carton conveyor **508**, positioned parallel to the container conveyor **502**, simultaneously transports cartons **200** (FIG. 8), each being disposed on its bottom wall **212**, along a carton path that follows the same direction of machine flow **506**. For example, the carton **200** is placed on the carton conveyor **508** such that first side wall **202** is perpendicular to and opposes the direction of machine flow **506** and top wall **208** is perpendicular to and faces the direction of machine flow **506**. Prior to reaching an infeed end of the lane dividers **510**, the direction of travel of each of the containers may be substantially the same as the direction of machine flow **506**. When the containers **504** enter the carton loading station, the containers **504** are metered or grouped by grouper lugs **812** (best shown in FIG. 8), elevated flight bars, or other means for grouping containers. The guide bars of the present invention are contemplated in machines having grouping means that span all or part the width of the container conveyor **502**, or that extend beyond either edge of the container conveyor. Each group of one or more containers **504** is forced into a lane defined by two successive parallel lane dividers **510**. The outfeed end of each pair of lane dividers **510** is angled so as to alter the direction of travel of the individual

containers **504**, thereby causing the group of containers **504** to move off the container conveyor **502**, across a transition region **512**, and toward an open end of a carton **200** (FIG. 8) that is transported on the carton conveyor **508**.

[0039] The transition region includes the area between the outfeed end of a lane, defined by two parallel lane dividers 510, and the infeed end of a carton 200. More specifically, the transition region is the area in which one or both of the parallel lane dividers 510 ceases to support the container 504 as it moves into a carton 200. The transition region may include a portion of the container conveyor 502, and additionally, can encompass a stationary or mobile element that is disposed between container conveyor **502** and carton conveyor **508**. Alternatively, there may be no element other than a gap between the conveyors 502, 508.

[0040] In the exemplary embodiment, the transition region includes the upper surface **514** of a bridge panel 512. Bridge panel **512**, which is normally a dead plate, separates the moving parts of container conveyor **502** and carton conveyor **508**. The bridge panel 512 provides an upper surface 514 for supporting the end wall panel **124a** of each carton 200 while the containers **504** slide on the end wall panel 124a into the carton **200**. The bridge panel **512** also guides the end wall panel **124a** so that the distal end portion of the end wall panel **124a** is placed under the conveyor elements of the container conveyor **502** while each carton is moved through the loading station. In other words, at the loading station, end wall panel **124a** extends across the transition plate, its distal end being disposed beneath the container conveyor **502**.

[0041] One or more guide bars **300** are mounted or otherwise attached to stationary components in the loading station of the packaging machine. Any suitable stationary component may be utilized to support each guide bar **300** including, but not limited to, a lane divider **510** or an overhead boom (not shown). As can be seen in FIGs. 5, 6, and 7, each guide bar **300** is mounted using a bracket **505**, which may be adjustable with respect to height, and with respect to distance from or angle between an adjacent lane divider **510**, so that the guiding edge **304** of the guide bar **300** rests against the cap or upper portion of each container **504** flowing along the lane. Each guide bar **300** forms an angle with respect to the direction of machine flow **506**. The angle of the guide bar **300** preferably approximates the angle of the closest lane divider **510**, which is also angled with respect to the direction of machine flow **506**. The guide bar **300** extends from the end of a lane and at least partially across the transition region. The guide bar

300 preferably, but not necessarily, extends no further than an edge of the open end of each carton **200** where the upper and lower edges of the open end of the carton **200** are defined by respective fold lines **132a** and **128a**.

[0042] FIG. 7 shows a section view, taken from the perspective of line VII-VII in FIG. 5, wherein a container **504** travels across the transition region. The guide bar **300** is preferably offset with respect to the lane divider **510**, such that the guiding edge **304** of the guide bar **300** is not aligned with either side of the nearest lane divider **510**. The amount of offset is engineered to place the guiding edge **304** matingly in contact with a surface of an upper portion **700** of a container **504**. The exemplary container **504** has an upper portion **700** that is tapered, stepped down, or otherwise made narrower than the base **702** of the container **504**. For instance, a container **504** may have shoulders that distinguish the upper portion **700** from the base **702**. The surface of the upper portion **700** of the container **504** matingly engages the guiding edge **304** of one of the guide bars **300** after such time as at least a portion of the container **504** has traveled beyond the extent of one or both of the adjacent lane dividers **510**.

[0043] As shown in FIG. 8, prior to each carton **200** entering the loading station, the distal end portion of the lower end wall panel **124a** is guided by an end wall panel guide (not shown) into the position under the conveyor elements of the container conveyor **502** to travel along with the conveyor elements. This allows the remainder of the end wall panel **124a** to be slidably held on and extended across the bridge panel **514** so that the end wall panel **124a** is capable of supporting the containers 504 that come off of the container conveyor **502** and guiding them into the carton **200**. As those skilled in the art will readily appreciate, as containers 504 move across the fold line 132a between end wall panel 124a and wall 112, they may tip easily due to variations in elevation and surface texture, and thus it is desirable for the guide bar 300 to extend as close to this point as possible without interfering with passage of the cartons on the carton conveyor 508. Fold line **132a** is then presented as the bottom edge of the open end of the carton **200,** and is positioned at the edge of the carton conveyor 508 or otherwise at the scoreline position **602** (shown in FIGs. 5 and 6). In alternative embodiments, the container conveyor 502 is adjacent to the carton conveyor 508 such that the scoreline position 602 is substantially at side edge 511 of the container conveyor.

[0044] Upper end wall panel **122a** may be folded at least slightly upward by an upper end wall panel guide, thereby exposing the uppermost edges **808**, **810** (FIG. 8) of end

flaps **118a/136a** and **120a** as the open ended cartons **200** move through the loading station. The leading edge **302** of guide bar **300** clears the uppermost edge **808** of end flap **120a**, containers **504** are pushed into the carton **200** guided by guiding edge **304**, and then the leading edge **302** of the guide bar **300** clears the upper edge **810** of end flap **118a/136a**.

[0045] It will be appreciated that the size and shape of the guide bar **300** is preferably engineered to correspond to the respective shapes and amount of clearance between end flaps **118a/136a** and **120a** and end wall panel **122a**, which in the nonlimiting exemplary embodiments shown, have angled upper edges **808**, **810**. The primary objectives are to provide a guide bar with an outfeed end portion that is shaped so as to easily clear carton end flaps while providing stability to the upper portions of containers flowing into the cartons. To that end, the guide bar can assume any shape that is suitable for the application, including but not limited to the shapes shown in FIGs. 9 through 12. Each of FIGs. 9 through 12 illustrates a side elevation of an alternative guide bar **900**, **1000**, **1100**, **1200** that has been angled, tapered, chamfered, or otherwise shaped to meet the objectives of the exemplary embodiments described herein. In FIGs. 9 and 10, the guide bar **900**, **1000** has a relatively thinner outfeed end and a relatively thicker infeed end which increases the overall strength of the guide bar without obstructing the carton flaps. At least a portion of the leading edge of the guide bar may be thinner as compared to at least a portion of the guiding edge of the guide bar. In FIGs. 11 and 12, the entire length of the guide bar **1100**, **1200** has a constant or graduated thickness, the guide bar having an elliptical, triangular, or polygonal cross section. A guide bar having a constant thickness should be constructed of a material strong enough to guide containers without yielding, such that the guide bar can be thin enough to avoid obstructing carton end flaps, but thick enough to matingly contact and provide support to containers.

[0046] Furthermore, any number of guide bars may be required to accomplish the objective of preventing containers from overturning. For example, one or more guide bars may be provided for each lane, or a single guide bar may be sufficient to guide containers in multiple lanes.

[0047] The present invention has been illustrated in relation to particular embodiments which are intended in all respects to be illustrative rather than restrictive. Those skilled in the art will recognize that the present invention is capable of many modifications and

variations without departing from the scope of the invention. For example, as used herein, directional references such as "top", "base", "bottom", "end", "side", "inner", "outer", "upper", "middle", "lower", "front" and "rear" do not limit the respective walls of the carton to such orientation, but merely serve to distinguish these walls from one another. Any reference to hinged connection should not be construed as necessarily referring to a junction including a single hinge only; indeed, it is envisaged that hinged connection can be formed from one or more potentially disparate means for hingedly connecting materials.

[0048] Those skilled in the art will also appreciate that the packaging machine described represents only one example of the various packaging machine types and configurations that will be suitable for implementation of the various embodiments of the invention. Each of the conveyors described with reference to the packaging machine can consist of a series or conveyors or other means for transporting articles or cartons from one location to another, with the speed and ultimate direction of flow of each conveyor being consistent with the synchronization and direction of machine flow. Accordingly, the scope of the present invention is described by the claims appended hereto and supported by the foregoing.

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CLAIMS

What is claimed is:

1. An article guide for preventing articles from overturning as said articles are loaded into a carton by a packaging machine, the packaging machine having a carton conveyor for conveying the cartons along a carton path in a direction of machine flow and an article conveyor for transporting said articles along an article path and toward said carton conveyor, the article guide comprising:

a guide bar mounted above said article conveyor, comprising:

an outfeed end that extends at least partially across a transition region between said article conveyor and said carton conveyor, said outfeed end including a support surface that supports an upper portion of each of said articles as said article crosses over said transition region.

2. The article guide of Claim 1, wherein:

said packaging machine includes at least one lane divider for directing articles along an infeed path across said transition region; and

said transition region is bounded by an edge of said carton conveyor and an edge of said open end of said carton; and

3. The article guide of Claim 2, wherein said guide bar is substantially parallel to said infeed path.

4. The article guide of Claim 1, wherein said outfeed end of said guide bar comprises a distal edge that is angled so as to generally parallel the direction of flow of said carton conveyor.

5. The article guide of Claim 1, wherein said guide bar further comprises a leading edge; and

wherein said support surface comprises a guiding edge opposite said leading edge, said guiding edge having a height such that said outfeed end guides an upper end wall panel of said carton as said articles cross said transition region.

6. The article guide of Claim 1, wherein the height of said infeed end is substantially greater than the height of said outfeed end.

7. The article guide of Claim 1, wherein said infeed end of said guide bar is adjustably mounted to guide articles of varying sizes and shapes.

8. A packaging machine for packaging articles into cartons, each carton having first and second opposed side walls and an open end, and each article having a base and a relatively narrower upper portion, comprising:

a carton conveyor for conveying the cartons in a direction of motion along a carton path, wherein each carton is conveyed with said side walls of said carton transverse to said direction of motion;

an article conveyor for transporting said articles along an article path toward said carton conveyor;

a carton loading station having a transition region between said carton conveyor and said article conveyor, said transition region being bounded by an adjacent edge of said carton conveyor and an adjacent edge of said open end of said carton;

at least one divider lane for directing articles along an infeed path toward said carton conveyor; and

at least one guide bar for supporting said upper portion of each article as said article moves across said transition region and into one of said cartons conveyed on said carton conveyor.

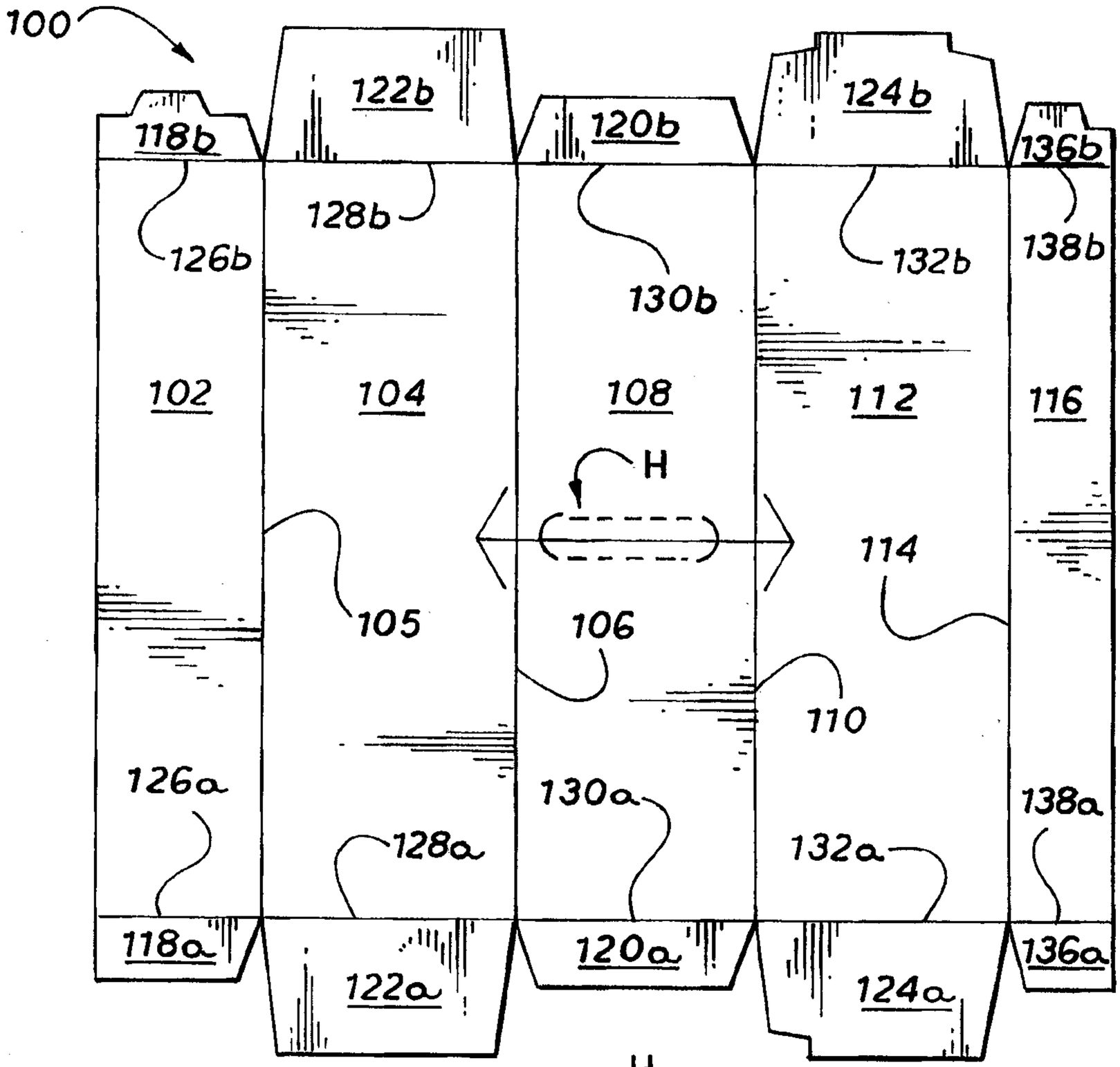

100
118b
122b
120b
124b
136b
126b
128b
130b
132b
138b
102
104
108
112
116
H
105
106
114
110
126a
128a
130a
132a
138a
118a
122a
120a
124a
136a
H

Fig_1

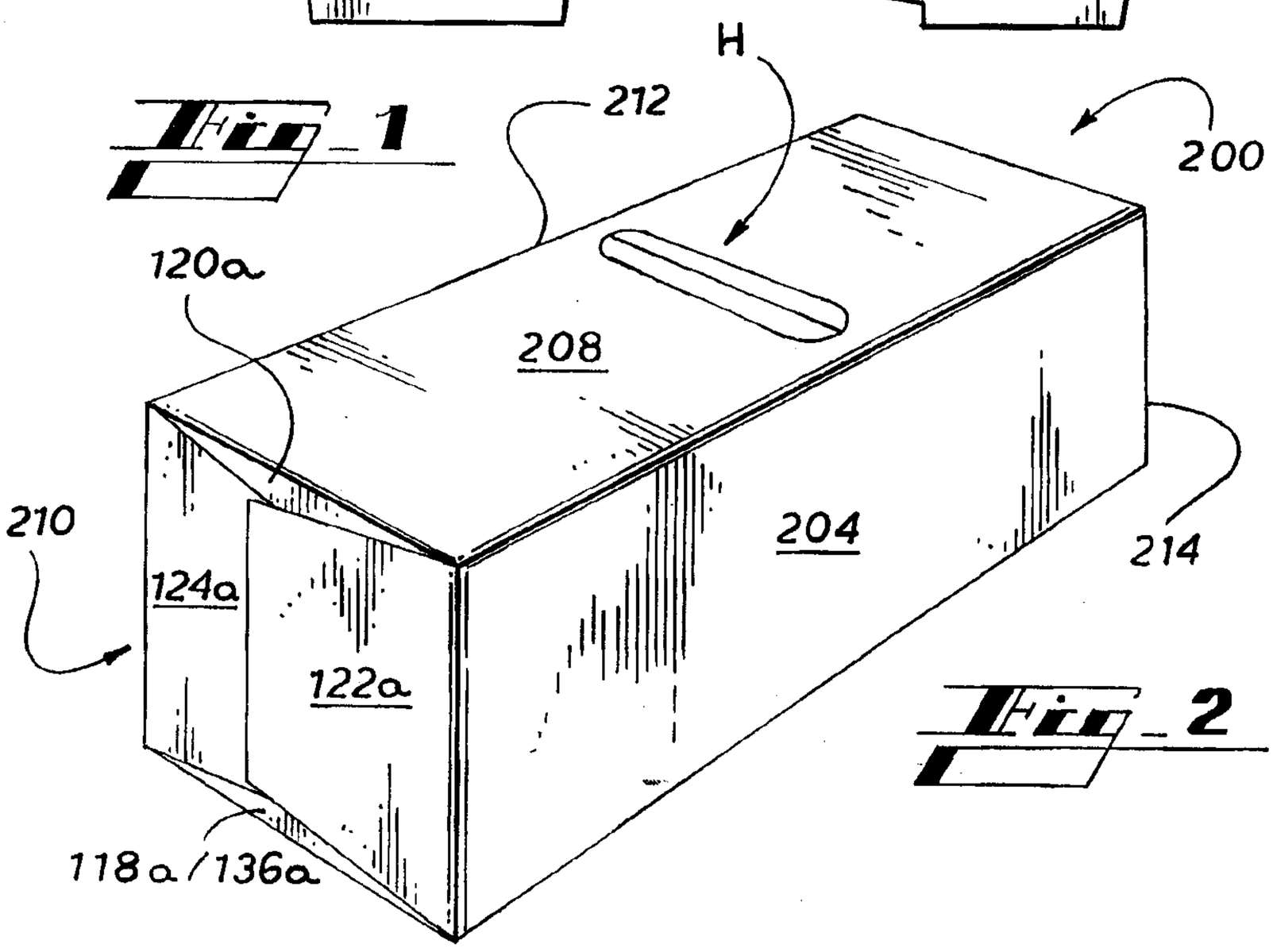

212
200
H
120a
208
210
204
214
124a
122a
118a/136a

Fig_2

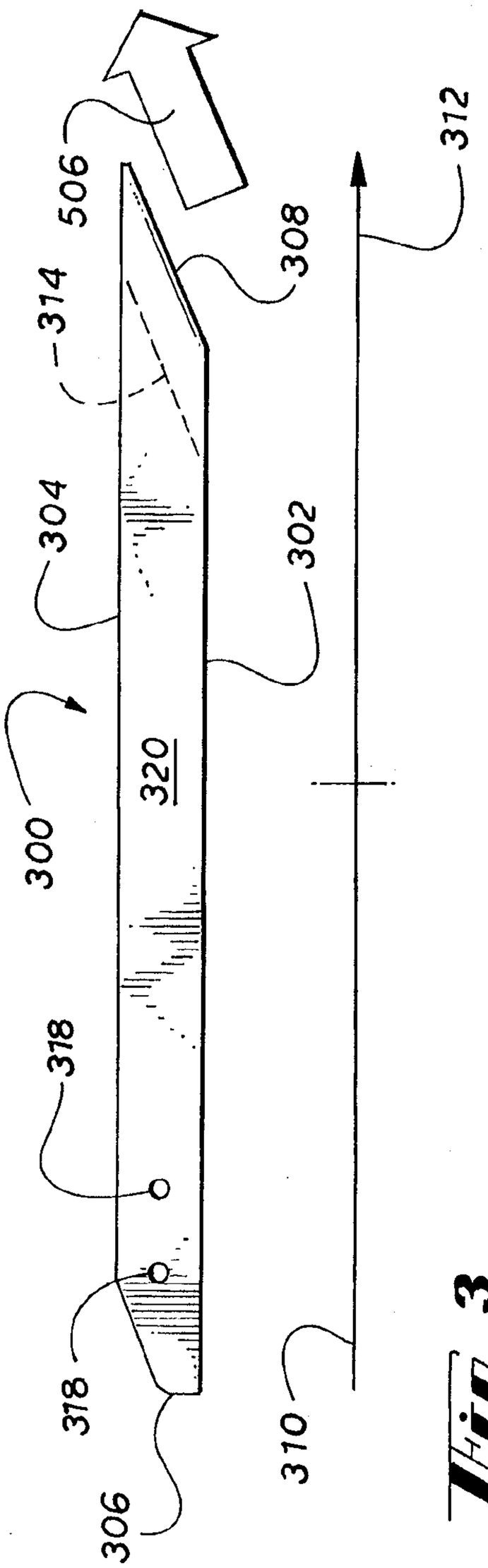


Fig. 3

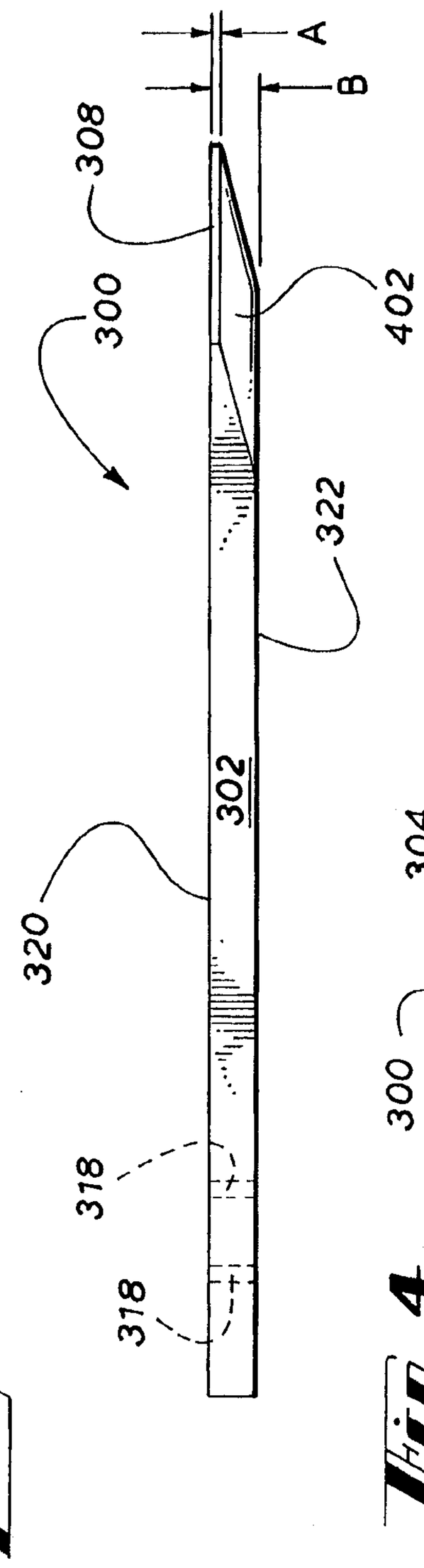


Fig. 4B

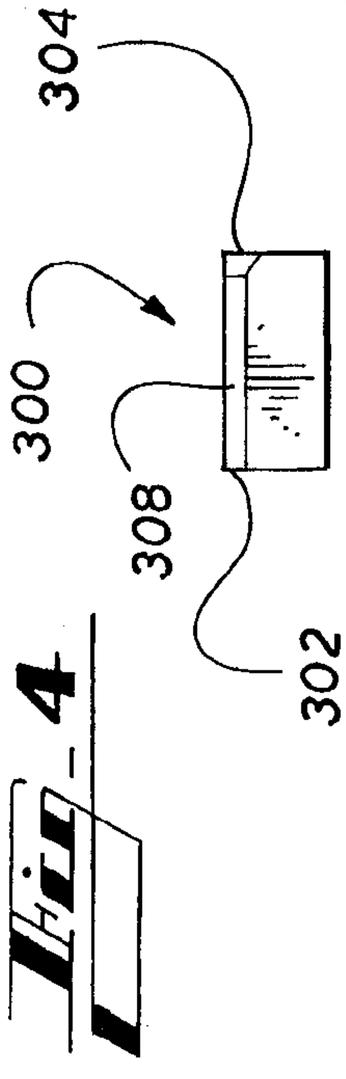


Fig. 4

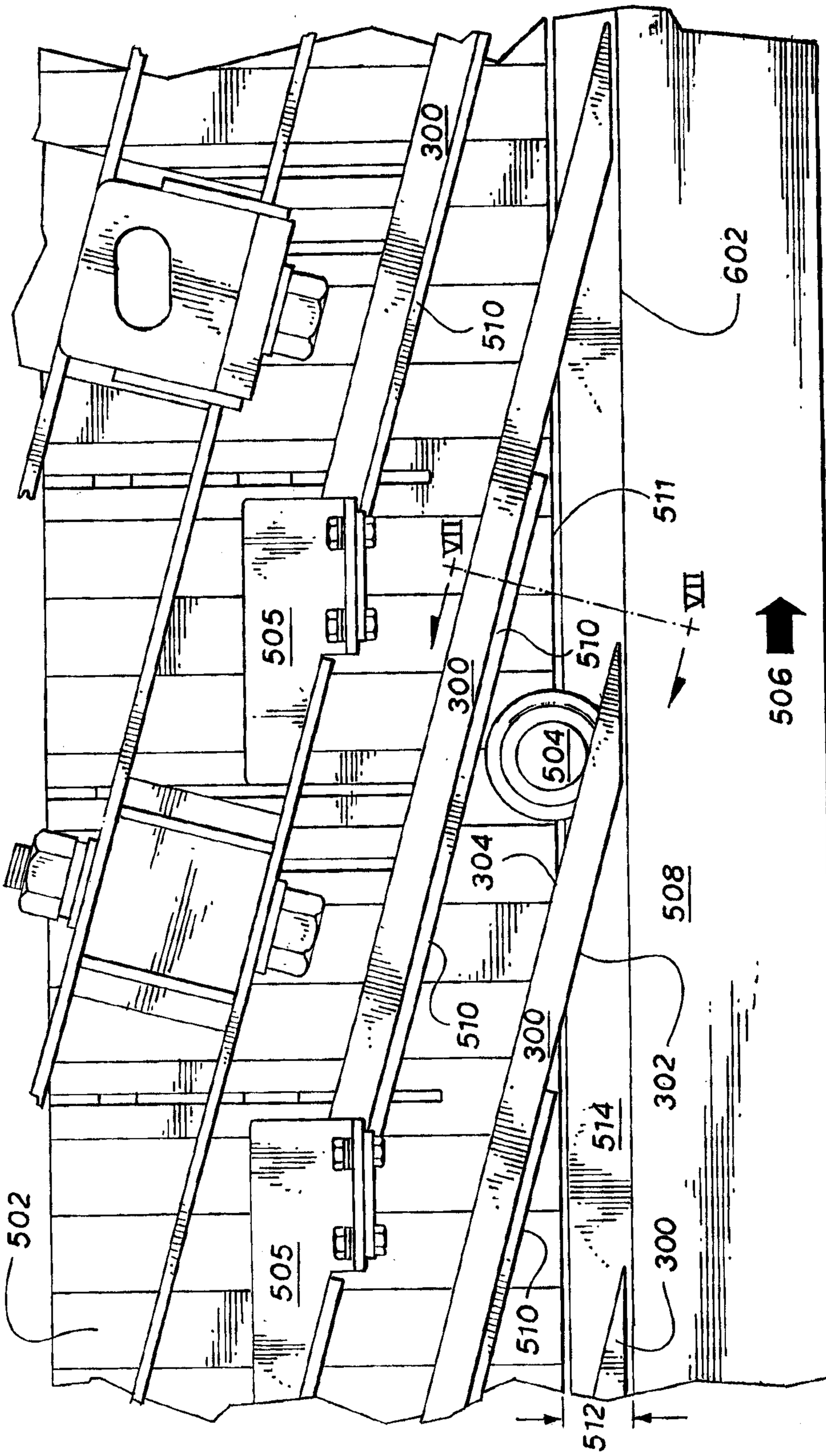

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Fig. 5

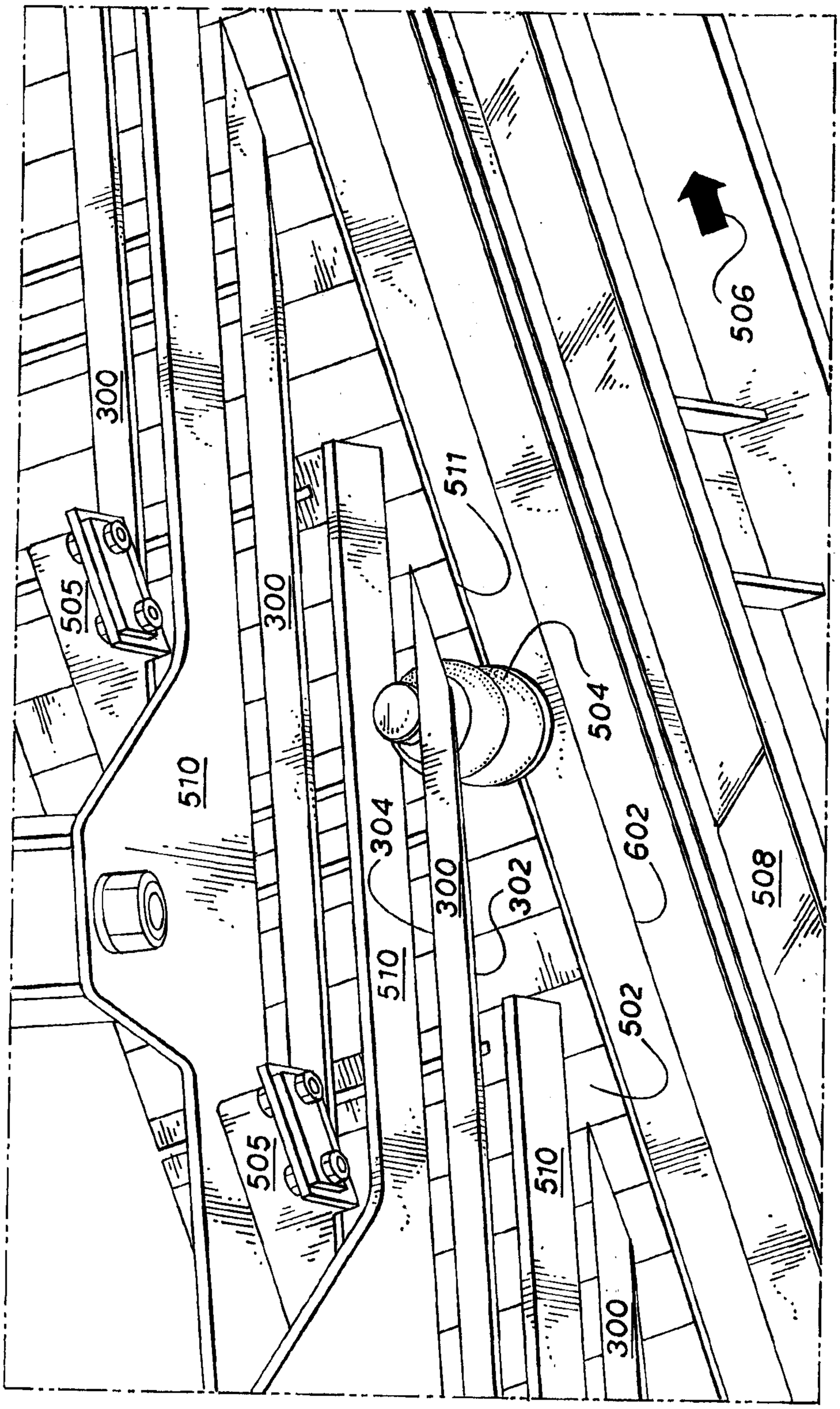

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Fig. 6

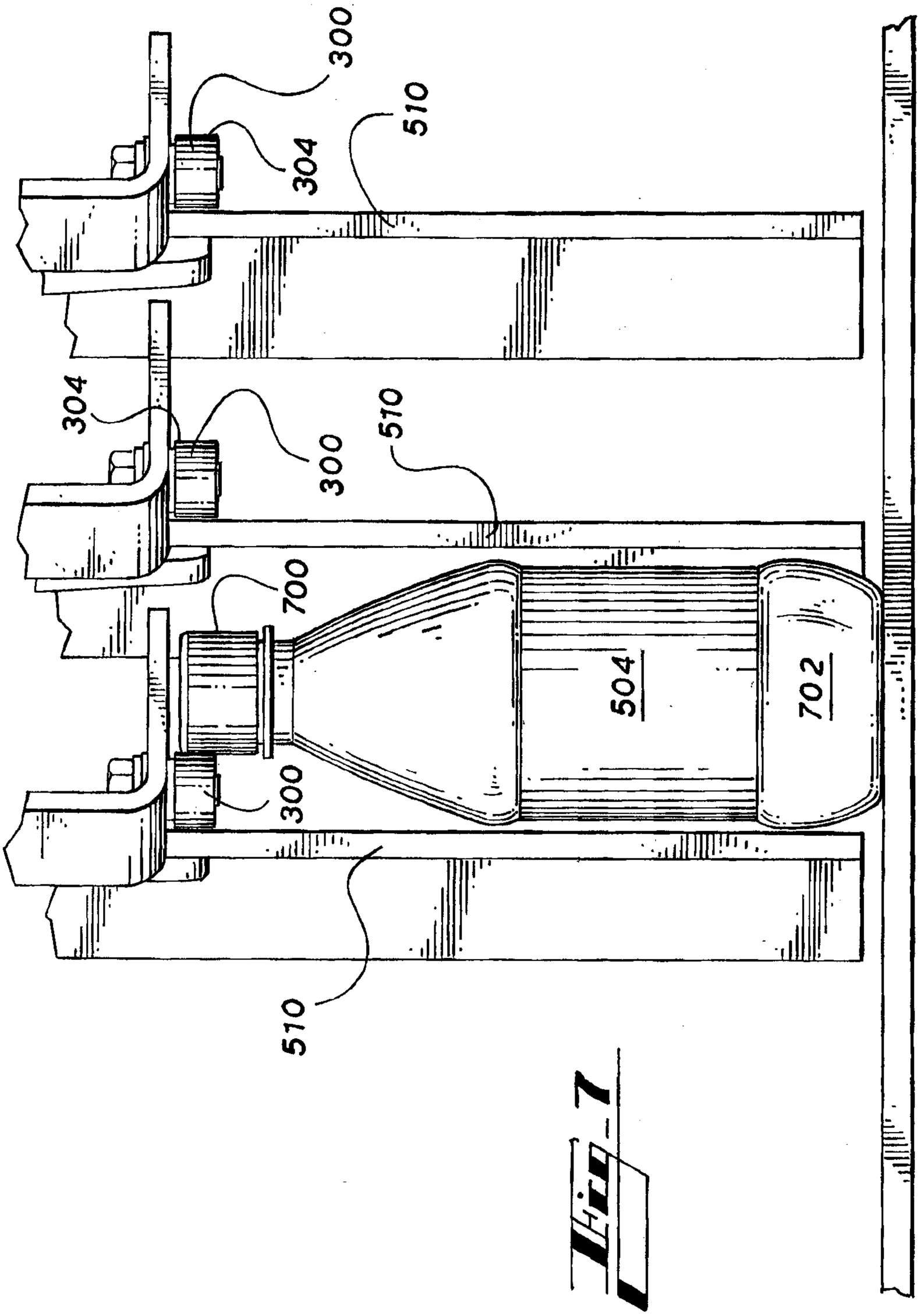


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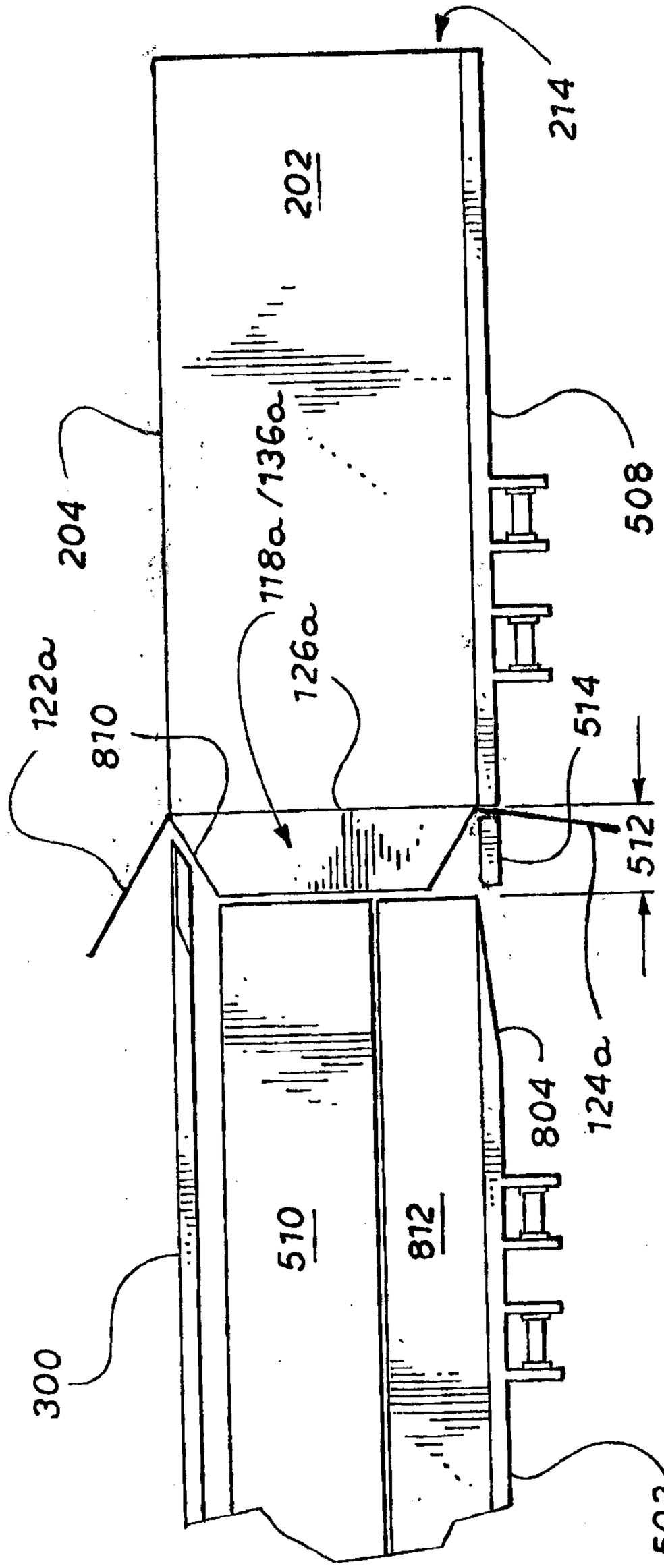

214
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Fig. 8

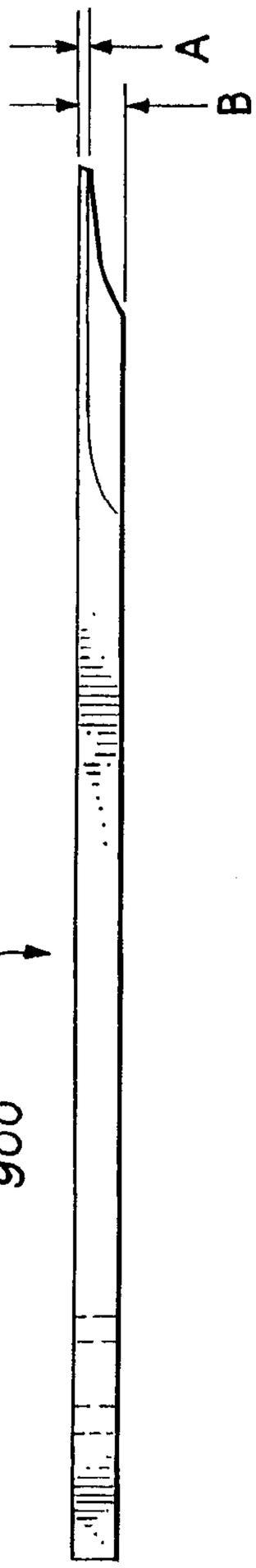


Fig. 9

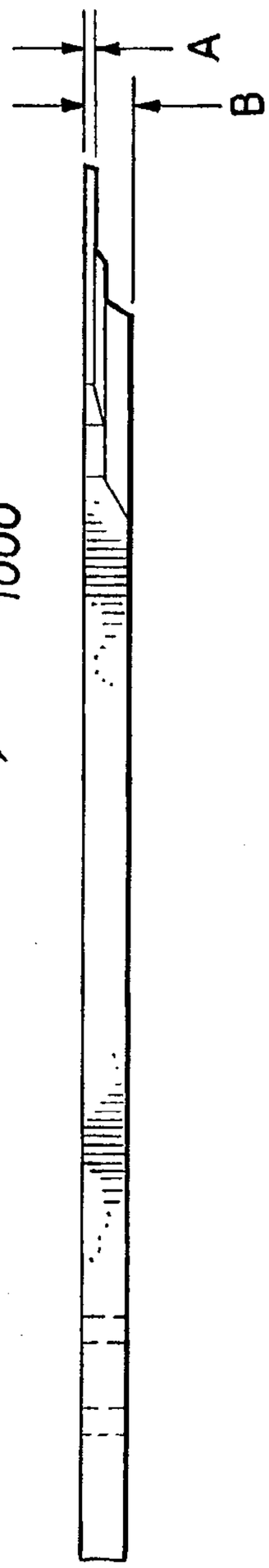


Fig. 10

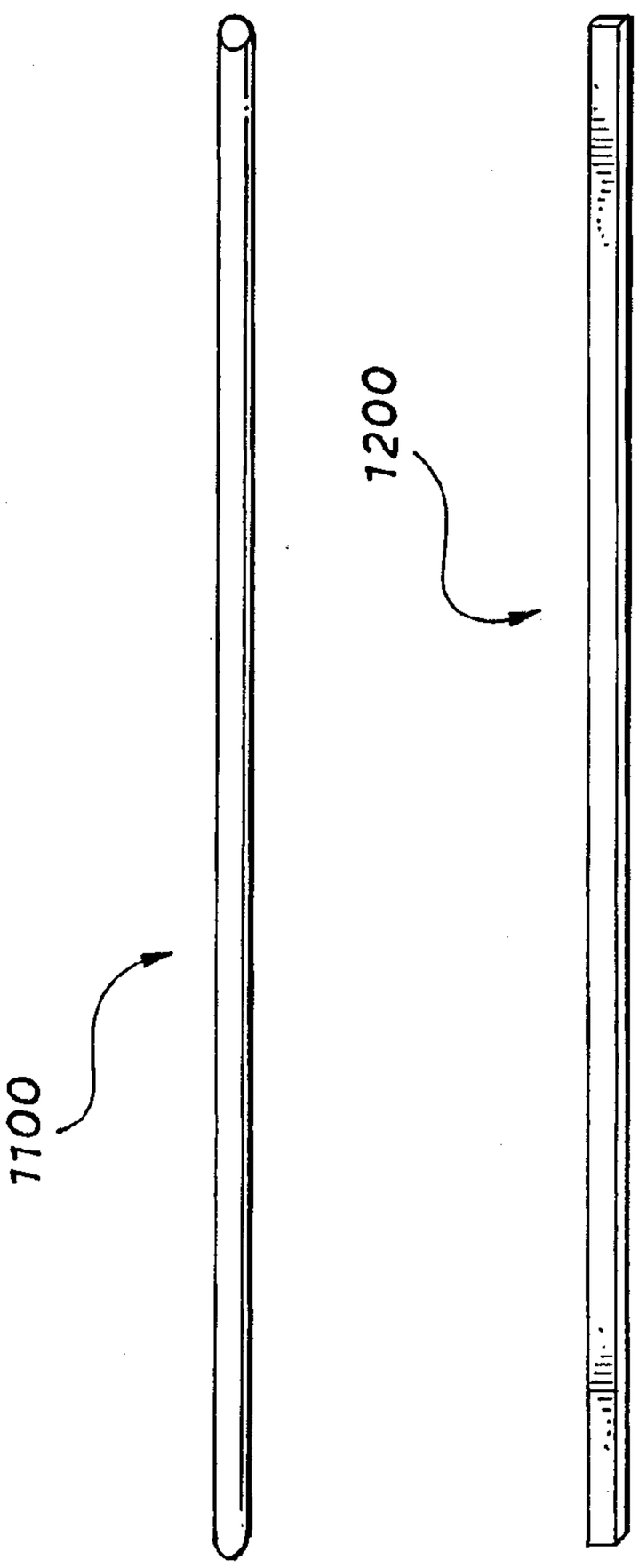


Fig. 11

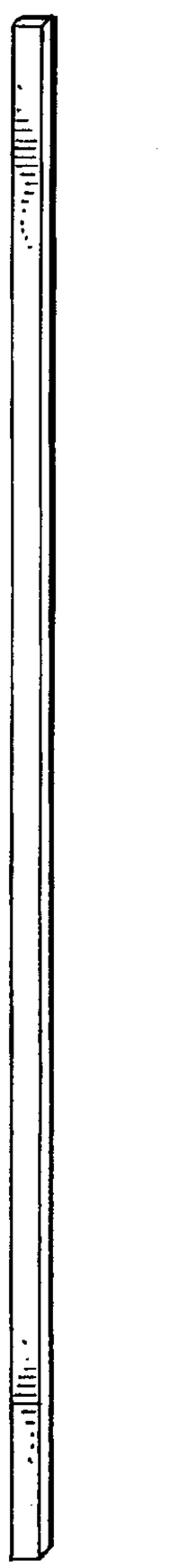
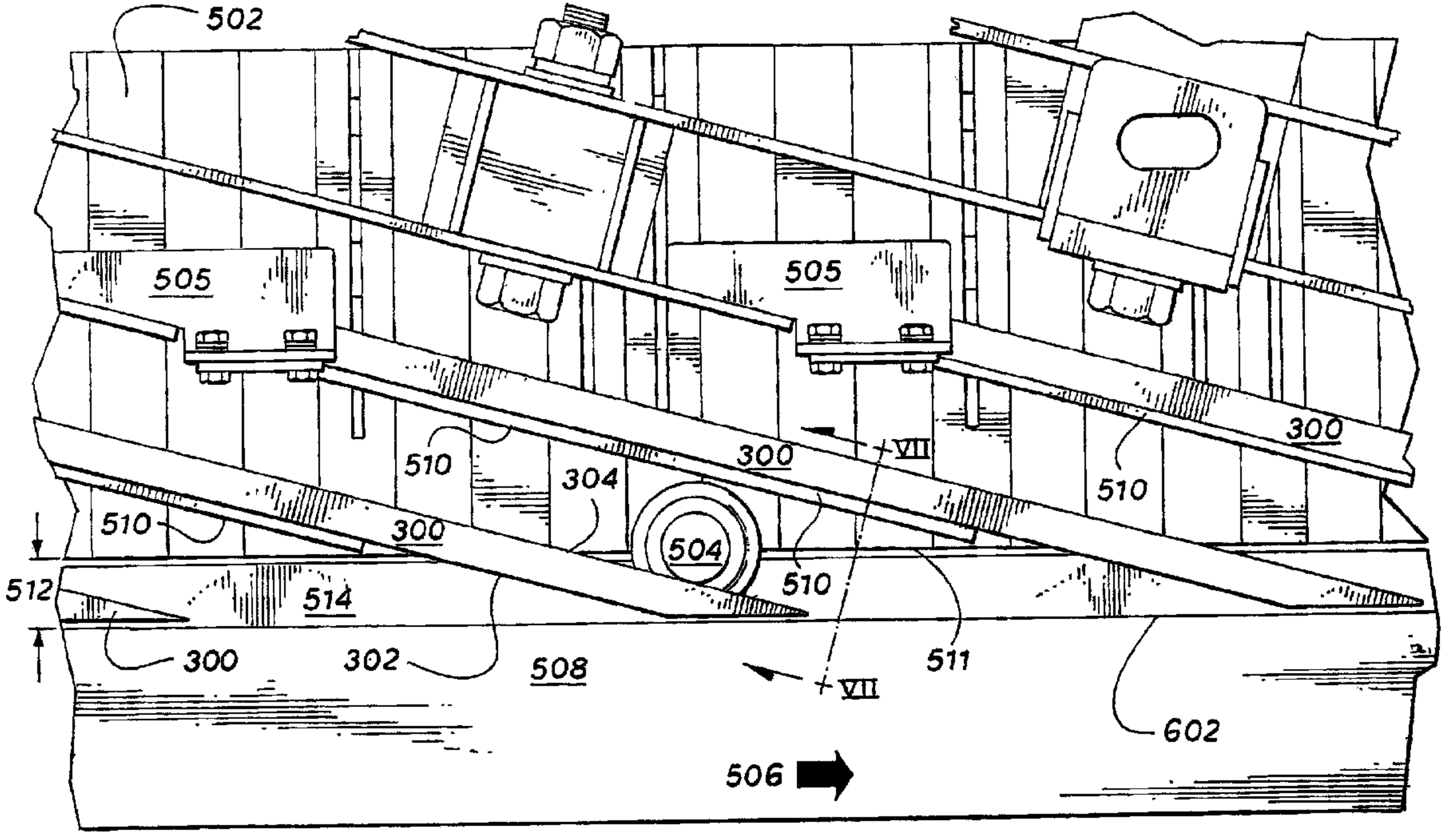


Fig. 12


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