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(54) Titre : PROCEDES ET APPAREILS PERMETTANT DE FRONCER LES RABATS LATERAUX D'ARTICLES ABSORBANTS

(54) Title: METHODS AND APPARATUSES FOR TUCKING SIDE PANELS OF ABSORBENT ARTICLES

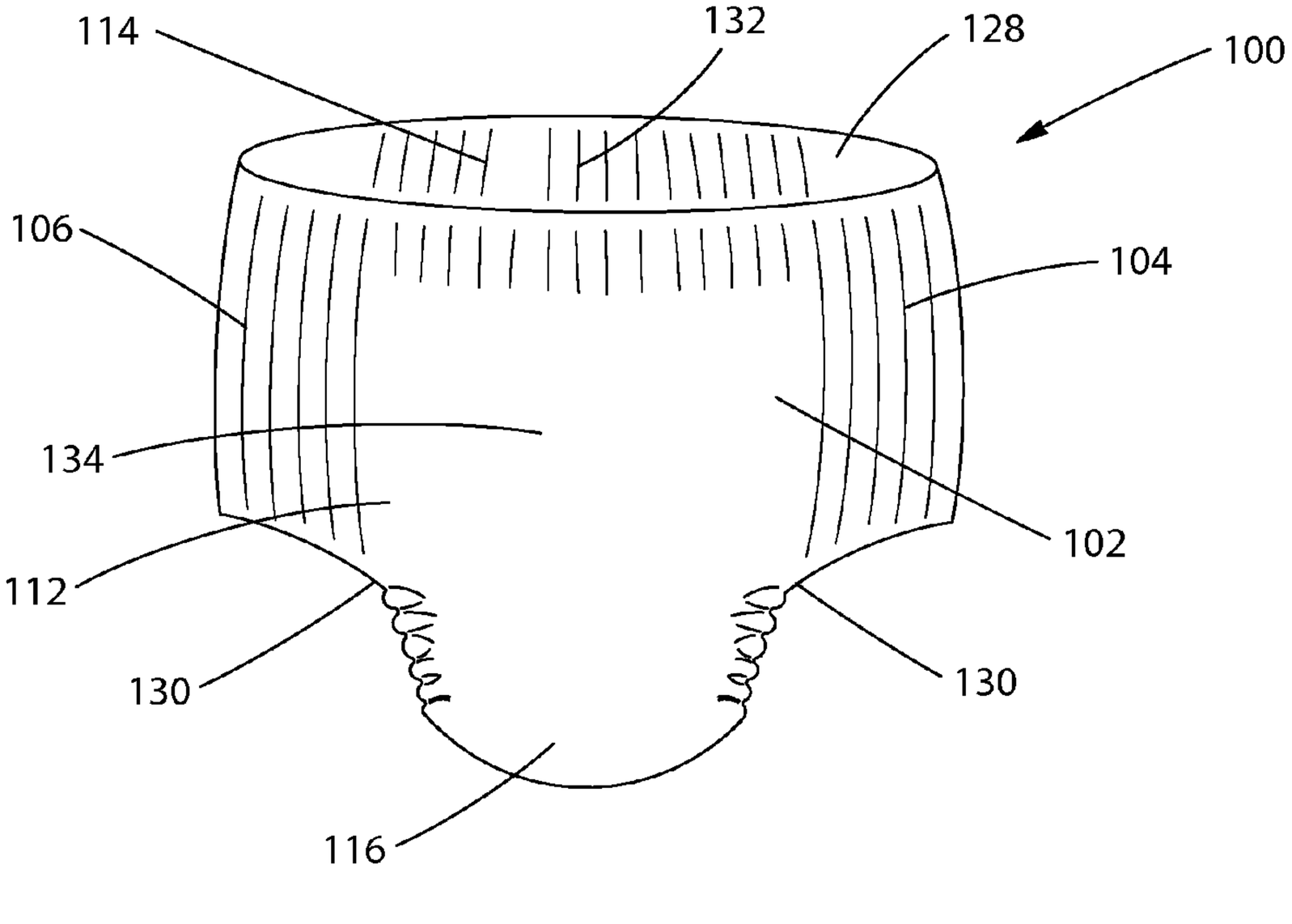

Fig. 1

(57) Abrégé/Abstract:
Aspects of the present disclosure relate to tucking opposing side panels into a chassis of a pant diaper. The apparatuses and methods may utilize one or more conveyors that advance the chassis along a machine direction. Each conveyor may have a

CA 2795515 A1 2011/10/13

(21) 2 795 515

(13) A1

(57) Abrégé(suite)/Abstract(continued):
vacuum zone that applies a vacuum force to hold the chassis. The chassis may be positioned between a first conveyor having a first vacuum zone and a second conveyor having a second vacuum zone. The conveyors may apply opposing vacuum forces to hold the first waist region apart from the second waist region while the chassis advances in the machine direction toward a tucking device. The tucking device may discharge air to push the side panels into the chassis and create longitudinal fold lines along edges of the absorbent core of the diaper.

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(54) **Title**: METHODS AND APPARATUSES FOR TUCKING SIDE PANELS OF ABSORBENT ARTICLES

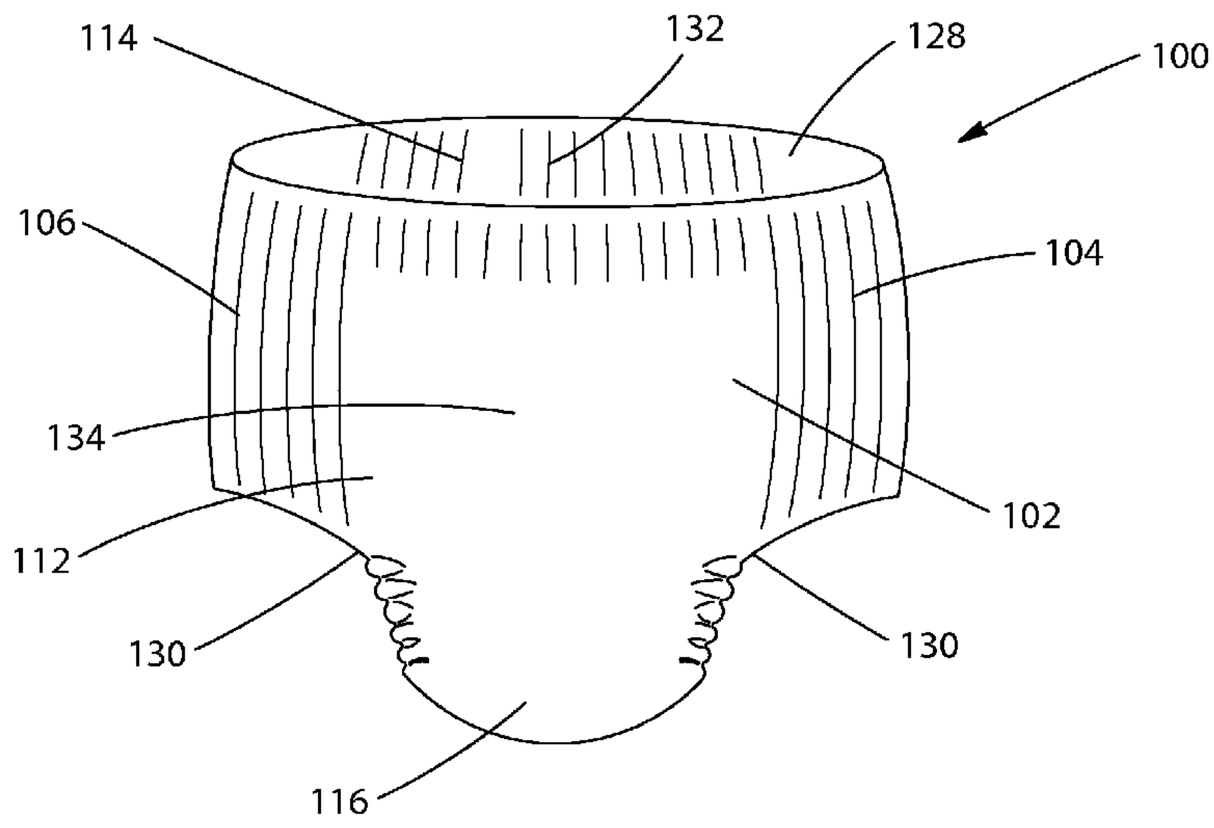

Fig. 1

(57) **Abstract**: Aspects of the present disclosure relate to tucking opposing side panels into a chassis of a pant diaper. The apparatuses and methods may utilize one or more conveyors that advance the chassis along a machine direction. Each conveyor may have a vacuum zone that applies a vacuum force to hold the chassis. The chassis may be positioned between a first conveyor having a first vacuum zone and a second conveyor having a second vacuum zone. The conveyors may apply opposing vacuum forces to hold the first waist region apart from the second waist region while the chassis advances in the machine direction toward a tucking device. The tucking device may discharge air to push the side panels into the chassis and create longitudinal fold lines along edges of the absorbent core of the diaper.

WO 2011/127111 A1

METHODS AND APPARATUSES FOR TUCKING SIDE PANELS OF ABSORBENT ARTICLES

FIELD OF THE INVENTION

The present disclosure relates to methods and apparatuses for manufacturing absorbent articles, and more particularly, methods and apparatuses for tucking side panels of pant diapers.

BACKGROUND OF THE INVENTION

Along an assembly line, various types of articles, such as for example, diapers and other absorbent articles, may be assembled by adding components to and otherwise modifying an advancing, continuous web of material. For example, in some processes, advancing webs of material are combined with other advancing webs of material. In other examples, individual components created from advancing webs of material are combined with advancing webs of material, which in turn, are then combined with other advancing webs of material. Webs of material and component parts used to manufacture diapers may include: backsheets, topsheets, leg cuffs, waist caps, absorbent core components, front and/or back ears, fastener components, and various types of elastic webs and components such as leg elastics, barrier leg cuff elastics, stretch side panels, and waist elastics. Once the desired component parts are assembled, the advancing web(s) and component parts are subjected to a final knife cut to separate the web(s) into discrete diapers or other absorbent articles.

After the final knife cut, absorbent articles may also undergo a folding process prior to packaging. Pant diapers may also include additional manufacturing steps not used in the manufacture of conventional taped diapers. For example, pant diapers may include side panels that connect front and rear waist regions with each other. Thus, after being folded into a U about a lateral centerline in the same or similar way as conventional diapers, the side panels on pant diapers may connect the front and rear waist regions to form a waist opening and a pair of leg openings. In addition, the side panels may be laterally tucked inside the pant diapers before packaging.

Some currently available side panel tucker processes advance the pant diaper in a machine direction between upper and lower vacuum conveyors. In such configurations, the upper vacuum conveyor may apply an upward vacuum force to the front waist region of the pant diaper while the lower vacuum conveyor may apply a downward vacuum force to the rear waist region of the

pant diaper. As such, the opposing vacuum forces hold the waist regions of the pant diaper apart from each other. Then, while the waist regions of the diaper are held apart by vacuum, a rotating tucker blade may be used to push the side panels into the interior of the diaper, creating longitudinal fold lines along the diaper. As such, some methods may rely on the location of the tucker blades relative the diaper to control the location of the longitudinal folds. Other methods may rely on the width of vacuum zones on the conveyors relative to the width of diaper to control the location of the longitudinal folds. However, with such methods, the locations of the longitudinal folds may be dictated in large part by the positions of the diapers relative to other equipment (e.g. conveyor, tuckers, etc.). Thus, the locations of the longitudinal folds in the diapers can be inconsistent due to varying positions of the diapers relative to such equipment during manufacture.

SUMMARY OF THE INVENTION

Aspects of the present disclosure relate to apparatuses and methods for tucking first and second opposing side panels into a chassis of a pant diaper.

In one form, a method may be configured for tucking first and second opposing side panels into a chassis of a pant diaper, wherein the chassis includes an absorbent core having opposing longitudinal side edges defining a lateral width, the chassis further including an inner surface and an outer surface, the chassis having longitudinally opposing first and second waist regions, longitudinally opposing first and second waist end edges disposed in the first and second waist regions adjacent to the respective waist end edges, a crotch region longitudinally intermediate of the first and second waist regions, the first and second side panels connecting the first waist region with the second waist region to form a waist opening and a pair of leg openings. The method may include the steps of: positioning the chassis between a first conveyor having a first vacuum zone and a second conveyor having a second vacuum zone; applying a first vacuum force from the first vacuum zone to the first waist region and applying a second vacuum force from the second vacuum zone to the second waist region, wherein the first vacuum zone and the second vacuum zone each define lateral widths that are smaller than the lateral width of the absorbent core; holding the first waist region of the chassis apart from the second waist region of the chassis using opposing vacuum forces from the first and second vacuum zones; advancing the chassis in a machine direction with the first and second conveyors; and discharging air against the first and second panels to push the first side panel and the second side panel a distance laterally

inward toward each other; and creating longitudinal folds in the chassis at the outer longitudinal edges of the absorbent core.

In another form, a method may be configured for tucking first and second opposing side panels into a chassis of a pant diaper, wherein the chassis includes an absorbent core having opposing longitudinal side edges defining a lateral width, the chassis further including an inner surface and an outer surface, the chassis having longitudinally opposing first and second waist regions, longitudinally opposing first and second waist end edges disposed in the first and second waist regions adjacent to the respective waist end edges, a crotch region longitudinally intermediate of the first and second waist regions, the first and second side panels connecting the first waist region with the second waist region to form a waist opening and a pair of leg openings. The method may include the steps of: positioning the chassis between a first conveyor and a second conveyor; applying a holding force to the chassis; holding the chassis on the first conveyor using holding force; advancing the chassis in a machine direction with the first conveyor; discharging air against the first and second panels to push the first side panel and the second side panel a distance laterally inward toward each other; and creating longitudinal folds in the chassis at the outer longitudinal edges of the absorbent core.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view a pant diaper.

Figure 2 is a partially cut away plan view of the pant diaper shown in Figure 1.

Figure 3 is a perspective view of the pant diaper of Figure 1 with side panels tucked into the interior of a chassis.

Figure 4 is a schematic side view of pant diapers traveling in a machine direction along a side panel tucking apparatus.

Figure 5 shows a cross-sectional view of the apparatus and a pant diaper of Figure 4 taken along line 5-5.

Figure 6 shows a cross-sectional view of the apparatus and a pant diaper of Figure 4 taken along line 6-6.

Figure 7 shows a cross-sectional view of a tucking apparatus utilizing rotating tucker blades with air discharged therefrom and the pant diaper of Figure 6 taken along line 7-7.

Figure 8 shows a cross-sectional view of a tucking apparatus utilizing converging rails with air jets and the pant diaper of Figure 6 taken along line 7-7.

Figure 9 shows a cross-sectional view of a tucking apparatus utilizing stationary nozzle members with air discharged intermittently.

Figure 10 shows a cross-sectional view of the tucker apparatus of Figure 9 taken along line 10-10.

Figure 11 shows a cross-sectional view of a tucking apparatus utilizing moving nozzle members with air jets and pant diapers.

Figure 12 shows a schematic side view of pant diapers traveling in a machine direction along a side panel tucking apparatus.

Figure 12A is a top view of a conveyor including clamps in a closed position.

Figure 12B shows the clamps of Figure 12A in an open position.

DETAILED DESCRIPTION OF THE INVENTION

The following term explanations may be useful in understanding the present disclosure:

"Absorbent article" is used herein to refer to consumer products whose primary function is to absorb and retain soils and wastes. Non-limiting examples of absorbent articles include diapers, training pants, pull-on pant-type diapers, refastenable diapers or pant-type diapers, incontinence briefs and undergarments, diaper holders and liners, feminine hygiene garments such as panty liners, absorbent inserts, and the like.

"Diaper" is used herein to refer to an absorbent article generally worn by infants and incontinent persons about the lower torso.

"Bi-fold" means the leading edge portion and the trailing edge portion of an article on a production line are brought together in a face-to-face configuration once the article is folded about a fold line extending laterally across the article as the article moves in the machine direction of travel.

The term "disposable" is used herein to describe absorbent articles which generally are not intended to be laundered or otherwise restored or reused as an absorbent article (e.g., they are intended to be discarded after a single use and may also be configured to be recycled, composted or otherwise disposed of in an environmentally compatible manner).

The term "disposed" is used herein to mean that an element(s) is formed (joined and positioned) in a particular place or position as a macro-unitary structure with other elements or as a separate element joined to another element.

As used herein, the term "joined" encompasses configurations whereby an element is directly secured to another element by affixing the element directly to the other element, and

configurations whereby an element is indirectly secured to another element by affixing the element to intermediate member(s) which in turn are affixed to the other element.

The term "machine direction" (MD) is used herein to refer to the direction of material flow through a process. In addition, relative placement and movement of material can be described as flowing in the machine direction through a process from upstream in the process to downstream in the process.

The term "cross direction" (CD) is used herein to refer to a direction that is generally perpendicular to the machine direction.

"Longitudinal" means a direction running substantially perpendicular from a waist edge to a longitudinally opposing waist edge of an absorbent article when the article is in a flat out, uncontracted state, or from a waist edge to the bottom of the crotch, i.e. the fold line, in a bi-folded article. Directions within 45 degrees of the longitudinal direction are considered to be "longitudinal." "Lateral" refers to a direction running from a longitudinally extending side edge to a laterally opposing longitudinally extending side edge of an article and generally at a right angle to the longitudinal direction. Directions within 45 degrees of the lateral direction are considered to be "lateral."

The term "taped diaper" (also referred to as "open diaper") refers to disposable absorbent articles having an initial front waist region and an initial back waist region that are not fastened, pre-fastened, or connected to each other as packaged, prior to being applied to the wearer.

Aspects of the present disclosure involve methods and apparatuses for manufacturing articles, and more particularly, apparatuses and methods for tucking first and second laterally opposing side panels into a chassis of a pant diaper. The pant diaper may include an absorbent core having opposing longitudinal side edges defining a lateral width. As discussed in more detail below, the absorbent core and/or acquisition system defines a location where the pant diaper naturally wants to fold as the side panels are tucked, because the lateral bending stiffness of the pant diaper along may be relatively high at the edge of the absorbent core as compared to the side panels. The chassis may also include longitudinally opposing first and second waist regions, and a crotch region longitudinally intermediate of the first and second waist regions. The first and second side panels may connect the first waist region with the second waist region to form a waist opening and a pair of leg openings. As discussed in more detail below, embodiments of the apparatuses and methods disclosed herein may utilize one or more conveyors that advance the chassis along a machine direction. Each conveyor may have a vacuum zone that applies a vacuum force to hold the chassis of the diaper. In some embodiments, the chassis is

positioned between a first conveyor having a first vacuum zone and a second conveyor having a second vacuum zone, wherein each vacuum zone defines a lateral width that is less than the lateral width of the absorbent core. The conveyors may apply a first vacuum force from the first vacuum zone to the first waist region and may apply a second vacuum force from the second vacuum zone to the second waist region. As such, the opposing vacuum forces hold the first waist region of the chassis apart from the second waist region of the chassis while the chassis advances in the machine direction toward a tucking device. While the first and second waist regions are held apart, a tucking device may push the side panels toward each other. Because the lateral widths of the vacuum zones are less than the lateral width of the absorbent core, pushing the side panels toward each other creates longitudinal folds along lateral side edges of the absorbent core. With the side panels tucked into the chassis, the front and rear waist regions may be pressed against each other to maintain the side panels in the tucked position.

As discussed in more detail below, various different configurations of side panel tuckers may be used to tuck the side panels into the chassis. The side panel tuckers according to the present disclosure utilize air discharged against the side panels to push the side panels into the chassis. In some instances, using air, as opposed to controlled mechanical displacement, to push the side panels helps to reduce the need to have a very precise and consistent relative position between the side panel tucker and the diaper. As such, the tucked width of the diaper may be independent of cross directional placement variations of the diaper relative to the conveyors and/or side panel tuckers.

The following provides a description of pant diapers and associated components to help provide additional context to the subsequent discussion of side panel tucking methods and apparatuses.

The terms “pant diaper” and “pant” (also referred to as “training pant,” “pre-closed diaper,” “diaper pant,” and “pull-on diaper”) refers herein to disposable absorbent articles having a continuous perimeter waist opening and laterally opposing continuous perimeter leg openings designed for infant or adult wearers. A pant can be configured with a continuous or closed waist opening and at least one continuous, closed, leg opening as packaged, prior to the article being applied to the wearer. A pant can be preformed by various techniques including, but not limited to, joining together portions of the article using any refastenable and/or permanent closure member (e.g., seams, heat bonds, pressure welds, adhesives, cohesive bonds, mechanical fasteners, etc.). A pant can be preformed anywhere along the circumference of the article in the waist region (e.g., side fastened or seamed, front waist fastened or seamed, rear waist fastened or

seamed or combinations thereof). Example pants are disclosed in various configurations are disclosed in U.S. Patent Nos. 5,246,433; 5,569,234; 6,120,487; 6,120,489; 4,940,464; 5,092,861; 5,897,545; 5,957,908; 6,036,805; 6,113,717; and U.S. Patent Publication No. 2003/0233082.

For the purposes of a specific illustration, Figure 1 shows one example of a plan view of a pant diaper 100 including a chassis 102 and opposing first and second side panels 104, 106. Figure 2 shows the pant diaper 100 in a flat, unfolded condition, with the portion of the diaper that faces away from a wearer oriented towards the viewer. A portion of the chassis structure is cut-away in Figure 2 to more clearly show the construction of and various features that may be included in embodiments of the pant diaper 100. Figure 3 shows the pant diaper 100 of Figure 1 with opposing side panels tucked into the chassis 102.

To provide a frame of reference for the present discussion, the chassis 102 is shown with a longitudinal axis 108 and a lateral axis 110. The chassis 102 is shown as having a first waist region 112, a second waist region 114, and a crotch region 116 disposed intermediate the first and second waist regions. The periphery of the chassis 118 is defined by a first longitudinal side edge 120, a second longitudinal side edge 122; a first waist end edge 124 disposed in the first waist region 112; and a second waist end edge 126 disposed in the second waist region 114. As shown in Figure 1, the first and second side panels 104, 106 connect the first waist region 112 with the second waist region 114 of the chassis 102 to form a waist opening 128 and two leg openings 130.

As shown in Figures 1 and 2, the chassis includes an inner, body facing surface 132, and an outer, garment facing surface 134. As shown in Figure 2, the chassis 102 may include a topsheet 138 forming a portion of the body facing surface 132. The chassis 102 may also include a backsheet 140 formed from a laminate including an outer covering layer and an inner layer. An absorbent core 142 may be disposed between a portion of the topsheet 138 and the backsheet 140. The chassis 102 may also include leg elastics 144, such as shown in Figure 2, and an elastic waist region to enhance the fit around the legs and waist of the wearer. Example leg elastic and leg cuff embodiments are disclosed in, for example, U.S. Patent Nos. 4,695,278 and 4,795,454. It is to be appreciated that any one or more of the regions of the chassis may be stretchable and may include various types of elastomeric materials and/or laminates. As such, the diaper may be configured to adapt to a specific wearer's anatomy upon application and to maintain contact with the wearer's anatomy during wear.

As previously mentioned, the chassis 102 may include a backsheet 140, shown for example, in Figure 2. The backsheet may also define the outer surface 134 of the chassis 102. In

some embodiments, the backsheet may be configured to prevent exudates absorbed and contained within the chassis from soiling articles that may contact the diaper, such as bedsheets and undergarments. Certain backsheet emodiments may be fluid permeable, while other embodiments may be impervious to liquids (e.g., urine) and include a thin plastic film. Some backsheet films may include those manufactured by Tredegar Industries Inc. of Terre Haute, Ind. and sold under the trade names X15306, X10962, and X10964. Other backsheet materials may include breathable materials that permit vapors to escape from the diaper while still preventing exudates from passing through the backsheet. Exemplary breathable materials may include materials such as woven webs, nonwoven webs, composite materials such as film-coated nonwoven webs, monolithic films and microporous films. Example breathable composite materials are described in greater detail in PCT Application No. WO 95/16746 and U.S. Patent No. 5,865,823. Other breathable backsheets including nonwoven webs and apertured formed films are described in U.S. Patent Nos. 5,571,096 and 6,573, 423.

The backsheet 140 may be formed by only one sheet (or layer) material such as a breathable (or microporous or monolithic) film material or a non-breathable (or non-microporous) film material. In some embodiments, the backsheet may be formed by two (or more) sheet (or layer) materials which may include a non-breathable (or breathable) film material and a nonwoven outer cover material. In some embodiments, the backsheet may be formed by a laminate of two sheet (or layer) materials joined together, for example, the backsheet may include a non-breathable film material forming the inner layer of the backsheet and a nonwoven material forming the outer layer which may be joined to the garment facing surface of the film material to provide a cloth-like and/or garment-like feel. In accordance with the discussion above, graphics may be printed on the film, the nonwoven, or the composite substrate to make printed component material, which may be converted into absorbent articles comprising printed backsheets.

As previously mentioned, the chassis 102 may include a topsheet 138, shown for example, in Figure 2. The topsheet 138 may also define a portion of the inner surface 132 of the chassis 102. All or a portion of the topsheet may be liquid pervious, permitting liquid to readily penetrate there through. As such, the topsheet may be manufactured from a wide range of materials, such as porous foams; reticulated foams; apertured nonwovens or plastic films; or woven or nonwoven webs of natural fibers (e.g., wood or cotton fibers), synthetic fibers (e.g., polyester or polypropylene fibers), or a combination of natural and synthetic fibers. One

example of a topsheet including a web of staple length polypropylene fibers is manufactured by Veratec, Inc., a Division of International Paper Company, of Walpole, Mass. under the designation P-8. Examples of formed film topsheets are described in U.S. Patent Nos. 3,929,135; 4,324,246; 4,342,314; 4,463,045; and 5,006,394.

Other topsheets may be made in accordance with U.S. Patent Nos. 4,609,518 and 4,629,643.

In some embodiments, the topsheet is made of a hydrophobic material or is treated to be hydrophobic in order to isolate the wearer's skin from liquids contained in the absorbent core. If the topsheet is made of a hydrophobic material, at least the upper surface of the topsheet may be treated to be hydrophilic so that liquids will transfer through the topsheet more rapidly. The topsheet can be rendered hydrophilic by treating it with a surfactant or by incorporating a surfactant into the topsheet. A more detailed discussion of such a treatment and hydrophilicity is contained in U.S. Patent Nos. 4,988,344 and 4,988,345.

A more detailed discussion of some methods for incorporating surfactant in the topsheet can be found in U.S. Statutory Invention Registration No. H1670, which was published on July 1, 1997, in the names of Aziz et al. In some embodiments, the topsheet 138 may include an apertured web or film that is hydrophobic. This may be accomplished eliminating the hydrophilizing treatment step from the production process and/or applying a hydrophobic treatment to the topsheet, such as a polytetrafluoroethylene compound like SCOTCHGUARD or a hydrophobic lotion composition, as described below. A more detailed discussion of various apertured topsheets can be found in U.S. Patent Nos. 5,342,338; 5,941,864; 6,010,491; and 6,414,215.

As previously mentioned, the chassis 102 may also include an absorbent core 142. As shown for example in Figure 2, the absorbent core 142 may include a first longitudinal side edge 146 laterally separated from a second longitudinal side edge 148, and a first end edge 150 longitudinally separated from a second end edge 152. The absorbent core may also include components such as an acquisition layer and absorbent material that is generally compressible, conformable, non-irritating to the wearer's skin and capable of absorbing and retaining liquids such as urine and other body exudates. The absorbent core can also be manufactured in a wide variety of sizes and shapes (e.g., rectangular, hourglass, T-shaped, asymmetric, etc.). The absorbent core may also include a wide variety of liquid-absorbent materials commonly used in disposable diapers and other absorbent articles. In one example, the absorbent core includes

comminuted wood pulp, which is generally referred to as airfelt. Examples of other absorbent materials include creped cellulose wadding; meltblown polymers, including coform; chemically stiffened, modified or cross-linked cellulosic fibers; tissue, including tissue wraps and tissue laminates; absorbent foams; absorbent sponges; superabsorbent polymers; absorbent gelling materials; or any other known absorbent material or combinations of materials.

It is to be appreciated that the configuration and construction of the absorbent core may be varied (e.g., the absorbent core(s) or other absorbent structure(s) may have varying caliper zones, a hydrophilic gradient, a superabsorbent gradient, or lower average density and lower average basis weight acquisition zones; or may comprise one or more layers or structures). Exemplary absorbent structures are described in U.S. Pat. Nos. 4,610,678; 4,673,402; 4,834,735; 4,888,231; 5,137,537; 5,147,345; 5,342,338; 5,260,345; 5,387,207; and 5,650,222.

The absorbent core may also have a multiple layered construction. A more detailed discussion of various types of multi-layered absorbent cores can be found in U.S. Pat. Publication Nos. 2004/0162536A1 and 2004/0167486A1; U.S. Pat. Nos. 5,669,894; 6,441,266; 5,562,646; European Pat. No. EP0565606B1; PCT Publication No. WO 2006/015141.

In some embodiments, the pant diaper includes an absorbent core that is stretchable. In such a configuration, the absorbent core may be adapted to extend along with other materials of the chassis in longitudinal and/or lateral directions. The absorbent core can also be connected with the other components of the chassis various ways. For example, the diaper may include a "floating core" configuration or a "bucket" configuration wherein the diaper includes an anchoring system that can be configured to counteract the forces tending to move the article on the wearer. Such an anchoring system can also be configured to anchor itself to a body of a wearer by contacting various parts of the body. In this way, the anchoring system can balance the collected moving forces with holding forces obtained from the anchoring. By balancing the collected moving forces with the obtained holding forces, the anchoring system can at least assist in holding the disposable wearable absorbent article in place on a wearer.

Embodiments of the pant diaper may also include pockets for receiving and containing waste, spacers which provide voids for waste, barriers for limiting the movement of waste in the article, compartments or voids which accept and contain waste materials deposited in the diaper, and the like, or any combinations thereof. Examples of pockets and spacers for use in absorbent products are described in U.S. Pat. Nos. 5,514,121; 5,171,236; 5,306,266; 5,397,318; 5,540,671; and PCT Application WO 93/25172. Examples

of compartments or voids are disclosed in U.S. Pat. Nos. 4,968,312; 4,990,147; 5,062,840; 6,482,191; and 5,269,755. Examples transverse barriers are described in U.S. Pat. Nos. 5,554,142 and 5,653,703; and PCT Patent Publication WO 94/14395. In addition to or in place of the voids, pockets and barriers, described above, embodiments of the absorbent article may also include a waste management element capable of effectively and efficiently accepting, storing and/or immobilizing viscous fluid bodily waste, such as runny feces, such as described in U.S. Pat. No. 6,010,491.

As previously mentioned with reference to Figure 1, embodiments of the pant diaper may include first and second side panels 104, 106 that connect the first waist region 112 with the second waist region 114 of the chassis 102 to form the waist opening 128 and two leg openings 130. As shown in Figures 1 and 2, the first side panel 104 includes a first ear panel 104a connected with a second ear panel 104b, and the second side panel 106 includes a first ear panel 106a connected with a second ear panel 106b. The first ear panels 104a, 106a each include proximal regions connected with the first waist region 112 of the chassis 102. And second first ear panels 104b, 106b each include proximal regions connected with the second waist region 114 of the chassis 102. Distal regions of the first ear panel 104a and the second ear panel 104b may be connected or fastened to each other to form the first side panel 104, and distal regions of the first ear panel 106a and the second ear panel 106b may be connected or fastened to each other to form the second side panel 106. Although the side panels shown in Figures 1 and 2 are formed by connecting ear panels together, it is to be appreciated that the side panels may be of a single unitary piece construction. It should be appreciated that the side panels may also be formed as continuous extensions of one or both the first and second waist regions of the chassis. It is also to be appreciated that embodiments of the pant diaper that may be used with the methods and apparatuses herein may include various different types and configurations of side panels than those shown and described herein. Examples of various types of side panels are disclosed in U.S. Patent Nos. 5,246,433; 5,569,234; 6,120,487; 6,120,489; 4,940,464; 5,092,861; 5,897,545; 5,957,908; 6,036,805; 6,113,717; and U.S. Patent Publication No. 2003/0233082.

It is to be appreciated that the proximal regions of the ear panels may be connected with the chassis in various ways, and the distal regions of the ear panels may be connected with each other in various ways. For example, the proximal regions and/or distal regions of the side panels may be permanently bonded, releasably connected, and/or refastenably connected with the

chassis and/or each other, with for example, adhesives, cohesives, thermal bonding, ultrasonic bonding, mechanical bonding and mechanical fastening, e.g. hook and loop type fasteners. For example, one or more fastener elements may be located on the side panels and may be adapted to refastenably connect with one or more corresponding fastening elements located in the first or second waist regions or alternatively the fastener elements may be adapted to refastenably connect with one or more components of the absorbent article including the side panels. The pant diapers can also include other features such as elastically extensible side panels that may each include one or more pieces of material.

Depending on the particular configuration, it is to be appreciated that various types of fastening elements may be used with the pant diaper. In one example, the fastening elements include hook & loop fasteners, such as those available from 3M or Velcro Industries. In other examples, the fastening elements include adhesives and/or tap tabs, while others are configured as a macrofastener or hook (e.g., a MACRO or "button-like" fastener). Some exemplary fastening elements and systems are disclosed in U.S. Pat. Nos. 3,848,594; 4,662,875; 4,846,815; 4,894,060; 4,946,527; 5,151,092; and 5,221,274. Additional examples of fasteners and/or fastening elements are discussed in U.S. Pat. Nos. 6,482,191; 6,251,097; and 6,432,098. Other fastening systems are described in more detail in U.S. Pat. Nos. 5,595,567; 5,624,427; 5,735,840; and 5,928,212. The fastening system may also provide a means for holding the article in a disposal configuration as disclosed in U.S. Pat. No. 4,963,140.

As previously mentioned, the apparatuses and methods according to the present disclosure may be utilized to tuck first and second opposing side panels 104, 106 into the chassis 102 of the pant diaper 100. Figure 1 shows a pant diaper 100 with the first and second side panels 104, 106 in an untucked configuration, and Figure 3 shows the pant diaper 100 with opposing side panels 104, 106 tucked into the chassis 102. As shown in Figure 3, portions of each side panel 104, 106 inserted into the chassis 102 of the pant diaper 100 such that portions of the side panels are disposed between the interior surface 132 of the first waist region 112 and the second waist region 114. In addition, the insertion of the side panels 104, 106 into the chassis 102 defines first longitudinal fold lines 150 along the first waist region 112 and second longitudinal fold lines 152 along the second waist region 114.

Figure 4 shows an embodiment of an apparatus 200 for tucking side panels 104, 106 into the chassis 102. The apparatus 200 can include a first conveyance 202, a second conveyance 204,

and a third conveyance 205. Each conveyance 202, 204, 205 may be in the form of a conveyor and include a movable surface 206 that may be in the form of a belt 208 wrapped around rollers 210 and configured in an endless loop. One or more of the belts 208 may also be configured as a movable foraminous vacuum conveyor belt that exerts vacuum forces on the chassis 102 to receive, hold, and/or transfer the pant diaper 100. It is to be appreciated that each conveyance may include more than one conveyor, such as for example, multiple conveyors arranged in series along the machine direction and/or arranged in parallel along the cross direction. In addition, one or more of the conveyances can be configured as a rotating drum or vacuum drum. As discussed in more detail below, the conveyances 202, 204, 205 advance pant diapers 100 in a machine direction, MD, through a tucking zone 212, represented generally by a dashed line box in Figure 4, wherein a side panel tucker pushes the side panels 104 and 106 into the chassis 102.

As shown in Figure 4, pant diapers 100 are received between the first conveyance 202 and the second conveyance 204. It is to be appreciated that the pant diapers 100 may be subjected to various methods and apparatuses of assembly and construction before being received by conveyances 202, 204. Examples of such upstream processes and apparatuses are disclosed in U.S. Patent Nos. 5,779,831; 6,036,805: 6,113,717; 6,497,032; 7,175,584; 7,322,925; and 7,335,150 and U.S. Patent Publication Nos. 2008/0083489A1; 2009/0098995A1; and 2009/0094941A1. As previously mentioned, the first conveyance 202 and second conveyance 204 may exert vacuum forces on the chassis 102 of the pant diaper 100 as the first and second conveyances 202, 204 advance the pant diaper in the machine direction, MD. For example, as shown in Figure 4, the belts 206 of the first conveyance 202 and the second conveyance 204 exert opposing vacuum forces on the outer surfaces 134 of the first waist region 112 and the second waist region 114. The belts 206 of the first conveyance 202 and the second conveyance 204 may also diverge from each other along at least a portion of the machine direction length of the conveyance 204. Thus, as the chassis 102 advances along the machine direction, the opposing vacuum forces exerted on the first and second waist regions of the chassis pull and hold the inner surfaces 132 of the first and second waist regions 112, 114 apart from each other.

Figure 5 shows a cross-sectional view of the pant diaper 100 and first and second conveyances 202, 204 of Figure 4 taken along line 5-5. As shown in Figure 5, the belt 206 of the first vacuum conveyance 202 includes a vacuum zone 214 that exerts a downward vacuum force on the outer surface 134 of the first waist region 112 of the chassis 102. And the belt 206 of the second vacuum conveyance 204 includes a vacuum zone 214 that exerts an upward vacuum force

on the outer surface 134 of the second waist region 114 of the chassis 102. As such, the opposing forces exerted by the vacuum zones 214 on chassis 102 hold the inner surfaces 132 of the first and second waist regions 112 and 114 apart. In addition, the side panels 104 and 106 are shown in Figure 5 in a relatively elongated and untucked configuration prior to the side panel tucker.

As shown in Figure 5, the vacuum zones 214 of the first and second conveyances 202, 204 each define a lateral or cross directional, CD, width ZW that are less than the lateral width CW defined by the opposing longitudinal edges 146 and 148 of the absorbent core 142. As such, the lateral or cross directional, CD, width ZW of the vacuum zones 214 may also be less than the lateral width defined by the opposing longitudinal edges 120 and 122 of the chassis 102. It is to be appreciated that the vacuum zones may be configured with different lateral widths and may define lateral widths that are larger or smaller than what is depicted. For example, some embodiments may include vacuum zones having lateral widths that are equal to or substantially equal to the lateral widths of the absorbent core and/or chassis. In addition, the conveyances may also be configured with more than one vacuum zone along the cross direction CD and/or machine direction MD.

As previously mentioned with reference to Figure 4, as the pant diaper 100 advances in the machine direction through the tucking zone 212, a side panel tucker 216 pushes the side panels 104 and 106 into the chassis 102, such as shown for example in Figure 6. As the side panels 104 and 106 are pushed into the chassis 102, the inner surfaces 132 of the first waist region 112 and the second waist region 114 may move toward each other. Tucking the side panels 104 and 106 into the chassis 102 creates longitudinal fold lines 150 and 152 in the chassis 102. In the configuration shown in Figure 6, the longitudinal fold lines 150 and 152 also coincide with and are defined by the longitudinal side edges 146 and 148 of the absorbent core 142. It is to be appreciated that the longitudinal fold lines 150 and 152 may be created in various different locations depending on the absorbent article configuration and/or tucking method. It should be appreciated that in some configurations, one or both the opposing vacuum forces exerted by the first and second conveyance 202 and 204 may be removed from the chassis while the side panel tucker pushes the side panels 104 and 106 into the chassis 102. Such a configuration is described for example in U.S. Published Patent Application No. 2011-0251038, entitled "Methods and Apparatuses for Tucking Side Panels of Absorbent Articles," and filed on March 18, 2011.

It is to be appreciated that side panel tuckers 216 may be configured in various different ways. For example, as shown in Figure 7, the side panel tuckers 216 are configured as rotating

blades 218, wherein air 219 is discharged from the blades 218. As the pant diaper 100 advances in the machine direction past the side panel tuckers 216, air 219 discharged from the rotating blade or blades 218 impinges on each of the side panels 104 and 106 and pushes the side panels into the chassis 102. In another embodiment, shown in Figure 8, the side panel tuckers 216 are configured as rails 220, wherein air 219 is discharged from the rails 220. As the pant diaper 100 advances in the machine direction past the side panel tuckers 216, air 219 discharged in the cross direction, CD, from the rails 220 impinges on each of the side panels 104 and 106 and pushes the side panels into the chassis 102. As shown in Figure 8, the rails 220 also converge toward each other in the cross direction, CD.

In yet other embodiments, the side panel tuckers may be configured to intermittently discharge air to push the side panels into the chassis. For example, Figure 9 shows side panel tuckers 216 that includes a first nozzle 300 that discharges air 219 toward the first side panel 104, and a second nozzle 302 that discharges air 219 toward the second side panel. With particular reference to Figures 9 and 10, the conveyor belt 208 includes sets 305 of apertures 306 spaced laterally outside the side panels 104, 106. The sets 305 of apertures 306 are also spaced from each other along the longitudinal length, or machine direction, of the conveyor belt 208 such that the apertures are aligned along the longitudinal lengths of the side panels 104, 106. As shown in Figure 10, pressurized air 304 travels upward through apertures 306 in the conveyor belt 208. As the conveyor belt 208 travels in the machine direction MD under the nozzles 300, 302, the pressurized air 304 is channeled through the nozzles 300, 302 and the air 219 is discharge from the nozzles 300, 302 toward the side panels 104, 106 while side panels move past the nozzles. Air 219 discharged from the nozzles 300, 302 push the side panels 104, 106 into the chassis 102. As the conveyor belt apertures 306 advance past the nozzles 300, 302, air is no longer discharged from the nozzles, until the next group 305 of apertures 306 passes under the nozzles 300, 302. Although each group 305 is shown to include 3 apertures 306, it is to be appreciated that a group 305 may include more or less than 3 apertures 306. Thus, air is intermittently discharge from the nozzles 300, 302 as the apertures 306 in the conveyor 208 pass under the nozzles. It should also be appreciated that the side panel tuckers may be configured as one of the aforementioned devices that also intermittently discharges air to push the side panels into the chassis as the side panels advance past the side panel tuckers.

In yet other embodiments, the side panel tucker may be configured to move along with the side panels in the machine direction while discharging air to push the side panels into the chassis. For example, Figure 11 shows side panel tuckers 216 that include nozzles 400 connected with a

conveyor configured as an endless belt 402. The belt 402 carries the nozzles 400 in the machine direction along side the side panels 104, 106. The nozzles may be configured to discharge air 219 toward the side panels 104, 106 to push the side panels into the chassis 102. The nozzles 400 may also be configured to discharge air 219 only when the nozzles are in relatively close proximity to the side panels 104, 106. In addition, as shown in Figure 11, the belt 402 may also be configured to move the nozzles 400 in the cross direction and closer to the side panels 104, 106 as the nozzles advance with the side panels 104, 106 in the machine direction.

Referring back to Figure 4, once the side panels 104 and 106 are pushed into the chassis 102, the pant diaper 100 may continue to advance on the first conveyance 202 in the machine direction. The waist regions 112, 114 of the pant diaper 100 may also be further compressed together to help hold the side panels 104 and 106 in the tucked position. For example, as shown in Figure 4, after the tucking zone 212, the pant diapers 100 advance between the first conveyance 202 and the third conveyance 205. The belts 206 of the first conveyance 202 and the third conveyance 205 may be spaced closer together than the first conveyance 202 and second conveyance 204, or the belts 206 may converge toward each other as the pant diaper 100 travels in the machine direction.

In still other embodiments, the side panel tucker may be configured with conveyors that do not utilized vacuum forces to hold the first and second waist regions apart while the side panels are tucked into the chassis. For example, Figure 12 shows pant diapers 100 received from a folding apparatus 500, such as described for example in U.S. Patent Nos. 5,779,831. It is to be appreciated that the folding apparatus 500 of Figure 12 could also be configured as apparatuses disclosed in 6,036,805; 6,113,717; 6,497,032; 7,175,584; 7,322,925; and 7,335,150 and U.S. Patent Publication Nos. 2008/0083489A1; 2009/0098995A1; and 2009/0094941A1. As shown in Figure 12, pant diapers 100 on the folding apparatus 500 are received between a first conveyor 502 and a second conveyor 504, each in the form of belt conveyors. Instead of utilizing vacuums to hold the diapers 100, the first conveyor includes clamps 506 that engage diapers and hold the diapers to the first conveyor 502. The diapers 100 pass through a tucking zone 508, represented generally by a dashed line oval in Figure 12, wherein a side panel tucker, such as the embodiments described above, pushes the side panels into the chassis 102. After the tucking zone, the clamps 506 may be configured to release the diaper 100. It is to be appreciated that various configurations of clamps 506 may be used. Figures 12A and 12B show an example configuration of conveyor 502 including clamps 506. Figure 12A shows the clamps 506 in a closed position, and Figure 12B shows the clamps in an open position. As shown in Figures 12A

and 12B, the clamps 506 may rotate inwardly toward each other to a closed position along the belt of the conveyor 502 when engaging and holding a diaper. The clamps 506 may also rotate outwardly away from each other to an open position along the belt of the conveyor 502 when releasing a diaper.

It is to be appreciated that although the conveyors 502, 504 of Figure 12 do not use vacuum forces to hold the chassis, one or both the conveyors may be configured with vacuum zones as described above. It is to be appreciated that various configurations of side panel tuckers could be utilized with the conveyor clamping arrangement shown in Figure 12, such as described above and in U.S. Published Patent Application No. 2011-0251038, entitled "Methods and Apparatuses for Tucking Side Panels of Absorbent Articles," and filed on March 18, 2011, as well as U.S. Patent Nos. 6,723,035 and 6,776,316.

The dimensions and values disclosed herein are not to be understood as being strictly limited to the exact numerical values recited. Instead, unless otherwise specified, each such dimension is intended to mean both the recited value and a functionally equivalent range surrounding that value. For example, a dimension disclosed as "40 mm" is intended to mean "about 40 mm."

The citation of any document, including any cross referenced or related patent or application, is not an admission that it is prior art with respect to any invention disclosed or claimed herein or that it alone, or in any combination with any other reference or references, teaches, suggests or discloses any such invention. Further, to the extent that any meaning or definition of a term in this document conflicts with any meaning or definition of the same term in a document cited herein, the meaning or definition assigned to that term in this document shall govern.

While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the invention described herein.

What is claimed is:

1. A method for tucking first and second opposing side panels into a chassis of a pant diaper, the chassis including an absorbent core having opposing longitudinal side edges defining a lateral width, the chassis further including an inner surface and an outer surface, the chassis having longitudinally opposing first and second waist regions, longitudinally opposing first and second waist end edges disposed in the first and second waist regions adjacent to the respective waist end edges, a crotch region longitudinally intermediate of the first and second waist regions, the first and second side panels connecting the first waist region with the second waist region to form a waist opening and a pair of leg openings, the method comprising the steps of:

positioning the chassis between a first conveyor having a first vacuum zone and a second conveyor having a second vacuum zone;

applying a first vacuum force from the first vacuum zone to the first waist region and applying a second vacuum force from the second vacuum zone to the second waist region, wherein the first vacuum zone and the second vacuum zone each define lateral widths that are smaller than the lateral width of the absorbent core;

holding the first waist region of the chassis apart from the second waist region of the chassis using opposing vacuum forces from the first and second vacuum zones;

advancing the chassis in a machine direction with the first and second conveyors; and

discharging air against the first and second panels to push the first side panel and the second side panel a distance laterally inward toward each other; and

creating longitudinal folds in the chassis at the outer longitudinal edges of the absorbent core.

2. The method of claim 1, further comprising the step of moving the first side panel in the machine direction along a first stationary rail and moving the second side panel in the machine direction along a second stationary rail.

3. The method of claim 2, wherein the step of discharging air further comprises discharging air from the first stationary rail against the first side panel and from second stationary rail against the second side panel.

4. The method of claim 1, further comprising the step of moving the first side panel in the machine direction along a first rotating tucker blade and moving the second side panel in the machine direction along a second rotating tucker blade.

5. The method of claim 4, wherein the step of discharging air further comprises discharging air from the first rotating tucker blade against the first side panel and from second rotating tucker blade against the second side panel.

6. The method of claim 1, wherein the step of discharging air further comprises discharging air from either the first conveyor or the second conveyor and intermittently channeling the air discharged from either the first conveyor or the second conveyor against the first side panel and the second side panel.

7. The method of claim 1, further comprising the step of moving a first air nozzle in the machine direction adjacent the first side panel and moving a second air nozzle in the machine direction adjacent the second side panel, and wherein the step of discharging air further comprises intermittently discharging air from the first air nozzle against the first side panel and from the second air nozzle against the second side panel.

8. The method of claim 7, further comprising the step of moving the first air nozzle in a cross direction toward the first side panel and moving the second air nozzle in the cross direction toward the second side panel.

9. The method of claim 1, further comprising the step of removing the first vacuum force from the first waist region and removing the second vacuum force from the second waist region and creating longitudinal folds in the chassis while the first vacuum force and the second vacuum force are removed from the first and second waist regions.

10. The method of claim 1, further comprising the step of moving the inner surface of the chassis in the first waist region and the second waist region toward each other while creating longitudinal folds in the chassis.

11. The method of claim 1, wherein the first conveyor comprises an endless belt.

12. The method of claim 1, wherein the first and second side panels refastenably connect the first waist region with the second waist region.

13. A method for tucking first and second opposing side panels into a chassis of a pant diaper, the chassis including an absorbent core having opposing longitudinal side edges defining a lateral width, the chassis further including an inner surface and an outer surface, the chassis having longitudinally opposing first and second waist regions, longitudinally opposing first and second waist end edges disposed in the first and second waist regions adjacent to the respective waist end edges, a crotch region longitudinally intermediate of the first and second waist regions, the first and second side panels connecting the first waist region with the second waist region to form a waist opening and a pair of leg openings, the method comprising the steps of:

positioning the chassis between a first conveyor and a second conveyor;

applying a holding force to the chassis;

holding the chassis on the first conveyor using holding force;

advancing the chassis in a machine direction with the first conveyor;

discharging air against the first and second panels to push the first side panel and the second side panel a distance laterally inward toward each other; and

creating longitudinal folds in the chassis at the outer longitudinal edges of the absorbent core.

14. The method of claim 13, wherein the step of applying a holding force to the chassis further comprises applying a vacuum force from the vacuum zone to the first waist region of the chassis, wherein the vacuum zone defines a lateral width that is smaller than the lateral width of the absorbent core.

15. The method of claim 13, wherein first conveyor comprises clamp members, and wherein the step of applying a holding force to the chassis further comprises engaging the clamp members with the chassis.

16. The method of claim 13, further comprising the step of moving the first side panel in the machine direction along a first stationary rail and moving the second side panel in the machine direction along a second stationary rail.

17. The method of claim 13, wherein the step of discharging air further comprises discharging air from either the first conveyor or the second conveyor and intermittently channeling the air discharged from either the first conveyor or the second conveyor against the first side panel and the second side panel.

18. The method of claim 13, further comprising the step of moving a first air nozzle in the machine direction adjacent the first side panel and moving a second air nozzle in the machine direction adjacent the second side panel, and wherein the step of discharging air further comprises intermittently discharging air from the first air nozzle against the first side panel and from the second air nozzle against the second side panel.

19. The method of claim 18, further comprising the step of moving the first air nozzle in a cross direction toward the first side panel and moving the second air nozzle in the cross direction toward the second side panel.

20. The method of claim 13, further comprising the step of moving the inner surface of the chassis in the first waist region and the second waist region toward each other while discharging air.

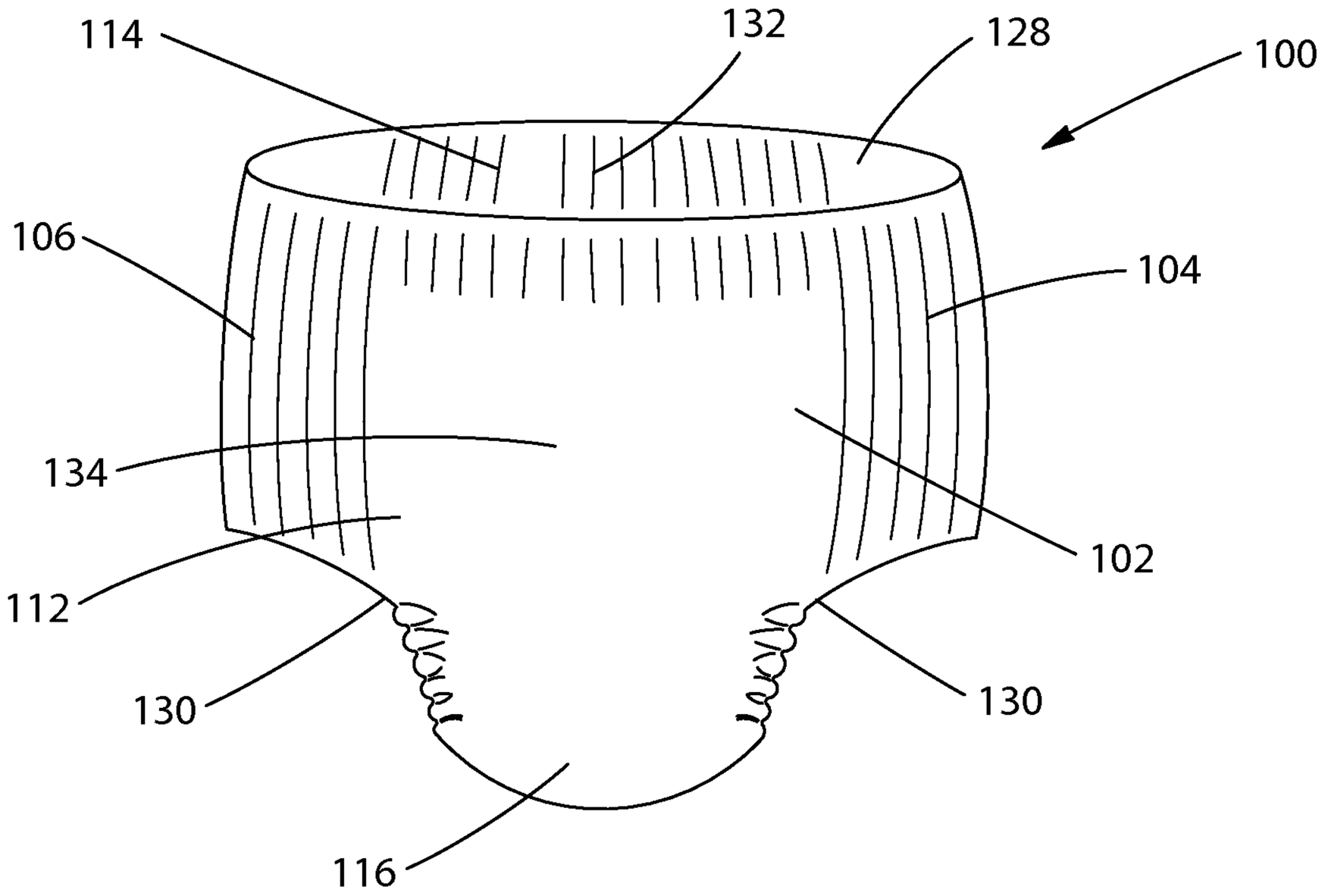

Fig. 1

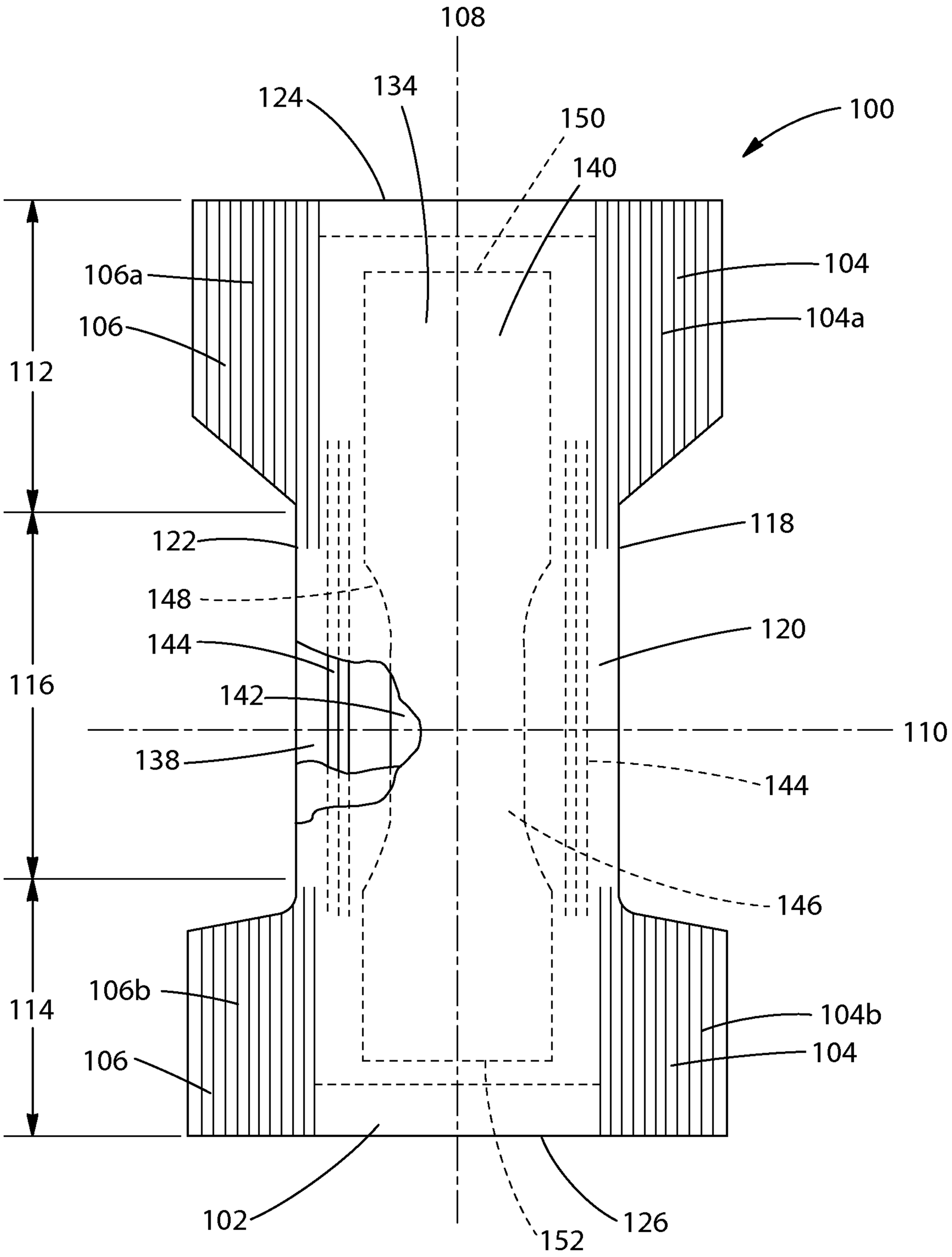
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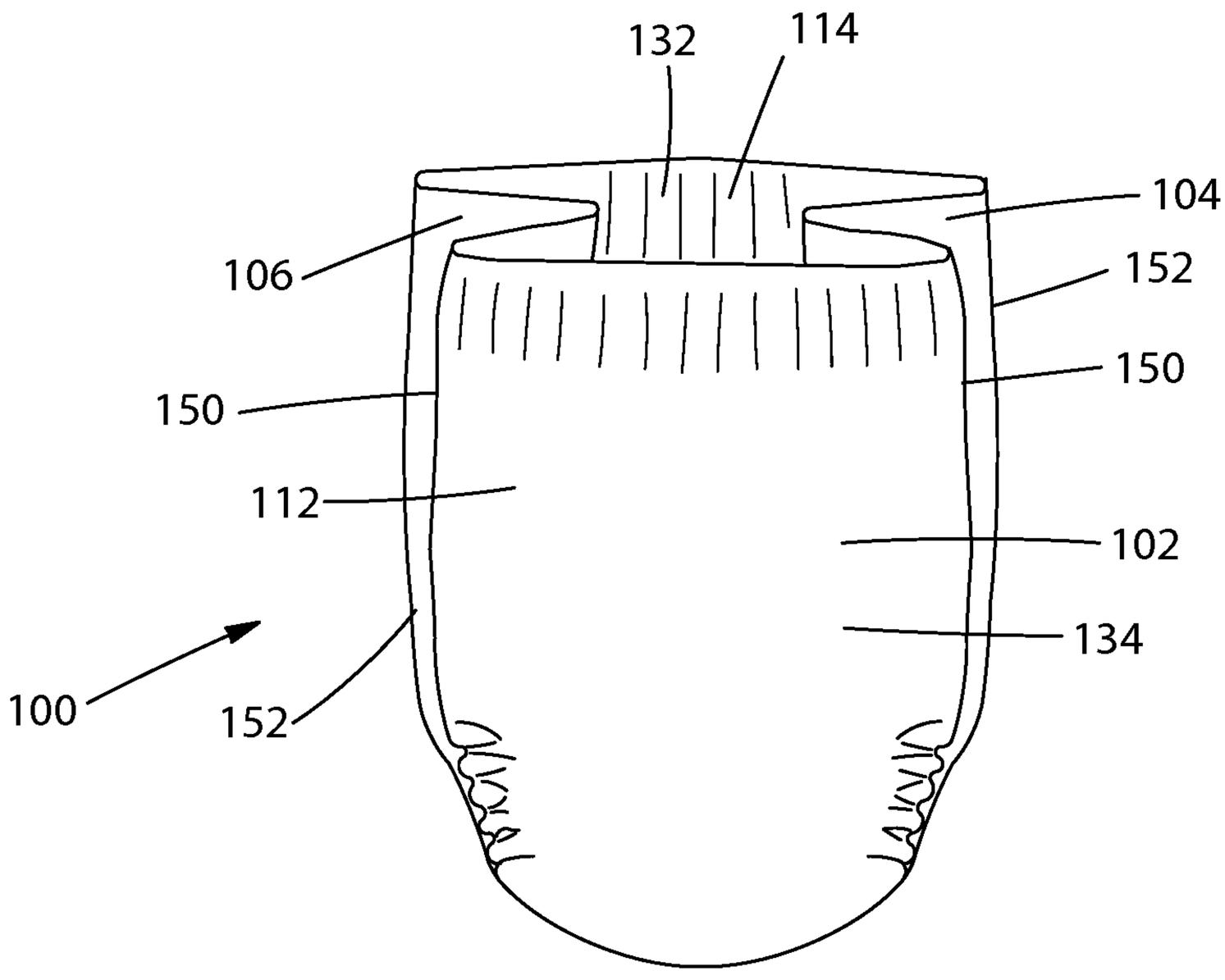
Fig. 2



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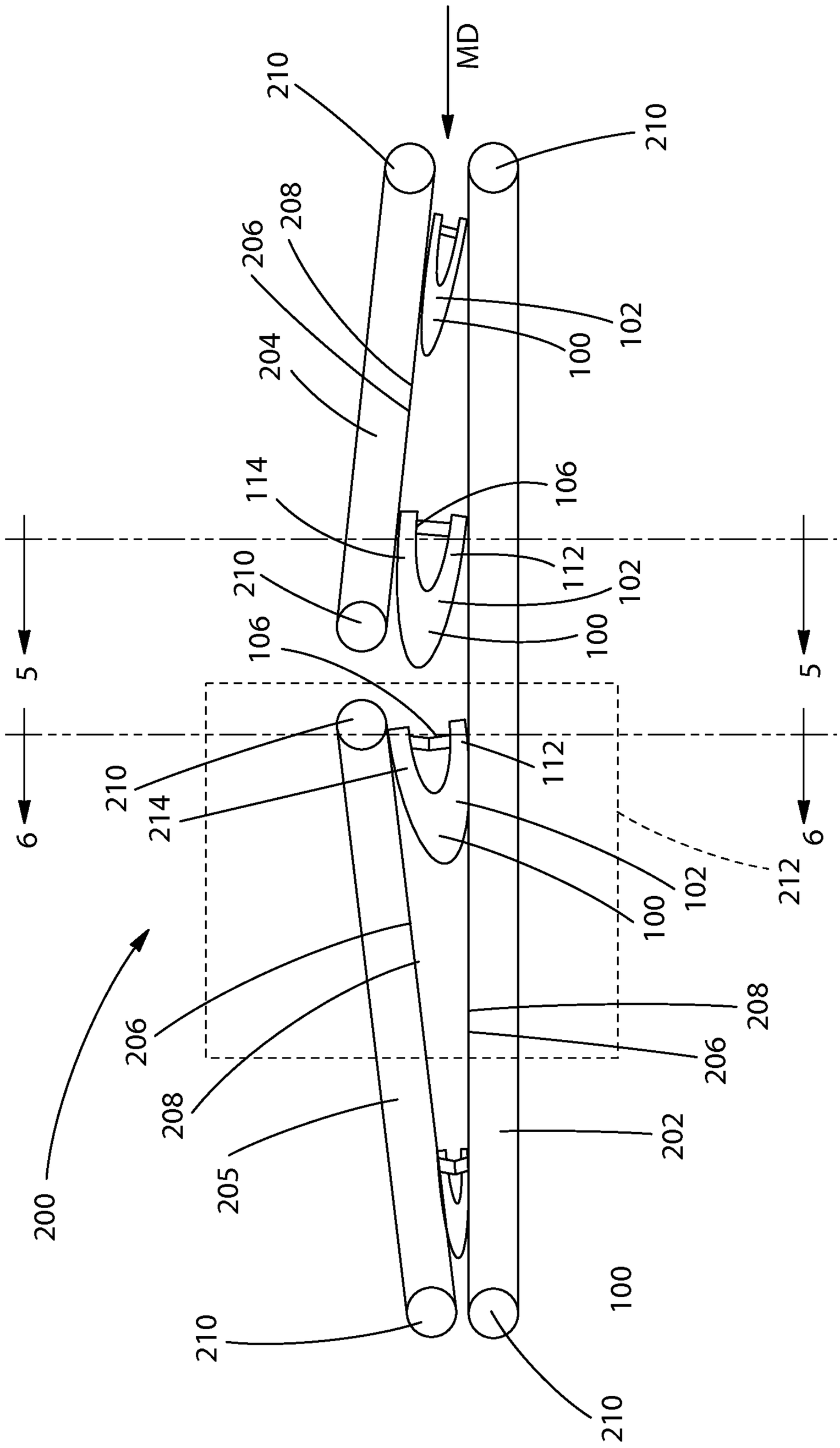
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Fig. 4

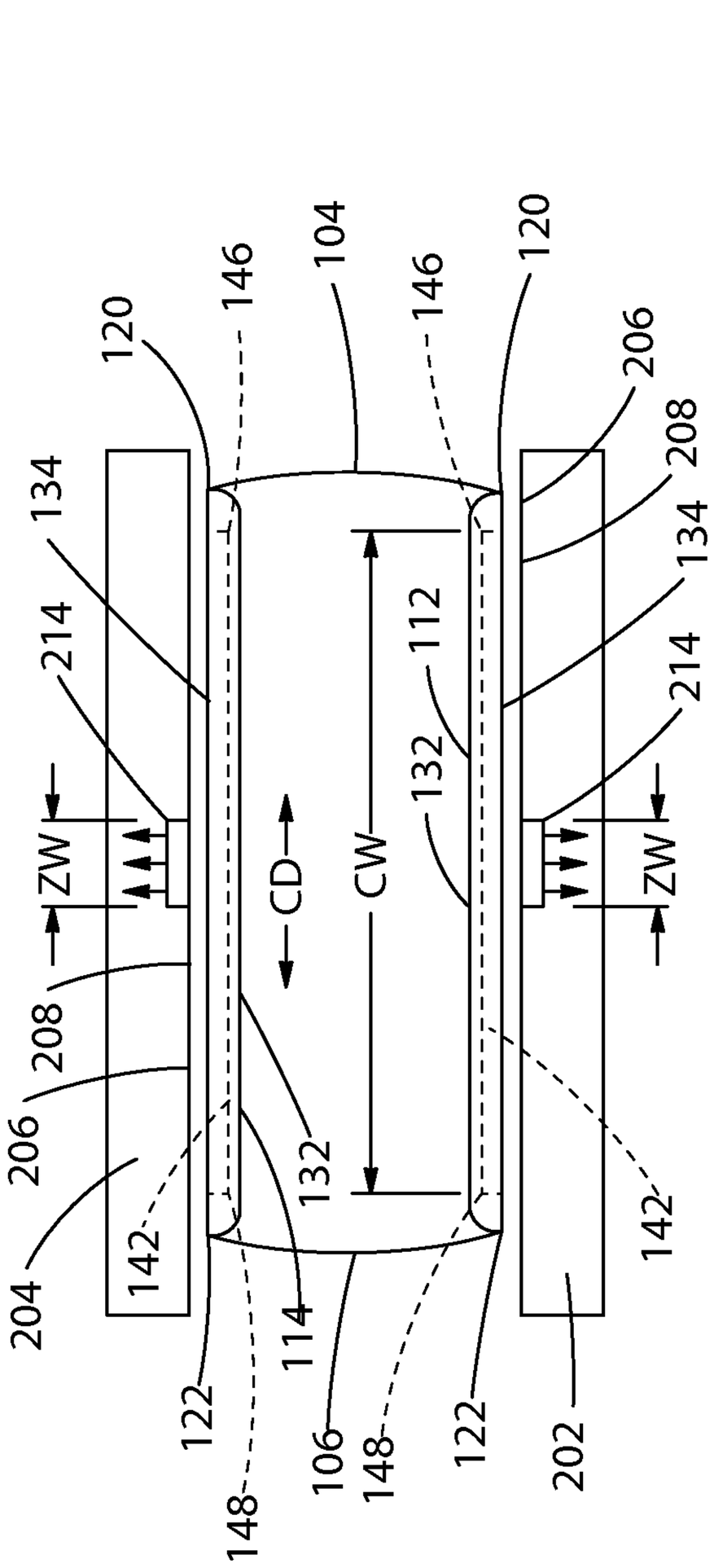
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Fig. 5

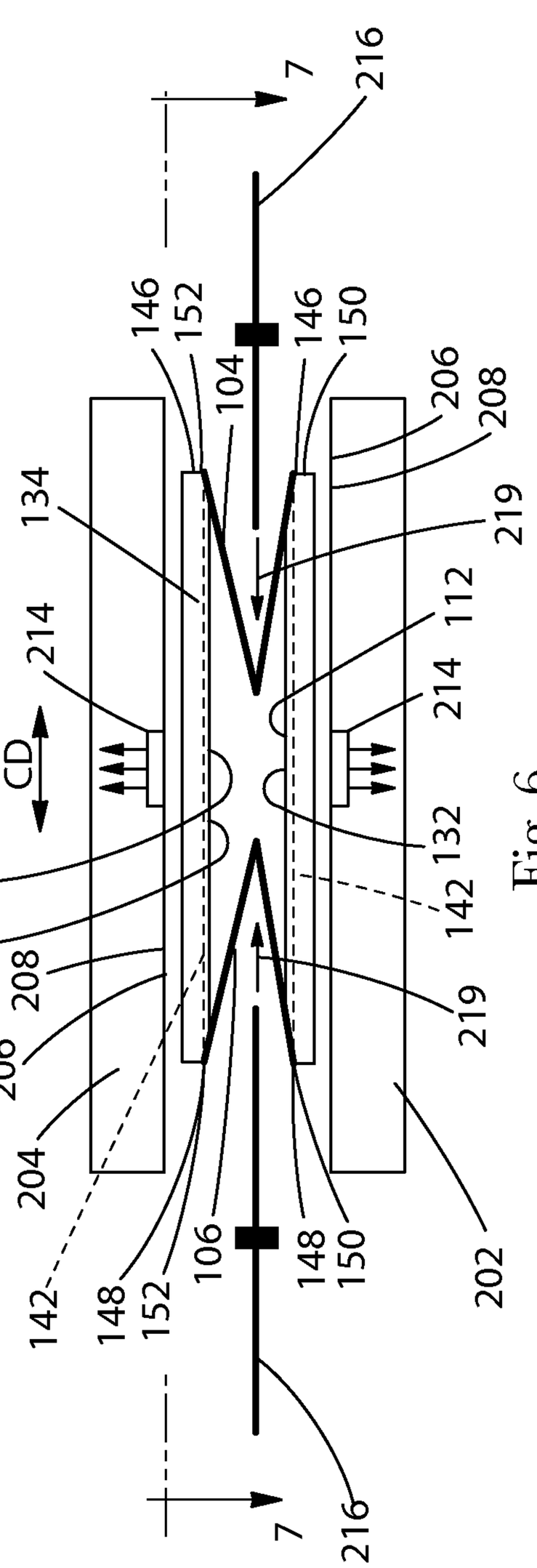
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Fig. 6

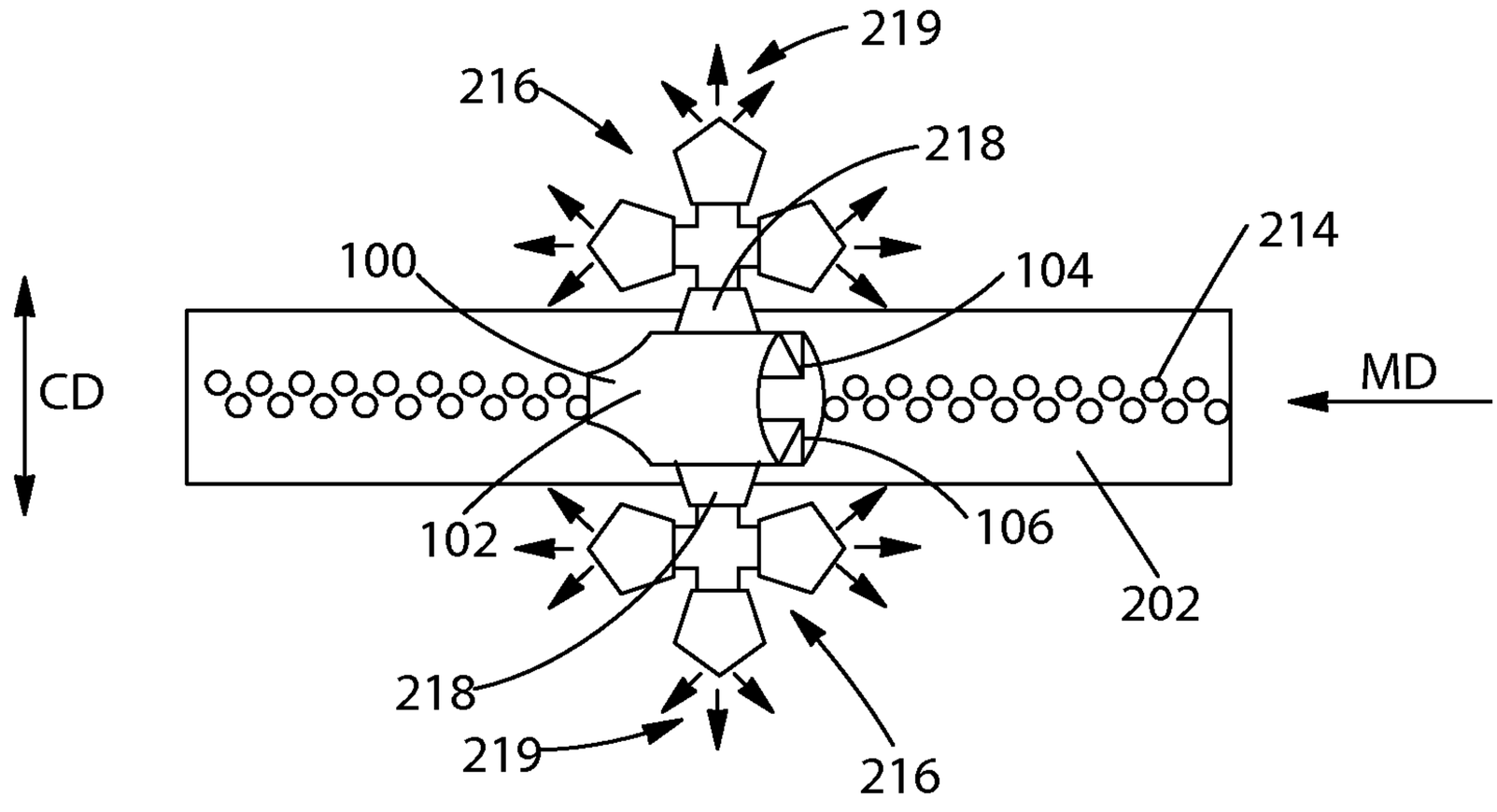
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Fig. 7

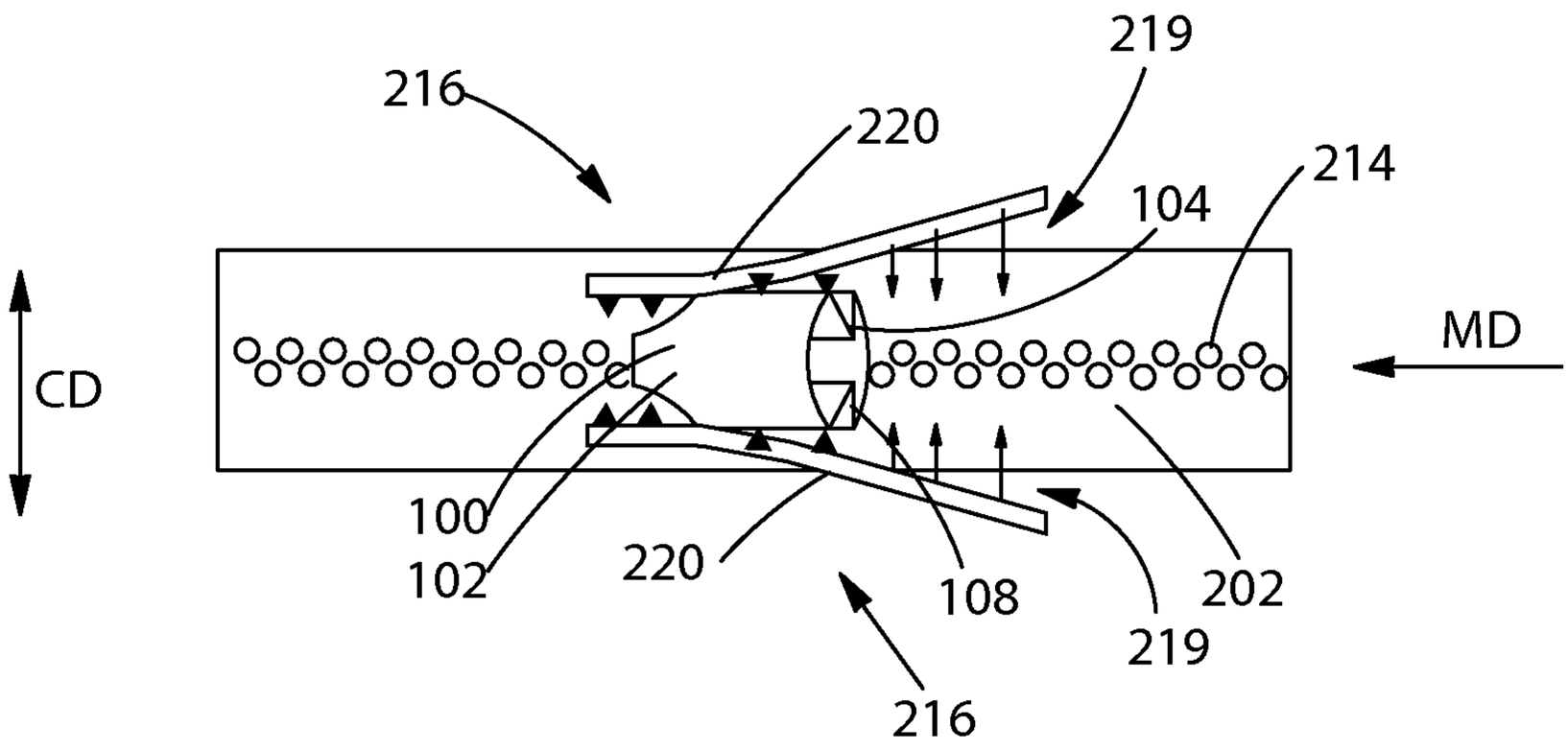
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Fig. 8

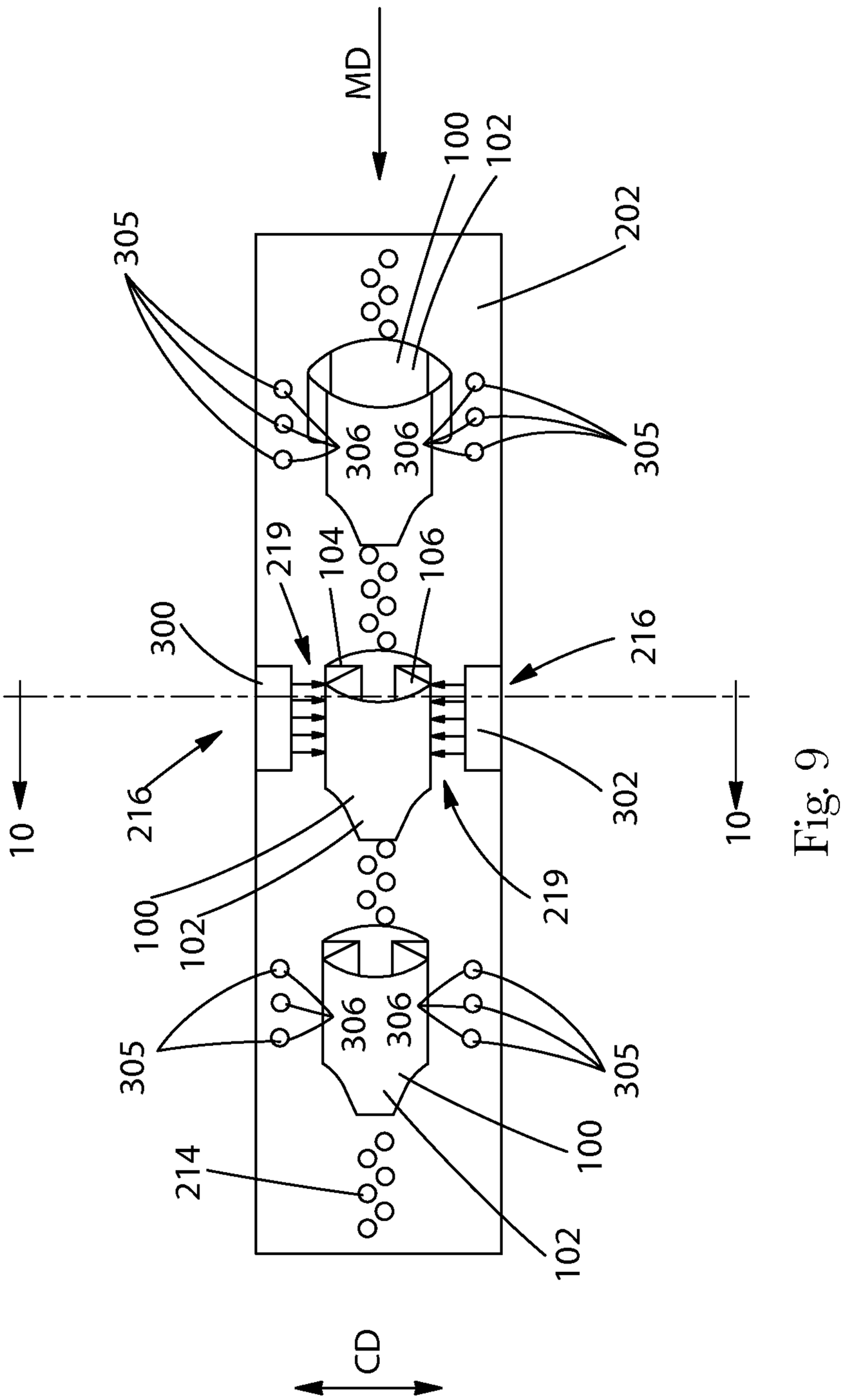
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Fig. 9

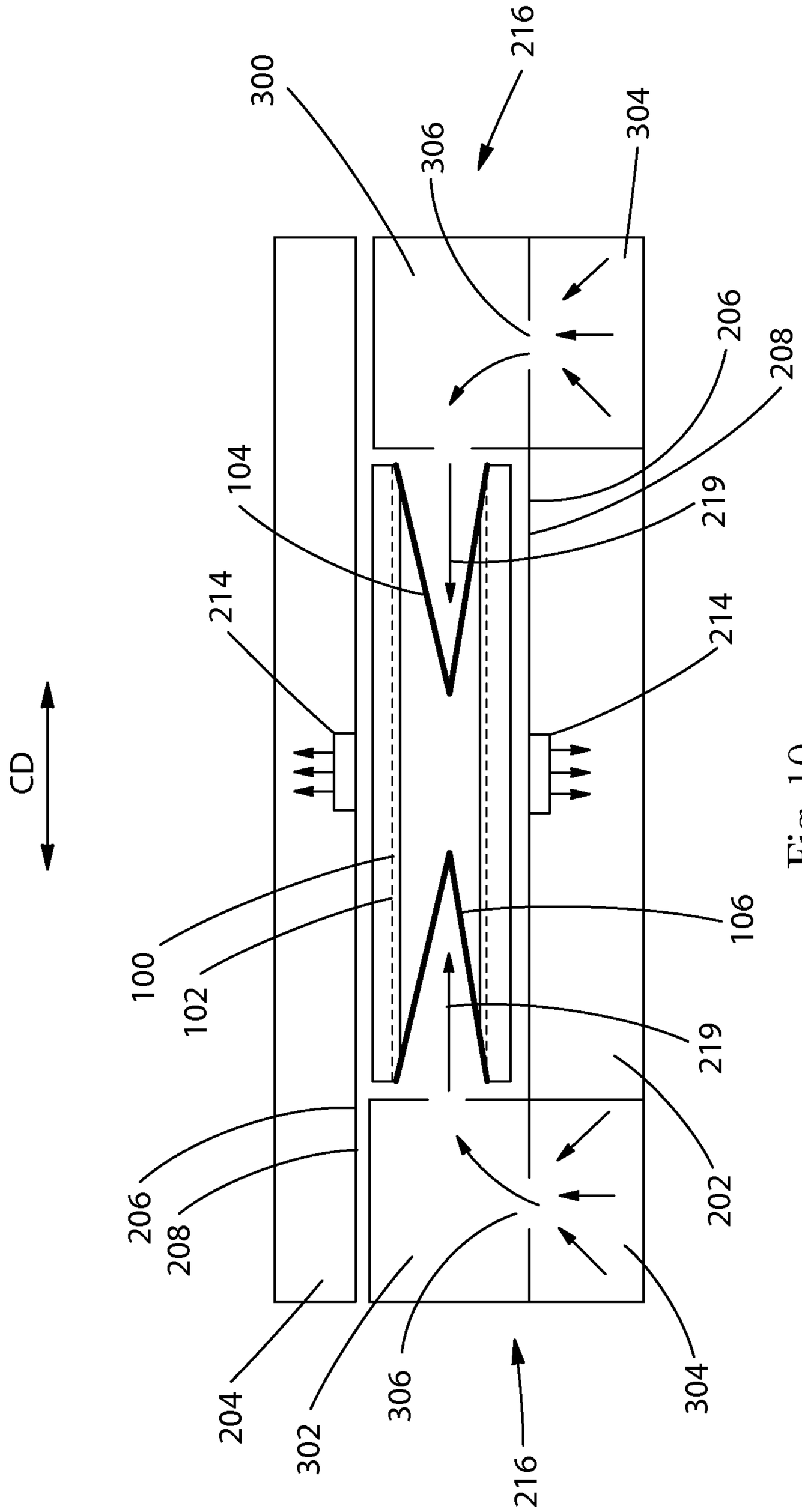
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Fig. 10

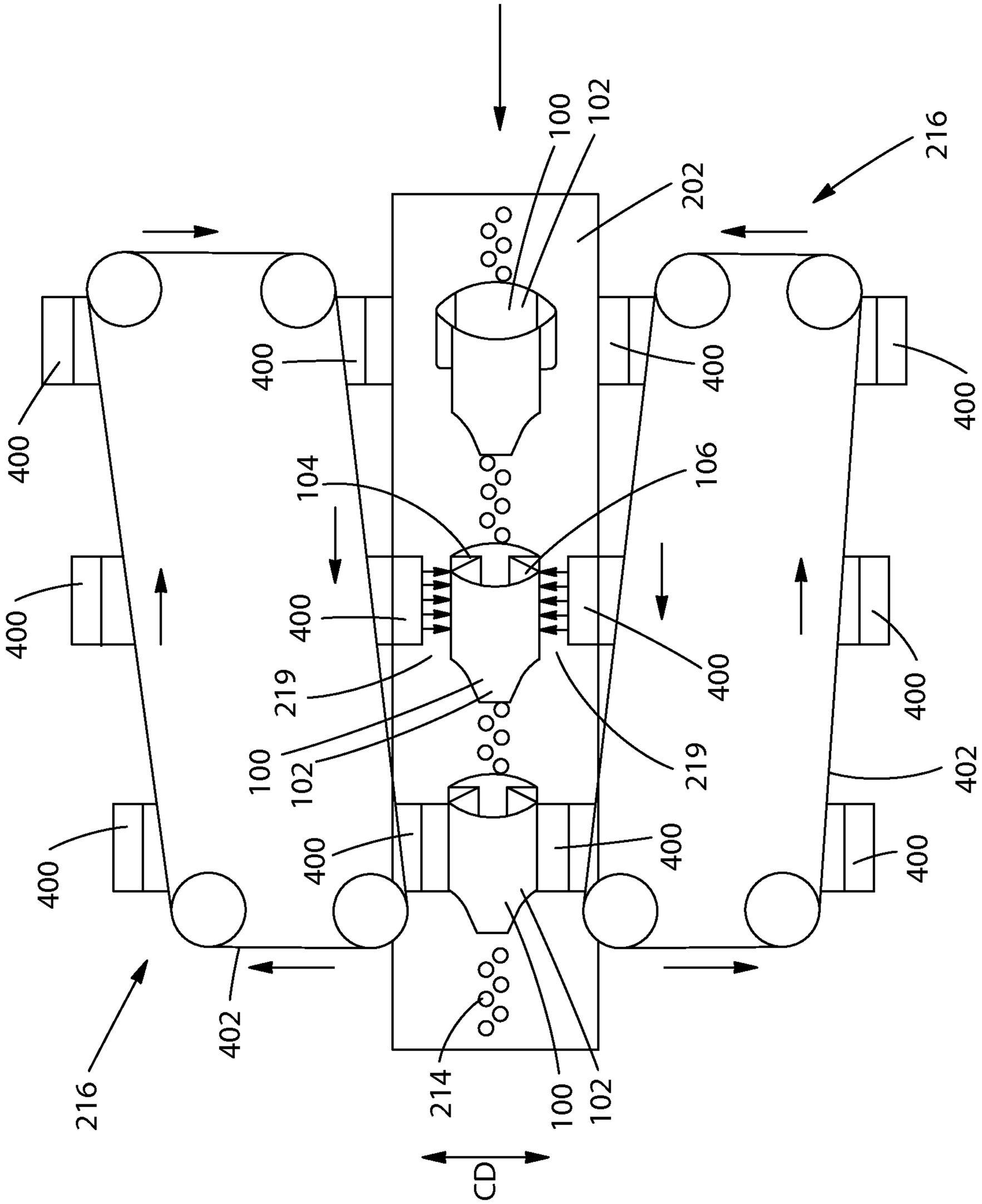

Fig. 11

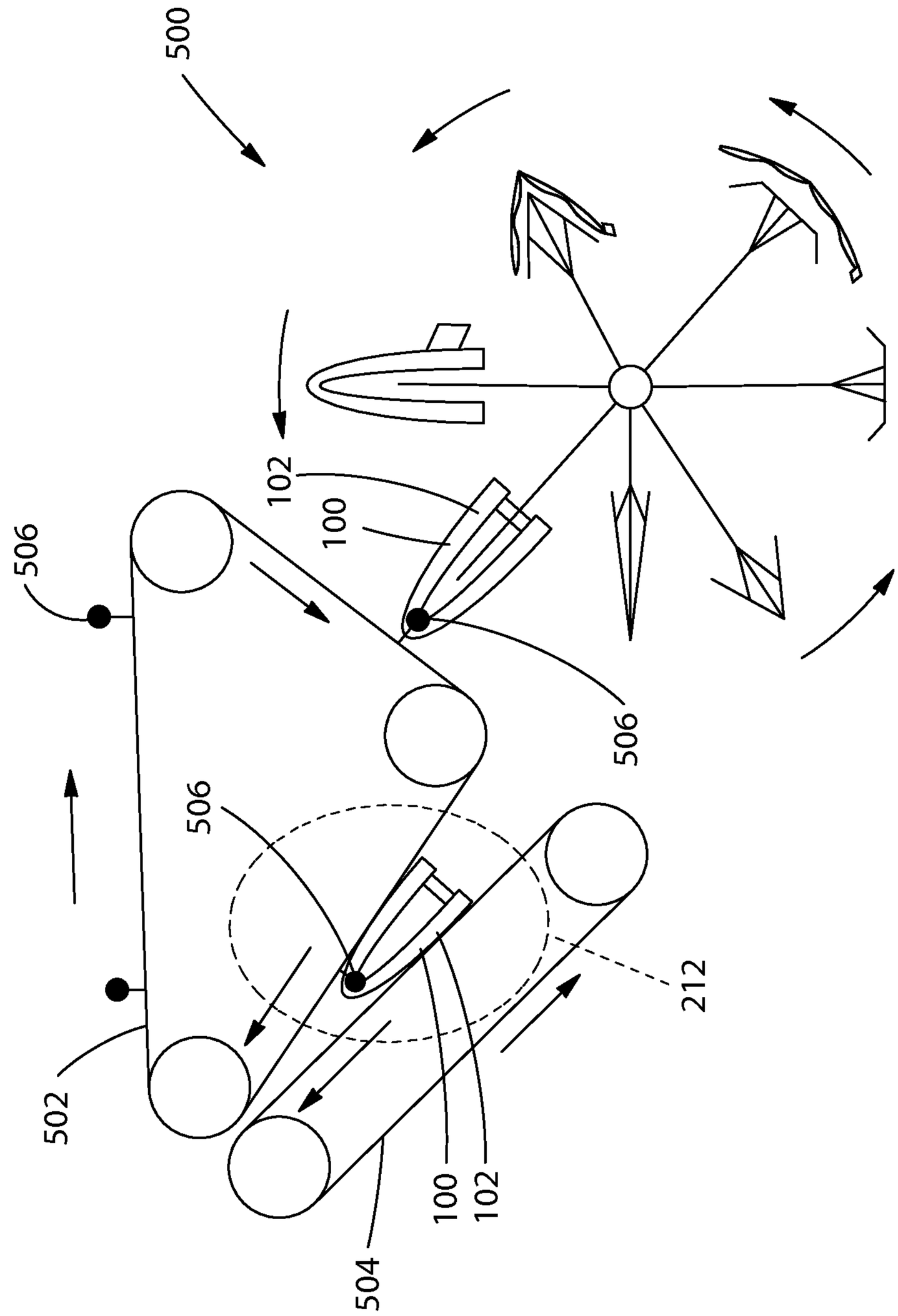

Fig. 12

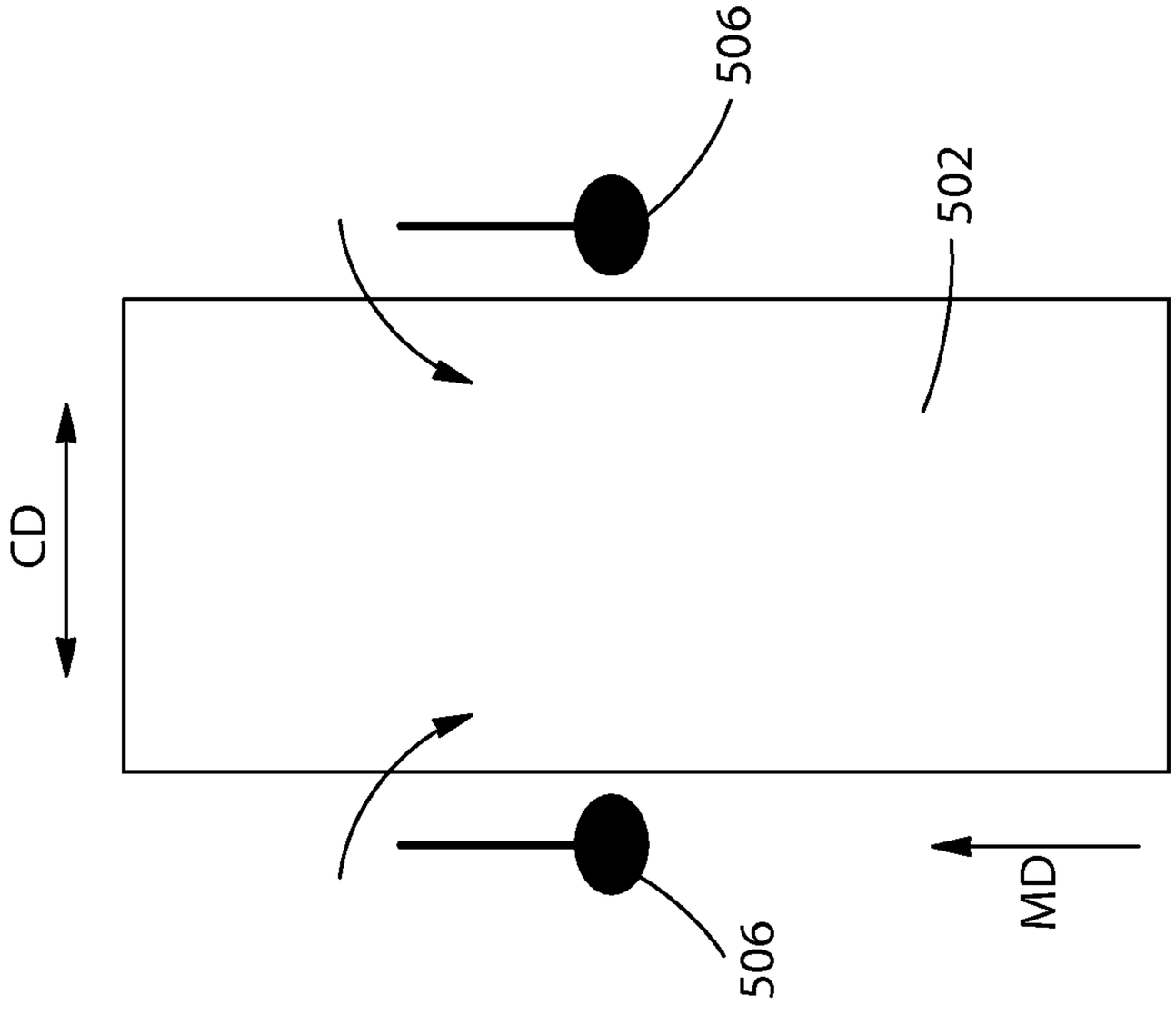

Fig. 12B

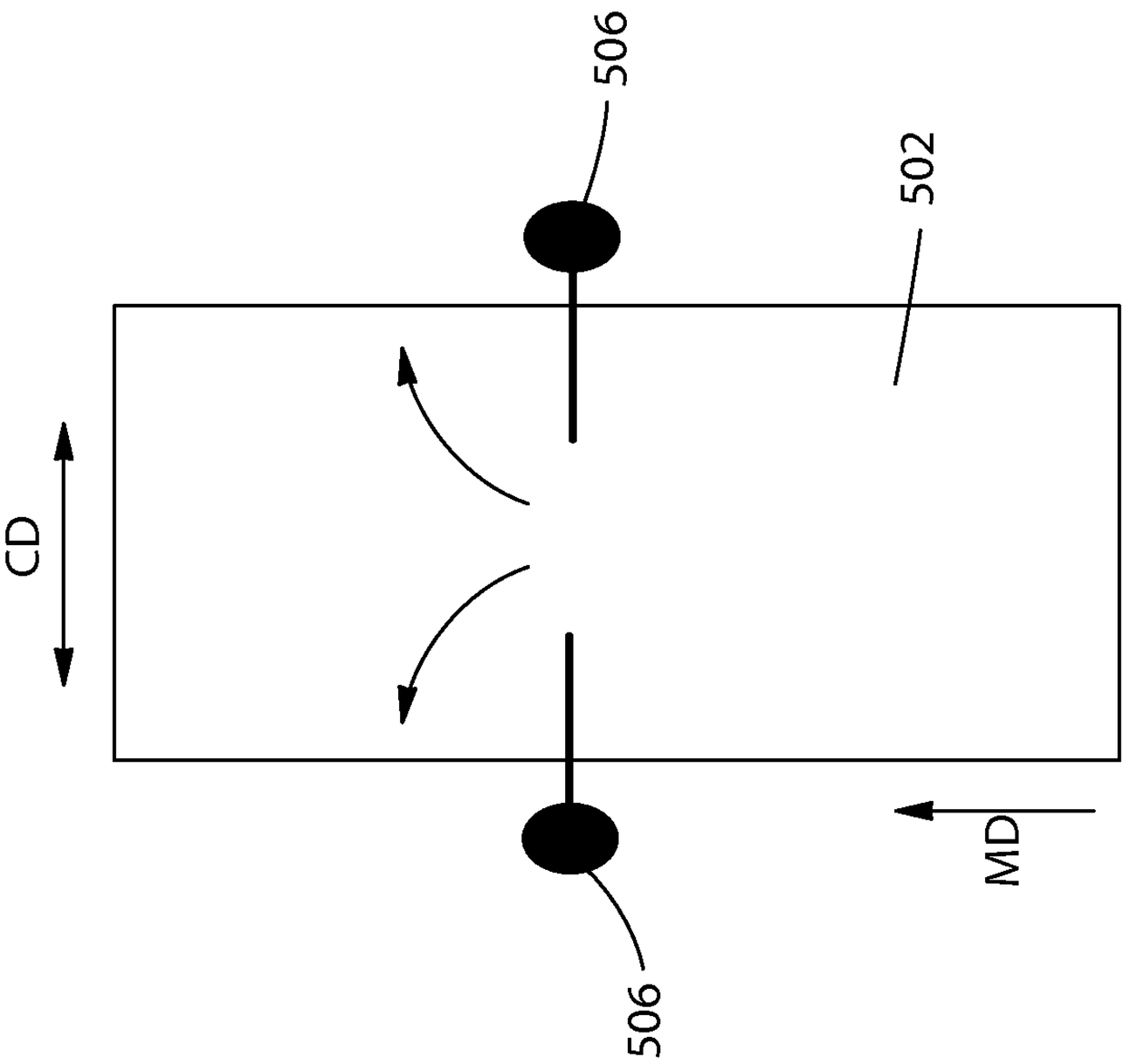

Fig. 12A

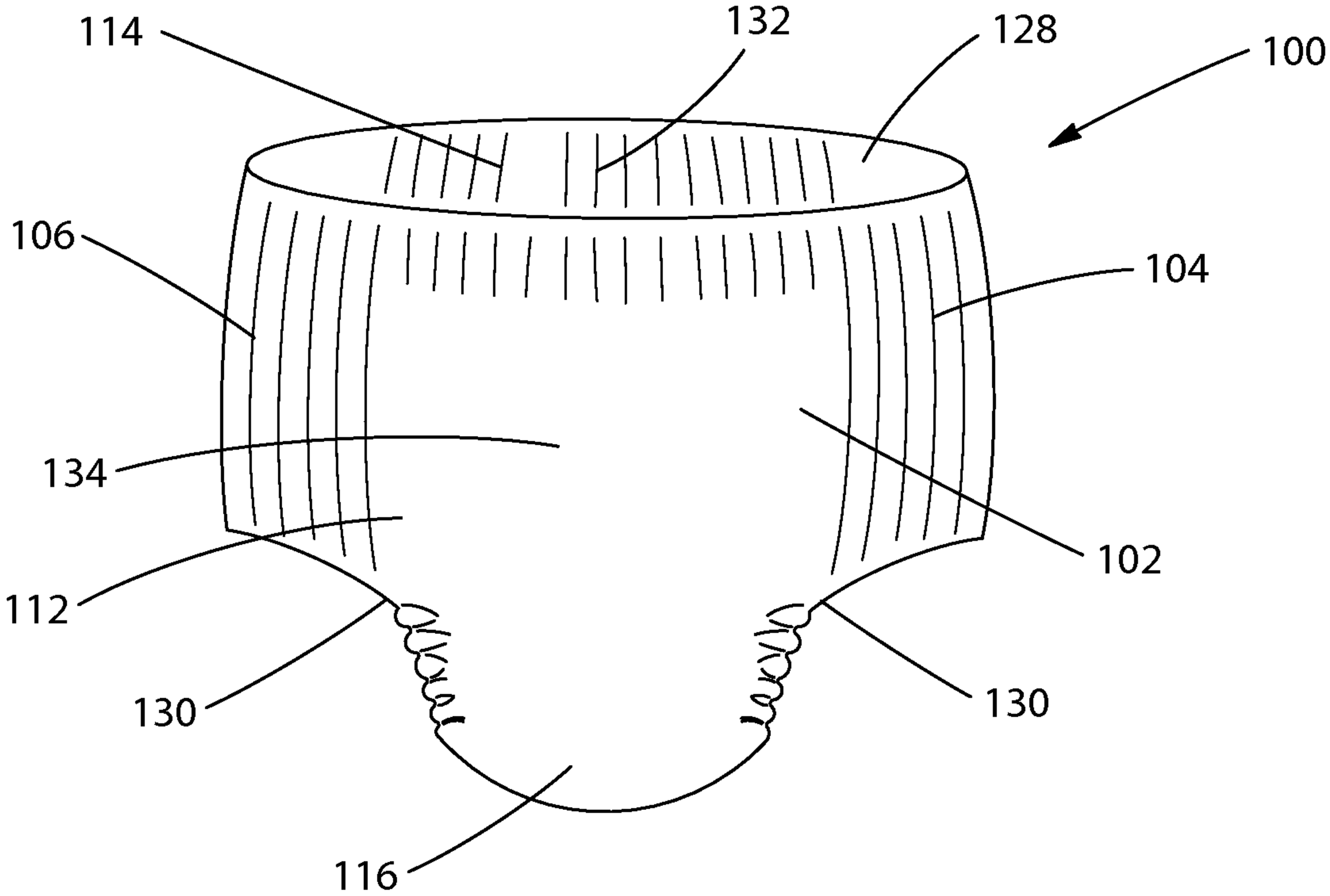

Fig. 1